

WOLF AND BROAD LAKE WATERSHED IMPLEMENTATION PLAN

FINAL VERSION
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WOLF AND BROAD LAKE WATERSHED IMPLEMENTATION PLAN

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Mission Statement

The mission of the Wolf Lake Watershed Implementation Plan (WIP) is to develop a more sustainable future for the resources, residences, and businesses located within the watershed by addressing all identified natural and wildlife resources concerns. The implementation of this plan also partially fulfills the mission of all members of the Wolf Lake WIT including: Delta F.A.R.M., Delta Wildlife, Mississippi Department of Environmental Quality, U.S. Environmental Protection Agency, Mississippi State University, Mississippi Department of Wildlife, Fisheries, and Parks, USDA Natural Resources Conservation Service, Mississippi Soil & Water Conservation Commission, The Nature Conservancy, Mississippi State Department of Health, Yazoo-Mississippi Delta Joint Water Management District, U.S. Fish and Wildlife Service, and all other partnering agencies, private landowners, farmers, and business owners in the watershed.

Wolf Lake Watershed Description

Wolf Lake drains approximately 27,113 acres of the Yazoo River basin in portions of Yazoo and Humphreys counties in west central Mississippi (MDEQ 2003a). We estimate that approximately 600 people lived in this watershed in 2000 (based on Census 2000 data for Yazoo and Humphrey's County). Although minutes from Yazoo City, only two communities, Carter and Lake City, are found in the watershed. In 1993 land use in the watershed was primarily agricultural (72%) (MDEQ 2003a). Crops produced in the watershed include corn, soybeans, cotton, milo, catfish, and rice. Unless otherwise specified, when Wolf Lake is mentioned it will be assumed that Broad Lake is also included in the description or statement.



Figure 1. Wolf Lake Watershed (Location within the State)

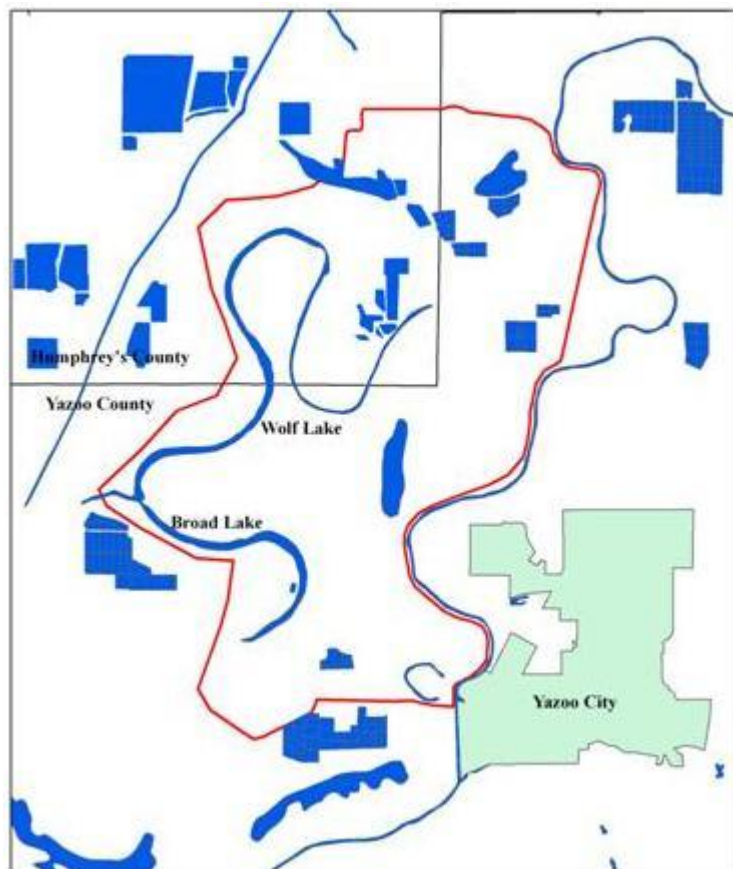


Figure 2. Wolf Lake Watershed

The watershed is underlain by Mississippi River alluvium. The topography of the watershed is primarily flat, with some ridge and swell topography provided by river terraces (MDEQ 2000). Dundee-Dubbs-Sharkey soils are prevalent throughout the watershed with Alligator-Sharkey-Forestdale comprising the remaining areas. The watershed is located in the Mississippi Alluvial Plain eco-region. Native vegetation in the watershed is bottomland hardwood forest, which includes oak, tupelo gum, cottonwood, and cypress (MARIS).

