

The Strategic Plan
for the
Grand Lake St. Marys Restoration Commission



Prepared By:

The Grand Lake St. Marys Restoration Commission

In Consultation With

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FOREWORD

The first goal of the Grand Lake St. Marys Restoration Commission is to ensure that the lake is functional for tourism use this year and every year thereafter. The members recognize the need to reduce phosphorus, silt and other nutrients from entering the lake and eliminate current sources of phosphorus in the lake. These actions can be divided into four basic categories: Sediment Management, Biological Treatments, Chemical Treatments and Best Management Practices.

In the past, regional support for these coordinated activities was missing, which mitigated or canceled the effects of previous environmental initiatives. Although sound scientific strategies are an essential part in bringing environmental renewal to the lake, they are only half of the equation. Regional cooperation is the other half, and an absolute requirement in eliminating ongoing pollution.

To help address this need, community leaders and volunteers came together in December 2009 to form the Grand Lake St. Marys Restoration Commission—a pioneering initiative dedicated to

fostering the regional cooperation and resources needed for the environmental renewal and sustainability to the lake. Our initial efforts primarily focused on identifying the proven scientific strategies and technological solutions able to solve our environmental crisis. The next step involved putting these strategies and solutions into the enclosed action plan. The commission executed a local fund raising effort netting over \$550,000 supported by two community foundations. Jointly, we also leveraged those dollars to receive over 1.6 million dollars this year in additional funds. Our future steps—the most challenging yet—entail raising the financial support and regional cooperation needed to implement the strategies and solution of this plan.



In order to succeed at these goals and restore the greatness of our lake, we are asking everyone to do their part. We ask land owners – both residential and rural – to choose fertilizers and pesticides without phosphorous. We ask farmers to apply best management practices. We ask teachers to help our children understand the science of environmental sustainability. We ask volunteers to be spokespersons and to help us raise funds. We ask elected officials to stand up for what is right in the long-term. We ask citizens to vote for legislation that will fund long-term environmental sustainability. And ultimately, we ask all community leaders to expand their local identity and embrace a regional mindset that can foster the necessary courage, perspective, and cooperation needed for addressing big issues and creating meaningful change in the Grand Lake St. Marys Region.

We know this is a tall order. But we also know that we no longer have a choice. The future of Grand Lake St. Marys hangs in the balance, along with the economic sustainability she has provided to the region for decades.

Our strategic plan is neither a “silver bullet,” nor a short-term fix for saving the lake. Rather, it addresses the big picture for the long-term. Many small steps are required. Patience and perseverance are also essential. But by working together, environmental renewal is possible, and the benefits of regional growth—economically and recreationally—will be our reward. Please join us. Let us work together to bring the greatness of our grand lake back again for our children and for the generations to come.

~ *The Grand Lake St. Marys Restoration Commission, 2010*

Board of Mercer County Commissioners

Board of Auglaize County Commissioners

City of Celina

City of St. Marys

Lake Improvement Association

Lake Development Corporation

Grand Lake St. Marys State Park

Grand Lake Wabash Watershed Alliance

St. Marys Community Foundation

Mercer County Civic Foundation

Auglaize/Mercer County Convention and Visitors Bureau

Date

Resolution of Support

WHEREAS, the objectives of the **GRAND LAKE ST. MARYS RESTORATION INITIATIVE** are to “Aid In The Improvement of the Water Quality of GRAND LAKE ST. MARYS,” to “Collaborate With All Individuals and Organizations Who Foster the Same Standards for the Water Quality in GRAND LAKE ST. MARYS,” and to “Enhance the Environmental and Economic Benefits of GRAND LAKE ST. MARYS Within the State of Ohio.”

WHEREAS, the need for improved water quality in GRAND LAKE ST. MARYS is of extreme importance and of the highest concern for this region and the state of Ohio; and

WHEREAS, the quality of the water in GRAND LAKE ST. MARYS is of critical economic and environmental importance to this region as hundreds of jobs are directly and indirectly tied to the continued existence of GRAND LAKE ST. MARYS; and

WHEREAS, the GRAND LAKE ST. MARYS region is in great need of funding for water quality improvements to retain and create jobs and enhance the environmental impact of the water in GRAND LAKE ST. MARYS; and;

WHEREAS, the GRAND LAKE ST. MARYS region needs to collaborate with all local and regional organizations who share common views—both public and private—to coordinate efforts in identifying technologies and funding critically needed water quality projects;

THEREFORE, by the resolution of the organizations and groups listed below;


BE IT RESOLVED, that we support the need for enhanced water quality in GRAND LAKE ST. MARYS.

BE IT FURTHER RESOLVED, that the need for enhanced water quality is critical to create and retain jobs and to enhance the economic and environmental vitality of the GRAND LAKE ST. MARYS REGION.

BE ALSO FURTHER RESOLVED, that we support the development of the **GRAND LAKE ST. MARYS RESTORATION INITIATIVE** to research and develop technologies and funding opportunities to enhance the quality of water in GRAND LAKE ST. MARYS and agree to collaborate with all the agencies listed here for the common good of the GRAND LAKE ST. MARYS region both environmentally and economically.




Mercer County Commissioner



City of Celina



Lake Improvement Association




Grand Lake St. Marys State Park



Auglaize/Mercer County CVB
Convention & Visitors Bureau




Auglaize County Commissioner



Grand Lake Wabash Watershed Alliance



Lake Development Corporation



City of St. Marys

EXECUTIVE SUMMARY

Grand Lake St. Marys has been an influence on the local and regional economy within Auglaize and Mercer Counties, West Central Ohio since its creation. As the health of the lake and its native habitat has thrived, so has the economy. However, the health of the lake in recent years has felt the drastic cumulative effects of gradual land use changes, related to both the growth and development surrounding the immediate lake area and the agricultural industry boom within the surrounding watershed.

These impacts have affected both recreational and economic activities throughout the lake communities. Although numerous plans to reduce the levels of pollution entering the lake have been developed over the years, the lake's water quality continues to suffer from nutrient inputs and other water quality degradation issues leading to dangerous levels of algae microcystin toxin, a byproduct of the breakdown of blue-green algae. These threats endanger public health and welfare. Algal blooms were of such a magnitude and duration during the summer of 2010, that the Ohio Environmental Protection Agency was forced to close the lake to all recreational activity. Overall, the lake is on the verge of a functional breakdown and ecological collapse. Despite improved conservation practices over the years, the algal blooms are clear indicators of the ecosystems inability to process and utilize the accumulated excess nutrients.



The Grand Lake St. Marys Restoration Commission has formulated this Strategic Plan to provide a framework and timeline for utilizing various projects and economic management tools to implement solutions for current and future lake improvements and revitalization. The Commission has identified the need to develop economic opportunities and activities that stem directly and/or indirectly from restoring degraded natural resources within Grand Lake St. Marys (GLSM). The creation of an economy derived from restoration of the lake within the GLSM watershed, will provide a new direction that is both environmentally sustainable and economically viable. Recognizing and correcting problems created by current and past activities and applying a new environmental and economic paradigm to the future offers a challenging, yet unique and exciting opportunity for the communities that have come to rely on the lake and watershed.

Cornerstone components and objectives of developing and implementing the Strategic Plan include: coordination, study/documentation, public outreach, economic revitalization and plan/design implementation. Associated with each of these objectives are specific action items which the Commission is pursuing. Some of these items include policy, stewardship, education, information and funding oriented applications or recommendations. Other action items are more directly related to improving the physical condition of the lake and the surrounding economy. These actions are specifically designed to reduce in-lake and watershed nutrient loading and include: Sediment Management, Biological Treatments, Chemical Treatments, and Best Management Practices.

