WIP for Porter Bayou

1.0 PLAN GUIDANCE

1.1 Vision Statement

Porter Bayou and its watershed are pleasant and safe places to live, work, recreate, and raise a family. Agriculture is productive and profitable, and its practices contribute to adequate water supply and quality to support fishing, swimming, aquatic life, and quality of life.

1.2 Mission Statement

Sustain agricultural profitability, and improve water quantity and quality.

1.3 Porter Bayou Watershed Implementation Team

The Porter Bayou Watershed Implementation Team is supported by P. Bhowal, MDEQ, and FTN Associates. Members of the Porter Bayou Watershed Implementation Team are:

2.0 WATERSHED DESCRIPTION

2.1 Geography

The 66,405 acre Porter Bayou Watershed (HUC # 08030207) includes parts of Bolivar and Sunflower Counties, Mississippi (Figure 2.1). Only one municipality exists in the watershed, the City of Shaw. Several smaller communities are scattered throughout the watershed including Choctaw, Hail, Fraizer, and Linn. State Highways 61, 278, 442, and 448 pass through the watershed. Cleveland and Indianola are two larger municipalities in close proximity (i.e., within 10 miles).

2.2 Geology

The watershed is located in the Delta (also known as Mississippi River Alluvial Plain) physiographic region, in the Mississippi Alluvial Plain Northern Holocene Meander Belts ecoregion. Geology in this area consists of mostly unconsolidated deposits of sands, silts, and clays dating back as far as the Pleistocene (Stewart 2003).

2.3 Soils

Soils in the Mississippi River Alluvial Plain physiographic region are primarily young soils (inceptisols) formed on alluvium, and range from mildly acidic to mildly alkaline (Stewart 2003). The 66,405 acre watershed is diverse, ranging from frequently flooded areas with heavy clay soils to well drained “cotton ground” with sandy loam soils. Alligator (poorly drained clay), Dundee (moderately to somewhat poorly drained fine sandy loam to silty clay loam), and Forestdale (somewhat poorly to poorly drained silty clay loam) soils are predominant throughout the watershed.

2.4 Hydrology

The headwaters of Porter Bayou vary from roadside ditches to stream remnants coursing through marginal agricultural lands. The tributaries merge in the southeast corner of Bolivar County, MS. Traveling downstream, the bayou meanders through parts of Bolivar and Sunflower

Counties in a large "horseshoe" fashion. Certain portions of the bayou are wide with gently sloping banks defined by cypress trees, while other portions are extremely narrow with high, steep banks. Eventually, Porter Bayou empties in to the Sunflower River north of Indianola, MS. Base flows in Delta streams naturally decrease during summer months due to low rainfall. However, in the Porter Bayou watershed, irrigation water often supplements summer base flows by providing a constant source of runoff throughout the growing season.

The watershed is also characterized by poor drainage. The slow, meandering nature of the bayou has resulted in the accumulation of sediments and dense vegetation, both of which negatively impact drainage.

2.5 Land use

A map of watershed land use is shown in Figure 2.2. Although 82% (55,893 acres) of the watershed is in production agriculture, no particular crop is dominant. Corn, cotton, soybeans, and rice are all common. In addition to production agriculture, 3.7% (2,529 acres) of the watershed is water, 8.8% (6,007 acres) in wetlands, 5.7% (3,882 acres) in urban areas, and the remaining 0.13% (88 acres) in pasture, barren, and non-wetland forest land.

2.6 Socioeconomics

2.6.1 Demographics

Estimated July 2008 population for Bolivar County was 37,195, and for Sunflower County it was 30,697. In both counties the 2008 estimated population was less than the population reported in the 2000 census[1].

2.6.2 Economy

There are a handful of small businesses within Shaw, however the lifeblood of the watershed is production agriculture. Catfish ponds? The Delta region of Mississippi where Porter Bayou is located is classified as economically depressed. The estimated 2008 median household

[1] http://www.olemiss.edu/depts/sdc/estimates/2008/CO-EST2008-01-28.htm, accessed June 2010

income for Bolivar County ($28,779) and Sunflower County ($28,266) were both below the state median household income ($37,818), and were in the lowest 11% of the state[2].

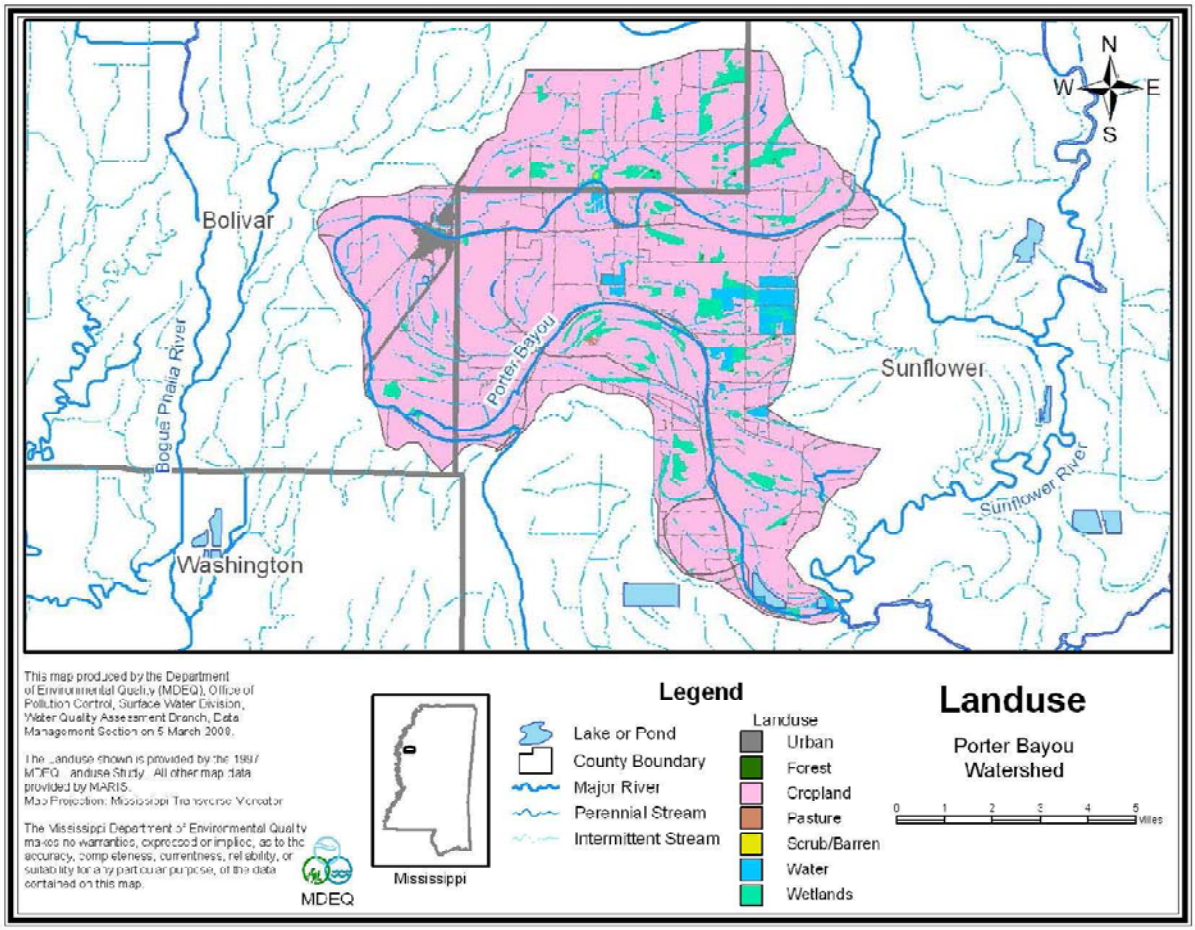

Figure 2.2. Land use map of Porter Bayou watershed.

