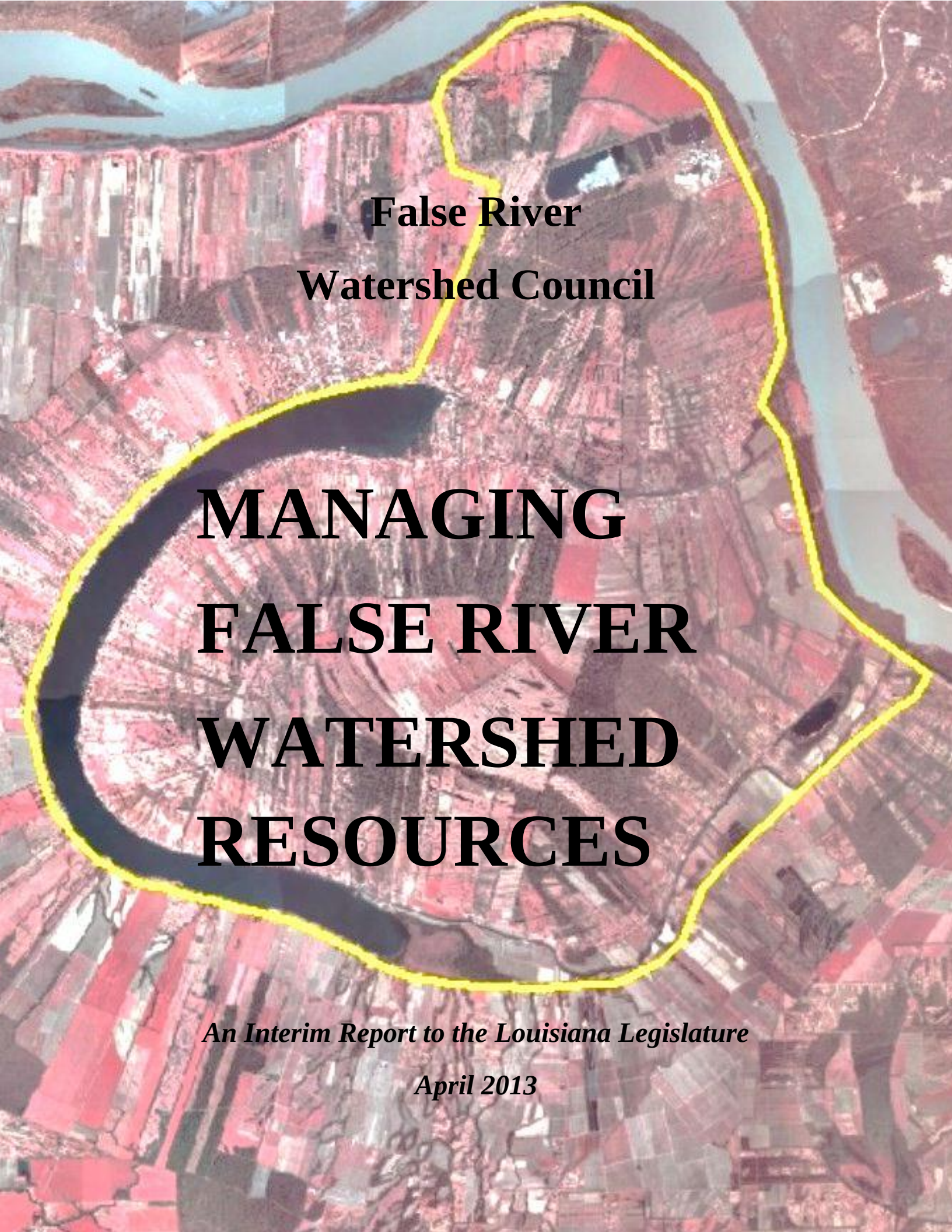

False River

Watershed Council

MANAGING FALSE RIVER WATERSHED RESOURCES

An Interim Report to the Louisiana Legislature

April 2013

To the Distinguished Members of the La. House Committee on Natural Resources and Environment and Senate Committee on Environmental Quality of the Louisiana Legislature and the People of the Great State of Louisiana

April 2013

Dear Members:

We, the members of the False River Watershed Council, have completed this timely report in accordance with House Concurrent Resolution No. 123 of Regular Session 2012.

Specifically, the False River Watershed Council has assembled and prepared this document which is a plan of action for watershed management. It is the intent of this Council, interested stakeholders, and all those involved in the project to preserve, protect, and enhance the quality of False River located in Pointe Coupee Parish - now and for generations to come.

The citizens of Louisiana deserve to have a restored and viable False River. The lake restoration and revitalization can be accomplished through engineering, education, enticement and, as well as, enforcement of new regulations focused on best management practices.

The report offers background information, an executive summary, graphs, charts and maps, and recommendations for your review. We look forward to any further guidance or feedback as we press forward with the False River Aquatic Resources Ecosystem Restoration Project.

We appreciate the support of the Louisiana Legislature as we move forward with this plan of action.

Sincerely yours,

The Members of the False River Watershed Council

False River Watershed Fact Sheet

False River Watershed:

- Pointe Coupee Parish
- Total area: ~35,000 acres
- Area of "The Island": ~18,400 acres (53%)
  (defined herein as east of False River, South of False Bayou, north of the Chenal and west of the Mississippi River)
- Discharge Bayou drainage area (M-1 and associated canals): ~17,600 acres (50%)
- M-2 Canal and False Bayou drainage area: ~9,500 acres (27%)
- Cultivated area (2011): ~2,300 acres (7%)
- Developed area (2011): ~1,700 acres (5%)

False River (lake)

- Owned by the State of Louisiana
- Oxbow/horseshoe lake – abandoned (~1722) meander of the Mississippi River
- Area: ~3,100 acres (3,200 acres with associated wetlands)
- Shoreline: 117,000 feet (22 miles)
- Developed shoreline: 110,000 feet (21 miles)
- Pool stage: 16 feet above mean sea level (NGVD)
- Volume (pool stage): 67,300 acre-feet (22 billion gallons)
- Maximum depth: 65 feet
- Average depth: 21 feet
- Highest water level recorded: 23.2 feet (1983)
- Lowest water level recorded: 13.8 feet (2000)
- Primary Outfall - Lighthouse Canal Structure maximum capacity: 1,400 cfs (three roller gates)
- Lighthouse Canal Structure owned by LDOTD and operated by PCPJ
- Secondary Outfall - Bayou Sere spillway eight: 16.5 feet.
- Estimated sediment influx (2011 - NRCS RUSLE2 model): 21,000 tons

Sources: LDNR, 2012; NRCS, 2011; USGS, 1999; LDWF, 2011; USACE, 2011

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EXECUTIVE SUMMARY

This report to the legislature has been prepared by the False River Watershed Council (FRWC) in response to House Concurrent Resolution No. 123 of the 2012 Louisiana Regular Session (HCR 123). HCR 123 established and mandated the FRWC to "meet as often as necessary to deliberate and produce a report that will identify, review, and evaluate management strategies to facilitate the goal of improving the aquatic habitat of False River; to provide recommendations for the optimal management and protection of the resources within the False River watershed, including but not limited to the following: the study of impacts and potential impacts to water quality, excess nutrient and sediment run-off management, shoreline modification management, watershed conservation measures, and innovative habitat restoration methodology; coordination of federal, state, and local efforts to improve and protect water quality; surface water resource management and protection policies; recommendations for the optimal management and protection of the natural resources in the False River watershed; identification of various funding options for ongoing maintenance of the False River watershed; recommended changes to current procedures and practices to make the management and protection of the natural resources in the False River watershed more efficient, comprehensive, and sustainable." The report is due not later than May 1, 2013.

