

STEELE BAYOU WATERSHED IMPLEMENTATION PLAN

**FINAL
July 24, 2009**

STEELE BAYOU WATERSHED IMPLEMENTATION PLAN

Prepared for:

Yazoo River Basin Team
Mississippi Department of Environmental Quality

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Mission Statement

The mission of the Steele Bayou 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 Steele Bayou WIT including: Delta F.A.R.M., Delta Wildlife, Inc., Mississippi Department of Environmental Quality, United States Army Corp of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, USDA Natural Resources Conservation Service, Mississippi Department of Wildlife, Fisheries, and Parks, Mississippi Levee Board, Mississippi Lower Delta Partnership, Mississippi State University, Yazoo-Mississippi Delta Joint Water Management District, and all other partnering agencies, private landowners, farmers, and business owners in the watershed.

Steele Bayou Watershed Description

Steele Bayou drains approximately 202,617 acres of the Yazoo River basin in portions of Washington, Issaquena, Sharkey, and Warren counties in west central Mississippi (MDEQ 2003a). We estimate that approximately 4,202 people lived in this watershed in 2000 (based on Census 2000 data for Washington, Issaquena, Sharkey, and Warren Counties obtained from MARIS). The towns of Cary and Mayersville are in the Steele Bayou watershed and in 1993 land use was primarily agricultural (71.5%) and forestland (16.5%) (MDEQ 2003a). Crops produced in the watershed include corn, soybeans, cotton, wheat, catfish, rice, and milo.

Figure 1. Location of the Steele Bayou Watershed at the State level.

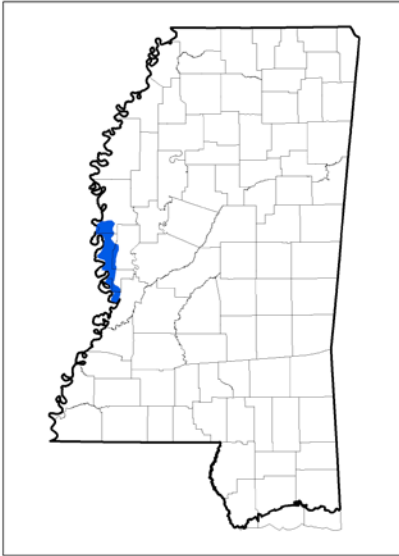
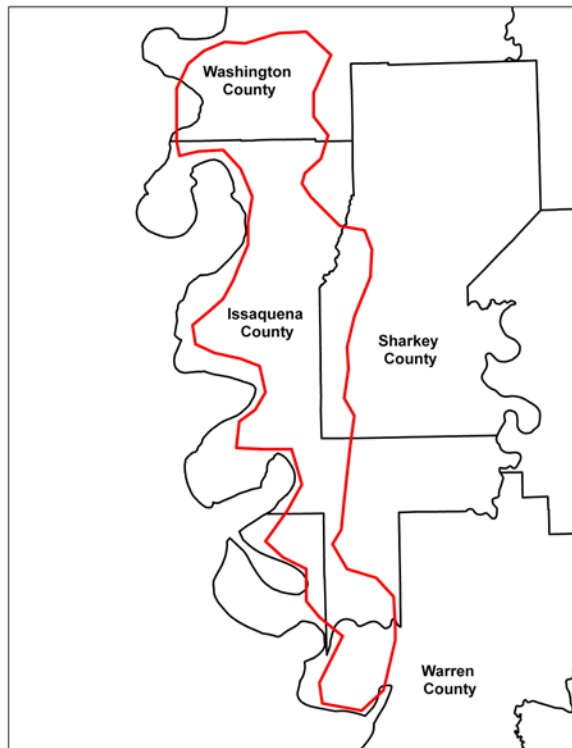


Figure 2. Location of the Steele Bayou Watershed at the County level.



The watershed is underlain by Mississippi River alluvium. The topography of the watershed is primarily flat, with the main topographic relief provided by river terraces (MDEQ 2000). Commerce-Tunica-Bowdre or Sharkey-Dowling-Tunica soil associations are prevalent throughout the watershed. 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).