[2] http://www.census.gov/did/www/saipe/data/index.html, accessed June 2010

2.7 Regulations

2.7.1 Federal

2.7.1.1 Clean Water Act

2.7.1.1.1. NPDES Point sources

There is one NPDES permitted wastewater discharge that discharges in the Porter Bayou watershed. The Shaw Publicly Owned Treatment Works (POTW) discharges in to Porter Bayou (permit # MS0024953)(enSearch, accessed June 2010). The Shaw POTW has a design flow capacity of 0.36 MGD.

2.7.1.1.2. NPDES Storm water

The Porter Bayou watershed is does not appear to be subject to MS4 storm water permitting under the Clean Water Act. Construction activities covering an area greater than ?? are subject to NPDES stormwater regulations.

2.7.1.1.3. 303(d) and TMDLs

Porter Bayou was placed on the Mississippi 2006 Section 303(d) List of Impaired Water Bodies (MDEQ 2007). Porter Bayou was listed due to evaluated causes of sediment/siltation, organic enrichment / low dissolved oxygen, nutrients, and total toxics. The Clean Water Act requires that total maximum daily load (TMDL) studies be completed for all water bodies included on the 303(d) list. Table 2.1 summarizes the TMDLs addressing Porter Bayou water quality impairments that have been completed as of June 2010. Because these TMDLs have been completed, these water bodies do not appear on the draft 2010 303(d) list (MDEQ 2010).

Table 2.1. TMDLs for Porter Bayou.

Parameter	TMDL Approval Date	Source to be Reduced	Recommended % Reduction
Total nitrogen	June 2008	NPS	84.05%
Total phosphorus	June 2008	NPS	95.17%
Sediment	April 2008	NPS	NA
Legacy pesticides	November 2005	NPS	NA

2.7.1.1.4. Navigable Waters

Several sections of the Clean Water Act deal with controlling impacts to navigable waters. Section 404 of the Clean Water Act controls the placement of dredge or fill materials into wetlands and other waters of the US. Section 401 of the Clean Water Act requires MDEQ to certify that a project requiring a Section 10 (see 2.7.1.2) or Section 404 permit will not violate the state water quality standards. These sections of the Clean Water Act require that impacts to qualifying waterbodies be avoided or minimized. Where impacts are unavoidable, mitigation may be required. Qualifying waterbodies include wetlands and "Other Waters of the US". The basic definition for Other Waters of the US, for the purpose of Section 404, is any waterbody that displays an ordinary high water mark (OHWM). This includes lakes and ponds that have a hydrological connection to a qualifying waterbody, and perennial, intermittent, or ephemeral stream channels which exhibit an OHWM. The US Army Corps of Engineers (USACE) administers the regulations associated with both of these sections.

The USACE issues two types of permits under Section 404; Individual Permits and Nationwide Permits (NWPs). Individual Permits are required when 1) impacts to wetlands exceed 0.5 acre, and/or 2) greater than 300 linear feet of a qualifying waterbody is to be impacted. This Individual Permit includes a period of public review, and processing generally takes between 60 and 120 days. The processing time can be greater if public hearings or environmental statements are required, or if all required information on the permit application form is not provided. NWPs are general permits typically used when minor impacts are necessary to wetlands (less than 0.5 acre) or a qualifying waterbody (any impacts less than 300 linear feet). Processing time is generally less and no public review period is necessary.

Mitigation for both wetland losses or stream function and value losses may be required by the USACE for a project authorized under either an individual or nationwide permit. The extent of the mitigation is dependent upon the size, quality, and functionality of the wetland or waterbody to be impacted.

2.7.1.2 Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act regulates activities that have the potential to obstruct navigation in waters of the US, including wetlands.

2.7.1.3 Farm Bill

Under the Federal Food Security Act (Farm Bill), initially passed in 1985, all US farm operators are required to follow soil and wetland conservation guidelines specified in the law (i.e., Sodbuster and Swampbuster programs). Compliance with these guideline is a prerequisite for participation in most federal farm programs. Subsequent amendments to the Farm Bill have added programs that provide incentives to farm operators for enhancing water quality through such actions as taking highly erodible lands out of production, and restoring wetlands. One such program is the Mississippi River Basin Healthy Watersheds Initiative (MRBI). The MRBI is being implemented through NRCS programs funded by the Farm Bill, including the Cooperative Conservation Partnership Initiative, Wetlands Reserve Enhancement Program, and Conservation Innovation Grants. The Porter Bayou watershed is a target sub-watershed of the Sunflower River watershed for the MRBI.

2.7.1.4 National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a non-regulatory federal program, which is administered by the Federal Emergency Management Agency (FEMA). However, this program provides mechanisms that can be used to restrict development in floodplains, which can have beneficial effects on water quality. The NFIP supports development and enforcement of floodplain management plans and ordinances. All of the unincorporated areas of Bolivar and Sunflower Counties participate in the NFIP, as well as the City of Shaw[3].

2.7.1.5 Safe Drinking Water Act

All drinking water systems serving 25 people or more are considered public drinking water systems and are subject to EPA regulation through the Safe Drinking Water Act. Elements of the Safe Drinking Water Act include the Enhanced Surface Water Treatment Rule,

[3] http://www.msema.org/insurance/floodplain.html, accessed June 2010

Disinfection Byproducts Rule, and the requirement for Source Water Assessment and Protection. In Mississippi, the Safe Drinking Water Act is administered by the Mississippi State Department of Health. The lists of public water utilities provided on the Mississippi State Department of Health website indicate that there is one public water utility serving the residents of the Porter Bayou watershed – the Town of Shaw[4]. According to the EPA Safe Drinking Water Information System, the Shaw utility water source is groundwater, it serves 2,319 people, and the only drinking water quality standard violation was for fecal coliforms in 2002[5].

2.7.2 State

2.7.2.1 Water quality standards

The water use classifications are established by the State of Mississippi in the document *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* (MDEQ, 2007). The designated beneficial use for Porter Bayou is Fish and Wildlife (MDEQ 2008). The water quality standard applicable to the use of the water body and the pollutant of concern is defined in the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters* (MDEQ, 2007). Mississippi's current standards contain a narrative criteria that can be applied to nutrients which states "*Waters shall be free from materials attributable 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, 2007)."

