Damariscotta Lake Watershed Protection Plan | 2015

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DAMARISCOTTA LAKE WATERSHED ASSOCIATION

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ACRONYMS USED

BMP – Best Management Practice
DLWA – Damariscotta Lake Watershed Association
EPA – U.S. Environmental Protection Agency
KLSWCD – Knox-Lincoln Soil and Water Conservation District
MDACF – Maine Department of Agriculture, Conservation and Forestry
MDEP – Maine Department of Environmental Protection
MDIFW – Maine Department of Inland Fisheries and Wildlife
MDOT – Maine Department of Transportation
MVLMP – Maine Volunteer Lake Monitoring Program
USDA NRCS – U.S. Department of Agriculture Natural Resource Conservation Service
USFS – U.S. Forest Service
YCC – Youth Conservation Corps

WATERSHED BACKGROUND INFORMATION

Document Scope and Purpose

The purpose of this Watershed Protection Plan, herein referred to as the "Plan," is to outline a plan and strategy for Nonpoint Source (NPS) Pollution mitigation and water quality protection efforts for the Damariscotta Lake Watershed over the next five years (2015 – 2020).

This Plan was developed to satisfy national watershed planning guidelines provided by the United States Environmental Protection Agency (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. The Maine Department of Environmental Protection (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. Damariscotta Lake meets these eligibility criteria, and this Plan was written to include the EPA and MDEP required planning elements.

Information collected during the 2014 Damariscotta Lake Watershed Survey establishes the basis for much of the plan. As such, the Damariscotta Lake Watershed Survey Report is attached to this Plan as Appendix A.

Watershed Background

Damariscotta Lake is located within the towns of Jefferson, Nobleboro, and Newcastle, while the Watershed extends to the towns of Somerville, Washington, and Waldoboro (Figure 1). The Lake has an approximate surface area of 4,686 acres and the watershed encompasses 56.8 square miles. Damariscotta Lake has three true basins: Great Bay in the north, Muscongus Bay in the south-east, and the South Basin or South Arm in the south-west, which leads to the outlet of the lake. The Damariscotta Lake State Park is located on the north shore of the lake and provides public day use facilities and access to a sand beach on Damariscotta Lake.

The Maine Department of Inland Fisheries and Wildlife (MDIFW) manages Damariscotta Lake for abundant cold and warm water fisheries. Of recreational significance, the lake is home to small- and large-mouth bass, landlocked salmon, brown trout, lake trout, rainbow smelt, and an annually increasing population of sea-run alewives due to the restoration of the fish ladder at Damariscotta Mills. In 2014, over 1 million alewives were counted as reaching the lake to spawn during the spring migration. Damariscotta Lake is nearly annually stocked with landlocked salmon, lake trout, and brown trout by MDIFW.

Damariscotta Lake is infested with the invasive plant *Hydrilla verticillata* in two distinct locations. The first infestation was discovered in 2009 in a secluded 6,500 sq. ft. cove by a volunteer Invasive Plant Patroller trained by the Damariscotta Lake Watershed Association (DLWA) and the Maine Volunteer Lake Monitoring Program (MVLMP). The site is currently quarantined from the remainder of the lake with a rip-rap barrier and plant biomass is controlled with an extensive benthic barrier and hand removal when necessary. The second location was discovered in 2011 in the lake's major tributary, Davis Stream. This location is controlled with hand removal and benthic barriers. Both infestations have undergone significant reductions in *Hydrilla* biomass since being discovered.

As the largest lake in Lincoln County, the approximately 44 mile shoreline of Damariscotta Lake is moderately developed with significant recreational and economic importance to the greater Mid-Cost Maine region. There is a mixture of seasonal and year-round residences on the shoreline, two campuses of a youth summer camp, the Damariscotta Lake State Park, a privately owned

campground, as well as several rental property subdivisions. There are three active hard-surfaced and trailer accessible boat launches on the lake, only one of which is managed by MDIFW. Many privately owned and maintained roads provide access to shoreline properties on the lake. Damariscotta Lake is not used as a source for public drinking water, however, it is used as the only water source for many private, mostly seasonal, residences.

Apart from the immediate shoreline, there is relatively little concentrated development in the remainder of the watershed. Most residential development is located close to major roads which intersect the Watershed, and higher development pressure is located closer to population centers such as Damariscotta. There are multiple agricultural properties adjacent to Damariscotta Lake, as well as lands cleared in the remainder of the Watershed for agricultural production. The remainder of the Watershed is forested with significant blocks of undeveloped forest, providing opportunities for the forestry industry.

The major inlet to Damariscotta Lake is Davis Stream, which drains all of the northern extent of the Watershed including Muddy Pond in Washington. Mill Stream in Nobleboro drains into Damariscotta Lake from the only other pond in the watershed, Cooks Pond. Damariscotta Lake drains in one outlet via the Damariscotta Mills dam and fish ladder into the Great Salt Bay and Damariscotta River.

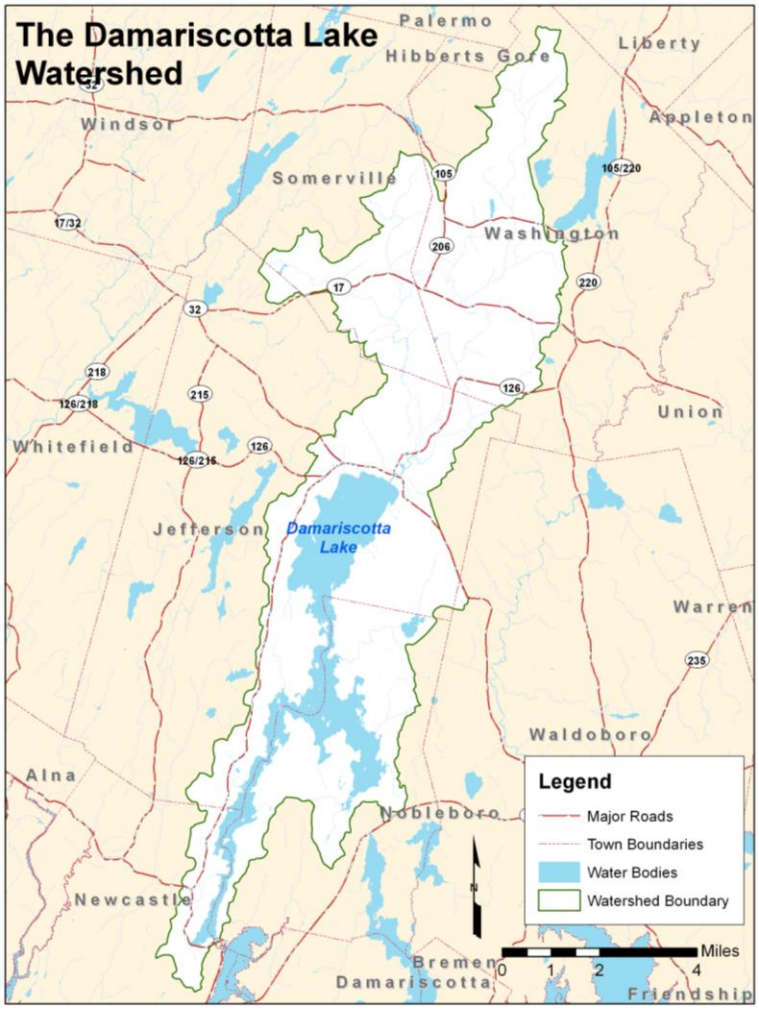

Figure 1. The Damariscotta Lake Watershed

Summary of Past Watershed Work to Address NPS Pollution

The Damariscotta Lake Watershed Association (DLWA) has been advocating for the protection of Damariscotta Lake since its inception in 1966. The first watershed survey to identify sources of NPS Pollution was conducted in 1990 by DLWA and MDEP. Approximately 14% of the watershed was surveyed again in 1992, resulting in the Damariscotta Lake Watershed Implementation Project, which was funded by the US EPA under the Clean Water Act Section 319. This project (#93-09) was completed in 1998. In the spring of 1999, the remaining ~86% of the watershed was surveyed for sources of NPS Pollution. The 1999 survey results were used to create the Damariscotta Lake Watershed Management Plan, which was funded by a Maine State Bond (project #99B-03), and was finalized in March of 2001. Using these results from 1990, 1992, and 1999, in 2001 DLWA received funding from the US EPA under the Clean Water Act Section 319 for the Damariscotta Lake Watershed Management Plan Implementation Project (#2001R-11) to implement conservation practices throughout the watershed. This Project completed 24 conservation practice cost-share projects throughout the watershed and provided landowners with technical assistance at 26 additional sites. In 2014 DLWA conducted a watershed survey of the entire Damariscotta Lake Watershed, which is the basis for this Plan. DLWA is the primary agency tasked with identifying and addressing issues related to NPS Pollution within this Watershed.

IDENTIFICATION OF THE CAUSES OR SOURCES OF THE NPS THREAT

Water Quality Summary

Water quality data has been collected on Damariscotta Lake since 1979. DLWA staff has overseen the collection of monitoring data by volunteers trained by the Maine Volunteer Lake Monitoring Program (MVLMP). Monitoring parameters include Temperature, Secchi Disk Transparency (SDT), Dissolved Oxygen (DO), Total Phosphorus (TP), and Chlorophyll-a (Chla). Limited phosphorus data was collected in 1977. In 2014, DLWA received a grant from the Maine Outdoor Heritage Fund to allow DLWA to conduct Phosphorus and Chrolophyll-a data, as well as other water quality indicators, which was previously outsourced to contractors. As Damariscotta Lake consists of three true basins, MDEP reports water quality indicators individually for each of the three basins. The MDEP summary of the water quality for each basin of Damariscotta Lake is as follows:

Sample Station #1 (Northern Basin – Great Bay)

In summary, the water quality of Station #1 in Damariscotta Lake is considered above average based on measures of SDT, total phosphorus (TP), and Chlorophyll-a (Chla). The potential for nuisance algal blooms on Damariscotta Lake is low. Damariscotta Lake is a non-colored lake (average color 18 SPU) with an average SDT of 5.2 m (17.4 ft). The range of water column TP for Damariscotta Lake is 7 - 14 parts per billion (ppb) with an average of 9 ppb. Chla ranges from 0.7 - 7.9 ppb with an average of 4.7 ppb. Recent dissolved oxygen (DO) profiles show moderate DO depletion in deep areas of the lake. The potential for phosphorus to leave the bottom sediments and become available to algae in the water column (internal loading) is low to moderate.

Sample Station #2 (Middle Basin – Muscongus Bay)

In summary, the water quality of Station #2 in Damariscotta Lake is considered average based on measures of SDT, total phosphorus (TP), and Chlorophyll-a (Chla). The potential for nuisance algal blooms on Damariscotta Lake is low to moderate. Damariscotta Lake is a non-colored lake (average color 21 SPU) with an average SDT of 5.0 m (16.4 ft). The range of water column TP for Damariscotta Lake is 7 - 11 parts per billion (ppb) with an average of 9 ppb. Chla ranges from 1.2 - 29.8 ppb with an average of 5.2 ppb. Recent dissolved oxygen (DO) profiles show moderate DO depletion in deep areas of the lake. The potential for phosphorus to leave the bottom sediments and become available to algae in the water column (internal loading) is moderate.

Sample Station #3 (South Basin – South Arm)

In summary, the water quality of Station #3 in Damariscotta Lake is considered average based on measures of SDT, total phosphorus (TP), and Chlorophyll-a (Chla). The potential for nuisance algal blooms on Damariscotta Lake is low to moderate. Damariscotta Lake is a non-colored lake (average color 16 SPU) with an average SDT of 5.2 m (17.1 ft). The range of water column TP for Damariscotta Lake is 8 - 17 parts per billion (ppb) with an average of 11 ppb. Chla ranges from 1.4 - 12.2 ppb with an average of 4.6 ppb. Recent dissolved oxygen (DO) profiles show high DO depletion in deep areas of the lake. The potential for phosphorus to leave the bottom sediments and become available to algae in the water column (internal loading) is moderate to high.

Threatened Status

Damariscotta Lake has been recognized for its sensitivity to additional NPS Pollution inputs. The Middle (Muscongus Bay) and South (South Arm) basins of Damariscotta Lake are listed on the Maine Stormwater Law, Chapter 502 Amended December 27, 2006 list of "Direct Watersheds of Lakes Most at Risk from New Development." The entirety of Damariscotta Lake is included in the Maine NPS Management Program Plan 2015 – 2019, released September 15, 2014 by MDEP, list of Threatened Lakes because of its sensitivity to additional phosphorus inputs due to the lake's hydrology and threats in the watershed. From MDEP:

> *"A lake was determined to be sensitive if DEP's vulnerability modeling predicts the number of years for the lake's phosphorus concentration to increase by 1 ppb is 25 years or less. The vulnerability model predicts changes in lake phosphorus concentration using watershed growth projections to estimate changes in phosphorus loading and the 1976 version of Vollenweider's lake model to convert load to concentration. The model compensates for the influence of upstream lakes. If these sensitive lakes were determined to have watershed threats, they were then added to the priority list."*

Watershed NPS Threats

Nonpoint source pollution is the leading source of impairment in Maine lakes.[1] As in other Maine lakes, NPS pollution is a serious threat to the water quality of Damariscotta Lake. Common sources of NPS pollution often include soil erosion; excess synthetic and natural fertilizers; herbicides and pesticides; oil, gas, and toxic chemicals; bacteria; and waste from livestock and animals.

