

# **PROVINCE LAKE WATERSHED SURVEY REPORT**



*Photo courtesy of Province Lake Association*

**PROVINCE LAKE ASSOCIATION**

**ACTON WAKEFIELD WATERSHEDS ALLIANCE**

**NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES**

**MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION**

## **JANUARY 2014**

## Acknowledgements

The following people and organizations were instrumental in the development of the Province Lake Watershed Survey Project and deserve special recognition for their efforts.

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### Sponsors

Acton Wakefield Watersheds Alliance  
Province Lake Association  
Province Lake Golf Club  
New Hampshire Department of Environmental Services  
Maine Department of Environmental Protection



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## **Introduction**

This report serves to compile, summarize, and analyze data collected during the Province Lake Watershed Survey conducted in May 2013 and is intended for residents, landowners, and local decision makers within the Province Lake Watershed. The survey is part of a larger project to develop a watershed management plan for the Province Lake Watershed.

## **Province Lake's Water Quality**

Province Lake has a surface area of approximately 1,008 acres and rests within a 7.3 square mile watershed in Wakefield and Effingham, NH and Parsonsfield, ME. The lake is fed by the Hobbs Brook and several small tributaries, and flows north into the Saco River Watershed via the South River. Province Lake has been classified as “impaired” for aquatic life by the New Hampshire Department of Environmental Services due to high amounts of phosphorus and chlorophyll-a. It is also classified as impaired for “primary contact recreation” (i.e., swimming, tubing, etc.) due to repeated cyanobacteria blooms. The lake is very shallow with a mean depth of nine feet and a maximum depth of only 17 feet. This keeps the lake from thermally stratifying, and means that the lake has wind driven circulation.

Transparency in Province Lake is measured using a Secchi disk. Secchi disk readings are measured in meters below the surface which the Secchi disk is visible. Province Lake's Secchi disk readings are considered “Good” at an average depth of 2.59 meters, however the shallow depth and constant stirring of the lake contributes to the readings being lower than the 4.0 meter average for other lakes in the region (FBE 2013).

According to NH Department of Environmental Services data analyzed by FB Environmental, Province Lake has a median Total Phosphorus (TP) concentration of 14.3 ppb (parts per billion). Phosphorus acts as the limiting nutrient in Province Lake; meaning that there is a direct relationship between the phosphorus concentrations in the lake and the amount of algae the lake can produce. The median concentration of TP in the state is 12 ppb, while the median for the White Mountain Region is 8 ppb. Historical data from the lake shows a trend of slightly increasing TP concentrations from 1979 to the present (FBE 2013).

The lake has a flushing rate of once per year, meaning that it takes a full year for water to flush through the Province Lake system. This is considered average for NH and Maine lakes.

As of 2006, Province Lake has been classified as a mesotrophic lake. Mesotrophic lakes are characterized as having a moderate level of productivity. Oligotrophic lakes are typically low in

nutrients with a rocky substrate and shoreline, deep water, and abundant dissolved oxygen. Eutrophic lakes are typically shallow, high in nutrients, low in dissolved oxygen and have sediment covered bottoms. Mesotrophic lakes lie somewhere in between, with moderately sedimented substrates and shorelines, and medium levels of oxygen and nutrients.

Thankfully, there are currently no known invasive species within Province Lake, although several species of invasive plants have been found in lakes in the surrounding area.

Water quality data has been consistently collected on Province Lake since 1991 by dedicated volunteers working through the NH Department of Environmental Services Volunteer Lake Assessment Program. Volunteers collect water samples which are tested for multiple parameters in order to establish and maintain a substantial water quality database for the lake.

### **Threats to Province Lake**

The greatest threat to Province Lake's water quality is polluted runoff, or nonpoint source pollution (NPS). Whenever surface water is allowed to flow directly into the lake it carries with



it whatever it has picked up along its path, including nutrients, pollutants, metals, sediment, heat and bacteria. In an undeveloped, forested watershed, runoff is slowed by the uneven forest floor and is allowed to infiltrate into the ground. The earth provides the easiest and most effective filtration for runoff.

In developed watersheds, storm water does not always receive the filtering treatment that the forest provided. Rain water picks

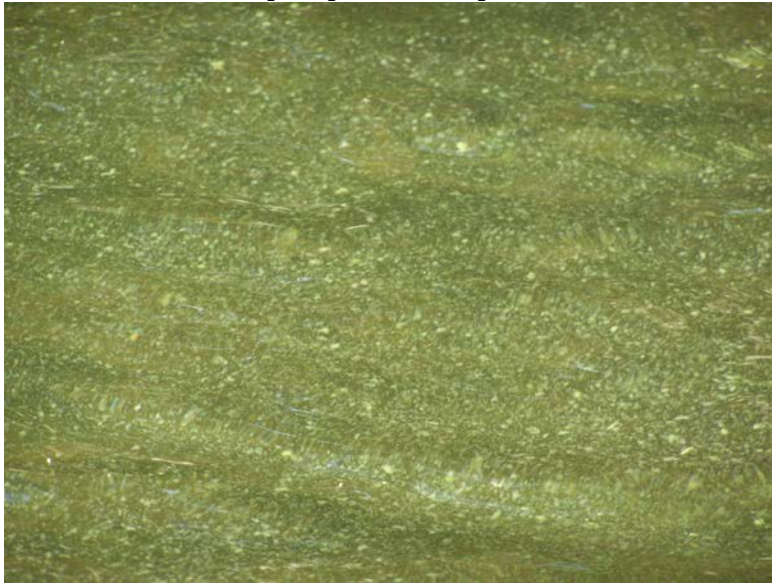
up speed as it flows across impervious surfaces like rooftops, compacted soil, gravel camp roads and pavement, and it becomes a destructive force.



Runoff from residential properties can adversely affect water quality. Erosion on these sites carries sediment, chemicals, and fertilizers into the water. Sediment increases phosphorus loading, chemicals can be poisonous, and fertilizers feed the lake excess nutrients, all leading to compromised water quality.

### WHY IS RUNOFF BAD?

The problem is not necessarily the water itself. It is the sediment and nutrients in the runoff that can be bad news for New England lakes. Studies have shown that runoff from developed areas has 5 to 10 times the amount of phosphorus compared to runoff from forested areas.



The nutrient, 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 extra phosphorus, algae growth increases dramatically.

Sometimes this growth causes choking blooms, but more often it results in small changes in water quality that, over time, damage the ecology, aesthetics and economy of lakes.

Soil is the biggest source of phosphorus to lakes. As every gardener knows, phosphorus and other nutrients are

naturally present in the soil. So, runoff is essentially “fertilizing” Province Lake with the soil that erodes from our driveways, roads, ditches, pathways, and beaches.