The standard for dissolved oxygen states, "DO concentrations shall be maintained at a daily average of not less than 5.0 mg/l with an instantaneous minimum of not less than 4.0 mg/l." In addition, the State water quality standard regulations include a natural condition clause which was used in the TMDL to determine the appropriate DO for Porter Bayou under critical conditions. Natural conditions are defined as background water quality conditions due only to non-anthropogenic sources. The DO numeric criteria apply specifically with regard to substances attributed to sources (discharges, nonpoint sources, or instream activities) as opposed to natural phenomena. Waters may

[4] http://msdh.ms.gov/msdhsite/_static/30,0,76,256.html, accessed June 2010
[5] http://oaspub.epa.gov/enviro/sdw_form_v2.create_page?state_abbr=MS, accessed June 2010

naturally have characteristics outside the limits established by these criteria. Therefore, naturally occurring conditions that fail to meet criteria should not be interpreted as violations of these criteria (MDEQ 2007).

WQ violations?

2.7.2.2 Highway Construction Runoff

The Mississippi Department of Transportation (MDoT) is responsible for implementation of erosion and sediment control practices on highway construction. MDoT is required to apply to MDEQ for a Certificate of Permit Coverage for construction projects to be permitted through the state construction storm water general permit. As of June 7, 2010, there are no active water permits for highway construction in the Porter Bayou watershed (MDEQ enSearch, accessed June 2010).

2.7.2.3 On-site wastewater treatment regulations

State regulations addressing on-site wastewater treatment systems are administered through the Mississippi State Department of Health. Regulations are in place to address single-family residence on-site wastewater treatment systems, as well as on-site systems serving recreational vehicle campgrounds, developments, and multi-family dwellings. These regulations require approval and certification of all new installations of on-site wastewater treatment systems, including replacement of old systems. Certification is not required for systems in use prior to enactment of the regulations, providing they meet criteria specified in the regulations (http://www.msdh.ms.gov/msdhsite/_static/30,0,78.html, accessed June 2010).

2.7.2.4 Fish consumption advisories

Fish tissue sampling is conducted by MDEQ for the purpose of identifying potential human health threats. These data are used by a multi-agency task force to evaluate the need for fish consumption advisories in Mississippi. Porter Bayou is included in the Delta-wide consumption advisory for toxaphene and DDT. This advisory recommends that people limit

consumption of carp, buffalo, gar, and catfish larger than 22 inches to no more than one meal every two weeks (MSDH 2001).

2.7.2.5 Water Withdrawals

Under Mississippi law, all wells drilled with a casing diameter of 6 inches or greater are required to have a water use permit. In addition, water use permits are required for surface water withdrawals, and construction of water storage impoundments. Permits are good for 10 years. The Yazoo Mississippi Delta Joint Water Management District (YMD) is responsible for processing water use permits in the Delta, including the Harris Bayou watershed. Water use permits are issued by the MDEQ State Permit Board.

2.7.3 Local zoning

Need info?

2.8 Existing management

Numerous drainage improvement efforts have been made over the years, and intense efforts are ongoing by the New Porter Bayou Drainage District (NPBDD) including; 1) Stream Bank Restoration, and 2) Alligator Weed Control and Eradication. Numerous sediment reducing BMPs have been voluntarily implemented throughout the watershed. Sediment reducing measures are also an integral part of NPBDD drainage projects

NRCS watershed protection and flood prevention work around 2003 (CFR 68(10):2007).

3.0 RESOURCES AND CONDITION

The primary use of Porter Bayou is agricultural drainage and irrigation.

3.1 Water quality

Little water quality data has been collected in the Porter Bayou watershed prior to 2010 (MDEQ 2008). As noted in Section 2.7.1.1, Porter Bayou has been identified by MDEQ as not having water quality adequate to support its designated uses (listed in Section 2.7.2.1). However, this water quality assessment was an evaluated assessment, not based on water quality data.

3.2 Water quantity

Water supply is a growing concern in the region. Ground water depletion in the Mississippi Alluvial Plain has resulted in lower flows in many streams, including the Sunflower River (MS Museum of Natural Science 2005). Ground water is withdrawn for drinking water and to irrigate crops.

3.3 Wildlife

The Mississippi Natural Heritage program has identified a number of plants and animals as species of special concern in Bolivar and Sunflower Counties: nine plant species and 15 animal species in Bolivar County, and seven plant species and 15 animal species in Sunflower County. A list of these species is included as Appendix.

The Mississippi Comprehensive Wildlife Management Plan (MS Museum of Natural Science 2005) identifies species of greatest conservation need and their habitats in Mississippi. Habitats that are identified as important for the animal species of special concern, and that occur in the Porter Bayou watershed include bottomland hardwoods, urban and suburban areas, cottonwood/black willow/river birch woodlands, sandbars, bald cypress/gum swamp forests, oxbow lakes, artificial ponds, reservoirs?, and streams. These habitats are identified as being important for 21 of the animal species of special concern in Bolivar and Sunflower Counties

(Appendix). Overall, the plan classifies all streams in the Delta, including Porter Bayou, as critically imperiled because of the widespread degradation of stream habitats in this region.

3.4 Recreation

There are very few opportunities for in-stream recreational use. Low water levels, flows, and dissolved oxygen during late summer months limit the existence of desirable fish species. Also, the only public access to Porter Bayou is the short segment within the city limits of Shaw.

4.0 STAKEHOLDER INTERESTS/ISSUES

Twelve producers living in the Porter Bayou watershed identified watershed issues they would like addressed through a Watershed Implementation Plan. The issues identified by these stakeholders included water management, sediment, nutrients, invasive aquatic plants, declining groundwater levels, and RoundUp-resistant weeds. This version of the watershed implementation plan will also address the Porter Bayou water quality impairments identified in the 2006 303(d) list for which TMDLs have been completed. Issues being addressed by the NPBDD are also included. These issues, and their causes and sources are discussed in greater detail below. All of the issues discussed below were identified in the 2006 303(d) list as present along the entire length of Porter Bayou, from the headwaters to the Sunflower River.

4.1 Water Management

Water management issues include both flooding and water shortages. The stakeholders identified flooding as a significant issue in the Porter Bayou watershed. They also identified a need for improved water use efficiency and storage capacity. The potential effects of improvements, or lack thereof, to some land parcels on flooding at other land parcels was also a stakeholder concern.

4.1.1 Locations Where Water Management is an Issue

Stakeholders stated that flooding is an issue throughout the watershed. Insufficient flow capacity in the Porter Bayou channel upstream of Shaw was identified by stakeholders as a particular area of concern.

4.1.2 Causes

During storms, water backs up and causes flooding. During the growing season, rainfall and surface water are not adequate to support crops.

4.1.3 Sources

Terrain in the watershed is relatively flat, making it less likely to drain well during storms. Stakeholders identified sedimentation as contributing to flooding by reducing the conveyance capacity of ditches and streams. Beaver dams were also identified by stakeholders as contributing to flooding in the watershed. Regional climate dictates the natural availability of water during the growing season.

4.2 Water Level Declines

The Porter Bayou watershed is near the area of greatest groundwater decline in the Delta (YMD 2008). Regional estimates of groundwater level change in the Delta indicate that between 1998 and 2008 the average groundwater level change in the area of the Harris Bayou watershed was between 0.4 and 0.9 foot per year (YMD 2008).

4.2.1 Locations Where Water Level Declines are an Issue

Groundwater levels are declining throughout the watershed (YMD 2008).

