LAKE ST. JOSEPH WATERSHED
STATE WATERBODY SUBSEGMENT 081202
LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Watershed Implementation Plan
2004

FOR DISSOLVED OXYGEN
AND NUTRIENTS

Nonpoint Source Program

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Executive Summary

Lake St. Joseph is an oxbow lake in the Ouachita River Basin. The lake is a former part of the Mississippi River. Lake St. Joseph, identified as waterbody sub-segment 081202, was listed on the Modified Court Ordered 303(d) List because the water quality data collected in 1999 indicated the lake did not fully meet the water quality standard for dissolved oxygen. Therefore, a total maximum daily load (TMDL) was calculated to determine what type of pollutant load reduction would be needed for Lake St. Joseph to meet the dissolved oxygen standard. The TMDL indicated there would need to be a 6% reduction in the types of pollutants that contribute to dissolved oxygen problems in Lake St. Joseph. The TMDL did not identify any point source dischargers within the watershed; therefore, the water quality impairment is attributed to nonpoint source (NPS) pollution.

Historically, the watershed was covered by bottomland hardwood forests. Today the watershed is comprised of agricultural land, mostly row crops including cotton, soybean, corn and some wheat and sorghum. Land on the west side of the lake appears to slope away from the lake, causing the surface water runoff to drain away from the lake. Only the land areas on the east and the northern portion of the watershed appear to drain toward the lake. Surface water runoff from the watershed enters the lake through small manmade agriculture ditches, primarily the Grudge Ditch, and sheet flow. NPS loading of excessive nutrients and sediment coming from agricultural drainages within the watershed is likely to have caused the water quality impairment within the lake.

Changes in the hydrology to promote efficient land drainage has accelerated sediment deposition in the lake over time. Increased rates and amounts of storm water runoff also transport nutrients into drainages, which function as direct conveyances to the lake. Higher peak flows, after rain events, have greater hydraulic energy causing the channel banks to become unstable and scoured, which contribute additional NPS loads to the lake.

Current and future sediment and nutrient loading to the lake will have a tendency to become trapped and to slowly degrade the dissolved oxygen in the lake. This degradative process occurs within the benthic layers of the lake and is referred to as sediment oxygen demand (SOD). Since the lake is primarily a closed system, there is a high potential for accumulation of sediment, causing it to become shallow and fill in. Decreased water volume and depth increases water temperature and the amount of sunlight reaching the bottom. These conditions cause increased loss of dissolved oxygen and excessive algae or plant growth within the lake. All of these factors contribute to water quality problems in the lake.

In order to reduce the amount of nutrients and sediment entering Lake St. Joseph, best management practices (BMPs) should be implemented on agricultural lands wherever possible. Contour farming (parallel to lake), vegetated/riparian buffers, grassed waterways, and wetland conservation could reduce NPS loading to the lake. Areas in the watershed that are more erosive and likely to contribute greater NPS pollutant loading should be the focus of conservation and BMP implementation.

1.0 INTRODUCTION

Lake St. Joseph, of the Ouachita River Basin, waterbody subsegment 081202, was listed on the February 29, 2000 Modified Court Ordered 303(d) List for Louisiana (EPA 2000) as not fully supporting the designated use for fish and wildlife propagation. In 1999, LDEQ conducted water quality sampling on Lake St. Joseph. The results indicated that the concentration of dissolved oxygen was less than the water quality standard. The dissolved oxygen standard that has been determined as supportive of fish and wildlife propagation in Lake St. Joseph is 5.0 mg/L year round. A Total Maximum Daily Load (TMDL) was prepared for the Lake St. Joseph Watershed by US EPA Region 6 after it was included on the 303(d) List. The *TMDL is the maximum amount of pollution the waterbody can receive on a daily basis and continue to maintain its water quality standards.* The NPS Implementation Plan will identify and address the likely sources and causes of NPS loading in this watershed.

The Lake St. Joseph Watershed TMDL was developed to estimate the total amount of oxygen-demanding substances, particularly nutrients that the lake can assimilate without violating the 5.0 mg/L dissolved oxygen water quality standard. The suspected sources and causes for the lake's water quality impairment are included in Table 1. TMDL reports typically separate the point source and nonpoint source (NPS) within the sub-segment (watershed). No NPDES (National Pollutant Discharge Elimination System) permits or point source discharges were identified in the watershed, only potential sources of NPS loading (EPA Region 6, 2000). The TMDL report established a NPS load allocation and projected a NPS pollutant load reduction that will be necessary to achieve water quality standards. The NPS Implementation Plan outlines the basis for what type of BMPs are recommended in the Lake St. Joseph Watershed to reduce NPS loading and a projected schedule for implementation (Table 8).

Table 1: Summary of 303(d) Listing for Subsegment 081202 (EPA 2000).

Subsegment Number	Waterbody Description	Suspected Sources	Suspected Causes
081202	Lake St. Joseph	Irrigated crop production Surface runoff Petroleum activities	Pesticides Nutrients Organic enrichment/low DO Suspended Solids

1.1 Eco-Region Description

Two different eco-regions make up the Ouachita River Basin, the *South Central Plains* and the *Upper Mississippi River Alluvial Plain.* The entire basin is divided in half by the Ouachita River, with distinctly different eco-regions on the east and west side of the river. The *South Central Plains* eco-region (maximum land elevations and relief, Pleistocene soils, and upland forest vegetation) is located on the west side of the Ouachita River. The *Upper Mississippi River Alluvial Plain* (low land elevations, deltaic/alluvial soils from Mississippi River, and bottomland hardwood vegetation) is located on its east side.

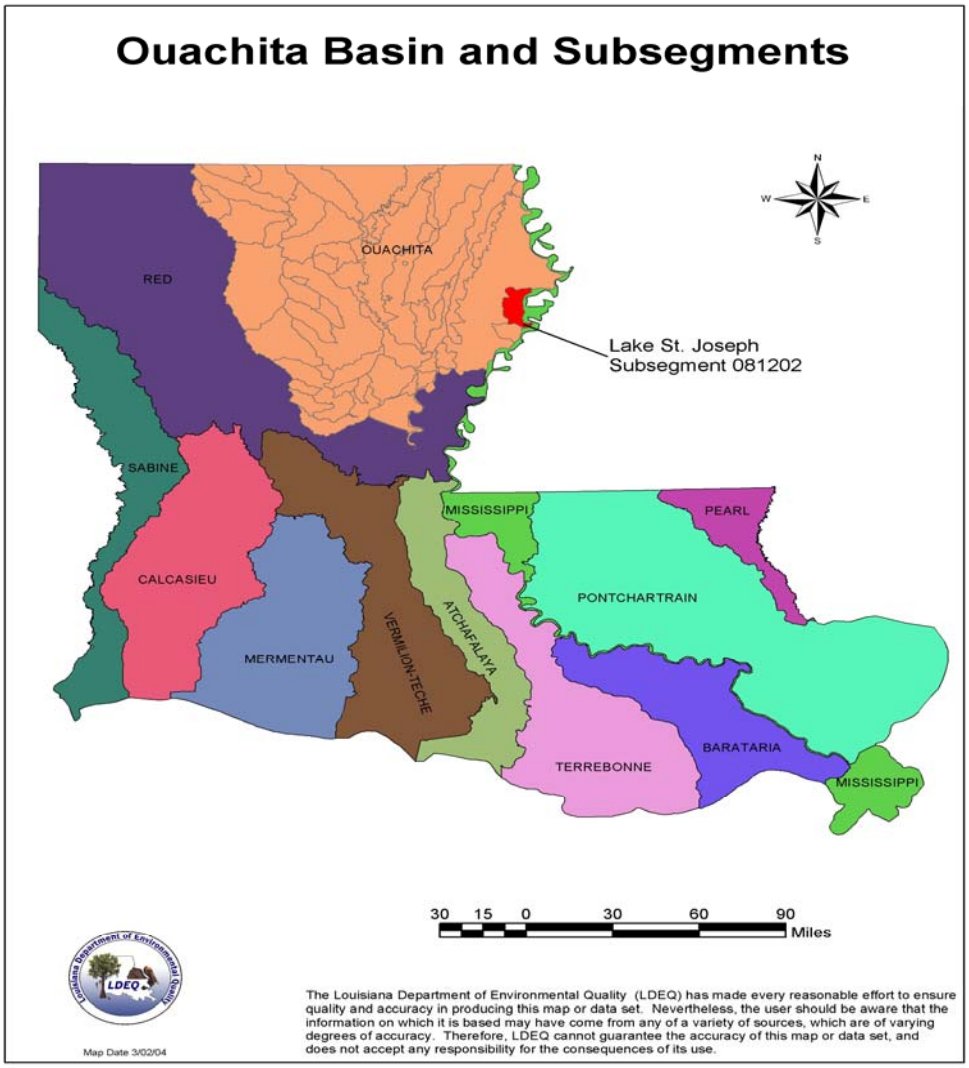
The Lake St. Joseph Watershed, water body sub-segment 081202 is located in the *Upper Mississippi River Alluvial Plain* eco-region on the east side of the Ouachita River. Row crop agriculture dominates the rich alluvial soils characteristic of the *Upper Mississippi River Alluvial Plain* eco-region, which was once covered by bottomland hardwood forests. The flat and fertile soil was deposited by the Mississippi River.

Figure 1: Map of Louisiana Eco-Regions

1.2 Ouachita River Basin Description

The Ouachita River Basin is located in northeast Louisiana and is positioned in a north-south direction between the Mississippi and Red River Basins. The drainage area of the Ouachita River Basin covers over 10,000 square miles (LDEQ 1992). The eastern-half of the basin consists of rich, alluvial plains cultivated in cotton, soybeans, and corn. The western-half of the basin primarily consists of upland vegetation where silvicultural (pine) and poultry operations occur. The headwaters of the Ouachita River begin in the Ouachita Mountains of west-central Arkansas near the Oklahoma border. The Ouachita River flows south through northeastern Louisiana, joining the Tensas River, and then the Black River, which empties into the Red River.

Figure 2: Location Map of the Ouachita River Basin and Subsegment 081202



1.3 Lake St. Joseph Watershed Description

Lake St. Joseph Watershed, Subsegment 081202 is located within Tensas Parish approximately 24 miles south of Tallulah, LA and approximately 30 miles east of Winnsboro, LA. Lake St. Joseph is a 1580 acre oxbow lake created by the Mississippi River (Figure 3). Some areas in the northern part of this watershed do not drain into the lake, rather toward the Tensas River without entering Lake St. Joseph. One outlet drains the lake named Clark's Bayou. Clark's Bayou drains to the Tensas River. The drainage area is approximately 23 mi^2 (USGS 1971), which is primarily the southern half of the watershed. Most of the drainages are manmade in the form of agricultural drainage ditches and canals. The topography of the land is flat.

