MOULTONBOROUGH BAY INLET

WATERSHED NONPOINT SOURCE SURVEY REPORT

PRODUCED FOR: Lake Winnipesaukee Association

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Acknowledgements

The following people and organizations were instrumental in the Moultonborough Bay Inlet Watershed Survey:

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1. Introduction

The Moultonborough Bay Inlet watershed covers 49 mi^2 of watershed area in the Towns of Moultonborough and Sandwich, NH (Figure 1). The Inlet is part of the larger headwaters to Lake Winnipesauke. Because of this, any pollution that occurs in the Moultonborough Bay Inlet can be transported to the larger lake.

View of the Moultonborough Bay Inlet watershed from Castle in the Clouds. Photo: FB Environmental.

The Inlet is highly sensitive to nutrient loadings, and thus, it is important to identify sources of pollution within the watershed. A watershed survey was conducted in May of 2015 to identify potential sources of pollution. It is the goal of this report to identify sites within the watershed where there is evidence of erosion and to provide recommendations for best management practices (BMPs) to reduce the erosion from these sites.

This report makes use of the Region 5 model (Michigan Department of Environmental Quality), which estimates the loading of total sediment, total phosphorus (TP), and total nitrogen (TN) as a result of each erosion site, as well as the reduction of nutrient inputs with installed BMPs. It is important to note that there are numerous assumptions in this model; the estimates produced are a way of assessing the impact of each site and must be viewed relatively. These impact ratings can then be used to choose the highest priority sites for BMP implementation. For some sites, measurement estimations were calculated via either GIS or field photography.

This survey identified **56 sites** where erosion could be contributing to the vulnerable water quality within the Moultonborough Bay Inlet (Figure 1). Detailed explanations on BMP recommendations are presented later in this report.

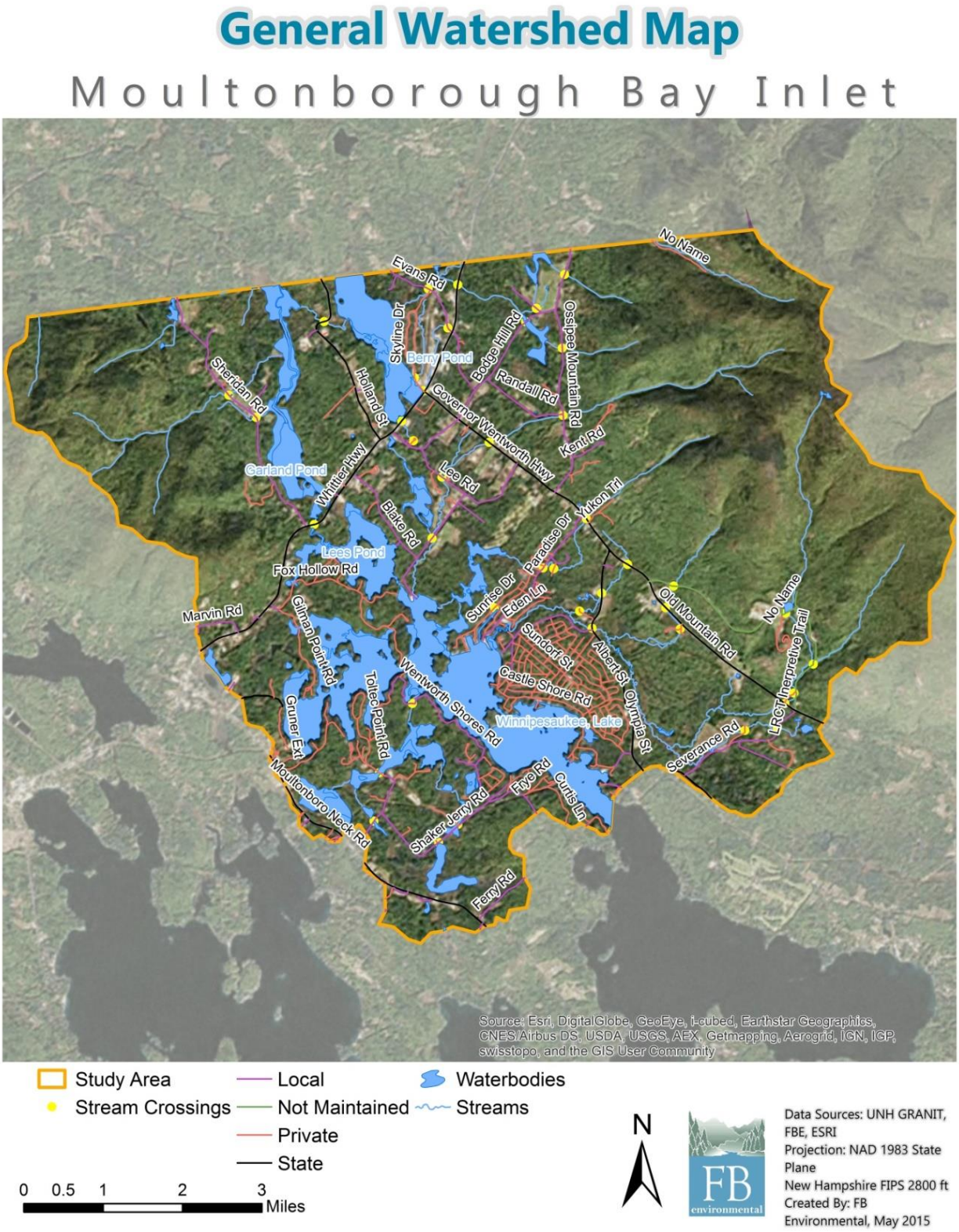


FIGURE 1: THE MOULTONBOROUGH BAY INLET WATERSHED

1.1. Water Quality at the Moultonborough Bay Inlet

While the Moultonborough Bay Inlet watershed consists of a large portion of undeveloped forest, the shorelines of the Inlet are densely developed in some areas and the watershed is traversed by transportation routes. These developed surfaces can cause nonpoint source pollution (NPS) to the inlet. NPS occurs when stormwater runoff from rain and snowmelt picks up soil, nutrients, and other pollutants as it flows overland and washes into surface waters. Undeveloped surfaces and forested areas act as a buffer to waterbodies; pollutants are filtered out by the vegetation and soil before entering the stream or lake water.