Steele Bayou meanders through the southwestern portion of the Mississippi Delta draining agricultural and forestland east of the mainline Mississippi River Levee and west of the Deer Creek watershed. Steele Bayou lies in a natural “sump” or low spot created by hundreds of years of floodwaters dropping coarse textured sediments on the banks of Deer Creek and the Mississippi River, thus increasing the elevation of adjacent lands. The area between these natural “fronts” or “ridges” served as a basin, collecting fine textured sediments and excess floodwaters. Much of Steele Bayou follows abandoned meanders of the Mississippi River channel created 700 to over 1000 years ago. As forested lands were cleared for agriculture and the need for improved drainage increased, the United State Army Corp of Engineers dredged and re-channelized Steele Bayou increasing the water storage and flow capacity.

Approximately 10,056 acres of wetlands occur in the watershed. Water levels in the Bayou are maintained by a series of weirs, the Steele Bayou Control Structure, and the shallow Mississippi River alluvial aquifer that underlies the watershed. 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. These withdrawals have resulted in ground water level declines in this aquifer. Deep, confined aquifers are the primary drinking water source in the watershed and are not affected by the alluvial aquifer. These confined aquifers are generally not susceptible to contamination (MDEQ 2000).

Watershed Implementation Team

Formal members of the Steele Bayou Watershed Implementation Team are listed below and represent various professional resource agencies, public and private landowners with interests in 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

- Garry Lucus, Kevin Brunke, Jackie Fleeman, Steven Chandler

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

- Todd Teitjen, Eric Dibble

USDA Natural Resources Conservation Service

- Phillip Barbour, Mike Oliver

U.S. Fish and Wildlife Service

- Lloyd Inmon, Bo Olswanger, Mike Yelverton

U.S. Geological Survey

- Richard Rebich, Mike Runner

Yazoo-Mississippi Delta Joint Water Management District

- Dean Pennington

The Nature Conservancy

- Stacey Shankle

Mississippi Levee Board

- Peter Nimrod, Bobby Thompson

Mississippi Lower Delta Partnership

- Meg Cooper

U.S. Environmental Protection Agency

- Kenneth Dean

United States Army Corp of Engineers

- Dave Johnson, Basil K. Arthur, Philip Hollis, Karen Myers, Mike Wilson

Delta State University

- Jeff Duguay, Chuck Smithart

Landowners

- Clark Carter, Chris Martin, Jason Wade, Bert Darnell, Gene Boykin, Roy Sias, James Hamlin, Charles Wessinger, State of Mississippi

Interests and Concerns

It is recognized that production agriculture is the primary source of economic stability in the Steele Bayou 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 a common theme among both the WIT and stakeholders. Both groups recognized that multiple resource concerns would benefit by addressing sedimentation and erosion in the watershed. These concerns included fisheries, irrigation water storage capacity, drainage, and aesthetics. Other common interests included noxious aquatic weeds such as water hyacinth (*Eichornia crassipes*) and alligatorweed (*Alternanthera philoxeroides*), and the overall fisheries condition including advisories for legacy pesticides.

In addition to sedimentation and erosion, several other concerns were listed by water quality resource agencies on the WIT. These concerns include, low dissolved oxygen, organic enrichment, and nutrients. The Mississippi Natural Heritage Program identified 12 threatened or endangered species in the watershed, including the Louisiana Black Bear (*Ursus Americanus luteolus*) and the Bald Eagle (*Haliaeetus leucocephalus*). Fisheries biologists were especially concerned with the presence of silver carp (*Hypophthalmichthys molitrix*).

Priority Concerns

Table 1. Priority Concerns in Steele Bayou Watershed

<i>Status</i>	<i>Description</i>
Concern: Cause: Location: Extent:	<i>Sedimentation/Turbidity</i> Nonpoint source agricultural runoff due to erosion Steele Bayou Entire watershed
Stressor: Justification: Location: Extent:	<i>Low DO/Organic Enrichment</i> Nonpoint source agricultural runoff Steele Bayou Approximately 60 miles of surface water
Concern: Cause: Location: Extent:	<i>High Nutrient Levels</i> Nonpoint source agricultural runoff Steele Bayou Approximately 60 miles of surface water
Concern: Cause: Location: Extent:	<i>Fish Advisories</i> Soil persistence of legacy pesticides (DDT & Toxaphene) Steele Bayou Entire watershed
Concern: Cause: Location: Extent:	<i>Noxious Aquatic Vegetation</i> Natural dispersal Steele Bayou Steele Bayou Channel, Black Bayou, Main Canal
Concern: Cause: Location: Extent:	<i>Fisheries Management</i> Presence of silver carp Steele Bayou Lower Steele Bayou Channel

Steele Bayou 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 use for these waters are Aquatic Life Support (MDEQ 2003). Table 2 lists the numeric water quality criteria applicable to Steele Bayou watershed perennial surface waters (MDEQ 2002).

