Pine River Pond Watershed Survey Report

2021

Acton Wakefield Watersheds Alliance

Pine River Pond Association

Acknowledgments

The following people and organizations were instrumental in the Pine River Pond Watershed Survey Project and deserve special recognition for their efforts:

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Supporting Organizations

Acton Wakefield Watersheds Alliance (AWWA)

Pine River Pond Association (PRPA)

New Hampshire Department of Environmental Services (NHDES)

Maine Department of Environmental Protection (ME DEP)

Great East Lake Improvement Association (GELIA)

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Introduction

This report serves to compile, summarize, and analyze the data collected during the Pine River Pond watershed survey conducted in the spring of 2021 and is intended for residents, landowners, and town officials within the Pine River Pond watershed.

Watershed surveys provide a snapshot of the condition of the watershed at the time the survey is conducted and document all evidence of sediment erosion. The information gathered during the Pine River Pond survey will be used by the Pine River Pond Association (PRPA), the Acton Wakefield Watersheds Alliance (AWWA), the Town of Acton, and the Town of Wakefield to guide future efforts to preserve the lake's pristine quality for future generations to enjoy.

Pine River Pond Watershed

The area of Pine River Pond is 570 acres (0.9 square miles) while the area of the entire watershed is approximately 7,808 acres (12.2 square miles). The maximum water depth is 55 feet, with an average depth of 12 feet. The lake is located in the town of Wakefield, NH and is a headwater lake for the Saco River. The shoreline of Pine River Pond is highly developed; all precipitation that falls in the watershed drains into the lake through a network of streams, ditches, and overland flow.

The major outlet at the northwest end of the lake is the Arthur Fox Dam controlled by the State of NH. The outflow becomes the Pine River which flows primarily north and eventually feeds into Ossipee Lake. Pine River Pond is a headwater lake for the Saco Watershed which ultimately flows out to the Atlantic Ocean at the Gulf of Maine.

What is a Watershed?

A watershed is defined as all of the land that drains or "sheds" into a given water body. A large watershed is made up of many smaller watersheds. For example, the watershed of Pine River Pond is part of the watershed of the Saco River and the watershed of the Saco River is part of the watershed of the Gulf of Maine.

Activity in any part of the watershed can affect the quality of the water body as a result of the flow from rivers, streams, surface runoff, and groundwater, roads, ditches, pathways, and beaches. This is why protection of Pine River Pond must be addressed on a watershed level rather than simply focusing on shoreline activity.

Water Quality

Volunteers have been testing the water quality of Pine River Pond since 1987. The UNH Lay Lakes Monitoring Program (LLMP), and NHDES have collaborated with PRPA in order to evaluate water quality, track algae blooms, and determine water quality trends. This includes 35 years of Secchi disk transparencies, total phosphorus (TP) data, and chlorophyll-a, (Chl-a) data, and of dissolved oxygen (DO) profiles.

Pine River Pond is on the cusp of being considered an impaired waterbody by the state of New Hampshire. The pond ranks highly for most water quality metrics but is considered impaired for DO and Aquatic Life Integrity. By New Hampshire standards, "outstanding water resources" exhibit average Secchi disk transparency (SDT) greater than 9.1 meters (30 feet), Chl-a levels of <2 ppb, and TP concentrations of 2 to 5 ppb. Pine River Pond has an average SDT of 5.5 meters, average TP of 5.9 ppb, and average Chl-a of 3 ppb. A detailed analysis has shown that TP has remained at a consistent level over 35 years, slightly decreasing over time.

> **Phosphorus -**
> *A nutrient needed for plant growth. It is generally present in small amounts, and limits plant growth in lakes. As the amount of phosphorus increases in the lake, this allows algae and bacteria populations to expand.*

Pine River Pond is classified as an Mesotrophic lake. Oligotrophic lakes are nutrient-poor. They tend to have rocky substrates and shorelines, deeper water, limited algae and aquatic plant growth, and an abundance of dissolved oxygen. Eutrophic lakes are nutrient rich, which allows for abundant plant growth and tends to lead to lower DO levels over time. Mesotrophic lakes are in between these two trophic levels. Pine River Pond has historically exhibited dissolved oxygen depletion in the deepest parts of the lake, which makes it more difficult for cold-water fish and other aquatic fauna to thrive. Despite relatively consistent TP levels, PRP has recently begun experiencing periodic cyanobacteria blooms. This is likely due to warmer temperatures combined with localized sources of stormwater runoff contributing excess nutrients that are not reflected by the average TP levels of the lake.

PRPA has been effective in recruiting volunteers to monitor the health and vitality of the lake. A dedicated water quality monitoring group has participated with the UNH LLMP since 1987. Weed Watchers and Lake Hosts have been actively engaged to prevent an infestation of aquatic invasive plants which can enter the lake and disrupt the fragile aquatic ecosystem.

PRPA and the Town of Wakefield support the efforts of AWWA and its Youth Conservation Corps (YCC) which provides technical assistance to landowners with erosion issues and advises them on the use of best management practices (BMPs) to address stormwater runoff. Landowners participating in the program supply the necessary landscaping materials and the YCC's labor is provided free of charge.

Threats to Pine River Pond

The largest threat to lakes in New England, including Pine River Pond, is polluted runoff or nonpoint source (NPS) pollution. Stormwater runoff from rain and snowmelt picks up soil, nutrients, and other pollutants as it flows across the land, and flushes into the lake.

In an undeveloped, forested watershed, stormwater runoff moves more slowly due to uneven terrain, tree and shrub roots, ground cover plants, leaves, and other natural debris on the forest floor. These features give runoff time to infiltrate into the ground, soaking into the uneven forest floor and filtering through the soil. The soil and mineral substrate below ground is the most effective form of filtration for stormwater runoff.

In a developed watershed, stormwater does not have the opportunity to infiltrate and does not receive the filtration provided by the forest floor. Rainwater picks up speed as it flows across impervious surfaces like rooftops, compacted soil, gravel camp roads, and pavement, and becomes a formidable, erosive force.

Although much of Pine River Pond's watershed is still forested, most of the shoreline is developed with seasonal and year-round residences as well as state and town roads and an extensive network of town and camp roads. While these residences and roads convey most of the runoff to the lake, public access points such as beaches and boat launches were found to contribute as well. Camp roads are subject to frequent wash-outs during periods of heavy precipitation and spring thaws. Wash-outs can transport significant quantities of sediment and gravel into the lake increasing the nutrient levels and reducing clarity.

A number of the camps that surround the lake are many decades old and some may have ineffective septic systems. Leaching of these systems can release excess nutrients and potentially dangerous bacteria into the lake.

Why is Storm Water Runoff a Problem?

The problem is not typically the water itself that is running into the lake, but the pollutants that it carries with it. The sediment and nutrients in the runoff can be bad news for freshwater lakes.

The nutrient known as phosphorus is food for algae and other plants and is found in soil, septic waste, pet waste and fertilizers. Algae in the lake react to the addition of phosphorus in the same way that plants in the home and garden react when nutrients like phosphorus, commonly in fertilizers, are fed to the plant—they grow. In natural conditions, the scarcity of phosphorus in a lake limits algae growth. Consequently, 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/Sediment is the biggest source of phosphorus for New Hampshire's lakes. As every gardener knows, phosphorus and other nutrients are naturally present in the soil. So, runoff is essentially "fertilizing" Pine River Pond with the soil that erodes from our driveways, roads, ditches, pathways, and beaches.

Reasons to Reduce Runoff

Pine River Pond's pristine conditions make it a valuable asset to the community for multiple reasons; economic, recreational, ecological, and cultural.

- Once a lake has declined, it is difficult or impossible to restore. Prevention is the key.

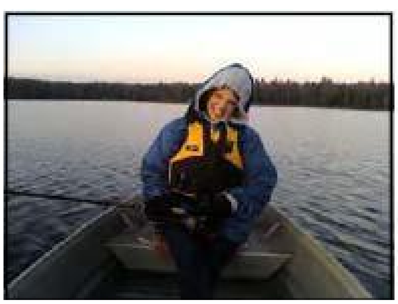
- Economic studies have found a direct correlation between water quality and waterfront property values, therefore, maintaining a clean and healthy lake is crucial to the Town's financial viability as well as protecting the investments of property owners.

- Fishing is a popular activity thanks to the abundance of fish species including smallmouth and largemouth bass, chain pickerel, blue backed herring, and black crappie. The pond is considered a warm water fishery by New Hampshire Fish & Game

- In addition to the numerous fish species, bald eagles and other large birds of prey utilize the lake habitat for hunting, nesting, and breeding. Loons are a frequent sight and have become a symbol of the region. Declining water quality could force these majestic birds to find healthier waterbodies to call home.