In a completely forested and undeveloped watershed, storm water and snowmelt is dissipated by the tree canopy and once it reaches the ground, other vegetation helps to infiltrate and filter that water into the soil. Any water that accumulates is slowed by the uneven forest floor, preventing it from gaining energy and creating excess soil erosion. This infiltration also serves to recharge the ground water supplies, which acts as a natural filter. As land is developed within a watershed, the natural topography is leveled and impervious surfaces are created which include rooftops, compacted soil, parking lots, and roads. With the associated loss of tree canopy, this development allows water to accumulate more readily and with more energy than previously. The increased energy combined with focusing water flow in ditches and culverts creates powerful forces that creates more soil erosion within a watershed, all focused to a single water body.

The problems created by NPS pollution are not inherently due to the water itself, the problem comes with what water can accumulate as it travels over land. The pollutants of concern due to impact on water quality are phosphorus and nitrogen. Phosphorus in particular is necessary for plant growth and is found naturally in soils, fertilizers, and animal waste. Phosphorus is also known as the limiting nutrient for lakes because the amount of available phosphorus can limit the growth of lake algae. Once phosphorus reaches an aquatic system such as a lake, algae are able to metabolize it rapidly. In completely natural systems, natural levels of phosphorus input limits the amount of algae that can grow. However, when excess phosphorus is added to the lake via NPS pollution it leads to excess algae growth and in extreme cases may cause an algae bloom. More commonly, additional phosphorus in a lake ecosystem leads to incremental declines in water quality that may take years to observe and even longer to stop or correct.

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[1] Maine Department of Environmental Protection. "Maine Nonpoint Source Management Program Plan 2015 – 2019." September 15, 2014.

The Damariscotta Lake Watershed Association raised funds for and conducted a watershed survey in 2014 to identify sources of phosphorus to Damariscotta Lake. The survey followed MDEP guidance described in "Volunteer Lake Watershed Surveys: How to Conduct a Nonpoint Source Phosphorus Survey."[2] The project was managed by the Damariscotta Lake Watershed Association with volunteer support as well as technical assistance from MDEP. In April and May of 2014, technical leaders and trained volunteers surveyed all developed portions of the shoreline of Damariscotta Lake, as well as roads and culverts throughout the Damariscotta Lake Watershed to document sites of soil erosion and runoff, recommended solutions, the relative impact each site had on water quality, and the estimated cost to implementing these recommendations. Survey findings were summarized in the Damariscotta Lake Watershed Survey Report, included here as Appendix A.

Within the Damariscotta Lake Watershed, 172 sites were identified as contributing Nonpoint Source Pollution to Damariscotta Lake. The majority (86 sites, 50%) of NPS sites were found on residential land uses. The second most common land use was on private roads at only 12% (20 sites). The next most common source of NPS sites were on state roads (18 sites), agricultural land uses (11 sites), and driveways (11 sites). Table 1 details all land uses and the associated number of NPS sites documented, as well as the relative level of priority for each site, rated by the impact to water quality, estimated cost to fix, and estimated technical level to fix each site. High priority sites are those which have the most impact on water quality and are the most expensive and technically demanding to fix. Low priority sites are often those which have low water quality impact and low costs, making them relatively easy for landowners to fix with some guidance and reference materials. Figure 2 displays these same data graphically.

[2] Maine Department of Environmental Protection. "Volunteer Lake Watershed Surveys: How to Conduct a Nonpoint Source Phosphorus Survey." September 2011.

Site Priorities by Land Use

Table 1. Total number of NPS sites by land use and priority

Land Use	High	Medium	Low	Total
Residential	13	24	49	86
Private Road	9	5	6	20
State Road	9	8	1	18
Agriculture	5	1	5	11
Driveway	2	4	5	11
Boat Access	1	4	4	9
Town Road	3	3	1	7
Beach Access	0	2	1	3
Commercial	0	0	3	3
Trail/Path	0	1	1	2
Construction Site	0	1	0	1
Municipal/Public	0	1	0	1
Total	**42**	**54**	**76**	**172**

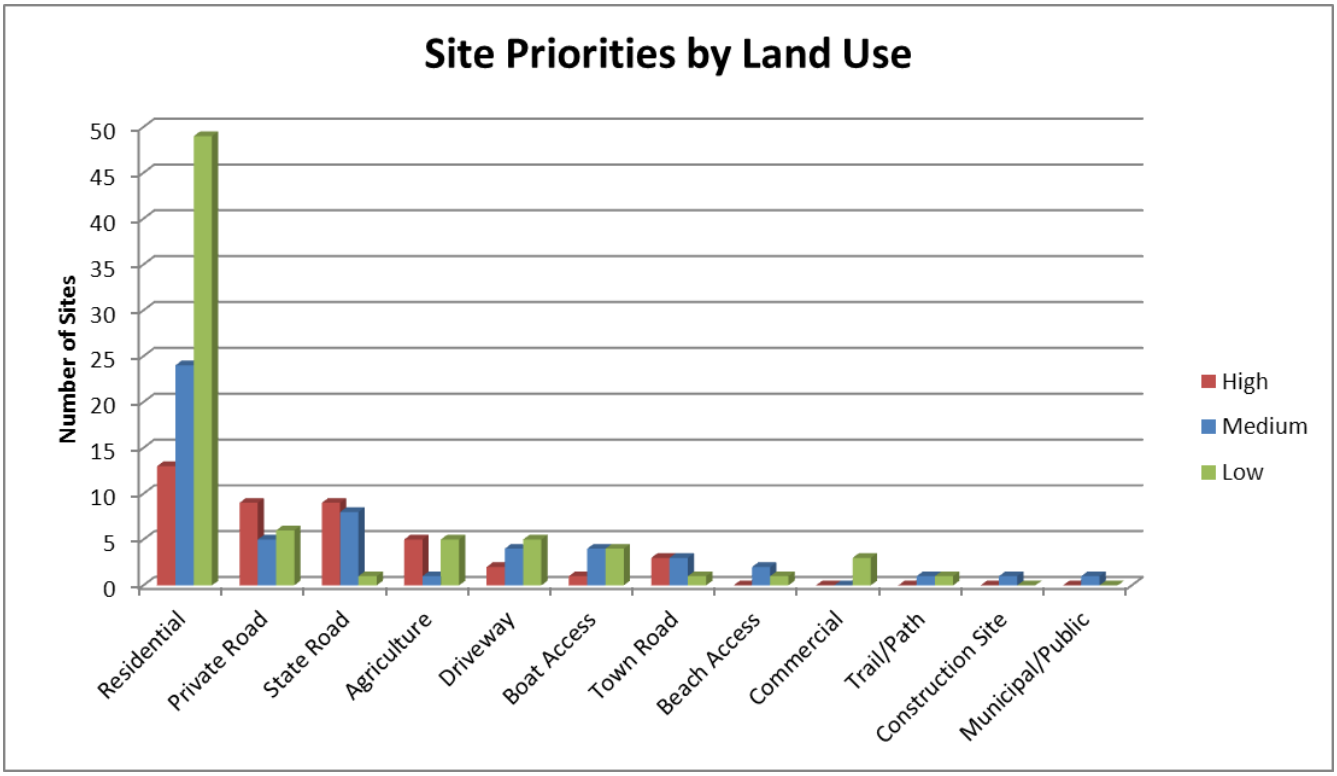

Figure 2. NPS sites categorized by land use and priority ranking

WATERSHED PROTECTION PLAN GOALS AND OBJECTIVES

The overall goal of the Damariscotta Lake Watershed Protection Plan is to maintain or improve the water quality of Damariscotta Lake, thus improving the water quality of this Class GPA lake by reducing phosphorus and sediment loading to the lake. This will be achieved through the following actions over the next five years (2015 – 2020):

- **Reduce current sources of phosphorus loading** by addressing 75 of the sites identified in the 2014 watershed survey from the high and medium priority rankings. This will be achieved by providing targeted outreach, technical assistance and cost-sharing assistance to install conservation practices at NPS sites.
- **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, and municipal officials.
- **Strengthen local capacity** for watershed stewardship by conducting outreach to local communities to recruit new members and membership donations and supporting watershed protection education programs.
- **Conduct ongoing assessment of lake and watershed conditions** by monitoring lake water quality and populating and maintaining the NPS Site Tracker

SCHEDULE & MILESTONES TO GUIDE PLAN IMPLEMENTATION

Actions to meet this Plan's goals and objectives are listed in the following tables. These actions were developed to discourage new NPS problems and address existing NPS sites with the highest impact and phosphorus loading to Damariscotta Lake. The number and types of sites targeted in this Plan are based on potential fundraising sources, landowner cooperation and other considerations. This Plan is designed to be implemented over the next five years. The estimated schedule for each implementation action is provided in Table 2. Potential funding sources and key partners are also identified for each action in Table 3. This Plan will be carried out with a combination of local, state and federal resources.

Table 2. Implementation Schedule

2015 **Year 0**	Apply for EPA Section 319 Clean Water Act implementation grant through MDEP Begin seasonal Damariscotta Lake Watershed Association Youth Conservation Corps (YCC) Notify landowners of NPS sites on their properties as identified in 2014 watershed survey Install 15 conservation practices on NPS sites identified in the 2014 watershed survey with YCC program Establish DLWA NPS Rapid Response Team to quickly address new NPS issues with technical assistance, materials, and ongoing support Update NPS site tracker with sites addressed by seasonal YCC program in 2015 Distribute DLWA bi-annual newsletter The Watershed Recruit DLWA membership Hold DLWA Annual Meeting Provide elementary watershed-based education to watershed towns for school-aged children Conduct water quality monitoring Distribute publications to local print and online media on YCC program accomplishments
2016 **Year 1**	Continue seasonal YCC program, extend program for one additional week Increase YCC program goals to install 17 conservation practices on NPS sites Conduct EPA 319 project (if funded) with targeted cost sharing and matching grants for high priority sites Update NPS site tracker with sites addressed by YCC program and EPA 319 project in 2016 Evaluate YCC projects from 2015, correct or maintain as needed DLWA uses data from NPS site tracker to identify maintenance needs and prompt ongoing road maintenance Continue support of DLWA NPS Rapid Response Team, establish municipal assistance and support Hold DLWA Annual Meeting and conduct presentation on YCC and EPA 319 programs Distribute publications to local print and online media encouraging watershed protection Distribute bi-annual DLWA newsletter The Watershed Recruit DLWA membership Provide elementary watershed-based education to watershed towns for school-aged children Conduct water quality monitoring
2017 **Year 2**	Continue seasonal YCC program, extend program based on demand and capacity Conduct EPA 319 project (if funded) with targeted cost sharing and matching grants for high priority sites Update NPS site tracker with sites addressed by YCC program and EPA 319 project in 2017 Evaluate YCC projects from 2015-2016, correct or maintain as needed DLWA uses data from NPS site tracker to identify maintenance needs and prompt ongoing road maintenance Hold DLWA Annual Meeting; present updates on YCC and EPA 319 programs Continue DLWA NPS Rapid Response Team Distribute publications to local print and online media encouraging watershed protection Distribute bi-annual DLWA newsletter The Watershed Recruit DLWA membership Provide elementary watershed-based education to watershed towns for school-aged children Conduct water quality monitoring

2018 **Year 3**	Continue seasonal YCC program, evaluate program's 3-year performance and efficacy Conduct EPA 319 project (if funded) with targeted cost sharing and matching grants for high priority sites Update NPS site tracker with sites addressed by YCC program and EPA 319 project in 2018 Evaluate YCC projects from 2015-2017, correct or maintain as needed DLWA uses data from NPS site tracker to identify maintenance needs and prompt ongoing road maintenance Hold DLWA Annual Meeting; present updates on YCC and EPA 319 programs Continue DLWA NPS Rapid Response Team Distribute publications to local print and online media encouraging watershed protection Distribute bi-annual DLWA newsletter The Watershed Recruit DLWA membership Provide elementary watershed-based education to watershed towns for school-aged children Conduct water quality monitoring
2019 **Year 4**	Continue seasonal YCC program, adjust program scale and scope to meet demand Update NPS site tracker with sites addressed by YCC program in 2019 Evaluate YCC projects from 2016-2018, correct or maintain as needed DLWA uses data from NPS site tracker to identify maintenance needs and prompt ongoing road maintenance Hold DLWA Annual Meeting; present updates on YCC and EPA 319 programs Continue DLWA NPS Rapid Response Team Distribute publications to local print and online media encouraging watershed protection Distribute bi-annual DLWA newsletter The Watershed Recruit DLWA membership Provide elementary watershed-based education to watershed towns for school-aged children Conduct water quality monitoring
2020 **Year 5**	Continue seasonal YCC program, evaluate program's 5-year performance and efficacy, adjust program scale and reach to meet demand Update NPS site tracker with sites addressed by YCC program in 2020 Evaluate YCC projects from 2017-2019, correct or maintain as needed DLWA uses data from NPS site tracker to identify maintenance needs and prompt ongoing road maintenance Hold DLWA Annual Meeting; present updates on YCC program Continue DLWA NPS Rapid Response Team Distribute publications to local print and online media encouraging watershed protection Distribute bi-annual DLWA newsletter The Watershed Recruit DLWA membership Provide elementary watershed-based education to watershed towns for school-aged children Conduct water quality monitoring