1.4 Field Survey of Lake St. Joseph Watershed

A site visit was made to the Lake St. Joseph Watershed on March 26, 2004 in order to conduct a field survey and to make a general assessment of the watershed. Satellite maps in digital orthographical quarter quadrangle DOQQ format, topographical maps, and hand-held GPS (global positioning system, WAAS ed. loaded with TOPO USA) were utilized during the field assessment to identify the different types of land use, their locations, and their percent of coverage in the watershed. The DOQQ maps with high resolution and detail were instrumental for identifying the potential sources of NPS loading in the watershed.

The primary land use type observed in the Lake St. Joseph watershed was agriculture, except for a residential and minor commercial area named Newellton. While traveling through the watershed, it was noted that none of the drainage ditches and canals on the west side of the lake drain toward it. The land within the watershed slopes from east to west; as a result, the land on the west side drains away from it. Surface water runoff that enters the lake appears to come only from the east side of the watershed from lands closest to the Mississippi River. This supports the idea that the land within the watershed slopes from east to west. The lake is shaped like a crescent, lying in a north-south fashion.

<u>Northern Watershed Area</u>
In the northern portion of the lake are four spots where agricultural roadways have been constructed across the lake. These roadway crossings act like dams, segregating the northern portions of the lake into four areas of pooled water distinct from the central and southern regions of the lake. As a result, these separated portions of the lake system have become very shallow, narrow, and covered with vegetation. The shallow waters could have resulted from siltation caused by sediment-laden runoff coming from adjacent agricultural land. Runoff from agricultural land can have high nutrient levels, which could have caused excessive growth of aquatic vegetation in these areas of the lake.

<u>Southern Watershed Area</u>
The southern portion of the lake is wider, deeper, and had less undesirable vegetation. This area of the lake appeared more conducive for recreational activities such as fishing, boating, and swimming. Several people were observed fishing from boats on the lake. Some, but not all, of the homes located along the lakeshore have fishing piers or some other form of access to the lake for fishing and recreation. The majority of the lake's shoreline is lined with mature cypress trees.

Very few trees exist within the watershed, except for a few cypress brakes (isolated swamp areas covered with cypress trees) that dot the eastern side of the lake. These cypress brakes are low depressions in this area of the watershed. They act like sinks that intercept and trap surface water runoff from adjacent lands that would otherwise drain into the lake. This beneficial consequence can prevent excessive amounts of potentially polluted NPS runoff from directly entering the lake. Only during long periods of heavy rainfall, would these areas overflow and contribute runoff into the lake. One of the main drainages flowing into the lake is named Grudge Ditch. It transverses the entire east side of the watershed and likely contributes the majority of surface water runoff. Grudge Ditch is nearly 20 feet wide, entrenched, lined by a narrow strip of trees and shrubs, and surrounded by agricultural land. A small basin comprised of shrubs and trees exist where Grudge Ditch enters the Lake St. Joseph.

On the field survey, a local landowner indicated concern about the sedimentation in the lake and the increased flood potential. The local perception is that both natural and agricultural runoff influences the lake. Clark's Bayou, a major drainage from the lake, has a large weir that influences the lake's water level and regulates its drainage. Clark's Bayou Bridge is the LDEQ water quality sample site for Lake St. Joseph. Clark's Bayou is located just south of the Town of Newellton.

Figure 3: Drainages and Waterways within the Lake St. Joseph Watershed

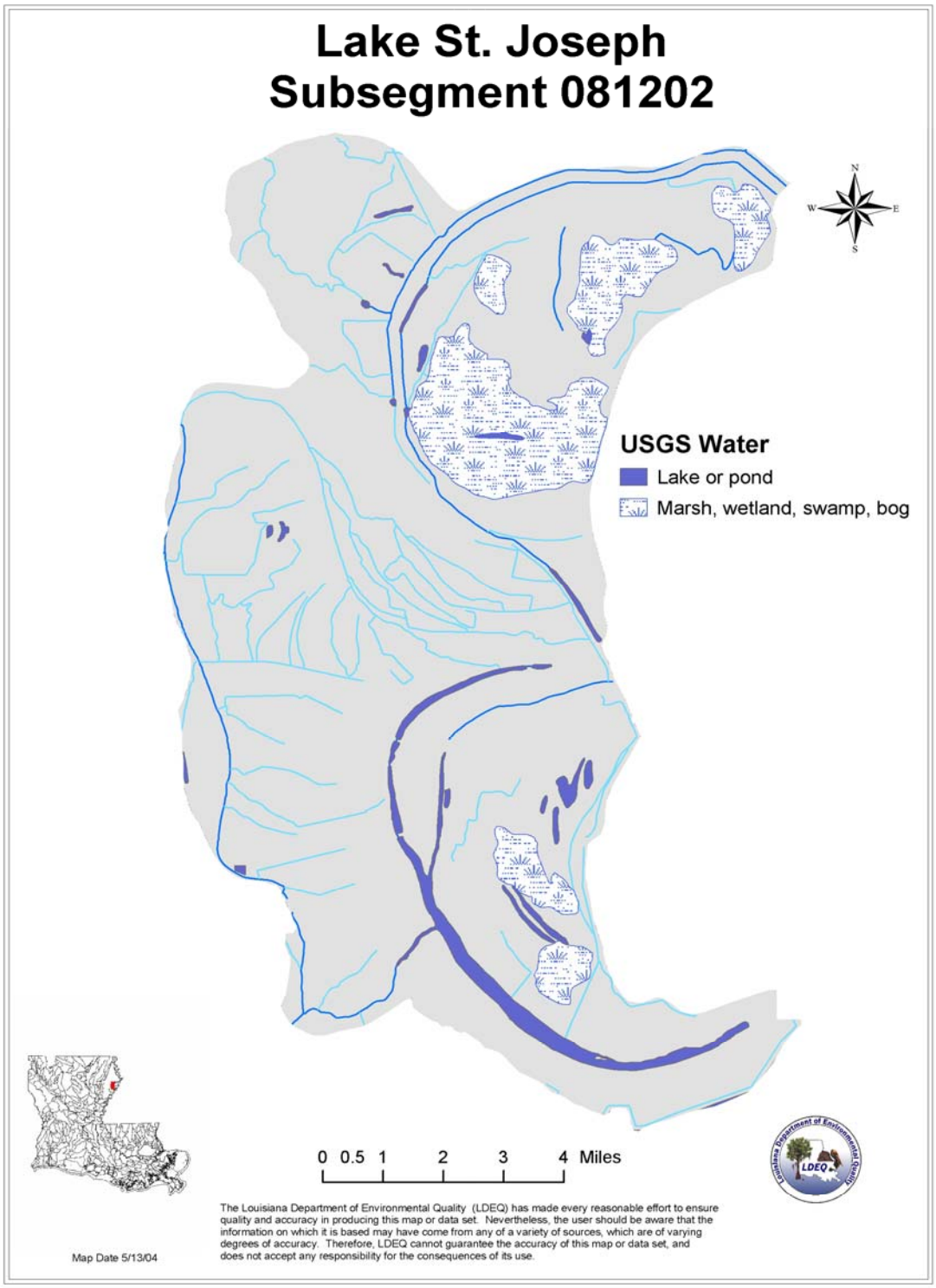


Figure 4: Digital Orthophoto Quarter Quadrangle map of Lake St. Joseph Watershed

2.0 WATER QUALITY ANALYSIS

An evaluation of the water quality data and the test results from water quality testing on Lake St. Joseph can help determine if the body of water is meeting its designated uses. The designated uses for Lake St. Joseph are *primary contact recreation, secondary contact recreation, and fish and wildlife propagation*. Water quality standards are defined by both narrative and numerical criteria. See Table 2 for the numerical criteria of the standards that are applicable to Lake St. Joseph.

Table 2: Numerical Criteria for Lake St. Joseph (LDEQ 2003)

Water Quality Parameters	Numerical Criteria
Chlorides (mg/L)	25
Sulfates (mg/L)	25
pH	6.0 – 8.5
Bacteria Concentration (MPN/100mL)	200 (summer value) and 1,000 (winter value)
Temperature C°	32
Total Dissolved Solids (mg/L)	250
Dissolved Oxygen (mg/L)	5.0

2.1 Water Quality Test Results from Lake St. Joseph

Water quality samples for Lake St. Joseph were collected and analyzed during 1999 from the LDEQ sampling site number 0800 from Clark's Bayou Bridge. The water quality test results showed that two out of the twelve months had dissolved oxygen levels less than the standard of 5.0 mg/L. During the month of July, the dissolved oxygen level dipped to 1.9 mg/L and again to 4.4 mg/L during September. On the other hand, it should be noted that eight of the twelve months had dissolved oxygen levels greater than 7.0 mg/L, with three sample results showing levels near and above 10.0 mg/L. The seasonal distribution for dissolved oxygen on Lake St. Joseph during the year of 1999 is illustrated in Chart 1.