Studies have shown that runoff from developed areas has five to ten times the amount of phosphorus compared to runoff from forested areas (NH DES, 2010). Phosphorus is food for algae and other plants and is found in soils, septic waste, pet waste, and fertilizers. In natural conditions, the scarcity of phosphorus in a lake limits algae growth. However, when a lake receives additional phosphorus, algae growth increases dramatically. This growth may cause algal blooms, but more often results in small changes in water quality that, over time, damage the ecology, aesthetics, and economy of lakes.

Soil erosion is the largest source of phosphorus in New Hampshire lakes. Phosphorus and other nutrients are naturally present in the soil. The soil that erodes from driveways, roads, ditches, pathways, and beaches essentially “fertilizes” the receiving waterbody.

1.2. Demographics

The Moultonborough Bay Inlet watershed is moderately developed with concentrated residential development located largely on the northeastern shorelines of the Inlet. Two housing developments (Suissevalle, Balmoral) make up a large portion of this developed area, with private lawns and boat access directly on the shoreline. The population of the Town of Moultonborough in 2013 was 4,049 persons. This has approximately doubled since 1980, when the population was at 2,206 persons (Economic & Labor Market Information Bureau, NH Employment Security, 2015). The natural terrestrial and aquatic resources available in the Town of Moultonborough make it appealing for both year-round living and seasonal tourism.

TABLE 1. CHANGE IN POPULATION FROM 1980-2013 IN THE TOWN OF MOULTONBOROUGH

Town	1980 Census	2013 Census	% Change
Moultonborough	2,206	4,049	83.5

1.3. Objectives

The five main objectives of the 2015 watershed survey were:

1. To identify and prioritize existing sources of polluted runoff, particularly soil erosion sites, within the watershed. The survey focused on investigating potential sources of erosion and runoff to all waterbodies in the Town of Moultonborough, NH.
2. To raise public awareness (through this report and other outreach conducted by LWA) about the connection between land use and water quality.
3. Provide the basis to obtain additional funds to assist in fixing identified erosion sites throughout the watershed.
4. Use the information gathered as one component of a long-term lake protection strategy.
5. Collect site information to model estimated pollutant load reductions for each NPS site identified in the Moultonborough Bay Inlet watershed.

The purpose of the survey was NOT to point fingers at landowners with documented problems, nor was it to seek enforcement action against landowners not in compliance with ordinances. It is the hope that through future projects, LWA can work with landowners to solve erosion problems on their property or help them learn how best to accomplish solutions on their own.

1.4. Survey Methodology

Technical staff from FB Environmental were assigned to survey zones 1 and 2 (Figure 2). Teams spent two days (May 18 and 19) documenting erosion on the roads, municipal properties, driveways, and stream crossings in their assigned sectors using cameras, Global Positioning System (GPS) units, and standardized forms. Problems were identified and documented, solutions were recommended, and the costs of improvements were estimated. In addition to documenting erosion sites, staff obtained information on road shoulder and stream bank erosion, as well as gully dimensions at each site. This information was then later used to estimate the pollutant load associated with each site. This estimated pollutant load can potentially be reduced by implementing the BMPs recommended for each site documented during the survey.

The collected data was entered into a spreadsheet and the documented erosion sites were plotted on maps (Appendix B). A description of sites, recommended actions, and associated costs are discussed in the next section of this report. A spreadsheet with data from the documented sites is provided in Appendix A.

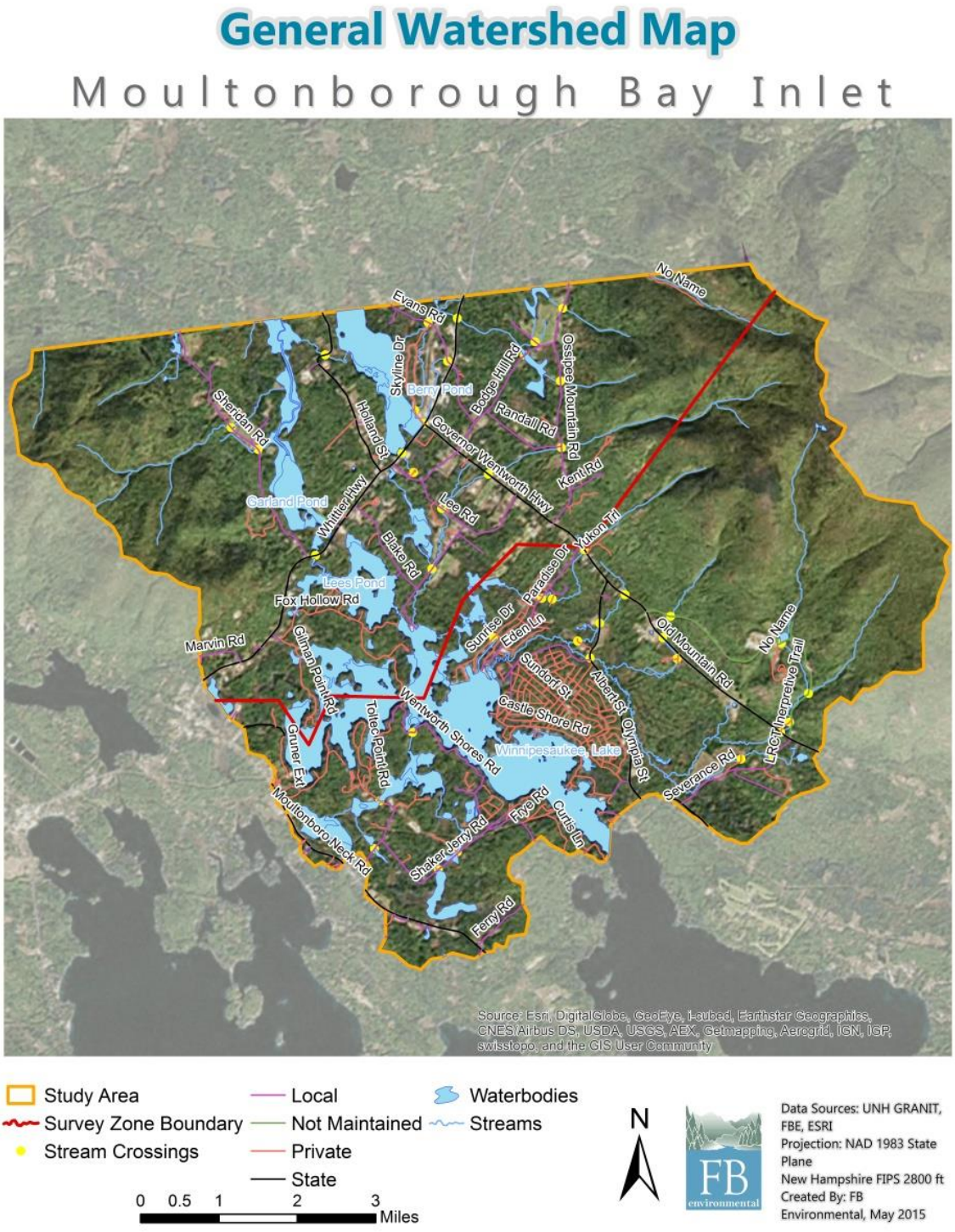


FIGURE 2. WATERSHED SURVEY SECTORS

2. NPS Survey Findings

Technical staff surveyed every public road in the watershed within the Town of Moultonborough and identified **56 sites** in the Moultonborough Bay Inlet watershed that are currently impacting or have the potential to impact water quality in the lake (Figure 3). Some key conclusions include:

- Twenty-three sites were located on town roads. These sites were often a result of eroding road shoulders and unstable culverts.
- Ten sites were located on private roads, concentrated in two developments on the northeast side of the Inlet. Landowners are encouraged to implement BMPs on these properties, primarily due to their proximity to the Inlet.
- Half of the identified sites were considered low impact. However, it is important to recognize that fixing multiple low impact sites can also have a significant impact on erosion control (Table 2).
- Fifty-five percent of sites were of medium cost to repair. These costs were then weighted by impact factor to identify the best way to cost-effectively improve erosion control. These numbers are available in Appendix A.

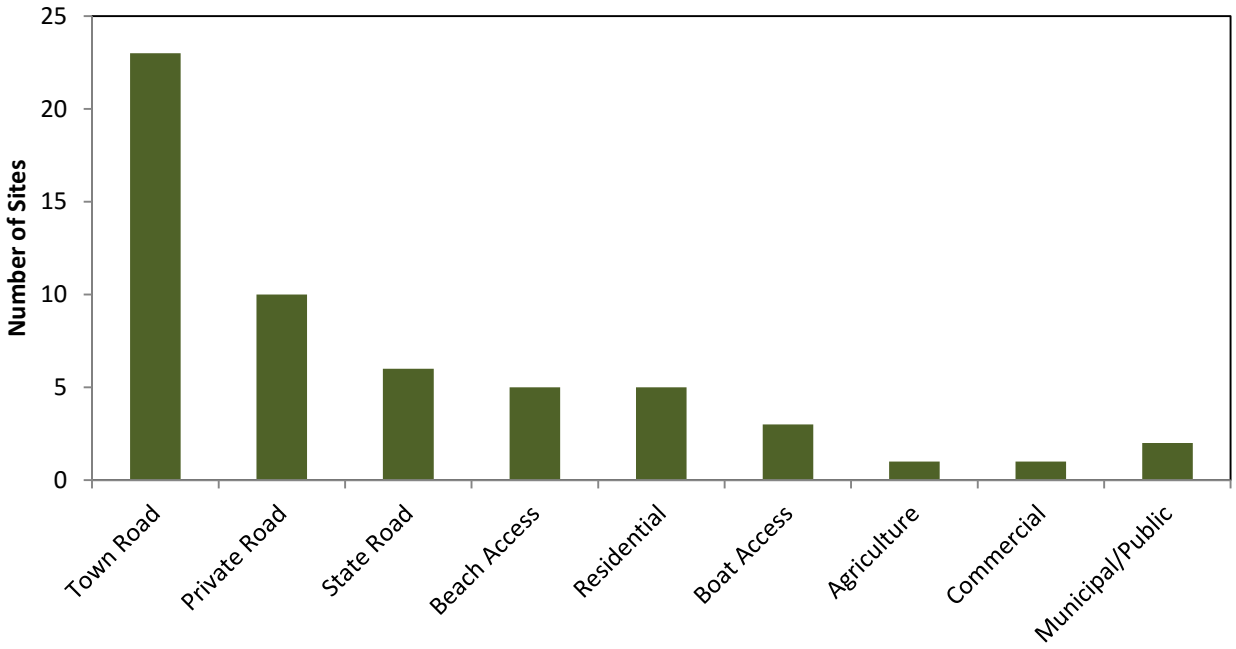


FIGURE 3. NUMBER OF SITES BY LANDUSE CATEGORY

TABLE 2. NPS SITES LAND USE AND IMPACT

LAND USE	HIGH	MEDIUM	LOW
AGRICULTURE	1	0	0
BEACH ACCESS	2	1	2
BOAT ACCESS	1	2	0
COMMERCIAL	0	1	0
MUNICIPAL/PUBLIC	0	1	1
PRIVATE ROAD	0	3	7
RESIDENTIAL	0	1	4
STATE ROAD	1	2	3
TOWN ROAD	2	10	11
TOTAL	**7**	**21**	**28**

2.1. Impact to Waterbodies

Each site was rated for its potential impact to waterbodies (Figure 4). "Low" impact sites are those with limited transport of soil off-site. "Medium" impact sites exhibit sediment transportation off-site, but the erosion does not reach high magnitude. "High" impact sites are those with large areas of significant erosion and direct flow to water.

Half of the surveyed sites were medium or high impact on water quality. **Impact** is based on slope, soil type, amount of eroding soil, buffer size, and proximity to water.

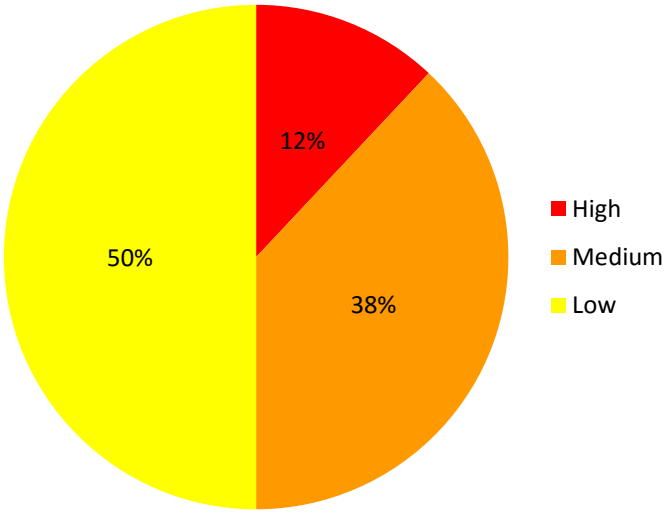


FIGURE 4. SITE IMPACT RATINGS

2.2. Cost of Materials and Labor

Recommendations were made for fixing each NPS site, and the associated cost of labor and materials were estimated (Figure 5). Cost is an important factor in planning for restoration and effective BMP applications.