False River is an abandoned meander of the Mississippi River. The cut-off began prior to 1699, and was well established by 1719. False River was a "Trophy Lake" between 1991 until the status was rescinded in 1998 due to the overall decline in the bass population. Alterations which occurred primarily during the 1970s and 80s along this oxbow lake and within this oxbow lake's watershed have resulted in deterioration of the water quality, aquatic vegetation and fisheries.

This watershed management plan addresses the changes that came about from the U.S. Soil Conservation Service's Watershed Plan and Environmental Impact Statement for Watershed Protection, Flood Prevention, and Drainage, Bayou Grosse Tete Watershed, Pointe Coupee Parish, Louisiana project that was completed in 1983, as well as changes resulting from land development along the lake shore, and any residual effect that remains to this day. Furthermore, the plan identifies potential changes that may occur in the future through land development within the

watershed and addresses those as well. This is a living document that should be periodically updated to address changes in conditions and to take advantage of scientific discoveries.

This plan takes a multifaceted approach to address issues within the watershed, including engineered, education, enticement and enforcement solutions. The plan draws from the expertise of many parish, state and federal agencies, including the Department of Natural Resources, the Department of Wildlife and Fisheries, the Department of Environmental Quality, the Department of Health and Hospitals, the Department of Agriculture and Forestry, U.S. Department of Agriculture's Natural Resources Conservation Service, as well as other local stakeholders. The plan also incorporated the findings and recommendations presented in a Feasibility Study previously performed by the U.S. Army Corps of Engineers. The first solution is to educate the public and parish officials to take a short and long term view of the maintenance of aquatic habitat and water quality of the lake. This requires the stakeholders to voluntarily maintain and/or modify their shoreline, bulkhead, sewerage system, land-use/farming practices and runoff in a manner consistent with best management practices. These common sense activities would be achieved through community information releases and outreach. The second solution would be to provide enticement to stakeholders not readily willing or able to make limited modifications to their property in the form of available material, and other non-monetary assistance, and assist landowners to take full advantage of programs supported by the state, the U.S. government and others. Finally, to prevent future deterioration of the lake shoreline, fisheries, aquatic habitat and water quality, implementation and enforcement of new ordinances will be sought to address these shortcomings.

The previously mentioned solutions address small scale issues that can be dealt with at the property level. For watershed scale issues designed to address the alteration previously performed by the U.S. Soil Conservation Service, an engineered solution is needed. Hydromodifications of channels, canals and sediment traps, and the accumulation of loose sediment in the lake's flats needs to be modeled/tested, designed and implemented. Hydromodification of the two principal drainage systems would address the sediment and nutrient flux into the lake, and result in improved water quality, aquatic habitat and fisheries, and assist in flood control/mitigation. Loose sediment accumulations are expected to be consolidated by lowering the lake's water level, thereby reducing turbidity, and can also be reused as part of aquatic habitat creation through the installation of islands or terraces in the North and South Flats. It is also recommended that a more natural fluctuation of

the lake level would be beneficial over the long term. In addition, these changes will need to be maintained in the long term by the Pointe Coupee Police Jury using best management practices.

The plan recommends the design and installation of measures and/or solutions addressing specific issues associated with the lake's hydrology, water quality and fisheries. Specific solutions include, but are not limited to, the following: artificial reefs to provide cover for sportfish; gravel spawning beds; aquatic and shoreline vegetation planting; hydromodification of drainage channels to provide for sediment retention; vegetation buffer/filter zone, grassed bench, as well as other vegetative edge/riparian habitats to improve water quality; retarding surface water runoff and stream flow by drainage network modification to provide for flood control; redesign and modification of bulkheads and piers to provide for wave attenuation; continued stocking of sportfish; maintaining the commercial fishing season to harvest roughfish stock; and the promulgation of ordinances to address future physical changes in the watershed. In addition, the plan also recommends long term monitoring of the lake's health and long term evaluation of progresses associated with the proposed mitigation efforts.

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ACRONYMS

ABP	Atchafalaya Basin Program (LDNR)
BMP	Best Management Practice
CPUE	Spring catch-per-unit-effort
EQIP	NRCS' Environmental Quality Incentives Program
FRWC	False River Watershed Council
GEC	Gulf Engineers & Consultants, Inc.
HCR	House Concurrent Resolution
LDAF	Louisiana Department of Agriculture and Forestry
LDEQ	Louisiana Department of Environmental Quality
LDHH	Louisiana Department of Health and Hospitals
LDNR	Louisiana Department of Natural Resources
LDOTD	Louisiana Department of Transportation and Development
LDWF	Louisiana Department of Wildlife and Fisheries
MSL	Mean sea level
NRCS	Natural Resources Conservation Service
PCPJ	Pointe Coupee Police Jury
NTU	Nephelometric turbidity units
NPS	Nonpoint Source Program
SCS	Soil Conservation Service (U.S.)
SWCD	Soil and Water Conservation Districts
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture

1 Introduction

This report to the legislature has been prepared by the the False River Watershed Council (FRWC) in response to House Concurrent Resolution No. 123 of the 2012 Louisiana Regular Session (HCR 123). HCR 123 of 2012 created the FRWC and mandated that the FRWC

> *". . . produce a report that will identify, review, and evaluate management strategies to facilitate the goal of improving the aquatic habitat of False River; to provide recommendations for the optimal management and protection of the resources within the False River watershed, including but not limited to the following: the study of impacts and potential impacts to water quality, excess nutrient and sediment run-off management, shoreline modification management, watershed conservation measures, and innovative habitat restoration methodology; coordination of federal, state, and local efforts to improve and protect water quality; surface water resource management and protection policies; recommendations for the optimal management and protection of the natural resources in the False River watershed; identification of various funding options for ongoing maintenance of the False River watershed; recommended changes to current procedures and practices to make the management and protection of the natural resources in the False River watershed more efficient, comprehensive, and sustainable."*

The report is to be submitted to the House Committee on Natural Resources and Environment and the Senate Committee on Environmental Quality no later than May 1, 2013.