Chart 1: Seasonal Trend of Dissolved Oxygen in Lake St. Joseph during 1999

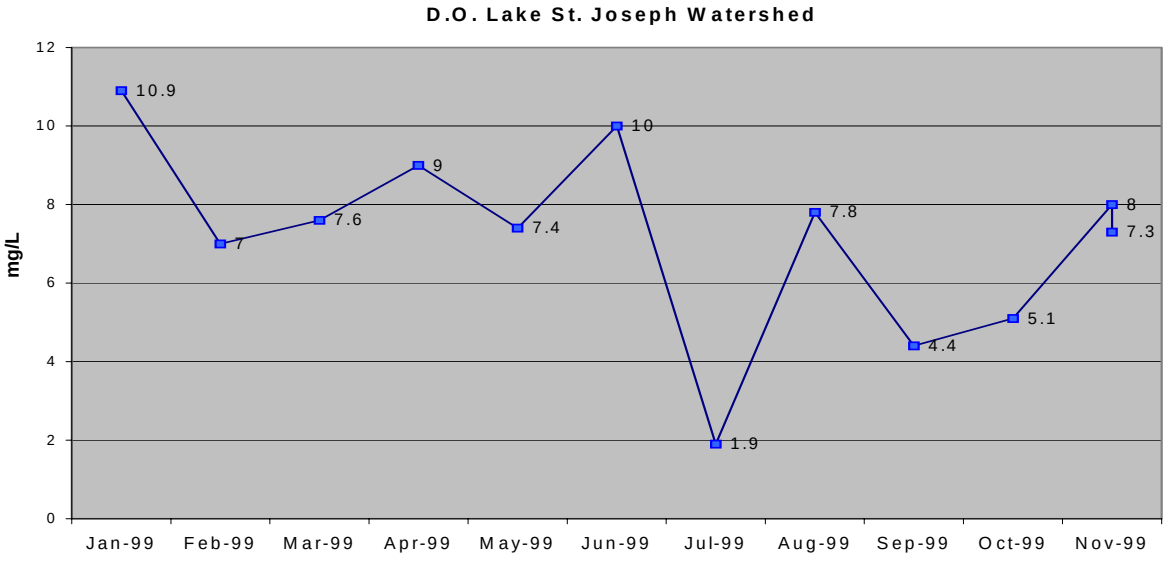


Chart 2: Seasonal Trend of Sediment in Lake St. Joseph during 1999

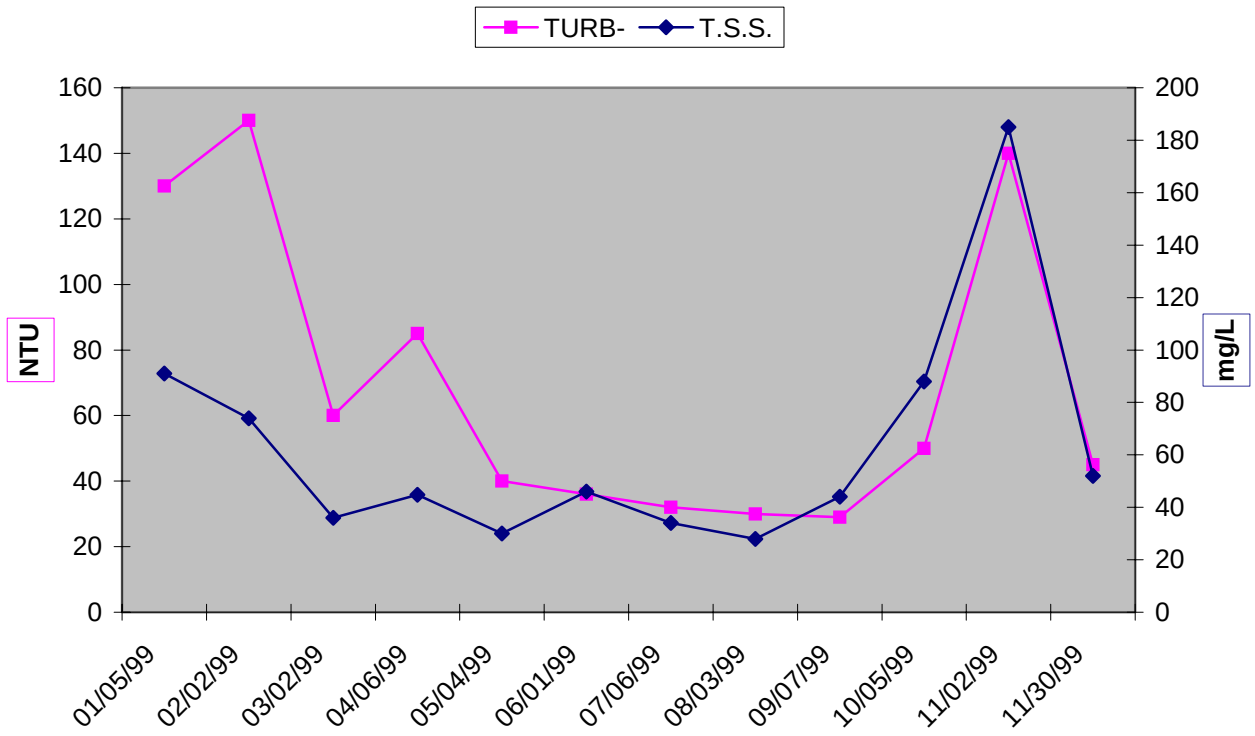
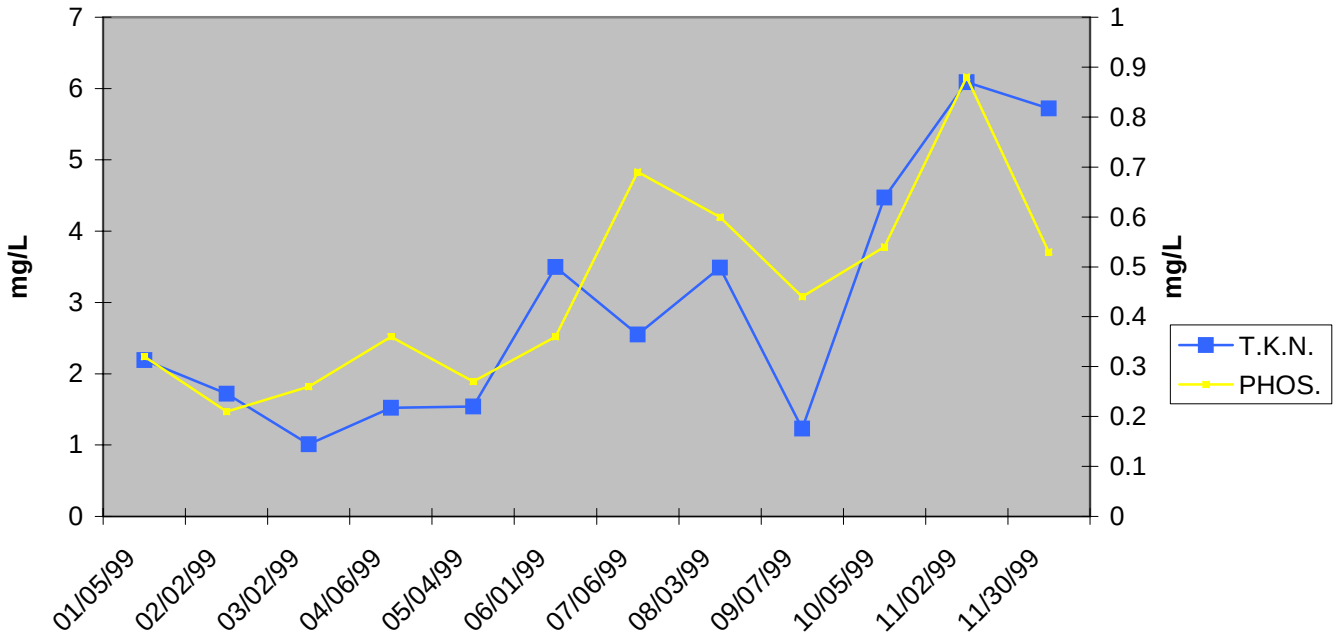


Chart 3: Seasonal Trend of Nutrients in Lake St. Joseph during 1999



Other water quality tests were conducted on Lake St. Joseph to analyze sediment and nutrients during 1999. Sediment tests measured the total suspended solids and turbidity. Test results revealed higher sediment levels occurred during November and February. Higher levels of turbidity were also observed during these times. Higher turbidity levels indicate lower water clarity, with the anticipation of a rise in sediment oxygen demand (SOD) when the sediment settles on the lake bottom. For all water bodies in the Ouachita Basin, the water quality criteria for turbidity are 50 NTU (LAC 33:1X.1113.B.9). During November, the turbidity level was near 200 NTU, nearly 2.5 times higher than other months. These levels tend to be a sharp rise and sharp fall, which may be indicative of a particular episodic event. The seasonal distribution of sediment, measured as turbidity and total suspended solids within Lake St. Joseph during 1999 is illustrated in Chart 2.

Water quality tests for nutrients in Lake St. Joseph showed high levels occurring during the month of November, which is consistent with the peaks in turbidity that also occurred during that month. Other high levels of nutrients were reported during July and August. The lowest level of nutrients occurred during February and March. The source of the nutrients at these times of the year is not clearly apparent. An explanation of higher levels of nutrients at these times could be attributed to a flush of pollutants from drainages occurring after heavy rainfall events. During periods of drought, pollutants tend to accumulate in drainage ditches and canals to Lake St. Joseph. At that time, pollutants never make it to the lake. However, during periods when rainfall is higher, drainages can reach bankfull water level. Bankfull water levels produce enough hydraulic energy and sheer stress to flush the accumulation of nutrients and sediment downstream, into Lake St. Joseph, far from the source. In Louisiana, much of the rainfall occurs during fall as cold fronts move down into areas with warm air temperatures. Another explanation could be that it is the time of year when a particular land use activity occurs, or a combination of both. The type and distribution of land uses in the Lake St. Joseph Watershed are described and evaluated in Section 5 of this plan. In the absence of successive years of historical data collection on Lake St. Joseph, it is difficult to say that these trends are representative of typical water quality conditions.

3.0 TMDL FINDINGS AND RECOMMENDATIONS

Total Maximum Daily Loads (TMDLs) are the maximum amounts of pollutants that can enter a water body on a daily basis without causing the water body to become impaired and/or violate water quality standards. TMDLs are the sum of the individual waste load allocations (WLAs) for point sources, load allocations (LAs) for nonpoint and natural background sources, and a margin of safety (MOS). TMDL Allocation = WLA + LA + MOS.

Water quality standards are developed in order to support the designated uses for each water body. The designated uses for Lake St. Joseph included primary contact recreation, secondary contact recreation, and propagation of fish and wildlife. Based upon the water quality data collected during 1999, Lake St. Joseph did not support the designated use of fish and wildlife propagation. This designated use is based upon a 5.0 mg/L dissolved oxygen water quality standard.

The TMDL report for Lake St. Joseph was developed by USEPA Region 6, through a contract by FTN Associates, Ltd. of Little Rock, Arkansas on May 28, 2002. A water simulation model (LA-QUAL version 4.13) was used for the TMDL report. A conservative approach was taken for the modeling simulation in order to project the water quality conditions during critical periods. Critical periods occur when temperatures are highest and water flows are lowest. Output from the model indicates the amount of pollutant load reduction that is necessary in order to meet the water quality standards during critical periods.

There were no point source wastewater dischargers (LPDES Wastewater Discharge Permits) identified in the watershed; therefore the main source of water quality impairment has been attributed to nonpoint source pollution (NPS). For modeling purposes, Lake St. Joseph was calculated as one reach because there was no physical or chemical evidence of spatial variations in water quality (EPA TMDL 2002). The TMDL for oxygen demanding substances (carbonaceous biochemical oxygen demand (CBOD), ammonia nitrogen, organic nitrogen, and sediment oxygen demand (SOD) was calculated. The model projection indicated that NPS loads will need to be reduced by approximately 6% in order to meet the DO of 5 mg/L in Lake St. Joseph during critical conditions.