"Low" cost sites were estimated to cost less than $500; "Medium" cost sites were estimated to cost between $500 and $2,500; "High" cost sites were estimated to cost more than $2,500. Fifty-five percent of sites were rated medium cost.

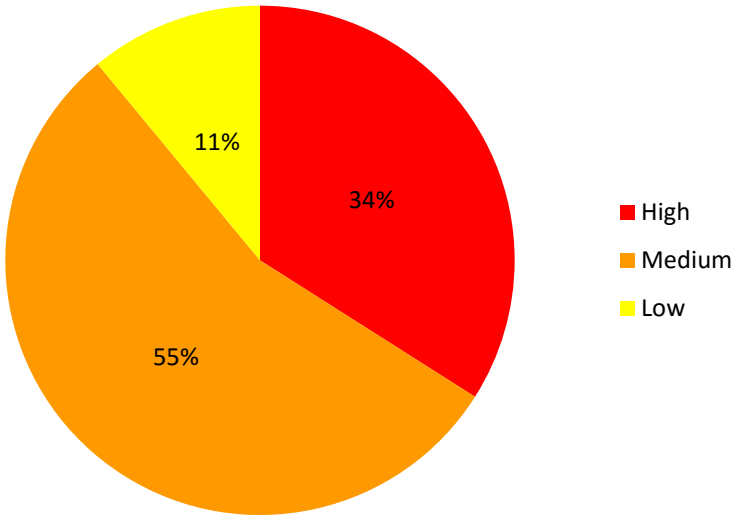


FIGURE 5. SITE COST RATINGS

2.3. NPS Site Observations

2.3.1. Town Roads

Town roads accounted for about 40% of identified sources of polluted runoff (23 of the 56 erosion sites). However, 11 of the sites were determined to be low impact, while 7 and 2 were medium and high impact, respectively. Of these 23 sites, 4 were identified as having a high cost, 16 as medium cost, and 3 as low cost. The high costs associated with the town roads were generally a result of undersized or unstable culverts. Undersized culverts frequently resulted in erosion around the inlet and the outlet of the culverts. These culverts should be replaced and armored at the inlet and the outlet. Other restoration recommendations for the town roads included re-vegetating the road shoulders and ditches.

Problem: Undersized and Unstable Culverts

Solution: Enlarge and lengthen culverts to properly accommodate water flow. Armor the inlets and the outlets of culverts to reduce erosion. Install check dams to slow water flow.

Photo From: Los Alamos National Laboratory

Check dams slow water from the ditch before entering the culvert.

Photo From: Texas A&M Forest Service

Armoring culverts reduces erosion of the road shoulder.

2.3.2. Boat and Beach Access

Three (3) erosion sites were located at boat access points along the shore of the Moultonborough Bay Inlet and 5 sites were located at beaches, accounting for approximately 14% of the total sites. Generally, boat access points were unpaved or only partially paved, and surface erosion was evident from the road to the waterbody. These sites were located on a combination of state, town, and privately-owned roads. A large marina had both boat slips and beaches with minimal to no vegetated buffer. A vegetated buffer traps sediment and absorbs water and nutrients before they are deposited into the water.

Problem: Shoreline Erosion

Solution: Apply recycled asphalt on boat launches and add vegetated buffers around shorelines.

Recycled asphalt reduces surface erosion from gravel roads.

2.3.3. Private Roads and Residential Areas

Ten (10) private roads and 5 residential areas were identified in the watershed survey. Four (4) of these sites were scored as medium impact and 11 as low impact. Four (4) sites were identified as having high costs, 9 as medium cost, and 2 as low cost. Residential sites were evaluated from the roads, and were frequently characterized by a lack of a vegetated buffer around streams and ponds passing through private property. Landowners are encouraged to allow a vegetated buffer to grow around the water body and to identify a no-mow zone.

Problem: Lack of Vegetated Buffer

Leaving a "no-mow" zone around residential ponds reduces the amount of runoff in the stream. This runoff can include toxic pesticides or excess nutrients that pollute the stream.

Solution: Plant a vegetated buffer along streams and ponds. Increase the road shoulder where narrow gravel roads pass through wetlands.

Planting vegetation along shorelines reduces erosion into the water.

3. Model Results

Using the dimensions of the observed erosion, as well as the underlying soil type, we were able to use the Region 5 Model to calculate the annual input of total sediment, phosphorus, and nitrogen to the lake from these identified NPS sites. Approximately 66.1 tons of sediment enter the Moultonborough Bay Inlet annually from these erosion sites. This sediment is estimated to deliver approximately 64.5 lbs. per year of phosphorus and 134.9 lbs. per year of nitrogen to the Inlet (Table 3). Best management practices (BMPs) were recommended for each erosion site. Based on the size and type of BMP, installation and annual maintenance costs were estimated. If all recommended BMPs were completed, it would cost approximately $266,448 for both installation and maintenance over a ten-year timeframe (Table 3).

To make these efforts more manageable to LWA, we then prioritized erosion sites by weighting the cost of each site by the impact score and the phosphorus loading by that site. The top 20 sites that had the lowest weighted cost per mass of phosphorus reduced were prioritized for BMP implementation (Table 6). While addressing high impact sites is desirable, this is a more cost-effective way to identify the sites that could realistically be fixed while also reducing overall costs. It is important to note that addressing multiple low priority sites can have a significant impact on the phosphorus loading.

TABLE 3. SUMMARY OF NUTRIENT DELIVERY TO THE MOULTONBOROUGH BAY INLET

SITES	SEDIMENT (TONS/YR)	TOTAL PHOSPHORUS (LBS/YR)	TOTAL NITROGEN (LBS/YR)	INSTALLATION COST	ESTIMATED 10 YR COST
ALL SITES	66.1	64.5	134.9	$213,448.00	$266,488.00
PRIORITIZED SITES	48.0	46.4	21.1	$36,286.00	$52,536.00

4. Next Steps

Fixing the NPS sites identified in this survey will require efforts by individuals, the Lake Winnipesaukee Association (LWA), road associations, and municipal officials. Information regarding recommended next steps, permitting, and BMP information is included below.

Lake Winnipesaukee Association

- Distribute copies of the survey report to road associations and towns with identified erosion problems. Send letters to landowners. Encourage all parties to make improvements.
- Apply for NHDES and other grants to help fix priority erosion problems.