The removal of phosphorus as a primary indicator or “keystone pollutant” was selected to prioritize and rank the nutrient removal/improvement strategies recommended for the lake to provide both

indications of water quality as well as economic status. Phosphorus is strongly interlinked with the environment and economy in Grand Lake St. Marys as the key pollutant interfering with delivery of economic services the lake once provided. Projects with the potential to improve the ecological health of the lake through the sequestration, removal or prevention of nutrients within the lake or watershed area were prioritized to establish those deemed most critical to achieving the objectives of the plan.

The prioritization process assessed the potential of each project type in six categories: Economic Benefit Potential, Scale of Effect, Lag time to Functional Effect, Term of Effect, Economic Value Estimate, and Implementation Strategy. Results of the process prioritized the following project types listed in order of importance:

1. **Sequestration of Soluble Reactive Phosphorus (Chemical Treatment)**
2. **Dredge Sediment Depositions**
3. **Beneficial Use of Organic Waste**
4. **Treatment Train Establishment**
5. **Rough Fish Removal**
6. **Algal Flipping**
7. **Aeration and Circulation**
8. **Water Level Management**

Specific information regarding the components and timeline for each project type are included in Appendix A.

The Strategic Plan should be viewed as a guide and resource for economic opportunities which will reinstate and improve the local economies surrounding the lake while supporting the environmental restoration of the lake. For more information about the Grand Lake St. Marys Restoration Commission, this Strategic Plan or updates about project efforts and status, visit www.LakeRestorationCommission.com.



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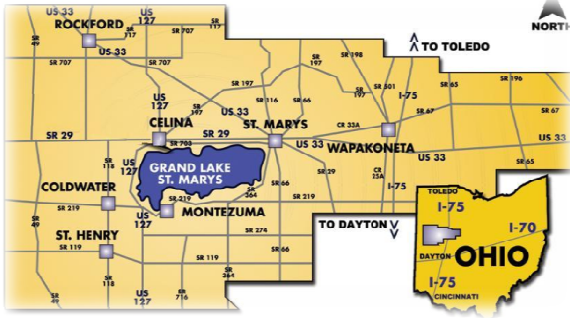
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SECTION I: BACKGROUND

Introduction: The Greatness of Grand Lake St. Marys

Grand Lake St. Marys is known as the “grand lake” – first because she was the largest man-made lake (13,500 acres) at the time of her completion (1841), and because she holds the status as Ohio’s largest in-land lake. The lake’s water runs through six cities/villages (Celina, Chickasaw, Coldwater,



Montezuma St. Marys and St. Henry), and eight townships (German, Jackson, Noble, St. Marys, Butler, Franklin, Granville, Jefferson, and Marion) located in Auglaize and Mercer counties in West Central Ohio as well as through eight stream systems; Barnes Creek, Beaver Creek, Chickasaw Creek, Coldwater Creek, Grassy Creek, Little Chickasaw Creek, Monroe Creek and Prairie Creek.

But her legacy is much bigger than her geographic size and the engineering feat behind it. The greatness of Grand Lake St. Marys is also seen in the prominent role she holds in the geographic and economic development of West Central Ohio described below.

Created as a reservoir for the Miami-Erie Canal, Grand Lake St. Marys supported an elaborate water transportation system that literally brought the first settlers, businesses, and villages to western Ohio during the 1800’s. When commerce from the canal system waned (as the country’s railroad systems expanded), Grand Lake St. Marys provided another wave of growth and income. In the 1890’s, when oil was discovered in the area, the lake quickly became spotted with an array of oil derricks, and played center stage to a short-lived oil boom with all its ensuing economic benefits.



Then quietly, after the excitement of oil drilling faded in the early 1900’s, Grand Lake St. Marys began to steadily grow over the next century into her most enriching and enduring role – a state park bringing over 750,000 visitors and \$150,000,000 in economic activity per year.

Unfortunately, adequate measures were not taken over these past decades to also safe-guard what is at the center of this recreational and economic activity; the waters of Grand Lake St. Marys. Although many attempts were made to reduce the level of pollution entering the lake—including a host of regulatory and enforcement actions, a building ban in 1972, a central wastewater collection system on the lake’s south side in 1986, and the development of a watershed action plan in 2004—little or no effective action resulted.

Grand Lake St. Marys has now become one of the most polluted water bodies in the State of Ohio. And, instead of offering recreational renewal or nature’s tranquil beauty, the lake is now characterized by foul smells, scum-laden shorelines, cloudy waters, fish kills, and decaying plant life.

The Grand Lake St. Marys Restoration Commission has formulated this Strategic Plan to provide a framework and timeline for utilizing various projects and economic management tools to implement solutions for current and future lake improvements and revitalization. The Strategic Plan should be viewed as a guide and resource for economic opportunities which will restore and improve the local economies surrounding the lake while supporting the environmental restoration of the lake.

Grand Lake St. Marys as an Economic Force

Auglaize and Mercer counties as well as the western Ohio region have historically enjoyed remarkable economic benefits from Grand Lake St. Marys. Mercer and Auglaize counties experience the greatest economic effects since they contain the entire watershed and spatial extents of the lake proper within the counties boundaries. To a lesser extent, West Central Ohio receives contributions from the infrastructure created by the industries and business fostered by the lake's position.

This economic activity, of course, was nurtured over the years, with private and public funding invested into the state park and its surrounding area, establishing it as a popular recreational center



and tourist attraction, complete with boating, swimming, water skiing, fishing, camping, hiking, picnicking, hunting, lodging, restaurants, and more. Additional investments were also made in the 1980's and 90's when a large boom in residential development took place in the lake area, fueled by people's desire to live close to the natural beauty and shorelines of Grand Lake St. Marys. The sustained growth in the real estate market enabled the property tax base to grow thus benefiting the counties and school districts.

The 'tangible' economic benefits this region has experienced from the recreational travel & tourism industry are documented in a report titled 'Tourism Economics – The Economic Impact of Tourism in Auglaize and Mercer Counties, Ohio' published July 2009. In the past, Grand Lake St. Marys was recognized as a recreational mecca for West Central Ohio in which the total economic gains (including sales, wages, and taxes) exceeded \$190 million dollars supporting over 2,400 local hospitality jobs. This does not include but is greatly enhanced by the trickledown effect felt by the buying power of seasonal property owners. In addition, the 'intangible' quality of life factors related to the recreational opportunities this region has to offer undoubtedly led to increased growth potential for non-lake related businesses in efforts to attract and retain quality people to the employment base. These economic engines include the region's manufacturing, finance, insurance, and health care industries which has enabled this part of the state to weather the economic slowdown the nation has experienced. The lake has provided great and lasting benefits to the region over the years.

The Environment and the Economy: an Intertwined Connection

There isn't any doubt Grand Lake St. Marys has been the centerpiece of both local and regional economic influence within West Central Ohio. As the health of the lake and its native habitat has thrived, so has the economy. However, the health of the lake in recent years has realized the drastic cumulative effects of gradual land use changes, related to both growth and development surrounding the immediate lake area and related to the agricultural industry boom within surrounding watersheds.

The Mercer and Auglaize County region of Ohio is known as some of the most fertile and productive agricultural land in the country. Historically ranking as the top producing county in total agricultural receipts, Mercer County alone generated \$411 million dollars in 2008, according to the Ohio Department of Agriculture's Annual Report.

The economic climate and culture within these counties and within the West Central Ohio region are clearly multifaceted with interdependent links between the land and water and production of services. Unfortunately, the gains within the agricultural facet of the economy have helped yield economic losses for tourism, recreation and businesses surrounding the Grand Lake St. Marys communities.