2 Identification of Historical, Current and Future Watershed Issues/Concerns

False River is an abandoned meander of the Mississippi River (Figure 1). The cut-off began prior to 1699, and was well established by 1719. Alterations along this oxbow lake and within this oxbow lake's watershed have resulted in deterioration of the water quality, aquatic vegetation and fisheries. The extent of the False River watershed is shown on Figure 1.

Based upon a rapid survey of available information, the following timeline can be established:

1948 The False River drainage control structure on the outlet channel (a.k.a. Lighthouse Canal – see Figure 1) is built to control the lake stage. The weir has a fixed elevation of 15.0 feet above mean sea level (MSL) with a maximum height of 20.96 ft. MSL with stop logs. Approximately 12,000 acres (71%) of The Island is not being used for agricultural purposes.

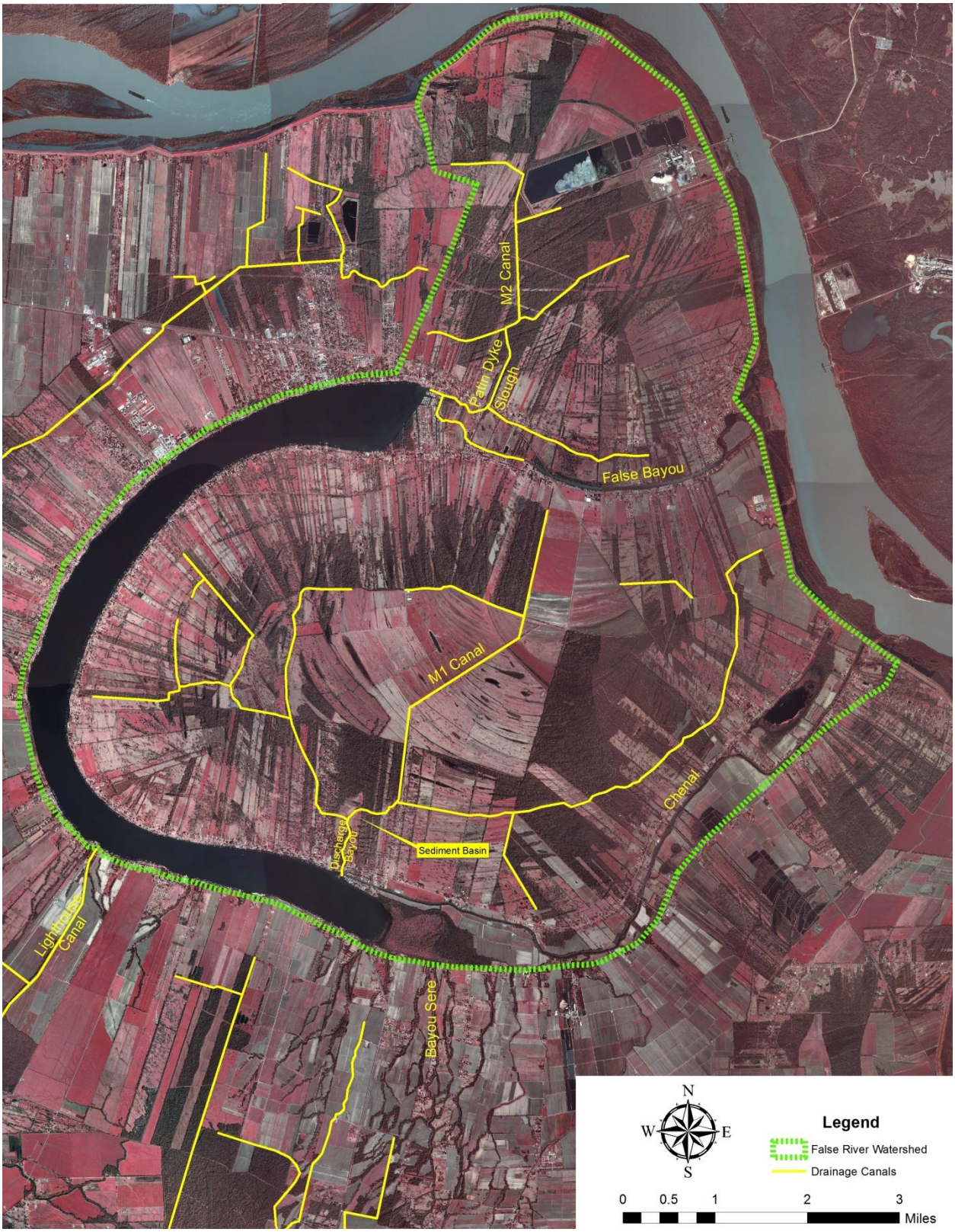


Figure 1: False River Watershed

1969 U.S. Department of Agriculture's (USDA) Soil Conservation Service's (SCS) Bayou Grosse Tete Watershed study and the design survey for the M-1 Canal (a.k.a. Discharge Bayou) are started.

1973 Most of the land enclosed in the oxbow lake (a.k.a. The Island) is cleared and drained, and was being converted to soy bean cultivation.

1976 Bayou Grosse Tete Watershed study is completed, a report entitled "Watershed Plan and Environmental Impact Statement for Watershed Protection, Flood Prevention, and Drainage, Bayou Grosse Tete Watershed, Pointe Coupee Parish, Louisiana" is published, and the work plan approved by the U.S. Congress.

1977 U.S. Environmental Protection Agency (USEPA) describes the lake as eutrophic with severely low dissolved oxygen levels in the summer.

1981 USDA's Natural Resources Conservation Service (NRCS) completes installation of the M-1 Canal and the associated sediment basin, and the M-2 Canal (Figure 1). As-built drawings of the M-1 canal and its sediment basin are drafted.

1983 Bayou Grosse Tete Watershed Project is completed. Only ~5,000 acres (28%) of The Island remains un-cultivated.

1980s Peak crop production occurs on The Island. Approximately 75% of The Island is under agricultural use.

1989 Louisiana Department of Transportation and Development (LDOTD) replaces the stop-logs with three 5x8 feet (ft.) sluice gates with invert elevation of 10 ft.

1999 PCPJ excavates a large amount of silt (>10,000 cubic yards) from the sediment basin.

1993 LDOTD approves an increase in pool level from 15 to 16 ft. MSL for part of the year.

1998 U.S. Geological Survey (USGS) performs a bathymetry survey of the lake.

2001 USACE proposes the False River Aquatic Ecosystem Restoration Study.

2003 USACE estimates that 28,000 tons of silt is being deposited into False River annually.

2005 NRCS surveys the M-1 Canal sediment basin and installs fencing along parts of the M-1 Canal.

2006 PCPJ excavates approximately 8,000 to 10,000 cubic yards of silt from the M-1 Canal sediment basin.

2010 PCPJ excavates 1,200-1,500 cubic yards of silt from the M-1 Canal sediment basin.

2010 Louisiana Department of Wildlife and Fisheries (LDWF) proposes a fall/winter drawdown of the lake to 10' MSL.

2011 Plans for a drawdown are called off.

2011 NRCS estimates that approximately 21,000 tons of sediment is being lost to erosion from crop and pasture land in the False River watershed.