Wolf Lake was formed by the Yazoo River in the most recent meander belt of the Mississippi River indicating the waterway is less than 3,000 years old (FTN 1991). Before Yazoo River levee construction, the watershed drained through Panther Creek and into the Yazoo River. Currently the watershed has one central outlet at the confluence of Wolf Lake and Broad Lake which drains (through two channels) into the landside ditch of the Wittington Canal. This landside ditch flows south into Lake George and ultimately the Yazoo River. This connection leaves the watershed un-protected from high water events on the Mississippi River. Lake levels typically fluctuate around 88' (NGVD), however floodwaters from the Mississippi River can push the lake level much higher flooding farmland and residences in the watershed.



Figure 3. Corn field flooded from Mississippi River backwater.



Figure 4. High waters at the confluence of Wolf Lake and Broad Lake.

Surface water levels in the watershed are maintained by rainwater, the Mississippi River alluvial aquifer, and the Yazoo River. Ground water withdrawals for agricultural use, primarily irrigation, are made from the alluvial aquifer and surface water, with a majority coming from the alluvial aquifer. However, the aquifer is readily recharged from the adjacent bluff hills and Yazoo River (FTN 1991).

Watershed Implementation Team

Members of the Wolf Lake Watershed Implementation Team are listed below. They represent various professional resource agencies and stakeholders within the watershed.

Delta F.A.R.M. and Delta Wildlife, Inc.

- Trey Cooke, Dan Prevost, Sam Franklin

Mississippi Department of Environmental Quality

- Pradip Bhowal, Ronn Killebrew, Richard Ingram

Mississippi Department of Wildlife, Fisheries, and Parks

- Ron Garavelli, Garry Lucas, Dennis Reicke

Mississippi State University, College of Forest Resources, Dept. of Wildlife & Fisheries

- Todd Teitjen, Eric Dibble

USDA Natural Resources Conservation Service

- Tim Manor, Chad Fieber, Bobby McCain

U.S. Fish and Wildlife Service

- Bo Sloan, Lloyd Inmon

U.S. Geological Survey

- Richard Rebich

Yazoo-Mississippi Delta Joint Water Management District

- Dean Pennington
- The Nature Conservancy
- Stacey Shankle
- FTN Associates
- Randy Reed
- U.S. Environmental Protection Agency
- Kenneth Dean
- United States Army Corp of Engineers
- Robert Simrall
- Landowners/Stakeholders
- De Paul, Denny Paul, Rob Coker, Sonny Baskin, John Hines, Bob Cato, Bill Brown, Kevin Erickson, Bernie Jordan, Ed Jordan, Howard Brent, Harry Simmons, Byron Seward
- Homeowners
- Steven Sanford, Ed Jordan, John Book, John Fouche, Linda Coker, Robert E. Coker, Joyce Singleton, Henry Tirey, W.E. Sanford Jr., Edward Gregory, Jimmy Dixon, Eulow Porter, Billy Vandevere, Lonnie Kight, Chuck Thomas, Susie Pepper, Ken Roberson, James Irwin Jr., Huey Townsend, Howard Brent, Hy Edwards, Tim Edwards, Sandra Harrell, Spincer Harrell, Billy Melton, Lamar Dorman, Skip Martin, Dale Martin, Dwight Curtis, Debbie Curtis

Interests and Concerns

It is recognized that production agriculture is the primary source of economic stability in the Wolf Lake Watershed. Therefore, the WIT and stakeholders shall only support activities that improve the overall natural resources of the watershed while promoting a more sustainable future for agriculture.

Sedimentation and erosion were the WIT's primary concern, followed by other water quality issues such as legacy pesticides, low dissolved oxygen, organic enrichment, and nutrients. Additional concerns include fecal coliform, threatened and endangered species, lake depth, fisheries, housing development, garbage dumping, and lake access.+

Over the course of three WIT meetings that involved natural resource agencies, farmers, landowners, and homeowners, a consensus was easily reached naming sedimentation as the primary concern in the Wolf Lake watershed. Head cutting, sheet erosion, ditch scouring, and gully formation on agricultural lands were all recognized as major contributors to sediment loading in the watershed. Wave action and subsequent bank erosion due to heavy boat traffic was also noted as a contributor of sediment. Other water quality parameters such as low dissolved oxygen, organic enrichment, nutrients, and legacy pesticides were also listed as concerns. However, it was recognized that reduced sediment loading would also address these other concerns to a certain extent.