The TMDL load distribution of oxygen demanding substances in Lake St. Joseph was divided into nonpoint sources (NPS - material suspended in the water column), sediment oxygen demanding substances (SOD- benthic load that resides on the stream bottom), and headwater and tributaries sources (loading from headwaters and tributaries). There was an estimated 81% NPS load and a 19% SOD load for Lake St. Joseph. The Lake St. Joseph system is encompassed by numerous agricultural fields with a couple of tributaries leading into and out of Lake St. Joseph. Since there are few tributaries entering the Lake St. Joseph system, there is a buildup of both NPS and SOD related material. These results indicate there is likely greater oxygen demanding substances suspended in the water column than there is on the bottom. NPS loading occurs when stormwater or agricultural runoff enters a waterbody. SOD loading occurs when the NPS load settles to the bottom of the waterbody and accumulates. Any NPS loading is likely to have settled on the bottom and become the SOD load.

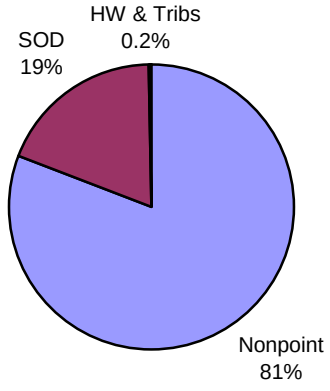
As noted in the watershed field survey that is included in Section 1.4 of this plan, a local farmer mentioned Lake St. Joseph is filling in with sediment. The upper reaches of Lake St. Joseph were observed to be very shallow, almost filled in with sediment. These areas were almost completely covered with vegetation.

Table 3: TMDL Load Distribution for Oxygen Demanding Substances in Lake St. Joseph Watershed

Source	kg/day	Percent of total load
Nonpoint (1)	27620.00	80.9%
SOD (2)	6461.24	18.9%
Headwaters and tributary (3)	74.96	0.2%
Incremental (4)	0.00	0.0%
Point Source load (5)	0.00	0.0%
Total	34156.21	100%

(1) Nonpoint load are the materials suspended in the water column.
(2) Sediment oxygen demand (SOD) is the benthic load that resides on the stream bottom.
(3) Headwaters and tributaries are the loading from tributaries and headwater.
(4) Incremental load includes ground water, NPS from rain events, and tributaries.
(5) Waste loads are the amount of pollutants discharge in from industrial and municipal point sources in the waterway.

Chart 4: TMDL Load Distribution of Oxygen Demanding Substances in Lake St. Joseph



4.0 IDENTIFYING HIGH PRIORITY AREAS IN THE WATERSHED

Watersheds are not homogeneous with regards to their potential for soil erosion. Soil type, the slope of the land, and land use are each important factors in determining the impacts to water quality from a given area. Therefore, when determining priority for conservation measures within a watershed both location and activity must be considered. Soils data, sediment loading models, and land use data are valuable tools that can provide clues as to where potential sources of water pollution may be and which problems can most easily be corrected.

4.1 Soils

Erosion of soil and its transport to the water bodies can cause a plethora of water quality problems. The addition of soil to surface water can decrease the amount of light reaching submerged vegetation, thereby reducing photosynthesis. Excessive sedimentation can result in a shallower lake, thereby reducing the volume of water that is available for recreational uses. Such conditions are conducive of stagnant waters and poorer water quality. Chemicals such as pesticides, fertilizers, and metals are often attached to soil particles and can become transported to water bodies and settle on the lake bottom. These chemicals have the potential to directly harm aquatic species in addition to reducing the amount of dissolved oxygen in the lake.

Knowledge of soil types and their locations in the watershed can be helpful when determining where there is greater need for requiring best management practices to protect water quality. Some soils tend to erode more easily than others, based on the content of sand, silt, and clay. Sensitive areas of land are those containing erosive soils located near waterways and tributaries. When these areas are disturbed or altered, they can contribute NPS sediment loading. A complete list of each different type of soil in the Lake St. Joseph Watershed can be found in the Parish Soil Surveys. This watershed lies within Tensas Parish.

As an oxbow lake, Lake St. Joseph existed as a former bend in the Mississippi River, with most all of the soils in the watershed originating from flood deposits at a time when no levees existed along the banks of the river. A review of the Soil Survey for Tensas Parish was conducted to determine each different type of soil in the watershed. The Soil Survey showed characteristic patterns of soil deposition around the lake and out into the watershed. Different bands of soil deposits in the form of ridges and swales parallel most of the lake. The widths of the ridges and swales can range from 15 feet – 350 feet with soil depths from 4 inches – several feet. The nutrient content of these soils tends to be low in nitrogen, while the phosphorus and potassium content are higher. Most of the soils have a high clay content with low permeability.

4.2 Sediment Run-Off

Sediment runoff within a watershed is principally related to the land-use type, the land slope (LS Factor), the soil erodibility (K-Factor), and the rainfall intensity. These variables are the most significant factors affecting agricultural NPS pollution. Rill and gully erosion create small or large ravines by undermining and downward cutting of soil.

Gully erosion is larger and more pronounced rill erosion. Gullies eventually produce ditches or ravines, exposing subsoils to erosion.

4.3 Water Run-Off

The average annual rainfall in the Lake St. Joseph Watershed is ~ 66 inches a year (Tensas Parish Soil Survey 1968, St. Joseph, LA weather station). Water runoff is influenced by a number of factors including soil chemical and physical properties, presence of impermeable surfaces, slope of the land, climate, type and amount of vegetative cover, and root mass.

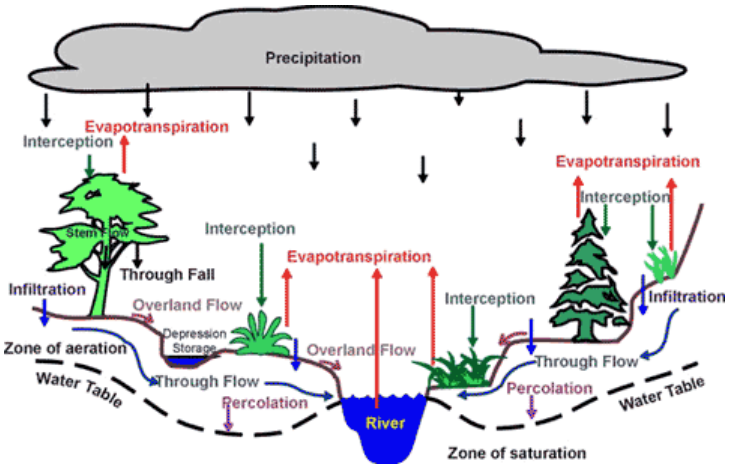


Figure 5: Hydrologic Cycle including the pathways water can take

Water is cycled through the environment following various pathways. When water precipitates from the atmosphere toward the earth's surface in the form of rain, sleet, or snow, it can become intercepted by trees and other vegetation. Remaining water can infiltrate into the ground (interflow) or wash across the surface (overland flow) to streams. Although the cycle is repeated throughout time, it can vary from one area to another and become altered by changes in land use activities. Knowing which areas in the watershed may produce greater amounts of surface water runoff, based on the type of land use activity or other factors can help focus conservation efforts that can reduce NPS pollutant loading. Areas of land that characteristically produce greater amounts and rates of water runoff can be of concern because they can be a chronic source of pollutants such as excessive sediment, nutrients, and organic debris.

5.0 WATERSHED LAND USE ACTIVITIES

The land uses observed in the Lake St. Joseph Watershed are agriculture and minor residential areas. Most residential areas are sparsely populated within the watershed, but a larger population occupies the town of Newellton in the west-central portion of the watershed on the lake. Agriculture occupies the majority of land throughout the watershed. Forests are minor and typically exist in the form of cypress brakes and strips of bottomland hardwoods along property borders. Much of the area in the watershed is

covered with water, hence the lake. Table 4 illustrates the types of land use, the amount of acreage, and the percent of coverage in the watershed.

Table 4: Land Uses in Sub-segment 081202 based on Landsat 5 Classification (LDEQ GIS 2004).

Land Cover	Acres	Percent
Corn	11,084	15.6%
Cotton	23,638	33.2%
Urban/Residential	635	0.9%
Forest Deciduous	15,553	21.8%
Forest Pine	3	0.0%
Pasture-Idle	8,224	11.6%
Rice	33	0.0%
Shrub/Scrub	35	0.0%
Sorghum	621	0.9%
Soybeans	6,370	8.9%
Sweet Potatoes	16	0.0%
Unclassified	1,594	2.2%
Water	2,383	3.3%
Wheat	1,009	1.4%
Total	71,198	100%

6.0 SOURCES OF NONPOINT SOURCE POLLUTION LOADING

Nonpoint source water pollution can result from many different sources in the watershed. NPS pollution can cause both direct and indirect impacts to water quality that can be both acute and/or chronic. In the Lake St. Joseph Watershed, the low dissolved oxygen levels are caused by NPS nutrient and sediment loading. NPS sediment and nutrient runoff comes from a variety of land use activities. Understanding what types of land use activities occur in the watershed may give an indication as to the location of sensitive areas in the watershed, where there is likely to be higher amounts of NPS loading. Other than land use activities, one must consider soil types (chemical and physical characteristics), steepness of land contours, erodibility of soils and their close proximity to the waterbody. All factors should be considered in the selection of conservation practices. Understanding what types of land use activities occur and where they occur in the watershed, provides insight about avoiding additional NPS loading. In the Lake St. Joseph Watershed (Sub-segment 081202), the following land use problems existed in 2004:

- Agriculture
- Urban
- Hydromodification

6.1 Agriculture

State water quality assessments continue to show that agriculture is the leading contributor of nonpoint source pollution to rivers and lakes (EPA 2000). The primary NPS pollutants of concern are nutrients, sediment, animal waste, salts, and pesticides. In the Lake St. Joseph Watershed, agriculture occupies the greatest percentage of land. The primary type of agriculture is row crops.

Table 5: Agricultural Land Use Amounts in Acres within Tensas Parish (LSU AgCenter 2004)

TENSAS PARISH	
AG LAND USE	**TOTAL ACRES**
Cotton	74,847
Corn	48,807
Soybean	23,154
Sorghum	8,815
Wheat	6,856

Row Crops

Cotton, corn, sorghum, and soybean are the primary types of row crops grown in the watershed. These row crops are often rotated with another type crop, which may, or may not serve as a winter cover during the year. The types of row crops may change from year to year, depending on profit for various crops. Therefore, the amount of acreage for each different type of row crop in the Lake St. Joseph is variable. An estimate of the amount of acreage for each type of row crop commonly grown within Tensas Parish is provided in Table 5.

Image 1: Conventional Row Crop Tillage Practice in Watershed.

