



**LAKE MONTICELLO
LAKE MANAGEMENT PLAN**
Fluvanna County, Virginia



Submitted by



Williamsburg Environmental Group, Inc.
3000 Easter Circle
Williamsburg, VA 23188
Ph:(757)220-6869 Fax: (757)229-4507
&

Virginia Lake Management Company
P.O. Box 236
Virginia Beach, VA 23458-0236
Ph: (757)591-8780 Fax: (757)873-4896



October 2004

**LAKE MONTICELLO
LAKE MANAGEMENT PLAN**
Fluvanna County, Virginia

Prepared for

Lake Monticello Owners' Association
41 Ashlawn Boulevard
Lake Monticello, VA 22963

Prepared by

Williamsburg Environmental Group, Inc.
3000 Easter Circle
Williamsburg, Virginia 23188
(757) 220-6869
Fax: (757) 229-4507

Virginia Lake Management Company
P.O. Box 236
VA Beach, VA 23458-0236
Phone (757)591-8780
Fax (757)873-4896

October 2004

EXECUTIVE SUMMARY

Williamsburg Environmental Group, Inc. (WEG) and Virginia Lake Management Company (VLM) have been retained by the Lake Monticello Owner's Association (LMOA) to prepare a lake management plan. The management plan includes an assessment of water quality conditions in the lake under current and projected build-out conditions, an assessment of sediment contributions and potential controls, recommendations regarding hydrilla and invasive weeds, fisheries management recommendations, and recommendations for structural and non-structural controls and management measures to protect and restore lake quality. WEG and VLM presented interim results in various phases of the development of the plan to the steering committee as the lake study was developed. The results of the study are summarized herein and include cost projections and an implementation plan for the recommended watershed management strategies.

Water Quality Assessment and Recommendations

The water quality evaluation consisted of several components. First, existing data for Lake Monticello was compiled and organized electronically for trend analysis. This information was compiled from available hard copy into spreadsheets and subsequently into a database format and related to a geographic information system (GIS) developed to house project base data. After compiling the existing data for Lake Monticello, a hydrologic model was prepared to evaluate flows to various nodes contributing to Lake Monticello to better predict the changes in flows and potential implications as the watershed develops. The land use information obtained for both past, present, and projected future conditions were then used to compute mass loadings of potential pollutants to Lake Monticello. This data was input into statistical software to predict potential changes in the trophic state of the lake as a result of development within the watershed.

The water quality data revealed that nutrient parameters for the lake under current conditions are generally within expected and acceptable ranges for mildly to moderately eutrophic, productive lake systems. The concentrations of nutrients and other parameters appear to be generally stabilizing over time, resulting in generally improved water quality and clarity. Temperature and Dissolved Oxygen monitoring results generally depict a well-stratified lake, as would be expected for a deep lake system like Lake Monticello. Increased impervious cover associated with build-out of the watershed is expected to have some adverse effects on water quality and clarity in Lake Monticello, but these effects are not expected to be dramatic. Based on the projected pollutant loadings to the

lake and the modeled lake response under a variety of development scenarios, an achievable goal was defined as a result of the analysis. The analysis yielded a recommendation to provide structural Best Management Practices (BMPs) to maintain pollutant loadings to the lake at current levels, by offsetting increases resulting from full build-out within the LMOA-controlled portion of the watershed.

Sediment Evaluation and Recommendations

The sediment evaluation for Lake Monticello consisted of several components. First, existing data related to sedimentation in the lake were evaluated, including previous bathymetric surveys and dredging-related information. Additional surveys of various coves were conducted in the field to ascertain the current extent of sedimentation and compare the results generally to previous bathymetric surveys. Mass loadings of sediment were then computed for each sub-watershed to estimate the amount of sediment delivered based on model projections. A stream assessment was conducted throughout the Lake Monticello area to categorize existing habitat and erosional characteristics of the streams that feed into the lake. Gross estimates of sediment contributions were also computed for various sources including stream erosion and sediment from construction sites for relative comparison to the overall values.

The results of the sediment assessment indicate generally that sedimentation is occurring in the headwaters of various coves within the lake. Accumulations of sediment were mapped and will be useful in the future for further comparison as sedimentation occurs within the watershed. Sources for the sediment include general watershed loadings from non-point sources, sediment from construction sites, and stream erosion. Sediment from shoreline erosion was not considered to be significant, as a large portion of the developed shoreline has been stabilized using structural measures (e.g., bulkheading, etc.). Sediment from construction sites was estimated to be significant due to the extent of home construction observed within the watershed and the lack of appropriate erosion and sediment controls observed. Stream erosion, in particular, appeared to be one of the most significant sources of sediment delivered to the lake due to uncontrolled increases in stormwater runoff throughout the contributing watershed. The results of the sediment assessment yielded recommendations to provide enhanced erosion and sediment controls in the watershed, to provide for stream restoration and stabilization where feasible at identified problem areas, and to conduct follow-up bathymetric surveys to evaluate sediment accumulations in the cove areas.