4.2.2 Cause

Water is being withdrawn from the Mississippi Alluvial Aquifer faster than it is being recharged.

4.2.3 Sources

Irrigation accounts for the majority of the ground and surface water withdrawals in the Porter Bayou watershed. As noted in Section 2.15, groundwater is also used to supply drinking water in the watershed.

4.3 Sediment

Stakeholders noted that sedimentation in ditches and streams contributes to flooding by reducing storage and flow conveyance capacity. There is a clear understanding among producers and the NPBDD that sedimentation directly results in reduced drainage. The presence of RoundUp-resistant weeds in the watershed may result in increased cultivation (i.e., decreased no-

till practice), which could increase erosion and sediment loads. MDEQ has determined that there is a high probability that sediment loads in Porter Bayou are at such levels that they interfere with fish and other wildlife. High sediment loads can affect aquatic life by causing reduced visibility (when the sediment is suspended in the water column) or by changing stream habitat when the sediment is deposited (e.g., covering spawning areas). The sediment TMDL recommended that sediment loads be reduced, although the recommended percent reduction was not specified.

4.3.1 Locations Where Sediment is an Issue

MDEQ has identified Porter Bayou from the headwaters near Indianola to the confluence with the Sunflower River as not supporting its designated use of aquatic life support due to sediment. Producers, the NPBDD, and other stakeholders believe erosion and sedimentation is an issue throughout the watershed. Are there any specific, priority locations?

4.3.2 Cause

Sediment is the pollutant causing sedimentation and turbidity issues in Porter Bayou. Sediment is caused by erosion of soil particles from land surfaces in the watershed and detachment of soil from the banks and beds of the bayou. Soils in the watershed are erosive?

4.3.3 Sources

On the Mississippi 2006 303(d) list, nonpoint sources are listed as the sources of sediment causing the impairment in Porter Bayou. In the sediment TMDL that addresses this impairment, a number of likely sediment sources were identified. These included agriculture, construction sites, roads, urban areas, mass wasting, gullies, channel instability, channel modification, and historical land use activities. The NPBDD has identified unstable banks as a significant source of sediment in Porter Bayou. Have specific locations been identified?

4.4 Nutrient Enrichment

MDEQ has determined that there is a high probability that nutrient concentrations in Porter Bayou are at levels that can create conditions harmful to fish and other wildlife. High

nutrient concentrations can support unusually high growth of algae or other aquatic plants. When the algae die, their decomposition uses oxygen from the water, which can result in low oxygen levels that are harmful to fish and other aquatic life. The TMDLs for these water bodies recommend reductions of total phosphorus loads by around 95%, and reductions of total nitrogen loads by about 84% (see Section 2.5).

4.4.1 Locations Where Nutrient Enrichment is an Issue

MDEQ has identified Porter Bayou from the headwaters near Indianola to the confluence with the Sunflower River as not supporting its designated use of aquatic life support due to nutrient enrichment.

4.4.2 Cause

Nitrogen and phosphorus are the pollutants that are suspected of causing eutrophic conditions in these water bodies with high productivity and low dissolved oxygen levels. Total nitrogen and total phosphorus are the nutrient species addressed in the TMDL (MDEQ 2008).

4.4.3 Source

4.4.3.1 Point Source

The Shaw POTW (MS0024953) permit is for the discharge of treated domestic wastewater (i.e., sewage). The NPDES permit for the Shaw POTW includes limits for ammonia, total nitrogen, and total phosphorus that will go into effect in 2013 at the latest. These limits are summarized in Table 4.1.

Table 4.1. Nutrient limits in the NPDES permit for the Shaw POTW.

Parameter	Maximum monthly average load (lb/day)	Maximum daily load (lb/day)	Maximum monthly average concentration (mg/L)	Maximum daily concentration (mg/L)
Ammonia N	7.5	11.2	2.48	3.72
Total nitrogen	34.5	69.0	na	na
Total phosphorus	15.6	31.2	na	na

4.4.3.2 Nonpoint Sources

The Porter Bayou Watershed WASP model indicated that the water quality impairment is due to nutrients from nonpoint sources. In the nutrient TMDL for Porter Bayou, cropland was assumed to be the greatest source of total nitrogen and total phosphorus loads (MDEQ 2008). In addition, the majority of nutrient loading to streams typically comes from storm water runoff (reference). As noted in Section 2.5, there are approximately ?? acres of cropland in the Porter Bayou watershed. How many acres fertilized? How much fertilizer used annually? Septic systems? Groundwater nitrate concentrations? Atmospheric deposition?

Total nitrogen is a combination of many forms of nitrogen found in the environment. Inorganic nitrogen can be transported in particulate and dissolved phases in surface runoff. Dissolved inorganic nitrogen can be transported in groundwater and may enter a water body from groundwater infiltration. Finally, atmospheric gaseous nitrogen may enter a water body from atmospheric deposition (MDEQ 2008).

Phosphorus is primarily transported in surface runoff when it has been sorbed by eroding sediment. Phosphorus may also be associated with fine-grained particulate matter in the atmosphere and can enter streams as a result of dry fallout and rainfall (EPA 1999). Phosphorus contained in the surface runoff due to fertilizers and animal excrement or watersheds with naturally occurring soils that are rich in phosphorus (Thomann and Mueller, 1987). Watersheds with a large number of failing septic tanks may also deliver significant loadings of phosphorus to a water body (MDEQ 2008). Water in the Mississippi Alluvial Aquifer (located under Porter Bayou watershed) is known to have a relatively high concentration of phosphorus. Therefore

phosphorus can also enter surface waters from ground water seeps or discharges. USGS has an on going sampling program to quantify phosphorus in groundwater in the Delta.

4.5 Organic Enrichment and Low DO

The presence of high levels of organic material in water bodies can reduce water oxygen levels such that aquatic life cannot be supported. The TMDL addressing this impairments states that reducing nutrient loads is expected to reduce organic enrichment and low dissolved oxygen conditions. Therefore, no reduction is specified in the TMDL for organic material (TBODu).

4.5.1 Locations Where Organic Enrichment and Low DO are Issues

MDEQ has identified Porter Bayou from the headwaters near Indianola to the confluence with the Sunflower River as not supporting its designated use of aquatic life support due to organic enrichment and low dissolved oxygen. Are there any specific, priority areas?

4.5.2 Cause

The nutrient TMDL assumed that nutrient enrichment was the cause of the organic enrichment and low dissolved oxygen conditions. As described in Section 4.2, high nutrient concentrations in a water body can encourage the growth of aquatic plants, which can encourage the growth of aquatic animals, all of which becomes organic material when it dies, and removes oxygen from the water as it decomposes. High levels of organic material decomposing in a water body can use up enough of the oxygen from the water that fish and other aquatic life can't get enough oxygen and become ill or suffocate.

4.5.3 Sources

While nutrient enrichment is believed to be the primary cause of organic enrichment and low dissolved oxygen conditions cited for Porter Bayou, there are potential sources of organic material in the watershed that may also contribute to these conditions. They are discussed below. See Section 4.2.3 for a discussion of nutrient sources in the Porter Bayou watershed.