Grand Lake St. Mary's Restoration Commission

The Grand Lake St. Marys Restoration Commission (GLSMRC) was established in January 2010, in response to the decline of the economic and ecological health of Grand Lake St. Marys. It is a collaborative partnership comprised of multiple community leaders, governmental entities and volunteers formed to collect, analyze and catalyze actions for the economic revitalization of Grand Lake St. Marys through planning, monitoring, fiscal management and project implementation of economically and environmentally sustainable initiatives. The Commission is made up of the following entities:

Commission Members

- Auglaize and Mercer Counties Convention and Visitors Bureau
- Board of Auglaize County Commissioners
- Board of Mercer County Commissioners
- City of Celina
- City of St. Marys
- Grand Lake St. Marys State Park
- Grand Lake /Wabash Watershed Alliance
- Lake Development Corporation
- Lake Improvement Association
- Mercer County Civic Foundation
- St. Marys Community Foundation
- Wright State University Lake Campus

Just as these issues surrounding the lake are multifaceted, so must the solutions. Through the efforts of the Lake Restoration Commission (Commission), academic relationships and various local, state and federal government agencies, limited funding has been provided to start implementation of a variety of short-term strategies in targeted locations throughout the watershed. These efforts have been focused on identifying proven strategies and technological solutions available to work toward improvement and restoration of the lake's water quality and economic values.

Beyond these efforts which the Commission will continue to support, as the core of the Commission's function, this Strategic Plan has been developed as a guide and resource for economic opportunities which will reinstate and improve the local economies surrounding the lake while supporting the environmental restoration of the lake.

SECTION II: PURPOSE AND NEED

Purpose and Need

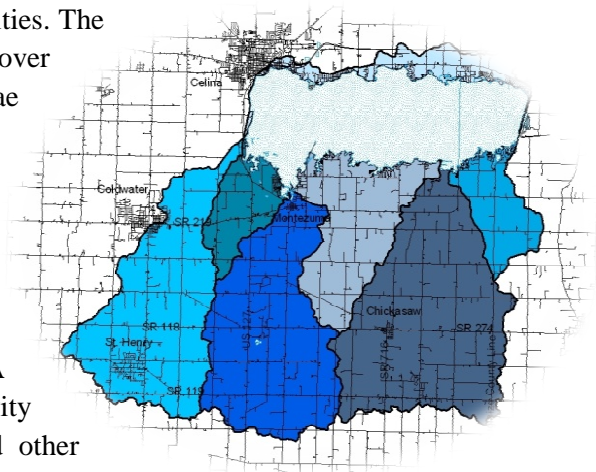
Over the past 50 years numerous stakeholder groups have developed plans to reduce nutrient loading into the lake as a component of regulatory requirements and/or land stewardship. These efforts initialized the process, but have been hampered by funding availability and regulatory authority. With the advent of a threat to public health and welfare associated with the continued decline of the lake, the degradation spread beyond the environmental condition of the lake to the economic condition of the region. This aspect of the problem lead to the creation of the Grand Lake St. Marys Restoration Commission and aided in the formulation of its approach to resolving the problem.

When describing the lake’s crisis, there are two key words to remember – sediment and phosphorus. The long term environmental and economic restoration of the lake lies at the intersection of its physical and economic revitalization. To achieve this condition the development of a strategic plan which integrates the practices necessary to remove the source causes of the degradation by applying of economic development principals to achieve a renewed and sustainable economy for the lake is required.

The Commission identified the need to develop economic opportunities and activities that stem directly and/or indirectly from restoring damaged natural resources such as Grand Lake St. Marys (GLSM). The creation of an economy, derived from restoration of the lake within the GLSM watershed, will provide a new direction that is both environmentally sustainable and economically viable. Recognizing and correcting problems created by current and past activities and applying a new environmental and economic paradigm to the future offers a challenging, yet unique and exciting opportunity for the communities that have come to rely on the lake and watershed.

Existing Conditions

GLSM ecosystem is exhibiting the symptoms of a functional “breakdown” and on the edge of ecological collapse from over 100 years of human activities. The frequency and intensity of algal blooms has increased over the past 10 years culminating in dangerous levels of algae microcystin toxin, endangering the public health and welfare. In May of 2009 the Ohio Environmental Protection Agency (OEPA) posted warnings advising people and animals to minimize contact with the lake water due to the potential effects of the toxin. Algae blooms which occurred during the summer of 2010 were of such a magnitude and duration, that the OEPA was forced to close the lake to ALL recreational activity due to the extremely high levels of microcystin and other toxins including cylindrospermopsin that resulted. This prompted immediate action by the State of Ohio to seek understanding and solutions to the problem to mitigate the re-occurrence of the blooms in 2011.



Causes and Sources

As the receiving water body of six contributing sub-watersheds totaling 112 square miles, GLSM has become severely degraded and nutrient enriched. The ongoing algal blooms are an outward representation of the ecosystems inability to process and utilize the accumulated, excess nutrients being contributed to it by its watershed despite improved conservation practices that have been adopted over the last decade.

Numerous studies and research efforts have defined cumulative loading of nutrients (phosphorus and nitrogen) as the root causes of water quality degradation. The Total Maximum Daily Load (TMDL) developed for the GLSM watershed by the OEPA in 2007, as a Clean Water Act requirement for 303(d) listed waters, identified the “probable sources of impairment in this watershed are tied to agricultural practices”. Additionally it cited human waste from unsewered areas with failing septic systems as a contributing source. The established TMDL enumerated a reduction of phosphorus by 175,000 lb/yr and nitrogen of 48,000 lb/yr was required to support the “Aquatic Life Use Support/Recreational Use” designations for GLSM and its tributaries.

Economic Effects of Lake Condition on Local/Regional Economy

Excess loading of nutrients into GLSM has resulted in specific impacts to the local and regional economy. These impacts are both directly accessed via lost business revenue/jobs and indirectly through lost property value. Other ancillary impacts in terms of decreased business recruitment and increased business relocation are being realized as casualties of the increased regulatory oversight being implemented to help restore and protect the lake.

The most notable and quantifiable impacts are those directly related to tourism. The ‘Economic Impact of Tourism in Auglaize and Mercer Counties’ report prepared by Tourism Economics, Wayne, PA, was published in July 2009. It reported that sales, wages and taxes generated approximately \$193M to the region and accounted for 2,487 jobs. Based upon surveys conducted with the many affected businesses in the region over the past 4-5 months (as part of the SBA Disaster Declaration Survey commissioned by Governor Strickland as evidence for the declaration), the average business revenue was down 35%-40%. By extrapolating this percentage across the region, recreational related revenues decreased approximately \$77,000,000.

During this period, property values have fallen precipitously by an estimated 14% based on the 2008 through 2010 WRIST, Inc., Housing Statistics. 6% of this decline can be attributed to the lake’s condition. Local real estate professionals have indicated that since the first health warnings by the state in 2009, the market for any properties in the region has all drastically decreased as evidenced by a 45% drop in conveyance fees collected by Mercer County alone. In addition, financing through Freddie Mac/Fannie Mae for homes in proximity to the lake has been denied. The cumulative effect of these items is difficult to determine, but it has been conservatively estimated at \$25,000,000

The GLSM region has made state and national news due to these issues. The agricultural industry is also beginning to feel the ripple effects. Historically many poultry producers have brokered their waste to land outside the watershed that is in need of nutrients. Local and state agencies in Indiana are now openly questioning whether this product should be spread on land in Indiana because of impacts being experienced in Grand Lake St. Marys. Furthermore, several livestock operations including a

recent multi-million dollar egg processing facility have decided to locate in Indiana due to the perceived future problems with locating in this region. As a large economic driver for this region, the agricultural industry in this part of the state will undoubtedly begin to suffer as a result of the negative cascading effect of the last two years. At this time the effect of these processes on the economy is not quantifiable. However it can be reasonably assumed that the overall impact will result in a loss of agricultural revenue.