Aquatic Weed Assessment and Recommendations

The lake received two physical inspections for aquatic weeds and more specifically, hydrilla, during the summer of 2004. The first weed inspection of the lake occurred in conjunction with the Fish Survey performed in May. The second inspection of the lake, which constituted the actual Weed Survey, was performed in August. Each of these visits to the property yielded valuable information regarding the current condition of the lake with respect to unwanted weed growth. During the original inspection of the lake in May, very few signs of any actively growing Hydrilla were found in the lake. Water clarity was extremely high, and accurate visibility of the bottom was observed to 8 ft. depths. It was apparent at that time that, although conditions seemed to be favorable for Hydrilla growth, the majority of the plants that had infested the lake the previous season were either still dormant or no longer present. The subsequent visit and inspection of the lake in August, which actually constituted the formal Weed Survey, revealed that the lake was, in fact, still quite infested with Hydrilla. However, unlike previous years, the growth had not topped out on the surface. Depth Soundings, GPS Tracking, and Bottom Sampling techniques were used to survey the entire lake and determine the current conditions and levels of Hydrilla infestation in the lake.

Although conditions this year have appeared to improve, it is likely not permanent. Due to a combination of environmental conditions that have resulted in the plants remaining significantly below the surface of the water, these plants were not a significant impediment to the desired activities on the lake in 2004. However, it is likely that the Hydrilla will continue to create significant seasonal problems in the future when conditions are more conducive to severe top growth. Additionally, if not managed properly, the Hydrilla will likely continue to spread into areas that are not currently infested, but where conditions are favorable for future Hydrilla growth. Specific recommendations for hydrilla control have been provided, including a screening structure for carp retention, triploid (sterile) grass carp stocking recommendations, treatment using systemic herbicides, follow-up spot treatments with contact herbicides, aquatic weed monitoring on defined intervals, and annual maintenance stocking of grass carp.

Fisheries Assessment and Recommendations

A fisheries survey was also conducted to provide a snapshot of the current fish community in Lake Monticello. Through observation and sampling, the team investigated several parameters of the fishery. Specific attention to fish abundance, diversity, and community structure has been prioritized with recommendations to better manage the fishery. The primary objective of this evaluation, based

on current recreational use and expectations for the lake, is to quantify and analyze the current fishery and provide recommendations for future management to create and perpetuate a solid largemouth bass sport fishery. In addition, recommendations for corrective actions are included.

Recommended management practices for the lake fishery include fish harvesting, supplemental fish stocking, efforts to limit hydrilla density, and facility and fishery recommendations. A diverse fish community currently exists in the lake with several trophic levels represented. However, the desired largemouth bass sport fishery is currently stunted. If the density of Hydrilla is kept low and a relatively large number of the stunted fish (10-inch bass) are removed, a more desirable sport fishery with larger top predators (largemouth bass) could result.

Watershed Protection Strategies

There are a variety of watershed protection strategies available that incorporate a combination of land use controls, non-structural management measures, and public education and structural controls for pollution prevention and reduction. The watershed management section discusses in a general nature those strategies that are available and might be applicable for LMOA to implement and addresses the tools that are available to protect and improve lake quality. The project team went through a screening process to evaluate the types of management practices available and appropriate for Lake Monticello.

Specific structural BMPs were screened and recommended for application at LMOA. These practices generally include the placement of larger structural facilities (including wet and dry ponds primarily) in various configurations at strategic locations in the watershed. Additionally, non-structural practices and management measures were screened for their ability to address the target pollutants identified in the water quality analysis. These parameters included sediment, nutrients, toxics, debris and litter, and reduction of increased runoff rates. Various non-structural practices and their application are discussed in detail. Additionally, stream restoration and stabilization practices are discussed in a general manner.

The goals of the recommended watershed management plan were developed after a detailed consideration of the projected mass loadings to the lake, the anticipated Eutrophic response, the conditions of existing streams and riparian corridors, and the recommendations provided by the fisheries management consultant. In general, the mass loadings to the lake increase to a relatively small extent in response to projected development within the LMOA controlled area. Load increases

were projected based on off-site development, but are largely attenuated by existing upstream BMPs and additional controls that may be required when off-site areas develop. The projected load increases are not anticipated to result in a large shift in the trophic state of the lake. As such, the proposed measures were developed generally to protect the existing high quality of Lake Monticello, and to prevent further degradation resulting from build-out within the LMOA controlled area.

