6.0 Management Strategies

6.1 Goals for Long-term Protection

The ultimate vision of the Lake Waukewan and Lake Winona Watershed Restoration Plan is to protect and enhance existing water quality in the lakes. This effort is supported by the idea that existing and new development can be conducted in a manner that sustains environmental values, and citizens, businesses, government, and other stakeholder groups can be responsible stewards of the Lake Waukewan/Lake Winona watershed. The long-term goal is to protect the watershed and water quality of Lake Waukewan and Lake Winona through a 10% (31 kg/year) and 5-10% (5-10 kg/year) reduction in median in-lake total phosphorus (TP), respectively[1]. Since TP comes from diffuse (i.e. nonpoint) sources in the watershed, such as residential development, roads, septic systems, and other land uses, achieving this goal will require an integrated and adaptive management approach that uses a variety of tools and methods for implementing **Best Management Practices (BMPs)**. This target reduction in TP can be achieved through the following **structural** and **non-structural BMP** objectives:

Best Management Practices (BMPs) are conservation practices designed to minimize discharge of NPS pollution from developed land to lakes and streams. Management plans should include both non-structural (non-engineered) and structural (engineered/permanent) BMPs for existing and new development to ensure long-term restoration success.

Structural BMPs, or engineered Best Management Practices are often on the forefront of most watershed restoration projects. However, **non-structural BMPs,** which do not require extensive engineering or construction efforts, can help reduce stormwater runoff and associated pollutants through operational actions such as land use planning strategies, municipal maintenance practices such as street sweeping and road sand/salt management, and targeted education and training.

Low Impact Development (LID) is an alternative approach to conventional site planning, design, and development that reduces the impacts of stormwater by working with natural hydrology and minimizing land disturbance by treating stormwater close to the source, and preserving natural drainage systems and open space, among other techniques.

1) Use the BMP matrix to identify, prioritize, and implement BMPs throughout the watershed to reduce sediment and phosphorus runoff from existing shoreland development and roads.

2) Educate landowners through BMP demonstration sites, workshops, and other communication strategies, targeting high priority septic systems (>20 years old, within 50 feet of a waterbody, and rarely pumped out).

[1] Although both lakes are currently below NHDES thresholds for median in-lake total phosphorus (TP) concentrations in oligotrophic (Lake Waukewan) and mesotrophic (Lake Winona) lakes, these target TP reductions will help safeguard these lakes against impacts from future development and land use change in the watershed.

3) Institute greater controls on new and re-development, require **low-impact development (LID)** in site plans, and encourage regular septic system maintenance.
4) Continue to protect and conserve high value plant and animal habitat, wetlands, and riparian areas through preservation, conservation, and restoration efforts.
5) Continue and/or expand the water quality monitoring and aquatic invasive plant control programs.

These objectives and more are discussed in greater detail in the Action Plan. Achieving the goals and objectives for future implementation work in the Lake Waukewan/Winona watershed will require a comprehensive and integrated set of activities as identified below.

6.2 Addressing Nonpoint Source Pollution (NPS)

Structural NPS Restoration

The Lake Waukewan/Winona watershed survey identified 65 sites that impact water quality through the delivery of phosphorus-laden sediment (Appendix E). Consequently, structural BMPs are a necessary and important component for the improvement and protection of water quality in Lake Waukewan and Lake Winona. The best methods for treating these sites are to:

- Address the top priority sites for both Lake Waukewan and Lake Winona, with an emphasis on cost-efficient fixes that have the lowest cost per kg of phosphorus treated, weighted by impact score (Table 24).
    - Priority rankings were based on field observations and model estimates. Local stakeholders reviewed the prioritized sites to determine the most appropriate sites for BMP implementation. Many other factors not considered in these rankings may change the order of prioritized sites, including landowner cooperation, funding availability, visibility, etc.
    - Conceptual designs and cost estimates were generated for two sites; one each in the list of top six sites identified in the Lake Waukewan and Lake Winona watersheds; Site 1-08A at the Waukewan Bath house, Meredith, and Site 2-12A/B site at the Lake Winona boat launch.
- Work with landowners to get commitments for treating and maintaining sites. Workshops and tours of demonstration sites can help encourage landowners to use BMPs on their own property.
- Measure the pollutant load reduction for each BMP installed.

These basic methods help guide the process and prioritization of BMP implementation in the watershed. Refer to the Action Plan and conservation practice fact sheets provided by the

Cumberland County Soil & Water District (http://www.cumberlandswcd.org/ta/index.htm) for a continued discussion of BMP implementation strategies.

The top 6 priority sites for Lake Waukewan will reduce the watershed TP load by an estimated 33.4 kg TP/year, or 108% of the total needed to reach the goal of 276 kg TP/year. Approximately $25,000 would need to be raised to successfully implement and maintain these BMPs over the next 10 years (Table 23). The top 6 priority BMP sites identified around Lake Winona will reduce the watershed TP load by an estimated 51 kg TP/year, or more than 500% of the total needed to reach the goal of 93-98 kg TP/year. This would cost roughly $49,000 over the course of 10 years. These estimates are based on the Region 5 model for estimating pollutant load reductions.

