Soil and Water Conservation Districts

Coulee Baton Microwatershed Plan

Prepared for

Vermilion Soil and Water Conservation District

By

USDA Natural Resources Conservation Service

Alexandria, Louisiana

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COULEE BATON MICROWATERSHED PLAN

ABSTRACT

This document describes a plan of land treatment to provide for watershed protection, and improving water quality in the Coulee Baton Microwatershed. Best Management Practices will be installed under the Environmental Quality Incentive Program (EQIP) and the Clean Water Act 319 Program in accordance with the Natural Resources Conservation Service (NRCS) Field Office Technical Guide (FOTG). Environmental impacts include reduced sheet, rill and gully erosion, and improved water quality.

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FOR

COULEE BATON

VERMILION PARISH, LOUISIANA

INTRODUCTION

The sponsor of the Coulee Baton Microwatershed is the Vermilion Soil and Water Conservation District (SWCD).

The Vermilion SWCD became interested in a microwatershed project after attending a Industry-Led Solutions (ILS) meeting in New Orleans in August 2004. This was a meeting of agricultural industry leaders to discuss hypoxia in the Gulf of Mexico and the role of agriculture to help resolve the problem. Louisiana is one of 33 states in the Gulf of Mexico drainage area that contributes to the Hypoxic Zone.

The Vermilion SWCD embarked on the process of selecting a watershed to demonstrate the ILS principles. The Texas Institute for Applied Environmental Research (TiAER) has developed an approach known as the Planned Intervention Microwatershed Approach (PIMA) which is a new model for addressing agricultural nonpoint source pollution. TiAER defines a micro watershed as an area within a watershed, incorporating anywhere from 3,000 to 20,000 acres, with identifiable hydrologic boundaries. According to TiAER, by dealing with smaller areas, project coordinators can reduce land-use variables and more readily identify pollutant load contributors.

The Vermilion SWCD partnered with other entities to find a microwatershed that was diverse in topography, drainage, and land use. Thus, the Coulee Baton Microwatershed was selected. This plan will be used to guide the efforts of the Vermilion SWCD in addressing the water quality problems in the Coulee Baton Microwatershed area. Voluntary application of various conservation and Best Management Practices (BMP) on the land by landowners and homeowners will be essential to the success of the project.

PROJECT SETTING

Location and Size

The Coulee Baton Microwatershed area is approximately 6,200 acres (Figure 1). It drains into the Seventh Ward Drainage System, which travels about 10 miles before

emptying into the Vermilion River via the Intracoastal Waterway. There are some producers in the watershed using such BMP's as irrigation land leveling, grade stabilization structures (pipedrops), fencing, pipelines, watering facility, and heavy use area protection (pads). There are some sugarcane, rice, and livestock producers not using BMP's. The Coulee Baton Microwatershed is diverse in topography and land use. Of the total acreage, 1,398 acres are in sugarcane, 2,176 acres are in rice, 1,312 acres are in pasture, 595 acres of land is idle, 537 acres are in crawfish production, 120 acres in hay production, 19 acres in subdivisions containing 33 homes, 17 acres in homesteads, 15 acres in orchards, and 11 acres in miscellaneous use.

History and Development

Vermilion Parish was established by the Louisiana Legislature in 1844. It was formed from the Attakapas District, one of 12 districts within the Territory of Orleans. The seat of government was formerly established in 1846 in Abbeville. When the early white settlers arrived in Vermilion Parish, the area was inhabited mainly by the Attakapas Indians. These early settlers included primarily Acadian exiles from Nova Scotia, a few English-speaking migrants from the Atlantic Seaboard, and some Spaniards from the Canary Islands. The fertile land, abundant wildlife, and tall prairie grasses attracted the settlers.

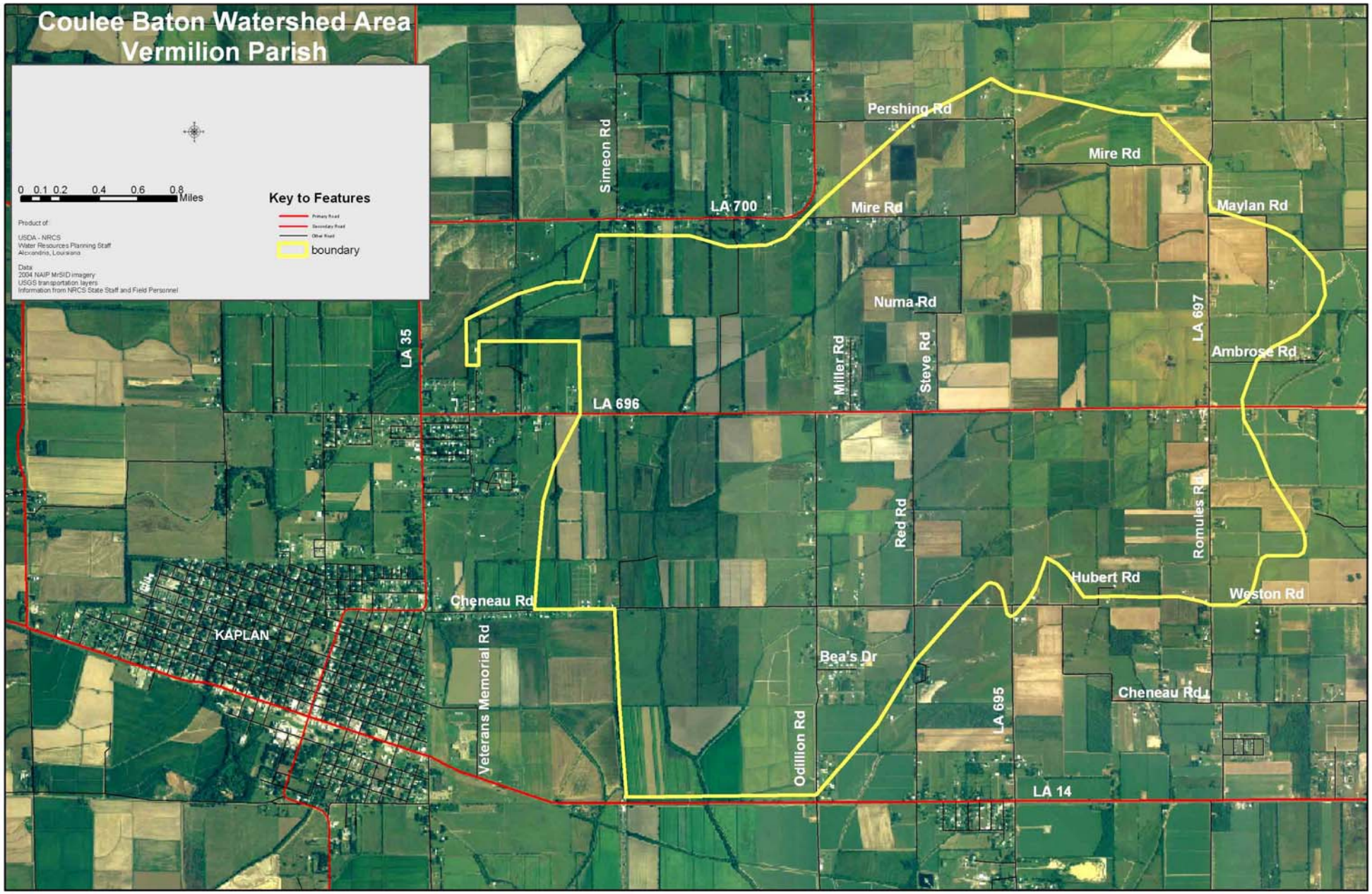
Agriculture was important in the early history of Vermilion Parish. Sugarcane and rice quickly became the main cash crops. The current economy of the parish, however, is more diverse. Agriculture remains the main enterprise, but the oil and gas industry and the fishing industry also contribute significantly to the economy.

Climate

In winter, the average temperature is 52^{o} F and the average daily minimum temperature is 42^{o} F. The lowest temperature on record, which occurred at Vermilion Lock on January 11, 1962, is 12^{o} F. In summer, the average temperature is 81^{o} F and the average daily maximum temperature is 89^{o} F. The highest recorded temperature, which occurred at Vermilion Lock on July 15, 1971, is 101^{o} F.

The total annual precipitation is about 59 inches. Of this, 35 inches, or about 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In two years out of 10, the rainfall in April through September is less than 28

Figure 1. Project Boundary Map



inches. The heaviest one-day rainfall during the period of record was 9.90 inches at Vermilion Lock on June 11, 1975.

Snowfall is rare. In 99 percent of the winters, there is no measurable snowfall. In one percent, the snowfall, usually of short duration, is less than 1 inch.

The average relative humidity in mid-afternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 80 percent of the time in summer and 50 percent in winter. The prevailing winds are from the south. Average wind speed is highest, 11 miles per hour, in the spring.

Water Resources

The Vermilion River, which flows in a southerly direction across the eastern part of the parish, is the major source of surface water in Vermilion Parish. In 1982, water from the Atchafalaya River was diverted into the Teche-Vermilion system via a major pumping station to supplement the low flows of Bayou Teche and the Vermilion River during the period of March through September. The amount of water diverted from the Atchafalaya River during these seven months is approximately 1,000 cubic feet per second, or 424,500 acre-feet. Some of the diverted water enters into the Vermilion River through Bayou Fusilier near Arnaudville. The average annual discharge of Bayou Fusilier is 206,500 acre-feet per year (1956-86). Also, flow from Bayou Teche is diverted into the Vermilion River through the Ruth Canal. The average annual discharge of the Ruth Canal is 204,300 acre-feet per year (1983-86).

Bayou Queue de Tortue, which forms the northwestern boundary of Vermilion Parish, is another source of surface water. The average flow of this bayou is 203,000 acre-feet per year. The bayou is a tributary to the Mermentau River, which forms a small segment of the northwestern boundary of the parish. About 402 million gallons of water per day is taken from the Mermentau River, and about 200 million gallons per day of this water is used within Vermilion Parish.

The parish includes several large bodies of water, including Vermilion Bay, Lake Arthur, and White Lake. The Gulf of Mexico forms the southern boundary of the parish. About 307.47 million gallons of water per day is drawn from surface water sources in Vermilion Parish. Of this amount, 288 million gallons per day is used to irrigate rice. The remaining 19.47 million gallons per day is used for aquaculture, livestock, and industrial purposes.

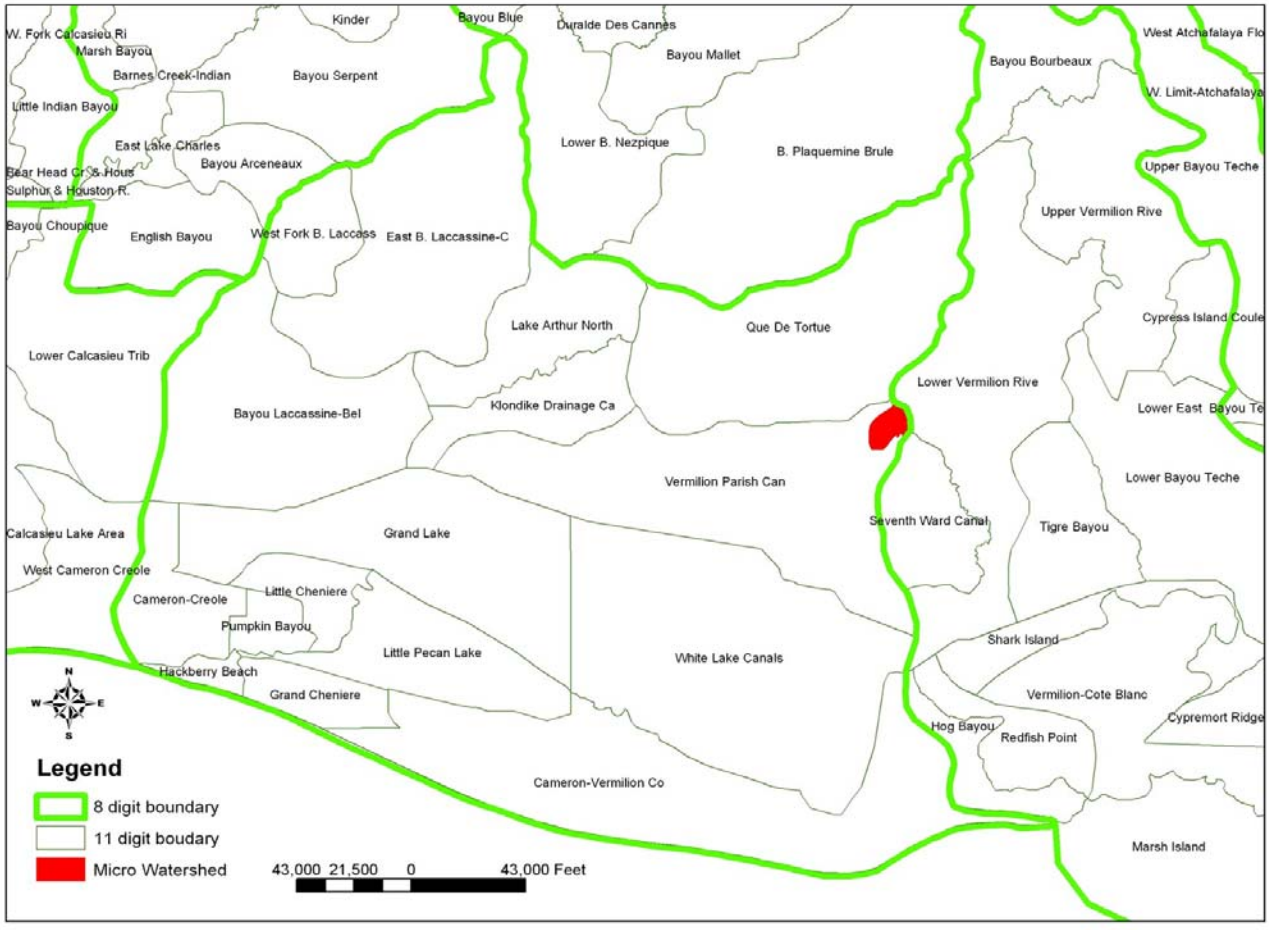
Sources of fresh subsurface ground water in Vermilion Parish are the Abbeville unit, the upper sand unit, and the lower sand unit of the Chicot Aquifer system. The three units also contain salt water. The maximum depth to fresh ground water in the parish is about 800 feet below land surface.

The Abbeville unit generally consists of fine to sandy silt that grades to sand and gravel with increasing depth. The unit ranges in thickness from 100 to 250 feet and dips toward the south. It is recharged directly from the Vermilion River because water levels have been drawn down to below the river stages. Water quality in the Abbeville unit reflects the quality of water in the Vermilion River because of the direct hydraulic connection.

Hydrologic Unit Boundary

Hydrologic unit boundaries define the aerial extent of surface water drainage to a point (Figure 2). The standardized 4th level United States Geological Survey (USGS) hydrologic units are broadly used; however, the geographical areas for the units are too large to adequately serve many water-resource investigations, resource analysis, and management unit needs.

Figure 2. Hydrologic Unit Map



Socioeconomic Resources

The following social and economic indicators are the most recent available for Vermilion Parish and Census Tract 9505. U.S. Census Bureau Census tract 9505 is located between Kaplan and Abbeville, Louisiana, in Vermilion Parish. The tract measures 20 miles across and contains approximately 95 percent of the Coulee Baton Microwatershed. The statistics used in section of the document were taken from the U.S. Census 2002 report.

Population

The population of Vermilion Parish in the year 2000 was 53,800, a 7.5 percent increase from its 1990 population of 49,760. This is higher than the state average increase of 5.9 percent over the same period of time, but lower than the national average increase, from 1990 to 2000, of 13.1 percent. Vermilion Parish's population is estimated to have increased to 54,750 for 2004, a 1.8 percent increase. Population fluctuations are often subtle indicators of an area's economic health.

Minority groups (refers to non-white racial minorities) comprise approximately 17.3 percent of the parish's population. This is significantly lower than the state's average minority ratio of 36.1 percent. Census tract 9505, containing the majority of Coulee Baton Microwatershed, lists a non-white minority ratio of only 6 percent. Census figures show 11,970 residents, or 22.2 percent of the parish population, as having at least one disability. This is slightly higher than the state average of approximately 20 percent.

Education

Educational level is another factor analysts use to gauge a community or area's progress. Vermilion Parish's ratio of adults, 25 years and older with a high school education in 2000, was 65.6 percent which is lower than the state average of 74.8 percent. Louisiana's percentage of adults, 25 years and older with a bachelors degree, was 18.7 percent in 2000, significantly higher that the parish's ratio of approximately 10.7 percent. Both are significantly lower than the national average of 24.4 percent.

Educational level for the residents of Census tract 9505 consists of an average adult high school graduation rate of 75 percent, approximately the state average. The ratio of census tract adult residents with at least a bachelor's degree was closer to the parish average at 11.8 percent.

Employment

Vermilion Parish's employment levels reached 22,720 in 2000. Nonagricultural related jobs accounted for all but approximately 880 positions. Major civilian employment occupations include mining (12 percent), service occupations, including healthcare

support (18 percent), accommodation and food services (5.7 percent), financial and insurance (5.6 percent), professional, scientific, and management services (5.5 percent), and public administration (4.5 percent).

Vermilion Parish's 2000 unemployment rate of 7 percent is significantly higher than the state average of 4.3 percent. The parish's unemployment rate among persons 16-19 and 20-24 years of age was 24 and 13 percent respectively, in 2000. Census tract 9505's unemployment rate for the same period was only 3.5 percent.

Income

Vermilion Parish's per capita income in 1999 was $14,200, approximately 6 percent lower than the state average of $16,910 and 65 percent of the national average of $21,590. The average per capita income, during the same period, for residents of Census tract 9505 was $15,950. Median household income for Vermilion Parish in 1999 was $29,500, 10 percent lower than the state median of approximately $32,560. Census figures for the same period show 22.1 percent of parish residents living in an impoverished condition, compared to 19.6 percent for the state, and 12.4 percent for the nation. That is almost double the national average. Census tract figures for the area (tract 9505) present a brighter picture with only 12.8 percent of households in an impoverished condition.

Residential property values for Vermilion Parish in 2000 were a median $68,000, 20 percent lower than the state median of $85,000, and almost half the national median of owner occupied residential value of $119,600. Census tract figures for the area were closer to the state average at $83,300.

Part 505.05 of the USDA's National Watershed Manual (NWSM) uses the following three indicators to determine whether a community is economically and socially disadvantaged: per capita income, residential property value, and unemployment rate. Based upon the aforementioned information, Vermilion Parish merits consideration as a disadvantaged area. The same cannot be said for residents of Census tract 9505.

Soils

The soils found in the microwatershed area are Crowley silt loam, Frost silt loam, Mowata silt loam, and Patoutville silt loam (Figure 3).

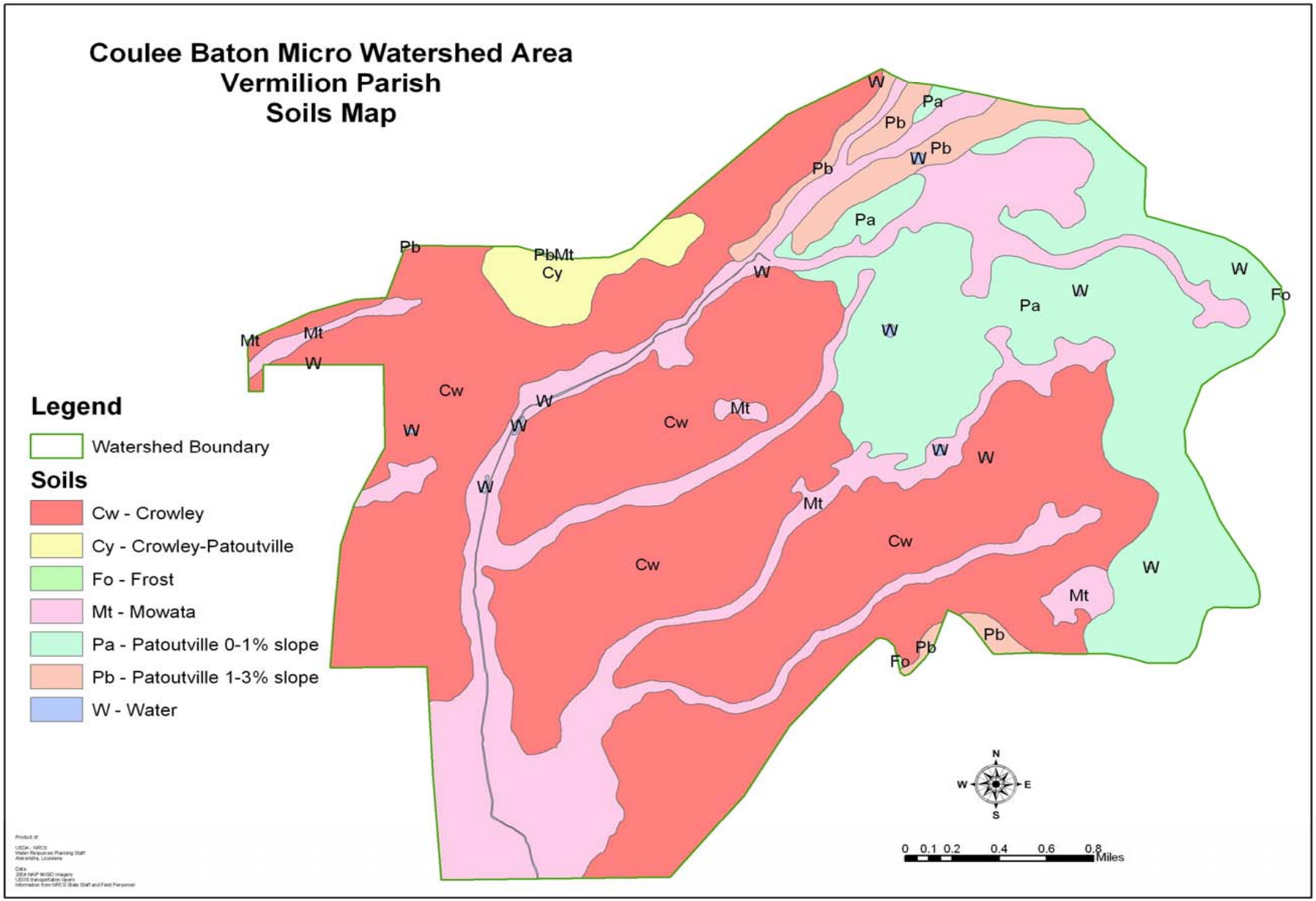


Figure 3. Soils Map

Cw – Crowley silt loam, 0 to 1 percent slopes

This level, somewhat poorly drained soil is on broad, slightly convex ridges on the Gulf Coast Prairies. It has a thick, loamy surface layer and clayey subsoil. Water runs very slowly off the surface and stands in low areas for short periods after heavy rains. Water and air move very slowly through the subsoil. A seasonal high water table is perched above the clayey subsoil at a depth of 0.5 foot to 1.5 feet during the period December through April. Natural fertility is medium. The subsoil has a high shrink-swell potential.

This soil is moderately well suited to cultivated crops and well suited to pasture. Wetness is the main limitation. Rice and soybeans are the main crops, but corn, small grains, and sweet potatoes are also suitable. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, ryegrass, white clover, and wild winterpea. Proper row arrangement, field ditches, and vegetated outlets can help to remove excess water. The soil is friable and can be easily kept in good tilth. Returning all crop residues to the surface will reduce erosion, help maintain organic matter and reduce crusting. Most crops and pasture plants respond well to lime and a complete fertilizer.