2011 The Louisiana Legislature requests the involvement of LDNR, in conjunction with the PCPJ, to assume the lead project sponsorship for the False River Aquatic Resources Ecosystem Restoration Project.

2011 LDNR meets with Representative Thibaut, author of HCR No. 168, and with representatives of the PCPJ, the LDWF, the USACE, and its contractor and NRCS to discuss the status of the project.

2012 LDNR prepares a report, in accordance with HCR-168 of 2011. FRWC is established under HCR-123 of 2012.

2.1 Flooding

Since June 1965, the lake stage has been collected from a staff gage located at the Lighthouse Canal (Figure 2). High spring and low fall waters levels in False River can be correlated with those of the Mississippi River (USACE Red River Landing gage), indicating that a remnant of hydraulic connection exists between the two systems, most likely through the Mississippi River Alluvial Aquifer (Figure 3). Similarly, a typical hydrograph shows high water periods in the spring and low water periods in the fall (Figure 4). The annual pattern contributes to productivity of the lake's fisheries. High spring water coincides with most sport fish spawning periods and covers areas that stay dry throughout most of the year. The newly-flooded substrate is ideal spawning substrate for nesting sport fish. Flooded terrestrial vegetation provides protection for newly-hatched fish. Without exception, increased sport fish recruitment is linked to timely high water of sufficient duration. Low water levels in the fall expose bottom sediments to the sun and atmosphere. In addition to beneficial soil compaction, a drying period reduces organic material that could otherwise negatively impact spawning success.

The development of the False River shoreline is associated with demands to control water fluctuation and maintain a stable water level to the extent possible. The resulting user group conflict has been the source of considerable debate for an extended period of time. Currently the PCPJ makes efforts to accommodate its constituents and manipulates the False River water level toward a stable level. Flood control is conducted to the extent possible. A local association has recommended that the lake be lowered at a rate of 6 inches per day to 13' MSL if a six-inch rain is forecasted within a 6 to 10 day period. Under normal operating procedures the PCPJ has

indicated that they can lower the lake 0.2 feet per day. Recommendations for planned low water periods have been met with strong opposition and have not occurred to date.

Currently an engineering firm, under contract by the LDNR is collecting hydrologic data along Discharge Bayou, including the M-1 Canal and its tributaries, and the Chenal (Figure 1) to assess the hydrologic response of this portion of the watershed to storm events and model the current hydrologic conditions on The Island. The model will be used to evaluate potential hydromodifications along the drainage canals and bayous to retard peak flow and increase storage capacity.

2.2 Water Quality

Water quality samples have been collected by various state and federal agencies or their contractor since November 18, 1963. There are 90 locations within the watershed where water quality and sediment samples were collected (Figure 5). A total of 26,954 readings and/or analyses were performed on water samples, and 620 on sediment samples. In addition, 44 fish tissue analyses are also available. This data was compiled by the LDNR into a database and used to prepare this report.