Recommended structural BMPs were quantified with respect to their ability to mitigate potential increases in non-point source pollutants within the LMOA controlled component of the watershed. The practices were then prioritized to ensure that the recommended BMP implementation has the ability to meet the load reduction targets. Additionally, stream restoration practices were quantified with respect to their ability to reduce sediment inputs to the lake. The stream restoration measures are additionally proposed to serve as partial compensatory mitigation for stream impacts associated with the structural BMPs. Non-structural controls were also prioritized and those that were determined to be feasible and cost-effective were recommended for implementation. Additionally, recommendations to improve monitoring efforts and for public education are provided.

Implementation and Costs

Specific measures recommended for implementation at Lake Monticello are referenced in the final section of the report. During each portion of the overall lake management study, the observations led to the development of detailed recommendations for components of the implementation plan. These recommendations include structural and non-structural management practices strategically located to reduce pollution or capture pollutants (sediment, nutrients, etc.) before they are delivered to the lake. Stream restoration and stabilization areas were also recommended to reduce sediment inputs to the lake, protect property, and restore aquatic resource quality. Detailed aquatic weed management and fisheries management were also incorporated into the implementation plan. These observations and resultant recommendations are expressed generally in the summary table below.

Summary Table Observations and Recommendations

Observations	Recommendations
Potentially Strong Correlation Between Nutrients and Stormflows	- Develop a program of Best Management Practices (BMPs) to reduce nutrient inputs to the lake
Sedimentation Observed At Coves	- Establish a program to reduce sediment inputs by restoring or stabilizing eroded streams - Establish a program of BMPs to reduce sediment inputs to lake - Improve Erosion and Sediment Controls at new Construction Sites
Erosion observed in Streams	- Establish a program for stream stabilization and restoration
Sub-optimal to poor instream habitat quality	- Establish a program for stream stabilization and restoration
Potential Increases in Nutrients and Associated Algae as Watershed develops	- Establish a program to maintain nutrient levels at existing levels - Reduce inputs through non-structural measures (Lawn care, proper yard waste) - Construct BMPs or other controls to reduce loadings (see above) - Establish a Public Education Program - Develop an Integrated Pest Management Plan for the Lake Monticello Golf Course
Hydrilla Infestation in Suitable Depths Throughout Lake Compromise Fishery and Water Quality	- Develop a Management Plan to control Hydrilla - Establish Guidelines for boats entering and leaving the lake to prevent import and export of Hydrilla
Size distribution of Largemouth Bass unsuitable for Sports Fisheries	- Establish a program to reduce amount of small bass in relation to large bass Develop a Management Plan to control Hydrilla
Strong Hydrogen Sulfide Odors and Associated Toxicity	- Establish a program to control delivery of organic materials and lawn waste to the lake

Planning level cost estimates were prepared for each of the recommended practices including structural BMPs, stream restoration measures, non-structural practices, fisheries management measures, and hydrilla control. Inflation adjusted costs for the proposed BMPs generally ranged from \$70,000-245,000 per facility for the structural practices, \$14,000-184,000 for various stream restoration reaches, and were variable for the other categories. Overall costs for the implementation of the recommended measures were assigned and estimated at a grand total of \$3,634,480 in present day dollars. The cost estimates also reflect accommodations for maintenance of these practices over the ten-year budget cycle.

Costs were assigned to all of the recommended practices and maintenance budgeting was also incorporated. The recommended management measures and associated costs are outlined in the summary table below.

**Summary Table
Overall Project Budget**

	Program Expenses	Annualized Expense
Structural Practices		
Total Programmed Expenses:	\$1,148,000	\$114,800
Stream Restoration Practices		
Total Programmed Expenses	\$1,514,625	\$151,463
Non Structural Practices		
Total Programmed Expenses	\$619,775	\$61,978
Weed Control Practices		
Total Programmed Expenses	\$352,080	\$35,208
Fishery Practices		
Total Programmed Expenses	\$0	\$0
Total Expense (no inflation)	\$3,634,480	\$363,448
Total Expense (inflation adjusted)	\$4,155,990	\$415,000

An outline of implementation planning for specific structural practices and stream restoration measures is provided in the final section. The recommended watershed protection measures and associated costs were budgeted over a ten-year period and an estimate of the annual budget commitment to achieve full implementation was provided. The computed annual contributions to the lake management program include provisions for maintenance reserves and for inflation. The total estimated annual cost over the ten-year budget for full implementation of the lake management plan is approximately \$415,000. Depending on a variety of factors including available funding, the necessity for maintenance reserves, and the extent of implementation desired by LMOA, this budget figure may be reduced substantially. The proposed measures will require further prioritization by LMOA to ensure that an acceptable and viable long-term management plan for Lake Monticello is adopted and implemented.