Wolf Lake has traditionally been an excellent fishery, both for bass and crappie. Much concern has been expressed for the sustainability and management of this productive fishery. The invasion of silver carp during periods of high water and hydraulic connectivity to the Yazoo River was also mentioned as a concern.

Due to its close proximity to both Yazoo City and Jackson, Wolf Lake is rapidly becoming a popular location for both year-round residences and weekend lake houses. This increased demand has driven up local property values and concern that future construction is done in a sustainable manner with minimal impacts to the natural resource base. Another concern associated with existing and future lakeside development is the amount of fecal coliform entering the lake through failing or deficient septic systems.

Priority Concerns

Table 1. Priority Concerns in Wolf Lake Watershed

<i>Status</i>	<i>Description</i>
Concern: Cause: Location: Extent:	Sedimentation/Turbidity Nonpoint source agricultural runoff due to erosion Impairment occurs in Wolf Lake Entire watershed
Concern: Cause: Location: Extent:	Low DO/Organic Enrichment/Nutrients Nonpoint source agricultural runoff and/or failing septic systems Impairment occurs in Wolf Lake 1,117 acres of surface water
Concern: Cause: Location: Extent:	Fish Advisories Soil persistence of legacy pesticides (DDT & Toxophene) Impairment occurs in Wolf Lake 1,117 acres of surface water
Concern: Cause: Location: Extent:	Fisheries Management Decline of game fish populations Impairment occurs in Wolf Lake 1,117 acres of surface water
Concern: Cause: Location: Extent:	Housing Development Growing interest in recreational and permanent residences The banks of Wolf Lake Entire watershed

Wolf Lake Resources

Water Quality Standards

The water use classification for all perennial surface waters of this watershed stated in the Mississippi water quality regulations is Fish and Wildlife Support. The designated beneficial uses for these waters are Aquatic Life Support (MDEQ 2003a). Table 2 lists the numeric water quality criteria applicable to Wolf Lake watershed perennial surface waters (MDEQ 2002).

Table 2. Water quality criteria for Wolf Lake watershed.

Parameter	Criteria
Dissolved Oxygen	5.0 mg/L daily average, 4.0 mg/L instantaneous
pH	Between 6.0 and 9.0 su
Temperature	32.2 deg C
Fecal coliform	May – October: geometric mean of 200 per 100 mL, 400 per 100 mL less than ten percent (10%) of the time during a 30 day period. November – April: geometric mean of 2000 per 100 mL, 4000 per 100 mL less than ten percent of the time during a 30 day period.
Specific conductance	1000 uohms/cm
Dissolved Solids	750 mg/L monthly average, 1500 mg/L instantaneous

Mississippi’s water quality standard for sediment is narrative and reads as follows: “Waters shall be free from materials attributed to municipal, industrial, agricultural or other discharges producing color, odor, taste, total suspended or dissolved solids, sediment, turbidity, or other conditions in such degree as to create a nuisance, render the waters injurious to public health, recreation or to aquatic life and wildlife or adversely affect the palatability of fish, aesthetic quality, or impair the waters for any designated use” (MDEQ 2002).

Current Condition

Surface Water Quality

There is not a routine water quality monitoring station in the Wolf Lake watershed. One major water quality study was conducted by FTN Associates in 1991. Data from this study indicates that:

- Broad Lake was more turbid than Wolf Lake
- Algae populations were low in the spring and summer due to turbid conditions
- Whole fish analyses found DDT to be persistent in Wolf Lake
- It was recommended that bottom sediments not be disturbed due to the potential for mercury and PCB contamination
- Wolf Lake had a tendency to be more nutrient rich than other Delta Lakes

- The majority of nitrogen, phosphorous, and sediments loads were associated with agricultural activities

Although the FTN study is the most recent, other studies on pesticides, water quality, and fisheries have been completed. Summaries of these studies can be found in the 1991 FTN report on pages a.10-1 – a10.4.

The Wolf Lake watershed has been evaluated as impaired (not based on water quality measurements) and is included on the Mississippi 303 (d) List (MDEQ 2004a). Table 3 summarizes the listings from the 2002 303(d) List.