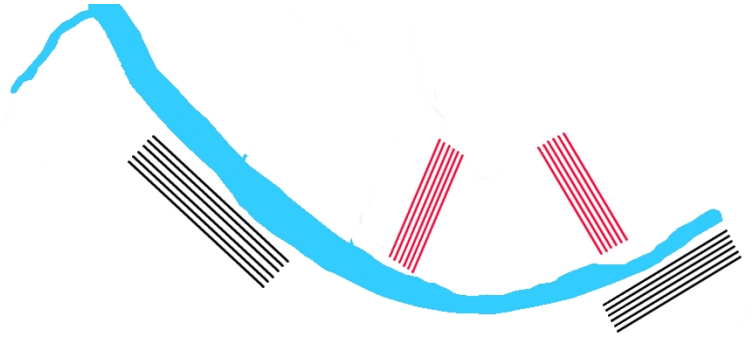
Image 2: New Row Crop in Watershed

Conventional Tillage Practice

Cotton, soybeans, corn and sorghum are the primary row crops in the Lake St. Joseph Watershed. Wheat is sometimes utilized as a winter cover crop. Traditional farm techniques and conventional tillage practices are commonly used throughout the watershed. These agricultural practices and techniques tend to focus on maximizing crop production, rather than on soil and water conservation. The common practice for preparing row crops is soil tillage where there is deep plowing followed by row heaping. Freshly prepared fields of barren soils without vegetation can cause NPS loading because there is little protection from wind and rain. When soils become exposed or disturbed, the impact from falling raindrops can cause particles of sediment to become dislodged. As surface waters accumulate, the unstable sediment becomes suspended, and easily carried away by runoff. As a result, there can be sediment deposition from these sites in lower elevations of the watershed such as local wetlands, tributaries, and the lake system. Sediment runoff is often laden with fertilizers, pesticides, and herbicides. Compared to rivers and streams, there is virtually no flow within a lake system. Lake St. Joseph has minor drainage flows into it and one drainage flow out of it via Clark's Bayou, which has a flow restriction weir across its channel. Any sediment loading into the lake is likely to become deposited and accumulate on the lake's bottom. As the seasons progress, warm temperatures increase the rate that pollutants degrade, thereby consuming greater dissolved oxygen from the lake.

Direction of Row Crop Fields near Lake

The potential for soil erosion and surface water runoff from row crop fields located adjacent to the lake can be increased or decreased, simply by changing the orientation of the row crop fields. Some of the agricultural fields adjacent to Lake St. Joseph have the row crop fields oriented perpendicular to the lake (see Figure 6). Since the lake is the lowest point in the watershed, it acts like a sink to capture runoff from adjacent fields. When agricultural field rows are tilled perpendicular (as opposed to parallel) to the lake, it is expected that the rate and amount of erosion and surface water runoff would increase, and be more likely to drain directly into the lake. These types of row crop fields are more likely to cause NPS pollutant loading.



Example of crop rows parallel (black) and perpendicular (red) to the lake.

Figure 6: Parallel and Perpendicular Crop Rows

Riparian and Vegetated Buffers

Fields cultivated all the way to the edge of a drainage way or lake have no buffer capacity for the runoff coming from the fields. Herbicides are the most common form of vegetation control that is used along field edges and drainage ways. The edges of fields and drainage ways are usually kept barren of vegetation, which offers no conservation of nutrients and soil runoff. Barren streambanks, canals, and ditches without vegetation can allow greater amounts of NPS loading to enter the lake. Agricultural fields located directly next to the lake or next to a drainage ditch that flows into the lake are more likely to contribute NPS loading. When a rain event occurs, sediment and nutrients in the field can wash directly into the waterway. There is little to no buffer to prevent or filter runoff before it enters the lake. Without any type of vegetative buffer to filter the runoff, the rate and amount of NPS loading becomes excessive.

Image 3: Conventional Tillage Practice on Bank of Lake St. Joseph

6.2 Urban

Urbanized areas in the watershed include the town of Newellton. This is a small community with minor commercial and residential sites. Urban areas are known to contain higher proportions of impervious surfaces. Impervious surfaces prevent water or rainfall from contacting the soil surface, thus preventing infiltration, percolation, and natural recycling of waters and the substances it may contain. There is greater accumulation of pollutants and greater amounts of storm water runoff. This causes a higher potential for NPS loading to the receiving waterways. Commercial parking lots followed by streets have the highest runoff coefficients. Potential sources of NPS pollutants include residential lawns, driveways, rooftops, parking lots, and streets.

Image 4: Streets of Newellton

Image 5: Drain Clogged with Sediment during Rain

6.3 Domestic Trash, Litter, and Debris

Throughout the Lake St. Joseph Watershed, there are residents who dispose of their trash, litter, and debris at bridge crossings or in remote areas. Typically, the local parish provides a trash pick-up service. In addition to decreasing the aesthetics of the lake, other problems occur each time it rains and the trash is washed into the waterway. Once in the waterway, it becomes waterborne debris, which can accumulate. Accumulations of waterborne debris will eventually wash into the lake; in the meantime, these accumulations can impede water flow in drainages and within the lake. The NPS loading resulting from this type of waterborne debris contains oxygen consuming substances such as chemicals, oil and grease, excess organic debris, and other substances. A field survey of the watershed revealed large volumes of domestic trash at each bridge crossing. The effects of improperly disposed trash, litter, and debris are apparent downstream from these sources. Besides degrading the aesthetic value of the tributaries and lake, excess amounts can result in both a direct and indirect NPS problem.

Image 6: Household Debris at Bridge across Grudge Ditch

6.4 Hydromodification

Low-lying areas comprise the majority of the land within the Lake St. Joseph Watershed, with most of the native landscape supporting plants and animals that favor wetter areas. The land is a product of alluvial soil deposits, which were historically covered by bottomland hardwood forests. These areas have been cleared and drained to access the rich alluvial soils for agricultural production. Many drainage systems were constructed and existing ones were modified. Most of the natural streams and drainages in the watershed have been straightened, widened, deepened, or paved with concrete. Hydromodification causes streams and/or tributaries to become unstable and lose their function.

When drainage ditches or canals are dredged to increase channel depth for improved drainage, head-cutting starts to occur upstream. Head-cutting is a grading process that waterways take in order to restore a more stable channel profile or longitudinal slope. This causes an eroding process within the channel that migrates upstream towards the

headwaters until its channel's slope becomes more stable. As a result of this process, the channel's headwaters that were once a small stream or drainage ditch can become a large canal, resulting from excessive channel erosion and land loss. The process can cause a chronic NPS sediment load. Sometimes channels are dredged to increase drainage rates. Channel dredging is known to lower the water table, which affects the base flow of upland waterways. Channel dredging not only affects the targeted area, but also the channel portions and tributaries located upstream from this point. Tributaries and drainage ditches connected to the dredged channel will start down-cutting until they reach the new lower water table and restore its base flow. These areas typically have incised or steepened channel banks, causing a perpetual sloughing of sediment into the channel. Down-cutting of streambanks also starts when channels are straightened. This type of bank erosion causes the streambanks to progress towards a more natural slope seeking access to the flood plain area. These processes can cause chronic NPS sediment loading into the channels, which drain into the lake. Other attempts to increase drainage capacity and volume is channel widening. Widening channels cause them to become inefficient in carrying sediment, which results in aggradation, or instream sediment deposition. Drainage systems that are not properly designed, constructed or modified can become an unstable waterway that is either too efficient or not efficient enough to function as they are intended. As a result, there can be chronic NPS loading of sediment, pollutants, and natural background substances into the lake.

Another concern is the public's awareness regarding the function and benefits of vegetation in and along all drainages and waterways. The majority of the public views vegetation along streambanks as detrimental because it could cause back flooding. The common maintenance practice for vegetation in and along drainage systems and waterways is to remove as much as possible. Most of these drainage systems had removed all of the native bank vegetation that comprised the riparian zone, or streamside management zone (SMZ). The importance of the riparian zone is a transition between land and water, which naturally stabilize the streambank, preventing erosion and filtering the pollutants that could enter the waterway. When streambank vegetation is cleared, there is a greater need for controlling streambank erosion. Common efforts to control streambank erosion include the use of man-made materials, rip-rap and trash for filling in eroded areas. The riparian zone is probably the single most beneficial feature in the landscape for managing nonpoint source pollutant loading. It also serves many other benefits such as protecting water quality, stabilizing streambanks, enhancing wildlife and recreation use, dissipating hydraulic energy during high flow runoff events and maintaining the landscape. For the most part, the perimeter of land around Lake St. Joseph has a healthy riparian area, which contributes a positive impact to the lake. On the other hand, the riparian zones along many of the agricultural drainage ditches and canals are sparse.

7.0 NONPOINT SOURCE (NPS) POLLUTION SOLUTIONS

Implementation of land-use best management practices (BMPs) in the watershed is the building block for watershed protection and improving water quality. Because the watershed encompasses a narrow range of land uses, the description of BMPs for the Lake St. Joseph Watershed is divided into categories such as agriculture, urban, and hydromodification. Each different category contains various options and site-specific BMPs that can help address a particular source of NPS pollution. BMPs can include structural controls and/or nonstructural controls. Whether natural or man-made, structural BMPs or controls can filter, detain, or reroute contaminants carried in surface runoff.

One of the most important strategies for successfully implementing BMPs and/or making water quality improvements in the watershed is providing local/public awareness, education, and participation. Achieving water quality goals and preventing future unnecessary water pollution requires a concerted effort involving all the stakeholders within the watershed. A complete list of BMPs can be viewed in the LDEQ 2000 Nonpoint Source Pollution Management Plan and by contacting the Natural Resource Conservation Service (NRCS). The following section includes a description of the various BMPs that can be effective for controlling NPS water pollution within the Lake St. Joseph Watershed.

7.1 Agriculture Row Crop BMPs

Agricultural BMPs are generally associated with the management of soil, nutrients, pesticides, and water, which are known to be a contributing source of NPS pollutant loads. If sediment, fertilizers, and herbicides/pesticides remained in the fields, the NPS load would be less. Runoff is a natural occurrence and agricultural sites provide no exception. Therefore, sites should be managed in such a way that the surface runoff rate is not excessive and not contaminated. Reducing NPS loading resulting from agriculture will require a concerted effort between all the associated federal, state, and local agencies. Proper management will require agriculture programs, which provide environmental education as well as effective production strategies. Agriculture programs should be designed to foster a sense of conservation stewardship for each type of agricultural producer. Examples of these programs are the Louisiana Master Farmer Program and Louisiana Master Logger Program.