- Continue to increase and empower the association's membership, and provide educational materials and guidance to members of the Moultonborough Bay community.
- Track sites as they are identified. Determine whether problems have been fixed or are ongoing.
- Organize workshops and volunteer "work parties" to start fixing identified erosion problems and teach citizens how to fix similar problems on their own properties.
- Educate municipal officials about lake issues and work cooperatively to find solutions.

Individual Landowners

- Look in the report or contact the LWA to see if you have an identified erosion problem. If so, try to start addressing the problem. Call the Belknap or Grafton County Conservation Districts, Lake Winnipesaukee Association, NH Lakes Association, or NHDES for free advice about how to get started.
- Let lawn and raked areas revert back to natural plants. Consider using plants with deep shrub and tree roots to help hold the soil in place.
- Avoid exposing bare soil. Seed and mulch bare areas.
- Read "Permitting ABCs" later in this report, and call the Town Code Enforcement Officer and NHDES before starting any cutting or soil disturbance projects.
- Maintain septic systems properly. Pump septic tanks (every 2 to 3 years for year-round residences; 4-5 years, if seasonal and minimal use) and upgrade marginal systems.
- Become part of the solution by joining road and local lake associations and establishing best practices on your property.

TABLE 6. TWENTY HIGHEST PRIORITY SITES

Site	Location	Direct Flow to	Land Use	Issues	Recommendations	Impact High = 3 Med = 2 Low = 1	Cost High = 3 Med = 2 Low = 1	Technical Level
1-18	Ossipee Mtn Rd. #446	Stream	Town Road	Unstable inlet and outlet; undersized culvert, moderate road shoulder erosion	Armor the inlet and outlet of the culvert and enlarge culvert (or build bridge). Build up road.	2	2	High
1-19	Wool Wakefield #23	Vegetation	Town Road	Slight ditch erosion and winter sand build-up.	Remove grader and winter sand.	1	1	Low
1-58	Blake Road by School	Vegetation/Wetland	Municipal/Public	Moderate surface erosion and a bare uncovered pile of soil.	Add mulch/erosion control mix and a rain garden.	2	2	Low
1-26	Blueberry Lane (end of Road)	Lake	Private Road	Slight surface erosion.	Build-up existing berm.	2	1	Medium
1-08	Sheridan Road near House #65	Vegetation	Town Road	Bank failure in the ditch and slight road shoulder erosion.	Armor the inlet of the culvert and remove the log. Reshape ditch and install turnouts on the East side.	1	2	High
1-12	Sheridan Road near Town Line	Wetland	Agriculture	Lack of shoreline vegetation, and cattle access to the waterbody (agricultural pond).	Establish buffer around the pond.	3	3	Low
1-14	Whittier Highway across from Moultonborough Self storage	Lake	Boat Access/State Road	Slight surface erosion from gravel road to lake without a buffer.	Add new surface material. Add apron of pavement on the slope near the highway and then add recycled asphalt to the bottom of the road near Berry Pond. Install a rubber razor at the steep slope of the road.	2	2	High
1-13	House #75	Ditch	Residential	Moderate road shoulder erosion in the driveway.	Vegetate shoulder and the slope to the ditch.	1	3	High
2-02	Paradise Drive	Stream	Town Road	Culvert misaligned.	Replace culvert and add to the vegetated buffer.	3	2	High
1-16	Evans Road	Stream	Town Road	Unstable inlet and slight road shoulder erosion.	Vegetate shoulder and add guardrail.	1	2	Medium
2-07	Severance Road	Stream	State Road	Severe road shoulder erosion.	Vegetate the shoulder and create a gentler slope.	3	3	Low
1-03	Holland Road at Weed Brook Crossing	Stream	State Road	Slight surface erosion	Vegetate area between road shoulder and stream bank.	1	2	Low
2-04	Balmoral Beach	Lake	Beach Access	Shoreline erosion, slight surface erosion.	Define and stabilize foot path; add mulch/erosion control mix	1	1	Medium
1-60	Lee Road	Stream	Town Road	Moderate surface erosion and moderate road shoulder erosion near the culvert.	Armor the inlet and the outlet of the culvert.	2	1	High
1-06	Parking lot West of Town Hall	Wetland	Commercial	Slight road shoulder erosion at edge of lot.	Install rain garden at the north end of the parking lot.	2	2	Low
1-20	Ossipee Mtn Rd. near Interstate Governor Wentworth	Stream	Town Road	Culvert is too short and road drops right off into the stream.	Lengthen culvert and build up the road. Extend the culvert and widen the road.	1	2	High
1-02	Holland Road - Weed Brook Crossing	Stream	State Road	Moderate surface erosion, moderate road shoulder erosion.	Grade the road shoulder and diver runoff further upstream by installing a turnout. Add trees to the Buffer.	2	3	Medium
1-30	Suissevale Beach and Marina	Lake	Boat Access	Lack of shoreline vegetation around marina.	Create a vegetated buffer at far end of parking lot and around island as much as possible.	3	3	High
1-59	Lee Road	Stream	Residential	Inadequate shoreline vegetation and shoreline erosion.	Establish buffer and add to existing buffer. Stop mowing.	2	3	Low
1-24	Blackbird Lane #14	Stream	Private Road	Moderate road shoulder erosion.	Establish a vegetated buffer at the end of the road.	2	2	Low

5. Conservation Practices for Homeowners

Fact sheets are available to help you install conservation practices on your property.

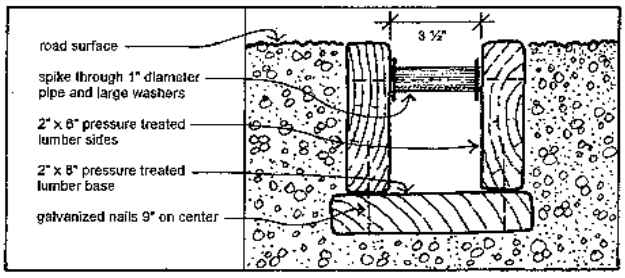
Download at http://des.nh.gov/organization/divisions/water/stormwater/stormwater-mgmt-homeowners.htm

After reading this report, or completing the NH Residential Loading Model, you probably have a general idea about how to make your property more lake-friendly. However, making the leap from concept to construction may be a challenge. NHDES has written the *New Hampshire Homeowner's Guide to Stormwater Management – Do-it-Yourself Stormwater Solutions* to provide guidance to homeowners aiming to better manage stormwater runoff on their properties. The Guide also provides a series of fact sheets that answers many common "how-to" questions. The fact sheets profile nine common conservation practices and include detailed instructions, diagrams, and color photos about installation and maintenance. The series includes the following:

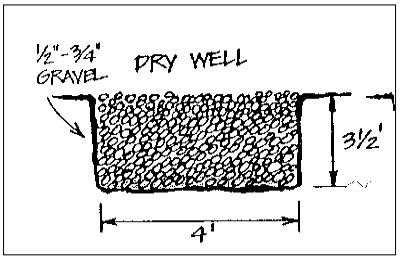
Dripline Infiltration Trench	Infiltration Steps	Rain Gardens
Driveway Infiltration Trench	Pervious Walkways & Patios	Vegetated Swales
Drywells	Rain Barrels	Water Bars

The document also includes native plant lists, information on State and Federal water quality regulations, a site sketch grid, and a project planning worksheet. The following are examples of lake friendly conservation practices to control stormwater runoff and prevent erosion.