Table 3. 2002 303(d) Listings for Wolf Lake watershed

Water Body	Beneficial Use	Impairment
Wolf Lake	Aquatic Life Support	Sediment/Siltation and Nutrients
Wolf Lake Drainage Area	Aquatic Life Support	Sediment/siltation, Organic Enrichment/Low DO, and Nutrients

Groundwater Resources

The majority of drinking water use in this watershed is supplied by groundwater from the deep aquifer. The majority of agricultural water use in this watershed is supplied by groundwater from the shallow alluvial aquifer. No issues have yet been raised with regard to the quality of groundwater in this watershed. Declining groundwater levels in the alluvial aquifer are an issue in the watershed (MDEQ 2000).

TMDLs

Wolf Lake has been included and listed as impaired on Mississippi’s 303(d) List. One total maximum daily load study (TMDLs) has been completed for sediment/siltation, organic enrichment/low dissolved oxygen (MDEQ 2003a). Although nutrients are listed as an impairment, no TMDL has been developed.

Nonpoint sources of sediment (due to erosion) are the primary sources of concern. Sources identified in the TMDL include agriculture, aquaculture, and the natural landscape of which ridge and swell topography is common. Wet weather conditions are critical for sediment loading to the water bodies. The target measure of sediment retention would reduce sediment yields to a range of 0.23 to 0.15 tons per acre per year. Meeting this goal requires a reduction in sedimentation rates on cultivated agricultural lands between 31 and 57 percent from current conditions (MDEQ 2003a).

The TMDL also addresses organic enrichment and low dissolved oxygen listings for Wolf Lake (MDEQ 2003a). There are currently no numerical criteria for nutrient concentrations in Mississippi surface waters, so a TMDL for nutrients was not developed.

However, nutrient contributions to oxygen demand were included in the dissolved oxygen TMDL. Nonpoint organic sources are considered to be the primary source of oxygen demand in the Wolf Lake system. Given this, the TMDL calls for a 48% reduction in the total ultimate biochemical oxygen demand (TBODu) to reach the target DO value of 5.0 mg/L (MDEQ 2003a).

Fisheries, Plant, and Wildlife Resources

The only federally threatened species that may occur in the watershed is the Louisiana black bear (*Ursus americanus luteolus*). Although not federally listed, the State of Mississippi has listed the Bald Eagle (*Haliaeetus leucocephalus*), Pyramid Pigtoe (*Pleurobema rubrum*), and the Southern Redbelly Dace (*Phoxinus erythrogaster*) as endangered and these species have the potential to be present in the Wolf Lake watershed.

All water bodies in the Delta, including those in the Wolf Lake watershed, were placed under fish consumption advisory in 2001 for the legacy pesticides DDT and Toxaphene. The fish covered by the advisory were carp, buffalo, gar, and non-farm raised catfish over 22 inches (MDEQ 2001).

Since 1985, bottomland wetland and forest habitats have been restored in the watershed through USDA Farm Bill Programs such as CRP and WRP. It is estimated that approximately 10% of the watershed has been restored to bottomland hardwood forests in the past 10 years using these federal cost-share programs. Because of increased forest lands and a moderate amount of natural wetlands, the Wolf Lake Watershed has fair populations of numerous consumptive wildlife species such as white-tailed deer, migratory waterfowl, and small game. The eastern wild turkey is also making a humble living in parts of the watershed.

Fishing far surpasses hunting as an outdoor recreational activity in the watershed. Wolf Lake is well known for being an excellent crappie and bass fishery. Bluegill can't be discounted either, a full moon during the hot summer months usually results in many fisherman pursuing this species rather than bass or crappie. Overall, the fishery appears to be in good health. However there is much concern over the sustainability of this fishery as its popularity grows.

Watershed Implementation Plan (WIP)

Goal

The primary goal of this watershed implementation plan is to achieve or exceed water quality parameters set forth by the TMDL, thereby removing the potential for regulatory actions to be carried out in this watershed. This can only be accomplished through the reduction of named pollutants in the watershed. Ultimately, Wolf Lake must reach and maintain the MDEQ designated use for Aquatic Life Support. The goals of this watershed plan can be achieved through the implementation of agricultural BMPs. Priority Concerns (Table 1) that do not directly identify 303(d) listed impairments or TMDLs in the watershed may also be addressed by this watershed plan because it is comprehensive in nature. But it must be noted that these concerns are secondary objectives. Most importantly, these objectives can't be achieved without the support of local landowners and farmers.