This soil is moderately well suited to woodland. Most areas, however, are used for cropland or homesites and not likely to be used for commercial timber production. The native vegetation is tall prairie grasses. If the soil is used for timber production, the main limitations due to wetness are severe equipment limitations, severe plant competition, and seedling mortality. The main trees suitable for planting are loblolly pine and slash pine. Silvicultural operations should be restricted to dry weather periods. Special site preparation, such as bedding and harrowing, using planting stock that is larger than normal, or using containerized planting stock can reduce the seedling mortality rate. Site index for loblolly and slash pine is 90.

Cy – Crowley - Patoutville silt loams

These nearly level, somewhat poorly drained soils are on broad flats and low ridges in the uplands. The components of this map unit are so closely intermingled that it is not practical to map them separately at the scale selected for mapping. Typically, areas are about 55 percent Crowley soil and about 30 percent Patoutville soil. Included with these soils in mapping are a few small areas of Frost and Mowata soils which make up about 15 percent of the map unit. The Crowley soil is on flats between ridges and the Patoutville soil is on low ridges. Slopes range from less than 1 percent on the flats to about 2 percent on the ridges.

The Crowley soil has a thick, loamy surface layer and clayey subsoil. Water runs very slowly off the surface and stands in low areas for short periods after heavy rains. Water and air move very slowly through the subsoil. A seasonal high water table is perched

above the clayey subsoil at a depth of 0.5 foot to 1.5 feet during the period December through April. Natural fertility is medium. The subsoil has a high shrink-swell potential.

The Patoutville soil formed in thin loess and is loamy throughout the profile. The surface layer is acid, and natural fertility is medium. Surface runoff is slow. Water and air move slowly through the soil. A seasonal high water table is 2 to 5 feet below the surface during December through May. The shrink-swell potential is moderate in the subsoil.

The Crowley and Patoutville soils are moderately well suited to cultivated crops. They are limited mainly by wetness. The main suitable crops are rice, soybeans, sweet potatoes, vegetables, cotton, and corn. Proper row arrangement, field ditches, and vegetated outlets help to remove excess surface water. Returning crop residue to the soils and minimizing tillage help to prevent crusting of the surface layer and compaction. Land grading and smoothing can improve surface drainage, allow more uniform applications of irrigation water, and improve the efficiency of farm equipment. Most crops respond well to applications of fertilizer and lime.

These soils are well suited to pasture. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, white clover, vetch, and ryegrass. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Fertilizer and lime are needed for the optimum growth of grasses and legumes.

These soils are moderately well suited to woodland. The native vegetation was tall prairie grasses. Seedling mortality is moderate on the Crowley soil because of the wetness. Plant competition is severe in areas of the Patoutville soil because of wetness. If these soils are used for timber production, the main concerns in areas of the Crowley soil are severe equipment limitations, severe plant competition, and the seedling mortality caused by the wetness. The main concerns in areas of the Patoutville soil are moderate equipment limitations and plant competition. The trees suitable for planting are loblolly pine and slash pine.

Fo – Frost silt loam

This level, poorly drained soil is on broad flats and along drainageways in the uplands. It formed in loess and is loamy throughout the profile. The surface layer is acid, and natural fertility is medium. Water runs off the surface at a very slow rate and stands in low areas for long periods after heavy rains. Water and air move through this soil at a slow rate. A seasonal high water table is within a depth of about 1.5 feet during the period December through April. The surface layer of this soil remains wet for long periods after heavy rains. The soil is subject to rare flooding by run-in water during unusually wet periods. The shrink-swell potential is moderate.

This soil is moderately well suited for cultivated crops and well suited for pasture. Wetness is the main limitation. The medium fertility is a minor limitation. Rice and soybeans are the main crops, but cotton, corn, small grain, and vegetables also are

suitable. The main suitable pasture plants are common bermudagrass, white clover, wild winterpea, vetch, bahiagrass, tall fescue, and ryegrass. Proper row arrangement, field ditches, and vegetated outlets are needed to remove excess water. Fertilizer and lime are needed for the optimum growth of crops and pasture plants.

This crop is moderately well suited to woodland. The main concerns in producing and harvesting timber are severe equipment limitations, severe plant competition, the risk of compaction, and seedling mortality. Sivicultural operations should be restricted to dry weather periods. The trees suitable for planting are loblolly pine and slash pine.

Mt – Mowata silt loam

This level, poorly drained soil is on broad, slightly concave flats and along drainageways on the Gulf Coast Prairies. It has a loamy surface layer and a clayey subsoil. Natural fertility is medium. Water runs off the surface at a very slow rate and stands in low areas for short periods after heavy rains. Water and air move through this soil at a very slow rate. A seasonal high water table is within a depth of about 2 feet during the period December through April. The subsoil has a high shrink-swell potential. The surface layer remains wet for long periods after heavy rains.

The soil is moderately well suited to cultivated crops and well suited to pasture. Rice and soybeans are the main crops, but corn and small grains also are suitable. Proper row arrangement, field ditches, and vegetated outlets are needed to remove excess surface water. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. The main limitation for pasture production is wetness. Excess surface water can be removed by field ditches and vegetated outlets. Land grading and smoothing will improve surface drainage. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, ryegrass, white clover, and wild winterpea. Fertilizer and lime are needed for the optimum growth of crops and pasture plants.

This soil is moderately well suited to woodland. The native vegetation is tall prairie grasses. Seedling mortality is moderate because of the wetness. The main management concerns for producing timber are severe equipment limitations, compaction, severe plant competition, and seedling mortality. The main trees suitable for planting are loblolly pine, slash pine, and sweetgum. Silvicultural operations should be restricted to dry weather periods. Seedling mortality rates can be reduced by special site preparation, such as bedding and harrowing, or by using containerized planting stock. Site index for loblolly, slash pine, and sweetgum is 90.

Pa – Patoutville silt loam, 0 to 1 percent slopes

This nearly level, somewhat poorly drained soil is on broad slightly convex ridges in the uplands. It formed in loess and is loamy throughout the profile. The surface layer is acid, and natural fertility is medium. Surface runoff is slow. Water and air move slowly

through the soil. A seasonal high water table is 2 to 5 feet below the surface during December through May. The shrink-swell potential is moderate in the subsoil.

The potential for cropland is fair and the potential for pastureland is good. The suitable crops are soybeans, rice, sugarcane, sweet potatoes, and corn. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, white clover, ryegrass, and vetch. Proper row arrangement, field ditches, and vegetated outlets are needed to remove excess surface water. Fertilizer and lime are needed for the optimum growth of crops and pasture plants.

This soil is well suited to woodland. The main management concerns are moderate equipment limitations, compaction, and severe plant competition caused by the wetness. The native vegetation is tall prairie grasses. Silvicultural operations should be restricted to dry weather periods. The trees suitable for planting are loblolly pine and slash pine. Site index for loblolly and slash pine is 95.

Pb – Patoutville silt loam, 1 to 3 percent slopes

This very gently sloping, somewhat poorly drained soil is on short side slopes in the uplands. It formed in loess and is loamy throughout. The soil is medium acid or strongly acid in the upper 20 inches of the profile. It has medium natural fertility. Surface runoff is medium. Water and air move through this soil at a slow rate. A seasonal high water table is present in the soil at 2 to 5 feet during the period December through May. The shrink-swell potential is moderate in the subsoil.

The potential for cropland and pastureland is good. Suitable crops are soybeans, corn, sugarcane, and sweet potatoes. The main limitations for cultivated crops are slope and a moderate hazard of erosion. Suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, white clover, ryegrass, and vetch. Traffic pans develop easily, but can be broken by chiseling or deep plowing. Ditching will improve surface drainage. The soil should be tilled on the contour or across the slope. Returning all crop residues to the surface will reduce erosion, help maintain organic matter and reduce crusting. Most crops, other than legumes respond well to nitrogen fertilizers. Lime and other fertilizers are usually needed.

This soil is well suited to woodland. The main management concerns are moderate equipment limitations, compaction, and severe plant competition caused by the wetness. Silvicultural operations should be restricted to dry weather periods. The trees suitable for planting are loblolly pine and slash pine. Site index for loblolly and slash pine is 95.

Biological Resources

Areas of open agricultural land provide fair to excellent habitat for such species as mourning and ground doves, bobwhite, woodcock, snipe, songbirds, cottontail and swamp rabbits, and many non-game animals. Wooded areas adjacent to Coulee Baton

provide a habitat for white-tailed deer, gray and fox squirrels. Grassed field borders in the sugarcane fields, and woody vegetation benefit wildlife by providing nesting and escape cover.

The Coulee Baton Microwatershed area offers recreational opportunities consisting of bullfrog harvesting, rabbit, deer, and small game hunting, as well as dove hunting. The Coulee Baton Microwatershed area is located within the Mississippi River Flyway and winters a significant variety of migratory birds every year. Fields that have pumping capabilities allow opportunities for reliable habitat during abnormally dry fall and winter months. When these agricultural fields are in crawfish production, or are crawfish ponds year around, they provide essential habitat during the spring migration north.

The channels and the coulees in the microwatershed area are mainly used for drainage and they support a limited population of game and forage fish. Some aquatic insects found in the waterbodies include bloodworms and rat-tailed maggots. The presence of these insects indicates low oxygen conditions.

A listing of the major vegetation, fish and wildlife species, marine invertebrates, fish species, amphibian, reptiles, birds, and mammals that can be found in Vermilion Parish is contained in Appendix A**.**

Crops such as rice are an important source of food for wildlife. Cropland normally provides a quality food source, especially if residue and waste grain remain as depicted in Figure 4.

Figure 4. Waste grain is a source of wildlife food.

PROJECT PLANNING

Meetings

The project has moved forward under the leadership and direction of the Vermilion SWCD. Through a series of meetings, field trips and a public meeting, the SWCD has maintained a strong leadership role in the development of this project to keep the focus at the local level. The Vermilion SWCD recognizes that partnerships are key to effective watershed management and that partnerships are the easiest way to develop and implement a successful Coulee Baton Microwatershed Plan. A list of the partners can be found in the Consultation and Public Participation section of this document.

Figure 5. The Vermilion SWCD conducted numerous meetings.

Public Meeting

In order to introduce the proposed Coulee Baton Microwatershed to constituents in the project area, and to get input from the public, the Vermilion SWCD hosted a public meeting on January 25, 2006, in Kaplan, Louisiana. There were approximately 40 people in attendance. Introduction of the Microwatershed, the role of the Vermilion SWCD and supporting agencies, typical conservation practices, Master Farmer and Homeowner BMP's were some of the topics discussed at the meeting. Public comments were received as well. The SWCD asked the LSU AgCenter to develop an Agricultural Producer and Homeowner Questionnaire (Appendix B) which was given to local residents and producers at the meeting. The results of the questionnaire are in Appendix B.

Figure 6. Public meeting in Kaplan, Louisiana

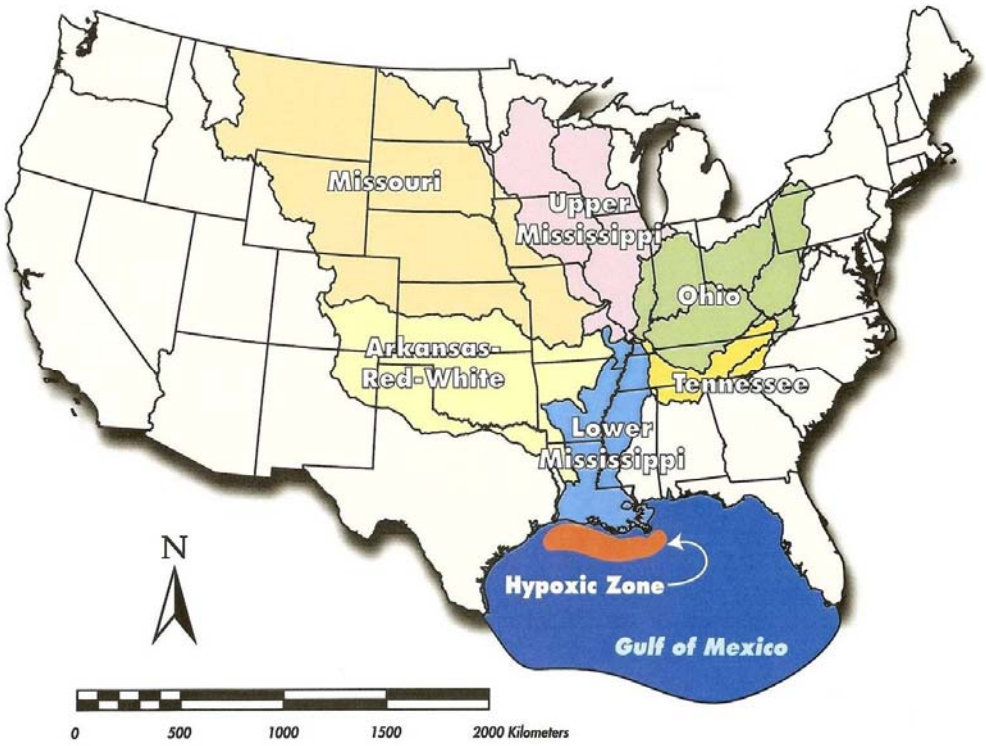
PROBLEMS

Gulf of Mexico Hypoxia

Hypoxia means an absence of oxygen reaching living tissues. It is characterized by low levels of dissolved oxygen, so that not enough oxygen is available to support fish and other aquatic species. The hypoxic zone, also referred to as "Dead Zone," covers an area in the Gulf of Mexico which can encompass up to 8,500 square miles (LaCoast News 2004) Figure 7. The Dead Zone has become a serious threat to commercial fishing, shrimping and recreational industries. Nutrients, such as nitrogen and phosphorus, are essential for healthy marine and freshwater environments. However, an overabundance of nutrients can trigger excessive algal growth (or eutrophication) which results in reduced sunlight, loss of aquatic habitat, and a decrease in oxygen dissolved in the water. Excess nutrients may come from a wide range of sources such as runoff from developed land, atmospheric deposition, soil erosion, and agricultural fertilizers. Sewage and industrial discharges also contribute nutrients. The livelihood of many thousands of people and their communities are at risk. (National Center for Appropriate Technology) Most aquatic species cannot survive at the low oxygen levels that are found in the hypoxic zone. The hypoxic zone forms in the middle of the most important commercial and recreational fisheries in the conterminous United States and could threaten the economy of this region of the Gulf (Ecological and Economic Consequences of Hypoxia).

Louisiana is located at the bottom of the funnel for drainage of our country's heartland with the hypoxic zone in our backyard. The Vermilion SWCD feels confident that they can work with producers in the Coulee Baton Microwatershed area to accelerate the installation of conservation practices which will positively affect water quality.

Figure 7. Hypoxic Zone (map source – TiAER)



Stream Impairment

The Louisiana Department of Environmental Quality publishes the state's 305(b) report on a biannual basis. LDEQ's statewide assessment reports contains data on the state's perspective on water quality problems that exist as result of their data collection program. The type of impairment, the number of water bodies impaired by the type of impairment, and the percentage on reported problems in 2004 can be found in LDEQ's Table 1 below. A typical example of an impaired waterbody is shown in Figure 8.

Figure 8. Sediment laden waterbodies common to the microwatershed area.

Table 1. Top impairments found in Louisiana waters

Type of Impairment	#Waterbodies Impaired by This Type of Impairment	Percentage on Reported Problems in 2004
Dissolved Oxygen	182	16%
Fecal Coliform Bacteria	133	11%
Nutrients (all forms of nutrients)	143	12%
Metals (waterbodies are sampled again with the Clean Metals Techniques to determine is a metals problem exists)	107	9%
Turbidity	82	7%
Total Suspended Solids	68	6%
Sedimentation/Siltation	47	4%
Pesticides	45	4%
Non-Naïve Plansts	44	4%

By implementing Best Management Practices (BMP) in the Coulee Baton Microwatershed area the sponsors are hoping to decrease the amount of soil being transported offsite.

TMDL Implementation

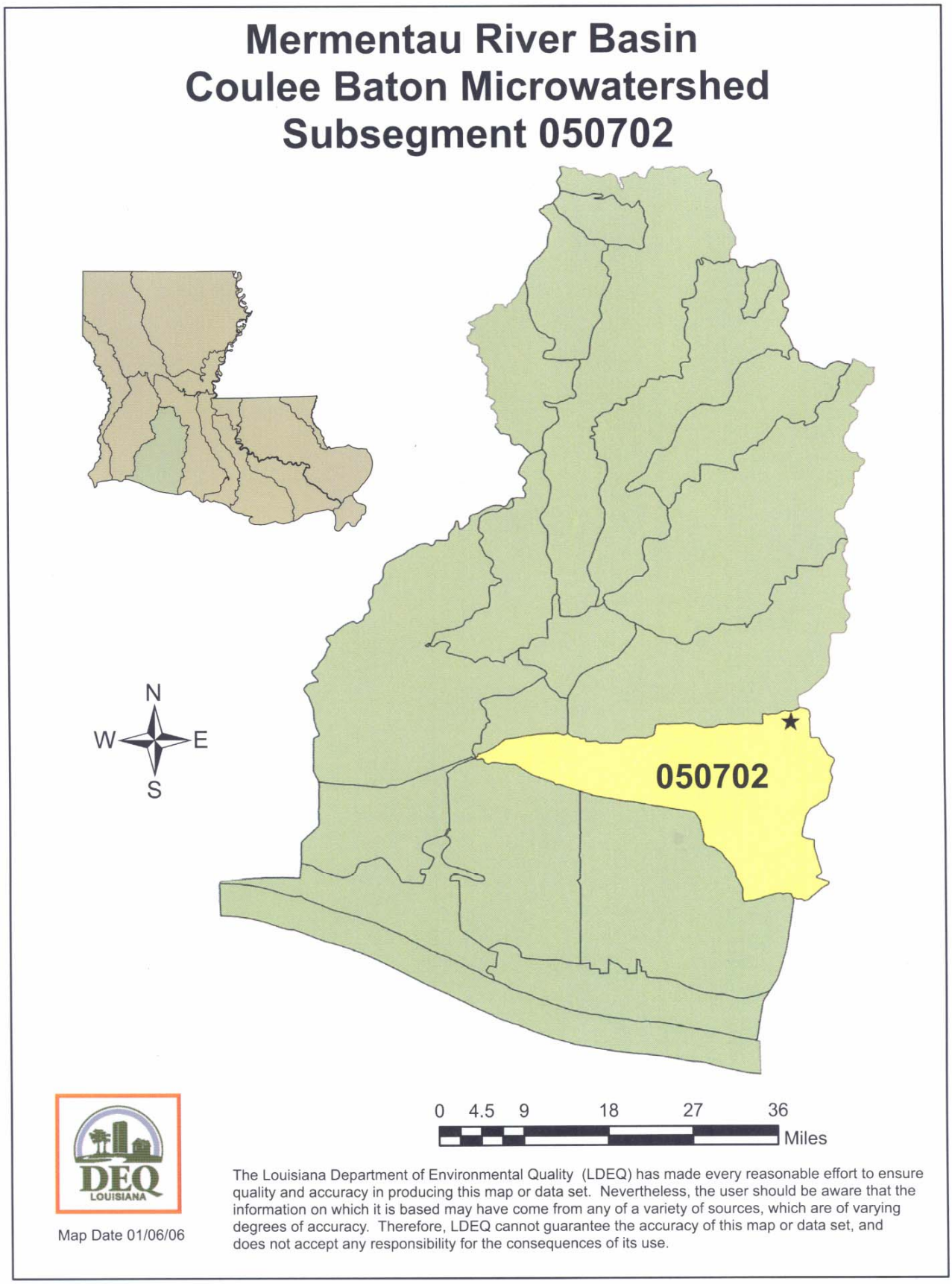
A Total Maximum Daily Load (TMDL) is a pollution budget for a specific waterbody (river, lake, stream, etc.). It is the maximum amount of a pollutant that can be released into a waterbody without causing the waterbody to become impaired and/or violate state water quality standards.

Vermilion Parish lends itself well to piloting the PIMA approach in Louisiana. The need for accelerated conservation practice implementation is demonstrated by several stream segments in the parish not meeting their designated uses. TMDL's have been established for some streams in the parish.

The Coulee Baton Microwatershed is in Louisiana Department of Environmental Quality's (LDEQ) mapping subsegment number 050702 described in the waterbody description of GIWW from the Mermentau River to the Leland Bowman Locks as indicated in Figure 9. There are numerous small canals and streams that are connected to either Grand Lake or the GIWW particularly between the Mermentau River and Leland Bowman Locks.

The suspected sources of pollutants include minor industrial point sources, package plants (small flows), non-irrigated crop production, irrigated crop production, petroleum activities, flow regulations/modifications, and industrial and municipal spills. The suspected causes of the water impairment include organic enrichment/low dissolved oxygen, oil and grease, suspended solids, turbidity, pesticides, nutrients, and mercury.

Figure 9. Coulee Baton Microwatershed is located in subsegment 050702



Permanent Gully Erosion

When water is discharged in an uncontrolled manner from fields through quarter drains, erosion can occur as shown in Figure 10. The Coulee Baton Drainage District has jurisdiction over approximately 40 miles of ditches and other water outlets in the microwatershed area. The Drainage District lacks the financial resources to remove offsite sediment from the ditches and other drainageways on a frequent basis.

Figure 10. Soil erosion

Permanent gullies are formed when untreated ephemeral gullies become too large for normal tillage operations. These gullies have become a part of the permanent drainage system, as they are located at the edge of fields where runoff water enters drainageways. In addition to depleting the natural resource base, the gullies become so deep and wide the annual repair cannot keep up with reformation. The erosive energy of a gully will continue until a stable grade is established.

Critical Area Adjacent to Livestock Watering Trough

Water troughs are utilized as a source of water for livestock in the project area. However, with the frequent and the intense use of the watering facility, critical eroded areas can occur in the immediate area of the troughs as indicated in Figure 11.

Figure 11. Water trough

SOLUTIONS

Funding

The success of this microwatershed project will be measured by continuous application of existing and future BMP's and related conservation practices that reduce the amount of sediment, nutrients, pesticides and organic material entering the surrounding water bodies on an annual basis.

Cost share assistance provided to constituents in the project area to address agricultural related resource concerns in the microwatershed area will be done through the Environmental Quality Incentive Program (EQIP) and 319 funding. A grant proposal will be submitted to the LDEQ

Nonpoint Source Pollution Program and Environmental Protection Agency (EPA) to address home sewer concerns for the homeowners in the project area as well.

The projected amount and cost of the proposed EQIP practices to be implemented in the microwatershed area are listed in Table 2**.** The implementation of these practices is dependent on funding.

Table 2. Proposed EQIP Practices

Practice	Cost Share	Amount	Cost
Irrigation Land Leveling	50%	1,000 acres	$22,000
Grade Stabilization Structures (Pipedrops)	75%	20 (number)	$15,000
Fence	50%	5000 feet	$ 8,500
Pipeline (Livestock Trough)	50%	1600 feet	$ 2,750
Watering Facility(Trough)	50%	12 (number)	$ 2,700
Water Well	50%	4 (number)	$12,000
Heavy Use Area Protection (Pads)	50%	12 (number)	$12,000
Total Cost			**$75,000**

The projected amount and cost of the proposed 319 practices to be implemented in the microwatershed area are listed in Table 3. The implementation of these practices is dependent on funding.