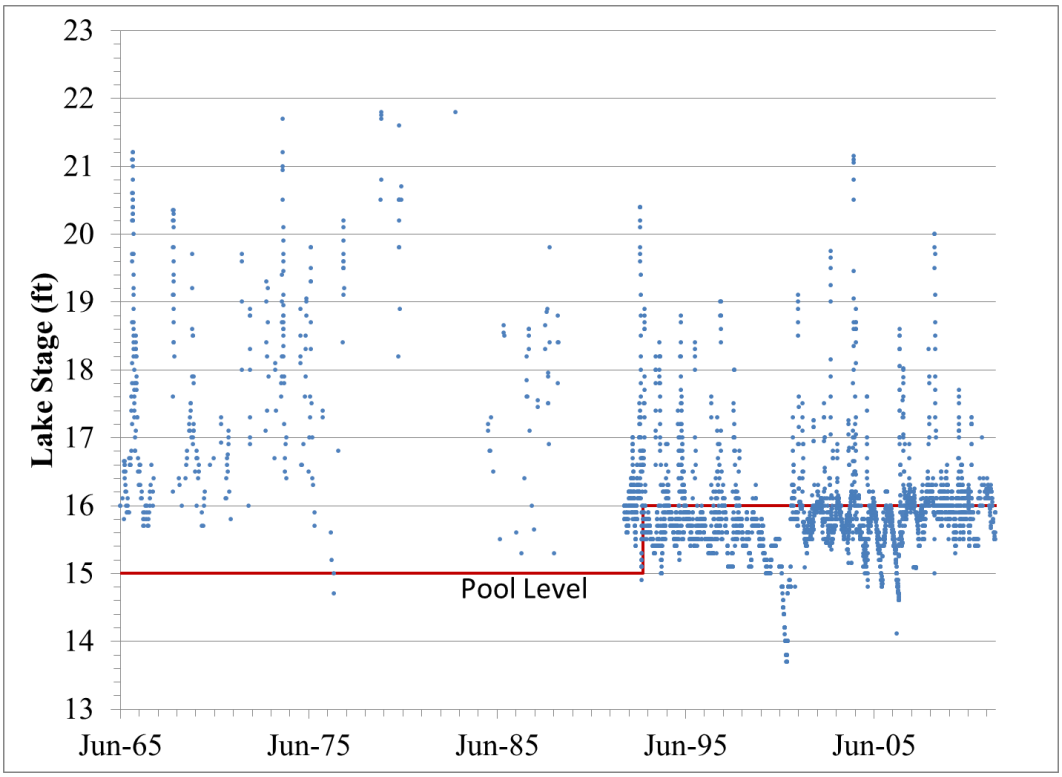


Figure 2: False River lake stages

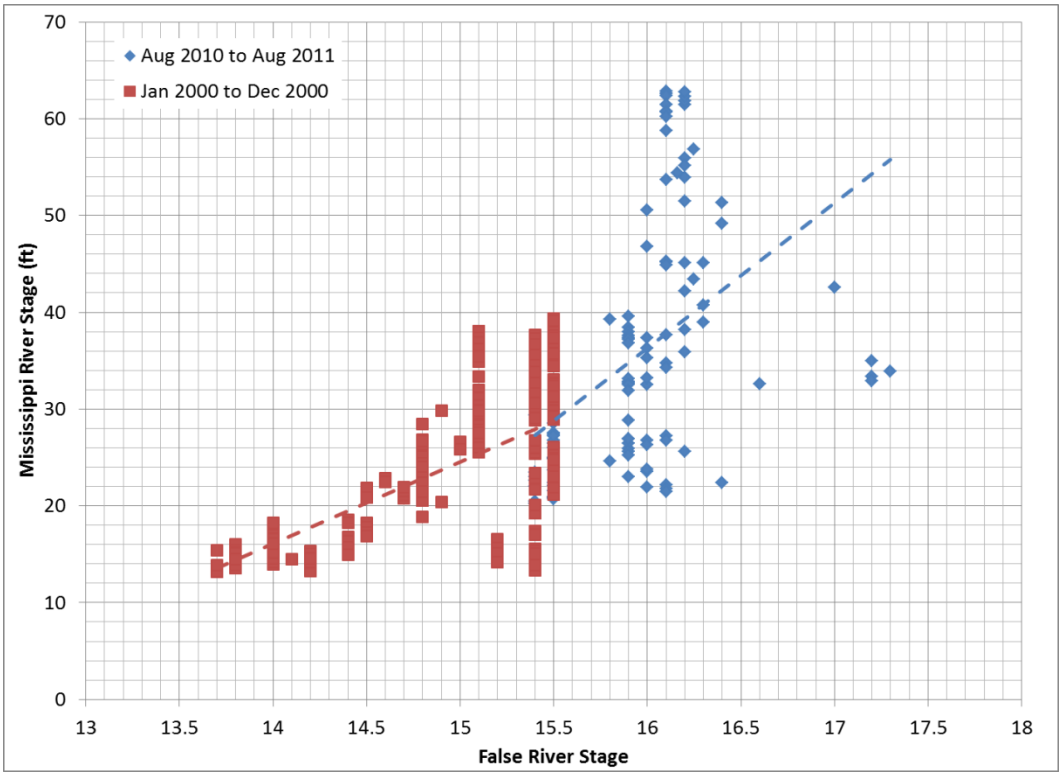


Figure 3: Correlation between False River and Mississippi River stages.

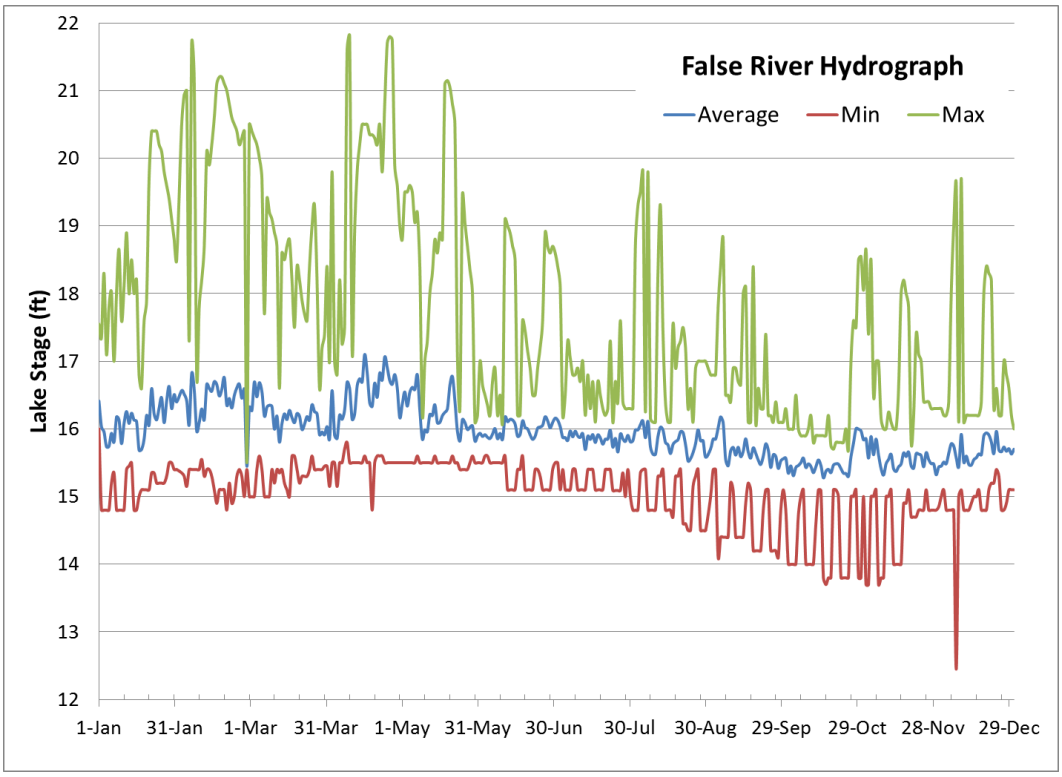


Figure 4: False River hydrograph (average, minimum and maximum stage values).