Using a simple scoring method, the shoreline survey served as an excellent tool for highlighting shoreline properties around each lake that exhibited significant erosion. This method of shoreline survey is a rapid technique to assess the overall condition of properties within the shoreland zone; but it does not allow for making specific recommendations for BMP implementation. Therefore, these properties should be resurveyed in person for more accurate estimations of TP reductions and BMP implementation costs by site. However, given some broad assumptions:

- Properties with no buffer (scored 5) have 100 ft shorelines contributing 2 kg TP/yr each and would each cost about $3,000 to revegetate and mulch with volunteer labor.

Revegetating impacted shoreline along Lake Waukewan would cost about $60,000 to implement and reduce TP by 80 kg/year (Table 25). Only one property along Lake Winona was observed to have no buffer, so buffer plantings would cost about $3,000 to implement and reduce TP by 2 kg/year.

Table 25. Summary of cost estimates and total phosphorus (TP) reductions for sites identified by the shoreline survey as needing buffer plantings.

Waterbody	# Sites with No Buffer (Score 5)	Total Cost to Revegetate ($)	TP Reduction (kg/yr)
Lake Waukewan	40	$60,000	80
Lake Winona	1	$3,000	2
	TOTAL	**$63,000**	**82**

All together, these BMPs would greatly reduce TP loading to Lake Waukewan and Lake Winona, well beyond the TP reduction goals set by the Waukewan/Winona Lake Study Advisory Committee (Table 26). The TP reductions for Lake Waukewan may be even greater if BMPs are implemented at Lake Winona, since this waterbody feeds into Lake Waukewan. Implementing these suggested BMPs at Lake Waukewan and Lake Winona would cost roughly $137,000 and would address more than 100% of the 5 or 10% (31 and 5-10 kg TP/year) needed in TP reduction for both Lake Waukewan and Lake Winona, respectively.

Table 26. Summary of total phosphorus (TP) reductions and estimated costs of priority BMP implementations at Lake Waukewan and Lake Winona.

Waterbody	Shoreline Survey - Buffer Score 5		Watershed Survey Top Priority		Grand Total	
	Cost ($)	TP Reduction (kg/yr)	Cost ($)	TP Reduction (kg/yr)	**Total Cost ($)**	**Total TP Reduction (kg/yr)**
Lake Waukewan	$60,000	80	$25,000	33	**$85,000**	**113**
Lake Winona	$3,000	2	$49,000	51	**$52,000**	**53**
					$137,000	**166**

It is important to note that, while the focus of this plan is on phosphorus, the treatment of stormwater will result in the reduction of many other kinds of harmful pollutants that could have a negative impact on these waters. These pollutants would likely include:

- Nutrients (e.g. nitrogen)
- Bacteria and viruses
- Heavy metals (cadmium, nickel, zinc)
- Petroleum products
- Road sand/salt

Without a monitoring program in place to determine these pollutant levels, it will be difficult to track successful reduction efforts. However, there are various spreadsheet models available that can estimate reductions in these pollutants, depending on the types of BMPs installed. These reductions can be input to the LLRM model developed for this project to estimate the response of the lakes to the reductions.

Non-Structural NPS Restoration

Non-structural watershed restoration practices prevent or reduce stormwater related runoff problems by reducing the exposure and generation of pollutants and providing a regulatory framework that minimizes impervious cover. Non-structural approaches to watershed restoration can be the most cost-effective and holistic practices within a watershed management framework. The non-structural approaches recommended in this plan can not only improve water quality, but can also enhance watershed aesthetics (e.g. through shade tree planting, landscaping, and trash reduction), streamline the permitting process (e.g. by removing conflicting design or stormwater codes), and reduce development costs (e.g. by minimizing impervious area development).

There are two primary components of non-structural BMPs:

1) Planning and design that minimizes or eliminates adverse stormwater impacts; and
2) Good housekeeping measures and education/training to promote awareness regarding the first component.

In watersheds with future development potential, such as the Lake Waukewan and Lake Winona watershed with buildable land extending across 65% of the watershed, it is critical for municipal staff and planning boards to develop and enforce stormwater management criteria to prevent any increase in pollutant loadings that may offset reduced loads as a result of plan implementation. Zoning in the watershed presents considerable opportunity for continued development (see Buildout Analysis) and, by extension, increased threats to aquatic habitat and recreational use of the lakes. In watersheds with significant development potential, the Center for Watershed Protection (CWP) identifies BMP/LID implementation requirements for development projects as the best mechanism for enhanced long-term stormwater management. It can be argued that local land use planning and zoning ordinances are the most critical components of watershed protection despite federal Clean Water Act requirements. The guidelines for local water policy innovation are as follows:

- Review current zoning ordinances for regulatory barriers and improvements.
- Set performance based standards.
- Take additional measures to reduce impervious cover.
- Promote the use of specific LID designs.
- Use overlay districts to add new requirements to existing zoning districts.
- Establish standards or incentives to improve stormwater management in developed areas.
- Address storage/use of pollutants that contact stormwater.