Table 3. Action Items and Milestones

	Schedule	Management	Potential Funding Sources
Reduce current sources of phosphorus loading by addressing NPS sites identified in watershed survey			
Landowner self-funded best management practice (BMP) installation at NPS sites			
Driveway sites (2 sites)	2015-2020	Landowners	Private
Residential sites (10 sites)	2015-2020	Landowners	Private
State Road site (9 sites)	2015-2020	MDOT	MDOT
Provide opportunity for cost sharing to install BMPs at NPS sites			
Agriculture sites (4 sites)	2016-2020	Landowners, DLWA	USDA NRCS, DLWA
Boat Access site (1 site)	2016-2017	MDACF, DLWA	EPA (319), MDACF
Driveway sites (3 sites)	2016-2020	Landowners, DLWA	EPA (319)
Private Road sites (9 sites)	2016-2020	Landowners, DLWA	EPA (319)
Residential sites (34 sites)	2015-2020	DLWA	EPA (319), DLWA
Town Road sites (3 sites)	2016-2020	Municipalities	EPA (319)
Notify landowners of NPS sites on their property	2015-2016	DLWA	DLWA
Conduct outreach and technical assistance as requested	Ongoing	DLWA, KLSWCD	DLWA
Prevent new sources of phosphorus loading			
Establish and operate DLWA NPS Rapid Response Team	2015-2020	DLWA	Private
Hold tours to highlight conservation practices	2016-2020	DLWA, KLSWCD	Private, EPA (319)
Work with towns and road associations to promote road maintenance	2015-2020	DLWA	DLWA, EPA (319)
Promote revision of municipal shoreland zoning ordinances	2016-2020	DLWA	DLWA
Strengthen local capacity for watershed stewardship			
Apply for EPA 319 Watershed Implementation Grant	2015	DLWA	Private
Fundraise to support ongoing YCC and Rapid Response Team	Ongoing	DLWA	Private, Towns
Conduct DLWA Annual Meetings	Ongoing	DLWA	DLWA
Continue watershed education in local schools	Ongoing	DLWA	DLWA
Conduct ongoing assessment of lake and watershed conditions			
Conduct annual water quality monitoring throughout watershed	Ongoing	DLWA	DLWA, Towns
Update and maintain NPS Site Tracker data annually	2015-2020	DLWA, MDEP	DLWA
Analyze trends in watershed land use and water quality data	2015-2020	DLWA, MDEP	DLWA, Private

Plan Outputs and Milestones

Organizational Outputs

- DLWA Youth Conservation Corps established and meeting demand
- DLWA NPS Rapid Response Team established and functioning
- DLWA applies for 319 grant for Phase I project
- NPS Tracker created, maintained, and used to prompt maintenance
- Contact made with all property owners and/or road associations with medium to high priority NPS sites identified in watershed survey
- Watershed-based education provided to school-aged children

NPS Mitigation Outputs

- Number of NPS sites fixed by Youth Conservation Corps
- Number of NPS sites fixed by landowners through private funding
- Number of 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

PROPOSED MANAGEMENT MEASURES

The Damariscotta Lake Watershed Survey Report (Appendix A) lists specific management measures recommended for the many of the NPS erosion issues identified during the survey. Typical problems and management measures for the most common land uses identified in the watershed survey are described in the section below. Recommendations follow guidelines commonly used by Soil and Water Conservation Districts and 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 conservation practices accomplish the plan goal of reducing phosphorus and sediment loading to Damariscotta Lake by stabilizing bare soil and erosion and diverting, infiltrating or filtering polluted runoff before it reaches the lake and its tributaries.

In addition to structural conservation practice recommendations, public education and outreach efforts will also be needed to promote responsible stewardship and ongoing maintenance activities. DLWA will expand landowner education of conservation practices by holding tours for homeowners highlighting practices that have been installed as a result of YCC and EPA 319 projects. DLWA will also work with local municipalities to facilitate training in conservation practices for road commissioners and other public works staff, as well as promoting changes to create uniform and appropriate shoreland zoning ordinances between towns that share frontage on Damariscotta Lake.

Residential Sites

NPS sites were most commonly observed at residential properties with a total of 86 sites (50%). Of these, 13 are high priority, 24 are medium priority, and 49 are low priority.

Common problems identified included:

- Surface erosion due to bare soil
- Undercutting on the shoreline
- Lack of shoreline vegetation
- Unstable water access areas, such as around docks and paths

Recommended solutions include:

- Seed and mulch bare soil
- Establish or enhance shoreline buffer with native woody vegetation
- Limit foot traffic in areas sensitive to erosion
- Place mulch or stone on heavily used footpaths

Maintenance for recommended solutions includes:

- Reseeding/over-seeding bare soil and replenishing erosion control mulch every two years or when area has been scoured or damaged (often from snow plowing or high use)
- Clean out stone in footpaths from debris or vegetation growth every two to five years to ensure proper infiltration
- Water vegetation frequently during first year of installation, especially during summer months and times of drought; replace dead and dying buffer plants

This Plan seeks to address 10 residential sites independently and self-funded by landowners after the problem and recommended solutions are brought to their attention through targeted outreach and/or technical assistance visits by DLWA. 34 residential sites will be addressed by providing small matching grants to landowners and through DLWA's YCC program. The YCC program will begin

in 2015 and operate three days per week for five weeks with a program director who will work an additional three weeks for project preparation and conclusion. The program will be evaluated and expanded in future years contingent on demand for projects and funding availability. Free technical assistance will be provided to residential landowners by experienced staff.

Private Roads and Driveway Sites

Together, private roads (20 sites) and driveways (11 sites) account for 12% of all NPS sites identified. For private road sites, 9 are high priority, 5 are medium priority, and 6 are low priority. For driveway sites, 2 are high priority, 4 are medium priority, and 5 are low priority.

Common problems identified include:

- Poor shaping; general surface erosion on moderate to steep slopes
- Erosion along road shoulder and ditch
- Culvert is either not present, blocked, clogged, or otherwise non-functioning

Recommended solutions include:

- Reshape road (crown), allowing it to shed water
- Install gravel or asphalt water bars or rubber razor water diverters to divert flow off road
- Improve culvert functionality by removing clogs, replacing and enlarging, and armoring culvert inlets and outlets
- Clean, reshape, and armor ditches with angular stone riprap or stabilize with turf reinforcement mats and grass seed

Maintenance for recommended solutions includes:

- Re-grade gravel roads twice each year and re-grade gravel driveways at least once each year when damp to property reestablish road crown
- Remove sediment and debris from behind water diverters, reestablish diverters if damaged or no longer functioning as intended
- Reestablish and repair ditches from snow plow damage where needed each spring; check ditches and culverts after major storm events to ensure they are functioning as intended
- Remove clogs and debris from culverts at least annually and after major storm events

This Plan seeks to address two driveway sites independently and self-funded by landowners after the problem and recommended solutions are brought to their attention through targeted outreach and/or technical assistance visits by DLWA. Three driveway sites and nine private road sites will be addressed with up to 50% cost sharing and free technical recommendations and engineered designs provided for the highest priority sites through EPA 319 implementation grant projects.

State and Town Road Sites

Together, state roads (18 sites) and town roads (7 sites) account for 15% of all NPS sites identified. Within state road sites, 9 are high priority, 8 are medium priority, and 1 is low priority. Within town road sites, 3 are high priority, 3 are medium priority, and 1 is low priority.

Common problems identified include:

- Moderate to severe road surface, shoulder, and ditch erosion
- Accumulation of winter sand
- Clogged or perched culverts
- Unstable culvert inlet/outlets

Recommended solutions include:

- Improve culvert functionality by removing clogs, replacing and enlarging, and armoring culvert inlets and outlets
- Properly size and align culverts
- Clean, reshape, and armor ditches with angular stone riprap or stabilize with turf reinforcement mats and grass seed
- Install plunge pools or check dams below and downstream of culverts to slow runoff and trap sediment

Maintenance for recommended solutions includes:

- Ensure culvert inlets and outlets are free of accumulated debris and sediment, check to make sure culvert is not damaged
- Replace fallen riprap at culvert inlets and outlets
- Reestablish and repair ditches from snow plow damage where needed each spring; check ditches and culverts after major storm events to ensure they are functioning as intended
- Remove accumulated sediment from plunge pools and check dams and properly dispose away from water resources
- Re-grade gravel roads twice a year when damp to properly reestablish road crown

This Plan seeks to address town road sites by providing up to 50% cost sharing and free technical recommendations and engineered designs for the highest priority sites through EPA 319 implementation grant projects. This Plan aims to address state road sites by notifying the State of Maine Department of Transportation for repair and maintenance. Towns and the State will be notified of water quality impact sites needing to be addressed through the watershed survey report in conjunction with DLWA outreach. All maintenance recommendations will be the sole responsibility of the municipality or State to perform.

Agriculture Sites

Eleven NPS sites were observed on properties being used for agricultural purposes. Of these, 5 were high priority, 1 was medium priority, and 5 were low priority sites.

Common problems identified include:

- Livestock access directly to the water body, either Damariscotta Lake or its tributaries
- Bare soils from crop rotation and soil tillage
- Lack of shoreline vegetation

Recommended solutions include:

- Fence off livestock away from the lake and streams; provide alternate water source if necessary
- Practice reduced tilling and plant cover crops at the end of the season to protect soil during spring runoff
- Establish or enhance shoreline vegetation especially in areas where natural or artificial fertilizers are applied at appropriate rates

Maintenance for recommended solutions includes:

- Ensure livestock remain within fenced areas
- Maintain maximum reasonable cover crop distribution and rotation plan to ensure beneficial soil and crop health

- Ensure shoreline vegetation is adequate to prevent or absorb soil or fertilizer runoff before reaching water resources

This plan seeks to address the highest priority agricultural sites by partnering with the U.S. Department of Agriculture Natural Resource Conservation Service as well as the Knox-Lincoln Soil and Water Conservation District where feasible to provide technical assistance and funding resources to landowners. This Plan will also address agricultural sites by providing up to 50% cost sharing and free technical recommendations and engineered designs for the highest priority sites through EPA 319 implementation grant projects.

Other Sites

The remaining 19 sites documented (11%) consist of 9 boat access sites, 3 beach access sites, 3 commercial sites, 2 trail/path sites, 1 construction site, and 1 municipal/public site. One of these is listed as high priority, 9 as medium priority, and 9 as low priority.

For the 9 boat access and 3 beach access sites, common issues were moderate to severe surface erosion, bare soil, direct flow of sediment to the water body, minimal vegetated buffer along the shoreline, and heavy foot traffic. Recommendations include seeding or mulching bare soil, hardening boat access ramps with proper surface material to cover bare soil, establishing or enhancing shoreline vegetation, and creating winding footpaths stabilized with mulch. Maintenance consists of reseeding or replenishing mulch, ensuring surface material is not eroding or deteriorating, and caring for shoreline vegetation.

Of the 3 commercial sites, 2 are located at a private campground on the lake, and one at a lakeside business. Observed issues include minimal shoreline vegetation and moderate erosion due to surface water flow. Recommendations include establishing or enhancing shoreline vegetation and diverting or infiltrating surface flow. Maintenance consists of caring for shoreline vegetation and cleaning or repairing runoff diverters or stone infiltration wells.

The 2 trail/path sites are due to issues of high foot traffic resulting in bare soil and moderate surface erosion. Recommendations include runoff diverters and erosion control mulch. Maintenance consists of cleaning and repairing runoff diverters and replenishing erosion control mulch every two years or sooner, contingent on foot traffic.

The construction site had observed issues of bare soil and a lack of erosion and sediment control practices in close proximity to the lake. Erosion and sediment control practices suitable for construction sites include properly installing silt fences or and erosion control mulch berm around the perimeter of the construction site and covering areas of exposed soil with seed and hay. Maintenance includes consistent monitoring and repairing areas in which sediment could potentially wash off site throughout entire construction period and until soil is stabilized.

The one municipal/public site is also a beach access site. The observed issue was moderate surface erosion directly to the lake. Recommendations include properly shaping nearby access road and parking area and installing runoff diverters to avoid channelized flow over beach access area. Maintenance consists of reshaping access road and parking area annually and annual cleaning and repair of runoff diverters

PLAN OVERSIGHT AND PARTNER ROLES

The Damariscotta Lake Watershed Association will take responsibility in ensuring this Plan is being implemented according to schedule and take initiative to update action items over time. Key partners assisting in the Plan's implementation are listed below with their general roles and responsibilities.

Damariscotta Lake Watershed Association (DLWA) will serve as the designated entity in seeing the Plan is implemented and updated as appropriate. DLWA will both provide funding and seek funding from outside sources to conduct landowner outreach, encourage DLWA membership, and begin and maintain the Youth Conservation Corps and NPS Rapid Response Team programs.

Knox-Lincoln Soil and Water Conservation District (KLSWCD) will assist with the Plan's implementation by providing technical support and resources as requested, and educating the community on the importance of water quality protection and conservation practices that may be implemented.

The **Towns of Jefferson, Nobleboro, and Newcastle** may provide funding support for DLWA's water quality monitoring and invasive plant control efforts. These towns are also key partners in addressing NPS sites on municipal roads and enhancing road commissioner and public works staff training and education.

The **Towns of Washington and Somerville** are key partners in addressing NPS sites on municipal roads and enhancing road commissioner and public works staff training and education.

Maine Department of Environmental Protection (MDEP) will continue to provide resources for technical assistance and guidance and provide the opportunity for financial assistance through the NPS Grants Program.

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

USDA Natural Resource Conservation Service (NRCS) may provide technical assistance and funding on a case-by-case basis for commercial agriculture or forestry properties.

Maine Department of Transportation, private road associations, and landowners will address NPS issues on their properties and conduct ongoing maintenance of BMPs.

WATER QUALITY RESULTS MONITORING

Monitoring Activity, Frequency and Parameters

Maine water quality criteria require that lakes and ponds have a stable or improving trophic state and be free of culturally induced algal blooms. DLWA will continue to monitor Damariscotta Lake twice per month from May through September for parameters including Secchi disk transparency, temperature and dissolved oxygen. Additional water quality monitoring on phosphorus, Chlorophyll a, color, conductivity, alkalinity and pH will be performed three times per year by DLWA staff trained by MDEP and the Maine Volunteer Lake Monitoring Program.