4.5.3.1 Point Sources

The Shaw POTW (MS0024953) permit is for the discharge of treated domestic wastewater (i.e., sewage). The NPDES permit for the Shaw POTW includes limits for oxygen demand and dissolved oxygen that will be effective no later than 2013 (Table 4.2). While this type of discharge can deplete oxygen downstream of the discharge point, the effect is usually fairly localized.

Table 4.2. Oxygen-related limitations in the NPDES permit for Shaw POTW.

Parameter	Maximum monthly average load (lb/day)	Maximum daily load (lb/day)	Maximum monthly average concentration (mg/L)	Maximum daily concentration (mg/L)	Minimum daily concentration (mg/L)
Dissolved Oxygen	na	na	na	na	6
BOD5	90	135	30	45	na

4.5.3.2 Nonpoint Sources

Organic material, such as crop residue, leaves, and chaff, can be washed into the water body from the surrounding land. Sources can also include plants along the stream banks.

4.6 Legacy Pesticides

A fish consumption advisory is in effect for long-lived pesticides in selected fish that covers all Delta streams and lakes, including those in the Porter Bayou watershed (see Section 2.7.2.4). Carp, buffalo, gar, and catfish are all common in Porter Bayou, and eaten by local inhabitants of the watershed. Pesticide concentrations (of neither legacy chemical, nor those in current use) in soils, nor surface and groundwater have not been identified as a health concern.

4.6.1 Locations Where Pesticides are an Issue

Legacy pesticides in fish are an issue for all Delta water bodies, including Porter Bayou and all other water bodies in the watershed.

4.6.2 Causes

DDT and Toxaphene are the pesticides named in the Delta-wide fish consumption advisory. These pesticides degrade very slowly in the environment and are bioaccumulative, meaning they accumulate in living tissue and can be passed on to other creatures through the food chain. Eventually, these pesticides can accumulate in certain fish species to the point that eating those fish can cause health problems in people. DDT and Toxaphene have been measured in fish tissue throughout the Delta at levels that may harm human health.

4.6.3 Sources

DDT and Toxaphene are no longer used in the US. The use of DDT was outlawed in the US in 1973, and use of Toxaphene was outlawed in 1982. However, years ago, DDT and Toxaphene were commonly used on croplands in the Delta, including the 55,893 acres of cropland in the Porter Bayou watershed. Because it takes decades for these chemicals to degrade, they are still found in soils, sediments, and living creatures in the Delta. Recent measurements of concentrations of DDT and Toxaphene in fish tissue collected from the Delta indicate that concentrations of these pesticides are decreasing (reference). This suggests that the residual DDT and Toxaphene is finally breaking down into less harmful chemical components.

4.7 Alligator Weed

Alligator weed is the object of an on-going NPBDD eradication program.

4.7.1 Locations

Need info

4.7.2 Causes

Need info

4.7.3 Sources

Need info

5.0 RESTORATION AND PROTECTION GOALS

The restoration and protection goals for this plan are the goals of the Delta Nutrient Reduction Strategy:

1. Determine the percent reductions of sediment, nitrogen, and phosphorus that are possible – are the 84% reduction of nitrogen load and 95% reduction of phosphorus load that are recommended in the Porter Bayou TMDL attainable?
2. Determine what is possible with regard to increased water use efficiency and ground water recharge.
3. Determine what nutrient reduction and increased water use efficiency costs.
4. Determine benefits to stakeholders from nutrient reduction and increased water use efficiency.

6.0 TARGETING AND PRIORITIZATION

BMPs are being implemented in the Porter Bayou watershed through the NPBDD, an EPA 319 grant, and through the Mississippi River Basin Initiative and Watershed Reserve Enhancement Program. The prioritization and targeting processes used for these projects are described below.

6.1 Delta Nutrient Reduction Strategy

Nutrient loading in agricultural effluent varies by region, watershed, and individual field. The nutrient cycle in an agricultural watershed is an extremely complex system with many inputs and variables. To fully address the issue, a comprehensive approach must be used to ensure that all factors are considered. As part of the Delta Nutrient Reduction Strategy, the Site Characterization Work Group was tasked with developing a strategy to classify agricultural systems for prioritization purposes. Systems within the Porter Bayou Watershed were classified based on soil type, cropping practices, and existing drainage infrastructure. Soils can be described as ***heavy*** (clays), ***medium*** (loams) ***light*** (sandy loams), and ***mixed*** (clay, loam, and sandy loams found in close proximity due to ridge and swale topography). Cropping practices were initially classified as ***irrigated*** or ***dry land***, then by ***soybeans***, ***rice/soybean rotation***, ***cotton, or corn***. Drainage infrastructure can be classified as ***developed*** or ***undeveloped***. Developed land typically consists of leveled or precision graded fields with pipes, pads, and tailwater ditches, or ridge and swale land that has been shaped to facilitate furrow irrigation. Undeveloped land is relatively self-explanatory. Areas with significant ridge and swale and/or subject to frequent flooding are typically not developed because the benefits are not greater than the cost.

Two catchments were selected as "work areas" within the Porter Bayou Watershed. These catchments are each characterized by a set of similar agricultural systems that are representative of the agricultural landscape throughout the watershed. The "north site" (Attachment B) catchment is roughly 1,000 acres in size and can be classified as *heavy, developed and undeveloped, irrigated rice/soybean*. The "south site" (Attachment C) catchment is approximately 2,500 acres of *mixed, undeveloped and developed, irrigated and dry land, corn,*

cotton, and rice/soybean. This diverse catchment is a representative sample of many watersheds throughout the region. Drainage infrastructure is mostly un-improved, consisting of four large drainage ditches. There is a small component of heavily irrigated rice, but the watershed primarily consists of conventionally farmed corn, cotton, and soybeans.

6.2 MRBI/CCPI Priority Areas

Need info

6.3 MRBI/WREP Priority Areas

GIS analysis will determine the extent and location of existing land cover for wildlife and waterfowl corridors, including forest cover, riparian habitat, CRP and WRP contracts. These analyses will identify high priority gaps or fragmented areas in existing land cover for wildlife and waterfowl habitat and eligible landowners within these gaps or fragmented areas. Ranking criteria for high priority restoration and enhancement projects, developed by DW/MDWFP, include factors such as location, riparian buffers, water availability, proximity to other waterfowl habitat, and connectivity with surrounding habitat. The Forest Breeding-Bird Decision Support Model results will also be considered as part of the prioritization process. In consultation with local NRCS staff, these ranking criteria will be used to help prioritize sites, as well as existing WRP easements that would benefit from additional management.

6.4 NPBDD Priority Areas

Need info

7.0 MANAGEMENT

There are two underlying management principles of this WIP: ecosystem-based management and adaptive management. The goals and objectives of this plan reflect these principles. Each of these management principles is briefly described below, followed by watershed management actions that are planned for the near future to work toward the vision for Lake Washington. Goals related to other existing or potential concerns in this watershed will be addressed in future implementation plans.