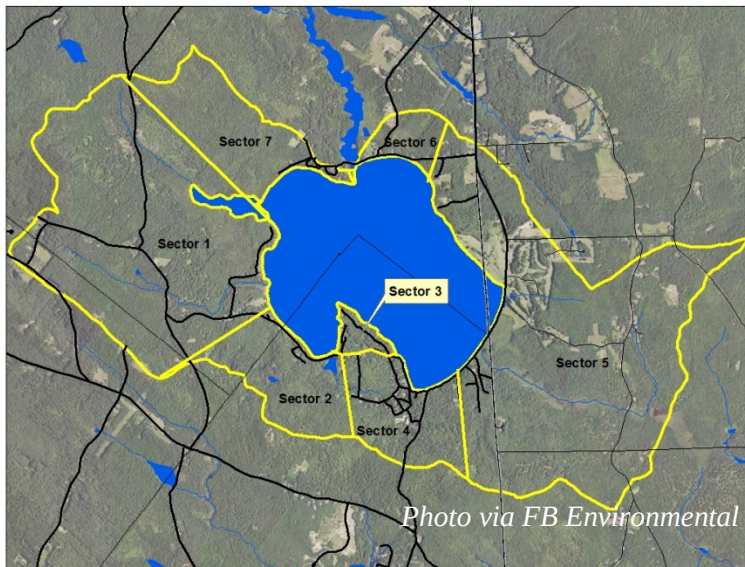
There are several campgrounds and outhouses around the lake in addition to many older camps with septic systems. Leaching and flooding of these systems could be contributing to both bacteria and nutrients into the lake, and a Septic System Survey is going to be performed in August 2013 in order to better understand the effects of these waste systems on the lake.

## Province Lake Watershed

A watershed is defined as all the land that drains, or “sheds” into a given water body. Activity in any part of a watershed can affect the quality of the water body as a result of the flow from rivers, streams, surface runoff, and groundwater. This is why protection of Province Lake must be addressed on a watershed level rather than simply focusing on shoreline activity. See Province Lake Watershed Map in Appendix A, map 1.

The area of Province Lake is 1,008 acres while the area of the entire watershed spans 7.3 square miles. The lake is located between Wakefield and Effingham, NH and Parsonsfield, Maine and the shoreline is quite diverse. There is an area of roughly 4,000 feet of shoreline on the lake which runs parallel to Route 153, a major road connecting Maine and New Hampshire. There is also an 18 hole golf course, Province Lake Golf Club, which runs right down to the edge of the lake. The golf course uses phosphorus free fertilizers and other Best Management Practices (BMP's), which helps to reduce the nutrient loading to the lake. Public and private beaches dot the lake due to its sandy shores. The outlet into the South River to the southeast is controlled by a

small dam. The inlets to Province Lake consist of Hobbs Brook to the northwest, the South River in the southeast, several wetlands and spring fed tributaries which run through residential areas and campgrounds.





## **Why Protect Province Lake?**

Province Lake is at a critical point in its development and aging. Currently designated as a mesotrophic lake, it could become fully eutrophic if nothing is done to protect and remediate it. All lakes naturally move from mesotrophic to eutrophic over time, however human impacts could accelerate the rate of change. Protection can slow the eutrophication process of the lake while also reducing or eliminating the occurrence of algae blooms.

In addition to the overall health of the lake, it is important to protect Province Lake due to the variety of benefits it brings to the local area economically, recreationally, ecologically and culturally.

**Economically:** A study performed in 1996 by the University of Maine (Michael et. al 1996) found that there is a direct correlation with water quality and local property values. The report estimates that a 3 foot drop in water clarity could reduce property values by as much as 20%. Many towns benefit from the property taxes of their shorefront dwellings. Therefore, having a clean and healthy Province Lake is crucial to the financial viability of the towns which surround it. It is also much easier and less expensive to correct the water quality while it remains in this mesotrophic stage than to attempt to restore a eutrophic lake.

**Recreationally:** Province Lake's convenient location draws in many weekenders who stay either at the campgrounds or their summer camps, as well as local year round residents who enjoy the lake through multiple seasons. There is an expansive privately owned beach commonly used by the public along Rt. 153, which brings in sunbathers and swimmers from local and surrounding towns. As with most lakes in the region, fishing is a popular sport and fish species include:

- Large Mouth Bass
- Small Mouth Bass
- Hornpout
- Sunfish
- Pickerel

Province Lake is also a host to many power sport enthusiasts such as wakeboarders, water-skiers, and tubers. The lake has, also, traditionally been great for kayaking, canoeing, and swimming. The Province Lake Golf Club brings in many locals and tourists alike with a full service restaurant and clubhouse with 18 holes of golf along the shores of Province Lake.

**Ecologically:** In addition to the species of fish residing in it, Province Lake supports several nesting eagles as well as owls, hawks and blue heron. Loons have attempted to nest on the lake, but with little success. Snapping turtles in the lake eat fish, amphibians, and pretty much anything else they can fit their jaws around. Muskrats on Province feed on freshwater clams in

the lake, and beavers tend to build dams blocking the South river. Moose graze the swamps leading to and from the lake, and deer populate the surrounding area. There are even elusive and mysterious freshwater jellyfish occasionally found in the lake, maxing out at about the size of a quarter. Province Lake, and the ecosystem within its waters, is truly integral to the greater ecosystem of the watershed.



Culturally: A clean lake with clear water is often seen as a community asset. Healthy lakes are regarded as being more valuable and desirable. Province Lake's current decline has led to a swelling of support and concern for the lake.

### **Purpose of the Province Lake Survey**

The purpose of the survey is to gain an in 'depth understanding of the current conditions of the Province Lake watershed in terms of surface sediment erosion through exhaustive direct observation.

The watershed survey is used for the following purposes:

- Identify and prioritize sources of polluted runoff.
- Raise public awareness about the connection between land use and water quality, and the impact of soil erosion on Province Lake; and to inspire people to become active watershed stewards.
- Provide a basis to obtain funding to fix identified erosion sites.
- Use the information gathered as one component of the upcoming Watershed Management Plan. The survey strengthens the plan because every parcel of land along the lake was inspected, and all sediment erosion going directly into the lake was documented. This will give the Province Lake Watershed Management Plan a real world perspective enhanced by hard data collected from first hand observations.
- Make general recommendations to landowners for fixing erosion problems on their properties.

## Survey Method

The survey was conducted by volunteers with the help of trained technical staff from NH Department of Environmental Services, Maine Department of Environmental Protection and the Acton Wakefield Watersheds Alliance. 18 volunteers were trained in survey techniques during a two hour classroom workshop on May 18, 2013. Following the classroom training, volunteers and technical staff spent the next several hours documenting erosion on the roads, properties, driveways and shorelines in their respective sectors using cameras and standardized survey forms. Teams worked together to document all sites in their sectors, and recorded sites with erosion. Technical staff verified the results and confirmed the exact locations using GPS coordinates.

All information collected was entered into a computerized spreadsheet to create a database of the raw data. This data was standardized and sorted into appropriate categories, and prioritized based on rankings of their impact to the lake, technical ability required to fix the problems, and estimated cost of remediation. The documented erosion sites were then plotted on maps using GIS software (Appendix A, map 2).