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 this Plan meets its goals of having stable or improving water quality over time.

Pollutant Load Reduction Estimates

Pollutant load reductions will be estimated for many NPS sites to help demonstrate the value of conservation practices 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 MDEP and EPA. Preliminary pollutant load estimates were already made during the watershed survey for select sites (Appendix B). These estimates can be used to further prioritize projects in the watershed.

APPENDIX A

DAMARISCOTTA LAKE WATERSHED SURVEY REPORT

Damariscotta Lake
Watershed Association

January 2015

Acknowledgements

Many volunteers graciously donated time and services to the Damariscotta Lake Watershed Association (DLWA) and deserve to be recognized for their dedication and assistance in this project. The Maine Department of Environmental Protection (DEP) provided significant planning and technical assistance throughout all stages of this project. Many thanks also to Viles Arboretum, Kennebec Land Trust, and Kennebec Estuary Land Trust for graciously loaning GPS units for this survey.

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Acronyms Used

DEP – Maine Department of Environmental Protection

DLWA – Damariscotta Lake Watershed Association

NPS – Nonpoint Source Pollution

YCC – Youth Conservation Corps

Introduction

This report is designed for residents and other interested parties within and beyond the Damariscotta Lake Watershed in mid-coast Maine. Interested parties may include landowners, state and municipal officials, education institutions, private contractors, resource extraction professionals, developers, real estate agents, and others. This report presents the results and analysis of a watershed survey focused on nonpoint source pollution conducted primarily in April and May of 2014. The Damariscotta Lake Watershed Association (DLWA) chose to conduct this watershed survey in 2014 as the most recent such survey was conducted in 1999 and was in desperate need of updating. It was also out of a concern for the water quality of Damariscotta Lake and a desire to maintain and improve water quality in the future.

The first watershed survey was conducted in 1990 by DLWA and the Maine Department of Environmental Protection (DEP). Approximately 14% of the watershed was surveyed again in 1992. These results were used to obtain funding from the Clean Water Act Section 319 to implement conservation practices throughout the watershed. This project was completed in 1998. In the spring of 1999, the remaining ~86% of the watershed was surveyed for nonpoint source pollution. This was the last survey prior to 2014 conducted in the Damariscotta Lake Watershed. The 1999 survey results were used to create the Damariscotta Lake Watershed Management Plan in March of 2001.

The Damariscotta Lake Watershed

The Damariscotta Lake Watershed Association has been promoting the protection of Damariscotta Lake since its inception in 1966. Damariscotta Lake is located within the towns of Jefferson, Nobleboro, and Newcastle, Maine (Figure 1). The lake has a surface area of 4,686 acres and the watershed encompasses 56.8 square miles, extending to include the towns of Washington, Somerville, and Waldoboro. Water quality data including temperature, transparency, dissolved oxygen, phosphorus, and chlorophyll has been collected on Damariscotta Lake since 1979. Limited phosphorus data was collected in 1977.

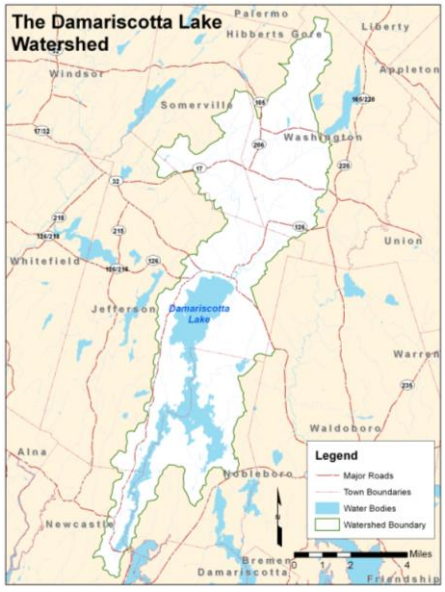


Figure 1. The Damariscotta Lake Watershed

Damariscotta Lake itself provide habitat for abundant cold and warm water fisheries. Of recreational significance, the lake is home to small- and large-mouth bass, landlocked salmon, brown trout, lake trout, rainbow smelt, and an annually increasing population of sea-run alewives due to the restoration of the fish ladder at Damariscotta Mills. In 2014, over 1 million alewives were counted as reaching the lake to spawn during the spring migration. In 2014 the Maine Department of Inland Fisheries and Wildlife stocked Damariscotta Lake with landlocked salmon, lake trout, and brown trout.

As the largest lake in Lincoln County, the approximately 44 mile shoreline of Damariscotta Lake is moderately developed with significant recreational and economic importance to the greater Mid-Cost Maine region. There is a mixture of seasonal and year-

round residences on the shoreline, two campuses of a youth summer camp, the Damariscotta Lake State Park, a privately owned campground, as well as several rental property subdivisions. There are three active hard-surfaced and trailer accessible boat launches on the lake, only one of which is managed by MDIFW. Many privately owned and maintained roads provide access to shoreline properties on the lake. Damariscotta Lake is not used as a source for public drinking water, however, it is used as the only water source for many private, mostly seasonal, residences.

Apart from the immediate shoreline, there is relatively little concentrated development in the remainder of the watershed. Most residential development is located close to major roads which intersect the Watershed, and higher development pressure is located closer to population centers such as Damariscotta. There are multiple agricultural properties adjacent to Damariscotta Lake, as well as lands cleared in the remainder of the Watershed for agricultural production. The remainder of the Watershed is forested with significant blocks of undeveloped forest, providing opportunities for the forestry industry.

The major inlet to Damariscotta Lake is Davis Stream, which drains all of the northern extent of the Watershed including Muddy Pond in Washington. Mill Stream in Nobleboro drains into Damariscotta Lake from the only other pond in the watershed, Cooks Pond. Damariscotta Lake drains in one outlet via the Damariscotta Mills dam and fish ladder into the Great Salt Bay and Damariscotta River.

The Threat of Nonpoint Source (NPS) Pollution

Nonpoint source pollution is the leading source of impairment in Maine lakes.[1] As in other Maine lakes, NPS pollution is a serious threat to the water quality of Damariscotta Lake. Common sources of NPS pollution often include soil erosion; excess synthetic and natural fertilizers, herbicides, and pesticides; oil, gas, and toxic chemicals; bacteria; and waste from livestock and animals.

> NONPOINT SOURCE POLLUTION
> Often called NPS pollution or polluted runoff, it is pollution that accumulates from many diffuse sources and cannot be traced to a single point. It is carried by rainfall or snowmelt and when combined, these pollutants often lead to significant impacts on water bodies.

In a completely forested and undeveloped watershed, storm water and snowmelt is dissipated by the tree canopy and once it reaches the ground, other vegetation helps to infiltrate and filter that water into the soil. Any water that accumulates is slowed by the uneven forest floor, preventing it from gaining energy and creating excess soil erosion. This infiltration also serves to recharge the ground water supplies, which acts as a natural filter. As land is developed within a watershed, the natural topography is leveled and impervious surfaces are created which include rooftops, compacted soil, parking lots, and roads. With the associated loss of tree canopy, this development allows water to accumulate more readily and with more energy than previously. The increased energy combined with focusing water flow in ditches and culverts creates powerful forces that creates more soil erosion within a watershed, all focused to a single water body.

[1] Maine Department of Environmental Protection. "Maine Nonpoint Source Management Program Plan 2015 – 2019." September 15, 2014.

How Does NPS Pollution Translate to Water Quality?

The problems created by NPS pollution are not inherently due to the water itself, the problem comes with what water can accumulate as it travels over the land area. The main pollutants we are concerned with for water quality are phosphorus and nitrogen. Phosphorus in particular is necessary for plant growth and can be found naturally in soils, fertilizers, and animal waste. Phosphorus is also known as the limiting nutrient for lakes because the amount of available phosphorus can limit the growth of lake algae. Once phosphorus reaches an aquatic system such as a lake, the plants that are able to use it rapidly are algae. In completely natural systems, some phosphorus input limits the amount of algae that can grow. However, when excess phosphorus is added to the lake via NPS pollution it leads to excess algae growth and in extreme cases may cause an algae bloom. More commonly, added phosphorus in a lake ecosystem leads to incremental declines in water quality that may take years to observe and even longer to stop or correct.

Why Damariscotta Lake must be protected from NPS Pollution

- Damariscotta Lake is the regional recreation and economic hub for Mid-Coast Maine.

- This lake has been infested with the invasive plant *Hydrilla* since 2009. As we have seen with invasive plants, the most efficient use of our resources is in prevention, rather than control. If we prevent NPS pollution now, we can avoid the huge burden of fixing an impaired lake in the future, which is difficult at best.

- The lake provides excellent warm and cold water fisheries. Algae blooms can often lead to fish kills because of decomposing algae using all the oxygen in the water. Preventing NPS pollution will help to maintain and improve these valuable fisheries.

Protecting & Conserving Damariscotta Lake is one of our Core Values

The Damariscotta Lake Watershed Association (DLWA) was established in 1966 as the Damariscotta Lake Association, the oldest of its kind in the State of Maine. DLWA has collected water quality data on the lake since the late 1970's, giving us over three decades of information on how to best protect it. The organization provides education programs in our schools to teach the next generation why water quality is important and actively promotes good conservation practices on watershed lands to prevent NPS pollution. In the summer of 2015, DLWA will establish the "Buffer Brigade," a Youth Conservation Corps intended to provide resources and assistance to watershed landowners who would like to install conservation practices on their property.

Purpose

The primary purposes for conducting this watershed survey are to:

- Find locations of Nonpoint Source pollution in the Damariscotta Lake watershed, a task that had not been completed since 1999 and one that had never been fully completed at once,
- Provide data to inform an update of the Damariscotta Lake Watershed-Based Management Plan, the most recent of which was completed in 2001,
- Use the Watershed-Based Management Plan to apply for project implementation funding from the Clean Water Act, Section 319,
- Inform the new "Buffer Brigade" program, a Youth Conservation Corps funded by DLWA that will employ local youth to implement conservation practices on waterfront lands that are sources of NPS pollution as identified in this survey,
- Increase awareness among watershed residents of the threats of Nonpoint Source pollution and to identify DLWA as a local resource for enhancing and improving these sites to better conserve the land and water resources in the watershed, and,
- Build relationships between local stakeholders, including community members, state and municipal officials, local contractors, resource extraction professionals, developers, real estate agents, and others that will aid in creating values for the prevention of NPS pollution that work for the local economy as well as aid in protecting a sensitive natural resource.

It should be clear that the purpose of this survey was never to take enforcement or reporting action against any landowners where NPS sites were found. None of the data collected during this survey was or will be used to enforce local, state, or federal regulations. The information gathered will solely be used for the purposes of assessing the amount of NPS pollution within the Damariscotta Lake watershed, the primary land use sources of such pollution, and to inform further work to be conducted at the desires of the landowner.

Methodology

A watershed survey steering committee was formed and met multiple times in the spring of 2014 to plan and prepare for this survey. The steering committee was incredibly valuable in determining the boundaries of each survey sector that was to be delineated around the lake as well as gathering data, preparing, editing, and sending a mailing (Appendix 1) to all watershed landowners notifying them of DLWA's intent to conduct this survey. The entire watershed was organized into 14 individual sectors (Figure 2). Due to the sheer area of the 56.8 square mile Damariscotta Lake Watershed, the Steering Committee decided the survey would be ongoing for one month, from April 26 to May 30.

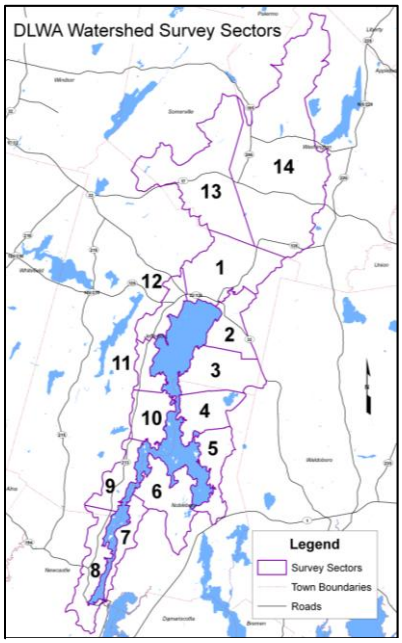


Figure 2. Watershed Survey sectors

Volunteers and technical leaders participated in an April 26 classroom and field training. Volunteers were divided into groups of 2-4 members with one technical leader in each group. Each group was equipped with survey data sheets (Appendix 2), maps showing aerial data and political boundaries, as well as GPS units. Technical leaders were expected to field train volunteers as much as possible on this day. Volunteers would then be able to continue their assigned sectors in groups without technical leaders for the remainder of the month. With technical assistance from DLWA when requested, volunteers were successful in completing their assigned sectors within the month allotted.

Once volunteers submitted their data, DLWA staff compiled survey sites, populated the NPS Site Tracker provided by the Maine Department of Environmental Protection, and mapped sites using GIS software for internal use only. While in the field, volunteers ranked sites to measure priority in terms of size, estimated cost, and estimated technical level. DLWA staff used these priority rankings to determine which sites were of highest priority. Staff then conducted follow up visits to sites of highest priority to gather data in order to calculate pollutant load estimates. Pollutant load estimates were calculated using U.S. Environmental Protection Agency Region 5 Method for non-road surface sites, and the U.S. Forest Service WEPP Method for road surfaces. These results were included in the NPS Site Tracker. It should be noted that DLWA plans to keep these data as relevant as is reasonably possible and, therefore, will be updating the NPS Site Tracker with new sites as they are discovered, including additional data for identified sites, and marking sites as no longer posing an issue as they become resolved.