Table 3. Proposed 319 Practices

Practice	Cost Share	Amount	Cost
Managed Field Borders for Sugarcane	25%	145,960 feet	$36,490
Nutrient Management	$5 per acre	3.665 acres	$18,325
Pest Management	$5 per acre	3,665 acres	$18,325
Record Keeping	$1 per acre	3,665 acres	$3,665
Irrigation Water Management	$6 per acre	1,632 acres	$9,792
Residue Management	$5 per acre	2,680 acres	$13,403
Total Cost			**$100,000**

- Field Borders will be paid the first two years and matched by the producer on the third year
- Nutrient, Pest, and Residue management will be paid the first year and the second and third years will be matched by the producer
- Record keeping will be paid 50 percent the first and second years then paid by the producer the third year
- Irrigation Water Management will be paid the first year only
- All figures are assuming 75 percent participation by the producers

The BMP's listed in the above tables will be implemented as part of a comprehensive Conservation Plan with the benefit of cost-share payments and incentive payments. The cost of implementing these BMP's, not covered by federal cost-share assistance, will be borne by the individual project participant. BMP implementation cost will not exceed unit cost as listed in the NRCS statewide average cost list or by the Louisiana Department of Agriculture and Forestry (LDAF). The number of acres and structures listed in the tables for a particular BMP are estimates and may change based on the combination of BMP's the landowner must implement to achieve the targeted level of environmental benefits.

BEST MANAGEMENT PRACTICES

The term Best Management Practice or BMP applies to structural and management practices used in agriculture, forestry, urban land development, and industry to reduce the potential for damages to natural resources from human activities. BMP's are the first line of defense for watershed projects.

Best

In every field of work, there are several methods for reaching a goal. Based on impacts to natural resources, efficiency, economics, and the needs of the individual operation, technical assistance is provided to landowners and operators to select the practices best suited to all of their goals. Technical agencies and institutions work to develop new and innovative practices to meet the changing needs of industry and agriculture, and to disseminate information concerning new practices. A BMP must have been selected through a conscious planning process designed to inventory resources and needs, determine available alternatives, evaluate alternatives, make decisions and follow up the selection of practices with monitoring and evaluation to determine if they are having the desired effect. In the Coulee Baton Microwatershed, water quality monitoring will be done according to the monitoring plan found in Appendix C.

Management

In this context, management refers to the way we do business or carry out work. Practices are incorporated into a management system. For instance, a logger implements riparian buffers and water bars to lessen the impact of timber harvesting on natural resources. The logger learns to manage his work more efficiently.

Practice

Practice is the method or customary way of doing something. In this context, a specific practice is recognized as having standards and specifications developed by an agency or institution with expertise in the relevant fields. A practice may be structural, something that is built, or involves changes in land forms or equipment; or it may be managerial, a specific way of using or handling infrastructure or resources.

LSUAgCenter

The LSU Agcenter, in cooperation with the Vermilion SWCD, will tailor its Master Farmer Program to meet the needs of the producers in the microwatershed area (Appendix D). Through the Master Farmer Program, producers will have an opportunity to participate in on-site demonstrations of effective conservation measures within the microwatershed. Producers will also learn about voluntary, effective and achievable BMP's.

Grade Stabilization Structures

In areas where the concentration and flow velocity of water require structures to stabilize the grade in channels or to safely remove surface water from fields, grade stabilization structures will be installed in the project area.

Figure 12. Grade Stabilization Structure with Riser attached

Managed Sugarcane Field Borders

One of the practices that will be implemented in the Coulee Baton Microwatershed area, to curb soil loss is the Managed Sugarcane Field Borders. Field borders are a strip or band of permanent vegetation established on the edge of a cropland field. To some degree grassed field borders in sugarcane can trap sediment, filter storm water, infiltrate storm water, absorb and decompose organic material and/or pollutants, serve to enhance wildlife food, nesting, or escape cover if the proper plant species and management are used. It also serves as an area to harbor beneficial and pest insects. There are approximately 1,456 acres of sugarcane in the microwatershed area.

Figure 13. Managed Sugarcane Field Border

Irrigation Land Leveling

A traditional practice associated with rice production in the microwatershed area has been water leveling. However, this practice contributes to much of the turbidity and sediment laden water body problems in the microwatershed area. An alternative practice that will be available to the rice producers is Irrigation Land Leveling.

Figure 14. Irrigation Land Leveling

Through the leveling practice, fields will be leveled to a planned grade to permit the uniform and efficient application of irrigation water to the leveled fields.

Figure 15. Alfalfa Valve

Watering Facility/Heavy Use Area Protection (Pads)

Watering Facility/Heavy Use Area Protection (Pads) will be two of the practices that will be available to cattle producers in the microwatershed area. Galvanized steel water tanks will be placed on crushed stone for a minimum distance of eight feet in all directions from the water trough. The finished surface shall be sloped to prevent the ponding of water.

Figure 16. Water Facility

Homeowner Best Management Practices

LSU AgCenter states in their flyer that homeowners in the Coulee Baton Microwatershed will have the opportunity to participate in environmental stewardship programs geared toward residential activities. The LSU AgCenter has developed the Best Management of Louisiana Lawns education program to demonstrate to homeowners how to minimize the environmental impacts they have and assist homeowners in basic lawn care and BMP's that they can follow to keep their lawns in good condition. Homeowners can also participate in programs that demonstrate the proper ways to maintain and operate a home septic system. The LSU AgCenter states that this program shows landowners that a malfunctioning system can contaminate groundwater – which might be a source of drinking water. The EPA's Homeowner's Guide to Septic Systems and Homeowner Septic System Checklist will be used as a training manual for landowners. Homeowners, such as the one shown in Figure 18, will be the recipients of homeowner BMP's in the microwatershed area.

Figure 17. Homesite in the microwatershed area

There are two subdivisions in the microwatershed area that contain approximately 30 homes. There are also 17 acres of homesteads in the microwatershed area.

The Vermilion SWCD will coordinate efforts to develop a proposal by which to seek funding through the LDEQ Non-point Source Program and EPA to assist homeowners with inadequate sewer systems.

Figure 18. Subdivision in Coulee Baton Microwatershed area

MONITORING

Water Quality Monitoring

The watershed of which Coulee Baton is a part, is impacted by excessive loading of Total Suspended Solids (TSS), turbidity, materials that produce low Dissolved Oxygen (DO), and silts. The water quality problems within the microwatershed area are primarily from non-point sources (NPS) in lieu of point sources. A Coulee Baton Monitoring Sub-Committee was created to address the method of sampling the water in the microwatershed. It was the consensus of the group that having baseline data for the monitoring was of the utmost importance. Field monitoring will involve dissolved oxygen, pH, electrical conductivity, turbidity, and temperature. The laboratory monitoring will consist of total Kjeldahl nitrogen, total phosphorus, nitrate, sulfate, chloride, fluoride, bromide, nitrite, ortho phophorus, total suspended solids, 5-day biochemical oxygen demand, ammonia, fecals, heterotrophic bacteria, pesticides, total sugar, and water soluble sugar. With the implementation of a 5 – 10 year resource plan, analyses can be done to determine the effects of implemented BMP's. The University of Louisiana at Lafayette (ULL) in consultation with LDEQ has a detailed Monitoring Plan for the Coulee Baton Microwatershed (Appendix C). As of the writing of this microwatershed plan, ULL has submitted the monitoring plan to EPA for funding.

Figure 19. Automated sampler/flow meter

Automated samplers and flow meters will be installed at five locations in the microwatershed area.

CONSULTATION AND PUBLIC PARTICIPATION

In August 2004, the Chairman of the Vermilion SWCD became aware of and interested in a microwatershed project when he attended the Industry-Led Solutions meeting in New Orleans, Louisiana. After returning from the New Orleans ILS meeting, the Chairman discussed the Planned Intervention Microwatershed PIMA approach with the Vermilion SWCD board. The SWCD board liked the idea and agreed to request assistance from various partners. On May 3, 2005, an initial Vermilion PIMA Meeting was held in Abbeville, Louisiana. After a series of field trips another PIMA meeting was held on September 21, 2005, in Abbeville, Louisiana. The Coulee Baton area was selected as the microwatershed. At this meeting it was decided that a Monitoring Subcommittee would be formed for the purpose of coordinating a Monitoring Plan for the microwatershed.
On October 4, 2005, the Coulee Baton Monitoring Subcommittee met to discuss the details of the overall monitoring plan. Finally on January 25, 2006, the Coulee Baton Microwatershed Public meeting was held in Kaplan, Louisiana. Over 40 people were in attendance at the meeting.

Additionally, presentations on the Coulee Baton Microwatershed have been given at a National Industry Led Solution meeting in Richmond,Virginia in January 2006, and at a Farm Bureau meeting in Little Rock, Arkansas, February 2006.

Cooperative Partnership

A Cooperative Partnership was formed with the following:

Cooperating Landowners and Home Owners
Vermilion Soil and Water Conservation District
Louisiana Department of Agriculture and Forestry
USDA Natural Resources Conservation Service
Louisiana Department of Environmental Quality
Louisiana State University AgCenter
Louisiana Cooperative Extension Service
Tarleton University (Texas Institute for Applied Environmental Research)
Environmental Protection Agency
University of Louisiana at Lafayette
USDA Farm Service Agency
Coulee Baton Gravity Drainage District
Vermilion Parish Police Jury
Gulf of Mexico Program
Local Agricultural Enterprises and Businesses
Louisiana Department of Natural Resources

APPENDICES

APPENDIX A

Biological Resources List

LIST OF VEGETATION IN VERMILION PARISH, LOUISIANA

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PTERIDOPHYTES

001 EQUISETACEAE

Equisetum hyemale	Horsetail

003 PSILOTACEAE

Psilotum nudum	Whisk Fern

004 SELAGINELLACEAE

Selaginella apoda	Meadow Spikemoss

008 POLYPODIACEAE

Adiantum pedatum	Northern Maidenhair Fern
Asplenium platyneuron	Ebony Spleenwort
==Athyrium aspleniodes Athyrium filax-femina aspleniodes	Southern Lady Fern
Cyrtomium fortunei	Holly Fern
Dryopteris ludoviciana	Louisiana Wood-fern
Onoclea sensibilis	Sensitive Fern
Polypodium polypodioides	Resurrection Fern
Polystichum acrostichoides	Christmas Fern
Pteridium aquilinum pseudocaudatum	Bracken Fern
Pteris cretica	Cretan Brake
Pteris vittata	Ladder Brake
Thelypteris dentata	Downy Shield Fern
Thelypteris interrupta	Willdenous Shield Fern
Thelypteris kunthii	Widespread Maiden Fern
==Thelypteris quadrangularis	Shield Fern

Thelypteris hispidula	
Thelypteris thelypteroides	Southern Marsh Fern
==Thelypteris torresiana	Mariana Maiden Fern
Macrothelypteris torresiana	
Woodsia obtusa	Blunt-lobed Woodsia
Woodwardia areolata	Netted Chain Fern
Woodwardia virginica	Virginia Chain Fern
012 SCHIZAEACEAE	
Lygodium japonicum	Japanese Climbing-Fern
013 OSMUNDACEAE	
Osmunda regalis	Royal Fern
014 SALVINIACEAE	
Azolla caroliniana	Mosquito Fern
Salvinia minima	Salvinia
015 MARSILEACEAE	
Marsilea vestita	Hairy Waterclover
017 OPHIOGLOSSACEAE	
Botrychium biternatum	Southern Grape Fern
Botrychium dissectum	Cutleaf Grape Fern
Botrychium virginianum	Rattlesnake-Fern
Ophioglossum crotalophoroides	Bulbous Adder's-Tongue
Ophioglossum engelmannii	Limestone Adder's-Tongue
Ophioglossum petiolatum	Long-stemmed Adder's-Tongue
Ophioglossum vulgatum	Common Adder's-Tongue

GYMNOSPERMS

023 PINACEAE	
Juniperus virginiana	Eastern Red Cedar
Pinus echinata	Shortleaf Pine
Pinus elliottii	Slash Pine
Pinus taeda	Loblolly Pine
Taxodium distichum	Baldcypress

ANGIOSPERMS

025 TYPHACEAE	
Typha domingensis	Southern Cattail
Typha latifolia	Common Cattail
028 POTAMOGETONACEA	
Potamogeton diversifolius	Waterthread Pondweed
Potamogeton nodosus	Long-leaved Pondweed
Potamogeton pectinatus	Sago Pondweed
Potamogeton pusillus	Small Pondweed
029 NAJADACEAE	
Najas guadalupensis	Southern Naiad
Najas minor	Brittle Naiad
032 ALISMATACEAE	
Echinodorus cordifolius	Creeping Burhead
Sagittaria calycina	Hooded Arrowhead

Sagittaria falcata	Coastal Arrowhead
Sagittaria graminea	Grassy Arrowhead
Sagittaria lancifolia	Bulltongue
Sagittaria latifolia	Duck-Potato
Sagittaria montevidensis	Hooded Arrowleaf
Sagittaria platyphylla	Delta Arrowhead
034 HYDROCHARITACEAE	
Hydrilla verticillata	Hydrilla
Limnobium spongia	Frog's-Bit
Ottelia alismoides	Ducklettuce
Vallisneria americana	Wildcelery
036 GRAMINEAE	
Agrostis elliottiana	Elliot Bentgrass
Agrostis hyemalis	Spring Bentgrass
Alopecurus carolinianus	Carolina Foxtail
Andropogon gerardii	Big Bluestem
Andropogon glomeratus	Bushy Bluestem
Andropogon virginicus	Broomsedge
Aristida longispica	Slim-spike Three-awn Grass
Aristida oligantha	Prairie Three-awn Grass
Arundinaria gigantea	Giant Cane
Arundo donax	Giant Reed
Avena sativa	Common Oats
Axonopus affinis	Carpetgrass
Axonopus compressus	Tropical Carpetgrass
Bothriochloa exaristata	Awnless Bluestem
Bothriochloa ischaemum	King Ranch Bluestem
Bothriochloa saccharoides	Silver Bluestem
Brachiaria fasciculatum	Browntop Panicum
Brachiaria platyphylla	Broadleaf Signalgrass
Brachiaria reptans	Sprawling Panicum
Briza minor	Little Quaking-grass
Bromus japonicus	Japanese Chess
Bromus racemosus	Hairy Bromegrass
Bromus tectorum	Downy Bromegrass
Bromus unioloides	Rescuegrass
Cenchrus echinatus	Southern Sandbur
Cenchrus incertus	Coastal Sandbur
Cenchrus myosuroides	Big Sandbur
Chasmanthium latifolium	Inland Sea Oats
Chasmanthium laxum	Chasmanthium
Chasmanthium sessiliflorum	Longleaf Uniola
Chloris virgata	Showy Chloris
Coelorachis tesselata	Jointgrass
Cynodon dactylon	Bermudagrass
Dactyloctenium aegyptium	Durban Crowfootgrass
Dichanthelium boscii	Bosc Panicum
Dichanthelium oligosanthes	Scribner Panicum
Dichanthelium scabriusculun	Velvet Panicum
Dichanthelium scoparium	Velvet Panicum
Dichanthelium sphaerocarpon	Roundseed Panicum
==Digitaria adscendens Digitaria ciliaris	Southern Crabgrass
Digitaria ciliaris	Southern Crabgrass
Digitaria ischaemum	Smooth Crabgrass

Digitaria sanguinalis	Northern Crabgrass
Digitaria villosa	Crabgrass
Distichlis spicata	Seashore Saltgrass
Echinochloa colona	Junglerice
Echinochloa crusgalli	Barnyardgrass
Echinochloa muricata	Wild Millet
Echinochloa walteri	Walter's Millet
Eleusine indica	Goosegrass
Elymus virginicus	Virginia Wild Rye
Eragrostis bahiensis	Bahia Lovegrass
Eragrostis capillaris	Lacegrass
Eragrostis curvula	Weeping Lovegrass
Eragrostis glomerata	Pond Lovegrass
Eragrostis hypnoides	Teal Lovegrass
Eragrostis intermedia	Plains Lovegrass
Eragrostis lugens	Mourning Lovegrass
Eragrostis pectinacea	Carolina Lovegrass
Eragrostis refracta	Coastal Lovegrass
Eragrostis secundiflora	Red Lovegrass
Eragrostis spectabilis	Purple Lovegrass
Eragrostis spicata	Spike Lovegrass
Eragrostis tephrosanthos	Gulf Lovegrass
Eremochloa ophiuroides	Centipedegrass
Erianthus giganteus	Sugarcane Plumegrass
==Festuca elatior Festuca pratensis	Meadow Fescue
Hordeum pusillum	Little Barley
Hydrochloa caroliniensis	Watergrass
Leersia hexandra	Southern Cutgrass
Leersia oryzoides	Rice Cutgrass
Leersia virginica	Whitegrass
Leptochloa fascicularis	Bearded Sprangletop
Leptochloa filiformis	Red Sprangletop
Leptochloa panicoides	Amazon Sprangletop
-=Leptochloa scabra	Rough Sprangletop
Limnodea arkansana	Ozarkgrass
Lolium perenne	Perennial Ryegrass
Manisuris exaltata	----
Muhlenbergia schreberi	Nimblewill Muhly
==Oplismenus setarius Oplismenus hirtellus setarius	Basketgrass
Oryza sativa	Rice
Panicum anceps	Beaked Panicum
Panicum capillare	Witchgrass
==Panicum commutatum Dichanthelium commutatum	Variable Panicgrass
Panicum dichotomiflorum	Fall Panicgrass
==Panicum dichotomum Dichanthelium dichotomum	Clute Panicgrass
Panicum hemitomon	Paille Fine
==Panicum laxiflorum Dichanthelium laxiflorum	Openflower Panicgrass
==Panicum leucothrix Dichanthelium acuminatum implicatum	Wooly Panicgrass
==Panicum lindheimeri Dichanthelium acuminatum lindheimeri	Panicgrass
Panicum repens	Torpedograss

Panicum rigidulum	Redtop Panicum
Panicum virgatum	Switchgrass
Paspalum boscianum	Bull Paspalum
Paspalum cojugatum	Sour Paspalum
Paspalum dilatatum	Dallisgrass
Paspalum distichum	Knotgrass
Paspalum floridanum	Florida Paspalum
Paspalum fluitans	Water Paspalum
Paspalum laeve	Field Paspalum
Paspalum langei	Rustyseed Paspalum
Paspalum lividum	Longtom
Paspalum notatum	Bahiagrass
Paspalum plicatulum	Brownseed Paspalum
Paspalum setaceum	Thin Paspalum
Paspalum urvillei	Vaseygrass
Paspalum vaginatum	Seashore Paspalum
Phalaris angusta	Canarygrass
Phalaris caroliniana	Carolina Canarygrass
Phanopyrum gymnocarpon	Savannah Panic
Phragmites australis	Common Reed
Poa annua	Annual Bluegrass
Poa sylvestris	Woodland Bluegrass
Polypogon monspeliensis	Rabbitfootgrass
Saccharum officinarum	Sugarcane
Sacciolepis striata	American Cupscale
Schizachyrium scoparium	Little Bluestem
Schizachyrium tenerum	Slender Bluestem
Setaria geniculata	Knotroot Bristlegrass
Setaria glauca	Yellow Foxtail
Setaria italica	Foxtail Millet
Setaria magna	Giant Bristlegrass
-=Setaria pallida-fusca	Foxtail
Sorghastrum avenaceum	Indiangrass
Sorghum bicolor	Sorghum
Sorghum halepense	Johnsongrass
Spartina alterniflora	Smooth Cordgrass
Spartina cynosuroides	Big Cordgrass
Spartina patens	Marshhay Cordgrass
Spartina spartinae	Gulf Cordgrass
Sphenopholis pensylvanica	Swamp Oats
Sporobolus asper	Tall Dropseed
Sporobolus indicus	Smutgrass
Steinchisma hians	Gaping Panicum
Stenotaphrum secundatum	St. Augustine
Tridens flavus	Purpletop
Tridens strictus	Longspike Tridens
Tripsacum dactyloides	Eastern Gamagrass
Trisetum pensylvanicum	Swamp Trisetum
Triticum aestivum	Wheat
Vulpia octoflora	Sixweeks Fescue
Zea mays	Corn
Zizania aquatica	Annual Wildrice
Zizaniopsis miliacea	Giant Cutgrass

037 CYPERACEAE

Carex alata	Wingseed Sedge
Carex albolutescens	Greenish-white Sedge

Carex bromoides	Bromeline Sedge
Carex cherokeensis	Cherokee Sedge
Carex comosa	Longhair Sedge
Carex crus-corvi	Crowfoot Sedge
Carex flaccosperma	Thinfruit Sedge
Carex frankii	Frank's Sedge
Carex hyalinolepis	Thinscale Sedge
-=Carex impressa	Caric-sedge
Carex leavenworthii	Leavenworth Sedge
Carex louisianica	Louisiana Sedge
Carex lupulina	Hop Sedge
Carex oxylepis	Sharpscale Sedge
Carex retroflexa	Reflexed Sedge
Carex squarrosa	Squarrose Sedge
Carex triangularis	Anglestem Sedge
Carex tribuloides	Bristlebract Sedge
Carex vulpinoidea	Fox Sedge
Cladium jamaicensis	Jamaica Sawgrass
Cyperus articulatus	Jointed Flatsedge
Cyperus compressus	Poorland Flatsedge
Cyperus elegans	Sticky Flatsedge
Cyperus erythrorhizos	Redroot Flatsedge
Cyperus esculentus	Chufa
Cyperus ferruginescens	Rusty Flatsedge
Cyperus filicinus	Nerved Flatsedge
Cyperus flavescens	Yellow Flatsedge
Cyperus globulosus	Baldwin Flatsedge
Cyperus haspan	Sheathed Flatsedge
Cyperus iria	Ricefield Flatsedge
Cyperus odoratus	Fragrant Flatsedge
Cyperus ovularis	Globe Flatsedge
Cyperus oxylepis	Sharpscale Flatsedge
Cyperus polystachyos	Manyspiked Flatsedge
Cyperus pseudovegetus	Green Flatsedge
Cyperus rotundus	Nutgrass
Cyperus strigosus	Straw-colred Nutsedge
Cyperus tenuifolius	Thinleaved Flatsedge
Cyperus virens	Green Flatsedge
Dichromena colorata	Starrush Whitetop-Sedge
Dulichium arundinaceum	Three-way Sedge
Eleocharis albida	Saltmarsh Spikesedge
Eleocharis caribaea	Canada Spikesedge
Eleocharis cellulosa	Gulfcoast Spikesedge
Eleocharis equisetoides	Northern Jointed Spikesedge
Eleocharis montana	Mountain Spikesedge
Eleocharis obtusa	Blunt Spikesedge
Eleocharis parvula	Dwarf Spikesedge
Eleocharis quadrangulata	Squarestem Spikesedge
Eleocharis robbinisii	Robbin's Spikesedge
Eleocharis tuberculosa	Large-tubercled Spikesedge
Eleocharis vivipara	Viviparous Spikesedge
Fimbristylis annua	Weak Fimbry
Fimbristylis caroliniana	Hairy Fimbry
Fimbristylis castanea	Corm Fimbry
Fimbristylis miliacea	Globe Fimbry
Fimbristylis tomentosa	Fimbry
Fimbristylis vahlii	Vahl Fimbry

Rhynchospora caduca	Falling Beakrush
Rhynchospora corniculata	Horned Beakrush
Rhynchospora glomerata	Clustered Beakrush
Rhynchospora inexpansa	Nodding Beakrush
Scirpus americanus	American Bulrush
Scirpus atrovirens	Green Bulrush
Scirpus californicus	California Bulrush
Scirpus cyperinus	Woolgrass Bulrush
Scirpus koilolepis	Keeled Bulrush
Scirpus maritimus	Saltmarsh Bulrush
--Scirpus olneyi	Olney Bulrush
Scirpus pendulus	Reddish Bulrush
Scirpus robustus	Saltmarsh Bulrush
Scirpus validus	Softstem Bulrush
Websteria submersa	-----

038 PALMAE

Sabal minor	Dwarf Palmetto

040 ARACEAE

Arisaema dracontium	Green Dragon
Colocasia esculenta	Elephant Ear
Peltandra virginica	Arrow-Arum
Pistia stratiotes	Waterlettuce