SECTION III: STRATEGIC PLAN

Strategic Goal

Through this initiative, the goal of the Grand Lake St. Marys Restoration Commission is specifically intended to evaluate and emphasize the economic revitalization of the lake through strategies and actions which yield the highest economic and environmental sustainable benefits. Thus, the overriding goal of the Strategic Plan is to:

Provide a holistic blueprint for the sustainable environmental and economic renewal of Grand Lake St. Marys and its contributing watersheds through an approach that will motivate and coordinate stakeholders to increase the ecological and economic effectiveness of restoration activities. These efforts will also help lake communities realize their potential to improve and protect the natural and economic resources of the region.

Strategic Objectives

The Strategic Objectives of the plan formulate a coordinated approach to achieve the goals of the GLSMRC Strategic Plan. These objectives form an interconnected framework which supports a matrix of opportunities for providing and applying various management tools and financial resources for current and future lake improvement and protection. Specific objectives and stepping stones in the Strategic Plan development and implementation process include: coordinate, public outreach, study/document, economic revitalization and design/ implementation. Each of these objectives is further described below. The end product is a living document which will be evaluated regularly and updated as new information becomes available.

- **Coordinate:** Provide a basis of interaction to coordinate and integrate the efforts experiences and resources of state, federal, private and business interests to achieve consensus on issues and solutions to realize a synergistic effect.
- **Public Outreach:** Establish open lines of communication to inform, educate and understand the needs and objectives of those who live within the ecological context of the system and holistically carry the message on to the overall populace.
- **Study/Document:** Promote the application of science and economic re-development analyses to understand the stressors impacting the environmental and economic systems in and around the lake. These effects will be documented to promote the most appropriate technologies and cost effective solutions with the most far reaching benefits.
- **Economic Revitalization:** Seek funding to implement projects through grants, sustainable business opportunities, contributions, state/federal initiatives, and to re-inoculate the economic drivers of the region. Funding mechanisms within the U.S. Environmental Protection Agency, the US Army Corps of Engineers, and Ohio Department of Environmental Protection as well as through other nonprofit resources will be pursued as part of these coordinated efforts to effectively provide the greatest environmental and economic benefits for the lake.
- **Design/Implementation:** Carry forward the identification and implementation of coordinated actions that will lead to the restoration of the lake and restore economic viability.

Strategic Actions

Associated with each of these objectives are specific action items which the Commission is pursuing to initiate and sustain progress toward achieving the strategic goals. Some of these actions are policy, stewardship, education, information and funding oriented and apply to the preliminary infrastructure necessary to support and achieve the development of a pragmatic Strategic Plan. These actions also provide the fundamental substructure necessary for the implementation of specific project opportunities designed to improve the physical condition of the lake and the surrounding economy.

Coordinate

Numerous groups/organizations including Ohio Department of Environmental Protection, Ohio Department of Natural Resources, Natural Resources Conservation Service, Grand Lake/Wabash Watershed Alliance, Lake Improvement Association, etc., have been developing plans and implementing projects through a variety of funding sources in an effort to stem the degradation of Grand Lake St. Marys. These efforts have focused primarily on the objectives delegated to the specific organization. Redundancy and a lack of integrated planning of projects influence the efficiency, scale of funding and support that could be readily achieved through a consolidated effort. Interlinking of the objectives to present a comprehensive front is necessary to synergize the overall work and allow for effective support at the federal, state and local governments level.

Action Items

1. Research and establish a legal entity dedicated to the environmental stewardship of the lake which can influence and promote a restorative approach.
2. Create and manage a program to identify, requisition and direct funding resources to achieve the strategic objectives of the plan.
3. Establish Special Use Districts within the region to foster development of sustainable business practices and provide economic incentives to promote growth in the region's most directly impacted by the lake's condition.
4. Establish a Consolidated Action Plan to integrate the economic, water quality and public health/welfare actions and provide a unified approach to the environmental and economic revitalization of the GLSM region.
5. Petition for the establishment of a State funded Lake Manager position to act as the primary coordinator for synchronization, monitoring and enforcement of state actions.
6. Integrate revisions to local land use/zoning regulations to reduce practices that promote nutrient loading into the lake or its tributaries in tandem with state actions.

Public Outreach

The scale of effect of the lake both as a local and regional economic driver as well as one of the area's greatest natural resources, far outreaches that which is normally associated with the impact of a single degraded resource. As such, the integration of stakeholder comments and concerns is critical to the

process of developing strategies and solutions as a means to manage and distribute information about the activities and progress of the plan and the commission. An information management system will be established to provide an interface for stakeholders to maintain a continuous portal for education and feedback.

Action Items

1. Establish and maintain a comprehensive communication's plan to integrate stakeholders' ideas and provide continuous flow of information.
2. Develop educational programs to promote grass roots understanding of lake degradation issues for elementary, secondary and public audiences.
3. Establish and implement a comprehensive fundraising plan to support the objectives of the Strategic Plan.

Study/Document

The availability of information and data to establish baseline conditions for measuring successes and providing supporting evidence for potential funding opportunities is currently a limiting factor. The "value" of the lake to the region, though recognized, has not been fully accredited in the restoration process. Critical data which provides the basis for determining the effect of various management techniques to support restoration opportunities is missing. Economic and scientific data will be collected to act as a metric for measuring success of the work being conducted and will provide critical baseline information to formulate and act on technological solutions.

Action Items

1. Conduct economic study on the impacts to the economy from lake conditions to use as a metric for improvements.
2. Install water quality monitoring stations in each contributing sub watershed to document achievements and provide critical data for lake management.
3. Define, initiate and monitor scientific and economic data that supports actions to undertake long term projects.

Economic Revitalization

The creation of economic opportunities that establish sustainable actions which have the ability to fuel the local economy while resolving the causes and sources of the lake degradation are a key component to restoring the economic viability of the region. The creation of a "restorative economy" through the development and application of market-based solutions and innovative funding mechanisms will be critical and necessary. The diversity of multiple funding sources and partnerships each targeting aspects of the problem from different angles and approaches will, over the long haul, fuel comprehensive and sustainable financial and ecologic solutions for the lake region.

To support the development of infrastructure needed to promote a "restorative economy", legislation, laws and policies that will help manage risk, and encourage/support the private sector will be

established. This framework will create markets for building the critical mass necessary to attract sufficient financial and technical influxes that will influence landscape level improvements. Four different strategies will be utilized to initiate, establish and sustain the economic initiative focused on restorative processes.

Funding Source Development: These actions develop financial resources through distribution of costs to user groups to finance the development/operation of infrastructure: (storm water utilities, drainage districts, etc.). This long-term strategy allocates funding to specific user groups.

Seed Funding and Incentives: These actions provide initial funding primarily through grants, public sources and/or bond issuance to promote economic initiative. This strategy utilizes incentive money to provide a financial guarantee for encouraging investment. This grouping includes; Government Funding, Natural Resource Tax Increment Financing (TIF), Tax Incentives, Subsidies, Renewable Energy/Clean Technology Programs with the intent/understanding that costs will be recovered through assessment of internal capacity building and revenue generation within the regional economy. These are short term actions used to “jump start” the local economy.

Corporate Structures: Several newly formulated corporate structures are available that provide varying incentives for businesses to both attract diverse funding/investment sources and tax relief in exchange for limitations on liability and structured profit margin. Examples of these structures include: L3C (Low-Profit Limited Liability Company), B-Corp (Benefit Corporation), and P3 (Public-Private Partnership). The application of these structures establishes long term commitments to sustain both the restoration and economic development of the region.