During the initial phase of this survey from April to May, volunteers were instructed not to survey or record agricultural sites of NPS pollution, but rather mark potential agricultural areas on the maps provided. In a conscious effort to build trusting, working relationships between agricultural landowners and the Association, DLWA staff elected to survey agricultural sites internally after the initial volunteer effort was completed. Agricultural sites were documented in the spring and fall of 2014 in hopes to gather data when runoff and also fertilizer or manure spreading is most common. In general, only agricultural lands within proximity of Damariscotta Lake were surveyed; agricultural properties not bordering the lake to the north were not included in this project. As is mentioned above, DLWA seeks to continually track and add sites to this data set as needed. Agricultural lands

not specifically included in this survey may be included in the future as sites are identified and recorded.

With the NPS data gathered in this survey, DLWA staff assigned point values to each degree of severity (high, medium, low) within each of the three categories documented in the field: water quality impact, estimated cost, and estimated technical level required to fix the site. These point values correspond to the severity of each indicator. For example, a ranking of 'high' would receive 3 points. Table 1 indicates the values given within each category. Sites were then prioritized using this scoring system, with each site receiving a unique score determining the overall priority. Table 2 demonstrates how a hypothetical site would be scored using this system. Once sites were scored, they were designated one of three priority categories based on this score, outlined in Table 3. In order to obtain a 'high' priority designation, a site would have needed to receive a 'high' scoring in one of the three categories: impact, cost, or technical level.

Table 1. Relative scoring for each variable

	WQ Impact	Cost	Technical Level
High	3	3	3
Medium	2	2	2
Low	1	1	1

Table 2. Sample scoring for a hypothetical site

	WQ Impact	Cost	Technical Level
High			3
Medium	2		
Low		1	
Score			**6**

Table 3. Priority rankings assigned to final site score

	Priority Rating		
	Low	Medium	High
Site Score	3 – 4	5 – 6	7 – 9

Finally, using geographic coordinate data collected for each site in the field, DLWA staff mapped the location of each site using ArcGIS Online software. This software allows for all data associated with each site to be included on the map. The map is included here as Appendix 3. DLWA is committed to ensuring landowner privacy and therefore will not be providing location specific results of the survey within this report. The map of identified sites included in this report is at a scale that does not allow for identification of specific properties.

Watershed Survey Results

Within the Damariscotta Lake Watershed, 172 sites were identified that are contributing nonpoint source pollution to the water bodies within the watershed. All these data were transferred from the field sheet (Appendix 2) to the digital NPS Site Tracker. Any high priority sites that have undergone pollutant load estimation include the resulting estimates in the following data.

Land Use

The majority (50%) of NPS sites were found on residential land uses, a total of 86 sites. The second most common land use was on private roads, shadowing the residential sites at only 12% of all sites. Figures 3 and 4 show all sites organized by land use, as total number of sites and percentage of total sites, respectively. Roads in general are the second leading source of NPS pollution in the watershed, with private roads, state roads, town roads, and driveways accounting for 33% of all NPS sites (Figure 5).

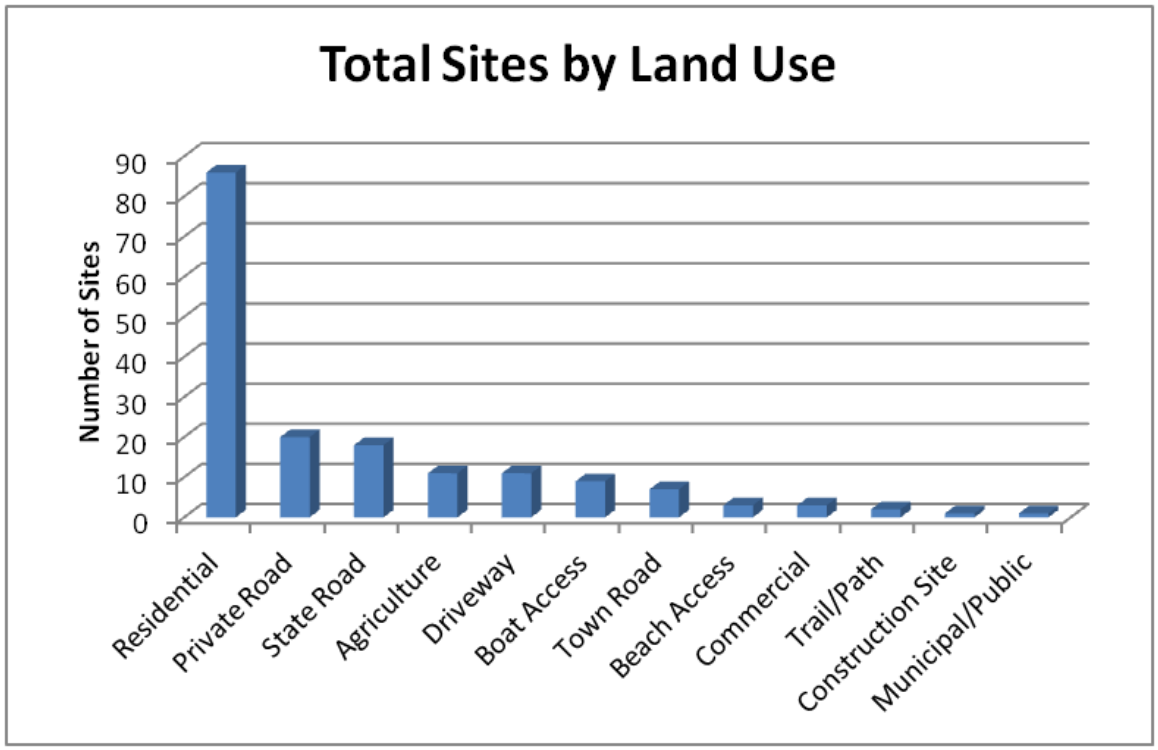


Figure 3. Total number of NPS sites organized by land use

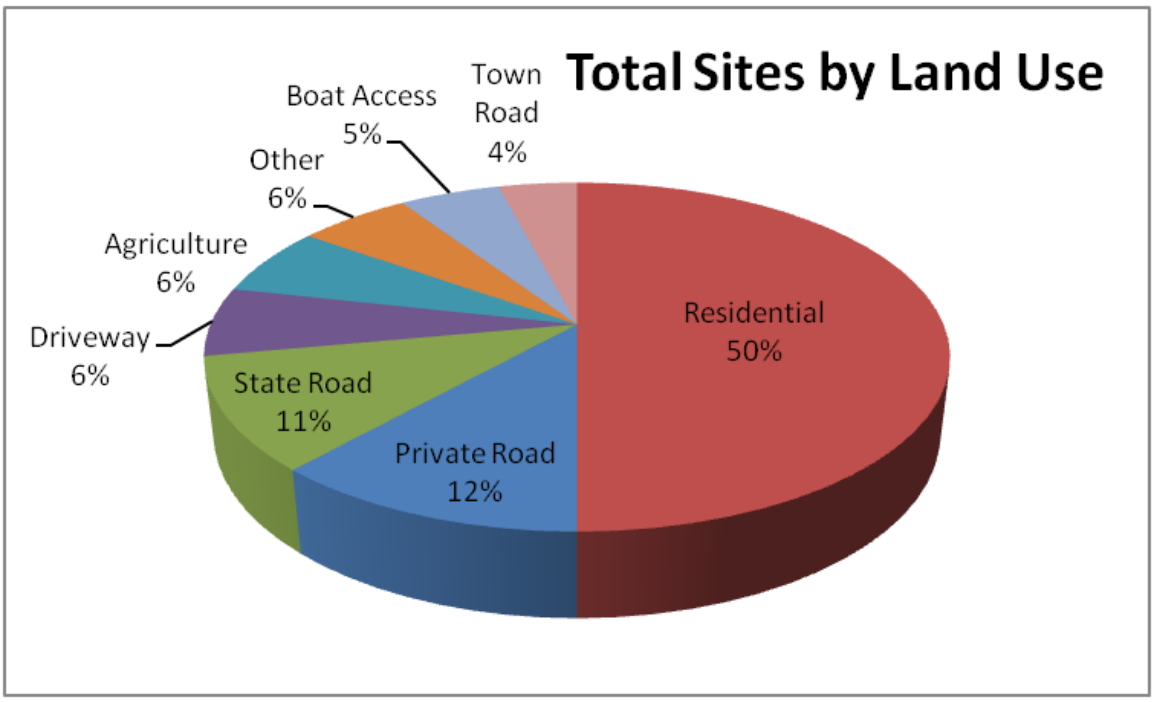


Figure 4. Total percent of NPS sites by land use. "Other" includes: Beach Access (1.7%), Commercial (1.7%), Trail/Path (1.2%), Construction Site (0.6%), Municipal/Public (0.6%).

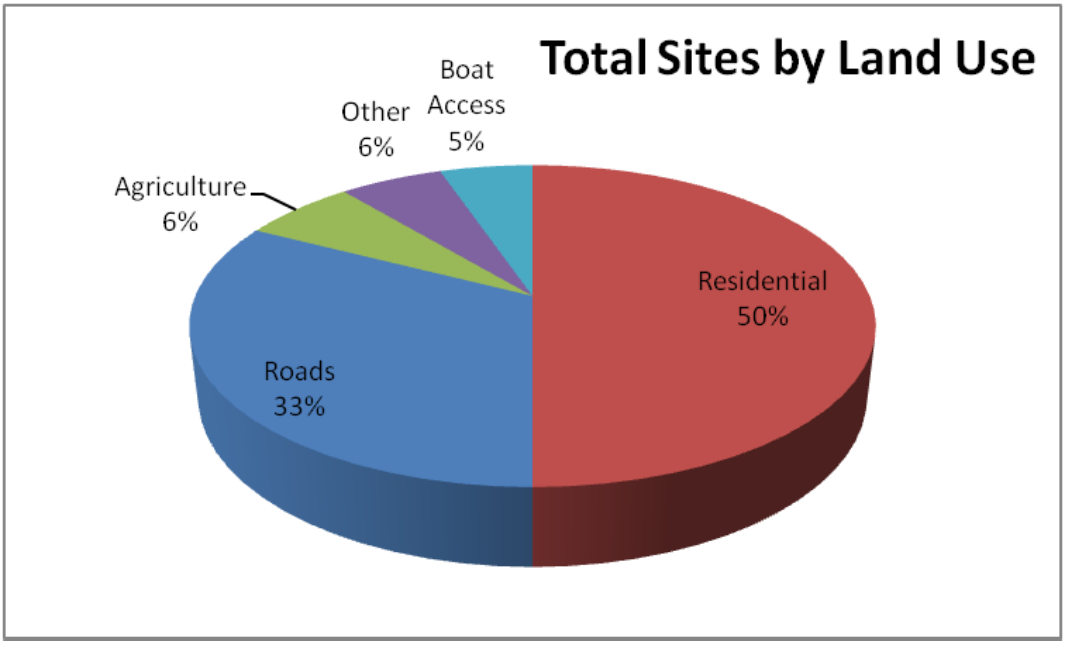


Figure 5. Total percent of NPS sites by land use, with all roads grouped

Impact to Water Quality

In the field, all sites were assessed based on the estimated impact each site would have on water quality using three factors to determine a rating of high, medium, or low impact. 20% of sites were determined to be high impact sites.

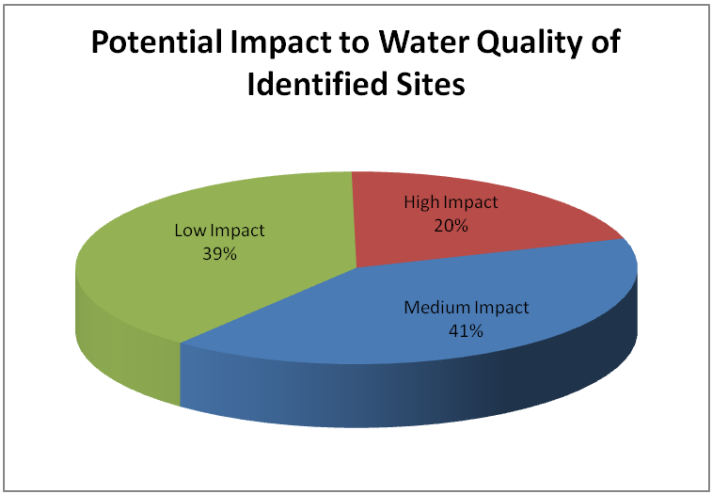


Figure 6. Percent of sites ranked by impact on water quality

Impact was determined by assessing the following factors:

- Type of erosion: sheet, rill, or gully, increasing in terms of severity
- Area: small, medium, or large
- Buffers and Filtering: Significant buffer or filter, some buffer or filter, and no filter

Estimated Cost

Each site was assessed on the estimate cost which would be required to fix the site based on each individual recommendation. Nearly the majority (45%) of sites were ranked as being low cost, typically those which a homeowner may be able to complete on their own.

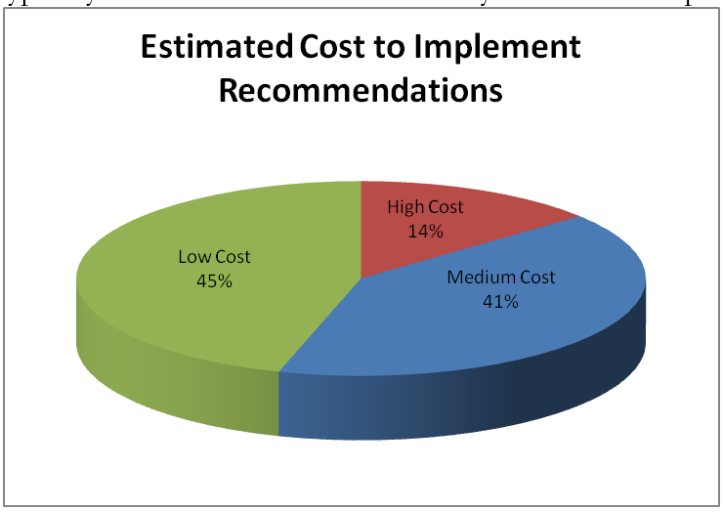


Figure 7. Percent of sites ranked by estimated cost

Cost was estimated under the following general categories:

- High: Greater than $2,500
- Medium: $500 - $2,500
- Low: Less than $500

Estimated Technical Level

Finally, each site was rated on the estimated degree of technical expertise that would be required to implement the recommendations. 48% of sites were estimated as needing no technical expertise, those which may be accomplished by a reasonably capable homeowner.