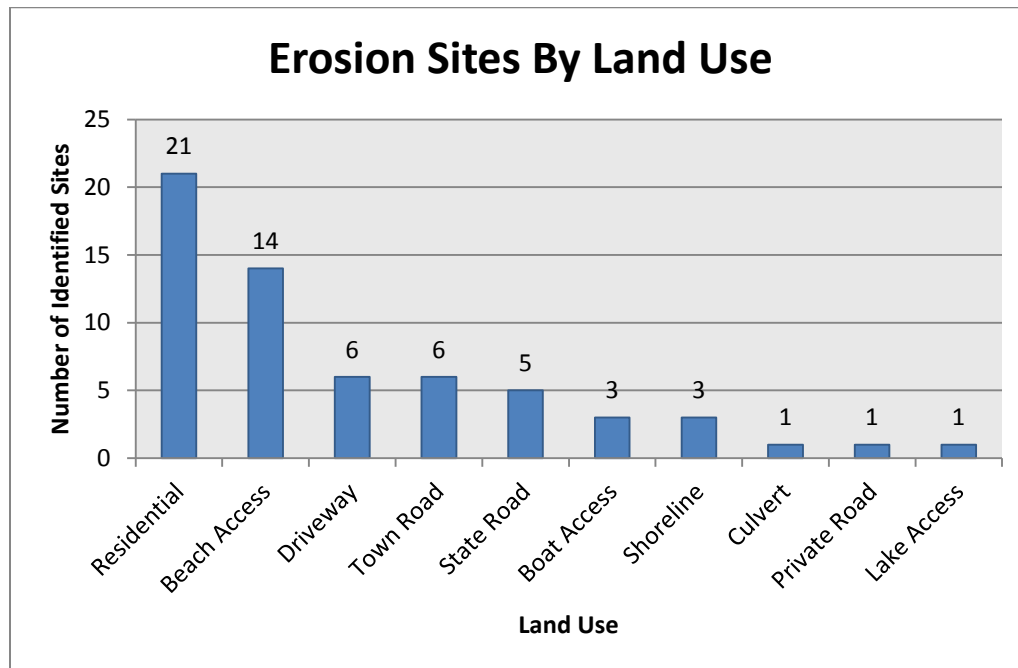
A description of the sites and associated rankings are discussed in the next section of this report. Maps of the erosion sites are located in Appendix A, and a spreadsheet with the documented sites is located in Appendix B.

## Summary of Survey Results

Volunteers and technical staff identified 61 sites in the watershed survey that were either impacting or had the potential to impact water quality.

- 21 of the identified sites (34%) were found on residential properties. Most of these sites have a medium to low impact on the lake with a low cost to fix. These tend to be simple fixes which don't require major engineering.
- 12 of the sites (20%) were associated with state, town or private roads. These sites typically have much higher associated costs (greater than \$2500) and skills required to complete.
  - Five of the sites (8%) were identified on Route 153. With such a large area of impervious road, Rt. 153 poses a serious threat to allow sand, salt, oil, gas and heavy metals into the lake as it currently stands. To address these issues, representatives from AWWA, FB Environmental, NH DES, Maine DEP, NH DOT, Maine DOT, the UNH Storm Water Center, and the Province Lake Association recently met to discuss the best course of action for runoff management on the road, and are in the progress of developing a plan.
  - The remaining seven road sites were on private and local town roads (11%). Many of these roads are pitched to the lake, and are composed of dirt and gravel. The surfaces of these roads often end up in the lake along with surface runoff. The formation of more road associations on Province Lake could assist with remediating these roads and focus on preventing erosion with proper camp road BMP's.
- Driveways account for six sites (10%). Driveways are often placed for direct access to the property without planning for the effects of runoff. Subsequently, many driveways are washed out, then repaired in the same way, only to wash out again in the next major rain event. This leads to a continuous source of sedimentation in the lake. Driveways should be designed with the same attention to storm water as roads. It may be strategically and economically wise for adjacent properties to share common driveways, thus limiting the area of impervious surfaces; especially in cases of seasonal use.
- Beach access accounts for 14 (23%) of the sites. Province Lake has a naturally sandy shoreline, but it is important to remember that beaches wash out very easily if water is allowed to reach them with any velocity. A sandy beach can typically quickly drain any water which lands on it, but when runoff is concentrated and gains speed, it can often be enough to cause a washout, leaving large gulleys where water carved through the sand. BMPs should be installed upslope from a beachfront to prevent major washouts.
- 10 different land uses were identified as impacting the lake in the survey. Thus, no single source is responsible for pollution of the lake; and all parties need to be involved in protecting the water quality of Province Lake. Every land use has aspects that can be

improved and there are numerous resources willing to aid in fixing erosion issues. Town officials, individual landowners, state and local agencies, and AWWA must all play a role and work together for the benefit of Province Lake.



**Figure 1**

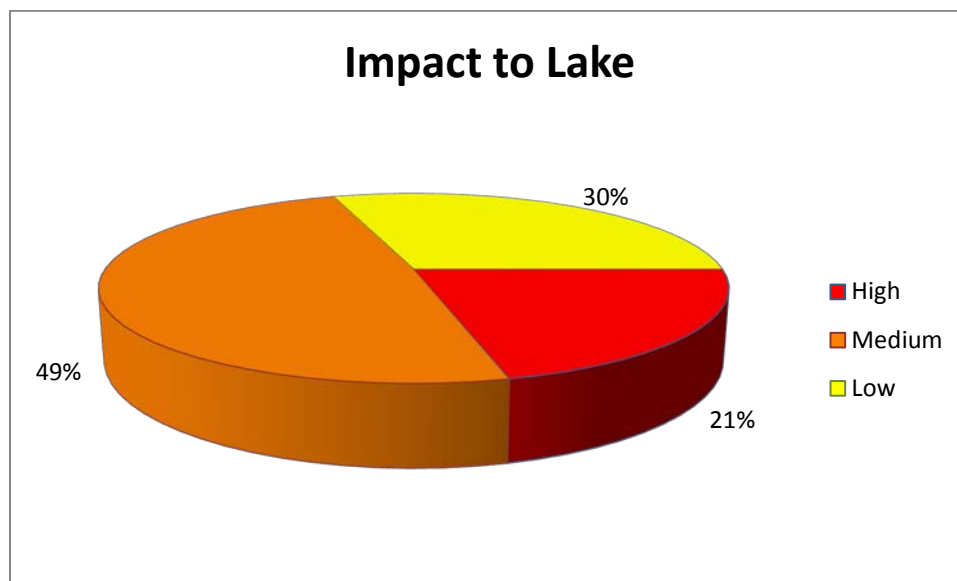
| Land Use Activity | High Impact | Medium Impact | Low Impact | Total     |
|-------------------|-------------|---------------|------------|-----------|
| Residential       | 4           | 9             | 8          | 21        |
| Beach Access      | 2           | 7             | 5          | 14        |
| Driveway          | 0           | 5             | 1          | 6         |
| Town Road         | 1           | 3             | 2          | 6         |
| State Road        | 4           | 1             | 0          | 5         |
| Boat Access       | 0           | 3             | 0          | 3         |
| Shoreline         | 1           | 0             | 2          | 3         |
| Culvert           | 0           | 1             | 0          | 1         |
| Private Road      | 1           | 0             | 0          | 1         |
| Lake Access       | 0           | 1             | 0          | 1         |
| <b>Total</b>      | <b>15</b>   | <b>30</b>     | <b>18</b>  | <b>61</b> |

**Figure 2**



**Impact to Lake:** Each site was rated for its potential impact to the lake. Impact was based on the type of erosion (sheet, rill, or gulley) the area of erosion (small, medium, large) and the amount of buffer and other filtration between the source of erosion and the water. Almost half of the sites were “Medium” impact sites, while “Low” and “High” sites made up 30 and 21 percent, respectively.