Multi-Use Drainage

A general type of BMP that can be very cost effective for all types of agriculture production is to utilize the drainage ditches serving each field site to act as a passive form of biological treatment for the surface water runoff draining from each field. Open drainage ditches at each site should be covered with native grasses and/or aquatic plants to increase effectiveness. This type of practice often occurs naturally throughout the state, serving as filtration of the surface water runoff before draining into rivers and lakes. Most agricultural field sites, whether pastureland, row crops, forestry, nursery, and/or rice and crawfish already maintain an open ditch system, designed to drain surface runoff from sites and prevent flooding. This would be a simple practice to incorporate into an existing drainage system by allowing and facilitating growth of native vegetation and aquatic plants in the drainage ditch. It is widely known that the roots of the aquatic plants provide an oxygen rich environment where high densities of microbes

thrive and biologically degrade nutrients and pollutants. Some other benefits for incorporating a multi-use drainage system include:

1) ditch serves as a capture mechanism for soil loss from the field, which can be recovered and redistributed by the farmer, as necessary;
2) minimal soil loss from eroding ditch banks;
3) native aquatic plants are less likely to impede flow;
4) reduced need for herbicides because the native vegetation, once established, will out-compete undesirable vegetation and prevent future weed growth;
5) benefits local environment by supporting an ecosystem that recycles nutrients, manages mosquitoes, increases aesthetics, and is low maintenance.

Image 7: Multi-Use Drainage Covered with Native Aquatic Vegetation Known as Delta Duck Potato (*Sagitaria platyphylla*)

Images 8 & 9: Mowing the Drainages as a Vegetation Management Practice

Row Crop BMPs

Traditional row crop production involves tillage practices that pulverize the soil in order to successfully grow a new crop. BMPs for this type of land use should be focused on soil and water management, as well as pesticide and nutrient management. Surface water runoff containing these constituents is known to cause NPS pollutant loads in receiving streams. Controlling the NPS pollutant load requires implementing BMPs that reduce the amount of surface runoff and the amount of NPS pollutants in it.

Conservation tillage

Conservation tillage practices such as stale seed bed and no till have proven to be successful in producing less NPS loading. These practices utilize bulk organic matter remaining from winter crops as a sponge, while planting directly into it. Leaving bulk material in the fields after harvest is known as residue management, which has a positive effect on surface water quality. Planting soybeans directly into the soil without tillage is another conservation practice. Conservation tillage is designed to reduce the amount of runoff and rate of flow. In return, there is more sediment, nutrients, and pesticides/herbicides remaining in the fields for growth each growing season. This saves money and reduces the NPS loading.

Image 10: Residue Management for Soil and Water Conservation in Watershed

Vegetated Filter Strip

Another BMP is to dedicate a strip of land around the perimeter of the field, planted with native grasses that could function as a sediment filter. As runoff washes from the fields, the strip of grass slows the flow rate and captures lost sediment. As noted previously,

the use of grassed waterways covered with native vegetation can do much in the way of capturing sediment runoff draining from field sites. The recommended approach for maintenance needed on grassed waterways is occasional mowing of streambanks and select use of herbicides for targeting only the invasive plant species. Sometimes herbicides are used to rid weed invasions in order to allow for re-establishment of native plants.

Optical Sensors

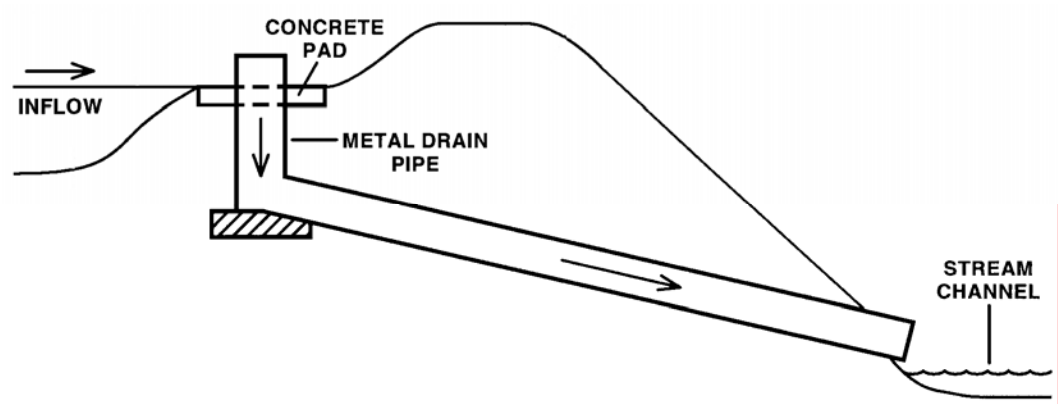
Recent technological advances in agriculture have enabled the use of optical sensors, which allow varying amounts of fertilizer to be applied to crops instead of one set amount for the entire field. Optical sensors can be mounted on tractors or other fertilizer application systems to deliver precise amounts of fertilizer to plants. By using infrared and near infrared light to assess the health of the crops, an optical sensor can instantly calculate the amount of fertilizer needed to obtain a maximum yield of crop. Since healthy plants absorb more infrared light during photosynthesis and reflect more near infrared light than unhealthy plants, the optical sensors can determine which plants need more fertilizer.

By using these sensors, the over-application of fertilizer can be drastically reduced and less fertilizer will be wasted. It also works equally well at night, when there is less wind drift. In addition to saving money, there will be less fertilizer available in the field to make its way into the runoff. It can also be used to apply herbicides to living weeds, and not waste spray on bare ground or dead weeds.

Pipe Drop Structures

As water flows downhill, it will make natural channels that can become large unsightly gullies. This can be prevented by installing pipe drop structures, which safely delivers the water at a lower level while preventing massive erosion.

Figure 7: Cross Section of a Pipe Drop Structure



Contour Farming

Contour farming can be used by following the natural contours of slope and soil deposits around the lake when tilling the soil, planting, and cultivating. This will result in rows that run parallel with the shoreline of the lake, as opposed to perpendicular (see Figure 6). The main purpose of this is to reduce erosion, control runoff water, and increase moisture infiltration.

Image 11: Upland Terraces Control Soil Erosion in a Small Watershed Project
Source: NRCS Strategic Plan 2005-2010.

Precision Land Leveling

Precision land leveling involves cutting or filling a field in order to create a constant slope between 0 to 0.2%. Global positioning systems (GPS) and/or laser-guided instruments are used to create the desired slope. A levee is constructed around the field so that the desired amount of water on the field can be maintained. By keeping the field flooded until ready for planting, there is an increase in nutrient availability and weed control. The water release is controlled while the fields are drained, thus decreasing sediment loading.

All of the BMPs mentioned above are very cost effective and prevent NPS loading. In addition to implementing BMPs, the producer should develop and utilize pollution prevention strategies such as spill prevention practices for sites where the agro chemicals and fertilizer are stored, off loaded, or prepared for field application.

For a more detailed description and list of BMPs that are recommended for controlling NPS pollution for each type of agriculture, refer to the *Louisiana's Nonpoint Source Management Plan.*

7.2 Urban BMPs

Preventing NPS pollutant loading in urban areas of the watershed involves managing existing sources of pollution and preventing new ones. NPS pollution is driven by storm water runoff; therefore BMPs should focus on management strategies that prevent or reduce sources of NPS pollution. Increasing the public's level of environmental awareness is the first step for solving these types of problems in the urban areas of the watershed. Another consideration is current and future development in the watershed that may cause a NPS load. Decisions regarding land use planning and protection of urban water resources are usually governed at the municipal level. For controlling sources of NPS pollution, BMPs are best implemented through site plan controls, storm water management plans, subdivision agreements, local ordinances, and erosion and control guidelines and standards. When attempting to implement such BMP programs, success will depend upon whether the local public has a clear understanding of the program and its overall goals and objectives. Examples of these objectives include measures such as:

- minimize impervious areas to decrease runoff quantity and quality from source areas
- conserve the critical and sensitive areas of the watershed
- protect local streams and rivers from adverse effects of urbanization
- preserve open-space land for aesthetics and recreation while also preserving water quality
- provide fair sharing of costs and benefits of protecting water quality

A comprehensive list of BMPs including programmatic goals and activities, future objectives, and milestones is included in the State of Louisiana Water Quality Management Plan, Volume 6, *Louisiana's Nonpoint Source Management*.

Public Education and Participation

Public education and voluntary action are important components of watershed protection and water quality improvement. Public education should begin before BMP implementation occurs because it will be critical during implementation. Citizens, particularly property owners, need to know the objectives for implementing BMPs, the benefits to the community and to themselves, and ways in which they can participate. Citizens generally respond positively when they understand what is occurring and why. Conversely, the public may react negatively to programs or activities to implement BMPs when they are poorly informed about why they are needed. Public awareness affects the acceptability of mandatory controls, the effectiveness of voluntary measures, and the degree of support provided by elected officials. A public education campaign can improve the feasibility of implementing BMPs to protect water quality and is critical for effective implementation. Finally, an informed public will be helpful in supporting and assisting monitoring and enforcement programs (AWWA, 1991).

Lawn BMPs

Nutrient levels in urban streams represent a composite of many different sources and pathways of which lawn care is but one. However, the runoff coming off of lawns is known to contribute to some of the highest NPS pollutant loads in an urban area for

pollutants such as fecal coliform and nutrients. Homeowners have an important role to play in residential source control. Less lawn fertilizer, more pet clean-ups, bio-degradable/phosphate free car wash products and more frequent driveway sweeping could collectively reduce NPS pollutants resulting from residential lawns areas. People should practice picking up their pet waste each time they take them out for a walk and properly dispose of it. The lawns in urban areas are usually landscaped with beautiful and exotic plants and grasses that often require large amounts of nutrients and water, which can cause polluted runoff. Instead, lawns could incorporate infiltration techniques that intercept and control runoff. A BMP that can be used on residential lawns is rain gardens. Rain gardens are natural depressions or can be man-made in the landscape that serves as a collection site for runoff that has been routed to it. The rain garden incorporates the use of wetland plants (facultative species), which help uptake the runoff water and return it back to the atmosphere by evapotranspiration. Another practice that is becoming more popular is to landscape with native plants. Native plants require less input in the form of maintenance and fertilizers, since they grow naturally in the local environment. Native plants used near runoff areas or in conjunction with drainage ditches and infiltration areas can function to mitigate NPS pollution at its source. Open channels can help manage contaminated runoff by way of filtration, infiltration, retention and remediation, thereby cleansing the water before it enters the river.