- A clean lake with clear water is perceived as being a community asset. Healthy lakes are regarded as being more valuable and desirable. The lake becomes a source of community pride to its users and fosters a sense of stewardship.

- Sediment deposited into the lake from erosion creates the ideal environment for invasive aquatic plants, algae, and cyanobacteria to thrive.




Purpose of the Pine River Pond Watershed Survey

The purpose of this survey was to gain an in-depth understanding of the current conditions of the watershed in terms of surface sediment erosion through direct observation.

The watershed survey is used for the following purposes:

- Identify and prioritize existing sources of polluted runoff, particularly soil erosion sites in the Pine River Pond watershed.
- To raise public awareness about the connection between land use and water quality and the impact of soil erosion on Pine River Pond, and to inspire people to become active watershed stewards.
- Provide the basis to obtain grant funding to assist in fixing identified erosion sites.
- Make general and specific recommendations to landowners for fixing erosion problems on their properties.
- Identify sites for future Youth Conservation Corps/grant projects
- To develop a Watershed-Based Protection Plan and use the information gathered as one component of a long-term lake protection strategy. The majority of lake front properties were physically inspected and all sediment erosion that reaches the lake was documented. The resulting lake protection plan thus has a real-world perspective with hard data collected from first-hand observations.

Note: The purpose of the survey is *NOT* to blame landowners with erosion or seek enforcement action against landowners not in compliance with ordinances. This is an education, outreach, and science-based tool intended to help the Pine River Pond community work together with landowners and community partners to solve erosion problems on their property through technical assistance, Youth Conservation Corp projects, and grants.

Local citizen participation was essential in completing the watershed survey and will be even more important in years to come. With the leadership of PRPA, AWWA and others concerned with lake water quality, the opportunities for stewardship are limitless.

Survey Method
The survey was conducted by PRPA volunteers with the help of trained technical staff from Maine DEP, New Hampshire DES, NH LAKES, GELIA, and AWWA. Thirty-eight volunteers were trained in survey techniques during a two-hour virtual training session on May 5th, 2021. On Friday, May 7th, the volunteers met in the parking lot of the Knotty Pine Grill and Tavern, organized into groups, and spent the day documenting erosion on the roads, properties, driveways, and shorelines in their assigned sectors using a tailored digital data collection app called Survey123. The volunteers completed the majority of the survey in a single day; a smaller group convened during the summer to complete the survey by boat. *Surveys are always conducted in the spring because this is when stormwater erosion is most apparent*. Each survey group had one technical leader, a group leader who lived in that sector, and 2-3 volunteers. The Technical Leader was responsible for entering data into the app and providing quality control for each entry. Team leaders and volunteers were responsible for efficiently navigating their sector, numbering site photos, and engaging with homeowners. The entire group was responsible for seeking and identifying erosion sources.

When erosion was identified on a site, it was categorized in three ways:

- ❖ Degree of impact on lake water quality
- ❖ Estimated remediation cost
- ❖ Technical level required to fix the erosion issue

Impact on Lake Water Quality: Each site was rated for its potential impact on lake water quality. The impact was based on slope, amount of soil loss, proximity to water, and the presence and size of a vegetated buffer.

- "Low" impact sites were those with limited soil transport off-site and little or no visible gullies.

- "Medium" impact sites had some sediment transport off-site with noticeable rills in the ground.

- "High" impact sites exhibited a large amount of sediment transported off-site with significant gullies eroded into the ground.

Estimated Remediation Cost: Recommendations were made for fixing erosion at each site and the associated cost of labor and materials was estimated for the homeowner.

- "Low" cost sites were estimated to cost less than $1,000

- "Medium" cost sites were estimated to cost between $1,000 and $3,000

- "High" cost sites were estimated to cost in excess of $3,000

Technical Requirements: In addition to cost, surveyors also determined what level of technical expertise would be required in order to correct an erosion issue. This often correlates with cost, but not always.

- "Low" tech recommendations can easily be installed by homeowners using hand tools and do not require landscape design knowledge or engineering.

- "Medium" tech recommendations require a site-specific landscape design using specific stormwater best management practices and could be completed by a landscape design company or by AWWA's Youth Conservation Corps Program.

- "High" tech recommendations will require large, complex installations and will likely require an engineered design.

Photos and additional site information were gathered for each site to get a full picture of the erosion. All site information was then submitted through the Survey123 App and downloaded into an excel spreadsheet for analysis. Island sites and additional sites were surveyed by boat.

Technical staff conducted follow-up examinations of some sites in subsequent months to verify data accuracy and estimate soil loss from the sites characterized as having a medium or high impact on Pine River Pond. Estimates of soil loss to the lake and the associated phosphorus loading estimates were made using the EPA Region 5 Model. This is the standard model used to estimate soil loss by many organizations including Maine DEP, NHDES, and the US EPA.

All information collected during the initial survey and subsequent soil loss estimations were entered into an excel database managed by AWWA. This data was standardized, validated, and organized to allow relationships and rankings to be determined. The sites that were identified by volunteers were prioritized for remediation based on rankings of their impact on the lake, required technical expertise, and estimated cost of remediation. The documented erosion sites were then marked on the Pine River Pond watershed map.

A description of 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 data from the documented sites is located in Appendix B. ***Contact PRPA or AWWA for additional site information or to find out if a site number corresponds with your property (contact info found on page 35).***

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Note: This Survey was conducted using the Maine DEP Lake Watershed Survey Protocol. View at: https://www.maine.gov/dep/land/watershed/materials/lakewsurveyguide.pdf

Summary of Watershed Survey Findings

Out of the 414 properties surveyed, volunteers identified 185 erosion sites that were directly impacting Pine River Pond. Of these 185 sites, 10 were low impact/ low priority erosion issues, 126 were medium impact, and 49 were deemed a high impact/high priority. Figure 1 demonstrates this breakdown. All three of these categories had a range of costs and technical complexity associated with fixing erosion.

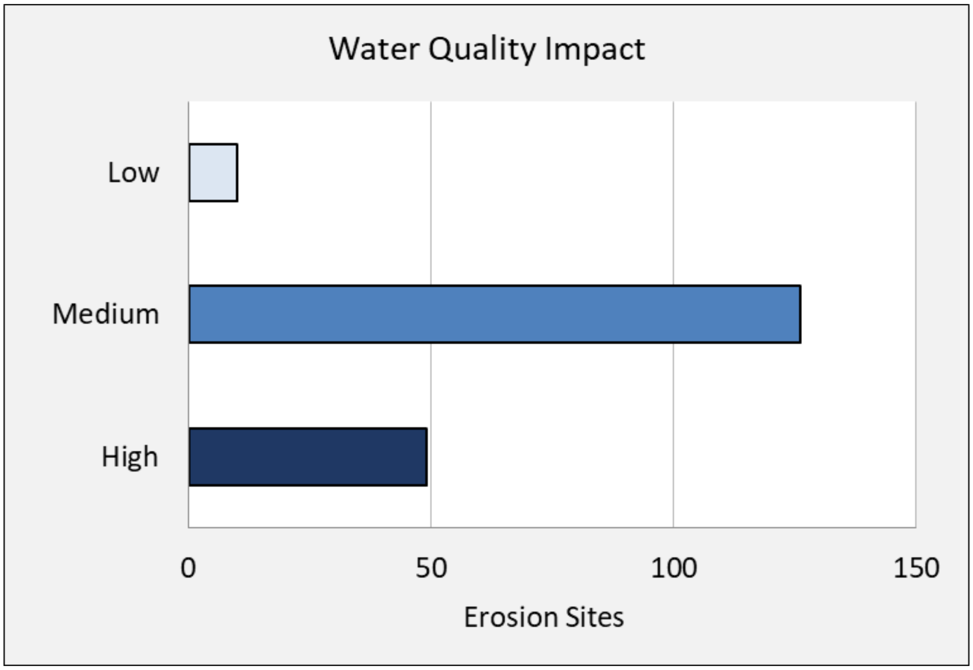


Figure 1. Identified Erosion sites based on estimated water quality impact.

In addition to being categorized by water quality impact, erosion sites were also identified by land use type. The majority of erosion sites were identified on residential properties, followed by shorelines and roads. Figure 2 depicts the various land-use types and their water quality impact on the lake. This is further outlined in Table 1.