041 LEMNACEAE

Lemna minor	Lesser Duckweed
Lemna perpusilla	Minute Duckweed
Lemna valdiviana	Pale Duckweed
Spirodela polyrhiza	Duckmeat
-=Spirodela punctata	Great Duckweed
Wolffia columbiana	Columbia Watermeal
Wolffia papulifera	Watermeal
Wolfiella floridana	Florida Mudmidget
Wolfiella gladiata	Bogmat
Wolfiella lingulata	Tongue Mudmidget
Wolfiella oblonga	Oblong Mudmidget

046 XYRIDACEAE

Xyris difformis	Southern Yellow-eyed-grass

049 BROMELIACEAE

Tillandsia usneoides	Spanish Moss

050 COMMELINACEAE

Callisia repens	----
Commelina communis	Common Dayflower
Commelina diffusa	Widow's-tears
Commelina erecta	Narrowleaf Dayflower
Commelina virginica	Virginia Dayflower
Murdannia nudiflora	Naked-stem Dewflower
Tradescantia hirsutiflora	Hairystem Spiderwort
Tradescantia occidentalis	Prairie Spiderwort
Tradescantia ohiensis	Ohio Spiderwort
Tradescantia virginiana	Virginia Spiderwort

051 PONTEDERIACEAE

Eichhornia crassipes	Water Hyacinth
Heteranthera limosa	Longleaf Mudplaintain
Heteranthera reniformis	Roundleaf Mudplaintain
Pontederia cordata	Pickerelweed
Zosterella dubia	Waterstargrass

053 JUNCACEAE

Juncus acuminatus	Taperleaf Bog-Rush
Juncus bufonius	Toad Rush
Juncus effusus	Soft Rush
Juncus interior	Inland Rush
-=Juncus macer	Soft Rush
Juncus marginatus	Shore Rush
Juncus repens	Creeping Rush
Juncus roemerianus	Black Needlerush
Juncus tenuis	Slender Rush

055 LILIACEAE

Allium bivalve	False Garlic
Allium canadense	Canada Garlic
-=Allium reticulatum	Garlic
Asparagus officinalis	Garden Asparagus
Smilax bona-nox	Saw Greenbrier
Smilax glauca	Cat Greenbrier
Smilax hispida	Bristly Greenbier
Smilax laurifolia	Laurel Greenbrier
Smilax pumila	Sarsaparillavine
Smilax rotundifolia	Common Greenbier
Smilax smallii	Small's Greenbier
Smilax walteri	Coral Greenbrier

057 AMARYLLIDACEAE

Crinum americanum	Swamp Lily
Crinum bulbispermum	Hardy Crinum
Hymenocallis caroliniana	Carolina Spiderlily
Manfreda virginica	Green Manfreda
Zephyranthes candida	Zephyr Lily

060 DIOSCOREACEAE

Dioscorea bulbifera	Wild Yam
Dioscorea villosa	Wild Yam

061 IRIDACEAE

Iris fulva	Red Flag
Iris virginica	Southern Blue Flag
Sisyrinchium angustifolium	Stout Blue-eyed Grass
Sisyrinchium atlanticum	Eastern Blue-eyed Grass
Sisyrinchium exile	Yellow Blue-eyed Grass
Sisyrinchium rosulatum	Annual Blue-eyed Grass

064 CANNACEAE

Canna flaccida	Golden Canna
Canna glauca	Louisiana Canna
Canna indica	Indian Canna
Thalia dealbata	Powdered Thalia

067 ORCHIDACEAE

Habenaria repens	Waterspider Orchid
Spiranthes cernua	Nodding Ladies Tresses
069 SAURURACEAE	
Saururus cernuus	Lizard's-tail
073 SALICACEAE	
Populus deltoides	Eastern Cottonwood
==Salix interior	Sandbar Willow
Salix exigua interior	
Salix nigra	Black Willow
074 MYRICACEAE	
Myrica cerifera	Southern Waxmyrtle
077 JUGLANDACEAE	
Carya aquatica	Bitter Pecan
Carya cordiformis	Bitternut Hickory
Carya glabra	Pignut Hickory
Carya illinoensis	Pecan
Carya myristiciformis	Nutmeg Hickory
Juglans nigra	Black Walnut
078 BETULACEAE	
Carpinus caroliniana	Ironwood
079 FAGACEAE	
Castanea pumila	Chinquapin
Quercus falcata leucophylla	Cherrybark Oak
Quercus falcata pagodaefolia	Cherrybark Oak
Quercus laurifolia	Laurel Oak
Quercus michauxii	Cow Oak
Quercus minima	Small Live Oak
Quercus nigra	Water Oak
Quercus nuttallii	Nuttall Oak
Quercus phellos	Willow Oak
Quercus stellata	Post Oak
Quercus undulata	Wavyleaf Oak
Quercus virginiana	Live Oak
080 ULMACEAE	
Celtis laevigata	Hackberry
Planera aquatica	Water Elm
Ulmus alata	Winged Elm
Ulmus americana	American Elm
Ulmus crassifolia	Cedar Elm
Ulmus rubra	Slippery Elm
081 MORACEAE	
Ficus carica	Fig
Morus alba	White Mulberry
Morus nigra	Black Mulberry
Morus rubra	Red Mulberry
082 URTICACEAE	

Boehmeria cylindrica	Boghemp
Laportea canadensis	Woodnettle
Parietaria pensylvanica	Hammerwort
Pilea pumila	Clearweed
Urtica chamaedryoides	Stinging Nettle

084 LORANTHACEAE

Phoradendron tomentosum	Mistletoe

094 POLYGONACEAE

==Antenoron virginianum Polygonum virginianum	Jumpseed
==Brunnichia ovata Brunnichia cirrhosa	Ladie's Ear-Drops
==Persicaria hydropiper Polygonum hydropiper	Water Smartweed
==Persicaria hydropiperoides Polygonum hydropiperoides	Smartweed
==Persicaria lapathifolium Polygonum lapathifolium	Smartweed
==Persicaria punctata Polygonum punctatum	Water Smartweed
Polygonum aviculare	Dooryard-weed
Polygonum persicaria	Ladie's-thumb
Polygonum sagittatum	Arrow-leaf Tearthumb
Rumex chrysocarpus	Amamastla
Rumex crispus	Curly Dock
Rumex mexicanus	Mexican Dock
Rumex paraguayensis	Dock
Rumex pulcher	Fiddle Dock
==Tovara virginiana Polygonum virginianum	Virginia Knotweed

095 CHENOPODIACEAE

Atriplex arenaria	Seabeach Orach
Atriplex patula	Fathen Saltbush
Atriplex pentandra	Saltbush
Chenopodium album	Lamb's-quarter
Chenopodium ambrosioides	Mexican Tea
Chenopodium berlandieri	Goosefoot
Chenopodium desiccatum	Thickleaf Goosefoot
Chenopodium glaucum	Goosefoot
Chenopodium murale	Lamb's-Quarter
Chenopodium standleyanum	Pigweed
Salicornia bigelovii	Bigelow Glasswort
Salicornia virginica	Woody Glasswort
Suaeda linearis	Annual Seepweed

097 AMARANTHACEAE

Alternanthera philoxeroides	Alligatorweed
Amaranthus albus	White Amaranth
Amaranthus arenicola	Sandhills Amaranth
Amaranthus hybridus	Green Amaranth
Amaranthus spinosus	Spiny Amaranth
Amaranthus viridis	Pigweed
Iresine rhizomatosa	Bloodleaf

098 NYCTAGINACEAE	
Boerhavia diffusa	Scarlet Spiderling
Boerhavia erecta	Upright Spiderling
Mirabilis jalapa	Four-O'clock
Mirabilis nyctaginea	Four-O'clock
099 BATACEAE	
Batis maritima	Maritime Saltwort
101 PHYTOLACCACEAE	
Phytolacca americana	Pokeweed
Rivina humilis	Pigeon-berry
102 AIZOACEAE	
Mollugo verticillata	Carpetweed
Sesuvium maritimum	Seaside Purslane
Sesuvium portulacastrum	Coast Purslane
Trianthema portulacastrum	Horse Purslane
103 PORTULACACEAE	
Claytonia virginica	Spring Beauty
Portulaca oleracea	Purslane
105 CARYOPHYLLACEAE	
Arenaria seryllifolia	Sandwort
Cerastium brachypodum	Shortstalk Chickweed
Cerastium glomeratum	Mouse-ear Chickweed
Cerastium semidecandrum	Mouse-ear Chickweed
Sagina decumbens	Pearlwort
Saponaria officinalis	Bouncing-Bet
Silene antirrhina	Sleepy Catchfly
Spergularia echinosperma	Bristleseed Sand-Spurry
Spergularia marina	Marine Sand-Spurry
Stellaria media	Chickweed
106 NYMPHAEACEAE	
Brasenia schreberi	Watershield
Cabomba caroliniana	Carolina Fanwort
Nelumbo lutea	American Lotus
Nuphar luteum	Spadderdock
Nuphar luteum macrophyllum	Littlehead Spadderdock
Nymphaea elegans	Blue Waterlily
Nymphaea mexicana	Yellow Waterlily
Nymphaea odorata	White Waterlily
107 CERATOPHYLLACEAE	
Ceratophyllum demersum	Coontail
==Ceratophyllum echinatum Ceratophyllum muricatum	Pimpled Hornwort
109 RANUNCULACEAE	
Clematis crispa	Blue Jasmine
Clematis ternifolia	Clematis
Clematis virginiana	Virgin's-Bower
==Delphinium ajacis	Rocket Larkspur

Consolida ambigua	
Ranunculus marginatus	Buttercup
Ranunculus muricatus	Buttercup
Ranunculus parviflorus	Small-flowered Crowfoot
Ranunculus platensis	Spearwort
Ranunculus pusillus	Low Spearwort
Ranunculus recurvatus	Hooked Crowfoot
Ranunculus sardous	Early Buttercup
Ranunculus scleratus	Cursed Buttercup
Ranunculus trilobus	Threelobed Buttercup
111 BERBERIDACEAE	
Nandina domestica	Nandina
Podophyllum peltatum	Mayapple
112 MENISPERMACEAE	
Calycocarpum lyoni	Lyon Cupseed
Cocculus carolinus	Carolina Snailseed
113 MAGNOLIACEAE	
Magnolia grandiflora	Southern Magnolia
Magnolia virginiana	Sweetbay
Schisandra coccinea	Bay Starvine
117 ANNONACEAE	
Asimina triloba	Pawpaw
121 LAURACEAE	
Cinnamomum camphora	Camphortree
Lindera benzoin	Spicebush
Persea borbonia	Red Bay
Sassafras albidum	Sassafras
123 PAPAVERACEAE	
Argemone albiflora	White Prickly Poppy
Corydalis micrantha	Scrambled Eggs
124 CRUCIFERAE	
Brassica napus	Rape
Brassica nigra	Black Mustard
Brassica oleracea	Common Kale
Cardamine hirsuta	Hairy Bittercress
Cardamine parviflora	Smallflowered Cress
Cardamine pensylvanica	Bittercress
Coronopus didymus	Swinecress
Lepidium densiflorum	Denseflower Peppergrass
Lepidium virginicum	Virginia Pepperweed
-=Palustris cernua	Marsh Yellowcress
Rorippa sessiliflora	Yellowcress
Sibara virginica	Rockcress
136 SAXIFRAGACEAE	
Itea virginica	Virginia Sweetspire
-=Penthorum sedoides	Ditch Stonecrop

142 HAMAMELIDACEAE
Liquidambar styraciflua Sweetgum

143 PLATANACEAE
Platanus occidentalis Sycamore

145 ROSACEAE
-=Crataegus intermedia Hawthorn
Crataegus marshallii Parsley Haw
Crataegus viridis Green Hawthorn
Duchesnea indica Indian Strawberry
Geum canadense White Avens
Prunus angustifolia Chickasaw Plum
Prunus caroliniana Laurel Cherry
Prunus mexicana Bigtree Plum
Prunus persica Peach
Prunus serotina Black Cherry
Prunus umbellata Flatwood Plum
Rosa laevigata Cherokee Rose
Rosa multiflora Multiflora Rose
Rubus flagellaris Northern Dewberry
Rubus louisianus Louisiana Blackberry
Rubus trivialis Southern Dewberry

147 LEGUMINOSAE
Acacia farnesiana Huisache
Acacia smallii Sweet Acacia
Aeschynomene indica Jointvetch
Albizzia julibrissin Mimosa
Amorpha fruticosa Leadplant
Amorpha laevigata Amorpha
Amphicarpa bracteata Hog Peanut
Apios americana American Potato Bean
Baptistia bracteata glabrescens Cream Wild Indigo
Baptistia bracteata laevicaulis Plains Wild Indigo
Baptistia lactea White Wild Indigo
Baptistia sphaerocarpa Round Wild Indigo
Cassia fasciculata Partridge Pea
Cassia obtusifolia Sicklepod
Cassia occidentalis Coffee Senna
Centrosema virginianum Butterfly Pea
Cercis canadensis Redbud
Clitoria mariana Pigeonwings
Crotalaria spectabilis Showy Crotalaria
Dalea candida Prairie Clover
Desmanthus illinoensis Illinois Bunchflower
Desmodium ciliare Littleleaf Tick-Clover
Desmodium illinoensis Illinois Tick-Clover
Desmodium nudiflorum Barestem Tick-Clover
Desmodium paniculatum Panicled Tick-Clover
Erythrina herbacea Coral-Bean
Galactia volubilis Downy Milk-Pea
Gleditsia aquatica Waterlocust
Gleditsia triacanthos Honey Locust
Glycine max Soybean
Lathyrus hirsutus Singletary Pea
Lespedeza cuneata Chinese Bush Clover

Lespedeza striata	Japanese Clover
Medicago arabica	Spotted Burclover
Medicago lupulina	Black Medic
Medicago polymorpha	Burclover
Melilotus alba	White Sweet Clover
Melilotus indica	Sour Clover
Melilotus officinalis	Yellow Sweet Clover
Mimosa strigillosa	Powder Puff
Neptunia lutea	Yellow-Puff
Neptunia pubescens	Tropical Neptunia
Parkinsonnia aculeata	Jerusalem Thorn
Pueraria lobata	Kudzu
Rhynchosia minima	Snoutbean
Robinia pseudoacacia	Black Locust
Schrankia hystericina	Sensative Brier
Sesbania drummondii	Rattlebush
==Sesbania macrocarpa Sesbania exaltata	Coffeebean
Sesbania vesicaria	Bagpod Coffeebean
Strophostyles helvola	Trailing Wild Bean
Strophostyles umbellata	Pink Wild Bean
Tephrosia onobrychoides	Hoary Pea
Trifolium campestre	Big Hop-clover
Trifolium dubium	Least Hop-clover
Trifolium reflexum	Buffalo Clover
Trifolium repens	White Clover
Trifolium resupinatum	Persian Clover
Vicia ludoviciana	Deerpea
Vigna lutea	Deerpea
Wisteria floribunda	Wisteria
Wisteria macrostachya	Kentucky Wisteria
Wisteria sinense	Chinese Wisteria

149 GERANIACEAE

==Geranium carolinianum Geranium sphaerospermum	Cranesbill
Geranium dissectum	Dissected Cranesbill

150 OXALIDACEAE

Oxalis corniculata	Creeping Ladies'-Sorrel
Oxalis florida	Wood-Sorrel
Oxalis rubra	Shamrock Sorrel
Oxalis stricta	Yellow Wood-Sorrel
Oxalis violacea	Violet Wood-Sorrel

155 ZYGOPHYLLACEAE

Tribulus terrestris	Punctureweed

157 RUTACEAE

Citrus reticulata	Satsuma Orange
==Citrus trifoliata Poncirus trifoliata	Trifoliate Orange
Ptelea trifoliata	Common Hoptree
Zanthoxylum clava-hervulis	Prickly Ash

160 MELIACEAE

Melia azedarach	Chinaberry Tree

165 POLYGALACEAE

Polygala incarnata	Pink Milkwort
Polygala leptocaulis	Swamp Milkwort
Polygala verticillata	Whorled Milkwort

167 EUPHORBIACEAE

Acalypha ostryifolia	Three-seeded Mercury
Acalypha rhomboidea	Three-seeded Mercury
Acalypha virginica	Three-seeded Mercury
Caperonia palustris	Caperonia
Croton capitatus	Wooly Croton
Croton glandulosa	Goat Croton
Croton monanthagynus	Croton
Euphorbia corollata	Flowering Spurge
Euphorbia dentata	Spurge
Euphorbia heterophylla	Summer Poinsetta
Euphorbia hirta	Spurge
Euphorbia maculata	Spotted Spurge
Euphorbia nutans	Eyebane
Euphorbia prostrata	Spurge
Euphorbia spathulata	Spurge
Phyllanthus caroliniensis	Leaf-flower
Phyllanthus urinaria	Leaf-flower
Sapium sebiferum	Chinese Tallowtree

168 CALLITRICHACEAE

Callitriche heterophylla	Larger Water-Starwort
==Callitriche terrestris	Terrestrial Water-Starwort
Callitriche deflexa austinii	

173 ANACARDIACEAE

Rhus copallinum	Winged Sumac
Rhus glabra	Smooth Sumac
Toxicodendron radicans	Poison Ivy

177 AQUIFOLIACEAE

Ilex cassine	Dahoon
Ilex decidua	Deciduous Holly
Ilex opaca	American Holly
Ilex vomitoria	Yaupon Holly

183 ACERACEAE

Acer negundo	Box Elder
Acer rubrum drummondii	Drummond's Red Maple
Acer rubrum	Red Maple

184 HIPPOCASTANACEAE

Aesculus pavia	Red Buckeye

185 SAPINDACEAE

Cardiospermum halicacabum	Balloonvine

188 BALSAMINACEAE

Impatiens capensis	Touch-Me-Not
189 RHAMNACEAE	
Berchemia scandens	Rattanvine
Rhamnus caroliniana	Carolina Buckthorn
190 VITACEAE	
Ampelopsis arborea	Peppervine
Ampelopsis cordata	Heartleaf Peppervine
Cissus incisa	Marinevine
Parthenocissus quinquefolia	Virginia Creeper
Vitis aestivalis	Summer Grape
Vitis cinerea	Gray Grape
Vitis labrusca	Fox Grape
Vitis mustangensis	Mustang Grape
Vitis palmata	Red Grape
Vitis rotundifolia	Muscadine
194 TILIACEAE	
Tilia caroliniana	Carolina Basswood
195 MALVACEAE	
Abutilon hulseamum	Butterprint
Abutilon theophrasti	Velvetleaf Butterprint
==Hibiscus esculentus Abelmoschus esculentus	Okra
Hibiscus moscheutos lasiocarpus	Wooly Rose-Mallow
==Hibiscus militaris Hibiscus laevis	Halberd-leaved Rose-Mallow
Hibiscus syriacus	Rose-of-Sharon
Kosteletzkya virginica	Virginia Saltmarsh-Mallow
Malva parviflora	---
Malvastrum coromandelianum	False Mallow
Malvaviscus arboreus	Wax Mallow
Modiola caroliniana	Carolina Mallow
Sida rhombifolia	Teaweed
Sida spinosa	Prickly Teaweed
198 STERCULIACEAE	
Melochia corchorifolia	Chocolate-Weed
207 GUTTIFERAE	
Ascyrum hypericoides	St. Andrew's Cross
Ascyrum stans	St. Peter's Wort
Hypericum densiflorum	Shrubby St. John's Wort
Hypericum drummondii	Nits-and-Lice
Hypericum gymnanthum	Clasping-leaved St.John's Wort
Hypericum mutilum	Dwarf St. John's Wort
==Hypericum walteri Triadenum walteri	Marsh St. John's Wort
211 TAMARICACEAE	
Tamarix gallica	Salt Cedar
213 CISTACEAE	
==Lechea mucronata Lechea villosa	Pinweed

218 VIOLACEAE	
Viola langloisii	Violet
==Viola rafinesquii	Field Pansy
Viola bicolor	
223 PASSIFLORACEAE	
==Passiflora incarnata	Maypop
Passiflora edulis	
Passiflora lutea	Passionflower
230 CACTACEAE	
Opuntia stricta	Prickly Pear
236 LYTHRACEAE	
Ammannia coccinea	Toothcup
Cuphea carthagenensis	Tarweed Cuphea
Cuphea glutinosa	Waxweed
Cuphea viscosissima	Blue Waxweed
Decodon verticillatus	Water-Willow
Lagerstroemia indica	Crepe-myrtle
Lythrum alatum	Winged Loosestrife
Lythrum lineare	Linear-leaved Loosestrife
Rotala ramosior	Toothcup
244 MELASTOMATACEAE	
Rhexia mariana	Maryland Meadow-Beauty
245 ONAGRACEAE	
Gaura lindheimeri	White Gaura
Gaura longiflora	Bigflower Gaura
Gaura parviflora	Velvetleaf Gaura
Ludwigia alternifolia	Seedbox
Ludwigia decurrens	Primrose-Willow
Ludwigia glandulosa	Cylindric-fruited Ludwigia
Ludwigia leptocarpa	Water-Primrose
Ludwigia linearis	Narrowleaf Water-Primrose
Ludwigia palustris	Marsh Purslane
Ludwigia peploides	Water-Primrose
Ludwigia repens	Red Ludwigia
Ludwigia uruguayensis	Primrose
Oenothera biennis	Common Evening Primrose
Oenothera laciniata	Cut-leaved Evening Primrose
Oenothera speciosa	Showy Primrose
247 HALORRHAGIDACEAE	
Myriophyllum brasiliense	Parrotfeather
Myriophyllum heterophyllum	Variable Watermilfoil
Myriophyllum spicatum	Eurasian Watermilfoil
Proserpinaca palustris	Marsh Mermaidweed
250 ARALIACEAE	
Aralia spinosa	Devil's Walkingstick
251 UMBELLIFERAE	
==Apium leptophyllum	Marsh Parsley
Ciclospermum leptophyllum	
Centella asiatica	Spadeleaf

Chaerophyllum tainturieri	Wild Chervil
Cicuta mexicana	Mexican Water Hemlock
Daucus carota	Queen Anne's Lace
Eryngium prostratum	Button Eryngo
Eryngium yuccifolium	Rattlesnakemaster
Hydrocotyle bonariensis	Large-leafPennywort
Hydrocotyle ranunculoides	Floating Pennywort
Hydrocotyle umbellata	Umbrella Pennywort
Hydrocotyle verticillata	Water Pennywort
Lilaeopsis attenuata	Carolina Lilaeopsis
Limnosciadium pumilum	Dog-Sunshade
Ptilimnium costatum	Ribbed Mock Bishopweed
Sanicula canadensis	Black Snakeroot
Sium suave	Waterparsnip
Spermolepis echinata	Prickly Scaleseed
Trepocarpus aethusae	Trepocarpus
252 CORNACEAE	
Cornus drummondii	Roughleaf Dogwood
Cornus florida	Flowering Dogwood
Cornus foemina	Swamp Dogwood
Nyssa aquatica	Tupelo Gum
Nyssa sylvatica	Black Gum
261 PRIMULACEAE	
Centunculus minimus	Chaffweed
Hottonia inflata	Featherfoil
Samolus parviflorus	Water-Pimpernel
263 SAPOTACEAE	
Bumelia lanuginosa	False Buckthorn
264 EBENACEAE	
Diospyros virginiana	Persimmon
265 STYRACACEAE	
Styrax americana	Small Snowbell
267 OLEACEAE	
Forestiera acuminata	Swamp Privit
Fraxinus caroliniana	Carolina Ash
Fraxinus pennsylvanica	Green Ash
==Fraxinus tomentosa	Pumpkin Ash
Fraxinus profunda	
Ligustrum japonicum	Japanese Privit
Ligustrum ovalifolium	Bigleaf Privit
Ligustrum sinense	Chinese Privit
Ligustrum vulgare	Privit
269 LOGANIACEAE	
Cynoctonum mitreola	Miterwort
Cynoctonum sessilifolium	Wand Hornpod
Gelsemium sempervirens	Yellow Jasmine
Polypremum procumbens	Juniperleaf
270 GENTIANACEAE	
Eustoma exaltatum	Catch-fly Gentian