7.1 Ecosystem-Based Management

Porter Bayou and its watershed represent the ecosystem management unit. Although bayous and lakes are typically considered the ecosystem, water bodies and their watershed cannot be divorced. Land use and land cover activities in the watershed directly or indirectly affect the water body. Sediment and nutrient loadings from the watershed drive many aquatic ecosystem processes, including both desirable and undesirable changes in the water body. The ecosystem, however, is characterized not only by its environmental attributes, but also by its socioeconomic attributes. Humans are part of, not apart from, aquatic ecosystems. Watershed management is fundamentally a social activity (Thornton and Creager 2001).

The benefits that accrue from reduced sediment and nutrient loadings to water bodies in the Porter Bayou watershed are not just in terms of increased water clarity, reduced sedimentation, reduced algal blooms, a more productive sport fishery, and greater recreational and aesthetic values. The agricultural community also benefits from reduced sediment and nutrient loadings. For example, Pimentel et al. (1995) estimated that each ton of sediment lost was worth about $6.75 per year to the farmer ($5.00 per ton for lost nutrients, and $1.75 per ton for lost soil and water capacity). The Delta sediment TMDL estimates that at least 0.007 tons per acre per day of sediment is lost. Based on this loss rate, just over approximately 170,000 tons of soil are lost from the Porter Bayou watershed each year (66,405 acres x 0.007), and the minimum estimate of dollars lost from the watershed is about $1.1 million per year. This is equivalent to approximately $850,000 in lost nutrients from the watershed and approximately $300,000 in lost sediment and water capacity. These estimates are very conservative because they are based on

yield from the watershed, not loss from the fields (field losses are higher than delivery to the waterbody). An ecosystem-based approach is being used for watershed management in the Porter Bayou watershed.

7.2 Adaptive Management Process

In addition to ecosystem-based management, an adaptive management process is being used for watershed management in the Porter Bayou watershed. Adaptive management is "learning by doing" and has become the recommended approach for ecosystem and natural resources management, including watershed management (Christensen et al. 1996; Holling 1978; Jackson et al. 2001). Adaptive management has helped shift management from the concept that there is a "balance of nature" to a more realistic concept that ecosystems are dynamic, non-equilibrium systems. The environment is continually changing – climate, development, agricultural practices, demographics, and societal values. Adaptive management is the only feasible approach for moving toward sustainable water resources (Coleman 1998).

Adaptive management, or learning by doing, means that periodic assessments must be made to determine if results-based criteria are being attained and if the water bodies and watershed are moving toward the desired vision for Porter Bayou and its watershed. The schedule for these periodic assessments and revision of the watershed management plan is discussed in Chapter 8. The rotating basin approach used by MDEQ is part of this periodic assessment process.

7.3 Planned activities

There are two key factors in this watershed that dictate which BMPs will be successful, *irrigation* and *development*. With development comes an increased financial investment by the landowner. As land cost increases, landowner willingness to implement edge of field BMPs decreases. This scenario calls for larger BMPs to be implemented in undeveloped areas that will treat runoff from upstream, developed areas. The less developed areas of the watershed are characterized by ridge and swale topography and there are more opportunities for BMP implementation. Low-lying swales are suitable for treatment wetlands, while unimproved

drainage ditches are prime candidates for low grade weirs, tail water recovery systems, and other BMPs.

Irrigation, particularly of rice, introduces an additional factor into the nutrient equation. Base flows in most Delta streams naturally decrease during the summer months due to less rainfall. Irrigation water supplements these base flows and often provides a constant source of runoff throughout the growing season. Although increased base flows benefit many aspects of stream health and water quality, it also reduces the ability of some BMPs to trap nutrients. For example, multiple low grade weirs are designed to trap and pool runoff allowing biological transformations to occur. With a steady base flow the utility of these in-stream BMPs is greatly diminished. To effectively treat this type of runoff we must focus on BMPs capable of treating or reusing large volumes of water. Therefore, areas of the watershed characterized by both development and irrigation, treatment wetlands and/or tail water recovery systems are the primary BMP solutions. The limited nutrient data and estimated existing ecoregion concentrations indicate reductions of nutrients can be accomplished with installation of best management practices (MDEQ 2008).

Given these considerations, the management practices currently targeted for the Porter Bayou watershed include

- Nutrient and sediment BMPs,
- Targeted land enrollment in WRP,
- Water management,
- Riparian buffer restoration, and
- Alligator weed control.

7.3.1 Nutrient and Sediment BMPs

Two catchments of Porter Bayou have been targeted for monitoring and installation of BMPs to reduce nutrient and sediment loads in cropland runoff. Specific BMPs that will be installed in these catchments include low-grade weirs, pipes and pads, treatment wetlands, and tailwater recovery systems. Low-grade weirs, pipes and pads, and tailwater recovery systems will be discussed in this section of the plan. Wetlands will be discussed in Section 7.3.2.

7.3.1.1 Low-grade Weirs

Installation of low-grade weirs in agricultural drainage ditches can improve water quality through removal of sediment and nutrients. The weirs slow flow during storm events and allow sediment to be deposited. In addition, holding water in the ditches behind the weirs creates environments that encourage biogeochemical transformation of nutrients, and may contribute to groundwater recharge (Kroger et al 2008a). One study in the Delta determined that low-grade weirs reduced annual phosphorus loads from cropland runoff by over 40% (Kroger et al. 2008b).

Low-grade weirs will be installed in several ditches in the targeted catchments. These ditches are associated with approximately ?? acres of cropland. Estimated pre-installation nutrient loads from these lands, along with the estimated potential load reductions, are shown in Table 7.?. Sediment loads estimates?

The cost of installing and maintaining these weirs is estimated to be ??. The weirs will be designed by MSU and installed by landowners with assistance from MSU, NRCS, and Delta F.A.R.M. Financial assistance for installation and maintenance of the weirs will be provided by Delta F.A.R.M. through the EPA Section 319 grant program.

7.3.1.2 Pipes and Pads

Need info

7.3.1.3 Tailwater Recovery

In addition to water quality improvement, tailwater recovery ponds can benefit several of the species of concern identified in Section 3.3.

Need info

7.3.2 Targeted Land Enrollment in WRP

Natural and constructed wetlands have been shown to improve water quality through removal of sediment and nutrients (references). Slow flow through the wetlands allows sediments to be deposited. Nutrients are used by wetland plants, and the wet environment

encourages biogeochemical transformation of nutrients. In addition, wetlands can be places of groundwater recharge.

Approximately 6,007 acres of wetlands currently exist in the Porter Bayou watershed. It is estimated that approximately ?? acres of wetlands will be restored and/or created in the Porter Bayou watershed. Acres of cropland associated with (i.e., runoff load input)? WQ improvement? Water storage, recharge? In addition to water quality improvement and groundwater recharge, restored and constructed wetlands can benefit several of the species of concern identified in Section 3.3. For example, wetlands can provide wintering habitat, migratory stop-over sites, late summer/fall foraging sites, and breeding/nesting habitat for a number of waterfowl, forest, and migratory bird species.

Delta Wildlife and Mississippi NRCS will assist with design of constructed wetlands. Mississippi Department of Wildlife Fisheries and Parks will assist with development of management plans for both restored and constructed wetlands. Financial assistance for design, installation, and maintenance of restored and constructed wetlands will be available from the NRCS Mississippi River Basin Initiative through the Wetland Reserve Enhancement Program.