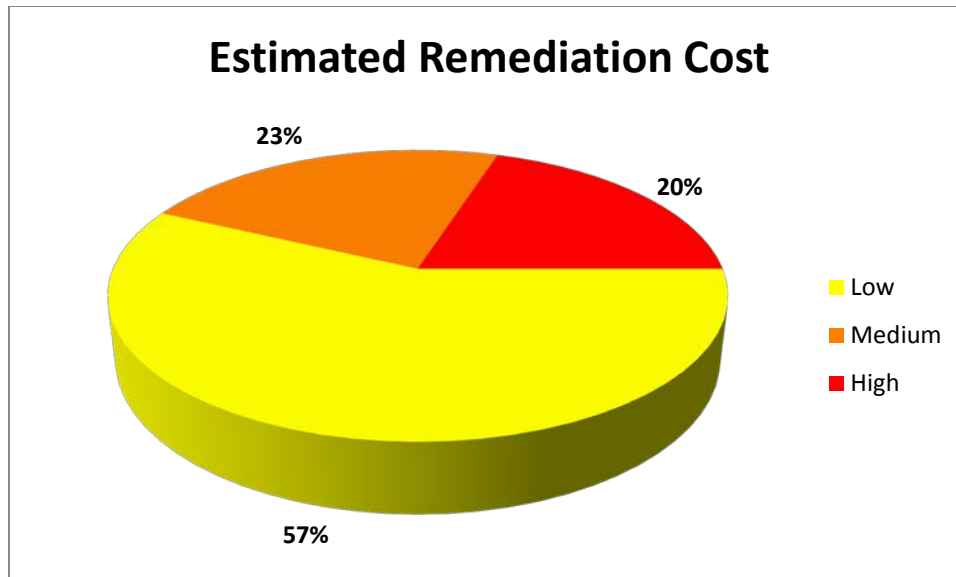
- “High” impact sites exhibited a large amount of soil transportation with significant gullies and little buffering.
- “Medium” impact sites typically consist of a variety of different areas, buffers, and erosion types, creating a check and balance type system that puts the total erosion between that of high and low sites.
- “Low” sites typically demonstrate a small area of sheet erosion with a fair amount of buffering.



**Figure 3**

**Estimated Remediation Cost:** Recommendations were made for fixing each site and the associated cost of labor and materials was estimated. Most sites were classified as “Low” cost, indicating that fixes could be affordable for the average landowner, although assistance would be beneficial.

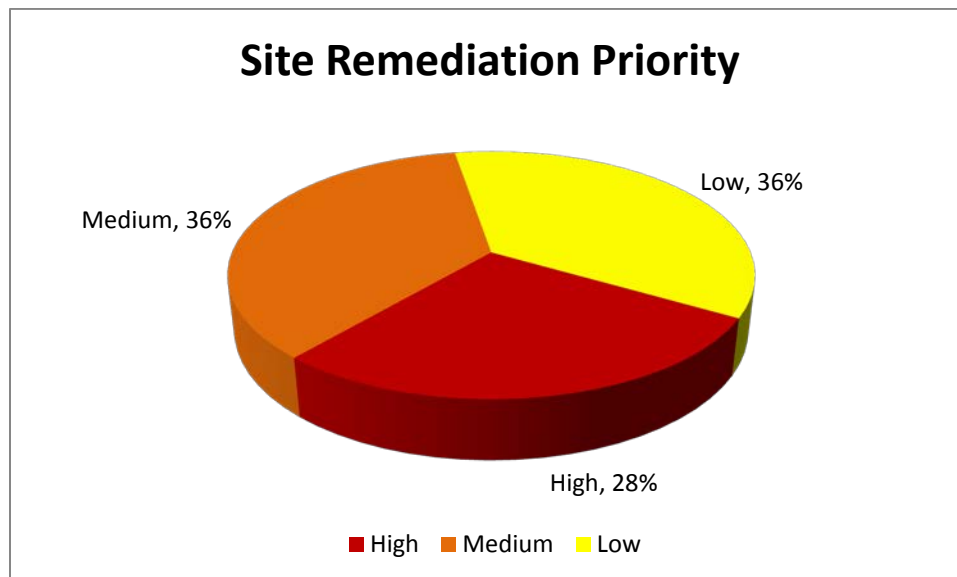
- “Low” cost sites were estimated to have labor and materials cost less than \$500
- “Medium” cost sites were estimated to cost between \$500 and \$2,500.
- “High” cost sites were estimated at costing over \$2,500 to fix.



**Figure 4**

**Site Remediation Priority:** Severity of site impact to the lake, estimated remediation cost, and speculation as to whether the site should be considered a YCC project were given numerical values and then totaled to score each site. The priority designation will help the PLA, AWWA, and the town and state authorities develop the remediation plan for the identified sites. 28% of the sites were given the “high” priority designation, indicating that the effort should be focused on these sites first when conducting remediation.

- “Low” priority sites were those that generally had a high cost, low impact to the lake, and were not considered to be potential YCC projects.
- “Medium” priority sites tended to be those that had medium impact and cost, and might be potential YCC sites.
- “High” priority sites were typically those that had high impact to the lake, a low associated cost, and could be YCC projects.



**Figure 5**

## **Next Steps- Where Do We Go From Here?**

Fixing the sites identified in this survey will require efforts by individuals, the Province Lake Association, the Acton Wakefield Watersheds Alliance, and state and local officials.

### **Province Lake Association**

- Increase and empower the association's membership, and provide educational materials and guidance to members of the Province Lake watershed community.
- Apply for grants to help fix erosion problems identified in the survey.
- Implement or improve programs such as Lake Host, Weed Watch, and water quality monitoring programs by hosting workshops, encouraging landowners to have property evaluations, and good lake stewardship.
- Assist existing road associations and help to promote the creation of new ones.