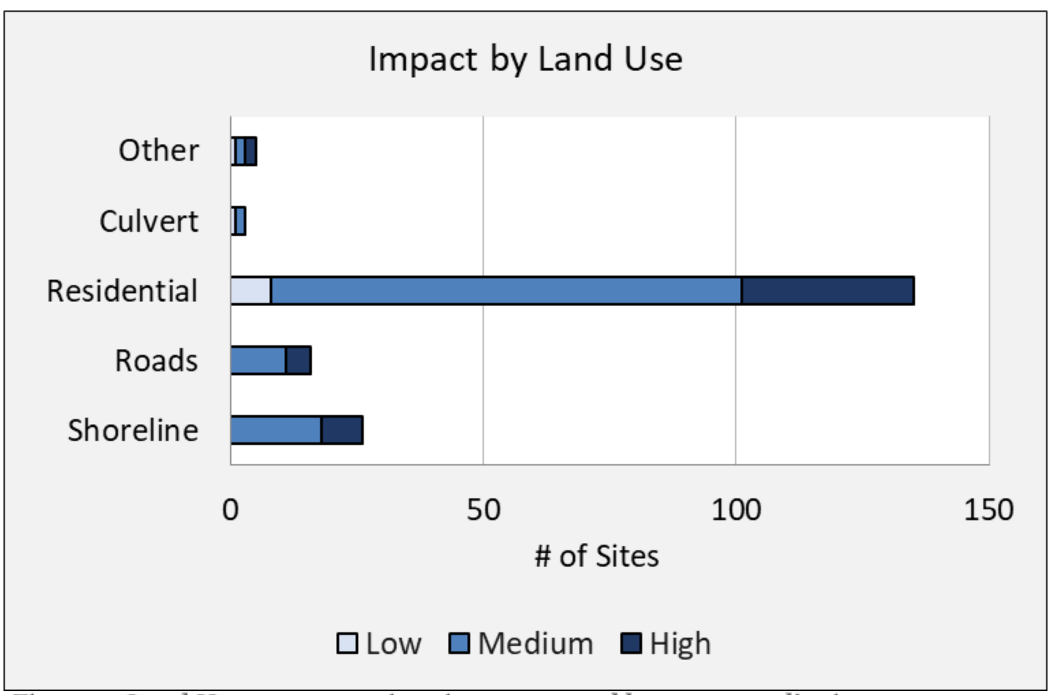


Figure 2. Land Use type at erosion sites, separated by water quality impact.

After assessing water quality impact, volunteers also assessed the estimated cost to fix an erosion site and the technical requirements needed to fix it. These are important considerations when prioritizing erosion control efforts given that inexpensive, simple projects can be completed in greater abundance and less time which could significantly benefit water quality. Figures 3 and 4 compare the water quality impact of a site to both cost and technical requirements. *Notice that the vast majority of identified sites are estimated to have low cost solutions*. This was true even in cases where the solution was more technically complex.

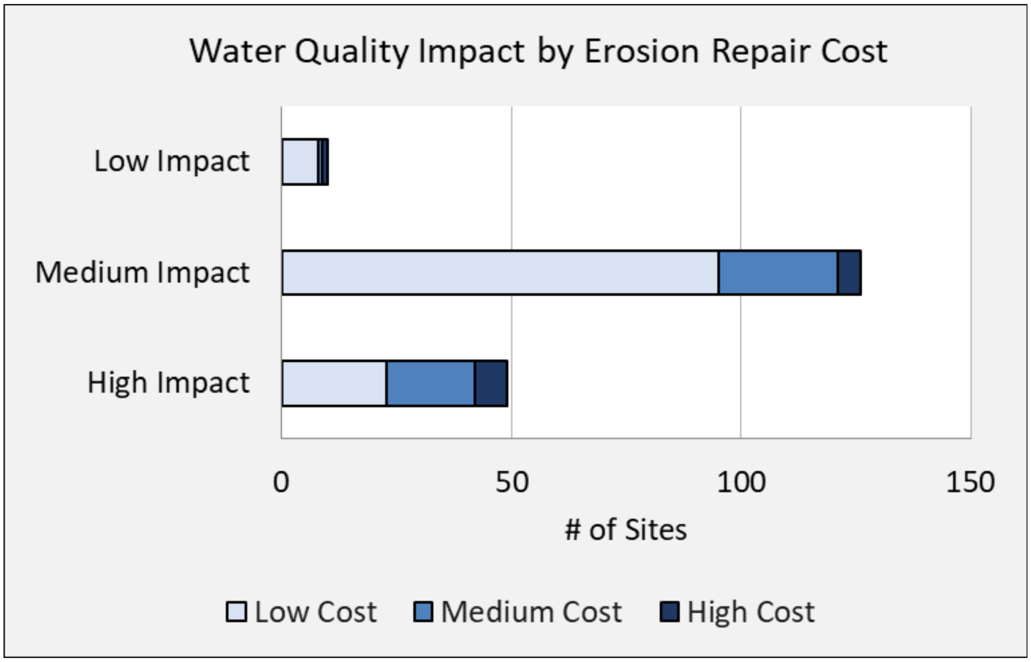


Figure 3. Water quality impact of erosion broken down by repair cost.

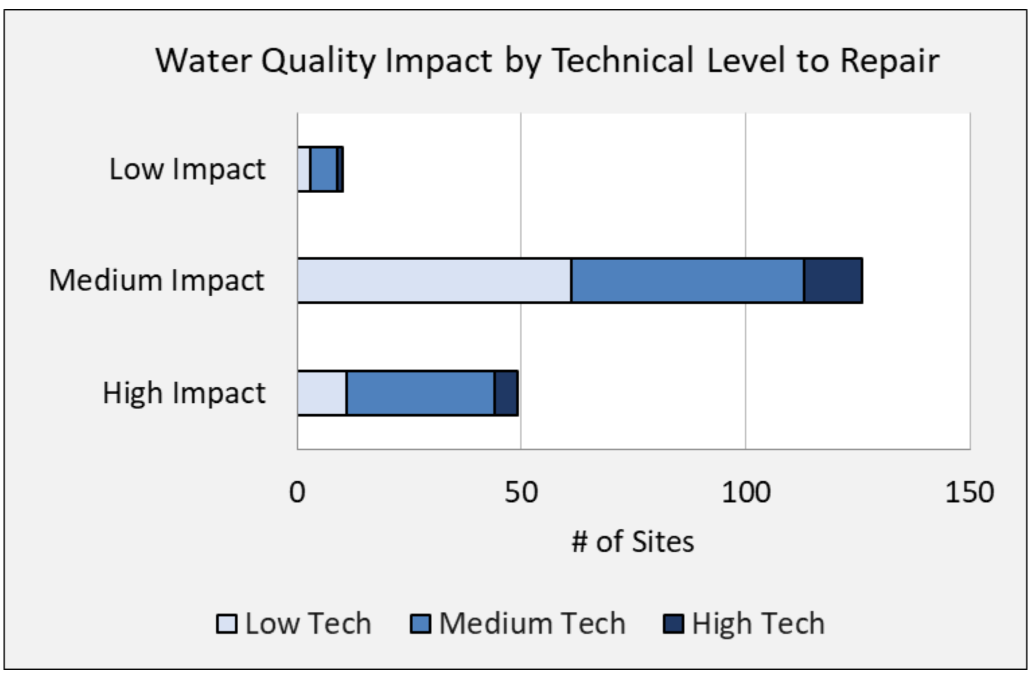


Figure 4. Water quality impact of erosion broken down by complexity of repair.

Discussion

As seen in these figures, the majority of erosion sites that were identified by volunteers have impact on water quality. It is important to remember that polluted runoff is a nonpoint source pollution problem, meaning that *no single source has a major impact on water quality*. When added together, however, these small impacts have a significant effect on water quality. These ratings (high, medium, and low), are relative and are primarily used as a way to prioritize which sites should be addressed by the community, but any erosion that can be addressed should be. For example, one high impact site may represent 5% of the overall erosion in the lake and should be addressed right away. A site that represents only 1% of the lake's erosion is a lower priority to repair, however, if 10 of these low priority sites are fixed, the effect will be 10% of erosion eliminated, twice as much as repairing the previously mentioned high priority site. **Every erosion source that is eliminated adds up to reduce overall water pollution.**

By prioritizing sites by impact, cost, and technical level, we can focus our efforts on high-priority, complex fixes, while encouraging homeowners to address the much larger category of inexpensive, low-impact sites. In Appendix B, the list of erosion sites is broken down by priority. The highest priority sites have a high impact on the lake but are inexpensive and easy to fix. The lowest priority is low-impact sites that would be expensive and complicated. This prioritization ensures that we spend our limited financial resources efficiently while having the greatest impact on the lake. **If your own property is ranked higher on the priority list, this does not mean you have more responsibility to protect water quality than others.** Everyone is responsible for doing whatever they can to minimize their property's effect on water quality. This data will be a resource to the Pine River Pond community for accomplishing that goal.

Tables

Figure 1. Different Land Uses at each site and their impact on water quality

Land Use	Low	Medium	High
Shoreline	0	18	8
Roads	0	11	5
Residential	8	93	34
Culvert	1	2	0
Other	1	2	2

Figure 2. Estimated Cost Range for identified sites broken down by water quality impact.