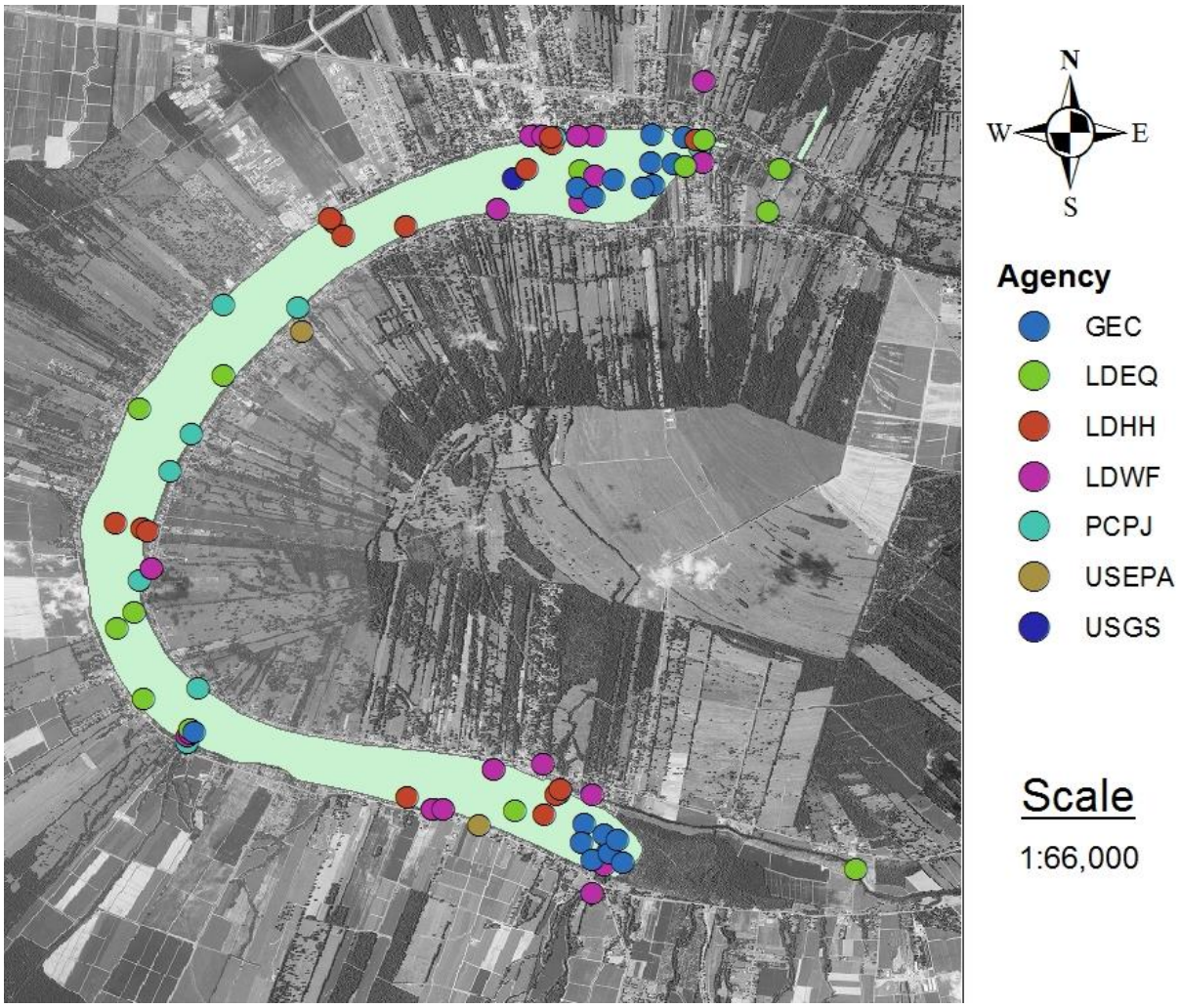


Figure 5: False River sampling and gaging locations

2.2.1 pH

The data collected suggests that the pH of False River is showing an increasing trend over the last 50 years (Figure 6). It is expected that the observed increase in pH values is due to the similar increase in water temperature and nutrient loading of the lake.

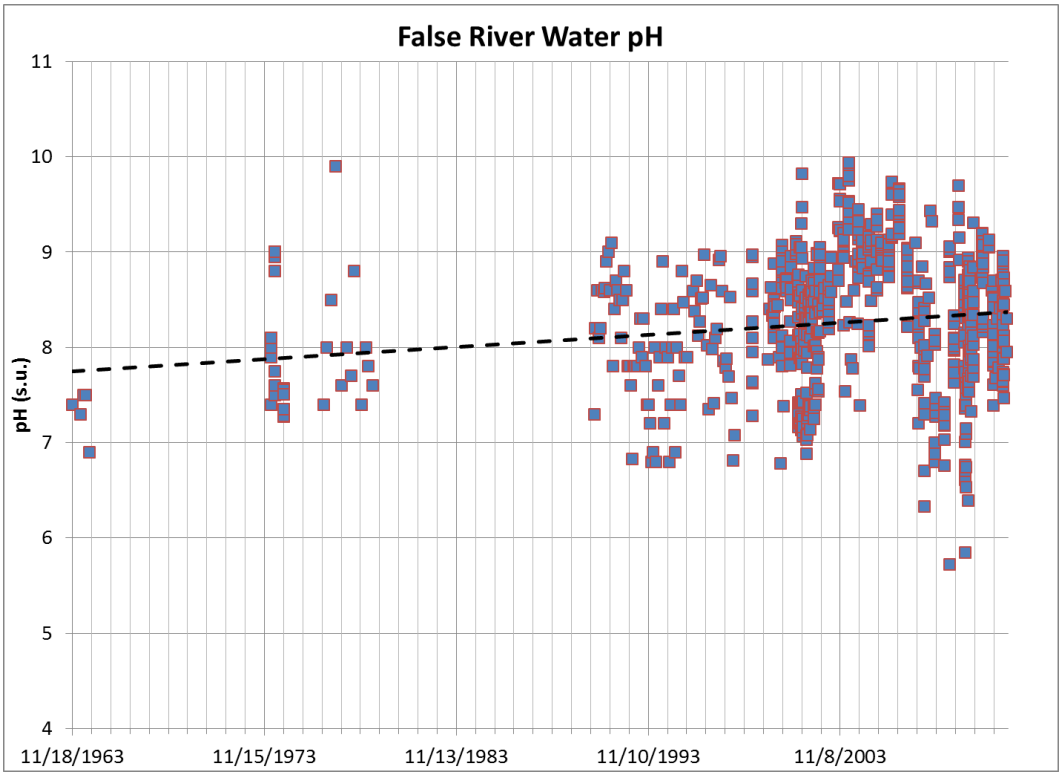


Figure 6: False River pH readings

2.2.2 Dissolved Oxygen

The data collected suggests that dissolved oxygen concentrations in False River have been declining over the record period (Figure 7). This decline can be partially attributed to poor water clarity, resulting in less sunlight reaching deeper into the lake's water. Sunlight fosters the growth of aquatic vegetation, and, therefore, photosynthesis and oxygen production. Without the presence of continuous water flow, False River is subject to annual stratification, a condition common to aquatic ecosystems. During the warm months of the year, stratification forms due to the effects of sunlight. The upper layer is warmer and less dense. The thickness of this upper layer is directly related to water clarity. In clear water, sunlight penetrates more deeply than in turbid water. Because sunlight is a requirement for oxygen production through photosynthesis, this upper layer is the region of highest dissolved oxygen. Water below the upper layer receives little sunlight, and, therefore, is colder and denser. This deeper layer has no incoming oxygen, and typically has very low dissolved oxygen. False River stratifies annually, and develops a 5 to 6-foot upper layer. Because average depth of False River is 21 feet, aquatic life that requires oxygen is limited to the relatively small portion of the waterbody during the warm months of the year.