Sediment/Turbidity

Participants

Delta F.A.R.M. and Delta Wildlife, Inc.
Mississippi Department of Environmental Quality (MDEQ)
Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP)
Mississippi State University, College of Forest Resources, Dept. of Wildlife & Fisheries
USDA Natural Resources Conservation Service (NRCS)
U.S. Fish and Wildlife Service (USFWS)
USDA-ARS National Soil Sedimentation Laboratory (Sedimentation Lab)
USDA Farm Service Agency (FSA)
U.S. Geological Survey (USGS)
Yazoo-Mississippi Delta Joint Water Management District (YMD)
The Nature Conservancy (TNC)
FTN Associates
U.S. Environmental Protection Agency (EPA)
United States Army Corp of Engineers (USACE)
Landowners/Stakeholders

Implementation/Action

Silt and soil that choke drainage, stress fisheries, increase turbidity, and shorten the overall life span of Wolf Lake come from adjacent cropland, bank sloughing, and head cutting due to flooding. All causes can be addressed by programs authorized and funded through the Conservation Title of the Farm Bill. Programs such as the Environmental Quality Incentives Program (EQIP), Conservation Reserve Program (CRP), Wildlife Habitat Incentives Program (WHIP), and Wetland Reserve Program (WRP) all provide significant financial incentives to help landowners address sedimentation issues in Wolf Lake. The USDA NRCS and/or FSA administers these programs and also provides

significant technical assistance opportunities to private landowners. Those landowners concerned about sedimentation in Wolf Lake can often find technical and financial assistance by simply contacting their local county USDA Service Center. Funding has also been authorized by Section 319 of the Clean Water Act to address non-point source pollutants, such as sediment, in the Wolf Lake watershed. These funds are routed through MDEQ and made available to directly address water quality impairments.

Technical assistance to address sedimentation in the Wolf Lake Watershed can be provided by Delta F.A.R.M., Sedimentation Laboratory, Mississippi State University Extension Service, USACE, and MDEQ.

If installed and maintained properly, the following Best Management Practices could be used to reduce sedimentation by 35% - 67% in the Wolf Lake Watershed.

- Water Control Structures (200 units minimum)
- Rip-Rap weirs (20 sites minimum)
- Bank Stabilization (20 sites minimum)
- Wetland Construction and Hydrology Restoration (50 acres)
- Bank Stabilization (20 sites minimum)
- Riparian Buffers and Grass Filter Strips (100 acres minimum)

Budget

Projected costs for implementing practices that address sedimentation and siltation can be found in Table 4.

Table 4. Projected Costs for Agricultural Best Management Practices

Practice	Unit Cost (w/installation)	Number of Units	Total Cost
Water Control Structures	\$6,200	200	\$1,240,000.00
Rip-Rap Weirs	\$16,125	20	\$322,500.00
Wetland Construction	\$1,500/acre	50/acres	\$75,000.00
Bank Stabilization	\$3,750.00/site	20/sites	\$75,000.00
Riparian Buffers	\$950/acre	100/acres	\$95,000.00
Total			\$1,807,500.00

Low DO, Organic Enrichment, Nutrients

Participants

Delta F.A.R.M. and Delta Wildlife, Inc.
Mississippi Department of Environmental Quality (MDEQ)
Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP)
Mississippi State University, College of Forest Resources, Dept. of Wildlife & Fisheries
USDA Natural Resources Conservation Service (NRCS)
U.S. Fish and Wildlife Service (USFWS)
USDA-ARS National Soil Sedimentation Laboratory (Sedimentation Lab)
USDA Farm Service Agency (FSA)
U.S. Geological Survey (USGS)
Yazoo-Mississippi Delta Joint Water Management District (YMD)
The Nature Conservancy (TNC)
FTN Associates
U.S. Environmental Protection Agency (EPA)
United States Army Corp of Engineers (USACE)
Landowners/Stakeholders

Implementation/Action

Nutrients, low DO, and organic enrichment are also attributed to non-point agricultural run-off. Similar to sediment, organic enrichment and nutrients can be significantly reduced by using those same BMPs listed in Table 4. By implementing these BMPs, nutrients can be reduced by approximately 70% (Freedman et al. 2003, Klapproth and Johnson 2000). It is expected that organic enrichment and DO will react similarly.