Impact	Low Cost	Medium Cost	High Cost
High Impact	23	19	7
Medium Impact	95	26	5
Low Impact	8	1	1

Figure 3. Technical Level to repair erosion broken down by water quality impact.

Impact	Low Tech	Medium Tech	High Tech
High Impact	11	33	5
Medium Impact	61	52	13
Low Impact	3	6	1

Next Steps

Remediating the erosion issues identified in this survey will require efforts by PRPA, AWWA, community members, road associations, municipal officials, and state agencies.

PRPA & AWWA

- Contact property owners, road associations, and towns with identified erosion problems to offer technical assistance and encourage them to make improvements.
- Provide copies of the survey report to property owners, road associations, and towns.
- Seek grant funding and implement projects to protect lake water quality. Maintain and update the Pine River Pond Watershed Based Plan.
- Continue to promote the Lake Host, Weed Watch, and water quality monitoring programs and encourage lake stewardship.
- Increase awareness through outreach and educational materials for the PRP community.
- Organize workshops and volunteers to start fixing identified erosion problems and teach citizens how to fix similar problems on their own properties.
- Liaise with town and state officials about lake issues and work together to find solutions.

Individual Landowners

- Repair areas of your property where erosion is occurring if possible. Contact AWWA for technical assistance and educational materials about best management practices.
- Become a member of the lake association (www.pineriverpond.org) to stay informed about water quality, the watershed, and other important information about the PRP community.
- Encourage growth of native vegetation, refrain from mowing and raking to allow areas to revert to a natural condition, and avoid exposing or disrupting soil where possible.
- Consult town or state agency websites, or call officials with questions about permitting.
- Maintain septic systems properly. Pump your tank every 2 to 3 years.
- Research ways to better manage ice and snow within the watershed to protect the lake.

Municipal Officials

- Support upholding and enforcement of shoreland zoning and other ordinances.
- Conduct regular maintenance on town roads in the watershed, and address town road issues identified in this survey where feasible.
- Provide training for road maintenance crews under the NH Certified Green SnowPro Program, and educate crews on how to better manage ice and snow within watersheds.

Forming a Road Association

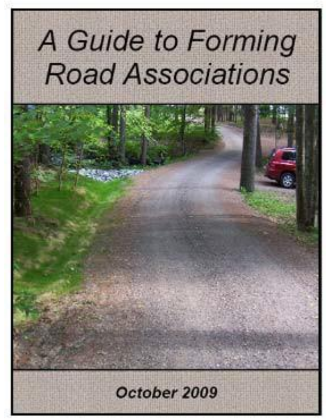
- Proper maintenance of camp roads is crucial to the long-term health of Pine River Pond.
- A road association is a way for landowners on a private camp road to share responsibility, make decisions, and split costs for road maintenance and repairs.
- While small roads can make do with informal associations, it is becoming more common to establish road associations as 501(c)3 non-profit organizations. These associations are run through a straightforward, democratic process and have the ability to collect dues, receive legal protections, and may qualify for grant funding to fix erosion issues.

Why form a road association on Pine River Pond?

- 14 impact sites identified during the watershed survey are on private roads. Maintaining these roads helps protect Pine River Pond from the impacts of soil erosion.
- A road association provides an avenue for private camp road users to formally manage roads in a fair, organized, and cost-effective manner.
- Regular maintenance can reduce road expenses over time. The Camp Road Maintenance Manual estimates that $1 spent on routine maintenance saves $15 in repairs.

For information on forming road associations:

- New Hampshire Road Association Laws - RSA 231:81-A
- NH Private Road Tax Payers Alliance - nhpvrta.com
- How to form a Non-Profit: learning.candid.org/resources/knowledge-base/starting-a-nonprofit
    - NH Charitable Trusts Unit - doj.nh.gov/charitable-trusts



Other useful resources:

Maine DEP's 'Guide to Forming a Road Association - www.maine.gov/dep/land/watershed/roadassociation.html.

Common Erosion Issues and Best Management Practices for Homeowners

Below are common examples of erosion and the Best Management Practices (BMPs) that are recommended to prevent it. Erosion takes many forms and can occur naturally, but in all cases, the end result is that running water (stormwater runoff) picks up soil and transports it into the lake. These practices are designed to trap stormwater and allow it to infiltrate into the ground before it reaches the lake, while also operating as functional and aesthetic landscaping features on a property. Some BMPs are useful for residential properties and some are specifically for use on private and town-owned roads. Residential BMPs are relatively simple to install and can be done by homeowners and landscapers. Road BMPs often require heavy machinery and in some cases require engineering (i.e. culvert installation).

For additional information on Stormwater Runoff and Erosion BMPs, please use the following resources:

- BMP Manuals (Maine DEP) - https://www.maine.gov/dep/land/watershed/materials.html
- Gravel Road Manual: www.maine.gov/dep/land/watershed/camp/road/gravel_road_manual.pdf
- NH Homeowner's Guide to Stormwater Management: https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/homeowner-guide-stormwater.pdf
- Conservation Practices for Homeowners - awwatersheds.org/conservation-practices-for-homeowners

Common Erosion Issues

Gully Erosion - forms when fast moving water forms a channel on bare soil and begins to pick up and transport sediment downhill to the lake. Most visually obvious form of erosion. Smaller gullies are referred to as rills.

Shoreline Erosion - Shoreline can erode both from stormwater runoff and intense wind and wave action. The root systems of plants on the shoreline work to stabilize soil on the slope and protect it from eroding. In the absence of permanent, woody vegetation, the bank soils have no structure and can easily erode into the lake.

Sheet Erosion - Less apparent than a gully. Occurs when soil erodes in equal amounts across the landscape and the soil level lowers. Exposed roots are evidence of this. Roots naturally grow underground, so the amount of soil loss equals at least the height of the exposed roots. Sheet erosion often goes unnoticed and can lead to significant soil loss.

Best Management Practices: *Infiltration*

Infiltration Path - a trench filled with crushed stone that traps stormwater. Can replace dirt paths susceptible to runoff.

Dripline Trench - Traps roof runoff and directs it into the ground. An alternative to gutters.

Infiltration Steps - Crushed stone steps that trap stormwater instead of allowing it to flow downhill.

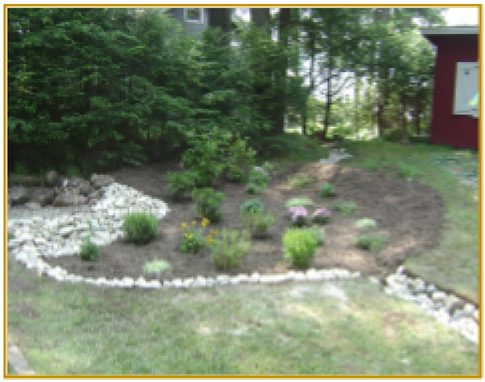
Best Management Practices: *Diversion*

Rubber Razor - strips of hard rubber are partially buried in the driveway, placed on an angle to divert stormwater into an adjacent trench or natural area.

Water Bars - 6"x 6" lumber is installed on a slope with crushed stone on the uphill side to trap and divert stormwater. Water bars are left slightly raised to slow water down an can be used as seen above, or placed in a pathway in shorter lengths to function as steps.

Firehose Diverter - In paved driveways, burying rubber and wood are not an option. Old firehose, or other durable material, can be filled with sand or stone and placed on an angle to divert stormwater. These have the added benefit of being movable.

Best Management Practices - *Retention*



Rain Garden - pervious detention basin designed to store stormwater during a rain event and allow it to infiltrate. Typically a trench directs water into the rain garden. Water tolerant plants are put in to uptake additional water and absorb excess nutrients.

Vegetated Buffer - The shoreline is the last line of defense from stormwater. Dense, woody vegetation slows down stormwater and the root system binds sediment together and keeps it from eroding.

Erosion Control Mulch - This chunky mulch is made of tree and stump grindings of various sizes, this allows it to bind together and trap stormwater without washing away. This is the simplest way to protect bare soil and will last for many years before breaking down.

Best Management Practices - *Roads*

Hard Pack - This is an aggregate stone material that does not wash away as easily as sand and gravel. The lack of fine materials means less sediment erosion.

Crowning - A dirt road must be slightly pitched so water will run off of it instead of forming potholes and gullies. The high point can be in the middle to direct water in both directions, or on a far side to direct all water in one direction.

Ditching - Once water is directed off the road, it should flow into a pervious ditch to allow it to infiltrate. There are various methods such as vegetation and check dams which can be used to slow stormwater down in a ditch.