Ecosystem Services Programs: These programs create a cap and trade system for ecosystem services within an established geographic region to address regulatory requirements. The privatization of these services provides the opportunity to conglomerate and focus the ecosystem service (nutrient removal) where it would be most effective. The establishment of these programs in conjunction with effective regulatory requirements Total Maximum Daily Loads (TMDL), provides a long term self-funded process for restoration.

Strategic Action Items

1. Evaluate highest priority projects and prepare prospectuses as to the economic development value that will be realized from implementation. Convert data into a business plan based on the best financial avenues to provide funding for implementation.
2. Seek legal/legislative approval and assistance to establish economic implementation strategies within the Grand Lake St. Marys special districts.

3. Develop supporting economic studies and valuations to substantiate business prospectuses for development which will promote economic implementation strategies.
4. Establish a Natural Resources Capital Improvement Program and supporting economic justification for the creation of Natural Resource TIF.
5. Initiate and foster the development of at least one sustainable business enterprise within the watershed that aids in treating critical stressors in the ecosystem.

Design/Implementation

The planning and implementation of projects specifically designated to reduce in-lake and watershed nutrient loading are the primary drivers to restore the lake. These activities are described briefly below and are more fully documented, evaluated and prioritized in Appendix B. These actions can be subrogated into four basic categories: Sediment Management, Biological Treatments, Chemical Treatments, and Best Management Practices

Sediment Management: Projects within this category will focus on the reduction/removal of sediment from the system as a means to sequester nutrient load. Sediment is the primary vehicle by which phosphorus migrates from the watershed to the lake where it is stored. Management of this material means both preventing it from entering the waterways through agricultural Best Management Practices (BMPs), stream restoration, and shoreline stabilization and removing the material that has already entered the system through sediment collection and dredging.



The dredged and collected material can then be reused for beneficial projects such as island creation to promote habitat benefits within the lake system or disposed of in upland settings. Project types within this category include; dredge spoil island development, upland disposal of dredge spoil, and stream bank stabilization.



Biological Treatments: Ecological balance within the lake system can be altered over time to create a self degrading system. This strategy can be accomplished by targeting specific components of the biological system that reset cycles based on specific conditions. Project types within this category include; fish stock adjustments, Micro Nutrient Modification, aeration/circulation, water level management.



Chemical Treatments: Alum and peroxide are chemicals used to sequester the phosphorus in the lake that feeds the algal blooms. The chemicals are applied to the lake from boats and quickly react to inactivate phosphorus. This treatment provides an excellent near term solution to the existing algal blooms in the lake while the source supply of phosphorus is reduced to sustainable levels.



Project types within this category include lake wide alum dosing and in-stream flocculation of sediment.

Best Management Practices: Non-point source inputs of nutrients into the lake are targeted through the application of Best Management Practices. These actions initiate and can maintain the long term protection of the lake. Project types within this category include; treatment trains, riparian buffer and stream restoration, wetland creation, Low Impact Development (LID) regulation establishment, manure/fertilizer management, and waste to energy strategies.

Prioritization of Design/Implementation Actions

The approach for prioritizing these actions to yield the greatest ecological and economic solution for the lake and surrounding communities was to select a primary indicator or “keystone pollutant” which could provide both indications of water quality as well as economic status. Phosphorus provides the baseline information for this analysis as well as the expected return based on removal efficiencies and calculated economic gains. Phosphorus is also strongly interlinked with the environment and economy in Grand Lake St. Marys as the key pollutant interfering with delivery of economic services the lake once provided. Thus, the choice of phosphorus as the keystone pollutant will allow this analysis to describe current conditions as well as anticipated water quality improvements and economic gains.

In support of the goals and objectives of the Strategic Plan, an approach was formulated to determine the inherent value of specific project types and/or projects. This process represents a prioritization of the action items that yield the greatest return for the efforts put forth. Project types that have the greatest potential to re-establish the economic conditions that result from a healthy lake, and have ancillary contributions to the overall economic well being of the region have the highest scoring.

The prioritization process assesses the potential of each project type in six categories; Economic Benefit Potential, Scale of Effect, Term of Effect, Economic Value Estimate, and Implementation Strategy. Each category has a maximum value of 100 points. Subsequently the total point score for each category is weighted, and the sum of the weighted points represents the projects point score value. This is a qualitative ranking and is only relative to other projects scored under this protocol.

Economic Benefit Potential - This factor estimates the probability the project has to affect the key factors which impact the local and regional economy. These factors can be described as the projects potential to impact:

Eco-Tourism: Encourage travel to the region from outside areas to experience the natural environment of the lake and surrounding watershed.

Recreational Use/Capacity: Increase utilization of the lake and surrounding watershed for recreational opportunities i.e. hunting, fishing, swimming, boating etc.

Research: Provide educational and business initiatives to understand the underlying matrix of processes which have lead to the decline of the natural environment and/or development of technologies to repair or utilize the stressors on the system for productive purposes.

Business Establishment: Create opportunities for the development or expansion of businesses in the region which implement practices aiding in the application of sustainable solutions for the primary stressors acting on the system. These businesses may also create ancillary services to support increased economic activity within the region.

Community Re-investment: Develop the economic structure within the region that provides internal utilization of established businesses as a result of the stimulus created from improved conditions of the natural environment.

Scale of Effect – This factor ranks the range of influence of the project. It speculates as to the extent of economic support that will result from its successful implementation.

Lag time to Functional Effect – This factor is an indicator of time necessary for the project to perform. Under the current plan, projects that have the most immediate functional effect have the greatest value.

Term of Effect – This factor provides recognition for the permanency of the project. Projects that provide effect over long periods of time take precedence over those that are short lived.

Economic Value Estimate – This factor relates nutrient loading of the lake to the economic impacts created by the excess loading. The state has established a Total Maximum Daily Load (TMDL) of nutrients at which the lake will function. Nutrients in excess of this amount degrade the system and lead to impacts upon the local and regional economy. Based on current information, the economic impact attributed to excess loading was estimated to be \$102,000,000. As such the value of loading in excess of the TMDL rate has a direct value which can be equated to determine its inherent value per unit. For this evaluation phosphorus loading has been selected as the keystone pollutant for ranking. Phosphorus loading into the lake has been estimated to average 192,000 lbs/year (2007 OEPA TMDL Report) which is 144,000 lbs/year above the recommended TMDL rate of 48,000 lbs/year. As such the economic value of phosphorus per lb in the watershed is \$708/lb. This value can then be applied to the anticipated removal/sequestration provided by the project to estimate its direct contribution to the economics of the region. In addition the implementation of projects may also stimulate new revenue leading to job creation, property improvements, increased tourism and product sales which may add to the value of various efforts recommended.

Implementation Strategy – This factor rates the method of implementation that is being considered for the project. Priority is given to implementation strategies that establish sustainable business enterprises which can generate economic investment into the region.

Actions Items

Projects with the potential to improve the ecological health of the lake through the sequestration, removal or prevention of nutrients within the lake or watershed area were prioritized to establish those deemed most critical for achieving the objectives of the plan. The list of actions below represents the initial projects to pursue as a result of this assessment in order of importance. Specific information regarding components and timeline for each project type are included in Appendix A.