Budget

Projected costs for implementing agricultural BMPs that reduce these pollutants are listed in Table 4.

Fish Advisories

Participants

Delta F.A.R.M. and Delta Wildlife, Inc.
Mississippi Department of Environmental Quality (MDEQ)
Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP)
Mississippi State University, College of Forest Resources, Dept. of Wildlife & Fisheries
USDA Natural Resources Conservation Service (NRCS)
U.S. Fish and Wildlife Service (USFWS)
USDA-ARS National Soil Sedimentation Laboratory (Sedimentation Lab)
USDA Farm Service Agency (FSA)
U.S. Geological Survey (USGS)
Yazoo-Mississippi Delta Joint Water Management District (YMD)
The Nature Conservancy (TNC)
FTN Associates
U.S. Environmental Protection Agency (EPA)
United States Army Corp of Engineers (USACE)
Landowners/Stakeholders

Implementation/Action

Fish advisories stem from the persistence and existence of levels of legacy pesticides like DDT and Toxaphene in fish tissue. The EPA sets tolerance levels for said fish advisories and MDEQ enforces these advisories. The Fisheries Bureau of MDWFP also assists MDEQ with educational processes associated with fish advisories.

The goal of this action item is to remove fish consumption advisories for DDT and Toxaphene, and reduction of water column concentrations to the DDT human health and aquatic organism standard, and the Toxaphene fresh water chronic standard. The methods proposed for achieving these targets included implementation of BMPs to reduce sediment loading to water bodies (pesticides are present in basin soils) and natural attenuation (historical pesticide monitoring data from the Yazoo River basin indicate a decreasing trend in pesticide concentrations in soils, fish tissue, and water) (MDEQ 2003b). Therefore, those BMPs listed in Table 4 will also serve to achieve this goal.

Budget

Projected costs for implementing BMPs that would reduce the loading of legacy pesticides are listed in Table 4.

Fisheries Management

Participants

Mississippi Department of Wildlife, Fisheries, and Parks
Mississippi State University, College of Forest Resources, Dept. of Wildlife & Fisheries

Implementation/Action

MDWFP Bureau of Fisheries and Mississippi State University will take an active role in ensuring the sustainability of the Wolf Lake fishery and documenting any response by the fish community to agricultural BMP's. MDWFP has proposed to map the lake's depth profile as a part of a comprehensive, statewide effort to provide new lake maps to the public. This project is ongoing. Furthermore, it is proposed that a fisheries management plan be developed, implemented and its subsequent results monitored. Management actions may include the implementation of specific creel and slot sizes on certain species of game fish like white crappie and black bass. Fish community monitoring will be carried out by MSU Department of Wildlife and Fisheries and the Mississippi Department of Wildlife, Fisheries and Parks. Mississippi State University will provide students/technicians to work with MDWFP personnel, using MDWFP provided electrofishing/sampling equipment. Working in conjunction with the water quality monitoring sampling sites will be selected that are more and less impacted and sites that likely will experience water quality improvements as a result of practices implemented in the watershed. These targeted sites will be combined with randomly selected sites to assess the fish community and the fishery. Data collected will include the information necessary for stock assessments by MDWFP as well as data on species composition, richness and diversity.

Budget

Projected costs associated with fisheries management on Wolf Lake are found in Table 5.

Table 5. Projected Costs for Fisheries Management on Wolf Lake

Practice	Unit Cost (w/installation)	Number of Units	Total Cost
Monitoring			\$13,622.00
Mgt. Plan Development	\$266/day	7	\$1,860.00
Mapping	\$554/day	4	\$2,216.00
TOTAL			\$17,698.00

Future Housing Development

Participants

Delta F.A.R.M.
Delta Wildlife
Mississippi Department of Environmental Quality (MDEQ)
Private Landowners and Homeowners

Implementation/Action

Concern exists among residents and stakeholders in the Wolf Lake watershed of future development and the possible impacts on the landscape and water quality. Sediment loading from construction sites is of minimal concern now, but as more development takes place it could present a problem in the future. If local stakeholders are willing, the participants plan to work with residents in the watershed and provide any assistance with developing a homeowners association or other organization of that nature. Once established, MDEQ can provide guidance and technical assistance on how development can occur with minimal impacts on water quality and the environment.

Budget

Because only technical assistance and advice would be provided, no budget was developed for this item.