Permitting and Regulations - New Hampshire

The Shoreland Water Quality Protection Act (SWQPA) establishes buffers known as "protected shoreland", located along public waters. Certain homeowner activities are regulated within the protected shoreland, which includes all lands within 250' of pubic waters:

- Lakes & ponds greater than 10 acres;
- Year-round flowing waters (streams and rivers) of fourth-order or higher;
- Coastal waters.

Waterfront Buffer Requirements

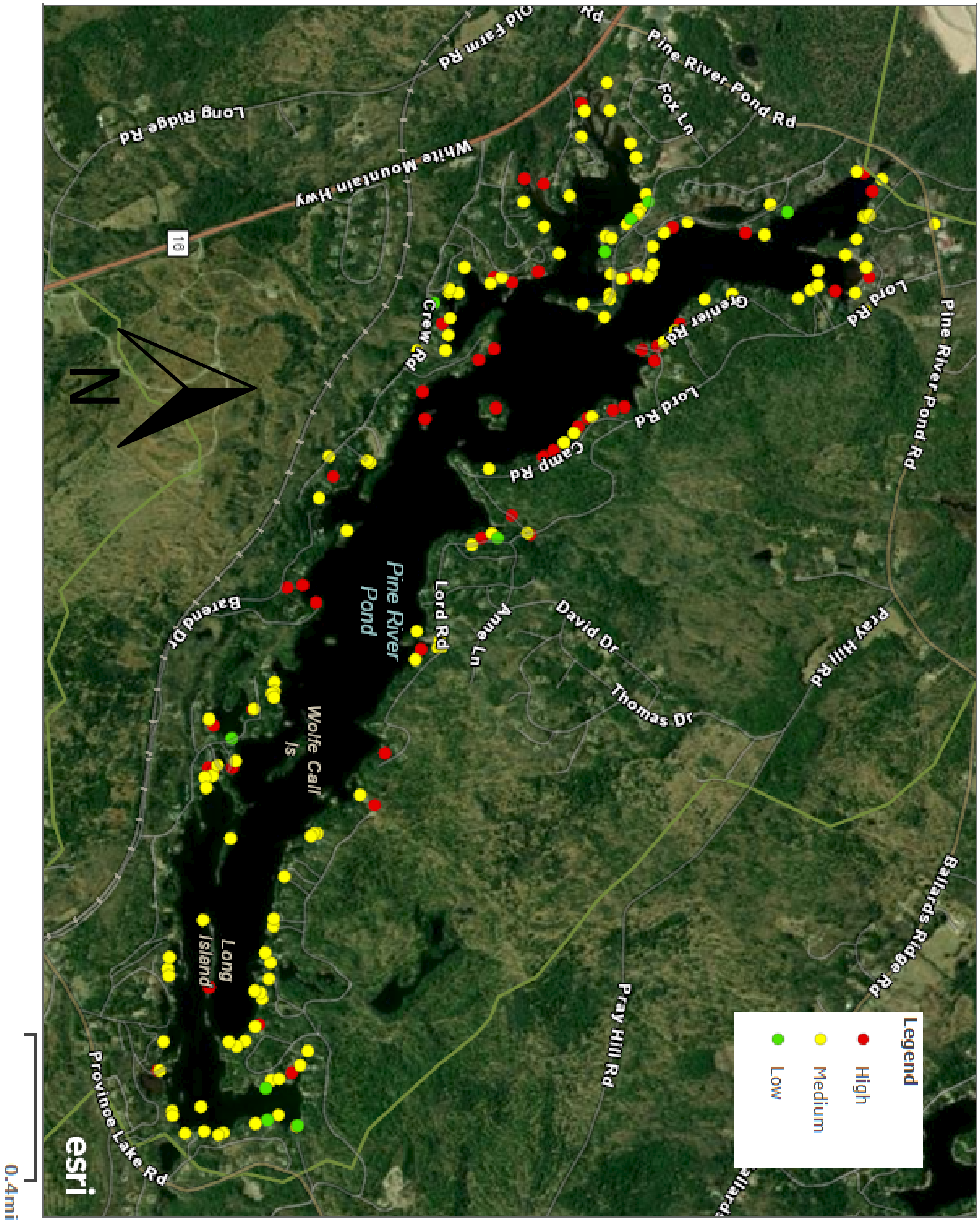
Within 50' of the reference line, ground cover and shrubs may not be removed and replaced with landscaping or lawn. They may only be removed to provide a 6' wide footpath to the water or to structures in the waterfront buffer (a shoreland permit may be required). Ground cover and shrubs may only be trimmed to a height of no less than 3'. Trees may also be pruned as long as the health of the tree is not endangered. Pruning only the bottom 1/3 of a tree is recommended to maintain property aesthetics and tree health. Pruning trees increases views while providing wildlife habitat, privacy, and retaining shade. No pesticides can be applied within 25' of the reference line, and no chemicals of any kind can be applied within 50' other than by an NH licensed professional.

Permitting Requirements

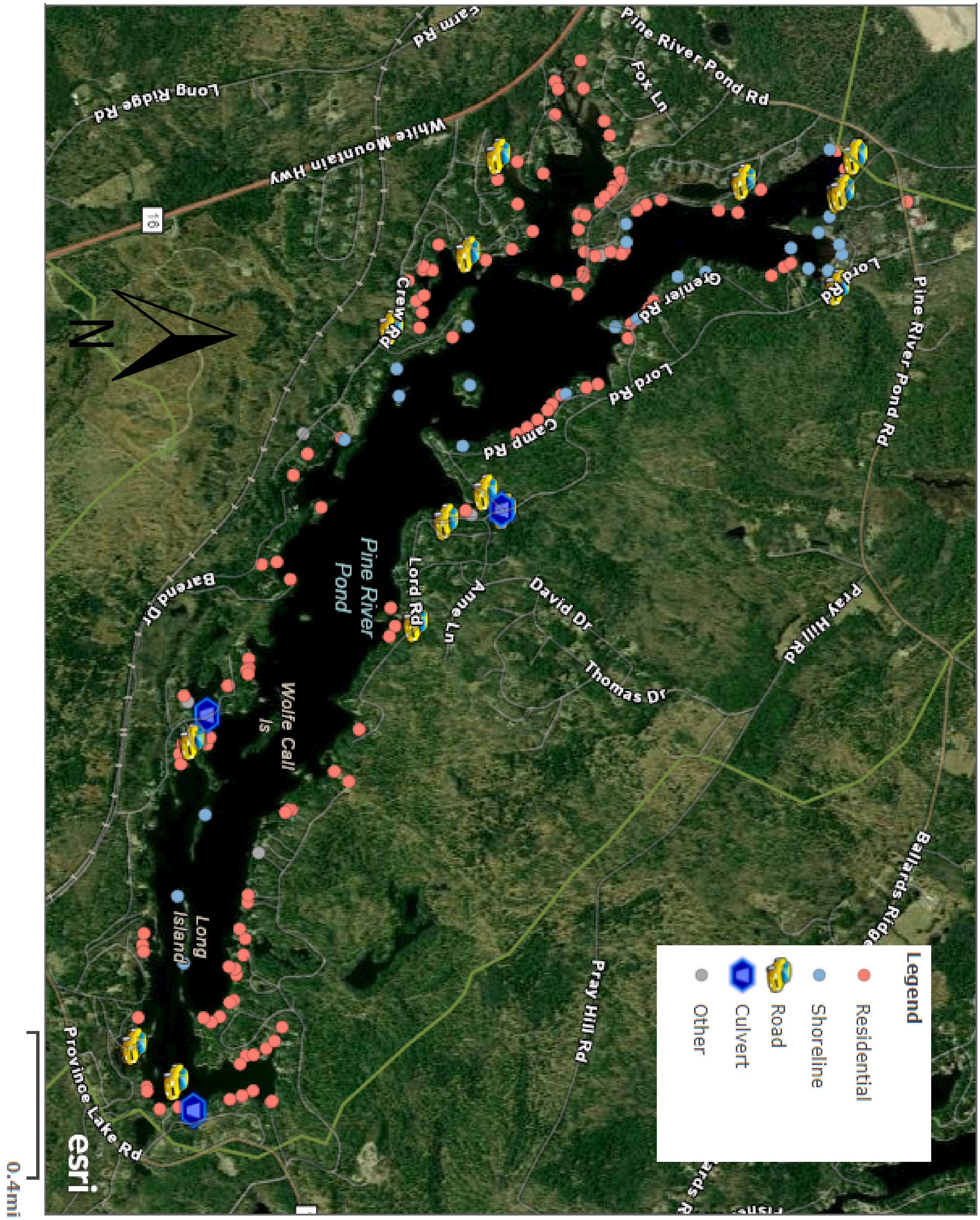
- A shoreland permit is not required for vegetation management provided it occurs in accordance with the SWQPA.
- Any dead, diseased or hazardous tree may be cut to ground level at any time without a shoreland permit.
- An NHDES shoreland permit is required for excavation, fill, or construction within 250' of the reference line. Examples include, but are not limited to removing stumps, constructing most walkways, patios, other structures, or grading. Any earthwork or construction on the bank, in the water, or on the bed of a waterbody is regulated by the NHDES Wetlands Bureau and is subject to the NHDES Wetlands Permitting Process.
- Areas cleared of ground cover, shrubs, or trees prior to July 1, 2008 may be maintained but not enlarged.
- Before removing trees, always check local ordinances as well. Many municipalities have standards that are stricter than the NH Shoreland Water Quality Protection Act.