Critical Implementation Priorities

1. Sequestration of Soluble Reactive Phosphorus (Chemical Treatment)

Purpose: Chemical sequestration of residual phosphorus through direct application of Aluminum Sulfate (Alum) and other chemical treatments such as peroxide. According to a 2010 report produced by Tetra Tech, Inc. for the U.S. and Ohio EPA, alum is highly effective at reducing the internal loading of phosphorus (i.e., recycling of sediment phosphorus), the major cause of the algal blooms in both thermally stratified and unstratified lakes. Although alum has proven to be highly effective at reducing internal loading in both shallow (unstratified) and deep (stratified) lakes, its effectiveness at reducing algae is often greater in shallow lakes because the phosphorus released from the sediment is immediately available in the photic zone (portion of the water column through which sunlight may penetrate and permit photosynthesis).

Action: Request action by the State of Ohio to provide for the lake-wide chemical dosing of the lake in spring 2011 as a means of providing relief to the residents and businesses affected by the Algae Blooms of 2009 and 2010.

2. Dredge Sediment Depositions

Purpose: Removal of accumulated phosphorus-enriched sediment layer via suction dredging over the bottom of the lake depending on measured sediment profiles. There are other purposes for dredging, such as removal of toxicants and lake deepening. The physical removal of the sediment bed load may be used to develop strategically placed islands and in-lake wetlands bringing great recreational benefits and important wildlife habitats. In addition, the development of islands in Grand Lake St. Marys can create windbreaks reducing the wave action that currently causes sediment to remain suspended in the water column

Action: Develop initial planning and request action by the Army Corps of Engineers to provide planning support for the development of dredge spoil islands in the lake as a means of sequestering internal nutrient loading in the system.

3. Beneficial Use of Organic Waste

Purpose: Provide alternative use for manure products in the watershed which will limit discharge into the system as a non-point source discharge, in addition to establishment of a revenue producing business in the locality.

Action: Create economic incentive package to attract private development and investment.

4. **Treatment Train Establishment**

- Purpose:** Act as a non-point source Best Management Practice (BMP) consisting of multiple BMPs integrated by stream flows that jointly result in improvements to the quality of water discharged into GLSM from the watershed. The 'train' starts with a stream bed load collector with integrated alum dosing, followed by a constructed wetland to provide secondary treatment, then filtration through a restored wetland for tertiary refinement prior to entering an embayment such that biological filtration and aeration (AiryGator) can be employed. The train will also help to generate the data needed to support and develop future watershed and lake improvement strategies by utilizing a gauge monitoring station on each stream. A NRCS-USDA stream gauge monitoring station, established in 2008 on the Big Chickasaw Creek provides valuable data related to the phosphorus load entering the lake. To accurately monitor the effectiveness of BMP's stream gauge stations need to be installed on each of the eight primary streams entering the lake.
- Action:** Establish Treatment Trains in drainage to the lake to act as a non-point source BMP.

5. **Rough Fish Removal**

- Purpose:** Restriction of ecological process that allows the cyclic nutrient processing from physical and metabolic activities of rough fish. Bio-manipulation includes the harvesting of rough fish (e.g., carp, shad, etc.) and the stocking of game fish in very large numbers. Rough fish digest and disturb sediments, making phosphorus more available to algae in the water column. They also prey on zooplankton, large populations of which are critical in the control of algal blooms. Large populations of game fish can help to control the large numbers of rough fish, providing better water quality and also improving the sport fishery. The goal is to alter biological assemblages and processes, of rough fish removal so that a stable, clearer water condition may develop.
- Action:** Develop program to remove rough fish and seek state approvals for large scale removal operations.

6. **HAB Prevention Through Micro Nutrient Modification**

- Purpose:** Seasonally modify the available micro nutrients in the lake system to prevent the development of toxic algae and promote the development of non-toxic algal varieties (diatoms). By optimizing the nutrient content of the water column through treatment early in the season, this strategy can prevent a toxic bloom from taking hold. Micro nutrient modification can selectively encourage the growth of

diatoms which are beneficial to the marine ecosystem and may be a valuable source of biomass for energy and products.

Action: Determine the effectiveness of the pilot project demonstrated in August 2010 as a basis of moving forward with a lake-wide project.

7. **Aeration and Circulation**

Purpose: Aeration and circulation are the most often used techniques in lake water quality management. Destratification and continued mixing can be achieved, so long as the flow rate is sufficient. Battelle Research Institute is analyzing data of a demonstration project that began in 2010 on an AiryGator (also utilized as part of the Treatment Trains) to determine the effectiveness and scalability of aeration within Grand Lake St. Marys. Airy-Gators serve multiple functions, including: creating an aerobic benthic cap that increases the activity of lake-bottom organisms that consume organic material; moving oxygenated water flows, destratifying the dissolved oxygen profile in the water column for higher forms of aquatic fauna; circulating oxygenated water; and enhancing nitrification/denitrification of the water column.

An additional benefit of circulation in relatively shallow lakes is that it neutralizes the buoyancy regulation mechanism of cyanobacteria (blue-green algae). Under quiescent conditions, cyanobacteria can adjust their position in the water column to obtain light and nutrients by expanding and contracting gas vacuoles with buoyancy rates of one to two meters per hour. Non-buoyant algae (e.g., diatoms and green algae) settle out of the water column under quiescent conditions, leaving the nutrients and cyanobacteria in the lighted zone. If circulation is strong enough to exceed those buoyancy rates, then diatoms and/or green algae can replace cyanobacteria in a well-mixed regime.

Action: Determine the effectiveness of the pilot project demonstrated in summer 2010 as a basis of moving forward with a lake-wide project.

8. **Water Level Management**

Purpose: Grand Lake St. Marys has a very high hydraulic residence time (HRT). HRT is the average amount of time required to completely replace the lake's water volume. Normally when water volume is relatively small and the flow of water is relatively high, the HRT is short: sediment and nutrients move quickly in and out of a lake. Unfortunately, this is not true for Grand Lake St. Marys.

Constructed as a shallow reservoir for the Miami and Erie Canal, the lake retains about 80 percent of the suspended sediment that enters from its eight main tributaries. The lake also retains virtually all of

the heavier sediment—known as “bedload”—that enters it. As a result, the lake functions exceptionally well as a retention basin for harmful phosphorus-charged sediment that would otherwise migrate downstream.

Action: Additional investigation of Spillway Tubes

Section VI: Time Line

	Objective	2011				2012			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Coordinate								
1	Research and Establish Legal Entity	Completion							
2	Funding/Program Management	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action
3	Establish Special Use Districts		Milestone Component		Completion				
4	Establish Consolidated Action Plan	Completion							
5	Petition for Establishment of Lake Manager	Completion							
6	Revise Land Use/Zoning Regulations		Milestone Component		Completion			Ongoing action	
	Public Outreach								
1	Establish and maintain a comprehensive Communications Plan	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action
2	Develop and Integrate Educational Programs		Milestone Component	Ongoing action	Ongoing action	Milestone Component	Ongoing action	Ongoing action	Ongoing action
3	Establish and Implement Fund Raising Program		Milestone Component	Ongoing action	Ongoing action	Milestone Component	Ongoing action	Ongoing action	Ongoing action
	Study Document								
1	Economic base line metrics study		Completion						
2	Water Quality Monitoring Stations	Completion	Completion	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action	Ongoing action
3	Define, initiate and monitor science and economic data	Milestone Component		Milestone Component		Milestone Component		Milestone Component	
	Economic Revitalization								
1	Prepare business plan/prospectuses	Milestone Component		Milestone Component		Milestone Component		Milestone Component	
2	Legal/legislative approvals				Completion				
3	Conduct Economic Studies for Prospectus Valuations	Completion							
4	Develop Natural Resources Capital Improvement Program		Completion			Ongoing action	Ongoing action	Ongoing action	Ongoing action
5	Institute Sustainable Business Enterprise			Completion					
	Design/Implementation								
1	Sequestration of Soluble Reactive Phosphorus		Completion						
2	Dredge Sediment Depositions		Ongoing action	Ongoing action	Milestone Component		Ongoing action	Ongoing action	Milestone Component
3	Beneficial Use of Organic Waste				Milestone Component				Milestone Component
4	Treatment Train Establishment		Milestone Component				Milestone Component		
5	Rough Fish Removal		Milestone Component				Milestone Component		
6	Micro Nutrient Modification	Milestone Component	Milestone Component						
7	Aeration and Circulation	Completion	Milestone Component	Ongoing action			Milestone Component	Ongoing action	
8	Water Level Management				Ongoing action			Ongoing action	
	Yearly Total								
	Contingency (10%)								
	Total Yearly Funding Target								