Education Strategy

Goal

The overall objective of the education strategy in the Wolf Lake watershed is to develop an atmosphere that promotes sustained, long-term protection and improvement of aquatic resources in the watershed. Specific objectives of education efforts in the watershed include the following.

- Increase farmer and landowner awareness of the value of clean water and their responsibility to insure others downstream have clean water.
- Increase farmer and landowner knowledge of programs that offer financial and/or technical assistance to plan, design, and/or install BMPs to improve water quality.
- Increase public awareness of the value of clean water.

- Increase public awareness of how common activities affect water quality and critical flora and fauna.
- Increase public awareness of how BMPs can be used to reduce negative water quality and habitat affects.
- Increase public awareness of the long term environmental and economic advantages of protecting and improving water quality and habitat in the Wolf Lake watershed.

Participants

Delta F.A.R.M.
Delta Wildlife
Mississippi Department of Environmental Quality (MDEQ)

Implementation/Action

Education and outreach are part of Delta Wildlife and Delta F.A.R.M.'s mission. Delta Wildlife publishes a quarterly magazine as Delta F.A.R.M. publishes a quarterly newsletter for members. Delta Wildlife and F.A.R.M. also make educational presentations at schools and to various civic organizations. A portion of these efforts will be targeted towards landowners and residents in this watershed. This implementation plan will also be available on both organization's website along with information for landowners in the watershed who wish to participate. Additionally, bumper stickers will be designed and offered free of charge to increase awareness and stakeholder participation in the WIP process. Press releases and additional information will made available to the public by MDEQ on their website and other avenues. Articles in popular magazines such as the Mississippi Sportsman will also serve to educate the general public on activities occurring in the watershed.

Evaluation

Monitoring

An automated, long term monitoring station will be constructed at a location to be determined in cooperation with Delta F.A.R.M., Mississippi Department of Environmental Quality and Mississippi State University. This system will be built around Eureka Environmental Manta multi-probe with their Eagle Eye remote data telemetry system. At a minimum the remote monitoring station will provide near real time monitoring of water temperature, turbidity (EPA method 180.1) and water level. Data will be retrieved from the unit either by satellite or cell phone telemetry based on cost and service availability. A specific maintenance and calibration schedule will be determined in conjunction with the manufacturer's recommendations and experience developed operating the station.

In addition to the permanent water quality monitoring station described above, regular (monthly) sampling will occur to monitor turbidity, total suspended solids, water temperature, dissolved oxygen pH, and specific conductance of surface waters. All parameters, except for total suspended solids, will be measured in-situ using a flow-through system (Eureka Manta multi-probe) while traveling along the length of the lake. This system will pump small volumes of lake water from the lake, through a manufacturer supplied flow-cell which houses the sensors, and back to the lake. Simultaneous recording of position (GPS coordinates) and these parameters will allow the assembly of a geo-referenced set of water quality data that can be correlated to specific management practices implemented in the basin. Additionally we will be able to “map” the distribution of water quality conditions across the surface of the lake using this data. Finally water samples will be collected from 20 randomly selected locations monthly in conjunction with the surface water turbidity/water quality measurements. These 20 sites will be changed monthly to ensure appropriate representation of the conditions across the surface of the lake. All locations will be identified and reported to MDEQ using GPS. Samples will be brought back and analyzed at the Mississippi State University Department of Wildlife and Fisheries Water Quality Laboratory.

Assessment of progress

Progress for this watershed implementation plan will be assessed and evaluated five (5) years (2008-2012). The following criteria will be used to determine progress toward plan goals:

- Reduction of sediment load by at least 6.2%/year
- Reduction of TBODu by 9.6%/year
- Achievement of all Mississippi water quality criteria.

Plan Evaluation Procedure

This watershed implementation plan will be evaluated and revised in 2012. The evaluation of this plan will be organized by the Wolf Lake Watershed Implementation Team beginning in January 2013. At this time the Implementation Team will develop a detailed schedule for review and revision of this watershed implementation plan. The

Implementation Team members will be responsible for notifying their stakeholders of the opportunity to propose changes to the watershed implementation plan. One month will be allowed for notification of stakeholders.

The plan will be evaluated by the Team, or their designee, and any interested stakeholders. One month will be allowed for evaluation and submittal of comments. Therefore, comments will be due two months after the evaluation procedure is initiated. The plan will be evaluated in two ways. First, to determine if the plan goals have been achieved. Second, to determine if it reflects the current condition of the watershed, state of science, and issues in the watershed.