To apply for a Shoreland Permit, visit the NHDES Shoreland webpage at this link: https://www.des.nh.gov/land/waterfront-development/protected-shoreland.
Many low-impact activities that propose no greater than 1,500 SQFT of impact may qualify for a shoreland permit by notification, which is a simplified permit with a faster turnaround.

Appendix A: Watershed Survey Map - Impact



Appendix A: Watershed Survey Maps - Land Use Type



Appendix B: Site Descriptions

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
8-24	High	Low	Low	Residential	Gully, Bare Soil	Native Vegetation, Reseed bare soil, cover/remove bare sand	NA	NA
8-08	High	Low	Low	Shoreline	Inadequate Shoreline Vegetation	Establish Vegetated Buffer, cover bare sand, add to buffer	10.6	6.3
3-50	High	Low	Low	Shoreline	Undercutting	Establish Vegetated Buffer, Shoreline Stabilization	21.5	12.5
8-02	High	Low	Low	Residential	Gully	Eliminate Raking, leaf blowing, Reseed bare soil, Erosion Control Mulch, dry well	0.6	0.4
3-13	High	Low	Low	Residential	Gully	Water Bars, Rubber Razors	0.3	0.2
3-14	High	Low	Low	Residential	Sheet, Bare Soil	Erosion Control Mulch, Native Vegetation, Terracing	4.3	2.5
8-23	High	Low	Low	Residential	Rill	Infiltration Path, Native Vegetation, Water Bars, Rubber Razors, Reseed bare soil	8.5	5.0
7-14	High	Low	Low	Residential	Sheet	Native Vegetation, Reseed bare soil	0.5	0.3
8-07	High	Low	Low	Residential	Sheet, Bare Soil	Native Vegetation, Reseed bare soil, Erosion Control Mulch	NA	NA
7-03	High	Low	Medium	Residential	Rill	Water Bars, Rubber Razors, Erosion Control Mulch	0.4	0.3
2-15	High	Low	Medium	Residential	Sheet, Bare Soil	Infiltration Path, Reseed bare soil, Erosion Control Mulch	5.3	3.1
3-05	High	Low	Medium	Residential	Sheet, Gully	Erosion Control Mulch, Rubber Razors, Reseed bare soil, Direct Road runoff to nearby veg areas	13.3	7.8
3-08	High	Low	Medium	Residential	Sheet	Erosion Control Mulch, Rubber Razors	1.3	0.8
3-10	High	Low	Medium	Residential	Sheet, Bare Soil	Erosion Control Mulch, Water Bars	17.0	10.0
3-11	High	Low	Medium	Residential	Sheet, Bare Soil	Infiltration Path, Erosion Control Mulch, Reseed bare soil	1.3	0.8
7-05	High	Low	Medium	Residential	Gully	Water Bars	3.4	2.0
7-05	High	Low	Medium	Residential	Gully	Native Vegetation, Rubber Razors, Erosion Control Mulch, Reseed bare soil	2.6	1.5
7-10	High	Low	Medium	Residential	Gully	Rubber Razors	4.3	2.5
7-15	High	Low	Medium	Residential	Sheet	Erosion Control Mulch, Native Vegetation, Rubber Razors	0.9	0.5

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
7-17	High	Low	Medium	Residential	Sheet, Bare Soil	Native Vegetation, Dripline Trench, Water Bars, Reseed bare soil	0.4	0.3
1-50	High	Low	Medium	Residential	Sheet, Gully	Erosion Control Mulch, Native Vegetation, Dripline Trench, Infiltration trench	17.0	10.0
3-09	High	Low	Medium	Shoreline	Excessive Clearing	Box out picnic area to separate from large beach access; add check dams to gully; rake out gullies	NA	NA
1-09	High	Low	Medium		No vegetation, sand	Native Vegetation, Erosion Control Mulch	NA	NA
3-17	High	Medium	Low	Residential	Sheet, Bare Soil	Erosion Control Mulch, Infiltration Path, Native Vegetation	2.6	1.5
4-11	High	Medium	Low	Residential	Bare Soil	Erosion Control Mulch, Reseed bare soil, Native Vegetation, Eliminate Raking, leaf blowing	NA	NA
8-12	High	Medium	Medium	Residential	Rill	Erosion Control Mulch, Eliminate Raking leaf blowing, Reseed bare soil, stabilize footpaths- lots of bare soil	NA	NA
5-01	High	Medium	Medium	Residential	Sheet	Erosion Control Mulch, Water Bars	20.4	12.0
5-23	High	Medium	Medium	Residential	Sheet	Erosion Control Mulch, Native Vegetation, Rubber Razors, Water Bars	15.9	9.4
7-20	High	Medium	Medium	Shoreline	Large beach with sediment transport to lake		NA	NA
7-50	High	Medium	Medium	Shoreline	Erosion, Inadequate Shoreline Vegetation, Unstable Access	Establish Vegetated Buffer, Shoreline Stabilization	21.3	12.5
7-49	High	Medium	Medium	Shoreline	Undercutting, Erosion	Establish Vegetated Buffer, Shoreline Stabilization	NA	NA
2-21	High	Medium	Medium	Residential	Sheet, Bare Soil	Water Bars, Rubber Razors, Reseed bare soil	NA	NA
5-15	High	Medium	Medium	Residential	Sheet, Gully	Erosion Control Mulch, Native Vegetation, Rubber Razors, Drywells	2.8	1.6
4-03	High	Medium	Medium	Residential	Rill, Sheet	Erosion Control Mulch, Eliminate Raking leaf blowing	0.1	0.1

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
4-09	High	Medium	Medium	Residential	Dripline, Sheet	Native Vegetation, roof drips directly into the lake, driveway has erosion over step slope into lake	2.1	1.3
4-09	High	Medium	Medium	Residential	Dripline, Sheet	Native Vegetation, roof drips directly into the lake, drive way has erosion over step slope into lake	NA	NA
3-21	High	Medium	Medium	Residential	Dripline, Sheet	Erosion Control Mulch, Infiltration Path, Dripline Trench, Reseed bare soil	NA	NA
1-48	High	Medium	Medium	Residential	Sheet, Rill	Erosion Control Mulch, Native Vegetation, Rubber Razors, Dripline Trench, buffer	2.6	1.5
2-07	High	Medium	Medium	Shoreline	Inadequate Shoreline Vegetation	Establish Vegetated Buffer	NA	NA
3-18	High	Medium	Medium	Residential	Sheet, Bare Soil	Erosion Control Mulch, Infiltration Path, Reseed bare soil, Improve/add terracing	1.6	0.9
8-28	High	Medium	Medium	Road	Gully	Crown, Add road base material, Rubber Razor, Open Top Culvert, Ditch & Check Dams,	NA	NA
2-14	High	Medium	High	Residential	Sheet, Rill, Gully, Bare Soil	Native Vegetation, Reseed bare soil	NA	NA
8-21	High	High	Medium	Road	Rill, Sheet	Pave, Crown, Ditch & Check Dams,, Rubber Razor, Open Top Culvert limit size of driveway	NA	NA
3-48	High	High	Medium	Road	Sheet, Rill, Gully	Crown, Turn outs, Ditch & Check Dams	17.0	10.0
3-49	High	High	Medium	Road	Sheet, Rill, Gully	Add road base material, Crown, Install Detention Basin, Turn outs, Ditch & Check Dams	8.5	5.0
8-06	High	High	High	Shoreline	Erosion, Undercutting	Shoreline Stabilization is going to need a creative solution here. very steep and severe. could try live staking or adding gabions? needs engineering	1.4	0.9
1-02	High	High	High	Residential	Gully	Engineered Site Visit	8.5	5.0
6-06	High	High	High	Road	Rill		0.0	0.0
2-10	High	High	High	Shoreline	Undercutting, Erosion, Inadequate Shoreline Vegetation	Establish Vegetated Buffer, Shoreline Stabilization	NA	NA