Sabatia calycina	Coast Rose-Gentain
Sabatia campestris	Prairie Rose-Gentain
Sabatia gentianoides	Gentain-like Sabatia
Sabatia stellaris	Little Sea-Pink

271 APOCYNACEAE

Amsonia glaberrima	Blue Star
Amsonia rigida	Blue Star
Amsonia tabernaemontana	Willow Amsonia
Apocynum cannabinum	Indian Hemp
Trachelospermum difforme	Climbing Dogbane

272 ASCLEPIADACEAE

Asclepias perennis	Aquatic Milkweed
Asclepias rubra	Red Milkweed
Asclepias viridis	Antelope-Horn
Matelea decipiens	Climbing Milkweed
Matelea gonocarpa	Trailing Spring Rod

273 CONVOVULACEAE

Cuscuta gronovii	Gronovius Dodder
Cuscuta indecora	Showy Dodder
Dichondra carolinensis	Pony's-foot
Ipomoea coccinea	Scarlet Morning-glory
Ipomoea lacunosa	Small White Morning-glory
Ipomoea quamoclit	Cypressvine Morning-glory
Ipomoea sagittata	Marsh Morning-glory
Ipomoea trichocarpa	Coastal Morning-glory
Ipomoea wrightii	Morning-glory
Jacquemontia tamnifolia	Tievine

274 POLEMONIACEAE

Phlox pilosa	Downy Phlox

275 HYDROPHYLLACEAE

Hydrolea ovata	Hydrolea
Hydrolea uniflora	Waterleaf
==Nemophila triloba	Baby Blue-eyes
Nemophila aphylla	
Phacelia strictiflora	---

276 BORAGINACEAE

Heliotropium amplexicaule	Heliotrope
Heliotropium curvassicum	Seaside Heliotrope
Heliotropium europaeum	European Heliotrope
Heliotropium indicum	Indian Turnsole
Heliotropium procumbens	Fourspike Heliotrope
Lithospermum carolinense	Carolina Gromwell
Myosotis macrosperma	White Forget-Me-Not
Myosotis verna	Spring Forget-Me-Not
Onosmodium molle hispidissimum	Hairy False Gromwell

277 VERBENACEAE

Callicarpa americana	French Mulberry
Clerodendron indicum	---
Lantana camara	West Indian Lantana

Lantana horrida	Texas Lantana
Lantana montevidensis	Lantana
Phyla lanceolata	Northern Frogfruit
Phyla nodiflora	Common Frogfruit
Verbena bonariensis	South American Vervain
Verbena brasiliensis	Brazilian Vervain
Verbena canadensis	Rose Vervain
Verbena halei	Texas Vervain
Verbena rigida	Tuber Vervain
Verbena scabra	Sandpaper Vervain
Verbena urticifolia	White Vervain
Verbena xutha	Gulf Vervain
Verbena x. hybrida	Vervain
Vitex agnus-castus	Chaste-Tree

278 LABIATAE

Ajuga reptans	Bugleweed
-=Clinopodium gracile	Clinopodium
Hedeoma hispidum	Rough Pennyroyal
Hyptis alata	Cluster Bushmint
Lamium amplexicaule	Henbit
-=Leonotis cardiaca	Lion's-Ears
-=Leonotis sibiricus	Lion's-Ears
Lycopus americanus	American Bugleweed
Lycopus rubellus	Stalked Water-Hoarhound
Lycopus virginicus	Virginia Bugleweed
Mentha rotundifolia	Applemint
Monarda punctata	Spotted Beebalm
Perilla frutescens	Beefsteakplant
Prunella vulgaris	Heal-All
Pycnanthemum albescens	White-leaved Mountain-Mint
Pycnanthemum tenuifolium	Slender Mountain-Mint
Salvia coccinea	Scarlet Sage
Salvia lyrata	Lyreleaf Sage
Satureja brownei	---
Scutellaria drummondii	Skullcap
Scutellaria integrifolia	Hyssop Skullcap
Scutellaria ovata	Heart-leaved Skullcap
Scutellaria parvula	Skullcap
Stachys agraria	Shade Betany
Stachys drummondii	Drummond Betany
Stachys floridana	Florida Betany
Stachys tenuifolia	Smooth Hedgenettle
Teucrium canadense	American Geremander
Teucrium cubense	Geremander

280 SOLANACEAE

Lycium carolinianum	Carolina Wolfberry
Lycopersicon esculentum	Tomato
Nicotiana longiflora	---
Physalis anqulata	Cutleaf Groundcherry
Physalis angustifolia	Groundcherry
Physalis cordata	Groundcherry
Physalis virginiana	Virginia Groundcherry
Solanum americanum	Nightshade
Solanum carolinense	Horsenettle
Solanum elaeagnifolium	Silverleaf Nightshade

Solanum nigrum	Black Nightshade
Solanum pseudocapsicum	Jerusalem-Cherry
Solanum ptycanthum	Jerusalem-Cherry
281 SCROPHULARIACEAE	
Bacopa caroliniana	Blue Water-Hyssop
Bacopa monnieri	Coast Bacopa
Bacopa rotundifolia	Disc Water-Hyssop
Buchnera americana	American Bluehearts
Gratiola neglecta	Hedge Hyssop
Gratiola virginiana	Hedge Hyssop
-=Limnophila indica	Limnophila
Linaria canadensis	Oldfield Toadflax
Lindernia anagallidea	False Pimpernel
Mazus japonicus	Japanese Mazus
-=Mazus pumilus	Mazus
Mecardonia acuminata	Purple Mecardonia
Mecardonia dianthera	Mecardonia
Micranthemum umbrosum	Sahde Mudflower
Mimulus alatus	Sharp-winged Monkeyflower
Penstemon tenuis	Beard-Tongue
Scrophularia marilandica	---
Verbascum thapsus	Common Mullein
Veronica agrestis	Speedwell
Veronica arvensis	Corn Speedwell
Veronica peregrina	Purslane Speedwell
Veronica persica	Persian Speedwell
282 BIGNONIACEAE	
Bignonia capreolata	Crossvine
Campsis radicans	Trumpetcreeper
Catalpa bignonioides	Southern Catalpa
288 LENTIBULARIACEAE	
Utricularia cornuta	Horned Bladderwort
Utricularia gibba	Humped Bladderwort
Utricularia inflata	Floating Bladderwort
Utricularia radiata	Little Floating Bladderwort
290 ACANTHACEAE	
Hygrophila lacustris	Lake Acanthus
==Justicia lanceolata Justicia ovata lanceolata	Lanceleaf Water-Willow
Ruellia caroliniensis	Wild Petunia
Ruellia humilis	Prairie Petunia
Ruellia nudiflora	Violet Wild-Petunia
292 PHRYMACEAE	
Phryma leptostachya	Lopseed
293 PLANTAGINACEAE	
Plantago lanceolata	English Plantain
Plantago major	Common Plaintain
Plantago rhodosperma	Red-Seed Plaintain
Plantago rugelii	Rugel's Plaintain
Plantago virginica	Pale-seeded Plaintain

294 RUBIACEAE	
Cephalanthus occidentalis	Buttonbush
Diodia teres	Poor Joe
Diodia virginiana	Buttonweed
Galium circaezans	Wild Licorice
Galium pilosum	Hairy Bedstraw
==Hedyotis australis Houstonia pusilla	Bluets
==Hedyotis crassifolia Houstonia minima	Small Bluets
Oldenlandia fasciculata	---
Sherardia arvensis	Field Madder
Spermococe glabra	Smooth Buttonweed
295 CAPRIFOLIACEAE	
Lonicera japonica	Japanese Honeysuckle
Sambucus canadensis	Elderberry
Viburnum dentatum	Southern Arrowwood
297 VALERIANACEAE	
Valerianella radiata	Corn Salad
299 CUCURBITACEAE	
Cucumis melo	Dudaim Melon
Cayaponia quinqueloba	Manso
Melothria pendula	Melonettee
Sicyos angulatus	One-seeded Bur-Cucumber
300 CAMPANULACEAE	
Lobelia cardinalis	Cardinalflower
Lobelia puberula	Downy Lobelia
Lobelia spicata	Palespike Lobelia
Sphenoclea zeylanica	Chickenspike
Triodanis biflora	Venus' Looking-glass
Triodanis perfoliata	Venus' Looking-glass
304 COMPOSITAE	
Achillea millefolium	Common Yarrow
-=Acmella oppositifolia	Creeping Spotflower
Ageratina rothrockii	White Snakeroot
Ambrosia artemisiifolia	Common Ragweed
Ambrosia psilostachya	Western Ragweed
Ambrosia trifida	Giant Ragweed
Amphiachyris dracunculoides	Annual Broomweed
Anthemis cotula	Dogfennel
Arnoglossum plantigineum	Tuberous Indian Plantain
Aster cordifolius	Heartleaf Aster
Aster drummondii	Drummond Aster
Aster dumosus	Bushy Aster
==Aster exilis Aster subulatus ligulatus	Aster
-=Aster fragilis	Fragile Aster
Aster lateriflorus	White Woodland Aster
Aster nebraskensis	Nebraska Aster
Aster ontarionis	Ontario Aster
Aster pilosus	Frost Aster

Aster praealtus	Aster
Aster puniceus	Purple-stemmed Aster
Aster spinosus	Devilweed Aster
Aster subulatus	Slim Aster
Aster tenuifolius	Saline Aster
Baccharis halimifolia	Salt Bush
Bidens pilosa	Beggarticks
Boltonia diffusa	Boltonia
Borrichia frutescens	Bushy Sea-oxeye
Calyptocarpus vialis	Prostrate Lawnflower
Chromolaena ivifolia	Boneset
Cirsium horridulum	Bull Thistle
Conoclinium coelestinum	Mist Flower
Conyza bonariensis	Horseweed
Conyza canadensis	Horseweed
Coreopsis tinctoria	Garden Tickseed
Cosmos bipinnatus	Spanish Needles
Dracopis amplexicaulis	Clasping Coneflower
Echinacea purpurea	Purple Coneflower
Eclipta alba	Yerba del Tago
Elephantopus carolinianus	Leafy Elephant's Foot
Elephantopus tomentosus	Devil's Grandmother
Erechtites hieraciifolia	Fireweed
Erigeron philadelphicus	Philadelphia Fleabane
Erigeron strigosus	Whitetop Fleabane
Erigeron tenuis	Blue Fleabane
Eupatorium capillifolium	Cypressweed
Eupatorium compositifolium	Yankeeweed
Eupatorium pinnatifidum	Boneset
==Eupatorium rugosum Ageratina altissima	White Snakeroot
Eupatorium serotinum	Late-Flowering Boneset
Euthamia leptocephala	Flat-Topped Goldenrod
Facelis retusa	Facelis
Fleischmannia incarnata	Pink Boneset
Gaillardia aestivalis	Winkler Gaillardia
Gaillardia pulchella	Indian Blanket
Gamochaeta calviceps	Cudweed
Gamochaeta pennsylvanicum	Wandering Cudweed
Gamochaeta purpurea	Purple Cudweed
Gnaphalium obtusifolium	Rabbit Tobacco
Helenium amarum	Bitterweed
Helenium flexuosum	Purple-headed Sneezeweed
Helianthus angustifolius	Narrowleaf Sunflower
Helianthus mollis	Ashy Sunflower
Helianthus simulans	Sunflower
Heterotheca subaxillaris	Golden Aster
Hypochaeris microcephala	Cat's-Ears
Iva annua	Sumpweed
Iva frutescens	Big-leaf Sumpweed
Iva imbricata	Dune Sumpweed
Krigia dandelion	Potato Dandelion
Lactuca canadensis	Lettuce
Lactuca floridana	Woodland Lettuce
Lactuca hirsuta	Hairy Lettuce
Liatris aspera	Rough Gayfeather
Liatris pycnostachya	Kansas Gayfeather

Machaeranthera phyllocephola	Camphor Daisy
Mikania cordifolia	Climbing Hempweed
Mikania scandens	Climbing Hempweed
Parthenium hysterophorus	Santa Maria Feverfew
Pluchea camphorata	Camphorweed
Pluchea foetida	Stinking Fleabane
Pluchea odorata	Saltmarsh Fleabane
Pluchea rosea	Stinkweed
Pyrrhopappus carolinianus	False Dandelion
Rudbeckia grandifolia	Rough Coneflower
Rudbeckia hirta pulcherrima	Late Brown-eyed Susan
Rudbeckia nitida	Texas Brown-eyed Susan
Rudbeckia triloba	Yellow Daisy
Senecio glabellus	Butterweed
Senecio imparipinnatus	Threadleaf Groundsel
Silphium gracile	Slender Rosinweed
Silphium integrifolium	Rosinweed
Silphium laciniatum	Compassplant
-=Silphium radula	Rosinweed
Smallanthus uvedalia	Bear's-Foot
Solidago altissima	Tall Goldenrod
Solidago canadensis	Goldenrod
Solidago sempervirens	Seaside Goldenrod
Soliva mutisii	Button Burweed
Soliva pterosperma	Stickerweed
Sonchus asper	Sow Thistle
Sonchus oleraceus	Sow Thistle
Spilanthes americana	American Spotflower
Taraxacum officianle	Dandelion
Verbesina alternifolia	Wingstem Crownbeard
Verbesina helianthoides	Gravelweed Crownbeard
Verbesina virginica	Frostweed
Vernonia baldwinii	Baldwin Ironweed
Vernonia gigantea	Tall Ironweed
Vernonia missurica	Missouri Ironweed
Vernonia texana	Texas Ironweed
Xanthium strumarium	Cocklebur
Youngia japonica	Oriental Hawkbeard

==Changed: Vol. 2 - Synonymy

-=Not listed in Vol. 2 - Synonymy

--OK as is Vol. 2 - Synonymy

APPENDIX B

LIST OF FISH AND WILDLIFE SPECIES IN VERMILION PARISH

Fish and wildlife species that could occur in Vermilion Parish, Louisiana are provided in taxonomic order. These listings were derived from information obtained from the U.S. Fish and Wildlife Service, Louisiana Department of Wildlife and Fisheries - Natural Heritage Program, and the National Audubon Society's Paul J. Rainey Refuge. In addition, the bird list includes observations from the Crowley Christmas Bird Count conducted from 1989 to 2004.

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MARINE INVERTEBRATES WITHIN VERMILION PARISH, LOUISIANA

Common Name	Scientific Name
Portuguese man-of-war	Physalia physalis
Sea nettle	Chrysaora quinquecirrha
Cabbagehead jellyfish	Stomolophus meleagris
Phosphorus jellyfish	Mnemiopsis mccradyi
Blood worm	Glycera americana
Periscope tube worm	Oiopatra cuprea
Oyster blister worm	Polydora websteri
Marsh periwinkle	Lettorina irrorata
Common mud snail	Nassarius vibex
White slipper shell	Crepidula plana
Atlantic slipper shell	Crepidula fornicata
Common marsh snail	Melampus bidentatus
Southern oyster drill	Thais haemostoma
Ribbed mussel	Geukensea demissa
Hooked mussel	Ishadium recurvum
Eastern oyster	Crassostrea virginica
Road shell clam	Rangia cuneata
Small macoma	Macoma mitchelli
Constricted macoma	Macoma constricta
Stout razor clam	Tagelus plebeis
Southern quahog	Mercenaria campechiensis
Bean clam	Donax variabillis
Squid	Loligo pealei
Acorn barnacles	Chelonibia spp.
Speckled crab	Arenaeus cribrarius
Blue crab	Callinectes sapidus
Blue crab	Callinectes similis
Flat mud crab	Eurypanoplus depressus
Stone crab	Menippe mercenaria
Common mud crab	Panopeus herbstii
Harris mud crab	Rithropanopeus harrisii
Red-jointed fiddler crab	Uca minax
Sand fiddler	Uca picgillator
Mud fiddler	Uca pugnax
-	Uca rapax
-	Uca spinicarpa
Wharf crab	Sesarma cinereum
Purple marsh crab	Sesarma reticulatum
Shore crab	Pachygrapsus gracilis
-	Pachygrapsus transversus
-	Petrolisthes armatus
-	Porcellana sigsbeiana
Mussel crab	Pinnotheres maculatus
Oyster crab	Pinnotheres ostreum
Spider crab	Libinia dubia
Striped hermit crab	Clibanarius vittatus
-	Isocheles wurdemanni
Long-armed hermit crab	Pagurus longicarpus
White River crayfish	Procambarus acutus

Marine Invertebrates (continued)

Common Name	Scientific Name
Red Swamp crayfish	Procambarus clarkii
Flat-browed mud shrimp	Upogebia affinis
Brown shrimp	Penaeus aztecus
White shrimp	Penaeus setiferus
Pink shrimp	Penaeus duorarum
Sea bob	Xiphopeneus kroyeri
-	Solenocerinae spp.
-	Acetes americanus
Freshwater shrimp	Macrobrachium ohione
Freshwater shrimp	Macrobrachium acanthurus
Grass shrimp	Palaemonetes pugio
Grass shrimp	Palaemonetes vulgaris
Big-clawed snapping shrimp	Alpheus heterochaelis
Mantis shrimp	Squilla empusa
Wood-boring isopod	Limnoria tripunctata
Rock louse	Ligia exotica
-	Bopyrissa wolffi
Smooth-backed sphaeroma	Sphaeroma quadridentatum
Fish louse	Cymothous sp.
Wharf roach	Ligia sp.
Beach flea	Orchestia grillus
-	Gammarus mucronatus
Marsh hopper	Talorchestia sp.

FISH OBSERVED WITHIN VERMILION PARISH, LA

Common Name	Scientific Name
Atlantic stingray	Dasyatis sabina
Spotted gar	Lepisosteus oculatus
Longnose gar	Lepisosteus osseus
Alligator gar	Atractosteus spatula
Bowfin	Amia calva
Ladyfish	Elops saurus
American eel	Anguilla rostrata
Speckled worm eel	Myrophis punctatus
Shrimp eel	Ophichthus gomesi
Skipjack herring	Alosa chrysochloris
Gulf menhaden	Brevoortia patronus
Gizzard shad	Dorosoma cepedianum
Threadfin shad	Dorosoma petenense
Scaled sardines	Harengula jaguana
Atlantic thread herring	Opisthonema oglinum
Striped anchovy	Anchoa hepsetus
Bay anchovy	Anchoa mitchilli
Largescale lizardfish	Saurida brasiliensis
Inshore lizardfish	Synodus foetens
Common carp	Cyprinus carpio
Golden shiner	Notemigonus crysoleucas
Bigmouth buffalo	Ictiobus cyprinellus
Blue catfish	Ictalurus furcatus
Black bullhead	Ictalurus melas

Fish (continued)

Common Name	Scientific Name
Yellow bullhead	Ictalurus natalis
Channel catfish	Ictalurus punctatus
Hardhead catfish	Ariopsis felis
Gafftopsail catfish	Bagre marinus
Pirate perch	Aphredoderus sayanus
Gulf toadfish	Opsanus beta
Atlantic midshipman	Porichthys plectrodon
Skilletfish	Gobiesox strumosus
Southern hake	Urophycis floridana
Bearded brotula	Brotula barbata
Bank cusk-eel	Ophidion holbrooki
Atlantic needlefish	Strongylura marina
Diamond killifish	Adinia xenica
Sheepshead minnow	Cyprinodon variegatus
Golden topminnow	Fundulus chrysotus
Gulf killifish	Fundulus grandis
Saltmarsh topminnow	Fundulus jenkinsi
Starhead topminnow	Fundulus blairae
Bayou killifish	Fundulus pulvereus
Longnose killifish	Fundulus similis
Rainwater killifish	Lucania parva
Mosquitofish	Gambusia affinis
Least killifish	Heterandria formosa
Sailfin molly	Poecilia latipinna
Brook silversides	Labidesthes sicculus
Rough silversides	Membras martinica
Inland silversides	Menidia beryllina
Dusky pipefish	Syngnathus floridae
Chain pipefish	Syngnathus louisianae
Gulf pipefish	Syngnathus scovelli
Lined seahorse	Hippocampus erectus
Striped bass	Morone saxatilis
White bass	Morone chrysops
Yellow bass	Morone mississippiensis
Flier	Centrarchus macropterus
Banded pygmy sunfish	Elassoma zonatum
Warmouth	Lepomis gulosus
Bluegill	Lepomis macrochirus
Redear sunfish	Lepomis punctatus
Bantam sunfish	Lepomis symmetricus
Largemouth bass	Micropterus salmoides
White crappie	Pomoxis annularis
Black crappie	Pomoxis nigromaculatus
Bluefish	Pomatomus saltatrix
Cobia	Rachycentron canadum
Crevalle jack	Caranx hippos
Atlantic bumper	Chloroscombrus chrysurus
Bluntnose jack	Hemicaranx amblyrhynchus
Leatherjack	Oligoplites saurus
Atlantic moonfish	Selene setapinnis
Lookdown	Selene vomer
Florida pompano	Trachinotus carolinus

Fish (continued)

Common Name	Scientific Name
Bigeye scad	Selar crumenophthalmus
Gray snapper	Lutjanus griseus
Tripletail	Lobotes surinamensis
Spotfin mojarra	Eucinostomus argenteus
Mottled mojarra	Eucinostomus lefroyi
Pigfish	Orthopristis chrysoptera
Sheepshead	Archosargus probatocephalus
Pinfish	Lagondon rhomboides
Freshwater drum	Aplodinotus grunniens
Silver perch	Bairdiella chrysoura
Sand seatrout	Cynoscion arenarius
Spotted seatrout	Cynoscion nebulosus
Silver seatrout	Cynoscion nothus
Banded drum	Larimus fasciatus
Spot	Leiostomus xanthurus
Southern kingfish	Menticirrhus americanus
Atlantic croaker	Micropogonias undulatus
Black drum	Pogonias cromis
Red drum	Sciaenops ocellatus
Star drum	Stellifer lanceolatus
Atlantic spadefish	Chaetodipterus faber
Striped mullet	Mugil cephalus
White mullet	Mugil curema
Guaguanche	Sphyraena guachancho
Atlantic threadfin	Polyactylus octonemus
Southern stargazer	Astroscopus y-graecum
Striped blenny	Chasmodes boquianus
Freckled blenny	Hypsoblennius ionthas
Fat sleeper	Dormitator maculatus
Emerald sleeper	Erotelis smargdus
Spinycheek sleeper	Eleotris pisonis
Lyre goby	Evorthodus lyricus
Violet goby	Gobioides broussoneti
Darter goby	Gobionellus boleosoma
Sharptail goby	Gobionellus shufeldti
Freshwater goby	Gobionellus shufeldti
Naked goby	Gobiosoma bosci
Code goby	Gobiosoma robustum
Clown goby	Microbius gulosus
Green goby	Microbius thalassinus
Pink wormfish	Microgobius longipinnis
Atlantic cutlassfish	Trichiurus lepturus
Spanish mackerel	Scomberomorus maculatus
Harvestfish	Peprilus alepidotus
Gulf butterfish	Peprilus burti
Bighead searobin	Prionotus tribulus
Ocellated flounder	Ancylopsetta quadrocellata
Bay whiff	Citharichthys spilopterus
Fringe flounder	Etropus crossotus
Gulf flounder	Paralichthys albigutta
Southern flounder	Paralichthys lethostigma
Lined sole	Achirus lineatus