Plan Revision Procedure

After evaluation, MDEQ will prepare a revised watershed implementation plan incorporating the changes requested by the reviewers. At this point it may be necessary to call a meeting to reconcile any conflicting comments or requests for change.

If the evaluation criteria are all being met in Wolf Lake surface waters, the watershed implementation plan will be revised to address a different restoration issue or issues, or to protect the quality of the watershed. If the evaluation criteria are not being met, the approach for restoring Wolf Lake watershed quality will be revised based on knowledge that has been gained since 2008.

The draft watershed implementation plan will be submitted to the Implementation Team, and all others who submitted comments. Within two weeks of receiving the draft watershed implementation plan, the Implementation Team will notify their stakeholders of the availability of the revised watershed implementation plan for stakeholder review. One month will be allowed for review of the draft. Comments will be due at the end of this review period.

Within a month after the comments on the draft watershed implementation plan are received, MDEQ will prepare a final watershed implementation plan. The final watershed implementation plan will be submitted to the Implementation Team for review and approval. After the final watershed implementation plan has been approved, the Implementation Team will notify their stakeholders of the completion and availability of the final plan for use as a guide to watershed restoration and protection activities.

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Appendix

APPENDIX A – Stressors

<i>Status</i>	<i>Description</i>
Stressor: Justification: Location: Extent:	<i>Sedimentation/Turbidity</i> Nonpoint source agricultural runoff due to erosion Impairment occurs in Wolf Lake Entire watershed
Stressor: Justification: Location: Extent:	<i>Low DO/Organic Enrichment/Nutrients</i> Nonpoint source agricultural runoff and/or failing septic systems Impairment occurs in Wolf Lake 1,117 acres of surface water
Stressor: Justification: Location: Extent:	<i>Fish Advisories</i> Soil persistence of legacy pesticides (DDT & Toxophene) Impairment occurs in Wolf Lake 1,117 acres of surface water
Stressor: Justification: Location: Extent:	<i>Fisheries Management</i> Decline of game fish populations Wolf Lake 1,117 acres of surface water
Stressor: Justification: Location: Extent:	<i>Housing Development</i> Growing interest in recreational and permanent residences The banks of Wolf Lake Entire watershed

APPENDIX B – Checklist of WIP Elements

Required Watershed Elements	Located Reference
<p>1a. Sediment/Siltation is the primary concern of both regulatory agencies and stakeholders. Sediment, erosion, and all other contributors to sediment loading must be stopped through the used of BMPs. Primary contributor is non-point source agricultural runoff.</p> <p>1b. Low DO, Organic Enrichment, Nutrients. Wolf Lake is listed for Organic Enrichment and Nutrients although all of the causes and standards are not known. Agricultural BMP’s should address these issues along with sediment.</p> <p>1c. Fish Advisories/Legacy Pesticides. DDT can be found in fish tissue and soils within the watershed. The only course of action is to further reduce sedimentation by using agricultural BMPs.</p> <p>1d. Fisheries Management. MDWFP and MSU will continue to monitor the fishery and develop lake depth maps, management plans, and determine if agricultural BMP’s have an impact on the fish community.</p> <p>1e. Housing Development. Delta F.A.R.M. and MDEQ will work with local stakeholders to address these concerns.</p>	Table 1
Attain water quality parameters as stated by TMDL’s	Page 14-15
<p>Water Control Structures (200 units minimum)</p> <p>Rip-Rap weirs (20 sites minimum)</p> <p>Bank Stabilization (20 sites minimum)</p> <p>Wetland Construction and Hydrology Restoration (50 acres)</p> <p>Bank Stabilization (20 sites minimum)</p> <p>Riparian Buffers/Grass Filter Strips (100 acres minimum)</p>	Page 17
<p>Ag BMP \$1,807,500.00</p> <p>Fisheries Management \$17,698.00</p> <p>TOTAL \$1,825,198.00</p>	Tables 4 and 5
The overall objective of the education strategy in the Wolf Lake watershed is to develop an atmosphere that promotes sustained, long-term protection and improvement of aquatic resources in the watershed.	Page 22
Implementation will be dependent on the cooperation of the private landowners.	Page 16
There are current plans for water quality monitoring in Wolf Lake Watershed.	Page 23