### **Acton Wakefield Watersheds Alliance**

- Send letters offering technical assistance to property owners, road associations, and towns with identified erosion problems and encourage them to make the improvements.
- Make copies of the survey report available to property owners, road associations, and towns.
- Apply for grants to help fix erosion problems identified in the survey.
- Promote lake conservation programs such as Lake Host, Weed Watch, and water quality monitoring programs by hosting workshops, encouraging landowners to have property evaluations, and good lake stewardship.
- Partner with the PLA, NH DES, ME DEP, the towns of Wakefield, Effingham, and Parsonsfield and others to seek funding and implement projects to protect lake water quality.
- Organize workshops and volunteers to start fixing identified erosion problems and to 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**

- If you have identified erosion problems, call AWWA for free advice about how to solve the issue.
- Become a member of the PLA. Lake associations provide a forum for landowners to voice their concern, and also provide valuable information about the lake, watershed, and community.
- Stop mowing and raking your shoreline and parts of your property. Let lawn and raked areas revert back to natural plants. Deep shrub and tree roots help hold the soil.
- Visit <http://www.pwd.org/news/publications.php#Brochures> to learn more about conservation practices you can do yourself.

### **Municipal Officers**

- Enforce shoreland zoning and other ordinances to ensure protection of Province Lake.
- Conduct regular maintenance on town and state roads in the watershed, and municipal problems defined in the survey.
- Participate in and support long term watershed management projects.
- Promote training for road crews, boards, commissions, and other decision makers.

## Where Can I Get More Information?

### **Province Lake Association**

(207) 200-3234

<http://provincelake.org/>

Jon Samuelson, President

[President@provincelake.org](mailto:President@provincelake.org)

Carl Davis, PLA Watershed Plan Chairperson

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### **Town of Wakefield**

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(603) 522-6205 x308,

[bldginspector@wakefieldnh.com](mailto:bldginspector@wakefieldnh.com)

Nate Fogg, Code Enforcement/ Health Officer

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[landusecodedept@wakefieldnh.com](mailto:landusecodedept@wakefieldnh.com)

### **Town of Effingham**

Rebecca Boyden, Zoning Enforcement Officer

(603) 539-7147

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[info@awwatersheds.org](mailto:info@awwatersheds.org)

Sam Wilson, Program Manager

(603) 473-2500

[swilson@awwatersheds.org](mailto:swilson@awwatersheds.org)

### **New Hampshire Department of Environmental Services, Portsmouth Regional Office Watershed Assistance Section**

*For technical assistance, grant program information, outreach materials, and general water quality information*

Sally Soule

(603) 599-0032

[ssoule@des.state.nh.gov](mailto:ssoule@des.state.nh.gov)

### **Wetlands & Shoreland Protection**

*For permitting, enforcement, and general information about NH wetlands and regulations*

NH DES Wetlands Bureau

(603) 271-2147

[wetmail@des.nh.gov](mailto:wetmail@des.nh.gov)

### **Maine Department of Environmental Protection**

#### **Watershed Management Division**

*For Technical Assistance, 319 Grant information, outreach materials*

Wendy Garland

(207) 822-6320

[wendy.garland@maine.gov](mailto:wendy.garland@maine.gov)

#### **Field Services Section**

Jeff Kalinich

(207) 822-6325

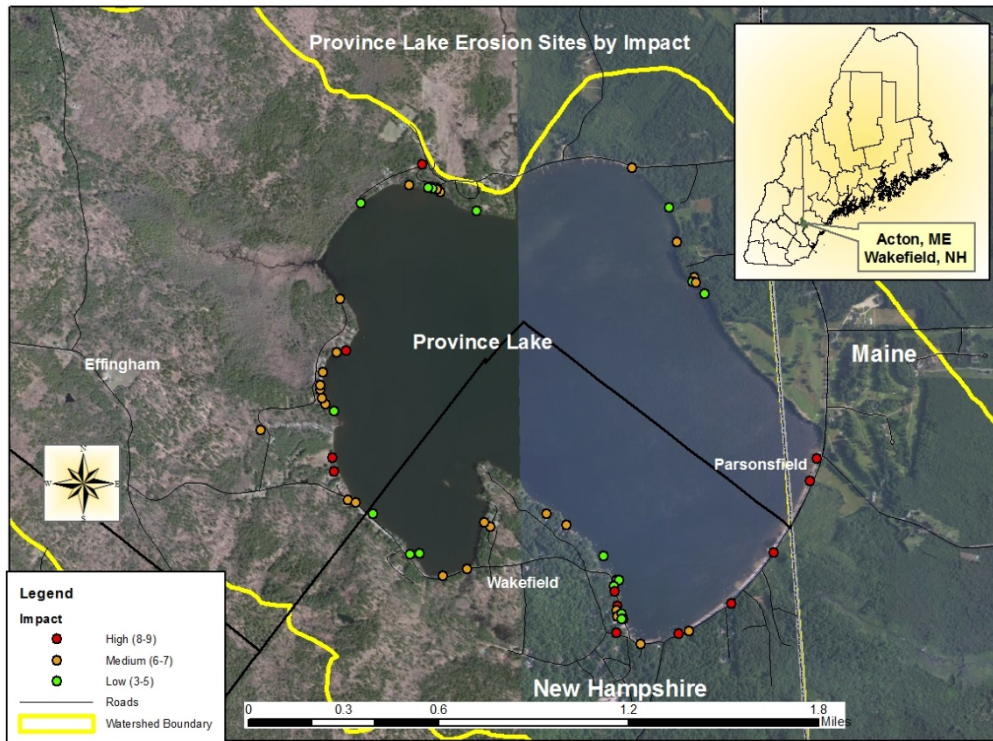
[jeffrey.c.kalinich@maine.gov](mailto:jeffrey.c.kalinich@maine.gov)

## **Works Cited**

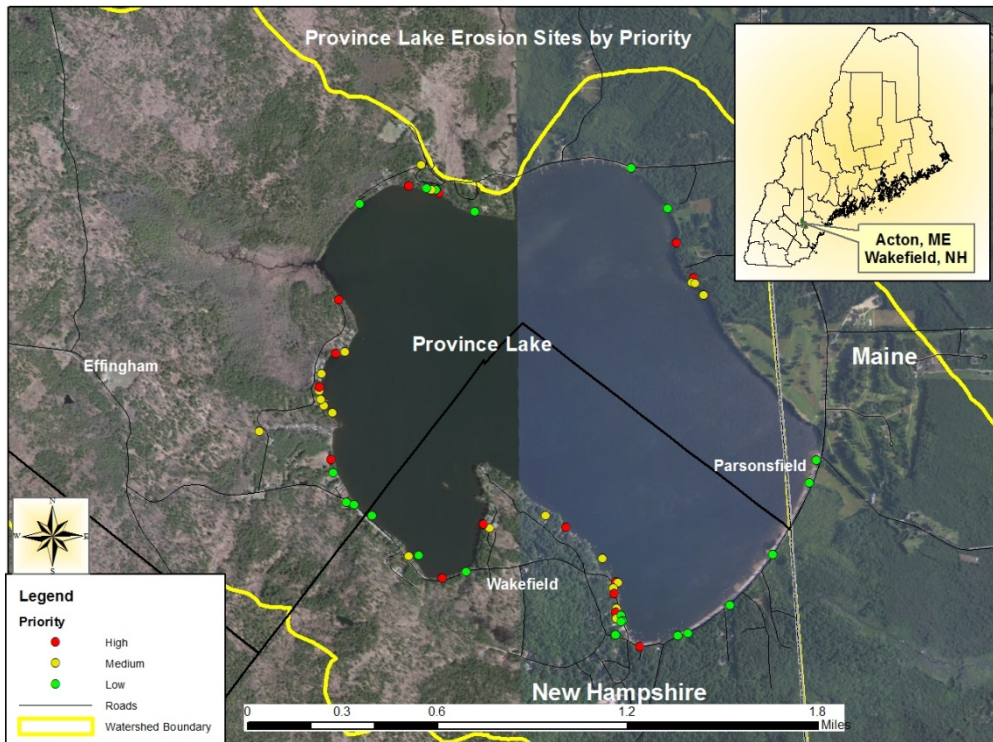
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- FB Environmental. "Province Lake Water Quality Analysis". July, 2013.