Fish (continued)

Common Name	Scientific Name
Hogchoker	Trinectes maculatus
Blackcheek tonguefish	Symphurus plagiusa
Pygmy filefish	Monacanthus setifer
Southern puffer	Sphoeroides nephelus
Least puffer	Sphoeroides parvus

AMPHIBIANS WITHIN VERMILION PARISH, LA

Common Name	Scientific Name
Western lesser siren	Siren intermedia
Central newt	Notophthalmus viridescens
Gulf coast toad	Bufo valliceps
Northern cricket frog	Acris crepitans
Green treefrog	Hyla cinerea
Spring peeper	Hyla crucifer
Squirrel treefrog	Hyla squirella
Eastern narrow-mouthed toad	Gastrophryne carolinensis
Bullfrog	Rana catesbeiana
Green frog	Rana clamitans
Southern leopard frog	Rana sphenocephala

REPTILES WITHIN VERMILION PARISH, LA

Common Name	Scientific Name
American alligator	Alligator mississippiensis
Green anole	Anolis carolinensis
Six-lined racerunner	Cnemidophorus sexlineatus
Five-lined skink	Eumeces fasciatus
Broad-headed skink	Eumeces laticeps
Ground skink	Scincella lateralis
Common snapping turtle	Chelydra serpentina
Common slider	Trachemys scripta
Stinkpot	Sternotherus odoratus
Common mud turtle	Kinosternon subrubrum
Salt marsh snake	Nerodia clarkii
Green water snake	Nerodia cyclopion
Plainbelly water snake	Nerodia erythrogaster
Southern water snake	Nerodia fasciata
Diamondback water snake	Nerodia rhombifera
Brown snake	Storeria dekayi
Rough earth snake	Virginia striatula
Rough green snake	Opheodrys aestivus
Western ribbon snake	Thamnophis proximus
Eastern garter snake	Thamnophis sirtalis
Glossy crayfish snake	Regina rigida
Graham's crayfish snake	Regina grahamii
Eastern hognose snake	Heterdon platyrhinos
Mud snake	Farancia abacura
Blue racer	Coluber constrictor
Corn snake	Elaphe guttata
Rat snake	Elaphe obsoleta
Common kingsnake	Lampropeltis getulus
Copperhead	Agkistrodon contortrix

Cottonmouth	Agkistrodon piscivorus
Timber rattlesnake	Crotalus horridus
Pygmy rattlesnake	Sistrurus miliarius

BIRDS WITHIN VERMILION PARISH, LA

Common Name	Scientific Name
Common Loon	Gavia immer
Pied-billed Grebe	Podilymbus podiceps
Horned Grebe	Podiceps auritus
Red-necked Grebe	Podiceps grisegena
Eared Grebe	Podiceps nigricollis
Western Grebe	Aechmophorus occidentalis
Northern Gannet	Morus bassanus
American White Pelican	Pelecanus erythrorhynchos
Brown Pelican	Pelecanus occidentalis
Double-crested Cormorant	Phalacrocorax auritus
Neotropic Cormorant	Phalacrocorax brasilianus
Anhinga	Anhinga anhinga
Magnificent Frigatebird	Fregata magnificens
American Bittern	Botaurus lentiginosus
Least Bittern	Ixobrychus exilis
Great Blue Heron	Ardea herodias
Great Egret	Casmerodius albus
Snowy Egret	Egretta thula
Little Blue Heron	Egretta caerulea
Tricolored Heron	Egretta tricolor
Reddish Egret	Egretta rufescens
Cattle Egret	Bubulcus ibis
Green-backed Heron	Butorides striatus
Black-crowned Night-Heron	Nycticorax nycticorax
Yellow-crowned Night-Heron	Nyctanassa violaceus
White Ibis	Eudocimus albus
Glossy Ibis	Plegadis falcinellus
White-faced Ibis	Plegadis chihi
Roseate Spoonbill	Ajaia ajaja
Wood Stork	Mycteria americana
Fulvous Whistling-Duck	Dendrocygna bicolor
Black-bellied Whistling-Duck	Dendrocygna autumnalis
Greater White-fronted Goose	Anser albifrons
Snow Goose	Chen caerulescens
Ross' Goose	Chen rossii
Canada Goose	Branta canadensis
Wood Duck	Aix sponsa
Green-winged Teal	Anas crecca
American Black Duck	Anas rubripes
Mottled Duck	Anas fulvigula
Mallard	Anas platyrhynchos
Northern Pintail	Anas acuta
Blue-winged Teal	Anas discors
Cinnamon Teal	Anas cyanoptera
Northern Shoveler	Anas clypeata
Gadwall	Anas strepera
American Wigeon	Anas americana
Canvasback	Aythya valisineria

Birds (continued)

Common Name	Scientific Name
Redhead	Aythya americana
Ring-necked Duck	Aythya collaris
Greater Scaup	Aythya marila
Lesser Scaup	Aythya affinis
Oldsquaw	Clangula hyemalis
Black Scoter	Melanitta nigra
Surf Scoter	Melanitta perspicillata
White-winged Scoter	Melanitta fusca
Common Goldeneye	Bucephala clangula
Bufflehead	Bucephala albeola
Hooded Merganser	Lophodytes cucullatus
Common Merganser	Mergus merganser
Red-breasted Merganser	Mergus serrator
Ruddy Duck	Oxyura jamaicensis
Black Vulture	Coragyps atratus
Turkey Vulture	Cathartes aura
Osprey	Pandion haliaetus
Mississippi Kite	Ictinia mississippiensis
Northern Harrier	Circus cyaneus
Sharp-shinned Hawk	Accipiter striatus
Cooper's Hawk	Accipiter cooperii
Red-shouldered Hawk	Buteo lineatus
Broad-winged Hawk	Buteo platypterus
Swainson's Hawk	Buteo swainsoni
Red-tailed Hawk	Buteo jamaicensis
Ferruginous Hawk	Buteo regalis
Rough-legged Hawk	Buteo lagopus
Golden Eagle	Aquila chrysaetos
American Kestrel	Falco sparverius
Merlin	Falco columbarius
Peregrine Falcon	Falco peregrinus
Wild Turkey	Meleagris gallopavo
Northern Bobwhite	Colinus virginianus
Yellow Rail	Coturnicops noveboracensis
Black Rail	Laterallus jamaicensis
Clapper Rail	Rallus longirostris
King Rail	Rallus elegans
Virginia Rail	Rallus limicola
Sora	Porzana carolina
Purple Gallinule	Porphyrula martinica
Common Moorhen	Gallinula chloropus
American Coot	Fulica americana
Sandhill Crane	Grus canadensis
Black-bellied Plover	Pluvialis squatarola
Lesser Golden-Plover	Pluvialis dominica
Snowy Plover	Charadrius alexandrinus
Wilson's Plover	Charadrius wilsonia
Semipalmated Plover	Charadrius semipalmatus
Piping Plover	Charadrius melodus
Killdeer	Charadrius vociferus
American Oystercatcher	Haematopus palliatus
Black-necked Stilt	Himantopus mexicanus

Birds (continued)

Common Name	Scientific Name
American Avocet	Recurvirostra americana
Greater Yellowlegs	Tringa melanoleuca
Lesser Yellowlegs	Tringa flavipes
Solitary Sandpiper	Tringa solitaria
Willet	Catoptrophorus semipalmated
Spotted Sandpiper	Actitis macularia
Upland Sandpiper	Bartramia longicauda
Whimbrel	Numenius phaeopus
Long-billed Curlew	Numenius americanus
Marbled Godwit	Limosa fedoa
Ruddy Turnstone	Arenaria interpres
Red Knot	Calidris canutus
Sanderling	Calidris alba
Semipalmated Sandpiper	Calidris pusilla
Western Sandpiper	Calidris mauri
Least Sandpiper	Calidris minutilla
White-rumped Sandpiper	Calidris fuscicollis
Pectoral Sandpiper	Calidris melanotos
Purple Sandpiper	Calidris maritima
Dunlin	Calidris alpina
Stilt Sandpiper	Calidris himantopus
Short-billed Dowitcher	Limnodromus griseus
Long-billed Dowitcher	Limnodromus scolopaceus
Common Snipe	Gallinago gallinago
American Woodcock	Scolopax minor
Wilson's Phalarope	Phalaropus tricolor
Red-necked Phalarope	Phalaropus lobatus
Pomarine Jaeger	Stercorarius pomarinus
Parasitic Jaeger	Stercorarius parasiticus
Laughing Gull	Larus atricilla
Franklin's Gull	Larus pipixcan
Bonaparte's Gull	Larus philadelphia
Ring-billed Gull	Larus delawarensis
Herring Gull	Larus argentatus
Lesser Black-backed Gull	Larus fuscus
Glaucous Gull	Larus hyperboreus
Great Black-backed Gull	Larus marinus
Black-legged Kittiwake	Rissa tridactyla
Gull-billed Tern	Sterna nilotica
Caspian Tern	Sterna caspia
Royal Tern	Sterna maxima
Sandwich Tern	Sterna sandvicensis
Common Tern	Sterna hirundo
Forster's Tern	Sterna forsteri
Least Tern	Sterna antillarum
Black Tern	Chlidonias niger
Black Skimmer	Rynchops niger
Rock Dove	Columba livia
White-winged Dove	Zenaida asiatica
Mourning Dove	Zenaida macroura
Inca Dove	Columbina inca
Common Ground-Dove	Columbia passerina

Birds (continued)

Common Name	Scientific Name
Black-billed Cuckoo	Coccyzus erythropthalmus
Yellow-billed Cuckoo	Coccyzus americanus
Groove-billed Ani	Crotophaga sulcirostris
Barn-Owl	Tyto alba
Eastern Screech-Owl	Otus asio
Great Horned Owl	Bubo virginianus
Burrowing Owl	Athene cunicularia
Barred Owl	Strix varia
Long-eared Owl	Asio otus
Short-eared Owl	Asio flammeus
Northern Saw-whet Owl	Aegolius acadicus
Common Nighthawk	Chordeiles minor
Chuck-will's-willow	Caprimulgus carolinensis
Whip-poor-will	Caprimulgus vociferus
Chimney Swift	Chaetura pelagica
Ruby-throated Hummingbird	Archilochus colubris
Black-chinned Hummingbird	Archilochus alexandri
Rufous Hummingbird	Selasphorus rufus
Belted Kingfisher	Ceryle alcyon
Red-headed Woodpecker	Melanerpes erythrocephalus
Red-bellied Woodpecker	Melanerpes carolinus
Yellow-bellied Sapsucker	Sphyrapicus varius
Downy Woodpecker	Picoides pubescens
Hairy Woodpecker	Picoides villosus
Northern Flicker	Colaptes auratus
Pileated Woodpecker	Dryocopus pileatus
Olive-sided Flycatcher	Contopus borealis
Eastern Wood-Pewee	Contopus virens
Acadian Flycatcher	Empidonax virescens
Least Flycatcher	Empidonax minimus
Eastern Phoebe	Sayornis phoebe
Vermilion Flycatcher	Pyrocephalus rubinus
Ash-throated Flycatcher	Myiarchus cinerascens
Great Crested Flycatcher	Myiarchus crinitus
Eastern Kingbird	Tyrannus tyrannus
Horned Lark	Eremophila alpestris
Purple Martin	Progne subis
Tree Swallow	Tachycineta bicolor
Northern Rough-winged Swallow	Stelgidopteryx serripennis
Bank Swallow	Riparia riparia
Cliff Swallow	Hirundo pyrrhonota
Barn Swallow	Hirundo rustica
Blue Jay	Cyanocitta cristata
American Crow	Corvus brachyrhynchos
Fish Crow	Corvus ossifragus
Carolina Chickadee	Parus carolinensis
Tufted Titmouse	Parus bicolor
Red-breasted Nuthatch	Sitta canadensis
Brown Creeper	Certhia americana
Carolina Wren	Thryothorus ludovicianus
Bewick's Wren	Thryomanes bewickii
House Wren	Troglodytes aedon
Winter Wren	Troglodytes troglodytes
Sedge Wren	Cistothorus platensis

Marsh Wren	Cistothorus palustris
Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
Blue-gray Gnatcatcher	Polioptila caerulea

Birds (continued)

Common Name	Scientific Name
Eastern Bluebird	Sialia sialis
Veery	Catharus fuscescens
Gray-cheeked Thrush	Catharus minimus
Swainson's Thrush	Catharus ustulatus
Hermit Thrush	Catharus guttatus
Wood Thrush	Hylocichla mustelina
American Robin	Turdus migratorius
Gray Catbird	Dumetella carolinensis
Northern Mockingbird	Mimus polyglottos
Brown Thrasher	Toxostoma rufum
Water Pipit	Anthus spinoletta
Sprague's Pipit	Anthus spragueii
Cedar Waxwing	Bombycilla cedrorum
Loggerhead Shrike	Lanius ludovicianus
European Starling	Sturnus vulgaris
White-eyed Vireo	Vireo griseus
Bell's Vireo	Vireo bellii
Solitary Vireo	Vireo solitarius
Yellow-throated Vireo	Vireo flavifrons
Warbling Vireo	Vireo gilvus
Philadelphia Vireo	Vireo philadelphicus
Red-eyed Vireo	Vireo olivaceus
Blue-winged Warbler	Vermivora pinus
Golden-winged Warbler	Vermivora chrysoptera
Tennessee Warbler	Vermivora peregrina
Orange-crowned Warbler	Vermivora celata
Nashville Warbler	Vermivora ruficapilla
Virginia's Warbler	Vermivora virginiae
Northern Parula	Parula americana
Yellow Warbler	Dendroica petechia
Chestnut-sided Warbler	Dendroica pensylvanica
Magnolia Warbler	Dendroica magnolia
Cape May Warbler	Dendroica tigrina
Black-throated Blue Warbler	Dendroica caerulescens
Yellow-rumped Warbler	Dendroica coronata
Black-throated Gray Warbler	Dendroica nigrescens
Townsend's Warbler	Dendroica townsendi
Black-throated Green Warbler	Dendroica virens
Blackburnian Warbler	Dendroica fusca
Yellow-throated Warbler	Dendroica dominica
Pine Warbler	Dendroica pinus
Prairie Warbler	Dendroica discolor
Palm Warbler	Dendroica palmarum
Bay-breasted Warbler	Dendroica castanea
Blackpoll Warbler	Dendroica striata
Cerulean Warbler	Dendroica cerulea
Black-and-white Warbler	Mniotilta varia
American Redstart	Setophaga ruticilla
Prothonotary Warbler	Protonotaria citrea
Worm-eating Warbler	Helmitheros vermivorus
Swainson's Warbler	Limnothlypis swainsonii

Ovenbird	Seiurus aurocapillus
Northern Waterthrush	Seiurus noveboracensis
Louisiana Waterthrush	Seiurus motacilla
Kentucky Warbler	Oporornis formosus

Birds (continued)

Common Name	Scientific Name
Mourning Warbler	Oporornis philadelphia
MacGillivray's Warbler	Oporornis tolmiei
Common Yellowthroat	Geothlypis trichas
Hooded Warbler	Wilsonia citrina
Wilson's Warbler	Wilsonia pusilla
Canada Warbler	Wilsonia canadensis
Yellow-breasted Chat	Icteria virens
Summer Tanager	Piranga rubra
Scarlet Tanager	Piranga olivacea
Western Tanager	Piranga ludoviciana
Northern Cardinal	Cardinalis cardinalis
Rose-breasted Grosbeak	heucticus ludovicianus
Blue Bunting	Cyanocompsa parellina
Blue Grosbeak	Guiraca caerulea
Indigo Bunting	Passerina cyanea
Painted Bunting	Passerina ciris
Dickcissel	piza americana
Green-tailed Towhee	Pipilo chlorurus
Rufous-sided Towhee	Pipilo erythrophthalmus
Chipping Sparrow	Spizella passerina
Clay-colored Sparrow	Spizella pallida
Field Sparrow	Spizella pusilla
Vesper Sparrow	Pooecetes gramineus
Lark Sparrow	Chondestes grammacus
Savannah Sparrow	Passerculus sandwichensis
Grasshopper Sparrow	Ammodramus savannarum
Henslow's Sparrow	Ammodramus henslowii
LeConte's Sparrow	Ammodramus leconteii
Saltmarsh Sharp-tailed Sparrow	Ammodramus caudacutus
Nelson's Sharp-tailed Sparrow	Ammodramus nelsoni
Seaside Sparrow	Ammodramus maritimus
Fox Sparrow	Passerella iliaca
Song Sparrow	Melospiza melodia
Lincoln's Sparrow	Melospiza lincolnii
Swamp Sparrow	Melospiza georgiana
White-throated Sparrow	Zonotrichia albicollis
White-crowned Sparrow	Zonotrichia leucophrys
Dark-eyed Junco	Junco hyemalis
Lapland Longspur	Calcarius lapponicus
Red-winged Blackbird	Agelaius phoeniceus
Eastern Meadowlark	Sturnella magna
Western Meadowlark	Sturnella neglecta
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Rusty Blackbird	Euphagus carolinus
Brewer's Blackbird	Euphagus cyanocephalus
Great-tailed Grackle	Quiscalus mexicanus
Boat-tailed Grackle	Quiscalus major
Common Grackle	Quiscalus quiscalus
Bronzed Cowbird	Molothrus aeneus
Brown-headed Cowbird	Molothrus ater
Orchard Oriole	Icterus spurius

Baltimore Oriole	Icterus galbula
Bullock's Oriole	Icterus bullocki
Purple Finch	Carpodacus purpureus
House Finch	Carpodacus mexicanus

Birds (continued)

Common Name	Scientific Name
Pine Siskin	Carduelis pinus
American Goldfinch	Carduelis tristis
House Sparrow	Passer domesticus

MAMMALS WITHIN VERMILION PARISH, LA

Common Name	Scientific Name
Virginia opossum	Didelphis virginiana
Short-tailed shrew	Blarina brevicauda
Least shrew	Cryptotis parva
Eastern mole	Scalopus aquaticus
Red bat	Lasiurus borealis
Hoary bat	Lasiurus cinereus
Northern yellow bat	Lasiurus intermedius
Seminole bat	Lasiurus seminolus
Southeastern myotis	Myotis austroriparius
Evening bat	Nycticeius humeralis
Rafinesque's big-eared bat	Plecotus rafinesquii
Nine-banded armadillo	Dasypus novemcinctus
Swamp rabbit	Sylvilagus aquaticus
Eastern cottontail	Sylvilagus floridanus
Gray squirrel	Sciurus carolinensis
Fox squirrel	Sciurus niger
Marsh rice rat	Oryzomys palustris
Fulvous harvest mouse	Reithrodontomys fulvescens
White-footed mouse	Peromyscus leucopus
Cotton mouse	Peromyscus gossypinus
Hispid cotton rat	Sigmodon hispidus
Eastern wood rat	Neotoma floridana
Muskrat	Ondatra zibethicus
House mouse	Mus musculus
Black rat	Rattus rattus
Norway rat	Rattus norvegicus
Nutria	Myocaster coypus
Coyote	Canis latrans
Gray fox	Urocyon cinereoargenteus
Red fox	Vulpes vulpes
American black bear	Ursus americanus
Northern Raccoon	Procyon lotor
Long-tailed weasel	Mustela frenata
Mink	Mustela vison
Striped skunk	Mephitis mephitis
Nearctic River otter	Lutra canadensis
Bobcat	Lynx felis

APPENDIX B

Agricultural Producers and Homeowners Questionnaire

Coulee Baton Microwatershed
Improving Water Quality in North-Central Vermilion Parish
Agricultural Producer Questionnaire

Name: _____

Name of Farming Operation: _____

Address: _____

Address 2: _____

City/St/Zip: _____

Phone: _____

E-mail: _____

1. Are you a: (Circle one)

    1. Farmer
    2. Homeowner
    3. Both

2. Which best describes the legal structure of your farm. (Circle one)

    1. Family or individual operation
    2. Partnership (including family partners other than spouse or pre-adult children)
    3. Incorporated under state law
    4. Don't know

3. How many years have you been a farmer/farm manager?

    _____ Years

4. How long have you farmed in the state of Louisiana?

    _____ Years

5. In which parish is your farm operation or majority of your farm operations located?

    _____ (name of parish)

6. Do you live on the farm? (Circle one)
    1. Yes
    2. No

7. Which product or commodity would you say produced the most gross sales on your operation in 2005? (Please circle all that apply)
    1. Rice
    2. Sugarcane
    3. Soybeans
    4. Beef Cattle
    5. Crawfish
    6. Other _____

8. How many total acres were in your operation in 2005, including all owned and rented land? Also include all locations and land uses (cropland, pasture and idle.)

_____ acres

9. Have you ever heard about Best Management Practices to address water quality? (Circle one)

1. Yes
2. No

10. Have you implemented Best Management Practices on your operation? (Circle one)

1. Yes
2. No

11. If yes, when did you first start implementing Best Management Practices on your operation? (Circle one)

1. 2004
2. 2003
3. 2002
4. 2001
5. 2000
6. 1999
7. 1998
8. 1997
9. Before 1997

12. What types of Best Management Practices have you adopted or are you planning to adopt on your operation? (Please circle all that apply)

1. Nutrient Management (soil testing, timing nitrogen applications)
2. Erosion Control (buffer strips, residue management)
3. Weed and pest control (pesticide storage shed)
4. Conservation Buffers
5. Conservation Tillage
6. Irrigation Water Management
7. Wellhead Protection/Groundwater Pollution Prevention
8. Other, please list: _____

13. Are you interested in participating in the Coulee Baton Microwatershed initiative?

1. Yes
2. No

14. Please provide us with suggestions for programs or components that would be useful in the Coulee Baton Microwatershed initiative.

_____

_____

_____

_____

Coulee Baton Microwatershed
Improving Water Quality in North-Central Vemilion Parish
Homeowner Questionnaire

Name: _____

Name of Farming Operation: _____

Address: _____

Address 2: _____

City/St/Zip: _____

Phone: _____

E-mail: _____

1. Are you a: (Circle one)

    1. Farmer
    2. Homeowner
    3. Both

2. If you are a homeowner, would you be interested in learning about proper irrigation techniques for your lawn and landscape?

    1. Yes
    2. No

3. If you are a homeowner, would you be interested in learning about recycling of yard clippings and creating compost with yard debris?

    1. Yes
    2. No

4. If you are a homeowner, would you be interested in learning about how to ensure that your lawn and landscape does not contain invasive plants such as Chinese tallow?

    1. Yes
    2. No

5. If you are a homeowner, would you be interested in learning about planting vines, shrubs, and trees to provide cover, nesting areas or food sources for birds, butterflies and other wildlife?

    1. Yes
    2. No

6. If you are a homeowner, would you be intested in learning about environmentally safe pesticide and fertilization techniques for your lawn and landscape?

    1. Yes
    2. No

7. If you are a homeowner, would you be interested in learning about techniques to utilize stormwater and rainwater to irrigate plants and use for other home benefits?

    1. Yes
    2. No

8. If you are a homeowner, would you be interested in learning about techniques to maintain and operate your home septic system?

    1. Yes
    2. No

9. If yes, what type of septic system do you own?

    _____

10. If yes, would you be interested in installing a new septic system?

    1. Yes
    2. No

11. Are you interested in participating in the Coulee Baton Microwatershed initiative?

    1. Yes
    2. No

12. Please provide us with suggestions for programs or components that would be useful in the Coulee Baton Microwatershed initiative.