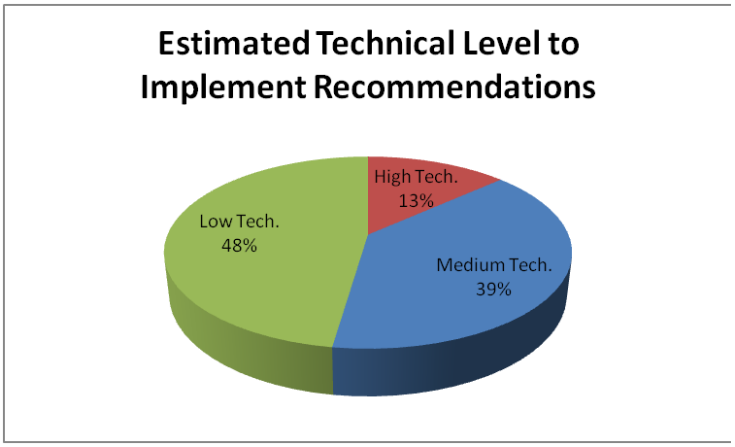


Figure 8. Percent of sites ranked by estimated technical level

Estimated technical level was assessed to the following degrees:

- High: Site requires engineered design
- Medium: Technical person should visit site and make recommendations
- Low: Property owner can accomplish with reference materials

Site Prioritization

With these data, DLWA sought to categorize all the sites using the measures that were collected: impact on water quality, estimated cost to fix, and estimated technical level. This prioritization seeks to inform the implementation of conservation practices on identified sites. As is mentioned in the Methodology, a high priority site would be one which was ranked high in at least one of the three above measures of impact, cost, or technical level.

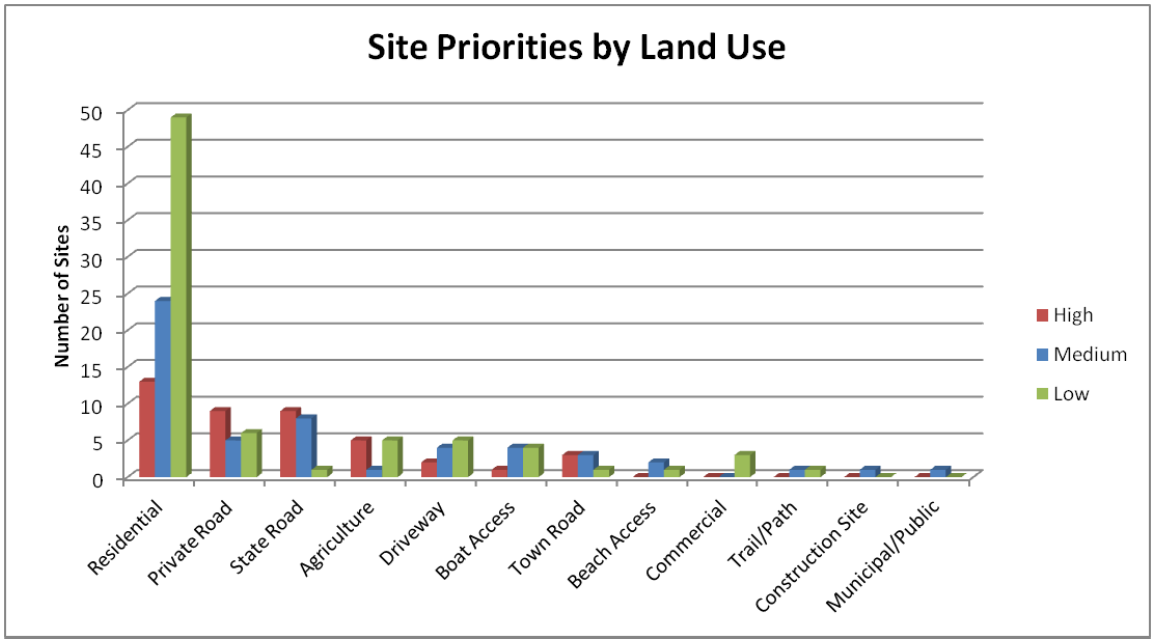


Figure 9. Total number of sites ranked by priority within each land use category

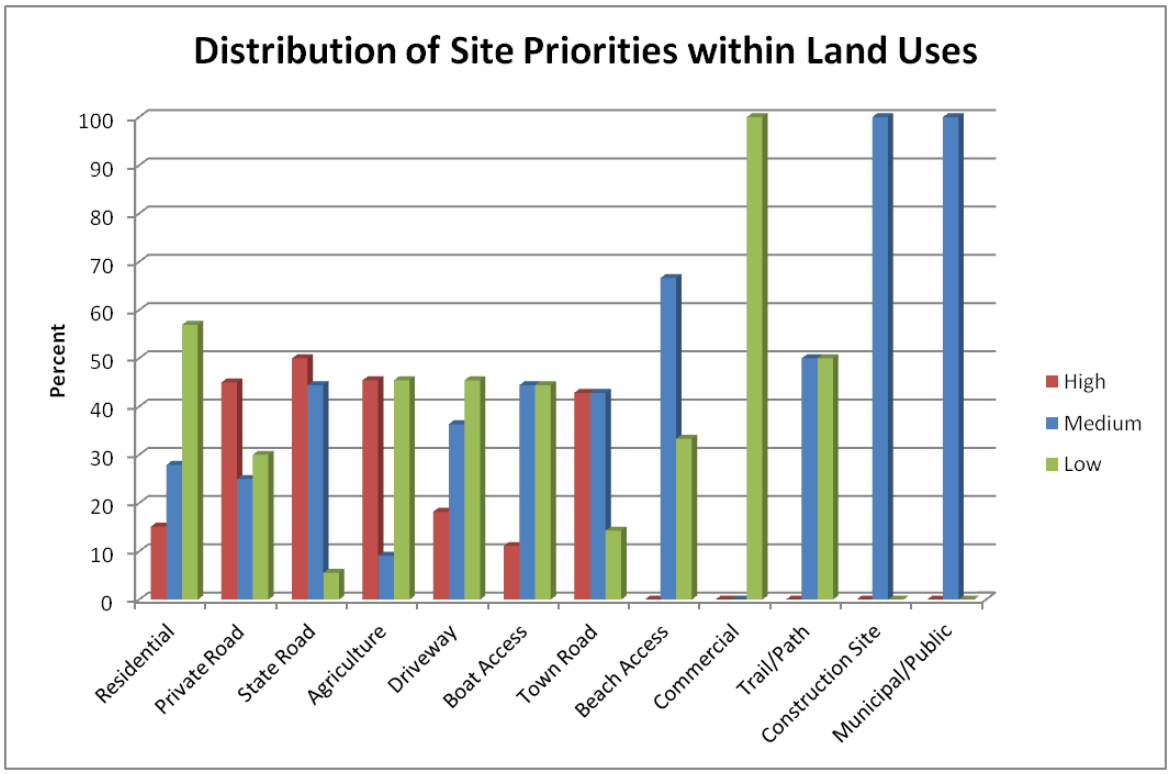


Figure 10. Percent of priority site distribution within each land use category. Notice that Private and State Roads have many high priority sites, while Residential land uses have many low priority sites.

Conclusions & Recommendations

Nonpoint Source pollution within the Damariscotta Lake Watershed is clearly located in areas of residential land use than any other. Residential sites account for 50% of all sites that were documented during this Watershed Survey. Of those 86 total sites, 13 are high priority, 24 are medium, and 49 are low priority sites. This implies that many residential issues would be relatively inexpensive to fix and require little or no technical expertise. Roads in general are the second leading cause of NPS pollution within the watershed. Private roads, state roads, town roads, and driveways combined account for 33% of all sites. As one might assume, road issues tend to be expensive to fix and require high degrees of technical expertise, leading many of them to be designated as high priority sites.

Moving forward, DLWA seeks to be a resource not only to landowners, but also to municipalities and private road owners and associations in order to address issues and concerns on roads and driveways that may be contributing to NPS pollution. This may involve general consultation for advice on conservation practices, permitting assistance, site review, and access to further technical support and assistance.

The following pages provide detailed explanations on common problems and potential solutions for NPS issues documented on a variety of land uses. These suggestions and ideas should be treated as such. If a landowner, municipality, or other organization would like further attention and/or suggestions for a particular site, please contact the Damariscotta Lake Watershed Association.

Examples & Common Recommendations

Residential

Residential NPS sites accounted for 50% of all sites documented during this survey, a total of 86 individual sites. Of these, 13 are high priority, 24 are medium priority, and 49 are low priority sites. 57% of residential sites alone can be addressed with little or no technical expertise and at relatively low costs.

Common Problem Identified

- Surface erosion due to bare soil
- Undercutting on the shoreline
- Lack of shoreline vegetation
- Unstable water access areas, such as around docks and paths

Common Solutions to these Problems

- Seed and mulch bare soil
- Establish or add to shoreline buffer with woody vegetation
- Limit foot traffic in areas sensitive to erosion
- Place mulch or stone on footpaths

Below is one example of a residential site that was documented during this Watershed Survey. Included are the problems and recommendations that are suggested for this specific site. This is also representative of a residential site as it is relatively easy to fix at a low cost.

Problems:

- Moderate surface erosion
- Bare/exposed soil
- Roof runoff erosion
- Lack of buffer vegetation

Recommendations:

- Infiltration trench at roof dripline
- Establish a vegetated buffer
- Mulch and/or erosion control mix
- Reseed bare soil

Private Roads & Driveways

These two land uses make up for 18% of all NPS sites identified. Of the 31 sites, 11 are high priority, 9 are medium priority, and 11 are low priority. For the purposes of demonstration, the two land uses have been grouped here because they are most likely to have a gravel surface and, in this watershed, are most likely to be on steep slopes. Therefore, private roads and driveways often share some of the same issues and recommended actions.

Common Problems Identified

- General surface erosion on moderate to steep slopes
- Erosion along road shoulder and ditch
- Culvert is either not present, blocked, or otherwise non-functioning

Common Solutions to these Problems

- Build up and/or crown road to direct water off the road immediately
- Install runoff diverters such as waterbars or rubber razors to force water off road surface
- Ensure proper placement and functionality of culverts

Below is one example of a road site that was documented during this Watershed Survey. Included are the problems and recommendations that are suggested for this specific site.

Problems:

- Severe surface erosion along road, in part due to steep slope
- Water accumulates, causing ruts
- Lack of road crown or ditching
- Minimal buffer between road and lake (not pictured)

Recommendations:

- Reshape (crown) road to direct water off road surface
- Install turnouts or runoff diverters such as waterbars
- Add new surface material

Town & State Roads

These two land uses make up for 15% of all NPS sites identified. Of 25 sites, 12 are high priority, 11 are medium priority, and 2 are low priority. For the purposes of demonstration, these land uses have been grouped here because they are most likely to be paved and have significant road shoulder and culvert issues. They also require similar processes to fix, as they must be addressed through municipal public works departments or the state Department of Transportation.

Common Problems Identified

- Moderate to severe road shoulder and ditch erosion
- Accumulation of winter sand
- Clogged or perched culverts
- Unstable culvert inlet/outlets

Common Solutions to these Problems

- Vegetate or armor ditch with stone
- Remove culvert clog
- Replace and enlarge culvert
- Armor culvert inlet/outlets
- Install check dams or sediment pools
- Vegetate road shoulder

Below is one example of a state road site that was documented during this Watershed Survey. Included are the problems and recommendations that are suggested for this specific site.

Problems:

- Severe ditch and road shoulder erosion
- Accumulation of sediment in ditch
- Undersized culvert
- Flow directly into stream (not pictured)

Recommendations:

- Armor and/or vegetate ditch and road shoulder
- Remove debris/sediment
- Replace and enlarge culvert
- Install check dams or sediment pools

Sites in Other Land Use Categories

Table 4. Total number of sites by land use and level of impact

Land Use	High	Medium	Low	Total
Residential	13	24	49	**86**
Private Road	9	5	6	**20**
State Road	9	8	1	**18**
Agriculture	5	1	5	**11**
Driveway	2	4	5	**11**
Boat Access	1	4	4	**9**
Town Road	3	3	1	**7**
Beach Access	0	2	1	**3**
Commercial	0	0	3	**3**
Trail/Path	0	1	1	**2**
Construction Site	0	1	0	**1**
Municipal/Public	0	1	0	**1**
Total	**42**	**54**	**76**	**172**

The following is a brief description of general findings when documenting sites of other land uses than those described above. Included here are generalities, by no means do these issues or recommendations apply to every site under the given land use. If landowners or others are interested in what can be done on a specific site, they are encouraged to contact DLWA to arrange a site visit.