***Rubber Razor Blade or Open Top Culvert*:** Use a rubber razor structure in a gravel driveway or camp road. It can be plowed over only if the plow operator is aware of its presence and lifts the plow blade slightly. Use an open top culvert (shown at right) in a gravel driveway or camp road that does not get plowed in the winter. Place at a 30 degree angle to the road edge and direct the outlet toward a stable vegetated area.



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



***Lake Shoreline Riprap*:** Use heavy, irregular-shaped rock (riprap) to manage severely eroded lake banks or shorelines, and in cases where limiting foot traffic, diverting upland runoff, and stabilizing banks with native vegetation has not been effective.

6. Permitting ABC's

Protection of New Hampshire's watersheds is ensured through the goodwill of lake residents and through laws and ordinances created and enforced by the State of New Hampshire and local municipalities. The following laws and ordinances require permits for activities adjacent to wetlands and waterbodies.

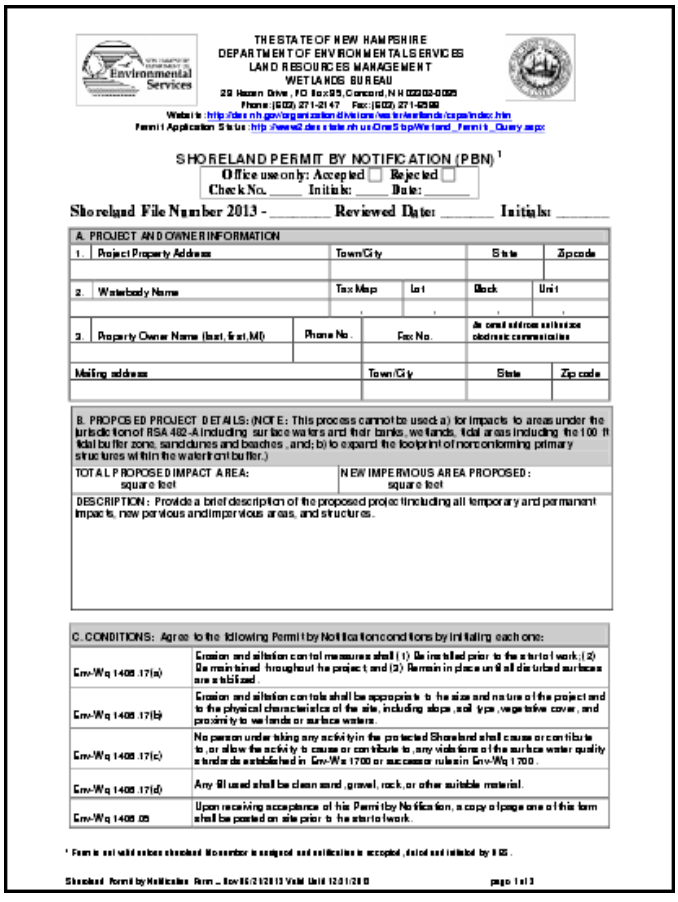
Laws protecting natural resources in the shoreland zone:

- ***Shoreland Water Quality Protection Act (SWQPA)***
- ***Comprehensive Shoreland Protection Act (CSPA)***

Contact the NHDES and Town Code Enforcement Officer if you have any plans to construct, expand, or relocate a structure, clear vegetation, create a new path or driveway, stabilize a shoreline, or otherwise disturb the soil on your property. Even if projects are planned with the intent of enhancing the environment, contact NHDES and the Town to be sure. Visit the NHDES webpage to determine if a shoreland permit is required at:
http://www.surveymonkey.com/s/shoreland

6.1. How to Apply for a Permit by Notification with NHDES

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



THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
LAND RESOURCES MANAGEMENT
WETLANDS BUREAU

SHORELAND PERMIT BY NOTIFICATION (PBN) [1]

Office use only: Accepted ☐ Rejected ☐
Check No. ____ Initials: ____ Date: ____

Shoreland File Number 2013 - _____ Reviewed Date: _____ Initials: _____

A. PROJECT AND OWNER INFORMATION

1. Project Property Address	Town/City	State	Zip code

2. Waterbody Name	Tax Map	Lot	Block	Unit

3. Property Owner Name (last, first, MI)	Phone No.	Fax No.	An email address and/or other electronic communication

Mailing address	Town/City	State	Zip code

B. PROPOSED PROJECT DETAILS: (NOTE: This process cannot be used: a) for impacts to areas under the jurisdiction of RSA 482-A including surface waters and their banks, wetlands, tidal areas including the 100 ft tidal buffer zone, sand dunes and beaches, and; b) to expand the footprint of nonconforming primary structures within the waterfront buffer.)

TOTAL PROPOSED IMPACT AREA: square feet	NEW IMPERVIOUS AREA PROPOSED: square feet

DESCRIPTION: Provide a brief description of the proposed project including all temporary and permanent impacts, new pervious and impervious areas, and structures.

C. CONDITIONS: Agree to the following Permit by Notification conditions by initialing each one:

Env-Wq 1408.17(a)	Erosion and siltation control measures shall (1) Be installed prior to the start of work; (2) Be maintained throughout the project; and (3) Remain in place until all disturbed surfaces are stabilized.
Env-Wq 1408.17(b)	Erosion and siltation controls shall be appropriate to the size and nature of the project and to the physical characteristics of the site, including slope, soil type, vegetative cover, and proximity to wetlands or surface waters.
Env-Wq 1408.17(c)	No person undertaking any activity in the protected Shoreland shall cause or contribute to, or allow the activity to cause or contribute to, any violations of the surface water quality standards established in Env-Wq 1700 or successor rules in Env-Wq 1700.
Env-Wq 1408.17(d)	Any fill used shall be clean sand, gravel, rock, or other suitable material.
Env-Wq 1408.05	Upon receiving acceptance of this Permit by Notification, a copy of page one of this form shall be posted on site prior to the start of work.