Street BMPs

Streets are identified as the leading source of urban NPS pollution. As stated, the amount of impervious cover strongly influences water quality. Since streets are the main conduit for public transportation in urban areas, they comprise most of the impervious cover in the watershed. Managing the pollution they contribute can significantly reduce the NPS load. Use of permeable road surfaces is another BMP that can reduce the amount of runoff due to infiltration. Another practice is proper disposal of litter and trash recycling. This will prevent trash and litter from being washed into local storm drains and into the river. For housing residents, they could practice composting techniques. This is a good way to recycle leaves, grass clippings, along with other debris, in order to keep them from being washed to the streets, into the storm drains, then into the river. Another BMP is to develop infiltration trenches or rock reed filters, where possible along the streets that serve to collect excess runoff and absorb NPS pollutants. Runoff that is flowing from streets can then be routed to such areas that are set-aside for this purpose.

Parking Lot BMPs

Parking lots are typically made of impervious surfaces that result in 100% runoff from the site. Impervious surfaces affect both water quality and water quantity. NPS loading resulting from parking lot runoff can be prevented with BMPs designed to capture and treat the runoff coming from it. Examples of these types of BMPs involve structural controls, such as:

- Retention Ponds – designed to capture surface runoff and act as a form of pre-treatment by allowing suspended sediment to settle out before the water is released or discharged. An additional step, which enhances natural treatment processes, is landscaping the pond with native vegetation including wetland plants. It can provide a level of secondary-treatment, making the pond function more effectively, while increasing aesthetics and lowering operating maintenance.

- Pervious Pavement – use pervious pavement, where possible, in order to reduce surface runoff by increasing infiltration

Prevention practices such as frequent trash collection can also prevent NPS loading into the receiving stream.

Rooftop BMPs

Rooftops act the same as the impervious surfaces in the watershed, except they do not usually accumulate NPS pollutants. Pollutants that are directly related to roof tops are zinc (if galvanized metal is used) and fecal coliform (from sparrows, pigeons, and/or seagulls). Indirectly, the quantities of runoff they displace can result in NPS loadings. Using gutter systems to capture runoff from rooftops and redirecting it to an absorption space or infiltration site, such as a rain garden or rock reed filter can mange NPS loading that may result. Home sites and/or businesses can construct a cistern with a spigot near the bottom for attaching a hose pipe in order to use the captured runoff for future landscape irrigation.

7.3 Hydromodification BMPs

The lake and its drainages, by natural design provide a value of natural resources to our society. Reducing NPS load caused by hydromodification will involve managing all of the drainage ditches, canals, and tributaries in the watershed in such a way that they properly function without degrading or becoming unstable. Traditional hydromodification practices have proved costly, have high operating and maintenance costs and can impair drainage function and the lake's designated uses. Proper management of drainages and waterways involves balancing multiple resource uses and the ability to predict responses to channel modifications. Reliable prediction requires clear understanding about the functions of a drainage way and the physical variables that influence their behavior.

Recently, there has been a resurgence of natural channel design in an effort to improve, mitigate, or to enhance unstable drainages and waterways (Rosgen, 1996). This approach results in a more stable stream that resists degradation. This type of challenge would involve the coordination and support of all interest groups and disciplines dealing with drainages and waterways in the Lake St. Joseph Watershed, particularly the agriculture producers and drainage boards. Utilizing natural channel design techniques and stream restoration projects can be an effective way to reduce or prevent NPS loading resulting from hydromodification activities in the watershed.

Presently several wetland areas are located in the Lake St. Joseph Watershed. Draining these wetland areas could be detrimental to the lake since they act as giant filters that can intercept surface water runoff before entering the lake. Taking action to preserve the wetlands within the watershed will help prevent excessive NPS loading. Hydromodification often takes place when residents or new developments locate in the flood plains, and along the banks of the lake and wetlands. Changes to the natural delineation and the drainage way are the first steps of modification to take place. When these natural features get modified and/or new ones are created, it results in a direct and indirect effect, thereby causing NPS loading. To reduce NPS loading, future residential and/or commercial sites could be designed in such a way that is adaptive to the local conditions.

Riparian zones and streamside vegetation prevent NPS loading. Proper maintenance of these areas should include the use of mowing machines as opposed to herbicidal sprays. This could be one of the most important techniques for preventing excessive NPS loading to the lake. Herbicides could be used to rid invasive weeds and to allow native plants that are beneficial to become more established. Once the native vegetation is established, maintenance requirements could be reduced. Vegetation along drainages, waterways, and the lake would prevent sediment erosion, as well as capture and filter NPS pollutants.

8.0 MAKING THE IMPLEMENTATION PLAN WORK

To implement BMPs and/or other conservation practices in order to reduce the NPS load in the Lake St. Joseph Watershed so that it meets its designated uses and is no longer listed on the 303(d) list, will require programs that provide technical assistance, funding, incentives, as well as foster a sense of stewardship. Many of these programs that are designed to assist the landowner are already in place. The Nonpoint Source Program provides monies distributed through the USEPA under Section 319 of the Clean Water Act. The funds are utilized to implement BMPs for all types of land uses within the watershed in order to reduce and/or prevent the NPS pollutants and achieve the water body's designated uses. The USDA and NRCS are federal government agencies that have several such programs made available by way of the Farm Security and Rural Investment Act of 2002. These programs are made available through the local Soil and Water Conservation District (SWCD). The NRCS has a list of BMPs for almost all types of agriculture and programs to facilitate their use.

8.1 Regulatory Authority

Federal Authority

Section 319 of the Clean Water Act (PL 100-4, February 4, 1987) was enacted to specifically address problems attributed to nonpoint sources of pollution. Its objective is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Sec. 101; PL 100-4), and instructs the Governor of each State to prepare and submit a Nonpoint Source Management Program for reduction and control of pollution from nonpoint sources to navigable waters within the State by implementation of a four-year plan (submitted within 18 months of the day of enactment).

State Authority

In response to the federal law, the State of Louisiana passed Revised Statute 30:2011, signed by the Governor in 1987 as Act 272. Act 272 designated the Louisiana Department of Environmental Quality as the Lead Agency for development and implementation of the State's nonpoint source management plan. The Louisiana Revised Statutes R.S. 30:2011.D (20) includes the following provision as the authority for LDEQ to implement the State's NPS Program.

To develop and implement a non-point source management and ground water quality protection program and a conservation and management plan for estuaries, to receive federal funds for this purpose and provide matching state funds when required, and to comply with terms and conditions necessary to receive federal grants. The nonpoint source conservation and management plan, the groundwater protection plan, and the plan for estuaries shall be developed in coordination with, and with the concurrence of the appropriate state agencies, including but not limited to, the Department of Natural Resources, the Department of Wildlife and Fisheries, the Department of Agriculture and Forestry, and the State Soil and Water Conservation Committee in those areas pertaining to their respective jurisdictions.

8.2 Actions Being Implemented By LDEQ

The LDEQ is designated the lead agency for implementation of the Louisiana Nonpoint Source Program. The LDEQ Nonpoint Source Unit through the USEPA utilizes funding allocated from the Clean Water Act, Section 319(h) to assist in implementation of BMPs and to address water quality problems on sub-segments listed on the §303(d) list. The 319 grant funds are utilized to sponsor the cost sharing, monitoring, and education projects for all types of land uses such as urban, agriculture, hydromodification, and home sewage. These monies are available to all private, for profit, and nonprofit organizations that are legal entities or governmental jurisdictions including cities, parishes, tribal entities, federal agencies, or agencies of the State. Presently, LDEQ is cooperating with such entities on approximately 40 NPS projects, which are active throughout the state. For example, in the Ouachita River Basin, the Louisiana Department of Agriculture and Forestry and the Soil and Water Conservation District are working in cooperative effort where they can be utilized to implement forestry restoration and environmental education in the Tensas Watershed.

8.3 Actions Being Implemented By Other Agencies

The U.S. Department of Agriculture (USDA) and Natural Resource Conservation Service (NRCS) offer landowners financial, technical and educational assistance to implement conservation practices and/or BMPs on privately owned land to reduce soil erosion, improve water quality, and enhance crop land, forest land, wetlands, grazing lands and wildlife habitat. The new Farm Security and Rural Investment Act of 2002, known as the 2002 Farm Bill provides funding to various conservation programs for each state by way of the NRCS and the State's local Soil and Water Conservation Districts (SWCD). Although most of these programs are designed to assist agriculture, there may be cases where they can be utilized for conservation practices for other land uses. A complete list of agriculture BMPs is provided by the NRCS in their Technical Guide Handbook. The handbook includes a description of each BMP and their recommended uses. Each BMP is listed by a code, i.e. Field Border (386). The following includes a brief summary of the programs available through the local SWCD under the oversight of USDA an NRCS. The descriptions of the program are general and are based on information available at the time; key points subject to change as rules established.

2002 Farm Bill Conservations Programs and Potential Funding Sources:
Environmental Quality Incentive Program (EQIP) provides 75% - 90% cost share for environmentally beneficial structural and management alterations, primarily 60% to livestock operations. Applications prioritized for benefits. Considered the Working Lands program. 2002 Farm Bill total funding allocation is 9 billion.

Wildlife Habitat Incentive Program (WHIP) provides 75% - 90% cost share for the costs of wildlife habitat restoration and enhancement on private lands. Eligible to private property owners (and lessees) for installing riparian buffers, native pine & hardwoods, wildlife corridors, and other wildlife enhancing measures, 5 – 10 year contracts. 2002 Farm Bill total funding allocation is 700 million.

Wetland Reserve Program (WRP) is a voluntary program for wetland restoration, enhancement, and protection on private lands. WRP provides annual payments and restoration costs for 10 year, 30 year, or perpetual easements on prior converted wetlands. Louisiana leads the US in WRP participation. 2002 Farm Bill total funding

allocation is 1.5 billion and expanded the program to purchase long-term easements and cost sharing to agriculture producers.

Conservation Reserve Program (CRP)
The 1985 Farm Bill established CRP as a voluntary program to protect highly erodible and environmentally sensitive lands. Has a positive value on rural environment by improving soil, water, and wildlife. Extends a pilot sub-program called the Conservation Reserve Enhancement program

Conservation Security Program (CSP) is a new national incentive payment program for maintaining and increasing farm and ranch stewardship practices. The CSP is designed to correct a policy disincentive in which independently conducted resource stewardship has disqualified many farmers from receiving conservation program assistance. Features an optional tiered level of farmer participation where higher tiers receive greater funding for greater conservation practices. 2002 Farm Bill established this program and the total funding allocation is 2 billion through 2007.