Agriculture Sites

Agricultural sites are clearly not as prolific as residential or road sites, however, they still deserve attention. These sites may prove difficult to address because they often include areas of bare soil which do not have the opportunity to stabilize due to annual crop rotation. Hay fields often may not cause significant problems as there are very few areas of exposed, bare soil. However, if fertilizer or manure is spread on crops or hay fields, it can lead to issues if the application exceeds what the crop can actually use. If there is excess application, this can lead to NPS pollution if there are not substantial buffers between these areas and water bodies. Common recommendations may include planting bare soils with a cover crop at the end of the season to ensure the soil is covered during spring snowmelt, reducing erosion. Limiting fertilizer use especially in near shore areas is also beneficial.

Livestock also play an important role as a source of NPS pollution. If livestock have access directly to or near water bodies, phosphorus-laden manure may be deposited directly into the water body or close enough that a rain event will wash it into the water with minimal chance of infiltrating into the soil. Livestock access directly to the lake as well as to any streams or tributaries to the lake can be equally significant sources of NPS pollution and ultimately have negative effects on water quality. Common recommendations include fencing off livestock from the lake as well as streams and tributaries and allowing an adequate vegetated buffer at least 25 feet wide between livestock areas and water bodies. Alternative watering systems may therefore need to be investigated. If desired, DLWA is eager to partner with agriculture professionals to address any issues and pursue funding opportunities.

Beach & Boat Access

These areas often inherently become sites of NPS pollution because they have bare soil or gravel on steep slopes that are uncovered – the perfect equation for erosion. These sites are also subject to significant wave, wind, and ice action throughout the year, further disturbing the soil and causing erosion. Boat access sites may often be improved by hardening the surface where it meets the water to prevent soil disturbance by waves or ice, as well as covering the soil to the side of a ramp using vegetation or armoring with rocks. Beaches constantly deposit sand and soil into water bodies because they are not otherwise stabilized. If a beach exists, the best that can be done is to prevent uphill runoff from increasing the erosion by installing runoff diverters or other infiltration methods.

Commercial

These three sites are not unlike other residential sites; however, the difficulty is in managing a commercial site. Many of the same residential recommendations apply to commercial sites. DLWA seeks to serve a role in educating and assisting businesses with storm water and runoff management on their properties.

Construction Sites

Construction sites may be difficult to manage for erosion because bare soil is often unavoidable. However, proper installation and maintenance of silt fencing, hay bales, and other temporary erosion control measures serve to prevent further NPS issues within the watershed. Because these erosion control measures are often required by law, training courses exist to instruct the proper use, placement, and maintenance of these controls. Frequent visits by professional code enforcement personnel are also critical in maintaining proper erosion control techniques.

Next Steps

Based on these data presented above, DLWA will have a two-pronged focus moving forward. The first goal will be to focus primarily on residential locations for landowner NPS education and assistance with implementation of conservation practices. NPS issues on residential locations are typically easy to implement at low costs and will have a high positive impact on water quality within the entire watershed. DLWA seeks to achieve this primarily through a Youth Conservation Corps to be launched in 2015 that will provide essential services to interested landowners for the implementation of conservation practices.

The second goal as a result of this survey will be to initiate a more intensive process that will seek to address many of the road issues that constitute a full third of NPS issues within the watershed. These sites tend to be more expensive and require technical expertise. DLWA will pursue funding that, if awarded, will be made available to municipalities and private road associations to subsidize the cost of fixing these issues.

Addressing the NPS issues identified in this report will require action by the Damariscotta Lake Watershed Association, individual residents, road associations, municipal and state officials.

Damariscotta Lake Watershed Association

- DLWA already has raised funds and is planning to launch a local Youth Conservation Corps program in the summer of 2015 to address sites of NPS pollution. This program is voluntary. The Association will provide a technical site design for erosion control, apply for any necessary permits for the landowner, and install the project with labor provided at no cost to the landowner. The landowner will only be responsible for providing supplies needed for the specific project.
- With the completion of this report, DLWA will be updating the Damariscotta Lake Watershed Based Management Plan, which will direct the NPS management within the watershed for at least the next 5 years and will identify crucial partners in this work.
- DLWA will be applying for funding through the Clean Water Act Section 319 which is provided to subsidize implementation of conservation practices in watersheds which have completed a watershed survey and have an updated Watershed Based Management Plan. This grant application is competitive and, if awarded, would not be disbursed for use until 2016.
- Promote collaboration between the Association and local municipal officials, road associations, and other organizations and individuals responsible for land and road development and maintenance.
- Provide a trained and knowledgeable staff who are able to inform and recommend erosion control techniques for landowners, municipalities, and other stakeholders.
- Encourage contractors to become trained in erosion control techniques as is required for any contractor moving greater than one cubic yard of soil within 100 feet of a lake or pond.

Municipal Officials

- Promote town and regional planning that limits the need for expanded infrastructure to accompany increased development within the Shoreland Zone.
- Enforce Shoreland Zoning Ordinances to ensure compliance with current requirements which protect local water bodies and limit NPS pollution.
- Conduct regular maintenance of town roads within the watershed, ensuring that conservation practices are in place to prevent recurring sites of NPS pollution.
- Promote and provide training in shoreland zoning requirements as well as Best Management Practices for roads and water crossings.

Road Associations or Those Who Manage Private Roads

- Conduct regular maintenance of roads in order to correct and prevent soil erosion and runoff.
- Ask contractors to provide the group with evidence of their work to ensure they are capable and knowledgeable in designing and maintaining roads to prevent runoff.
- Contact your local organizations for further assistance, including DLWA, the Knox-Lincoln Soil and Water Conservation District (K-LSWCD), or the Maine Department of Environmental Protection.

Individuals

- Manage properties in a way that prevents soil erosion and polluted runoff from entering local water bodies: lakes, ponds, streams, or wetlands.
- Minimize as much as is reasonably possible the amount of cleared land on a single property. NPS pollution is enhanced without any protection of the soil and without structure beneath the soil to hold it in place.
- Plant and encourage woody vegetation to grow, especially in the shoreland zone. This provides cover and structure to the soil, preventing runoff and buffering any other NPS pollution from entering the water.
- Understand the local and state shoreland zoning ordinances and apply for the proper permits if you are doing work on your property that involves moving soil.
- Contact the local Code Enforcement Officer with questions about permitting and before cutting or altering vegetation within 250 feet of lakes and ponds, or within 75 feet of streams.
- Maintain septic systems regularly. Old systems are at higher risk of leaching pollutants into the soil and groundwater. Pump systems on a regular schedule, typically every 2-3 years for year round residences, and every 4-5 years for seasonal residences.

Resources for More Information

Damariscotta Lake Watershed Association

38 Lake Farm Circle
PO Box 3
Jefferson, Maine 04348

Phone: 207-549-3836
Emails: garrison@dlwa.org or jodyjones@dlwa.org
Website: dlwa.org

Provides local expertise in training, education, site assessment, programs, and resources for land and water conservation

Knox-Lincoln Soil & Water Conservation District

893 West Street
Suite 103
Rockport, Maine 04856

Phone: 207-596-2040
Email: info@knox-lincoln.org
Website: knox-lincoln.org

Provides technical assistance, education programs, workshops, sales, resources, and publications for land and water conservation

Maine Department of Environmental Protection

28 Tyson Drive
17 State House Station
Augusta, Maine 04330

Phone: 207-287-3901
Website: maine.gov/dep

Provides training, technical assistance, permitting, enforcement, and education resources

U.S. Department of Agriculture Natural Resource Conservation Service

For Lincoln County:
Augusta Field Office
21 Enterprise Drive, Suite 1
Augusta, Maine 04330

Phone: 207-622-7847 ext. 3
Website: nrcs.usda.gov

For Knox County:
Belfast Field Office
46 Little River Drive
Belfast, Maine 04915

Phone: 207-338-1964 ext. 3
Website: nrcs.usda.gov

Provides technical assistance as well as financial incentive programs for commercial agriculture or forestry operations to implement beneficial conservation practices

March 28, 2014

Dear Damariscotta Lake Watershed Landowner,

The Damariscotta Lake Watershed Association (DLWA), with the support of the Maine DEP, is coordinating a survey of the Damariscotta Lake Watershed. The purpose of the survey is to locate erosion sites and possible sources of phosphorus pollution that may be having an impact on the lake's water quality. The survey findings will be used to make recommendations for voluntary improvements to address the issues at identified sites, with the potential of funding to subsidize these voluntary improvements.

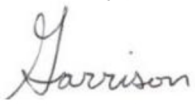
A lake watershed is the area where all rain and snowmelt running off the land drains to the lake. Activities in the watershed that take place far from the lake itself can have as much impact on water quality as those occurring in the shoreline area. The Damariscotta Lake Watershed covers approximately 56+ square miles in the towns of Somerville, Washington, Jefferson, Waldoboro, Newcastle, and Nobleboro.

The survey will be conducted by DLWA volunteers who have been trained by technical advisors from the DEP and DLWA. The survey fieldwork will take place from late April through May, with the survey kick off on April 26. Some follow-up fieldwork may occur in late May and June.

Locally-led watershed surveys such as this one have been used successfully throughout Maine to document threats to water quality. The information we gather will be used to give us the most accurate representation of possible sources of pollution to Damariscotta Lake, to provide opportunities for addressing problem sites, and provide the information needed for DLWA to apply for grant funding to be used to fix the sites with high priority pollution issues. Please be assured that in *no* way will the information gathered be used for any enforcement purposes.

Your participation as a landowner within the Damariscotta Lake watershed is purely voluntary. We would like to invite you to include your land in this survey, but we will respect your property if you do not want us to include your property in this survey. **Please contact me if you do <u>not</u> want us to survey your land**, if you know of any erosion sites you would like included in the survey, or if you have any other questions or comments.

Sincerely,



Garrison Beck
Senior Program Manager
207-549-3836
garrison@dlwa.org

Final Site #_____ Checked by _____ Date _____

Damariscotta Lake Watershed Survey

REMINDER: Only write up if there is likely transport of sediment or phosphorus into the lake.

Sector & Site _____ Date_____ Surveyor Initials _____

Location *(house #, road, utility pole #)* _____

Building Color _____ Landowner Name _____

Tax Map & Lot _____ Talked to Landowner? _____

Flow into Lake via (check ONE): ❒ Directly into Lake ❒ Stream ❒ Ditch ❒ Minimal Vegetation

Note: If flow does not make it into lake, do not fill out a form. It would not be considered a site.

GPS Coordinates in **UTM**

(no degrees or decimal points)

0						

Land Use/Activity Circle ONE	**Description of Problems** Circle ALL that apply	
State Road Town Road Private Road Driveway Residential Commercial Municipal / Public Beach Access Boat Access Trail or Path Logging Agriculture Construction Site **OTHER:**	**Surface Erosion** Slight Moderate Severe **Culvert** Unstable Inlet / Outlet Clogged Crushed / Broken Undersized **Ditch** Slight Erosion Moderate Erosion Severe Erosion Bank Failure Undersized **Road Shoulder Erosion** Slight Moderate Severe **Roadside Plow/Grader Berm**	**Soil** Bare Uncovered Pile Delta in Stream/Lake Winter Sand **Roof Runoff Erosion** **Shoreline** Undercut Lack of Shoreline Vegetation Inadequate Shoreline Vegetation Erosion Unstable Access **Agriculture** Livestock Access to Waterbody Tilled Eroding Fields Manure Washing off Site **OTHER:**

Slope: ❒ Flat ❒ Moderate ❒ Steep **Size of Area Exposed or Eroded** (length & width): _____

Site is linked to another: Cause of Site # _____ Result of Site # _____

Recommendations		
Culvert	**Roads / Driveways**	**Paths & Trails**
Armor Inlet/Outlet	Remove Grader/Plow Berms	Define Foot Path
Remove Clog	Build Up	Stabilize Foot Path
Replace	Add New Surface Material	Infiltration Steps
Enlarge	• Gravel	Install Runoff Diverter (waterbar)
Lengthen	• Recycled Asphalt	**Roof Runoff**
Install Culvert	• Pave	Infiltration Trench @ roof dripline
Install Plunge Pool	Reshape (Crown)	Drywell @ gutter downspout
Ditch	Vegetate Shoulder	Rain Barrel
Vegetate	Install Catch Basin	**Other**
Armor with Stone	Install Detention Basin	Install Runoff Diverter (waterbar)
Reshape Ditch	Install Runoff Diverters	Mulch / Erosion Control Mix
Install Turnouts	• Broad-based Dip	Rain Garden
Install Ditch	• Open Top Culvert	Infiltration Trench
Install Check Dams	• Rubber Razor	Water Retention Swales
Remove debris/sediment	• Waterbar	**Vegetation**
Install Sediment Pools	**Construction Site**	Establish Buffer
Other Suggestions:	Mulch	Add to Buffer
	Silt Fence / EC Berms	No Raking
	Seed / Hay	Reseed bare soil & thinning grass
	Check Dams	

Impact: Circle one choice in each column, add the three selected numbers together, and then circle the site's corresponding impact rating (high, medium, or low).

Type of Erosion	Area	Buffers and Other Filters
Gully - **3**	Large - **3**	No filter, all channelized direct flow into lake or stream - **3**
Rill - **2**	Medium - **2**	Some buffer or filtering, but visible signs of concentrated flow and/or sediment movement through buffer and into lake - **2**
Sheet - **1**	Small - **1**	Significant buffer or filtering* - **1**

IMPACT

High: 8-9 pts

Med: 6-7 pts

Low: 3-5 pts

* Confirm there is likely sediment/runoff delivery. If not, do not write up as a site.

Cost to Fix

High:	Greater than $2,500
Medium:	$500-$2,500
Low:	Less than $500

Technical Level to Install

High:	Site requires engineered design
Medium:	Technical person should visit site & make recommendations
Low:	Property owner can accomplish with reference materials

Guidance on Filling out Lake Watershed Survey Field Forms

Remember, only erosion sites which are a source of sediment which is likely to enter the lake should be documented as a problem site using this form. See the below section 'Flow into Lake via' or the "Lake Watershed Survey Site Guidelines" for more details on determining whether to write up an erosion site as a problem site or not. The "Lake Watershed Survey Site Guidelines" may also be useful to bring into the field to use as guidance.