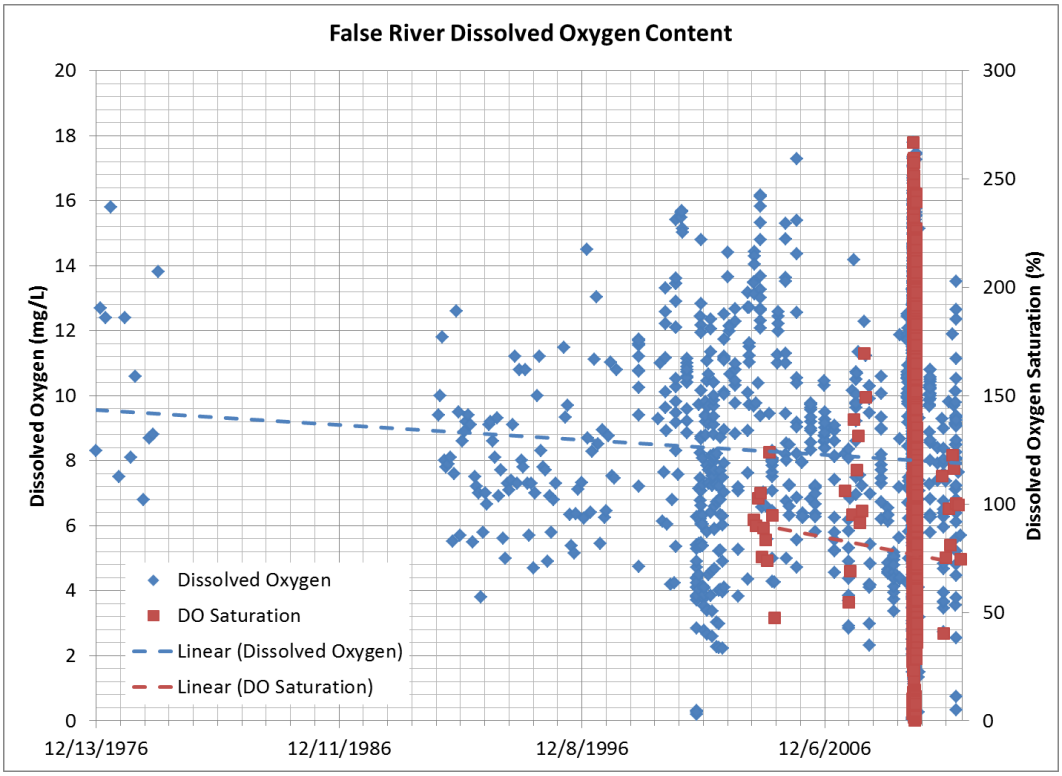


Figure 7: False River dissolved oxygen concentrations

2.2.3 Fecal Coliform

In the late 1990s and early 2000s, the PCPJ investigated the source of elevated fecal coliform counts measured in the lake's water (Figure 8). The PCPJ and other stakeholders remedied the sources identified by repairing and extending sewers. As shown on Figure 3, fecal coliform exceedences (primary standard: >100 col/100 mL and secondary standard: >1,000 col/100mL) were more common prior to 2004, and have not been observed since.

The Louisiana Department of Health and Hospitals (LDHH) is requiring an update of individual waste treatment systems when a property transfer occurs. Furthermore, recently the PCPJ has made an application to LDHH to finance the expansion of sewer service around the entire lake.

PCPJ has submitted a grant application to LDEQ for the evaluation of a sanitary sewer system for The Island. LDNR is working with LDHH to make information on the LDNR's website available, regarding when new individual sewer systems are required, and best management practices for existing individual waste water treatment systems. Information obtained to date has been placed on the LDNR website.

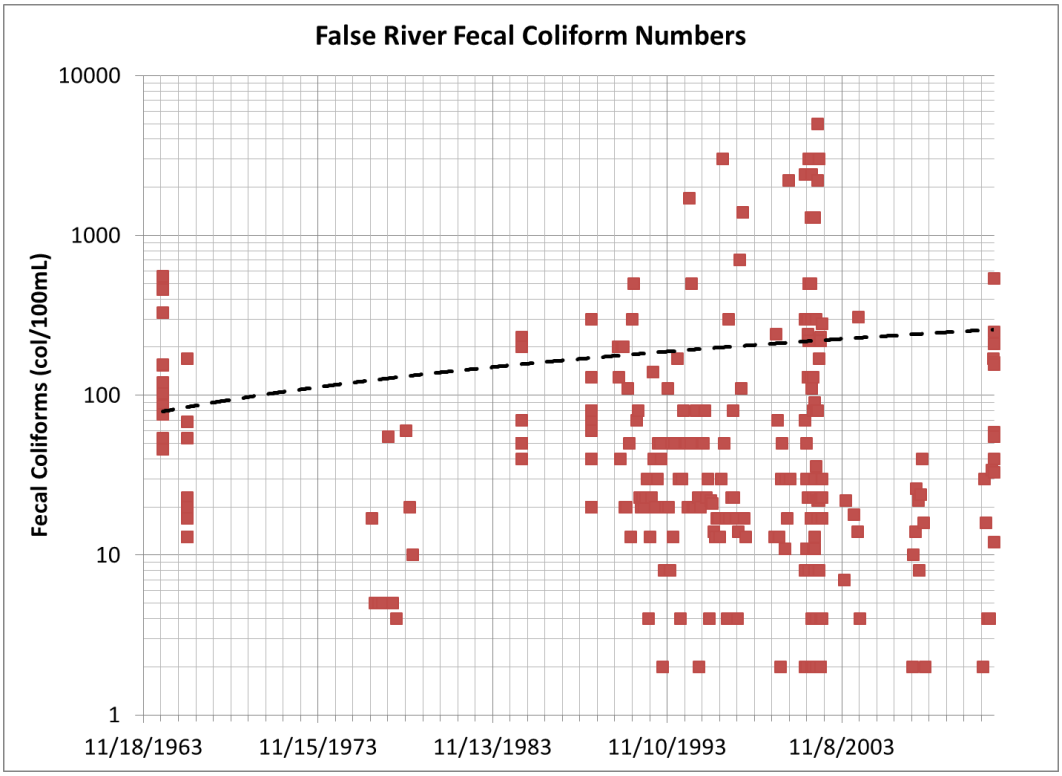


Figure 8: False River fecal coliform concentration

2.2.4 Nutrients

Since 1963, for False River the nutrient concentrations availability has been sporadic. Inorganic nutrients (Nitrate + Nitrite as N) have consistently ranged between below detection limit and at/or slightly above 1 mg/L (Figure 9). Organic nutrients (Total Kjeldahl Nitrogen) have consistently ranged between below detection limit, and at or slightly above 2 mg/L (Figure 10). One sample collected by LDEQ on 8/1/2000 reported a concentration of 57.6 ppm. Total Inorganic Nutrient (Nitrate + Nitrite as N plus Ammonia Nitrogen) ranged between below detection limit and 1 mg/L (Figure 11). This data is only available for 1974 and 1979. Total Nitrogen (calculated as Nitrate + Nitrite as N plus Total Kjeldahl Nitrogen) ranged between below detection limit and 2.5 mg/L N. The 8/1/2000 elevated data point was not considered when calculating TN. Total Phosphorus ranged between 0 and 0.8 mg/L, except for one sample in 2002 with a concentration of 1.5 mg/L, and another in 2000 with a concentration of 24.4 mg/L (Figure 12). There are no specific standards for nutrients in surface water, except for Florida (Appendix A). Using these standards (Total N 1.27 mg/L and Total P 0.05 mg/L), we can see that False River would be regularly above the Total Nitrogen and Total Phosphorus, as well as Chlorophyll-A standards. Two-thirds (67%) of the recent Chlorophyll-A (Figure 13) data from False River exceeded 30 mg/L. This is the threshold between eutrophic and hyper-eutrophic, according to the National Lakes Assessment (USEPA, 2009).