Completion
 Ongoing action
 Milestone Component

	Objective	2013				2014			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Coordinate								
1	Research and Establish Legal Entity								
2	Funding/Program Management								
3	Establish Special Use Districts								
4	Establish Consolidated Action Plan								
5	Petition for Establishment of Lake Manager								
6	Revise Land Use/Zoning Regulations								
	Public Outreach								
1	Establish and maintain a comprehensive Communications Plan								
2	Develop and Integrate Educational Programs								
3	Establish and Implement Fund Raising Program								
	Study Document								
1	Economic base line metrics study								
2	Water Quality Monitoring Stations								
3	Define, initiate and monitor science and economic data								
	Economic Revitalization								
1	Prepare business plan/prospectuses								
2	Legal/legislative approvals								
3	Conduct Economic Studies for Prospectus Valuations								
4	Develop Natural Resources Capital Improvement Program								
5	Institute Sustainable Business Enterprise								
	Design/Implementation								
1	Sequestration of Soluble Reactive Phosphorus								
2	Dredge Sediment Depositions								
3	Beneficial Use of Organic Waste								
4	Treatment Train Establishment								
5	Rough Fish Removal								
6	Micro Nutrient Modification								
7	Aeration and Circulation								
8	Water Level Management								
	Yearly Total								
	Contingency (10%)								
	Total Yearly Funding Target								
	Completion								
	Ongoing action								
	Milestone Component								

	Objective	2015				2016			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Coordinate								
1	Research and Establish Legal Entity								
2	Funding/Program Management								
3	Establish Special Use Districts								
4	Establish Consolidated Action Plan								
5	Petition for Establishment of Lake Manager								
6	Revise Land Use/Zoning Regulations								
	Public Outreach								
1	Establish and maintain a comprehensive Communications Plan								
2	Develop and Integrate Educational Programs								
3	Establish and Implement Fund Raising Program								
	Study Document								
1	Economic base line metrics study								
2	Water Quality Monitoring Stations								
3	Define, initiate and monitor science and economic data								
	Economic Revitalization								
1	Prepare business plan/prospectuses								
2	Legal/legislative approvals								
3	Conduct Economic Studies for Prospectus Valuations								
4	Develop Natural Resources Capital Improvement Program								
5	Institute Sustainable Business Enterprise								
	Design/Implementation								
1	Sequestration of Soluble Reactive Phosphorus								
2	Dredge Sediment Depositions								
3	Beneficial Use of Organic Waste								
4	Treatment Train Establishment								
5	Rough Fish Removal								
6	Micro Nutrient Modification								
7	Aeration and Circulation								
8	Water Level Management								
	Yearly Total								
	Contingency (10%)								
	Total Yearly Funding Target								
	Completion								
	Ongoing action								
	Milestone Component								

	Objective	2017				2018			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Coordinate								
1	Research and Establish Legal Entity								
2	Funding/Program Management								
3	Establish Special Use Districts								
4	Establish Consolidated Action Plan								
5	Petition for Establishment of Lake Manager								
6	Revise Land Use/Zoning Regulations								
	Public Outreach								
1	Establish and maintain a comprehensive Communications Plan								
2	Develop and Integrate Educational Programs								
3	Establish and Implement Fund Raising Program								
	Study Document								
1	Economic base line metrics study								
2	Water Quality Monitoring Stations								
3	Define, initiate and monitor science and economic data								
	Economic Revitalization								
1	Prepare business plan/prospectuses								
2	Legal/legislative approvals								
3	Conduct Economic Studies for Prospectus Valuations								
4	Develop Natural Resources Capital Improvement Program								
5	Institute Sustainable Business Enterprise								
	Design/Implementation								
1	Sequestration of Soluble Reactive Phosphorus								
2	Dredge Sediment Depositions								
3	Beneficial Use of Organic Waste								
4	Treatment Train Establishment								
5	Rough Fish Removal								
6	Micro Nutrient Modification								
7	Aeration and Circulation								
8	Water Level Management								
	Yearly Total								
	Contingency (10%)								
	Total Yearly Funding Target								
	Completion								
	Ongoing action								
	Milestone Component								

	Objective	2019				2020			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	Coordinate								
1	Research and Establish Legal Entity								
2	Funding/Program Management								
3	Establish Special Use Districts								
4	Establish Consolidated Action Plan								
5	Petition for Establishment of Lake Manager								
6	Revise Land Use/Zoning Regulations								
	Public Outreach								
1	Establish and maintain a comprehensive Communications Plan								
2	Develop and Integrate Educational Programs								
3	Establish and Implement Fund Raising Program								
	Study Document								
1	Economic base line metrics study								
2	Water Quality Monitoring Stations								
3	Define, initiate and monitor science and economic data								
	Economic Revitalization								
1	Prepare business plan/prospectuses								
2	Legal/legislative approvals								
3	Conduct Economic Studies for Prospectus Valuations								
4	Develop Natural Resources Capital Improvement Program								
5	Institute Sustainable Business Enterprise								
	Design/Implementation								
1	Sequestration of Soluble Reactive Phosphorus								
2	Dredge Sediment Depositions								
3	Beneficial Use of Organic Waste								
4	Treatment Train Establishment								
5	Rough Fish Removal								
6	Micro Nutrient Modification								
7	Aeration and Circulation								
8	Water Level Management								
	Yearly Total								
	Contingency (10%)								
	Total Yearly Funding Target								
	Completion								
	Ongoing action								
	Milestone Component								

Appendix A – Scoring and Prioritization

Project Evaluation and Prioritization Process

In support of the goals and objectives of the GLSMRC plan, an approach was formulated to determine the inherent value of specific project types and or projects. This process represents a prioritization of the action items that yield the greatest return for the efforts put forth. Project types that have the greatest potential to re-establish the economic conditions that result from a healthy lake and have ancillary contributions to the overall economic well being of the region have the highest scoring.

The prioritization process accesses the potential of each project type in six categories; Economic Benefit Potential, Scale of Effect, Term of Effect, Economic Value Estimate, and Implementation Strategy. Each category has a maximum value of 100 points. Subsequently the total point score for each category is weighted, and the sum of the weighted points represents the projects point score value. This is a qualitative ranking and is only relative to other projects scored under this protocol.

Economic Benefit Potential (weight -15%) This factor estimates the probability the project has to affect the key factors which impact the local and regional economy. These factors can be described as the projects potential to:

Eco-Tourism: Encourage travel to the region from outside areas to experience the natural environment of the lake and surrounding watershed.

Recreational Use/Capacity: Increase utilization of the lake and surrounding watershed for recreational opportunities, i.e. hunting, fishing, swimming, boating etc.

Research: Provide educational and business initiatives to understand the underlying matrix of processes which have lead to the decline of the natural environment and/or development of technologies to repair or utilize the stressors on the system for productive purposes.