7.3.3 Riparian Buffer Restoration

The NPBDD Stream Bank Restoration Project involves the mulching and grinding of woody underbrush along the banks of Porter Bayou. Native Warm Season Grasses are being planted in these areas as a means of bank stabilization. These riparian buffers also serve as filter strips removing sediments from agricultural runoff entering the bayou through overland flow.

7.3.4 Alligator Weed Control

Need info

7.3.5 Water Management Projects

Water management activities anticipated for Porter Bayou include installation of tailwater recovery systems, off-channel storage, and the PHAUCET irrigation computer protram. Tailwater recovery systems are described in Section 7.3.1.2. The remaining activities are described below.

7.3.5.1 Channel maintenance

Clearing and snagging, dredging/channel improvement

Need info

7.3.5.2 Off-channel storage

Off-channel water storage will be added in the Porter Bayou watershed through installation of tailwater recovery impoundments (see Section 7.3.1.2), and restoration and construction of wetlands (see Section 7.3.2).

7.3.5.3 PHAUCET

YMD is working with producers in the Delta to implement the NRCS PHAUCET Irrigation Computer Program. This program helps producers design flat poly pipe furrow irrigation systems by identifying the appropriate hole sizes to punch in the pipe based on variables such as the well pump rate, field slope, row lengths, and size of poly pipe (YMD 2009). This design assistance is expected to reduce water usage. Feedback from producers who have used PHAUCET has all been positive (YMD 2009).

7.4 Schedule

The schedule for implementation of management practices is summarized in Table 7.1.

Table 7.1. Management schedule

Management Activity	Milestone	Start Date	End Date
Nutrient and sediment BMPs	installation of low-grade weirs in north target catchment		
	installation of low-grade weirs in south target catchment		
	Selection of additional sites for BMP installation		
	Installation of BMPs at selected sites		
NPBDD Projects	riparian buffer restoration projects		
	Alligator weed eradication program		
	Clearing and snagging		
	dredging/improvement		
WRP Enrollment	targeting of catchments in Sunflower River watershed		
	Contact targeted landowners		
	Targeted lands enrolled in WRP		October 2013
	Design of constructed wetlands		
	Develop wetland management plans		
	Wetlands constructed		
	Biennial inspections		October 2016
	paid wetland maintenance		October 2016
Water Management	Select locations		
	install tailwater recovery systems		
	install re-lift systems		
	implement PHAUCET		

7.5 Budget

The budget for implementation of management practices is summarized in Table 7.2.

Table 7.2. Management budget.

Management Activity	Actions	Budget	Funding Sources
Nutrient and sediment BMPs	installation of low-grade weirs in target catchments		319 grant with Delta FARM, producers
	Selection of additional sites for BMP installation		MRBI CCPI grant with Delta Wildlife and MDWFP
	Installation of BMPs at selected sites		MRBI CCPI grant with Delta Wildlife and MDWFP
NPBDD Projects	riparian buffer restoration projects		NPDD
	Alligator weed eradication program		
	Clearing and snagging		
	dredging/improvement		
WRP Enrollment	targeting of catchments in Sunflower River watershed		MRBI WREP grant with Delta Wildlife and MDWFP
	Contact targeted landowners		
	Targeted lands enrolled in WRP		
	Design of constructed wetlands		
	Develop wetland management plans		
	Wetlands constructed		
	Biennial inspections		
	paid wetland maintenance		
Water Management	Select locations		MRBI CCPI grant with Delta Wildlife and MDWFP
	install tailwater recovery systems		MRBI CCPI grant with Delta Wildlife and MDWFP
	install re-lift systems		MRBI CCPI grant with Delta Wildlife and MDWFP
	implement PHAUCET		NRCS, YMD, producers

8.0 EDUCATION AND OUTREACH

8.1 Goals

Need

8.2 Management Team

Need info

8.3 Survey

Need info

8.4 NPBDD

8.5 Nutrient and Sediment BMPs

The landowners in the targeted catchments were contacted to provide input on issues they perceived and would like addressed in the management plan. Producers in the area will be contacted with information regarding benefits of BMPs. The data gathered from the monitoring will be used to educate producers in the area, and the BMP sites will be included on informative tours for Delta farmers.

8.6 Targeted Enrollment of Land in WRP

DW will prepare a brochure that describes the WREP objectives, available funds for both enhancement and protection/restoration, WRP process of enrollment, and general management requirements. The brochure will be distributed to all potential WRP landowners, including landowners currently under WRP contracts (are there any in Porter Bayou watershed?). The most effective outreach efforts are those that work one on one with individual landowners, which is the process that will be used by both DW and MDWFP. DW will work with individual landowners first, to enroll in WRP and contract for wetland easements in perpetuity, or at least for 30 yr. Once the contracts are signed, DW will work with NRCS engineers, and the individual landowners to design and construct the WRP project, ensuring compatibility with farming

practices, and providing insight and information on how wetland functions benefit the landowner. In addition, ancillary benefits the landowner receives by having the WRP project on their property will be described and documented. MDWFP will work with NRCS engineers and the individual landowners in developing and implementing the WRP management plan. This will include annual consultation and inspections for 3 years to make any needed mid-course changes in management practices, or reinforce the need for specific management actions.

Personal contact with individual landowners and producers through annual inspections will be used to increase their awareness of the benefits of the wetlands to them. The success stories and value of wetland ecosystem services will be published in producer magazines, DW, MDWFP magazine articles and brochures, included on their web sites, documented through NRCS Fact Sheets, presented at agricultural conferences/meetings, included in MSU Cooperative Extension Farm Day Demonstrations, and disseminated through any other information sources that will increase stakeholder awareness and outreach. Sustaining both the wetland functions and management activities over time will be significantly enhanced with three years of individual landowner outreach on wetland management. After three years, the wetlands will be established and close to being self-sustaining. Further, after 3 years of individual consultation and encouragement, landowner management activities are expected to become part of their routine farming practices. Through the MDEQ 319 program, ecosystem services and associated benefits will be quantified and provided to DW and MDWFP for distribution and discussion with the individual land owners. Finally, exceptional WRP projects will be nominated for Ducks Unlimited, Partners in Flight, and similar national and international program awards that acknowledge landowner stewardship and leadership.

8.7 CCPI Projects

Need info

8.8 Schedule

The schedule for education and outreach activities is summarized in Table 8.1.

Table 8.1.

Education, Outreach Activity	Milestones	Start Date	End Date
Management Team			
Survey			
NPBDD			
319 Project			
WRP Enrollment			
CCPI Projects			

8.9 Budget

Budget information for education and outreach activities is summarized in Table 8.2.

Table 8.2.

Education, Outreach Activity	Budget	Funding Sources
Management Team		319 grant with Delta FARM, MRBI CCPI grant with Delta Wildlife and MDWFP
Survey		319 grant with Delta FARM
NPBDD		NPBDD
319 project		319 grant with Delta FARM
WRP Enrollment		MRBI WREP grant with Delta Wildlife and MDWFP
CCPI Projects		MRBI CCPI grant with Delta Wildlife and MDWFP

9.0 EVALUATION

9.1 Monitoring

9.1.1 Water Quality

A water quality monitoring plan has been prepared for evaluating the impacts of BMPs to be installed in the Porter Bayou target catchments (see Appendix). This monitoring is being conducted by USGS and MSU and funded by NRCS and Delta Wildlife through the EPA 319 grant program.