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
3-16	Medium	Low	Low	Residential	Gully	Water Bars, Improve terraced beach	0.2	0.1
8-13	Medium	Low	Low	Residential	Sheet, Bare Soil	Erosion Control Mulch, Reseed bare soil, Native Vegetation	0.4	0.3
5-16	Medium	Low	Low	Residential	Rill	Erosion Control Mulch, Native Vegetation, Dripline Trench, Infiltration trench	0.1	0.0
4-06	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Infiltration Path	NA	NA
2-20	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	NA	NA
8-26	Medium	Low	Low	Residential	Rill	Infiltration Path, Reseed bare soil, Eliminate Raking leaf blowing, Native Vegetation	0.4	0.2
6-12	Medium	Low	Low	Residential		Erosion Control Mulch	0.3	0.2
6-13	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch	0.2	0.1
7-11	Medium	Low	Low	Residential	Rill	Erosion Control Mulch, Native Vegetation, Reseed bare soil	0.5	0.3
7-19	Medium	Low	Low	Residential	Sheet	Native Vegetation	1.7	1.0
1-06	Medium	Low	Low	Residential	Sheet, Rill	Erosion Control Mulch, Infiltration Path, Native Vegetation, Infiltration steps leading to beach	0.2	0.1
5-03	Medium	Low	Low	Residential	Sheet	Dripline Trench, Erosion Control Mulch	3.2	1.9
5-11	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	6.8	4.0
5-17	Medium	Low	Low	Residential	Sheet, Rill	Erosion Control Mulch, Native Vegetation, Water Bars, Reseed bare soil	6.8	4.0
5-29	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	1.0	0.6
4-07	Medium	Low	Low	Shoreline	Inadequate Shoreline Vegetation	Establish Vegetated Buffer, adjust fertilizer use	NA	NA
2-05	Medium	Low	Low	Shoreline	Inadequate Shoreline Vegetation	Establish Vegetated Buffer	6.8	4.0
2-06	Medium	Low	Low	Shoreline	Inadequate Shoreline Vegetation	Establish Vegetated Buffer	1.0	0.5
1-05	Medium	Low	Low	Shoreline	Erosion, Inadequate Shoreline Vegetation	Establish Vegetated Buffer	0.4	0.3
6-49	Medium	Low	Low	Shoreline	Undercutting, Erosion	Establish Vegetated Buffer, Shoreline Stabilization	1.7	1.0

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
7-02	Medium	Low	Low	Residential	Gully	Water Bars, Reseed bare soil, Erosion Control Mulch	0.2	0.1
3-06	Medium	Low	Low	Residential	Gully	Infiltration Path, Great spot to retrofit existing steps with infil steps	0.5	0.3
8-17	Medium	Low	Low	Residential	Rill, Dripline	Dry well	0.0	0.0
6-03	Medium	Low	Low	Residential	Sheet	Infiltration Path	0.5	0.3
6-09	Medium	Low	Low	Residential	Rill, Sheet	Infiltration Path	0.0	0.0
6-10	Medium	Low	Low	Residential	Sheet, Rill	Erosion Control Mulch, Infiltration Path	0.1	0.0
7-16	Medium	Low	Low	Residential	Sheet	Native Vegetation, Erosion Control Mulch	NA	NA
1-07	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	1.7	1.0
1-08	Medium	Low	Low	Residential	Sheet	Infiltration berm	0.4	0.2
1-23	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	1.3	0.8
8-10	Medium	Low	Low	Residential	Gully	Water Bars, Reseed bare soil	0.1	0.0
8-18	Medium	Low	Low	Residential	Sheet, Dripline, Bare Soil	Erosion Control Mulch, Dripline Trench, Eliminate Raking leaf blowing, Reseed bare soil, Native Vegetation	NA	NA
8-19	Medium	Low	Low	Residential	Sheet, Bare Soil	Eliminate Raking leaf blowing, Erosion Control Mulch	NA	NA
8-22	Medium	Low	Low	Residential	Sheet, Bare Soil	Erosion Control Mulch, Native Vegetation, Reseed bare soil, Eliminate Raking leaf blowing	NA	NA
8-24	Medium	Low	Low	Residential	Sheet, Bare Soil	Erosion Control Mulch, Eliminate Raking leaf blowing, Reseed bare soil	NA	NA
8-25	Medium	Low	Low	Residential	Rill	Infiltration Path	1.9	1.1
6-12	Medium	Low	Low	Residential	Sheet, Rill	Erosion Control Mulch	NA	NA
1-11	Medium	Low	Low	Residential	Sheet, Bare Soil	Erosion Control Mulch, Native Vegetation, Infiltration Path, Rubber Razors	1.3	0.8
5-14	Medium	Low	Low	Residential	Sheet, Rill	Erosion Control Mulch, Rubber Razors, trench	1.3	0.8
5-18	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Infiltration Path, Native Vegetation	3.4	2.0
1-46	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	1.7	1.0
5-02	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Dripline Trench,, Native Vegetation Drywell	6.8	4.0
1-49	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Infiltration Path	1.0	0.6

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
2-08	Medium	Low	Low	Shoreline	Inadequate Shoreline Vegetation	Establish Vegetated Buffer	6.4	3.8
3-01	Medium	Low	Low	Shoreline		Shoreline Stabilization	1.1	0.6
3-07	Medium	Low	Low	Shoreline	Erosion, Inadequate Shoreline Vegetation	Establish Vegetated Buffer	0.1	0.0
8-05	Medium	Low	Low	Shoreline	Erosion, Unstable Access	Establish Vegetated Buffer, cover roots ans bare soil	0.0	0.0
6-14	Medium	Low	Low	Culvert		Armor Inlet Outlet	NA	NA
6-50	Medium	Low	Low	Shoreline	Undercutting	Shoreline Stabilization	17.0	10.0
2-03	Medium	Low	Low	Residential	Rill	Erosion Control Mulch, Native Vegetation	0.1	0.1
1-03	Medium	Low	Low	Residential	Rill	Infiltration Path,, Native Vegetation, Reseed bare soil Infiltration steps, vegetative buffer in and stone trough along house	1.0	0.6
1-26	Medium	Low	Low	Residential	Sheet	Native Vegetation, Infiltration step	0.2	0.1
5-10	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	1.7	1.0
5-13	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Infiltration Path, Native Vegetation, Dripline Trench	6.4	3.8
1-10	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation Push path farther inland,	0.1	0.1
5-07	Medium	Low	Low	Residential	Rill	Erosion Control Mulch, Infiltration Path, Native Vegetation, Dripline Trench, Fieldstones	0.3	0.2
5-24	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	7.4	4.4
3-04	Medium	Low	Low	Shoreline	Undercutting, Erosion, Inadequate Shoreline Vegetation	Establish Vegetated Buffer, Shoreline Stabilization	0.2	0.1
3-19	Medium	Low	Low	Shoreline	Erosion	Establish Vegetated Buffer	0.8	0.5
5-19	Medium	Low	Low	Residential	Sheet	Erosion Control Mulch, Native Vegetation	0.2	0.1
3-03	Medium	Low	Medium	Residential	Sheet, Bare Soil	Erosion Control Mulch, Native Vegetation, Reseed bare soil, Add timber atop existing, retrofit existing steps with infil steps	0.3	0.2
8-11	Medium	Low	Medium	Residential	Rill	Water Bars, Rubber Razors	4.3	2.5

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
6-02	Medium	Low	Medium	Residential	Sheet	Infiltration Path, infiltration steps	1.5	0.9
6-08	Medium	Low	Medium	Residential	Sheet, Rill	Erosion Control Mulch, Infiltration Path, Native Vegetation, Water Bars	0.3	0.2
7-06	Medium	Low	Medium	Residential	Sheet	Native Vegetation, Erosion Control Mulch	NA	NA
7-07	Medium	Low	Medium	Residential	Gully	Erosion Control Mulch, Native Vegetation, Dripline Trench, Reseed bare soil	0.4	0.3
5-09	Medium	Low	Medium	Residential	Sheet, Rill	Erosion Control Mulch, Infiltration Path, Native Vegetation, Dripline Trench, Rubber Razors	6.8	4.0
5-21	Medium	Low	Medium	Residential	Sheet	Erosion Control Mulch, Infiltration Path, Native Vegetation	NA	NA
3-11	Medium	Low	Medium	Shoreline	Erosion, Inadequate Shoreline Vegetation, Excessive Clearing	Establish Vegetated Buffer, Shoreline Stabilization	21.3	12.5
1-04	Medium	Low	Medium	Shoreline	Erosion	Shoreline Stabilization, Establish Vegetated Buffer	1.5	0.9
7-08	Medium	Low	Medium	Residential	Sheet	Erosion Control Mulch	1.3	0.8
7-09	Medium	Low	Medium	Residential	Sheet	Dripline Trench, Erosion Control Mulch, Reseed bare soil	1.0	0.6
7-13	Medium	Low	Medium	Residential	Sheet	Rubber Razors	NA	NA
1-20	Medium	Low	Medium	Residential	Gully	Infiltration steps in replacement of old steps	0.1	0.0
5-25	Medium	Low	Medium	Residential	Rill	Erosion Control Mulch, Rubber Razors, Drywell	NA	NA
4-08	Medium	Low	Medium	Residential	Dripline, Bare Soil	Erosion Control Mulch, Infiltration Path, Dripline Trench	0.3	0.2
3-15	Medium	Low	Medium	Residential	Sheet, Bare Soil	Erosion Control Mulch, Native Vegetation, Reseed bare soil, Terracing or vegetate top of wall	8.0	4.7
8-16	Medium	Low	Medium	Residential	Sheet	Infiltration Path,, Eliminate Raking leaf blowing, Native Vegetation, Erosion Control Mulch retrofit existing steps.	NA	NA
1-48	Medium	Low	Medium	Residential	Sheet	Erosion Control Mulch, Infiltration Path, Native Vegetation, Dripline Trench	1.3	0.8
2-13	Medium	Low	Medium	Road	Rill	Vegetate Shoulder, Install Catch Basin	0.4	0.3