6.3 Adaptive Management Approach

An **adaptive management approach** is highly recommended for protecting lake watersheds because it enables stakeholders to conduct restoration activities in an iterative manner. For example, the advisory committee should review and update the BMP matrix annually to re-establish priorities as the plan progresses. This provides opportunities for utilizing available resources efficiently through BMP performance testing and watershed monitoring activities. Stakeholders can evaluate the effectiveness of one set of restoration actions and either adopt or modify them before implementing effective measures in the next round of restoration activities. The adaptive management approach recognizes that the entire watershed cannot be restored with a single restoration action or within a short-time frame. Instead, adaptive management features establishing an ongoing program that provides adequate funding, stakeholder guidance, and an efficient coordination of restoration activities. Implementation of this approach would ensure that restoration actions are implemented and that surface waters are monitored to document restoration over an extended time period. The adaptive management components for future implementation efforts should include:

> The **Adaptive Management Approach** recognizes that the entire watershed cannot be restored with a single restoration action or within a short time frame.

- **Maintaining an Organizational Structure for Implementation.** Since the watershed spans multiple municipalities, a cooperating group, representing the towns, association, and other local watershed groups, should be established for the implementation of future efforts in the watershed. This will help coordinate the implementation of restoration activities. In addition to state and municipal officials and watershed groups, this collaborative approach should involve the various commercial business interests in the watershed to allow for a full consideration of all issues relevant to an effective, efficient, and cost-effective restoration program.
- **Establishing a Funding Mechanism.** A long-term funding mechanism should be established to provide financial resources for restoration actions. In addition to construction and organizational management costs, consideration should also be given to the type and extent of technical assistance needed to design, inspect, and maintain stormwater BMPs. Technical assistance costs for the annual field monitoring program should also be considered. Funding is a critical element of sustaining the restoration process, and, once it is established, the management plan can be fully vetted and restoration activities can move forward.
- **Synthesizing Restoration Actions.** This watershed management plan provides prioritized recommendations to support restoration (e.g., structural/nonstructural recommendations for priority areas). These recommendations, or action items, need to be revisited and synthesized to create a unified watershed restoration strategy. Once a funding mechanism is established, the lake watershed restoration program should begin in earnest by developing detailed designs for priority restoration activities on a project-area basis and scheduling their implementation accordingly.
- **Continuing the Community Participation Process.** The development of the Lake Waukewan and Lake Winona Watershed Restoration Plan has greatly benefited from the active involvement of an engaged group of watershed stakeholders with a diversity of skills and interests. Plan implementation will require their continued and ongoing participation as well as additional community outreach efforts to involve even more stakeholders throughout the watershed. A sustained public awareness and outreach campaign is essential to secure the long-term community support that will be necessary to successfully implement this project.
- **Developing a Long-Term Monitoring Program.** Although current monitoring efforts are strong, a detailed monitoring program (including ongoing monitoring of watershed tributaries) is necessary to track the health of the lakes. Indeed, the overall goal of the watershed management planning process is the improvement of water quality and long-term health of these lakes. Refer to Monitoring section of the Action Plan.
- **Establishing Measurable Milestones.** A restoration schedule that includes milestones for measuring the restoration actions and monitoring activities in the watershed is critically important to the success of the plan. In addition to monitoring, several environmental, social, and programmatic indicators have been identified to measure the progress of the

Lake Waukewan and Lake Winona Watershed Management Plan. These indicators are listed below and are intricately tied to the action items identified in the Action Plan.

7.0 Plan Implementation

Plan implementation will be led by the Waukewan Winona Lake Study Advisory Committee. Local participation is an integral part of the success of this plan, and should include the leadership of NHDES, local municipalities (including Meredith, New Hampton, Center Harbor, Holderness, and Ashland), local lake associations, local schools, community groups, local businesses, road associations, and individual landowners. The advisory committee will need to meet regularly and be diligent in coordinating resources to implement practices that will reduce NPS pollution in the Lake Waukewan and Lake Winona watershed.

7.1 Action Plan

The Action Plan was developed through the combined efforts of the LWA and FB Environmental, as well as the advisory committee. The Action Plan is a critical component of the plan because it provides a list of specific strategies for improving water quality and the means to make the water quality goals a reality. The Action Plan consists of action items to help address threats identified within five major categories:

1. Septic Systems
2. Best Management Practices (BMPs)
3. Municipal Ordinances, Planning, & Land Conservation
4. Education & Outreach
5. Water Quality Monitoring

In addition to the goal of nutrient (phosphorus) reduction, the Action Plan was also developed to foster thinking about long-term strategies for improving the water quality and related natural resources within the watershed, and to promote communication between citizens, municipalities, and state agencies. The Action Plan outlines responsible parties, potential funding sources, approximate costs, and an implementation schedule for each task within each category. Current cost estimates for each action item will need to be adjusted based on further research and site design considerations.

1. Wastewater Systems

Septic system effluent typically stores a thousand times the concentration of phosphorus in lake waters, which means that a small amount of effluent could have a major impact on the lake. An old or improperly-maintained septic system can also result in the delivery of chemicals and hormones