Reductions in sediment, N and P will be documented through a tiered monitoring approach in the Big Sunflower River watershed. Tier 1 and 2 monitoring sites are active in the Porter Bayou watershed within the Big Sunflower River watershed (Figure ?). MDEQ, COE, USGS, MSU, and DW are monitoring flow, sediment, N, and P, and other constituents during both base flow and storm flow, prior to, and after, construction and implementation of conservation management practices to determine the resulting percent reduction in sediment, N, and P.

NPBDD projects

CCPI projects

9.1.2 Habitat

MDWFP and DW will conduct bi-annual management inspections and consultations (spring and fall) with the landowner for 3 years as the wetland becomes established or enhanced. GIS coverage will track improvements in green infrastructure and corridors for waterfowl and wildlife throughout the 4 year period in which wetland ecosystems are restored and enhanced. DW/MDWFP cash will be used to document increased waterfowl, wildlife, and migratory songbird use of restored/enhanced wetland acreage and reconnected corridors. Restored/enhanced wetlands will be categorized by type and location throughout the Delta. Spring and fall waterfowl, wildlife, and bird counts will be conducted for each of the restored/enhanced wetlands. One quarter of the wetlands will be monitored each year. Monitoring initiation will begin in the second year of management following completion of construction. All wetlands will be monitored by the conclusion of the project in 2016.

Waterfowl, wildlife and migratory songbird use will be related to factors such as wetland type, location, and management practices and documented in a management report.

9.1.3 Water Levels

Ground water levels in Porter Bayou watershed are routinely monitored at selected wells by YMD. YMD surveys water levels in 550 wells throughout the Delta every year in the spring and fall (YMD 2008). There are no USGS continuous ground water monitoring wells located in the Porter Bayou watershed.[6]

Surface water levels do not appear to be routinely monitored at any water body in the Porter Bayou watershed. Water levels in the Sunflower River are monitored by a USGS gage upstream of Porter Bayou, at Sunflower.[7]

9.1.4 Water Use Survey

YMD conducts an annual water use survey for the five major crop types in the Delta – corn, cotton, soybeans, rice, and catfish. Between 100 and 150 sites are surveyed each year. Irrigation water volumes are estimated based on pump flow rate and monthly electricity usage.

9.1.5 Schedule

The schedule for monitoring activities is summarized in Table 9.1.

[6] http://waterdata.usgs.gov/ms/nwis/gw
[7] http://waterdata.usgs.gov/ms/nwis/dv/?site_no=07288500&referred_module=sw

Table 9.1.

Monitoring Activity	Milestones	Start Date	End Date	Frequency
Water quality	pre-implementation monitoring north catchment	March 2010	July 2010	monthly and during storms
	post-installation monitoring north catchment	August 2010	August 2013	
	pre-implementation monitoring south catchment	March 2010	March 2011	
	post installation monitoring	April 2011	April 2014	
Wetland habitat	monitor wildlife use of constructed and restored wetlands			
Water level	Ground water levels	1990s	TBD	bi-annual
Water use	water use survey	2002	TBD	monthly data collection Apr - Sep

9.1.6 Budget

Budget information for monitoring activities is summarized in Table 9.2.

Table 9.2.

Monitoring Activity	Budget	Funding Source
Water quality		319 grant with Delta FARM, MRBI CCPI grant with Delta Wildlife and MDWFP
Wetland habitat		Delta Wildlife and MDWFP
Ground water levels		YMD
Water use		YMD

9.2 Criteria

9.2.1 Nutrient targets

Mississippi does not have water quality standards for allowable nutrient concentrations. MDEQ currently has a Nutrient Task Force (NTF) working on the development of criteria for nutrients. An annual concentration of 1.05 mg/l is an applicable target for TN and 0.16 mg/l for TP for water bodies located in the west side of the Delta. MDEQ is using these preliminary target values for TMDL development (MDEQ 2008).

9.2.2 Sediment

Simon et al (2000) developed acceptable ranges of sediment loadings at the effective discharge of Mississippi water bodies from suspended sediment concentration (SSC) data measured at stable streams in the same ecoregion. The effective discharge is the discharge which moves the most sediment, or is the channel-forming flow. The target range for the water bodies within the Yazoo River basin (which includes Porter Bayou) is 0.0014 to 0.0045 tons per acre per day at the effective discharge.

9.2.3 Water Levels

Need info

9.3 Assessment

Implementation milestones and schedules have been developed for the management actions and education and outreach activities described in this plan. This information is summarized in Table 7.? for use in tracking and evaluating implementation of this plan. For implementation to be considered successful, all activity milestones must be met on time. The Team will meet quarterly to review progress on achieving the milestones and make needed adjustments to the schedule. Each Team member serves as the chair for one of the major management categories, such as sewerage, sediment and nutrient loading, etc. There is a subcommittee associated with each of these categories to ensure that the management actions are implemented.

9.3.1 Plan

Specific management action schedules toward achieving the vision for the Porter Bayou watershed are described in Chapters 5.0 and 6.0 and summarized in Table 7.?. If the schedules are not being met, the causes behind the failure to meet the goals will be determined, and actions will be taken.

9.3.2 Education and outreach

Specific management action goals and/or expectations are described in Chapter 5.0. Specific goals and/or expectations for education and outreach activities are described in Chapter 6.0. If the activity goals were not met, the causes behind the failure to meet the goals will be determined. In addition, the plan activities will be evaluated with regard to information and knowledge about the watershed and its waterbodies that has been gained since the existing plan was developed, as well as any relevant physical changes in the watershed or changes in policy affecting the watershed. Implementation of the activities will be reevaluated in light of all of this information on a quarterly basis, as discussed above.

9.3.3 Budget and Funding

Need info

10.0 PLAN REVISION

After evaluation, the Team will prepare a revised WIP, incorporating the changes requested by the reviewers and reconciling any conflicting comments or requests for change.

If the evaluation criteria are all being met for Porter Bayou watershed, the WIP will be revised to address different restoration issues, and to continue activities that protect the water quality of the lake. If the evaluation criteria are not being met, the approach for restoring Porter Bayou watershed quality will be revised based on knowledge that has been gained since 2007. The draft of the revised WIP will be completed one month after the evaluation has been completed.

The draft WIP will be submitted to the Team and all others who submitted comments. Within two weeks of receiving the draft WIP, the Team will notify their stakeholders of the availability of the revised WIP 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 WIP are received, the Team will prepare a final updated WIP. The updated WIP will be submitted to the Team for review and approval. After the updated WIP has been approved, the Team will notify their stakeholders of the completion and availability of the updated WIP for use as a guide to watershed restoration and protection activities.

The plan will be reviewed and revised following the MDEQ Rotating Basin schedule for the Yazoo River Basin. This will permit the Team to incorporate monitoring information and assessment reports prepared by MDEQ. This approach also is consistent with adaptive management and the process used by the Team for managing Porter Bayou watershed.

Budget and funding

11.0 REFERENCES

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