Each identified NPS site is documented on a form depending on what is observed in the field. Volunteers should fill out all sections of the field sheet for each site according to the following guidance:

Sector and Site - Sites are numbered by the designated sector number and the number of sites encountered in each sector. For example, if a group surveys Sector 2, the first site that they document should be labeled 2-1. This number should also be recorded on the field maps and in the photograph (using the photo ID cards).

Location & Building Color – Surveyors should provide detailed information to identify the site location. If the problem is located on a private driveway or residential area, the road name and house number should be provided. In many cases, however, the house number is not clearly marked. In this case, other information should be included (e.g., 3rd house on the right, between #7 and #9). House color should also be noted for problems associated with private properties (e.g., red with white shutters).

Landowner Name – Landowner name should be documented if available. This information helps make landowner contact for future mitigation efforts, and oftentimes landowners are interested in learning if there was a problem on their property. Landowner name might be clearly posted on a mailbox or house sign, and volunteers often know the names of their neighbors. If tax map and lot information is available, this is another way to obtain landowner names.

Tax Map and Lot – If possible, each survey team should have town tax maps of their assigned sectors. As sites are identified, surveyors should note the site number directly on these maps as close to the actual location as possible. This will serve as a way to cross check the accuracy of the GPS points.

Talked to Landowner? – Surveyors should knock on the door of all private homes prior to surveying the property. If someone is home, surveyors should remind them about the watershed survey and letters that notified them about the project. They should confirm that they agree to have their property included in the survey. If contact is made with the landowner, 'Yes' should be entered in this field with any relevant comments about the interaction (e.g., supports effort, would like more information about plants). If no one is home, 'No' should be entered in the field.

Flow into Lake via – Check the one box that best describes where the eroded sediment from a site goes. This field is used as a reminder to follow the flow of the erosion to determine where it goes, and to only write it up as a site if it likely makes it into the lake either directly, via a stream, via a ditch, or through some vegetation. This field is also used to help determine the potential impact to the lake. Note: Check **Minimal Vegetation** if the sediment washes into a vegetated buffer next to the lake or a stream but it is likely that some sediment or phosphorus will still reach the lake. This would still be considered a problem site. However, it should not be written up as a site if the eroded sediment washes into a large, vegetated buffer without a clear connection to the lake or a feeder stream.

GPS Coordinates – GPS coordinates will be recorded for all point and line data. All data for the Damariscotta Lake Watershed Survey will be collected in UTM Zone 19N projection.

Land Use/Activity – Circle one land use that best describes the site. If it is not clear whether a road is town or private, circle both and place a '?' next to the entry. Circle 'Residential' if the problem is located on a residential property, but it is not the driveway. The 'Beach Access', 'Boat Access', and 'Trail' categories are usually areas with unclear ownership that are used by many parties. Trails are typically ATV trails through the woods. Typically, Boat Access areas are shared right-of-ways that appear to be used primarily to launch boats. Beach access areas are typically shared right-of-ways that appear to be used primarily for swimming, lounging activities. Construction sites are areas undergoing new home construction or major renovations with extensive bare soils due to excavation activities. Municipal / Public areas include public beaches, parks, and parking areas owned by a municipality.

Note: Erosion problems that cross multiple land uses should be documented as two separate sites on two separate sheets. For example, a problem that starts on a private road and continues onto a private residential area should be designated as two different sites. Also, if there is a problem noted on one property's driveway **and** the same property's adjacent yard, this should also be documented on two field sheets.

Description of Problem – The problems observed at each specific site should be documented by circling all the characteristics that apply. Circle only the items listed under each bold faced category. The bold faced categories should not be circled; they are listed to prompt surveyors to think about potential problems with a given land use (e.g., culvert, ditch, road shoulder).

Surface Erosion categories (slight, moderate or severe) should be circled for soil erosion sites that are not covered in one of the following categories. This usually applies to erosion on areas including residential lands and road surfaces. However, if there is soil erosion along a road shoulder, surveyors should circle only the appropriate selection under the **Road Shoulder Erosion** category.

Three categories (**Surface Erosion, Ditch Erosion, Road Shoulder Erosion)** include **Slight, Moderate** and **Severe** options. In general, these can be differentiated as follows. Slight Erosion should be selected for areas with sheet erosion – bare soil without any small channels or rills cutting through the soil. Areas with Moderate Erosion have small rills and channels carved through the soil. Severe Erosion includes larger gully erosion – channels with significant soil movement that are large enough to step into.

Size of Area Exposed of Eroded – Enter the approximate width and length of the site (e.g., 12' x 10'). Surveyors should measure their pace at the beginning of the field session. Site measurements can then be approximated by pacing the eroded area. If there are two discrete eroded areas on a property or road segment, they can either be entered separately (e.g., 12' x 10' and 75' x 5') or lumped together. If the dimensions of two eroded areas are similar, it makes sense to lump them together. For example, if there is erosion in the ditches on both sides of a road that measures 100' in length and each ditch is 4' wide, the **Size of the Area Eroded** could be listed at 100 x 8'.

Site is Linked to Another – Oftentimes, a problem on one land use is connected to the problem on an adjacent land use. If this is the case, list the site number of the related site. For example, runoff from a private road flows down an adjacent driveway. This should be noted, since the driveway might not be able to be fixed without first addressing the problem on the private road.

Recommendations – Circle all the possible BMPs that might be able to fix the erosion problems at each site. Circle only the items listed under each bold faced category. The bold faced categories should not be circled; they are listed to prompt surveyors to think about potential BMPs for each given land use (e.g., culvert, ditch, road shoulder). The recommendations, **Add New Surface Material** and **Install Runoff Diverters** can be circled, but there are also bulleted options under each of these headings if it is clear which sub-option would be most suitable.

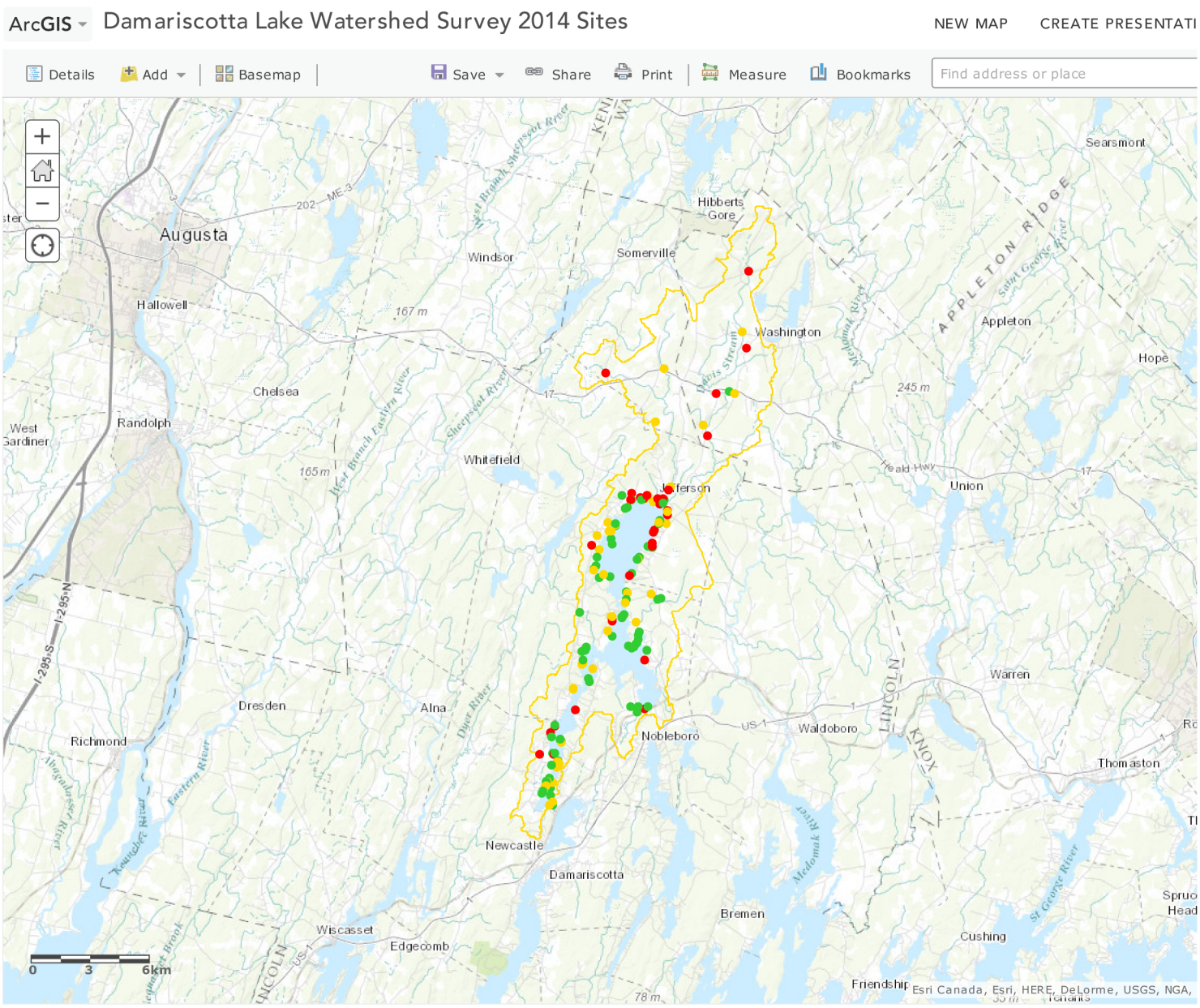
Impact Rating – The impact rating is an indicator of how much soil and phosphorus erodes into the lake from a given site. The impact is selected based on the amount of buffer or other filter, slope, size and severity of the eroded area, and amount of soil eroded. Use the point system to help consider these factors and determine the site's impact rating.

Select one choice and corresponding points for each of the categories 'Type of Erosion,' 'Area,' and 'Buffers and Other Filters,' and then add your three selected numbers together for the impact score. Circle the site's impact rating.

For example, a large eroded area with gully erosion and direct flow into the lake would be 9 points and rated as High Impact. A small patch of bare soil undergoing sheet erosion next to the lake without any buffer would be 5 points and rated as Low Impact. Many times sites do not clearly fit into these categories, so the survey team discusses the impact rating factors of a site and decides upon the best fit.

If a site has significant deposition in a vegetated area, be sure to confirm there is likely some sediment/runoff delivery into the lake. If there is not, the erosion site should not be documented as a problem site.

Cost Rating – The cost rating for each identified erosion site is based on the number and types of recommendations selected at the top of the page. Low Cost would be selected for small residential sites that only need a few low cost BMPs such as mulch, runoff diverters, seed/hay, drywells or a small buffer. Most road-related BMPs tend to be more expensive. If heavy equipment is needed to install several recommended BMPs, the project would probably be a High Cost. As with the Impact Ratings, many sites do not clearly fit into these categories. Oftentimes, a survey team discusses the impact rating of a site and decides upon the best fit.


ArcGIS
Damariscotta Lake Watershed Survey 2014 Sites
NEW MAP
CREATE PRESENTATI
Details
Add
Basemap
Save
Share
Print
Measure
Bookmarks
Find address or place
Augusta
Hallowell
Chelsea
Randolph
West Gardiner
Windsor
Somerville
Hibberts Gore
Searsmont
Appleton
Hope
Washington
Whitefield
Jefferson
Union
Dresden
Alna
Richmond
Nobleboro
Waldoboro
Warren
Thomaston
Newcastle
Damariscotta
Bremen
Cushing
Wiscasset
Edgecomb
Friendship
0 3 6km
Esri Canada, Esri, HERE, DeLorme, USGS, NGA,

APPENDIX B

Pollutant Load Estimates for Select Sites

Site	Sediment (tons/yr)	Phosphorus (lb/yr)	Nitrogen (lb/yr)	Method
1-16	2.14	1.82	3.64	US EPA Region 5 Gully
1-18	0.71	0.61	1.21	US EPA Region 5 Bank
1-21	1.40	1.19	2.38	US EPA Region 5 Gully
1-22	0.45	0.45	0.89	US EPA Region 5 Gully
1-24	4.22	3.59	7.18	US EPA Region 5 Bank
2-04	0.64	0.64	1.29	US EPA Region 5 Bank
2-06	0.06	0.06	0.12	USFS WEPP Road
2-11	0.07	0.07	0.13	US EPA Region 5 Gully
2-14	38.15	38.15	76.31	US EPA Region 5 Gully
3-04	1.03	1.03	2.07	US EPA Region 5 Bank
5-03	3.19	3.19	6.38	US EPA Region 5 Bank
8-01	0.19	0.19	0.19	US EPA Region 5 Gully
8-04	1.12	0.95	1.91	US EPA Region 5 Bank
9-05	1.98	1.98	1.98	US EPA Region 5 Gully
9-05	2.49	2.49	4.98	USFS WEPP Road
10-05	0.03	0.02	0.05	US EPA Region 5 Bank
10-06	2.93	2.93	5.85	US EPA Region 5 Bank
11-08	0.23	0.23	0.23	US EPA Region 5 Gully
14-04	0.14	0.12	0.24	US EPA Region 5 Bank
14-04	0.47	0.47	0.47	US EPA Region 5 Gully
14-06	0.42	0.42	0.42	US EPA Region 5 Gully
14-08	3.32	3.32	3.32	US EPA Region 5 Gully
Total	61.661	60.195	117.514	