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
2-19	Medium	Low	Medium	Road	Gully	Install Catch Basin	0.4	0.3
3-02	Medium	Low	Medium	Shoreline	Erosion	Establish Vegetated Buffer, Shoreline Stabilization	0.3	0.2
5-05	Medium	Low	Medium		Boat launch		0.7	0.4
7-01	Medium	Low	Medium	Residential	Gully	Rubber Razors, Erosion Control Mulch	0.8	0.5
1-12	Medium	Low	Medium	Residential	Sheet	Infiltration steps, Rubber Razors	NA	NA
1-14	Medium	Low	Medium	Residential	Sheet, Rill	Native Vegetation, Rubber Razors Vegetated buffer and edge, infiltration step and diversion	1.7	1.0
1-16	Medium	Low	Medium	Residential	Sheet	Native Vegetation, Rubber Razors Vegetated barrier on retaining wall, infiltration berm	4.3	2.5
1-17	Medium	Low	Medium	Residential	Rill, Sheet	Rubber Razors Drip edge; razors and divert for rill and infiltration steps and trench for sheet	1.2	0.8
1-19	Medium	Low	Medium	Residential	Gully, Sheet	Rubber Razors Infiltrate high, using razor to direct into infiltrate area	0.2	0.1
1-24	Medium	Low	Medium	Residential	Gully	Native Vegetation, Infiltration berm	0.2	0.1
1-25	Medium	Low	Medium	Residential	Sheet, Rill	Rubber Razors Infiltration, crown the road	4.8	2.8
1-27	Medium	Low	Medium	Residential	Sheet	Native Vegetation,, Rubber Razors Infiltrate before fire pit	0.4	0.3
5-22	Medium	Low	Medium	Residential	Rill	Infiltration Path, Erosion Control Mulch, Native Vegetation, Fieldstones	0.4	0.3
6-04	Medium	Low	Medium	Road	Gully	Vegetate Shoulder, Install Catch Basin	0.0	0.0
1-01	Medium	Low	High	Residential		Rubber Razors	1.3	0.8
4-12	Medium	Medium	Low	Residential	Bare Soil	Erosion Control Mulch, Native Vegetation, Eliminate Raking/leaf blowing, Reseed bare soil	1.7	1.0
2-11	Medium	Medium	Medium	Residential	Sheet, Bare Soil	Erosion Control Mulch, Native Vegetation	NA	NA
2-12	Medium	Medium	Medium	Residential	Sheet, Bare Soil	Erosion Control Mulch, Native Vegetation, Infiltration Path	NA	NA
4-10	Medium	Medium	Medium	Residential	Sheet, Bare Soil, Dripline	Erosion Control Mulch, Infiltration Path, Dripline Trench	0.9	0.5
5-06	Medium	Medium	Medium	Residential	Rill	Erosion Control Mulch, Native Vegetation, Rubber Razors, Drywell	0.3	0.2
2-02	Medium	Medium	Medium	Road	Gully	Add road base material, Rubber Razor, Install Catch Basin	2.1	1.3

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
2-04	Medium	Medium	Medium	Shoreline	Undercutting, Inadequate Shoreline Vegetation	Establish Vegetated Buffer, Shoreline Stabilization	3.4	2.0
8-03	Medium	Medium	Medium		ditch		0.4	0.3
8-09	Medium	Medium	Medium	Road	Gully	Vegetate Shoulder, road shoulder and bank near culvert needs to be stabilized	0.3	0.2
8-20	Medium	Medium	Medium	Shoreline	Unstable Access, Erosion	Shoreline Stabilization, driveway low point drains down boat launch and washes out sand	1.4	0.8
6-05	Medium	Medium	Medium	Road	Sheet		0.3	0.2
6-16	Medium	Medium	Medium	Residential	Gully	Water Bars, Rubber Razors	NA	NA
6-18	Medium	Medium	Medium	Residential	Sheet	Erosion Control Mulch	1.4	0.8
1-21	Medium	Medium	Medium	Residential	Sheet	Erosion Control Mulch, Native Vegetation	1.0	0.6
4-02	Medium	Medium	Medium	Residential	Sheet, Dripline	Erosion Control Mulch, Dripline Trench	0.1	0.1
8-01	Medium	Medium	Medium	Residential	Rill	Eliminate Raking/leaf blowing, Rubber Razors, Dripline Trench, improve driveway turnouts	0.2	0.1
1-28	Medium	Medium	Medium	Residential	Rill, Gully	Native Vegetation Infiltration steps, vegetation berm to slow flow,	NA	NA
2-01	Medium	Medium	Medium	Road	Rill	Vegetate Shoulder, retaining wall	NA	NA
7-18	Medium	Medium	High	Road	Sheet	Remove Grader Plow Berms, Turn outs, Install Detention Basin	NA	NA
5-04	Medium	Medium	High	Residential	Rill	Remediate outlet pipe	0.1	0.1
2-16	Medium	Medium	High	Shoreline	Undercutting	Shoreline Stabilization	NA	NA
4-14	Medium	Medium	High	Culvert			0.2	0.1
1-13	Medium	Medium	High	Residential	Gully	Native Vegetation Retaining wall, wrap thatching to build vegetation in hill so plants can grow over bank	NA	NA
2-09	Medium	Medium	High	Road	Sheet	Vegetate Shoulder, Install Catch Basin	0.2	0.1
4-13	Medium	Medium	High	Road	Rill	Install Catch Basin, Turn outs	NA	NA
6-07	Medium	Medium	High	Residential	Rill	enhance veg buffer, install catch basin with rip rap outlet	NA	NA
8-04	Medium	High	Medium	Residential	Gully	Erosion Control Mulch, Native Vegetation	NA	NA
5-12	Medium	High	High	Residential	Sheet	Erosion Control Mulch, Infiltration Path, Native Vegetation, Water Bars, Dripline Trench, Rebuid retaining wall	NA	NA

Site	Impact	Cost	Technical Level	Land Use	Issue	Recommendations	P Loading lb/yr	Soil Loss tons/yr
4-05	Medium	High	High	Road	Gully	Ditch & Check Dams, Open Top Culvert	1.1	0.6
6-11	Medium	High	High	Residential	sheet	remove sand or fix retaining wall	NA	NA
6-01	Medium	High	High	Residential	Gully	permeable pavement	0.2	0.1
8-14	Low	Low	Low	Residential	Rill, Bare Soil	Erosion Control Mulch, Reseed bare soil, remove or cover sand pile	0.0	0.0
5-28	Low	Low	Low	Residential	Sheet	Infiltration Path, Erosion Control Mulch, Native Vegetation	0.5	0.3
6-17	Low	Low	Low	Residential	Sheet	Native Vegetation, Erosion Control Mulch	0.2	0.1
2-18	Low	Low	Medium	Residential	Sheet	repair wall	0.4	0.3
1-15	Low	Low	Medium	Residential	Rill	Retention wall, infiltration trench, vegetated border at the perched beach	0.8	0.5
1-18	Low	Low	Medium	Residential	Sheet	Infiltrate high to take down velocity, vegetation buffer	3.4	2.0
1-22	Low	Low	Medium	Residential	Sheet	Rubber Razors,, Native Vegetation Razor above razor present, reposition razor to prevent erosion under deck	2.1	1.3
5-20	Low	Low	Medium	Residential	Sheet	Erosion Control Mulch, Infiltration Path, Native Vegetation	0.3	0.2
4-01	Low	Medium	Medium		bank undercutting		NA	NA
7-12	Low	High	High	Culvert	eroding sides	Armor Inlet Outlet, wing walls	NA	NA

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Publications

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