[1] Form is not valid unless shoreland file number is assigned and notification is accepted, dated and initialed by NHDES.

Shoreland Permit by Notification Form – Rev. 06/21/2013 Valid Until 12/31/2018 page 1 of 3

- Fill out a notification form before starting any work. Forms are available from your Town Code Enforcement Officer, NHDES offices, or online at:
  http://des.nh.gov/organization/divisions/water/wetlands/cspa/documents/shoreland-pbn-app.pdf
- Confirm completion of your PBN and submittal of all required forms and documentation by visiting the *NHDES OneStop Wetland and Shoreland Permits Query* online at:
  https://www2.des.state.nh.us/onestop/Wetland_Permits_Query.aspx
- The Shoreland PBN processing time is 25 days from the date of submittal. If you have not heard from DES, you may begin work after the 25 day processing time. To have your

permit request processed within 10 days, you can have your PBN application signed by your town Conservation Commission (or similar local government authority) in Section 11 of the permit application form. Note: All permit applications (10 day AND 25 day processing times) must be signed by your Town Clerk and submitted to the town prior to submittal to DES.

- Follow all standards required for the specific permitted activities to keep soil erosion to a minimum. It is important that you obtain a copy of the standards so you will be familiar with the law's requirements for permitted activities in the shoreland zone. The *Erosion Prevention and Sedimentation Control Practices Guide* provides further information on the importance of erosion and sedimentation controls, and can be used as a checklist of required practices that must be followed before, during, and after construction or for other activities in the shoreland zone.
- An additional permit requirement for shoreland PBNs is the *Project Completion Form*. This form must be submitted to DES within 10 days following completion of your project and requires a site description and photographs of the work conducted under the conditions of the permit.
- The *Erosion Prevention and Sedimentation Control Practices Guide* and the *Project Completion Form* can also be downloaded from the DES website at:

  http://des.nh.gov/organization/divisions/water/wetlands/pbn.htm

7. More Information

7.1. Contacts

Lake Winnipesaukee Association
Pat Tarpey, Executive Director
PO Box 1624
Meredith, NH 03253
ptarpey@winnipesaukee.org
(603) 581-6632

Belknap County Conservation District
2 Airport Road, Gilford, NH 03249
(603) 527-5880
Offers assistance with watershed planning and surveys, environmental education, engineering support, seminars and training sessions, and education on the use of conservation practices.

New Hampshire Lakes Association
14 Horseshoe Pond Lane, Concord, NH 03301
(603) 226-0299

http://www.nhlakes.org/

New Hampshire Department of Environmental Services
29 Hazen Dr., Concord, NH 03301
(603) 271-3503
Provides permit applications and assistance, numerous reference materials, environmental education, funding opportunities, and stewardship activities for lakes.

7.2. Publications

New Hampshire Homeowner's Guide to Stormwater Management: Do-it-Yourself Stormwater Solutions for Your Home. NH DES. 2011.
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

Shoreland Protection Fact Sheets. NH DES.
http://des.nh.gov/organization/commissioner/pip/factsheets/sp/index.htm

Native Shoreland/Riparian Buffer Plantings for New Hampshire. NH DES.
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/vrap_native_plantings.pdf

Rain Garden App for iPhones - leads homeowners & contractors through the proper siting, sizing, construction, planting and maintenance of rain gardens.
http://nemo.uconn.edu/tools/app/raingarden.htm

Winnipesaukee Gateway Website http://winnipesaukeegateway.org/: Residents can access watershed information and maps, management plans, learn how to get involved in watershed stewardship, and run the Stormwater Footprint Calculator – "What's Your P?" This calculator is based on the NH DES Residential Loading Model:
http://winnipesaukeegateway.org/resources/phosphorus-calculator/

8. References

Michigan Department of Environmental Quality: Surface Water Quality Division, 1999. *Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual.*

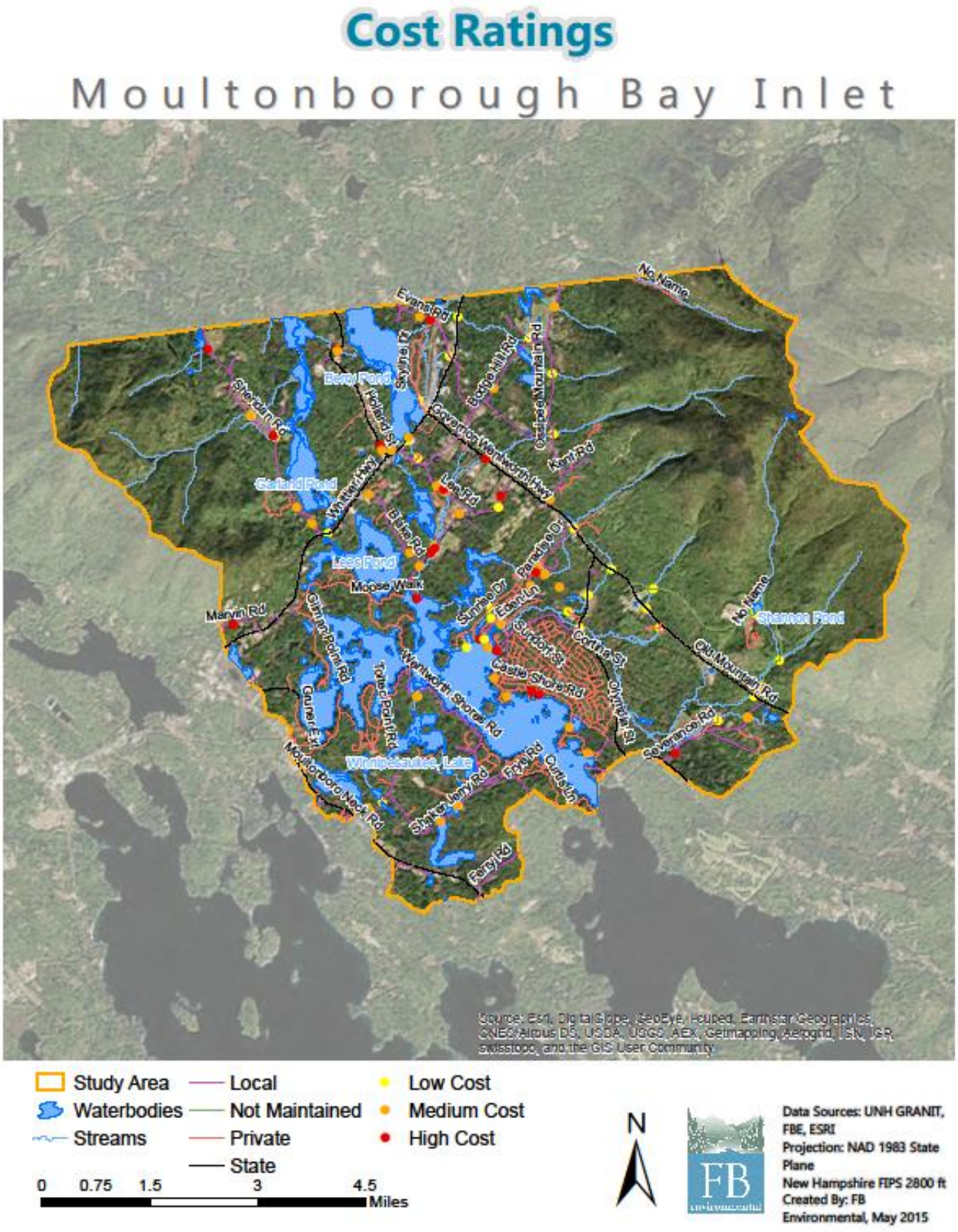
New Hampshire Fish and Game Department, 2012. *Depth Maps of Selected NH Lakes and Ponds*. http://www.wildnh.com/Fishing/bathy_maps.htm