Table 2. Water quality criteria for Steele Bayou 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 2003).

Current Condition

Surface Water Quality

Although there is not a routine water quality monitoring station in Steele Bayou watershed, several projects and studies have documented water quality parameters over the years. The Vicksburg District Corps of Engineers began collecting various sediment and nutrient related data in the 1990’s with the implementation of the Upper Steele Bayou Project. In January 2007, USEPA published a “Yazoo Basin Water Quality Model Parameters Study”. Many analytical parameters such as suspended sediment, nutrients, dissolved oxygen, sediment oxygen demand, and biological oxygen demand were recorded along with physical characteristics including channel width/ depth and light penetration (USEPA 2007).

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

In the past, the Steele Bayou watershed has been included on Mississippi 303(d) List. However, two total maximum daily load studies (TMDLs) have been completed, one addressing sediment/siltation, and one addressing nutrients, thus subsequent removal from the 2008 303(d) List.

A TMDL addressing sediment/siltation impairment listings for Steele Bayou has been completed and approved by U.S. EPA (MDEQ 2003a). However, this TMDL does not apply to segment MS404E of Steele Bayou of which this plan pertains to.

A TMDL addressing total nitrogen and total phosphorous for selected large rivers in the Delta, including segment MS404E of Steele Bayou, has been completed and approved by U.S. EPA (MDEQ 2008). There are currently no numerical criteria for nutrient concentrations in Mississippi surface waters. However, a Nutrient Task Force (NTF) under the direction of MDEQ is working on the development of such criteria. For water bodies on the west side of the Delta, an annual concentration of 1.05 mg/l (total nitrogen) and 0.16 mg/l (total phosphorous) are applicable targets. These are preliminary targets and subject to revision after the development of numeric nutrient criteria (MDEQ 2008).

Fisheries, Plant, and Wildlife Resources

The only federally endangered species listed by the Mississippi Natural Heritage Inventory for the Steele Bayou watershed is pondberry, (*Lindera melissifolia*) in Sharkey and Issaquena County. The only federally threatened species that may occur in the Sharkey-Issaquena-Warren County portion of the watershed is the Louisiana black bear (*Ursus americanus luteolus*). These species have the potential to be present in the Steele Bayou watershed. There are also 10 “state listed” species of concern for Issaquena, Sharkey, Washington, and Warren counties included in the Natural Heritage Inventory.

Table 3. Species of Special Concern in Steele Bayou Watershed

Scientific Name	Common name	Status
<i>Scaphirhynchus albus</i>	Pallid Sturgeon	State Listed
<i>Ursus americanus luteolus</i>	Louisiana Black Bear	Federally Threatened
<i>Actinonaias ligmentina</i>	Mucket	State Listed
<i>Pleurobema rubrum</i>	Pyramid Pigtoe	State Listed
<i>Mycteria americana</i>	Wood Stork	State Listed
<i>Puma concolor coryi</i>	Florida Panther	State Listed
<i>Falco peregrinus</i>	Peregrine Falcon	State Listed
<i>Haliaeetus leucocephalus</i>	Bald Eagle	State Listed
<i>Phoxinus erythrogaster</i>	Southern Redbelly Dace	State Listed
<i>Sterna antillarum athalassos</i>	Interior Least Tern	State Listed
<i>Thryomanes bewickii</i>	Bewick's Wren	State Listed
<i>Lindera melissifolia</i>	Pondberry	Federally Endangered

All water bodies in the Delta, including Steele Bayou, 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).