_____

_____

_____

_____

_____

_____

Survey Questionnaire from Coulee Baton 'Microwatershed' Outreach Meeting, January 25, 2006

First	Last	Farming Operation	Address	City	State	Zip	Phone	E-mail	Meeting Attended	Farmer	Homeowner	Structure of Farm	Years Farming	Years in LA	Parish Farm	Live on Farm?	Gross Sale Commodity	Total Acres	Heard about BMP	Implemented BMP	Year of BMP
Therese	LaBry		112 N. Hebert Ave.	Kaplan	LA	70548	337-643-7044		Coulee Baton		Yes	Don't Know			Vermilion	No	Rice,Sugarcane				
Leona	Breaux		8838 Miller Road	Kaplan	LA	70548	337-643-8322		Coulee Baton		Yes										
Wilmes	Breaux		8838 Miller Road	Kaplan	LA	70548	337-643-8322		Coulee Baton		Yes										
Ethel	Stutes		8618 Miller Road	Kaplan	LA	70548	337-643-2721		Coulee Baton		Yes										
Shelvin	Stutes		8616 Miller Road	Kaplan	LA	70548	337-643-2721		Coulee Baton		Yes										
Ester	McNabb		8605 Miller Road	Kaplan	LA	70548	337-643-3016		Coulee Baton		Yes										
Walter	Vincent		102 Robert Drive	Lafayette	LA	70506	337-234-3073		Coulee Baton												
John	Simon	Cattle Farmer	15426 Mire Road	Kaplan	LA	70548	337-643-1606		Coulee Baton	Yes	Yes	Family/Individual	35	35	Vermilion	No	Beef Cattle, Hay	98	Yes	Yes	Before '97
Dudley	Duhon		16626 La Hwy 696	Kaplan	LA	70548	337-643-8694		Coulee Baton		Yes										
Ronnie	Hartman		12712 Pioneer Road	Kaplan	LA	70548	337-643-7053		Coulee Baton												
Jimmie	Meaux Sr.	Cross Circle J.	9716 Odilon Road	Kaplan	LA	70548	337-643-8904		Coulee Baton	Yes	Yes	Family/Partnership	50	50	Vermilion	Yes	Beef Cattle	350	Yes	Yes	Before '97
Jim J.	Meaux Jr.		9614 Odilon Road	Kaplan	LA	70548	337-643-6106	jmeaux@kaplantel.net	Coulee Baton		Yes										
Howard	Cormier		1105 West Port	Abbeville	LA	70510	898-4335														
Johnie	Broussard	Double Five Meadows LLC	10027 LA Hwy 695	Kaplan	LA	70548	337-643-8009	wrbrous@yahoo.com	Coulee Baton	Yes	Yes	Partnership	22	22	Vermilion	Yes	Beef Cattle	275	No	No	
Wanda	Broussard																				
Rita	Guillory	Shanae	10138 Odilon Road	Kaplan	LA	70548	337-478-5429	rrguillory@yahoo.com	Coulee Baton	Yes	Yes	Family/Individual	4	4		Yes-Part time	Beef Cattle				
Changyoon	Jeong						337-482-6486														
Joseph	Pillette		804 N. East St.	Abbeville	LA	70510	337-898-3327		Coulee Baton		Yes										
Michael	Morgan		9716 Odilon Road	Kaplan	LA	70548	337-523-1929		Coulee Baton		Yes										
Randy	Trahan		8829 Miller Road	Kaplan	LA	70548	337-643-1576		Coulee Baton		Yes										
Agency Personnel																					
Durga D.	Poudel							ddpoudel@louisiana.edu													
John James	Clark							john.j.clark@la.gov													
Vicky Granger	Toups																				
Colette	Anzalone							colette@louisiana.edu													
Hubert	Faulk																				
Max	Forbes							max.forbes@la.gov													
Raris	Menard		12620 Hwy 695	Kaplan	LA	70548	337-643-8502		Coulee Baton	Yes	Yes	Family/Individual	47	47	Vermilion	Yes	Rice, Crawfish				
Will	Husband	Cattle	8232 Alpha Road	Abbeville	LA	70510	337-523-9812	will.husband@la.usda.gov	Coulee Baton	Yes	Yes	Family/Individual	16	16	Vermilion	Yes	Beef Cattle	50	Yes	Yes	Before 1997
Larry	Thibodeaux							larry.thibodeaux@la.usda.gov													
Ernest	Girouard							girouard@kaplantel.net													
Bruce	Lehto							bruce.lehto@la.usda.gov													
Pamela	Monceaux							pamela.monceaux@la.nacdnet.net													
Bart	Devillier							bart.devillier@la.usda.gov													
Justin	Meaux							justinmeaux@la.nacdnet.net													
Kyle	Soileau							ksoileau@ldaf.state.la.us													
Roy	Bailey																				
Pat	Hebert																				
Dexter	Sapp							dexter.sapp@la.usda.gov													
Kelia	Fontenot							kelia.fontenot@la.gov													
Britt	Paul							britt.paul@la.usda.gov													
Wendall	Meaux							wendall.meaux@la.usda.gov													
Carrie	Mendoza							cmendoza@agcenter.lsu.edu													
Brian	Naquin							binaquin@agcenter.lsu.edu													
Buster	Griffin																				

		Learn About	Learn About	Learn About	Learn About	Learn About	Learn About	Learn about				
Adopted BMP	Initiative?	Proper Irrigation Techniques?	Recycling Yard Clippings?	Invasive Plants?	plant covers?	Pesticide?	Utilizing storm water?	septic system?	Type of Septic System	Install New Septic?	Initiative?	Suggestions
		Yes	Yes	Yes	Yes							
			Yes		Yes							
		Yes	Yes		Yes							
		Yes	No	Yes	No	Yes	Yes	No		Yes	Yes	
		Yes	No	Yes	No	Yes	Yes	Yes		No	Yes	
		Yes	Yes	Yes	No	Yes	Yes	No		No	Yes	
Nutrient Management, Erosion Control, Irrigation Water Management, Wellhead Protection	Yes	No	No	Yes	No	Yes	Yes	Yes	New	No	Yes	Drain the land, Clean Coulee Baton, install right size bridge and pipes, keep it clean
Nutrient Management, Erosion Control, Weed and Pest Control	Yes											Get as many farmers as can. Get public official to get involved..
		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Double Tank	Yes	Yes	
Nutrient Management, Erosion Control, Weed control, buffers, Irrigation, Weelhead Protection	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Mechanical	No	Yes	
		Yes	Yes	Yes	Yes							
								yes	56,000 GPD Extended Acration System	Yes	Yes	
		No	Yes	Yes	Yes							
			No	Yes	No							
Nutrient Management, Weed/Pest Control	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	

APPENDIX C

Coulee Baton Microwatershed Non-point Source Pollution Monitoring and Modeling Plan

I. Cover Sheet

Project Title: The Coulee Baton Microwatershed Nonpoint Source Pollution Monitoring and Modeling Project

Name of Grant: FFY 2006 Section 319(h)

Project Funding Period: January 2007 – December 2009

Project Area: The Coulee Baton Microwatershed is in LDEQ's mapping subsegment number LA-050702, described in the waterbody description of GIWW from the Mermentau River to the Leland Bowman Locks. There are numerous small canals and streams that are connected to either Grand Lake or the GIWW, particularly between the Mermentau River and Leland Bowman Locks. The Coulee Baton Microwatershed is one of the major landscapes that drain into the subsegment number LA-050702. TMDL's have been completed for subsegment number LA-050702. Suspected causes include organic enrichment/low DO, oil and grease, suspended solids, turbidity, pesticides, nutrients, and mercury.

Sponsoring Cooperator:

University of Louisiana at Lafayette
Department of Renewable Resources
P.O. Box 44650
Lafayette, Louisiana 70504

Durga D. Poudel
337-482-6163 Office
337-482-5395 Fax
ddpoudel@louisiana.edu
Federal Tax Id: 72-6000820

Date Submitted: May 18, 2006

II. Executive Summary

This proposal is to request funds to generate surface water quality data from at least five locations in the Coulee Baton Microwatershed, and to identify "hot spots" for nonpoint source pollution in the Coulee Baton Microwatershed using modeling three-year runoff water quality data generated from Vermilion-Teche water quality monitoring project. The LSU AgCenter is going to provide flow meters, samplers, batteries, and other accessories for field instrumentation of five locations for surface water quality monitoring.

Since 2001, the University of Louisiana at Lafayette (ULL) was involved in surface water quality monitoring in a nearby area of Coulee Baton Microwatershed in Vermilion-Teche River Basin, Louisiana. We monitored TSS, BOD_5, NO_2/NO_3,-N, SRP, pH, TP, and TN in surface runoff water from sugarcane fields, pasture lands and rural residential areas, and fecal coliform from pasture lands, with and without Best Management Practices (BMPs). All six sites were fully instrumented with Flowmeters (4250 and 3230 models) and automated ISCO samplers (6700 model) powered by 12V batteries and 20V solar panels. Four sites had culverts and AV probes while two sites had 18" flumes and bubbler gauges. All instruments were safe and secured in boxes, and fences were built for two pasture sites. Each site was equipped with a standard rain gauge. Water quality samplings were done for the most rain events and hydrographs were generated for each site from September 2002 to August 2004. As compared to the control sugarcane site, the BMP sugarcane site showed a reduction of 43%, 70%, and 68% in TSS, TN and TP annual loading, respectively. Similarly, the TSS and TN loading rates in BMP pasture site were lower by 81% and 36%, respectively, compared to the control pasture site. Total P in BMP pasture site, however, was higher by 9% compared to the control pasture site. These results clearly indicate the effectiveness of BMPs in controlling nonpoint source pollution.

The TSS, TN and TP loading rates for BMP residential site were higher by 12%, 33%, and 14%, respectively, compared to the control residential site. These higher nutrient loading rates for BMP residential site may be attributed to lawn fertilization, leaves, grass biomass, etc. Since no BMPs are developed for residential areas, and it is obvious that a significant amount of nutrient load comes from residential sites, efforts should be made to understand more about the nutrient loadings from residential areas.

Along with a good scientific literature review, the 3-year runoff water quality dataset from Vermilion-Teche water quality monitoring project will allow modeling to assess water quality status in the Coulee Baton Microwatershed, and more accurate quantification of the contribution of landuse types to nonpoint source pollution. Through water quality modeling, we will identify "hot spots" for nonpoint source pollution in the Coulee Baton Microwatershed where the Vermilion Soil and Water Conservation District will work with private landowners so that implementation of BMPs can begin using the voluntary conservation cost share programs available. LSU AgCenter, through its Master Farmer Program can then install samplers for edge-of-field monitoring and BMPs impact assessment on nonpoint source pollution control on these areas. Also, the LSU AgCenter will educate residents and producers on BMPs.

III. General Description of Watershed

The Coulee Baton Microwatershed, which is located in the north-central Vermilion Parish in lower Mermentau Basin of Louisiana (Fig. 1), contains approximately 6,200 acres mainly in agriculture production. Rice production (2,176 acres), sugarcane production (1,398 acres), pasture land (1,312 acres), idle land (595 acres), and miscellaneous (11 acres), are the major landuse types in the watershed. There is crawfish production in 537 acres, orchard (15 acres), subdivision (19 acres), homestead (17 acres), and hay production on 120 acres (unused pasture) as well. Irrigation land leveling, managed field borders for sugarcane, grade stabilization structures, fencing, water well; pipeline, heavy use area protection, and watering facility; and underground irrigation pipeline are some of the BMPs installed in rice, sugarcane or livestock production in the watershed. Crowley silt loam, Mowata silt loam, and Patoutville silt loam are the major soil series found in the microwatershed. Crowley silt loam is somewhat poorly drained soils and has a loamy surface layer and clayey subsoil. Mowata silt loam is poorly drained soil and is found on broad, slightly concave flats and along drainage ways on the Gulf Coast Prairies. It also has a loamy surface layer and clayey subsoil. Patoutville silt loam (Pa) is found in nearly level areas and is somewhat poorly drained soil, while Patoutville silt loam (Pb) is found in very gently sloping, somewhat poorly drained soil in the uplands. The Patoutville silt loam series (Pb) which formed in loess is loamy throughout.

The Vermilion Soil and Water Conservation District (SWCD) became interested in a microwatershed project after attending an Industry-Led Solutions (ILS) meeting in New Orleans in August 2004. This was a meeting of agricultural industry leaders to discuss hypoxia in the Gulf of Mexico and the role of agriculture to help resolve the problem. Following the meeting, the Vermilion SWCD contacted the Texas Institute for Applied Environmental Research (TiAER) who has developed an approach known as the Planned Intervention Microwatershed Approach (PIMA) which is a new model for addressing agricultural nonpoint source pollution. TiAER defines a microwatershed as an area within a watershed, incorporating anywhere from 3,000 to 20,000 acres, with identifiable hydrologic boundaries. According to TiAER, by dealing with small areas, project coordinators can reduce landuse variables and more readily identify pollutant load contributors.

The Vermilion SWCD partnered with other entities in the region to find a microwatershed that was diverse in topography, drainage, and landuse. The Coulee Baton Microwatershed was selected. This proposal is a part of the larger-scale Coulee Baton Microwatershed Plan for voluntary application of various conservation measures and Best Management Practices (BMPs) on the land by landowners and homeowners in addressing the water quality problems in the Coulee Baton Microwatershed area.

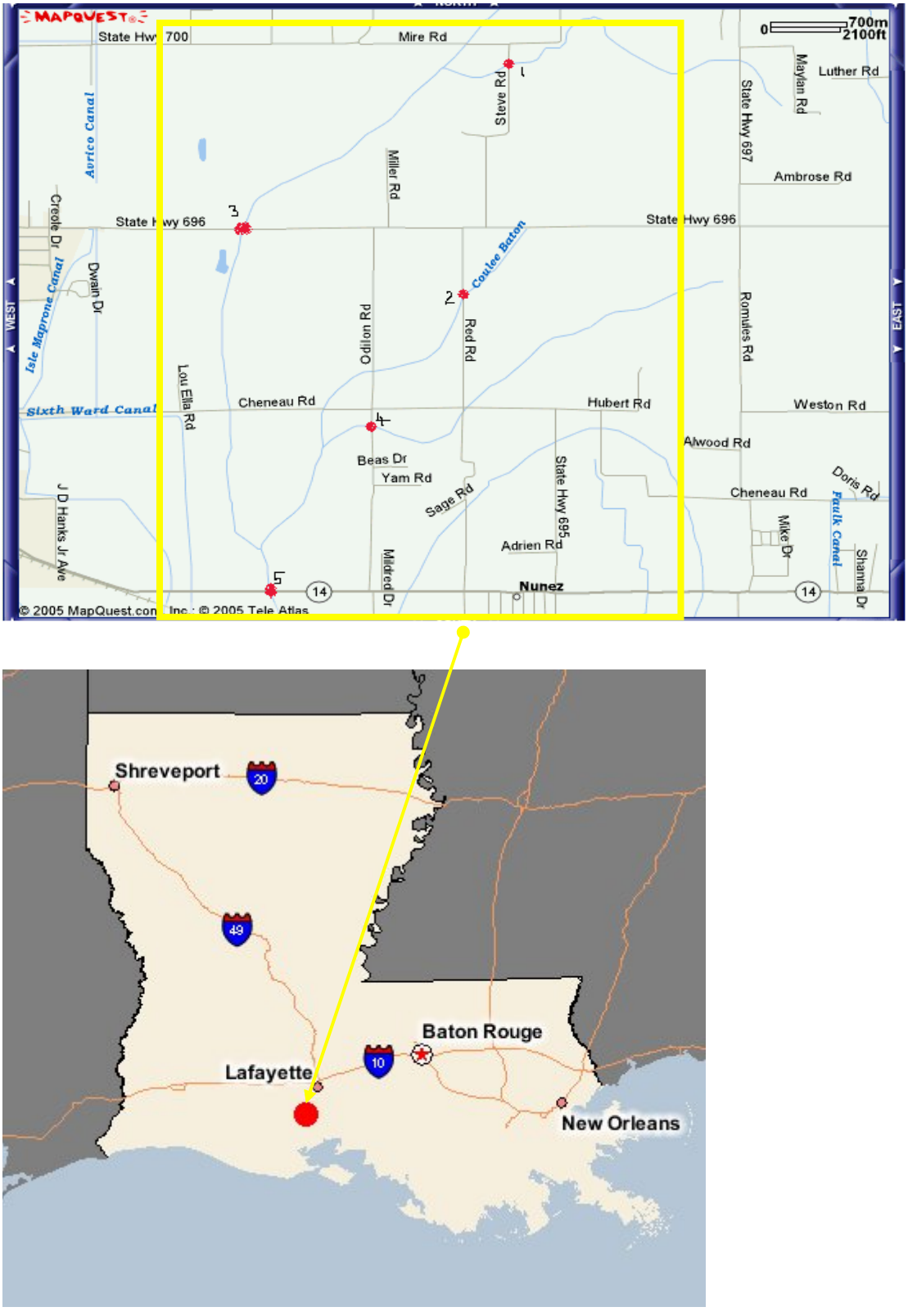


Figure 1. Location of the Coulee Baton Microwatershed area, Vermilion Parish, Louisiana.

IV. Project Goal and Objectives

Goal: The goal of this project is to address nonpoint source pollution in the Coulee Baton Microwatershed where various conservation measures and BMPs will be applied by landowners and homeowners.

The specific objectives:

- Monitor field (dissolved oxygen, pH, electrical conductivity, turbidity, and temperature) and laboratory (total Kjeldahl nitrogen, total phosphorus, nitrate, sulfate, chloride, fluoride, bromide, nitrite, ortho phophorus, total suspended solids, 5-day biochemical oxygen demand, ammonia, fecals, heterotrophic bacteria, pesticides, total sugar, and water soluble sugar) surface water quality parameters for Coulee Baton Microwatershed. Pesticides and sugars will be determined only for select rain events.

- Quantify the contribution of landuse types such as agriculture, forestry, and residential areas on nonpoint source pollution (e.g. TSS, TN, TP, and BOD_5) in Coulee Baton Microwatershed, through modeling of water quality data from recently completed Vermilion-Teche Water Quality Monitoring Project. A good literature search will be done to see if the values that we have for the local work are consistent with the similar work done in other areas, even though our conditions are unique.

- Identify 'hot spots' for nonpoint source pollution in the microwatershed, and make the information available to the Vermilion Soil and Water Conservation District so that the producers implementing the can begin using the voluntary conservation cost share programs available. LSU AgCenter, through its Master Farmer Program can then install samplers for edge-of-field monitoring of the impacts of BMPs on nonpoint source pollution control.

- Establish baseline information to quantify the effectiveness of best management practices in reducing pollution loads.

Measurable Results:

- Development of a QAPP for water quality monitoring and modeling in Coulee Baton Microwatershed.

- Water quality data collection and compilation in conformance with QAPP protocols.

- Establishment of more accurate quantitative relationship between sources of nonpoint source pollutants, landuse types, and water quality in the watershed through monitoring and modeling.

- Development and publication of findings in formats usable by the Vermilion SWCD and participating agencies for explaining to farmers and the public about land use in improving regional water quality.

- Presentations of findings in national and international workshops and conferences.

- Conducting water quality monitoring and modeling workshop involving farmers, landowners, and other stakeholders.

- Generation of baseline information for the development of Implementation Plans by LDEQ for TMDL listed watersheds.

V. Project Activities and Deliverables

The proposed project elements and associated tasks are identified below. The deliverables are described for each task along with the anticipated schedule, the requested federal funds and the estimated institutional cost share. Requested and match amounts per task are estimates; however, it should be noted that the requested amount will not be exceeded and the total match will be met or exceeded.

Project Element 1 – Develop Quality Assurance Project Plan (QAPP)

Task 1.0: The QAPP must characterize the collection, analyses, evaluation, and reporting of all data used for decision making process. The QAPP shall be modeled after the EPA requirements for QAPPs (EPA QA/R5) and address each element as it pertains to this project. After LDEQ approves the QAPP, LDEQ will send it to EPA for their review and approval.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Provide draft and final QAPP to LDEQ and EPA for review, comment, and approval. Once the QAPP is approved by EPA, provide a digital copy and a hard copy of the document to LDEQ.

Schedule: Months 1 – 3

Payment: Federal: $ Match: $

Delay in approval of QAPP by LDEQ may result in modification of project timeline and budget.

Project Element 2 – Water Quality Monitoring

Task 2.0: Following consultation with LDEQ, Vermilion SWCD and other participating agencies, install surface water quality monitoring network in Coulee Baton Microwatershed. We expect technical guidance from LDEQ on site identification, field installations and calibrations of the samplers. The tentative locations for field installations and water quality monitoring in the microwatershed are presented in figure 2. Collect and analyze samples, and compile data in

accordance with the QAPP. Collect event-specific runoff samples in response to rainfall, cultural activities, or other circumstances that provide the opportunity to understand current conditions and effectiveness of BMP's. Support LDEQ and Vermilion SWCD in public meetings and interactions with stakeholders. Work with LDEQ and Vermilion SWCD personnel on an ongoing basis to provide information for GIS, water quality programs and interactions with EPA.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Report quarterly to LDEQ on progress made in water quality data collection and analysis program. Provide photo-documentation and map of sampling sites that are included within the program.

Schedule: **Months 3 –15**

Payment: Federal: $ Match: $

Project Element 3 – Identify, compile, and analyze data for computer modeling and GIS

Identify water quality modeling data such as rainfall, soils, crop management, hydrology, tillage practices, and landuse types in the watershed. Several agencies such as Vermilion SWCD, USDA-NRCS Vermilion Parish, NASA Regional Center at UL Lafayette, Farm Service Agencies, Universities, and websites are some of the data sources for water quality modeling effort. Once data sources are identified, data will be collected, and a project database will be developed. Landuse maps will be developed, and a landuse summary will be reported. Standard QA procedures will be followed in utilizing these secondary data sets.

Task 3.0: In collaboration with LDEQ GIS Center and LDEQ NPS Unit, create a detailed landuse map for the 2007/2008 year using available satellite images/aerial photographs for the watershed. Map data layers will include soils, landuse types, Digital Elevation Model (DEM), Digital Ortho Quarter Quadrangles (DOQQ), Topographic Quadrangle, drainage map, and hydrology. Cropping systems and management practices data will be collected from NRCS-Vermilion Parish or Farm Service Agencies. Precipitation, solar temperature, and other

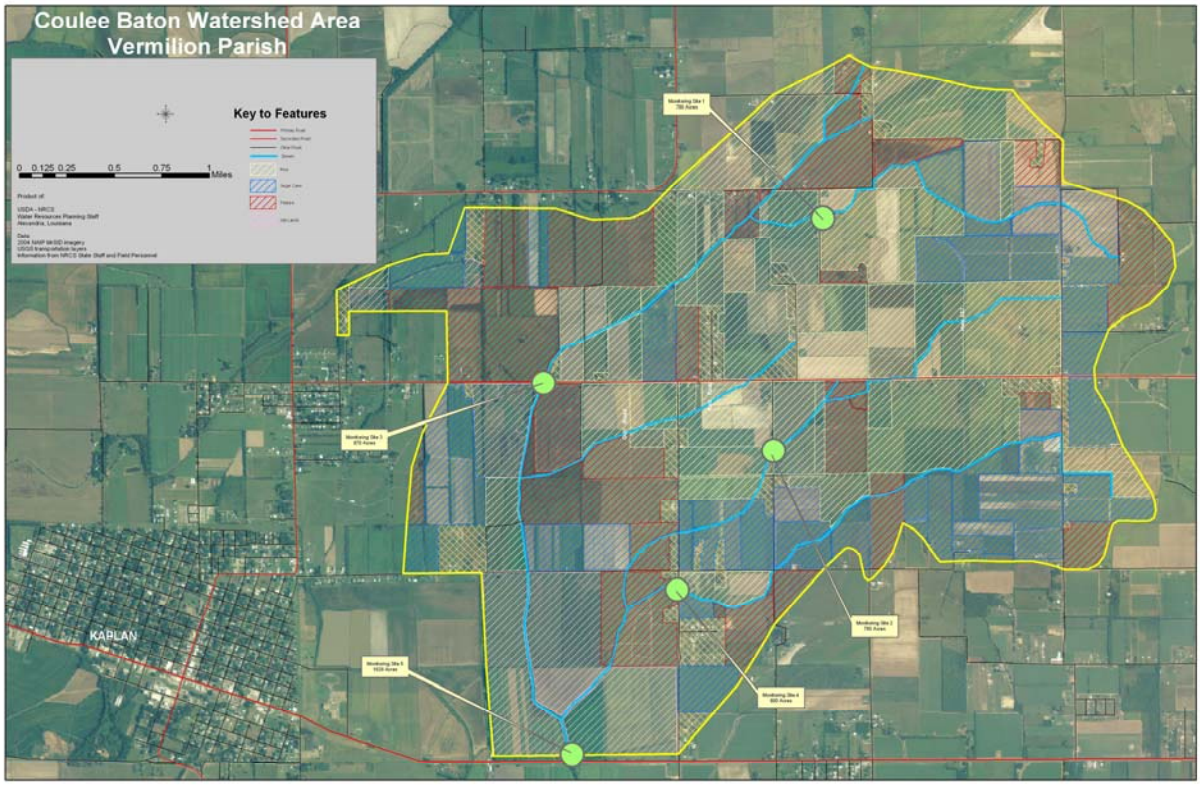


Figure 2. Tentative locations for surface water quality monitoring in the Coulee Baton Microwatershed, Vermilion Parish, Louisiana.