New Hampshire Office of Energy and Planning, 2013. State Data Center. 2010 Census. *Population of New Hampshire Towns and Counties 1960-2010*.
http://www.nh.gov/oep/data-center/census/index.htm

Economic & Labor Market Information Bureau, NH Employment Security, 2015. *Moultonborough, NH.*
http://www.moultonborough.org/Pages/MoultonboroughNH_WebDocs/about

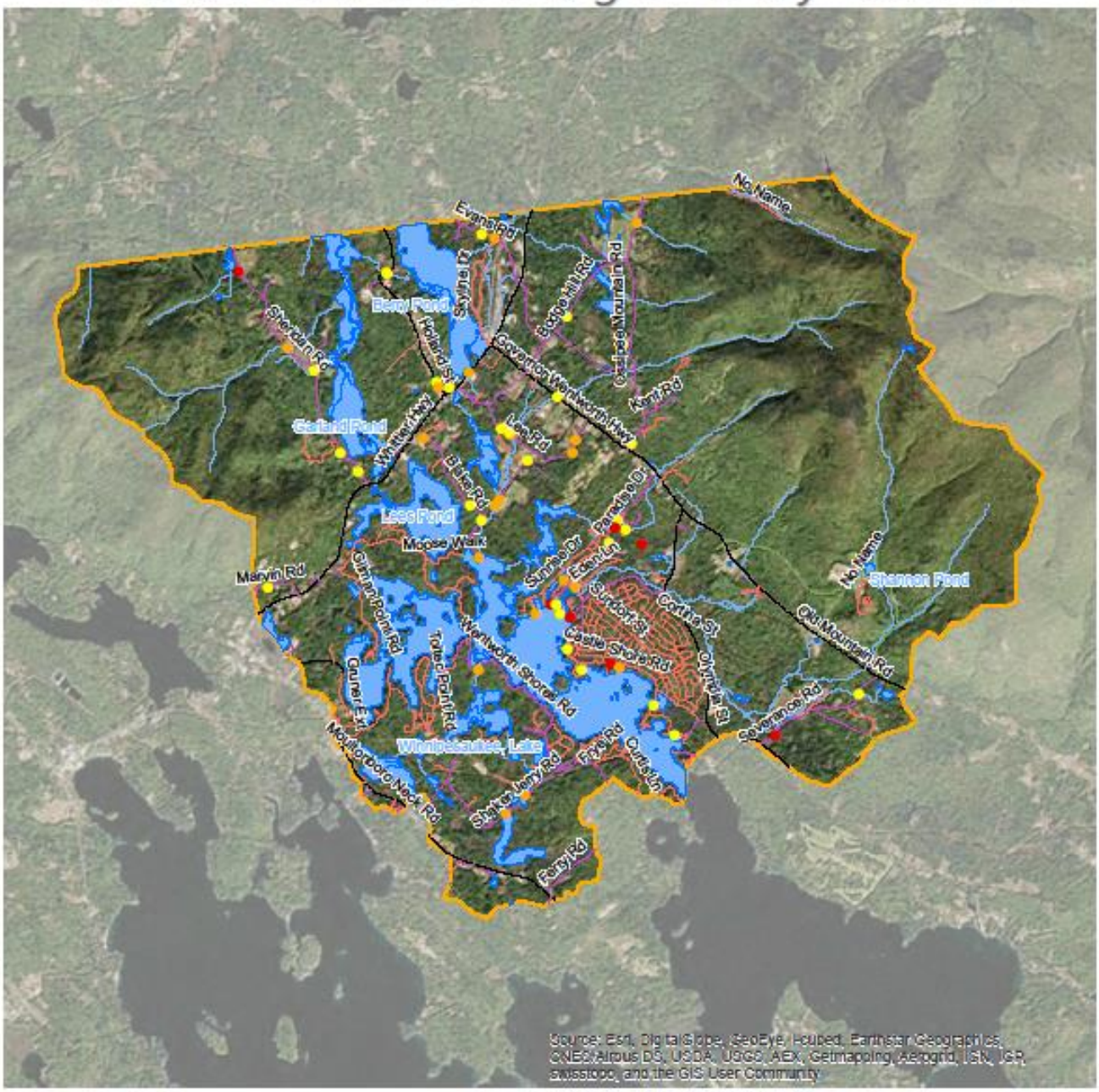
Appendix A – Watershed Survey NPS Sites (refer to BMP Matrix spreadsheet)

Appendix B – Watershed Survey Site Maps by Cost and Impact Level



Impact Ratings

Moultonborough Bay Inlet



Study Area
Waterbodies
Streams
Local
Not Maintained
Private
State
Low Impact
Medium Impact
High Impact

0 0.75 1.5 3 4.5 Miles

N

FB Environmental

Data Sources: UNH GRANIT, FBE, ESRI
Projection: NAD 1983 State Plane New Hampshire FIPS 2800 ft
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