The Steele Bayou Watershed offers numerous opportunities for recreational hunting activities, especially waterfowl hunting. Two popular Wildlife Management Areas (WMA's) are located in the Watershed, Mahannah and Howard Miller. Both WMA's are intensively managed by Mississippi Department of Wildlife, Fisheries, and Parks and hold large numbers of waterfowl every winter. The southern portion of the watershed is heavily forested and holds significant populations of consumptive wildlife species such as white-tailed deer, eastern wild turkey, and other small game.

Fishing is only second to hunting as an outdoor recreational activity in the watershed. The lower portion of Steele Bayou holds a fair amount of blue, channel, and flathead catfish. The entire watershed contains abundant populations of rough fish such as gar, carp, and buffalo which provide ample opportunities for bowfisherman. Eagle Lake and Lake Washington are two very popular oxbow lakes in the lower Steele Bayou Watershed known for good bass, catfish, and crappie fishing, as well as recreational skiing, tubing, and boating.

Watershed Implementation Plan (WIP)

Goal

The goals of this watershed implementation plan are geared towards achieving compliance with TMDL's issued for Steele Bayou. This can only be accomplished through the reduction of named pollutants in the watershed. Ultimately, Steele Bayou must reach and maintain their MDEQ designated use for Fish and Wildlife Support. Many 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.

Sediment/Turbidity

Participants

Delta F.A.R.M.
Delta Wildlife, Inc.
Mississippi Department of Environmental Quality (MDEQ)
Private Landowners and Farmers
US Army Corps of Engineers (USACE)
US Environmental Protection Agency (USEPA)
Mississippi Department of Wildlife Fisheries and Parks
USDA Natural Resource Conservation Service
US Geological Survey (USGS)

Implementation/Action

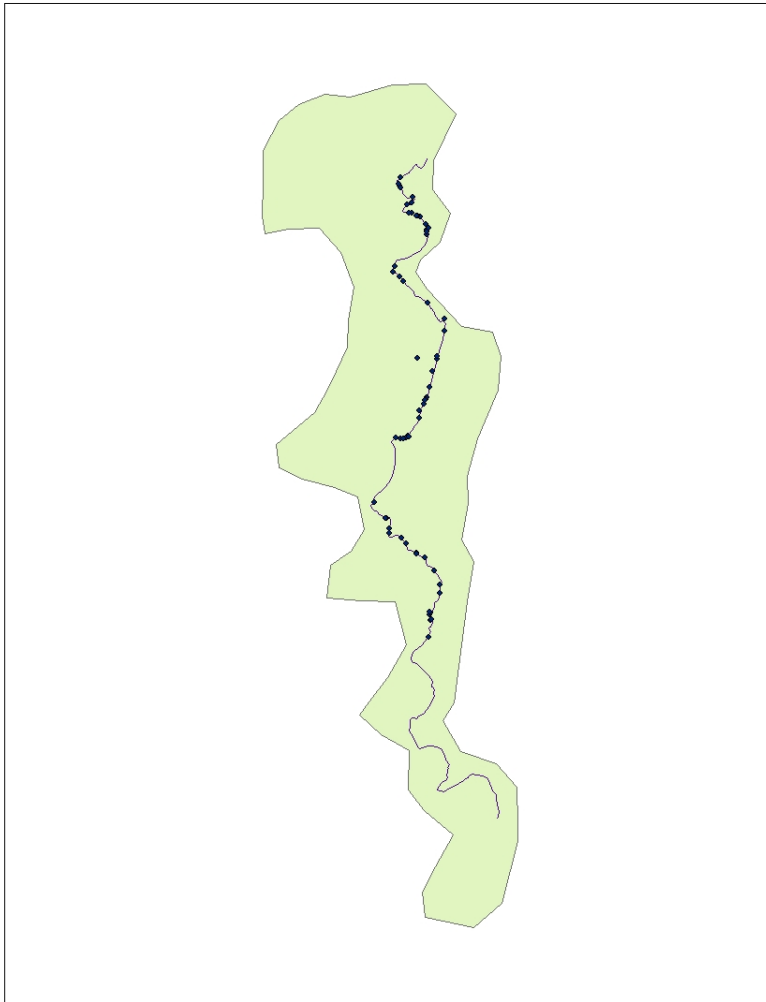
Silt and soil that choke drainage, stress fisheries, increase turbidity, and decrease water holding capacity in Steele Bayou come from adjacent cropland, bank sloughing, and head cutting due to flooding. All causes can be addressed by programs authorized and funded through the Conservation Title of the 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 Steele Bayou. 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 Steele Bayou can often find technical and financial assistance by simply contacting their local county USDA Service Center.