## Appendix A- Survey Maps



**Map 1: Erosion Sites on Province Lake by Impact**



**Map 2: Erosion Sites on Province Lake by Priority**

## Appendix B- Survey Data (Figure 6)

| Sector | Site | Location                                    | Land Use                 | Description of Problems                                                                      | Type of Erosion | Area       | Impact       | Cost   | YCC Project |
|--------|------|---------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------|-----------------|------------|--------------|--------|-------------|
| 1      | 1    | Bridge over campground stream               | Town Road                | Shoreline Undercut, Inadequate Shoreline Vegetation                                          | Gully (3)       | Small (1)  | Medium (6-7) | Low    | Yes         |
| 1      | 2    | 90 Remick Road                              | Residential              | Slight Surface Erosion; Bare Soils                                                           | Sheet (1)       | Small (1)  | Low (3-5)    | Low    | Yes         |
| 1      | 3    | 94 Remick Road                              | Boat Access              | Slight Surface Erosion; Bare Soils; Bare Sand Leading to Launch                              | Sheet (1)       | Medium (2) | Medium (6-7) | Low    | No          |
| 1      | 4    | 98 Remick Road                              | Residential              | Moderate Surface Erosion; Bare Soil                                                          | Rill (2)        | Small (1)  | Medium (6-7) | Medium | Yes         |
| 1      | 5    | 100 Remick Road                             | Residential; Boat Access | Slight Surface Erosion; Ruts                                                                 | Sheet (1)       | Medium (2) | Medium (6-7) | Low    | No          |
| 1      | 6    | 108 Remick Road                             | Residential              | Moderate Surface Erosion; Bare Soil                                                          | Rill (2)        | Medium (2) | Medium (6-7) | Low    | Yes         |
| 1      | 7    | 118 Remick Road                             | Residential              | Point Source - Perimeter Drains Exit on Beach                                                | Gully (3)       | Small (1)  | Medium (6-7) | Low    | No          |
| 1      | 8    | 142 Remick Road                             | Residential              | Moderate Surface Erosion; Inadequate Shoreline Vegetation & Erosion                          | Rill (2)        | Medium (2) | Medium (6-7) | Low    | Yes         |
| 1      | 9    | 144 Remick Road                             | Residential              | Severe Surface Erosion; Bare Soils                                                           | Gully (3)       | Large (3)  | High (8-9)   | Medium | Yes         |
| 1      | 10   | 168 Remick Road                             | Residential              | Slight Surface Erosion; Bare Soil                                                            | Sheet (1)       | Medium (2) | Medium (6-7) | Low    | Yes         |
| 2      | 1    | 121 Bonnyman Road                           | Residential              | Severe Surface Erosion; Lack of Shoreline Vegetation & Erosion; 8 Large Gullies              | Gully (3)       | Large (3)  | High (8-9)   | Medium | Yes         |
| 2      | 2    | 141 Bonnyman Road                           | Residential              | Moderate Surface Erosion; Lack of Shoreline Vegetation & Erosion; Beach Area                 | Gully (3)       | Large (3)  | High (8-9)   | High   | No          |
| 2      | 3    | Bonnyman Road Between #157 & 161            | Town Road                | Slight Surface Erosion; Slight Shoulder Erosion; road picking up sand                        | Rill (2)        | Large (3)  | Medium (6-7) | High   | No          |
| 2      | 4    | Bonnyman Road in Effingham @ Wakefield Line | Town Road                | Moderate Surface Erosion; Moderate Road Shoulder Erosion; Roadside Plow/Grader Berm          | Rill (2)        | Large (3)  | Medium (6-7) | High   | No          |
| 2      | 5    | Bonnyman Road in front of lot 6-3           | Town Road                | Slight Road Shoulder Erosion; Undercut Shoreline                                             | Rill (2)        | Small (1)  | Low (3-5)    | High   | No          |
| 2      | 6    | Base of Silver Hill Road                    | Town Road                | Moderate Road Shoulder erosion; Runoff from Silver Hill Rd crosses Bonnyman Rd & Erodes Bank | Sheet (1)       | Small (1)  | Low (3-5)    | High   | No          |