Farmland Protection Program (FPP) provides funding to states, tribes, or local governments and to nonprofit organizations to help purchase development rights and protect farmlands with prime, unique, or productive soil; historical or archaeological significance; or farmlands threatened by urban sprawl. Louisiana does not currently have any FPP contracts. 2002 Farm Bill total funding allocation is $ 985 million, $ 100 million average through 2007.

Grassland Reserve Program (GRP) is a new program to enroll up to 2 million acres of virgin and improved pastureland. GRP easements would be divided 40/60 between agreements of 10, 15, or 20-years and agreements and easements for 30-years and permanent easements to restore grassland, rangeland, and pasture through annual rental payments. 2002 Farm Bill established GRP and authorizes $ 254 million in funding for 2 million acres through 2007.

Small Watershed Rehabilitation Program (SWRP) provides essential funding for the rehabilitation of aging small watershed impoundments and dams that have been constructed over the past 50 years. 2002 Farm Bill the established program and the total funding allocation is $ 275 million through 2007.

Resource Conservation and Development Program promotes the protection of natural resources and the improvement of local economies.

Forestry Land Enhancement Program Sodbuster is a conservation compliance requirement that was established by the 1985 Farm Bill to discourage plowing of erosion-prone grasslands for use as cropland. Eligibility for program benefits is tied to an approved conservation plan. Compliance is required.

Swampbuster
Swampbuster was established in the 1985 Farm Bill as a conservation compliance mechanism to discourage draining of wetlands for use as cropland. Eligibility for program benefits can be lost for any wetland converted after 12/23/85. Compliance is required.

In addition to the programs mentioned, the following organizations have signed an MOU with LDEQ within the state's NPS Management Plan that each will aid LDEQ in achieving the goals of the management plan:

Louisiana Department of Agriculture and Forestry
Louisiana Department of Health and Hospitals
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Transportation and Development
Louisiana Department of Natural Resources
Louisiana State University Agricultural Center
Natural Resources Conservation Service
USDA – Farm Services Agency
Louisiana Forestry Association
US Fish and Wildlife Service
USDA Forest Service
US Army Corps of Engineers
US Geological Survey
Federal Emergency Management Agency
Louisiana Farm Bureau Federation

As mentioned earlier in the plan, the Master Farmer Program (developed by Louisiana State University Agricultural Center) is to encourage on-the-ground BMP implementation with a focus on environmental stewardship. The LSU AgCenter is promoting the Master Farmer Program to help farmers address environmental stewardship through voluntary, effective, and economically achievable BMPs. The program will be implemented through a multi-agency/organization partnership including the Louisiana Farm Bureau (LFB), the Natural Resources Conservation Service (NRCS), the Louisiana Cooperative Extension Service (LCES), USDA-Agriculture Research Service (ARS), LDEQ, and agricultural producers.

The Master Farmer Program will have three components: environmental stewardship, agricultural production, and farm management. The environmental stewardship component will have three phases. Phase I will focus on the environmental education and crop specific BMPs and their implementation. Phase II of the environmental component will include in-the-field viewing of implemented BMPs on Model Farms. Farmers will be able to see farms that document BMP effectiveness in reducing sediment runoff. Phase III will involve the development and implementation of farm-specific, comprehensive conservation plans by the participants. A member must participate in all three phases in order to gain program status.

This program can help to initiate and distribute the use of BMPs throughout the Lake St. Joseph Watershed. Participants will set an example for the rest of the agricultural community and will work closely with NRCS staff and other Master Farmers to identify potential problems areas in the watershed. They will receive information on new and innovative ways to reduce soil and nutrient loss from their fields. They will be kept informed of the water quality monitoring occurring in the watershed and alerted of any degradation or improvements.

9.0 TIMELINE FOR THE NPS IMPLEMENTATION PLAN

The NPS Implementation Plan for Lake St. Joseph Watershed outlines a multiple year management plan to reduce NPS pollutants reaching the waterway. LDEQ intensively samples each watershed in the state once every 4 years to see if the water bodies are meeting water quality standards. Statewide sampling began using a 5-year schedule (Table 6), but was changed to a 4-year schedule in 2004 (Table 7). Lake St. Joseph was first included in the statewide ambient samples in 1999, and will be sampled again in 2005 and either 2008 or 2009. The data from 1999 will be used as a baseline to measure the rate of water quality improvement in samples taken in subsequent years. If no improvement in water quality is witnessed, LDEQ will revise the NPS Implementation Plan to include additional corrective actions to bring the waterway into compliance. Additional BMPs and/or other options will be employed, if necessary, until water quality standards are achieved and Lake St. Joseph is restored to its designated uses.

10.0 SUMMARY OF THE LAKE ST. JOSEPH WATERSHED IMPLEMENTATION PLAN

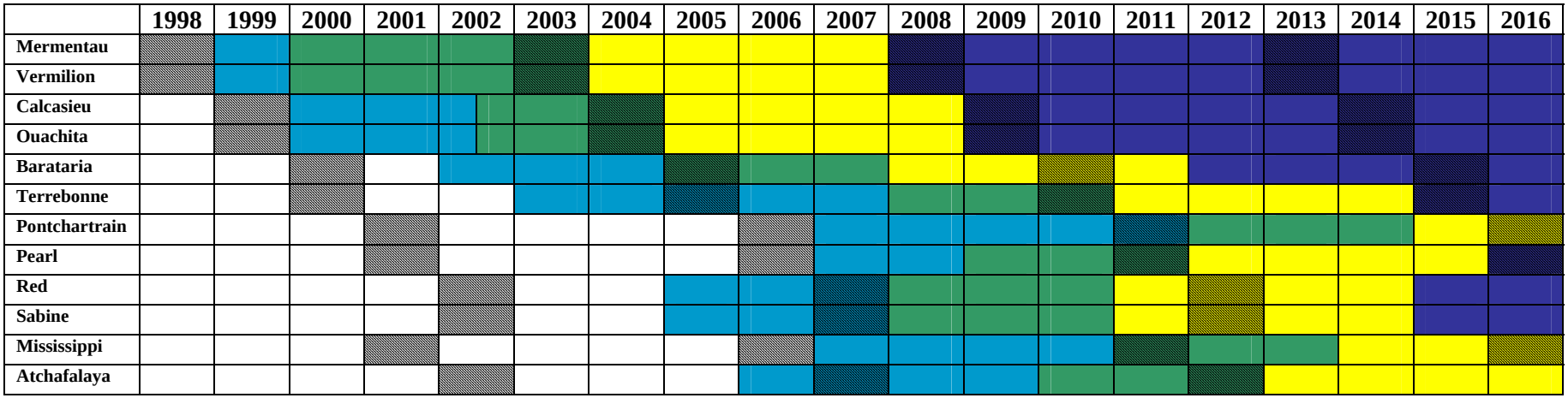
In order to restore the water quality and designated uses of Fish and Wildlife Propagation in Subsegment 081202 in the Lake St. Joseph Watershed, it will require a concerted effort from all of the stakeholders within it, including government (local, state, and federal), private and public groups and local citizens. Primarily the agricultural land owners, in conjunction with the NRCS and local SWCD, will be the main entities/cooperators for reducing and controlling NPS pollution. Additionally, everyone who lives there and/or owns property in the watershed is a stakeholder and stands to benefit from their contribution toward protecting it. Public education is the first critical element for accomplishing goals and objectives, because it is necessary that they understand and support efforts to implement BMPs. Successful outcomes are more likely, when citizens understand what is occurring and why. When stakeholders volunteer to demonstrate conservation practices on their land, they should receive positive recognition and other incentives. Soon, there will be even greater participation.

The dominant land use in the watershed is agriculture and natural wetland areas. Each type of land use that has been identified within sub-segment 081202 has BMPs available that are known for managing NPS pollutants loads. Prevention of sediment runoff and runoff containing excess nutrients from land use activities occurring within the Lake St. Joseph Watershed will make significant water quality improvements in the lake. Improved water quality will help to achieve and to sustain the lake's designated uses, which in turn benefits other natural resources and future generations to come. Planning is likely the greatest strategy for controlling NPS loading from agriculture sites. Use of maps for identifying nearby streams, land topography, and drainage patterns can effectively increase a farmer's strategy when developing a plan for preventing NPS loads by implementing BMPs. Preservation of the riparian areas along tributaries and drainages is another BMP that can function to prevent NPS loading from agricultural activities and other land use types. Any type of land use activity that disturbs the soil and/or leaves an area of barren earth for a period of time should plan to utilize existing plants as filters or establish new vegetation around the perimeter of the disturbed site. Additionally, the use of multi-function drainages covered with native plants could be established on each farm site to act as filters and drainage systems. These type BMPs are very simple and very cost-effective, although there may be others types, which may or may not be more effective at preventing NPS loading.

Urban development and new construction are nearly non-existent in the watershed. However, future growth could be likely. In the event of new development, it is important for the government for local parishes and local communities in the watershed to work together and plan strategies for smart growth and low impact development. Actions should be taken to develop proper zoning and ordinances, which protect and conserve natural resources, particularly the existing wetlands.

Although some of the BMPs and the recommended course of actions were described within this plan, a consolidated list of BMPs recommended for each of these land uses can be viewed in the State of Louisiana Water Quality Management Plan, Volume 6, *Louisiana's Nonpoint Source Management*.

Table 6: Timeline for watershed planning and implementation



1- Black Stripes = Collect Water Quality Data to Develop Total Maximum Daily Loads (TMDLs) and to Track Water Quality Improvement at the Watershed Level **[Objective 1**]
2- Light Blue = Develop Total Maximum Daily Loads for the Watersheds on the 303(d) List [**Objective 2]**
3- Green = Develop Watershed Management Plans to Implement the NPS Component of the TMDL **[Objective 3]**
4- Yellow = Implement the Watershed Management Plans **[Objectives 4-8]**
5- Dark Blue = Develop and Implement Additional Corrective Actions Necessary to Restore the Designated Uses to the Water Bodies **[Objective 9-10]**

Table 7. Louisiana 4-Year Ambient Water Quality Sampling Schedule

Basin	***First 4-Year Cycle***	***Second 4-Year Cycle***
Mermentau	2004, 2005, 2006, 2007	2008, 2009, 2010, 2011
Vermilion-Teche	2004, 2005, 2006, 2007	2008, 2009, 2010, 2011
Calcasieu River	2004,2005	2008,2009
Ouachita River	2004,2005	2008,2009
Barataria	2004,2005	2008,2009
Terrebonne	2004,2005	2008,2009
Mississippi River	2004,2005	2008,2009
Lake Pontchartrain	2006,2007	2010,2011
Pearl River	2006	2010
Red River	2004,2005,2006,2007	2008,2009,2010,2011
Sabine River	2006,2007	2010,2011
Atchafalaya River	2004,2005	2008,2009