Technical assistance to address sedimentation in the Steele Bayou Watershed can be provided by Delta F.A.R.M., USACE, USEPA, and MDEQ. Implementation will be dependent on the cooperation of the private landowners.

If installed and maintained properly, the following Best Management Practices could be used to reduce sedimentation by 35% - 67% in the Steele Bayou Watershed. Figure 3 maps the location of these BMP's within the watershed.

- Structures for Water Control (25 units minimum)
- Large Overfall Pipes (39 units)
- Water Diversion Pads (1000 linear feet minimum)
- Bank Stabilization (as needed 4 minimum)
- Rip-Rap weirs (5 units minimum)

Figure 3. BMP locations in the Steele Bayou Watershed.



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	\$1,500	25	\$37,500
Large Overfall Pipes	\$101,721	36	\$3,661,956
Water Diversion Pads (feet)	\$3	1000	\$3,000
Bank Stabilization	\$4,000	6	\$24,000
Rip-Rap Weirs	\$15,400	5	\$77,000
Total			\$3,803,456

Low DO/Organic Enrichment

Participants

Delta F.A.R.M.
Delta Wildlife, Inc.
Mississippi Department of Environmental Quality (MDEQ)
Private Landowners and Farmers
US Army Corps of Engineers (USACE)
US Environmental Protection Agency (USEPA)
US Geological Survey (USGS)

Implementation/Action

Although there are many causes for low DO levels and high organic enrichment, it is thought that non-point sources from agricultural runoff is the primary cause in the Steele Bayou Watershed.

Implementing agricultural BMPs that reduce erosion and sedimentation improve DO levels and reduce organic enrichment. Therefore, the first course of action would be to implement those BMPs listed in the previous section as addressing sediment and turbidity.

Low DO levels can also be caused by low flow/shallow waters, algae blooms, and extreme water temperatures. These issues can be addressed by the installation of low water weirs to impound more water during periods of drought. Furthermore, flows could be augmented by other water sources as they have in other Yazoo Basin streams. MDEQ, USACE, USEPA, USGS, and YMD all have experience in these activities. Extreme water temperatures can also be mitigated by installing riparian forest buffers near waters to provide shading. The die-off of noxious aquatics may also cause low DO levels in the fall. However, an action plan to address noxious aquatics will be discussed in a later section.

High Nutrient Levels

Participants

Delta F.A.R.M.
Delta Wildlife, Inc.
Mississippi Department of Environmental Quality (MDEQ)
Private Landowners and Farmers
US Army Corps of Engineers (USACE)
US Geological Survey (USGS)
US Environmental Protection Agency (US EPA)

Implementation/Action

High nutrient levels are also attributed to non-point agricultural run-off. Similar to sediment and organic enrichment, nutrients can be significantly reduced by using those same BMPs listed in Table 5. By implementing these BMPs, nutrients can be reduced by approximately 70% (Freedman et al. 2003, Klapproth and Johnson 2000).

Fish Advisories

Participants

Delta F.A.R.M.
Delta Wildlife, Inc.
Mississippi Department of Environmental Quality (MDEQ)
Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP)
Private Landowners and Farmers
US Army Corps of Engineers (USACE)
US Environmental Protection Agency (USEPA)

Implementation/Action

Fish advisories stem from the persistence and existence of levels of legacy pesticides like DDT and Toxaphene in fish tissue. The USEPA 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 removal 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 2003d). Therefore, those BMPs listed in Table 5 will also serve to achieve this goal.