| Sector | Site | Location                                            | Land Use     | Description of Problems                                                                                         | Type of Erosion | Area       | Impact       | Cost   | YCC Project |
|--------|------|-----------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------|-----------------|------------|--------------|--------|-------------|
| 2      | 7    | Shore along lot 8-39                                | Residential  | Moderate Surface Erosion                                                                                        | Sheet (1)       | Medium (2) | Low (3-5)    | Low    | Yes         |
| 2      | 8    | On Bonnyman Road Beach Access @ Summer Camps        | Beach Access | Moderate Surface Erosion; Slight Road Shoulder Erosion                                                          | Sheet (1)       | Medium (2) | Medium (6-7) | Low    | Yes         |
| 2      | 8    | On Bonnyman Road Beach Access @ Summer Camps        | Beach Access | Moderate Surface Erosion; Slight Road Shoulder Erosion                                                          | Sheet (1)       | Medium (2) | Medium (6-7) | Low    | Yes         |
| 2      | 9    | At Wetland Stream Crossing Lot 8-46                 | Culvert      | Unstable Culvert Outlet; Delta in Stream/Lake                                                                   | Sheet (1)       | Medium (2) | Medium (6-7) | Medium | No          |
| 3      | 1    | Driveway with red barn                              | Driveway     | Moderate Surface Erosion; Bare Soils                                                                            | Sheet (1)       | Medium (2) | Medium (6-7) | Medium | Yes         |
| 3      | 2    | 47 Sunset Road                                      | Driveway     | Moderate Surface Erosion; Bare Soils                                                                            | Rill (2)        | Small (1)  | Medium (6-7) | Low    | Yes         |
| 3      | 3    | 114 Point Road                                      | Driveway     | Moderate Surface Erosion; Bare Soils; Roof Runoff Erosion; New Septic                                           | Sheet (1)       | Medium (2) | Medium (6-7) | Medium | Yes         |
| 3      | 4    | 70 Point Road                                       | Residential  | Bare Soil; Roof Runoff Erosion; Lack of Shoreline Vegetation                                                    | Rill (2)        | Medium (2) | Medium (6-7) | Low    | Yes         |
| 4      | 1    | Beach Access Along Bonnyman Road                    | Beach Access | Moderate Surface Erosion; Bare Soils                                                                            | Sheet (1)       | Medium (2) | Low (3-5)    | Low    | Maybe       |
| 4      | 3    | Side of road across 165/167 Bonnyman                | Beach Access | Slight Surface Erosion; Slight Road Shoulder Erosion; Bare Soils; Lack of Shoreline vegetation; Unstable Access | Rill (2)        | Medium (2) | Medium (6-7) | Low    | Yes         |
| 4      | 4    | 165/167 Bonnyman Road                               | Driveway     | Slight Surface Erosion; Slight Road Shoulder erosion                                                            | Sheet (1)       | Small (1)  | Low (3-5)    | Low    | Yes         |
| 4      | 5    | Across from 159 Bonnyman Rd                         | Beach Access | Slight Surface Erosion; Bare Soils; Lack of Shoreline Vegetation                                                | Sheet (1)       | Small (1)  | Low (3-5)    | Low    | Yes         |
| 4      | 6    | Across from 153 Bonnyman Rd (Being bought by Tonks) | Beach Access | Severe Surface Erosion; Severe Road Shoulder Erosion; Bare Soils; Shoreline Erosion                             | Gully (3)       | Large (3)  | High (8-9)   | Medium | Yes         |
| 4      | 7    | Across from 115 Bonnyman Rd                         | Town Road    | Moderate Surface Erosion; Moderate Road Shoulder Erosion, failure                                               | Gully (3)       | Large (3)  | High (8-9)   | Medium | No          |
| 4      | 9    | 115 Bonnyman Road                                   | Driveway     | Moderate Surface erosion                                                                                        | Gully (3)       | Medium (2) | Medium (6-7) | Low    | Yes         |
| 4      | 10   | 111 Bonnyman Road                                   | Driveway     | Moderate Surface Erosion                                                                                        | Gully (3)       | Medium (2) | Medium (6-7) | Low    | Yes         |
| 4      | 11   | Across 111 Bonnyman Rd                              | Beach Access | Slight Surface Erosion; Slight Road Shoulder Erosion; Unstable Access; Failing Retaining Wall                   | Sheet (1)       | Small (1)  | Low (3-5)    | Medium | No          |
| 4      | 12   | Across from 101 Bonnyman Rd                         | Beach Access | Slight Surface Erosion; Slight Road Shoulder erosion; Bare Soils                                                | Sheet (1)       | Small (1)  | Low (3-5)    | Low    | Yes         |

| Sector | Site | Location                                               | Land Use     | Description of Problems                                                                                                          | Type of Erosion | Area       | Impact       | Cost   | YCC Project |
|--------|------|--------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|--------------|--------|-------------|
| 4      | 13   | Across from 93 Bonnyman Rd                             | Beach Access | Slight Surface Erosion; Lack of Shoreline Vegetation; Bare Soils                                                                 | Sheet (1)       | Small (1)  | Low (3-5)    | Low    | Yes         |
| 4      | 14   | Towle Farm Road                                        | Private Road | Moderate Surface Erosion; Moderate Ditch Erosion & Bank Failure; Moderate Road Shoulder Erosion                                  | Gully (3)       | Large (3)  | High (8-9)   | High   | No          |
| 4      | 15   | Beach along Bonnyman Road                              | Beach Access | Slight Surface Erosion; Slight Road Shoulder Erosion                                                                             | Rill (2)        | Medium (2) | Medium (6-7) | Low    | Yes         |
| 4      | 16   | Just off 153 onto Bonnyman Rd                          | Beach Access | Severe Surface Erosion                                                                                                           | Gully (3)       | Large (3)  | High (8-9)   | High   | No          |
| 4      | 17   | Road and Forrest side of 153, ~100 yards from Bonnyman | State Road   | Slight Surface Erosion                                                                                                           | Rill (2)        | Medium (2) | Medium (6-7) | High   | No          |
| 5      | 1    | Rte 153 - NH Stretch from Robeson to ME line           | State Road   | Severe Surface Erosion; Severe Road Shoulder Erosion; Roadside Plow/Grader Berm; Winter Sand; Lack of Shoreline Vegetation       | Gully (3)       | Large (3)  | High (8-9)   | High   | No          |
| 5      | 2    | NH Rte 153 - culvert inlet                             | State Road   | Sever Surface Erosion; Unstable Culvert Inlet                                                                                    | Gully (3)       | Medium (2) | High (8-9)   | High   | No          |
| 5      | 3    | Rte 153 Maine - NH Border to shore acres road          | State Road   | Moderate to Severe Surface Erosion; Severe Road Shoulder Erosion; Winter Sand; Lack of Shoreline Vegetation; Parking on Shoulder | Gully (3)       | Large (3)  | High (8-9)   | High   | No          |
| 5      | 4    | Rte 153 Culverts @ Shore Acres Road                    | State Road   | Severe Surface Erosion; Unstable inlet/outlet Culvert; Severe Road Shoulder Erosion; winter sand                                 | Gully (3)       | Medium (2) | High (8-9)   | High   | No          |
| 5      | 5    | #54 Jolly Roger Campground                             | Residential  | Moderate Surface Erosion; Bare Soil; Unstable Access                                                                             | Rill (2)        | Small (1)  | Medium (6-7) | Low    | Yes         |
| 5      | 6    | ROW to lake - Jolly Roger Campground                   | Lake Access  | Moderate Surface Erosion; Bare Soils                                                                                             | Rill (2)        | Medium (2) | Medium (6-7) | Low    | Yes         |
| 5      | 7    | Jolly Roger Campground #31                             | Residential  | Slight Surface Erosion; Bare Soil; Inadequate Shoreline Vegetation                                                               | Sheet (1)       | Small (1)  | Low (3-5)    | Low    | Yes         |
| 5      | 8    | Between Yellow & Green Camps #32 & 33 Jolly Roger      | Residential  | Moderate Surface erosion                                                                                                         | Rill (2)        | Medium (2) | Medium (6-7) | Medium | Yes         |
| 5      | 9    | #37 Jolly Roger Campground                             | Residential  | Moderate Surface Erosion; Bare Soils; drainage filled paths                                                                      | Rill (2)        | Small (1)  | Low (3-5)    | Low    | Yes         |
| 5      | 10   | 45 Bailey Road                                         | Residential  | Inadequate Shoreline Vegetation; Collapsed Wall                                                                                  | Rill (2)        | Small (1)  | Low (3-5)    | Medium | Maybe       |
| 5      | 11   | Bailey Road Beach                                      | Beach Access | Slight Surface erosion, Slight road shoulder erosion, bare soils; Bailey road dumps to it                                        | Sheet (1)       | Medium (2) | Medium (6-7) | Medium | No          |
| 5      | 12   | 81 Bailey Road - Sign @ road "No Trespassing"          | Beach Access | Slight Surface erosion; bare soils; unstable shoreline                                                                           | Rill (2)        | Small (1)  | Medium (6-7) | Low    | Yes         |