Weather data will be collected from various sources, and USGS websites. Landuse data will also be collected from LDEQ GIS Center.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Report quarterly to LDEQ on progress made on data collection, compilation, analyses, and landuse map of the watershed. Cropping sequence for agricultural landuse will be identified. Landuse, hydrology, and soil maps will be submitted. Landuse summary will be reported.

Schedule: Months 1- 9

Payment: Federal: $ Match: $

Project Element 4- Model Selection

Task 4.1: Candidate models will be selected by using model information, literature review, personal contacts, and other sources. In addition to SWAT, AnAGNPS, BASINS, CREAMS, EPIC, other water quality models will be considered as candidate models.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Quarterly report to LDEQ on the progress of model selection. A summary on the candidate models will be developed.

Schedule: Months 1-6

Payment: Federal: $ Match: $

Task 4.2: Candidate models will be evaluated based on several criteria including their daily/monthly input parameters, user friendliness, expense, input/output parameters, robustness, technical support, and the acceptance by the governmental agencies.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Quarterly reports on model evaluation.

Schedule: Months 6-12

Payment: Federal: $ Match: $

Task 4.3: Final model for water quality monitoring will be selected. Techniques such as ranking will be utilized if needed for the final selection of a model.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Quarterly reports on final model selection will be submitted to LDEQ. A summary on final model selection for application will be developed.

Schedule: Months 12-15

Payment: Federal: $ Match: $

Project Element 5- Model Calibration and Verification

Task 5.1: Selected model will be calibrated using two years of surface water quality monitoring data from the watershed. Other necessary model input parameters will be used from literature sources, and project database developed in this project.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Quarterly reports on model calibration will be submitted to LDEQ. Summary on water quality outputs from the model will be submitted to LDEQ.

Schedule: Months 15 – 20

Payment: Federal: $ Match: $

Task 5.2: Selected water quality model will be verified using two years of surface water quality monitoring data collected from the Vermilion-Teche water quality monitoring project.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Quarterly reports on model input/output and verification will be submitted to LDEQ. Summary on water quality outputs from the model verification will be submitted to LDEQ.

Schedule: Months 21 – 24

Payment: Federal: $ Match: $

Project Element 6 – Quantify the contribution of landuse types in nonpoint source pollution

Task 6.1: Modeling TSS, TN, TP, NO3/NO2-N and SRP loads for Coulee Baton microwatershed.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Documentation of the TSS, TN, TP, NO3/NO2-N, and SRP loads for Coulee Baton microwatershed. Quarterly reports on the progress of the nonpoint source pollution loads for the Coulee Baton microwatershed.

Schedule: Months 25 – 28

Payment: Federal: $ Match: $

Task 6.2: Quantification of the contribution of landuse types on nonpoint source pollution (TSS, TN, TP, NO_3/NO_2-N, SRP) in Coulee Baton Microwatershed.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Documentation of the contribution of landuse types such as agriculture, forestry, and residential areas on TSS, TN, TP, NO_3/NO_2-N, and SRP pollution in Coulee Baton microwatershed. Quarterly reports on the progress of the quantification of landuse types and nonpoint source pollution in Coulee Baton Microwatershed.

Schedule: Months 29 – 32

Payment: Federal: $ Match: $

Project Element 7- "Hot spots" identification

Task 7.0: "Hot spots" for nonpoint source pollution in the microwatershed will be identified for the Vermilion Soil and Water Conservation District so that the producers implementing the BMPs can begin using the voluntary conservation cost share programs. LSU AgCenter, through its Master farmer Program can then install samplers for edge-of-field monitoring of the impacts of BMPs on nonpoint source pollution control in Coulee Baton microwatershed.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: "Hot spots" for nonpoint source pollution in the Coulee Baton microwatershed. Quarterly reports on the progress of model simulation, and 'hot spots' identification submitted to LDEQ.

Schedule: Months 32 – 36

Payment: Federal: $ Match: $

Project Element 8- Water Quality monitoring and modeling workshop

Task 8.0: Conduct water quality modeling workshop in coordination with the Vermilion SWCD involving farmers, landowners, students, scientists, governmental agencies, LDEQ personnel and other stakeholders in the region. Preliminary results from water quality monitoring and modeling efforts for Coulee Baton Microwatershed will be presented.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Workshop report.

Schedule: Months 18- 24

Payment: Federal: $ Match: $

Project Element 9- Quarterly Reports, Annual Reports and Final Report

UL Lafayette will communicate with LDEQ on all aspects of the project during the course of the contract term. Quarterly reports, annual reports, invoices and deliverables are to be submitted in a timely manner.

Responsible entity: Durga D. Poudel and his research team.

Task 9.1: Quarterly reporting documenting all project activities and results will be submitted to LDEQ. Submit accompanying deliverables as required by individual tasks upon their completion. Invoices should accompany reports.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Quarterly reports with attached deliverables to LDEQ throughout the duration of the project which detail progress to date and will specify any problems or issues encountered during the course of the project.

Payment: Payment received by task accomplished.

Schedule: Due the month following each quarter (April 10, July 10, October 10, January 10)

Task 9.2: Annual reports will document the results of project accomplishments that year. Statutory requirements of the Clean Water Act require that the State (LDEQ) report each year on the water quality improvement that has been achieved as a result of the program. LDEQ provides this report to EPA Region 6 in January of each year. This report is an analysis of results rather than a description of activities. Analysis of results includes discussion about such things as reduction of sediment loads, increased implementation of BMPs, and improvements to water quality.

Responsible entity: Durga D. Poudel and his research team.

Deliverable: Annual reports to LDEQ each calendar year of the project which detail progress to date and will specify any problems or issues encountered during the course of the project to date.

Payment: Payment received by task accomplished.

Schedule: Due January of each year during project period.

Task 9.3: Develop and submit a ***draft*** final report upon completion of the project to LDEQ for review. Report should give a detailed account of all activities, results, findings, and recommendations of the project. All photographs, finished deliverables, publications, etc, shall be re-submitted and thoroughly explained in the final report.

Responsible entity: Durga D. Poudel and his research team.

Deliverables: Draft project report detailing the accomplishments, highlights, and findings learned throughout project implementation.

Payment: Payment received once EPA approves final report.

Schedule: November 2009

Task 9.4: Develop and submit a ***final*** report/implementation plan upon completion of the project to LDEQ and eventual EPA approval. Upon incorporation of LDEQ revisions to the draft final, triplicate copies of the final report and all deliverables shall be submitted to LDEQ.

Responsible entity: Durga D. Poudel and his research team.

Deliverables: Final project report detailing the accomplishments, highlights, and findings learned throughout project implementation. Provide final report to LDEQ and EPA for review, comment, and approval. Once the report is EPA approved, provide a digital copy and hard copy of the document.

Schedule: December 2009

Payment: Federal: $ Match: $

Appendix A: Quality Assurance Project Plan (QAPP)

Section A5. Problem Definition and Background

The Coulee Baton Microwatershed, which is located in north-central Vermilion Parish in the lower Mermentau Basin of Louisiana (Fig. 1), contains approximately 6,200 acres mainly in agriculture production. Rice production (2,176 acres), sugarcane production (1,398 acres), pasture land (1,312 acres), idle land (595 acres), and miscellaneous (11 acres), are the major landuse types in the watershed. There is crawfish production in 537 acres, orchard (15 acres), subdivision (19 acres), homestead (17 acres), and hay production on 120 acres (unused pasture) as well.

The Coulee Baton Microwatershed is in LDEQ's mapping subsegment number LA-050702 described in the waterbody description of GIWW from the Mermentau River to the Leland Bowman Locks. There are numerous small canals and streams that are connected to either Grand Lake or the GIWW particularly between the Mermentau River and Leland Bowman Locks. The Coulee Baton Microwatershed is one of the major landscapes that drain into the subsegment number LA-050702. TMDLs have been completed for subsegment number LA-050702. Suspected causes include organic enrichment/low DO, oil and grease, suspended solids, turbidity, pesticides, nutrients, and mercury. The goal of this project is to address nonpoint source pollution in the Coulee Baton Microwatershed where various conservation measures and BMPs will be applied by landowners and homeowners.

Section A6. Project/Task Description

This project has the following tasks:

Task 1. Prepare a Quality Assurance Project Plan (QAPP) for review and approval by LDEQ and EPA.

Task 2. Install automated ISCO samplers and flow meters at least on 5 locations in Coulee Baton Microwatershed for watershed-scale nonpoint source pollution monitoring. The LSU AgCenter is going to provide flow meters, samplers, batteries, and other accessories for field instrumentation of five locations for surface water quality monitoring.

Task 3. Identify, compile, and analyze computer model and GIS datasets such as rainfall, weather, surface water quality, soils, hydrology, landuse, crop management, tillage, etc.

Task 4. Model selection (SWAT, AnnAGNPS, BASINS, EPIC, etc.) for water quality modeling.

Task 5. Model calibration, verification, and simulation using 3 years of water quality data collected at Vermilion-Teche water quality monitoring project at Milton sites.

Task 6. Through modeling, quantify the contribution of landuse types such as agriculture, forestry, and residential sites on nonpoint source pollution (e.g. TSS, TN, TP, and BOD_5) in Coulee Baton microwatershed.

Task 7. Identify 'hot spots' for edge-of-field monitoring of the impacts of BMPs on nonpoint source pollution control, and share this information with the participating agencies.

Task 8. Conduct water quality monitoring and modeling workshop in coordination with the Vermilion

SWCD involving farmers, landowners, students, governmental agencies, experts in water quality modeling, and other stakeholders.

Task 9. Submit quarterly reports, annual reports, and final report.

Section B1. Sample Process Design

Five sites will be identified for water quality monitoring in the Coulee baton Microwatershed. The tentative locations for surface water quality monitoring in the Coulee Baton Microwatershed are presented in Figure 1. Each site will be fully instrumented with Flowmeters (4250 and 3230 models) and automated ISCO samplers (6700 model) powered by 12V batteries and 20V solar panels. All instruments will be safe and secured in boxes, and fences will be built as needed. Each site will also be equipped with a standard rain gauge. Water quality samplings will be done for the most rain events.

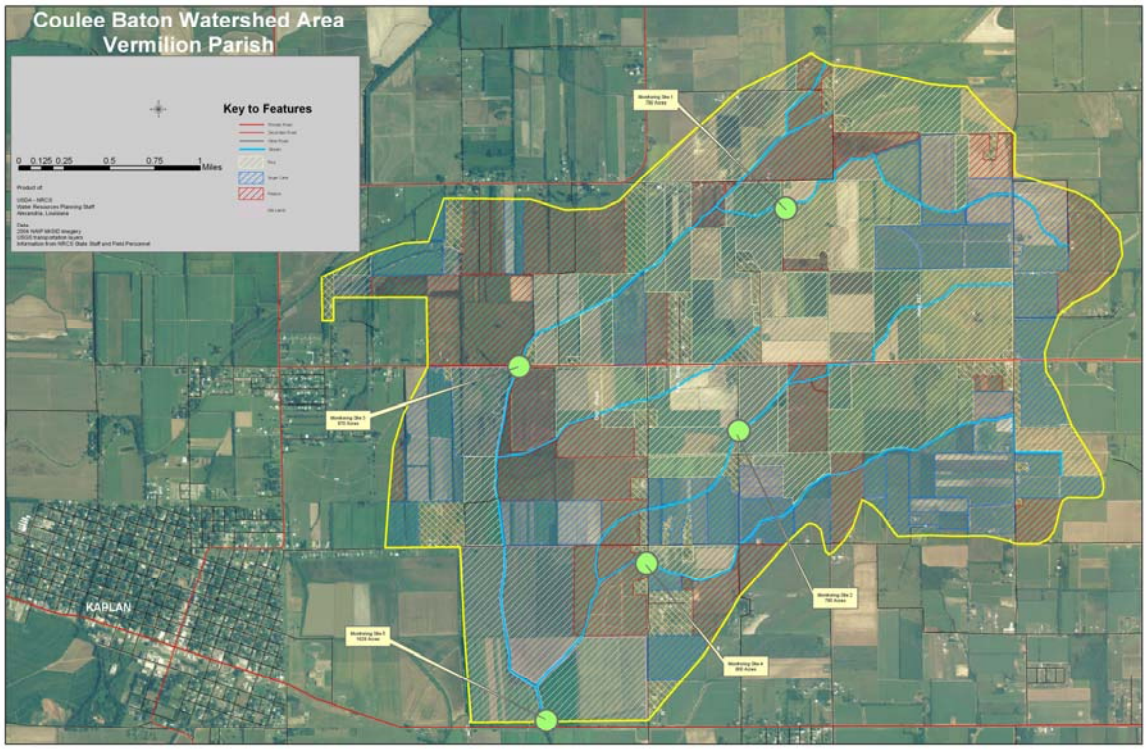


Figure 1. Tentative locations for surface water quality monitoring in the Coulee Baton Microwatershed, Vermilion Parish, Louisiana.

Field (dissolved oxygen, pH, electrical conductivity, turbidity, and temperature) and laboratory (total Kjeldahl nitrogen, total phosphorus, nitrate, sulfate, chloride, fluoride, bromide, nitrite, ortho phophorus, total suspended solids, 5-day biochemical oxygen demand, ammonia, fecals, heterotrophic bacteria, pesticides, total sugar, and water soluble sugar) surface water quality parameters will be determined for each sampling event. Pesticides and sugars will be determined only for select rain events.

Section B2. Sampling Methods of the QAPP

The primary method of water sample collection is automated ISCO samplers. However, water sample collection by grab method may also be done if needed. Field measurements will be done using YSI or Hydrolabs, while laboratory determinations will be done at W.A. Callegari Environmental Center Water Quality Laboratory, LSU AgCenter, Baton rouge. Below is the list of the methods to be used in sample determinations:

Table 1. Methods for laboratory determination of water samples.

Determinations	Method
TKN	EPA 351.4
TP	EPA 365.3
OP	EPA 365.3
Anions (nitrate, sulfate, chloride, Fluoride, bromide)	EPA 300.0
Nitrite	EPA 300.0
TSS	EPA 160.2
BOD5	SM 5210-B
NH3	SM 4500-NH3-E
pH	EPA 150.1
Fecal	SM 9221-E
Heterotrophic bacteria	SM 9215-A
Pesticides	EPA 507/508

Water sampling and management will be done according to the EPA standards and l

APPENDIX D

LSU AgCenter Brochure

be available to producers participating in this project. Producers may receive up to 75% cost share assistance to implement BMPs in the Coulee Baton microwatershed. Some of these practices include:

Rice

- ✤ Irrigation land leveling
- ✤ Grade stabilization structures
- ✤ Underground irrigation pipeline

Sugarcane

- ✤ Grade stabilization structures
- ✤ Managed field borders

Livestock

- ✤ Fencing
- ✤ Water well, pipeline and watering facility

Success of the program could allow additional cost share incentives.

These agriculturally led efforts are an attempt to demonstrate that agricultural producers can and will voluntarily reduce the impact that agricultural production has on Louisiana's environment by implementing sound conservation systems..

For Homeowners

Homeowners in the Coulee Baton microwatershed will have the opportunity to participate in environmental stewardship programs geared toward residential activities. Caring for our lawns can contribute to the amount of pollutants entering streams, lakes, estuaries and groundwater. Lawns adjacent to lakes and bayous are of most concern, but other lawns also will drain into a ditch or street drain and the runoff eventually ends up in a bayou or other water body. Louisiana residents must do all that they can to protect their environment.

The LSU AgCenter has developed the Best Management of Louisiana Lawns education program to demonstrate to homeowners how to minimize the environmental impact they have and assist homeowners in basic lawn care and best management practices that they can follow to keep their lawns in good condition. Our goal is to demonstrate that a healthy and properly maintained lawn will resist weeds and other pest problems – thus a minimum of pesticide products will be needed.

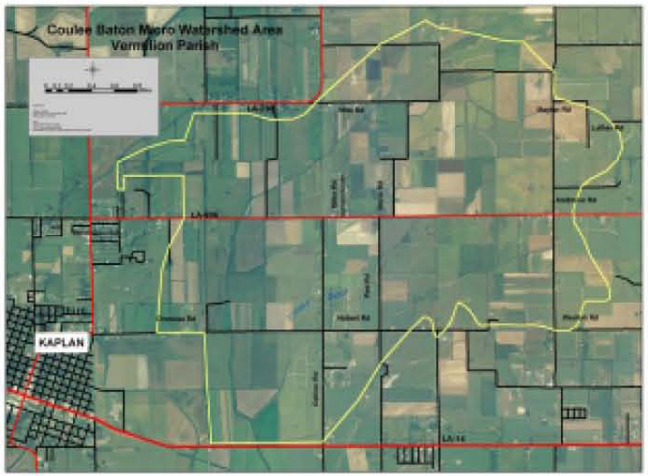
Homeowners also can participate in programs that demonstrate the proper ways to maintain and operate a home septic system. This program will show landowners that a malfunctioning system can contaminate groundwater – which might be a source of drinking water. The EPA's Homeowner's Guide to Septic Systems and Homeowner Septic System Checklist will be used as a training manual for landowners. This guide helps landowners care for their septic systems. These workshops will help homeowners understand how the system works and what steps they can take to ensure their systems will work properly. The Acadiana RC&D will be conducting workshops using the Home Sewer Awareness toolkit, which covers topics such as "Save Money by Maintaining Your Home Sewer System," "Why Do Home Sewer Systems Fail?" and "The Hazards of Failing Home Sewer Systems."

For more information, contact:

Kyle Soileau
Vermilion Soil and Water Conservation District
(337) 893-5664, Ext. 3

Carrie Mendoza
LSU AgCenter
(225) 578-2906

The Coulee Baton 'Microwatershed'



Improving Water Quality in North-Central Vermilion Parish (Proposed Plan)

The Coulee Baton 'Microwatershed'

Improving Water Quality in North-Central Vermilion Parish

Program Introduction

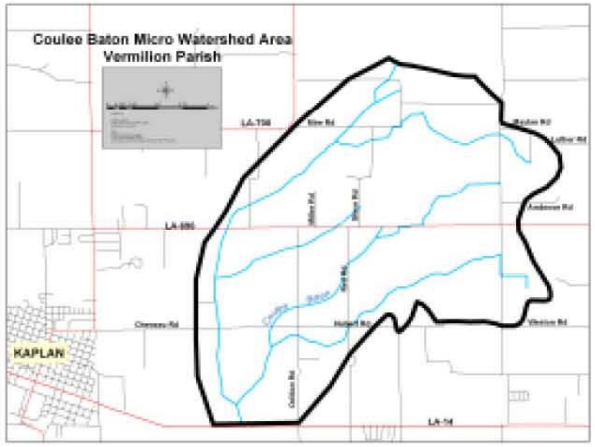
Public concern over agricultural and residential environmental quality has grown in recent years. Based on current data, Louisiana has 285 water bodies listed as being impaired for one or more reasons, and only 91 of our 476 designated water bodies are currently considered fully meeting standards.

The Coulee Baton "Microwatershed" is a 6,200- acre watershed project located 2 miles east of Kaplan, La. The goal of this locally led project is to improve water quality in the area. The Vermilion SWCD formed a cooperative partnership with thirteen other entities to assist landowners and homeowners in carrying out watershed work. Voluntary application of various conservation techniques and best management practices on the land by landowners and homeowners is essential to the success of the project.

What is a microwatershed?

A microwatershed is a geographically subdivided watershed that enables landscape pollutants to be more easily identified and controlled in smaller, more discrete areas.

The Coulee Baton microwatershed is located in the lower Mermentau Basin of Louisiana and is nestled between Kaplan and Abbeville. The watershed is made up of a diverse array of agricultural production systems – including sugarcane production on 1,398 acres; rice production, 2,176 acres; pasture land, 1312 acres; idle land, 595 acres; and miscellaneous, 11 acres. Within that total 6,200 acres, you also can find 120 acres of hay production,537 acres of crawfish production, and 15 acres of orchards. In addition, the area contains 70 homes, contained in 19 acres of subdivisions and 17 acres of homsteads.



What is involved?

This project is the first of its kind in Louisiana. We are using an approach that has been successful in neighboring states such as Texas. It is called the Planned Intervention Microwatershed Approach (PIMA). This approach allows landowners and homeowners to work with the Vermilion Soil and Water Conservation District other participating agencies, and academia, to voluntarily implement best management practices to address water quality challenges within the Coulee Baton microwatershed. This will involved a combination of strategies including:

- Conservation program cost-sharing/assistance
- Conservation program technical assistance
- Monitoring of the effectiveness of best management practices
- Implementation of educational programs for agricultural producers
- Implementation of educational programs for homeowners

Who is involved?

The Vermilion Planned Intervention Microwatershed Approach is a cooperative effort led by the Vermilion Soil and Water Conservation District and includes the following agencies/ organizations:

- Cooperating landowners and homeowners
- Vermilion Soil and Water Conservation District
- Louisiana Department of Agriculture and Forestry
- USDA Natural Resources Conservation Service
- Louisiana Department of Environmental Quality
- Louisiana State University Agricultural Center
- Tarleton University (Texas Institute for Applied Environmental Research)
- Environmental Protection Agency
- University of Louisiana at Lafayette
- USDA Farm Service Agency
- Acadiana Resource Conservation & Development Council
- Gulf of Mexico Program
- Local agricultural enterprises and businesses
- Louisiana Department of Natural Resources (Coastal Management Division)

For Agricultural Producers

The program provides producers with cost-sharing/financial assistance, technical assistance and science-based information to facilitate achievement of established water quality goals. Producers will learn about voluntary, effective and economically achievable best management practices in the Louisiana Master Farmer Program and will have an opportunity to participate in on-site demonstrations of effective conservation measures within the watershed. Other educational programs offered to agricultural producers include the Master Cattle Producer Program and the Certified Prescribed Burn Manager Training for sugarcane producers.

Agricultural producers will work in cooperation with the Vermilion Soil and Water Conservation District to develop conservation plans and implement BMPs designed to address agricultural runoff. A number of cost-sharing opportunities will