Noxious Aquatic Vegetation

Participants

Delta F.A.R.M.
Delta Wildlife, Inc.
Mississippi Levee Board
Mississippi Department of Transportation
Washington County Drainage District
The Nature Conservancy
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Mississippi State University
Mississippi Department of Environmental Quality
Mississippi Bureau of Plant Industry
Mississippi State University
USDA Agricultural Research Service

Implementation/Action

Water hyacinth (*Eichornia crassipes*) has been identified as the primary noxious aquatic weed found in the Steele Bayou Watershed. The rapid spread and growth of the aquatic plant has caused a great deal of concern among local stakeholders and natural resource agencies. In a span of three years water hyacinth has spread the entire length of Steele Bayou. Large, dense mats have completely blocked the Bayou immediately south of the Yazoo National Wildlife Refuge blocking all boat traffic, eliminating recreational opportunities, and decreasing dissolved oxygen levels. Chemical control measures using 2-4D can and will be used. The Mississippi Department of Transportation and the Washington County Drainage District will coordinate mechanical removal of water hyacinth. The Mississippi Levee Board will provide herbicide and application required for treatment while Delta F.A.R.M. will provide additional assistance with application.

The severe water hyacinth problems faced on Steele Bayou have prompted members of the Mississippi Department of Environmental Quality's Yazoo River Basin Team to form a work group focused on the detection, monitoring, and control of aquatic weeds. Representatives from multiple natural resource agencies plan to increase communication and cooperative efforts to combat aquatic invasive weeds throughout the entire Delta.

Budget

Projected costs for control of noxious aquatic vegetation are listed in Table 7.

Table 5. Project Costs for Noxious Aquatic Weed Control

Practice	Unit Cost	# of Units	Total Cost
Herbicide	\$27/gallon	200 gallons	\$5,400.00
Herbicide Treatments	\$425/hour	90 hours	\$38,250

Mechanical Removal	\$500/hour	25 hours	\$12,500
Total			\$56,150.00

Fisheries Management

Participants

Mississippi Department of Wildlife, Fisheries, and Parks
Delta Wildlife
Mississippi State University

Implementation/Action

MDWFP Bureau of Fisheries takes an active role in the management of most popular public waters in the state. Public access to Steele Bayou is very limited, thereby reducing public use and the importance of MDWFP’s activities in the watershed.

To address silver carp concerns, Delta Wildlife and Mississippi State University have submitted a request for funding from the National Sea Grant Program. The proposed project would monitor the movements of silver carp in Steele Bayou and associated floodplains to better understand and predict their movements, allowing for increased harvest by selective traps and commercial fisherman.

Budget

Projected costs associated with fisheries survey and management.

Table 6. Projected Costs for Fisheries Management on Steele Bayou

Practice	Unit Cost (w/installation)	Number of Units	Total Cost
MDWFP			
Monitoring			
Field	\$590/day	4	\$2,360.00
Fish Pop. Reports	\$266/day	2	\$532.00
Field	\$288/day	28	\$8,064.00
Mgt. Plan Development	\$266/day	7	\$1,862.00
Delta Wildlife/MSU			
Graduate Research Assistant	\$20,000/year	2	\$40,000
Vemco VR2 Receiver	\$1,200 each	18	\$21,600
Vemco VR100 Receiver	\$7,000 each	2	\$14,000
Vemco V16 Tags	\$280 each	90	\$25,200
Material to Install Receivers	\$150 each	6	\$900
Boat Operation and Maintenance	\$8,000/2 years	1	\$16,000
Travel	\$6,000/2 years	1	\$12,000
Administrative Support	\$42,630/2years	1	\$42,630

Total		\$185,148.00
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Education Strategy

Goal

The overall objective of the education strategy in the Steele Bayou 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 Steele Bayou watershed.
- Increase public awareness of aquatic invasive species and how to prevent their accidental spread.

Participants

Delta F.A.R.M.
Delta Wildlife
Mississippi State University Cooperative Extension Service 4-H Program
Mississippi Levee Board
Mississippi Department of Environmental Quality
Mississippi Bureau of Plant Industry
Mississippi's Lower Delta Partnership

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 and make educational presentations at schools and to various

groups. A portion of these efforts will be targeted towards landowners and residents in this watershed. Furthermore, the organization will use other means of outreach through press releases and their website. 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.

Delta F.A.R.M. and the Issaquena County 4-H Program will be partnering to develop and place signs at Steele Bayou boat ramps that will increase the public's awareness of invasive aquatic plants and how to reduce the risk of transport and spread. Delta F.A.R.M. will also host a field day for high school students in the 4-H program to introduce and educate them on locally occurring aquatic invasive species.