| Sector | Site | Location                                                                   | Land Use     | Description of Problems                                                                                | Type of Erosion | Area       | Impact       | Cost   | YCC Project |
|--------|------|----------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------|-----------------|------------|--------------|--------|-------------|
| 5      | 13   | Next to 81 Bailey Rd - Sign @ road said "Private Property. No Trespassing" | Shoreline    | Stream inlet w/ tea colored water; from here east, the lake is bordered by a double ice berm w/ shrubs | Gully (3)       | Medium (2) | High (8-9)   | Low    | No          |
| 6      | 1    | 19 Oak Avenue                                                              | Residential  | Undercut Shoreline                                                                                     | Gully (3)       | Medium (2) | High (8-9)   | Medium | Maybe       |
| 6      | 2    | Next to 23 Oak Avenue                                                      | Residential  | Moderate Surface erosion; Undercut and eroded Shoreline                                                | Gully (3)       | Small (1)  | Medium (6-7) | Low    | Maybe       |
| 6      | 3    | 23 Oak Avenue                                                              | Residential  | Bare Soil; Lack of Shoreline Vegetation; Inadequate Shoreline Vegetation; Erosion                      | Sheet (1)       | Small (1)  | Low (3-5)    | Low    | No          |
| 7      | 1    | 217 Bailey Road                                                            | Beach Access | Slight Surface Erosion; Bare Soils                                                                     | Sheet (1)       | Medium (2) | Medium (6-7) | Low    | Yes         |
| 7      | 2    | 219 Bailey Road                                                            | Residential  | Severe shoreline erosion, failed coir log installation                                                 | Rill (2)        | Medium (2) | Medium (6-7) | Medium | No          |
| 7      | 3    | 13 Senter Lane                                                             | Residential  | Inadequate Shoreline Vegetation; Erosion                                                               | Rill (2)        | Medium (2) | Low (3-5)    | Low    | Yes         |
| 7      | 5    | 21 Senter Lane                                                             | Boat Access  | Bare Soils; Lack of Shoreline Vegetation, erosion, unstable access                                     | Rill (2)        | Small (1)  | Medium (6-7) | Low    | Yes         |
| 7      | 6    | End of Lakeshore Drive                                                     | Shoreline    | Inadequate Shoreline Vegetation; Erosion; Unstable Access; Algal filled stream outflow                 | Sheet (1)       | Medium (2) | Low (3-5)    | Low    | No          |



## Appendix (C): List of Stormwater Sites Requiring Engineering Assistance

| Sector ID | Tax Map/Lot # | Address                          | Description                                                                                                | Picture                                                                               |
|-----------|---------------|----------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1-3       | 107-19        | 94 Remick Road                   | Slight Surface Erosion; Bare Soils; Bare Sand Leading to Launch<br><br>Launch needs to be re-engineered.   |     |
| 1-7       | 107-14        | 118 Remick Road                  | Point Source - Perimeter Drains Exit on Beach                                                              |    |
| 2-02      | 109-4         | 141 Bonnyman Road                | Moderate Surface Erosion; Lack of Shoreline Vegetation & Erosion; Beach Area<br><br>Retention wall failing |   |
| 2-03      | 109-12/13     | Bonnyman Road Between #157 & 161 | Slight Surface Erosion; Slight Shoulder Erosion; road picking up sand                                      |  |

| Sector ID | Tax Map/Lot # | Address                                     | Description                                                                                                     | Picture                                                                               |
|-----------|---------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 2-04      | 109           | Bonnyman Road in Effingham @ Wakefield Line | Moderate Surface Erosion; Moderate Road Shoulder Erosion; Roadside Plow/Grader Berm                             |    |
| 2-05      | 6-3           | Bonnyman Road in front of lot 6-3           | Some buffer/Filtering, but Visible Signs of Concentrated Flow and/or Sediment Moving through Buffer to Lake (2) |   |
| 2-06      | 8-38/39       | Base of Silver Hill Road                    | Moderate Road Shoulder erosion; Runoff from Silver Hill Rd crosses Bonnyman Rd & Erodes Bank                    |  |
| 2-09      | 8-46          | At Wetland Stream Crossing Lot 8-46         | Unstable Culvert Outlet; Delta in Stream/Lake                                                                   |   |

| Sector ID | Tax Map/ Lot # | Address                       | Description                                                                                     | Picture                                                                               |
|-----------|----------------|-------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 4-07      | 9-92           | Across from 115 Bonnyman Rd   | Moderate Surface Erosion; Moderate Road Shoulder Erosion, road failure                          |     |
| 4-11      | 9-93           | Across 111 Bonnyman Rd        | Slight Surface Erosion; Slight Road Shoulder Erosion; Unstable Access; Failing Retaining Wall   |    |
| 4-14      |                | Towle Farm Road               | Moderate Surface Erosion; Moderate Ditch Erosion & Bank Failure; Moderate Road Shoulder Erosion |   |
| 4-16      | 9-99           | Just off 153 onto Bonnyman Rd | Severe Surface Erosion                                                                          |  |



| Sector ID  | Tax Map/Lot # | Address           | Description                                                                                                                                                      | Picture                                                                                                                                                                                                                                                                                                                                        |
|------------|---------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5-1 to 5-4 |               | Along Route 153   | Severe Surface Erosion; Severe Road Shoulder Erosion; Roadside Plow/Grader Berm; Winter Sand; Lack of Shoreline Vegetation<br>Winter Sand, Unstable Inlet/outlet |     |
| 5-11       | 103-6         | Bailey Road Beach | Slight Surface erosion, Slight road shoulder erosion, bare soils; Bailey road dumps to it                                                                        |                                                                                                                                                                                                                                                            |

| Sector ID | Tax Map/Lot # | Address               | Description                                                                                                     | Picture                                                                              |
|-----------|---------------|-----------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 6-01      | 105-1/2       | 19 Oak Avenue         | Undercut Shoreline                                                                                              |    |
| 6-02      |               | Next to 42 Oak Avenue | Moderate Surface erosion; Undercut and eroded Shoreline                                                         |    |
| 6-03      |               | 42 Oak Avenue         | Some buffer/Filtering, but Visible Signs of Concentrated Flow and/or Sediment Moving through Buffer to Lake (2) |   |
| 7-02      | 101-1         | 219 Bailey Road       | Severe shoreline erosion, failed coir log installation                                                          |  |

| Sector ID | Tax Map/Lot # | Address                | Description                                                                            | Picture                                                                             |
|-----------|---------------|------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 7-04      | 101-3         | Senter Lane            | Undercut Shoreline and Erosion                                                         |   |
| 7-06      | 106-3         | End of Lakeshore Drive | Inadequate Shoreline Vegetation; Erosion; Unstable Access; Algal filled stream outflow |  |