Business Establishment: Create opportunities for the development or expansion of businesses in the region to implement practices which aid in a sustainable resolution to the primary stressors acting on the system, or create ancillary services to support increased economic activity within the region.

Community Re-investment: Develop the economic structure within the region that provides internal utilization of established businesses as a result of the stimulus created from improved conditions of the natural environment.

High – 20 pts Moderate – 10 pts Low – 5 pts N/A – 0 pts

Scale of Effect (weight - 10%) – This factor ranks the range of influence of the project. It speculates as to the extent of economic support that will result from its successful implementation.

Regional – 100 pts Watershed – 50 pts Local – 20 pts

Lag time to Functional Effect (weight - 10%) – This factor is an indicator of actual start time to actual performance of the project. Under the current plan, projects that have the most immediate functional effect have the greatest value.

Immediate – 100 pts <12 months – 60 pts 12 months – 2 years – 40 pts >2 years – 20 pts

Term of Effect (weight – 15%) – This factor provides recognition for the permanency of the project. Projects that provide effect over long periods of time take precedence over those that are short lived.

1 to 5 years - 20 pts 5 to 10 years – 40 pts 10 to 20 years – 60 pts Permanent – 100 pts

Economic Value Estimate (weight – 45%) – This factor relates the nutrient loading of the lake to the economic impacts created by the excess loading. The state has established a Total Maximum Daily Load (TMDL) of nutrients at which the lake will function. Nutrients in excess of this amount degrade the system and lead to impacts to the local and regional economy. This economic impact attributed to the excess loading was estimated to be \$102,000,000. As such, the value of loading in excess of the TMDL rate has a direct value which can be equated to determine its inherent value per unit. For this evaluation phosphorus loading has been selected as the keystone pollutant for ranking. Phosphorus loading into the lake has been estimated to average 192,000 lbs/year (2007 OEPA TMDL Report) which is 144,000 lbs/year above the recommended TMDL rate of 48,000 lbs/year. As such the economic value of phosphorus per lb in the watershed is \$708/lb. This value can then be applied to the anticipated removal/sequestration provided by the project to estimate its direct contribution to the economics of the region. In addition the implementation of projects may also stimulate new revenue leading to job creation, property improvements, increased tourism and product sales which may add to the value of various efforts recommended.

>\$10 million – 100 pts 5 to 10 million – 60 pts 2 to 5 million – 40 pts <2 million – 20 pts

Implementation Strategy – (weight - 5%) This factor rates the method of implementation that is being considered for the project. Priority is given to implementation strategies that establish sustainable business enterprises which can generate economic investment into the region.

TIF – 50 pts	Grant – 30 pts	Stimulus – 40 pts	Public – 20 pts
P3 – 80 pts	B-Corp – 40 pts	Incentive – 60 pts	Private – 100 pts

Cost of Implementation

Not ranked, used to establish funding calendar and cash flow projections

Maintenance/Operations Cost

Not ranked, used to establish funding calendar and cash flow projections

Appendix B- Project Descriptions and Forms

Project Prioritization Scoring

Project	Economic Benefit	Scale of Effect	Lag Time to Functional Effect	Term of Effect	Economic Value	Implementation of Strategy	Total Score
Sequestration of Soluble Reactive Phosphorus	6.75	10	10	3	45	2.5	77.25
Dredge Sediment Depositions	7.5	5	2	15	45	2.5	77.00
Beneficial Use of Organic Waste	7.5	5	6	9	45	4	76.50
Treatment Train Establishment	7.5	5	6	9	18	2.5	48.00
Rough Fish Removal	5.25	5	10	3	9	2	34.25
Algal Flipping	8.25	5	6	3	9	1	32.25
Aeration and Circulation	8.25	5	6	3	9	1	32.25
Water Level Management	8.25	5	6	3	9	1	32.25

Appendix C – Actions Implemented

Accomplishments and Partnerships

Prior to the development of this document, the Commission initiated partnerships with governmental, nonprofit, private and research entities to compile and calibrate information, and compose the best and most sustainable solutions for the lake. These entities offer the most current research and/or experience in water quality and economics directly related to the issues of Grand Lake St. Marys:

Environmental Consulting Businesses

Algaeventure Systems Inc.
KCI Technologies, Inc.
Mad Scientist
Streamside Systems
Tetra Tech Inc.

Government Agencies (Local, State, and Federal)

Auglaize Soil and Water Conservation District (Auglaize SWCD)
Grand Lake Wabash Watershed Alliance
Mercer Soil and Water Conservation District (Mercer SWCD)
Natural Resources Conservation Service (NRCS)
ODNR – Division of Soil and Water Resources (DSWR)
Ohio Department of Agriculture (ODA)
Ohio Department of Health (ODH)
Ohio Department of Natural Resources (ODNR)
Ohio Environmental Protection Agency (OEPA)
U.S. Department of Agriculture (USDA)
U.S. Army Corps of Engineers (USACE)

Research/Educational Institutions

Ball State University
Battelle Memorial Institute
Bowling Green State University
Findlay University
Heidelberg University
Ohio Northern University
Ohio State University
University of Dayton Research Institute
Western Ohio Educational Foundation
Wright State University Lake Campus

These partnerships are intended to provide the best information and technological advancements to support physical, biological and environmental integrity of lake and surrounding watersheds. It is the intent of the Commission to evaluate and build from these resources to deliver the most effective long term economic solutions. The Commission supports this integrated approach as a unified platform for the future economic sustainability of Grand Lake St. Marys and her communities.

Accomplishments through December 2010

- Engaged educational teams to promote conservation and nutrient management practices in the watershed with over \$1.5 million in incentive funds for operators of producers.
- Initiated pilot testing and partnership with EPA, ODNR and established partnerships/research support from Ohio Northern, Bowling Green and Heidelberg Universities.
- Selected GLSMRC Facilitator, Tom Knapke as the Commission's local leader.
- Established legislative representation through a lobbyist and formation of a legislative committee to promote statewide awareness of restoration progress and to recruit funding for continued research and lake improvements.
- Initiated a water quality monitoring program in partnership with Wright State University, MAD Scientist Inc. and the Battelle Institute to develop baseline data and monitor progress toward lake restoration.
- Contracted work with watershed/lake experts, KCI and Battelle Institute, to develop a science-based lake restoration plan and specific strategic action items.
- Continue to hold public meetings and provide media access through radio, website and newspaper vehicles. Most recent public meeting held October 2010.
- Established website for the strategic plan, and provided opportunity for public comment.
- Initiated investigation to develop options for financial assistance to mitigate business and industry losses.
- Initial fundraising of over \$550,000 supported by Mercer County Civic Foundation and St. Marys Community Foundation.
- Applied for and received EPA SWIF Grant of \$60,000 for Airy Gator to add constant aeration to sediment layers of the lake. Airy Gators in Park Grand and Southmore Shores have been installed.
- Applied for and received an EPA 319 Grant Award of \$485,000 for an in-stream Treatment Train and floating wetlands in the Prairie Creek Watershed.
- Installed three Streamside Collection Units in Big Chickasaw, Beaver Creek and Barns Creek
- Installed water quality monitoring station on Big Chickasaw Creek
- Coordinated with State to conduct test dosing of alum in preparation for full scale application in 2011.
- Coordinated with State to conduct Silica/Micronutrients algal flipping test

Appendix D – Research Reports and Scientific Studies

Research Reports and Scientific Studies

The following are reports and studies on Grand Lake St. Marys that provided the foundation for this strategic plan.

- *Auglaize and Mercer Counties Convention and Visitors Bureau. Ohio's Other Great Lake Visitors Guide.* St. Marys, Ohio. Not Dated.
- *Celina Sanitary Landfill.* Brochure. Celina, Ohio. 2003
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