Press releases and magazine articles in publications of partnering agencies are also an important component of the educational outreach plan. The Mississippi Levee Board, Mississippi Department of Environmental Quality, Mississippi Bureau of Plant Industry, and Mississippi's Lower Delta Partnership all publish monthly or quarterly magazines/newsletters that will serve as important outlets for increasing awareness of Steele Bayou and different components of the WIP.

Evaluation

Monitoring

Participants

United States Geological Survey (USGS)

Implementation/Action

The United States Geological Survey (USGS) will collect suspended sediment samples from Steele Bayou main channel periodically at four bridge crossings, and at five field edge locations where grade control structures will be installed. USGS will collect samples during four storm runoff trips from the main channel per year, beginning in 2008. Up to 24 discrete samples will be captured from the edge of field sites using automatic samplers during each of the four storm runoff trips. Samples will be analyzed by the USGS Baton Rouge Sediment Laboratory to determine the efficacy of the grade control structures. Water stage recorders will be installed at the four main channel sites along with discharge measurements and annual cross-sectional survey to document sediment depositions and changes in channel morphology.

Budget

Table 7. Projected Costs for Water Quality Monitoring on Steele Bayou

Practice	Unit Cost (w/installation)	Number of Units	Total Cost
Labor	\$55,800	1	\$55,800
Analysis	\$17,400	1	\$17,400
Travel	\$19,900	1	\$19,900
Vehicles	\$4,100	1	\$4,100
Supplies	\$73,200	1	\$73,200
Total	\$170,400	1	\$170,400

Assessment of progress

Progress for this watershed implementation plan will be assessed and evaluated five (5) years (2013). Water quality data, as well as information on activities occurring in the watershed and stakeholder concerns collected during the period from 2007 – 2013 will be utilized. The following criteria will be used to determine progress toward plan goals:

- Reduction of sediment load by at least 2 tons/year, and
- 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 Steele Bayou 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 Steele Bayou 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 Steele Bayou 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.

References

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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 Steele Bayou Entire watershed
Stressor: Justification: Location: Extent:	<i>Low DO/Organic Enrichment</i> Nonpoint source agricultural runoff Steele Bayou Approximately 60 miles of surface water
Stressor: Justification: Location: Extent:	<i>High Nutrient Levels</i> Nonpoint source agricultural runoff Steele Bayou Approximately 60 miles of surface water
Stressor: Justification: Location: Extent:	<i>Fish Advisories</i> Soil persistence of legacy pesticides (DDT & Toxaphene) Steele Bayou Entire watershed
Stressor: Justification: Location: Extent:	<i>Noxious Aquatic Vegetation</i> Natural dispersal Steele Bayou Steele Bayou Channel, Black Bayou, Main Canal
Stressor: Justification: Location: Extent:	<i>Fisheries Management</i> Presence of silver carp Steele Bayou Lower Steele Bayou Channel

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. Other activities such as AG BMP's and Aquatic Weed Control will address this concern as well.</p> <p>1c. High Nutrients. Specific lakes and stream segments in the Steele Bayou Watershed are listed for High Nutrients. Ag BMPs should address most nutrient loading.</p> <p>1d. 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 ag BMPs.</p> <p>1e. Noxious Aquatic Vegetation. Water Hyacinth threatens both recreational access and water quality through organic enrichment and DO demand during the fall and winter. Water Hyacinth will be treated by chemical and mechanical means and funded by MDOT, MS Levee Board, Washington County Drainage District, and MDEQ.</p> <p>1f. Fisheries Management. MDWFP will continue to monitor the fishery for changes due to the invasion of silver carp and take action if a solution is found.</p>	Table 1
<p>Structures for Water Control (25 units minimum) Overfall Pipes (39 units minimum) Water diversion pads (1000 feet minimum) Bank Stabilization (4 minimum) Rip-rap weirs (5 minimum)</p>	Page 15
<p>Ag BMP \$3,803,456 Noxious Aquatics \$27,350 Fisheries Management \$185,148 TOTAL \$4,015,954</p>	Tables 4, 5, 6
<p>The overall objective of the education strategy in the Steele Bayou watershed is to develop an atmosphere that promotes sustained, long-term protection and improvement of aquatic resources in the watershed.</p>	Page 20
<p>Implementation will be dependent on the cooperation of the private landowners.</p>	Page 14
<p>USGS will conduct water quality monitoring plan.</p>	Page 22