Review of this information by LDEQ showed that these observations are consistent with their findings, reported in LDEQ's January 8, 2003 report. Total Phosphorus concentrations of unpolluted waters are reported to be usually less than 0.1 mg/L (Lind, 1979). Reid and Wood (1976) state that the mean total phosphorus content of most lakes ranges from 0.010 to 0.030 mg/L. Approximately two-thirds (62.5%) of recent Total Phosphorus data from False River reported exceeds the 0.1 mg/L value reported in the Common Methods citation above. In addition, data reported by LDEQ in 2003 indicate Total Phosphorus values approximately ten times the values reported by Reid and Wood (1976) as average lake values.

Nitrate concentrations vary widely across the U.S. However, in 2010 the National Atmospheric Deposition Program reported that average annual nitrate concentrations in rainfall in Louisiana were 0.4-0.5 mg/L. Approximately one-third of data exceeds that found in rainfall. While nitrogen concentrations may not frequently exceed rainfall values, it does appear that nitrogen compounds are present in sufficient quantities so as not to be limiting to aquatic plant growth.

False River Lake appears to be experiencing organic enrichment. That conclusion is supported by frequent anecdotal observations of significant algal populations, as evidenced by the frequent visible "pea-green" color of the lake water, and the elevated Chlorophyll-A values discussed above.

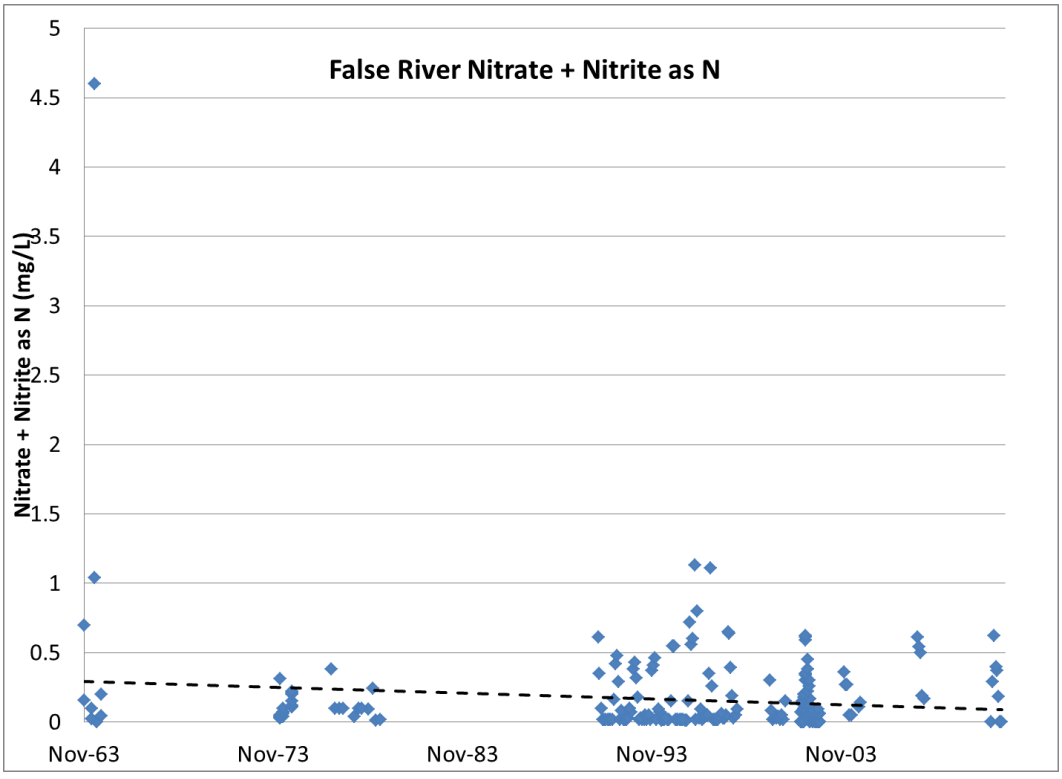


Figure 9: False River Nitrate + Nitrite concentration

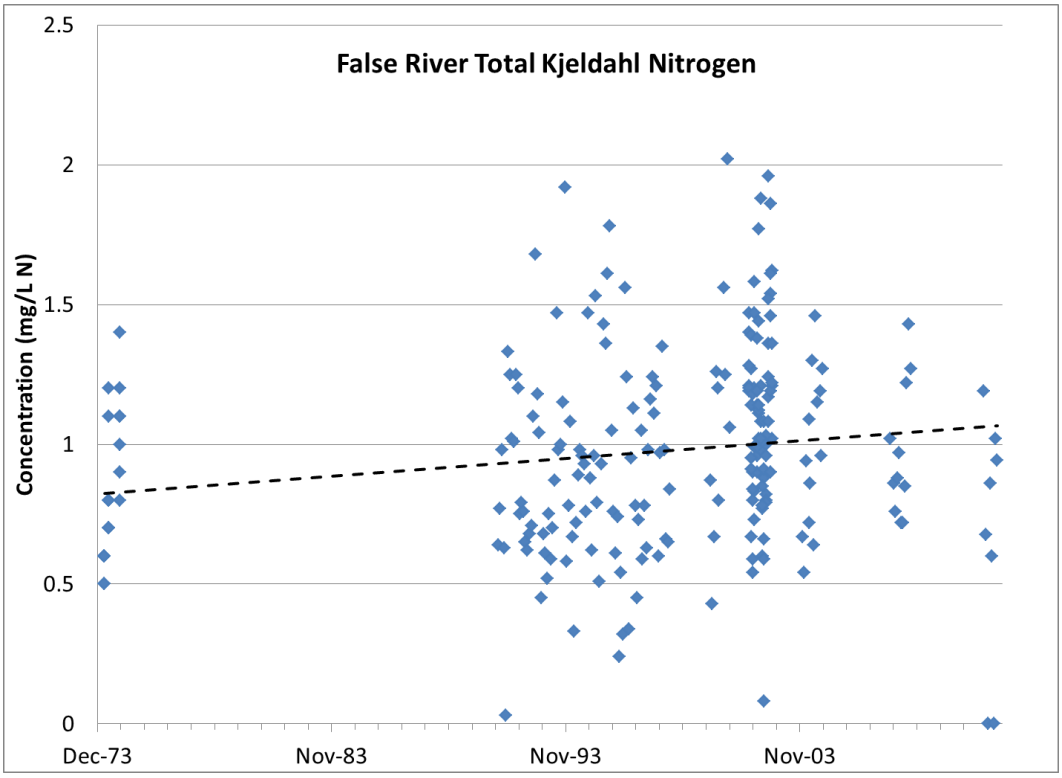


Figure 10: False River Total Kjeldahl Nitrogen concentration

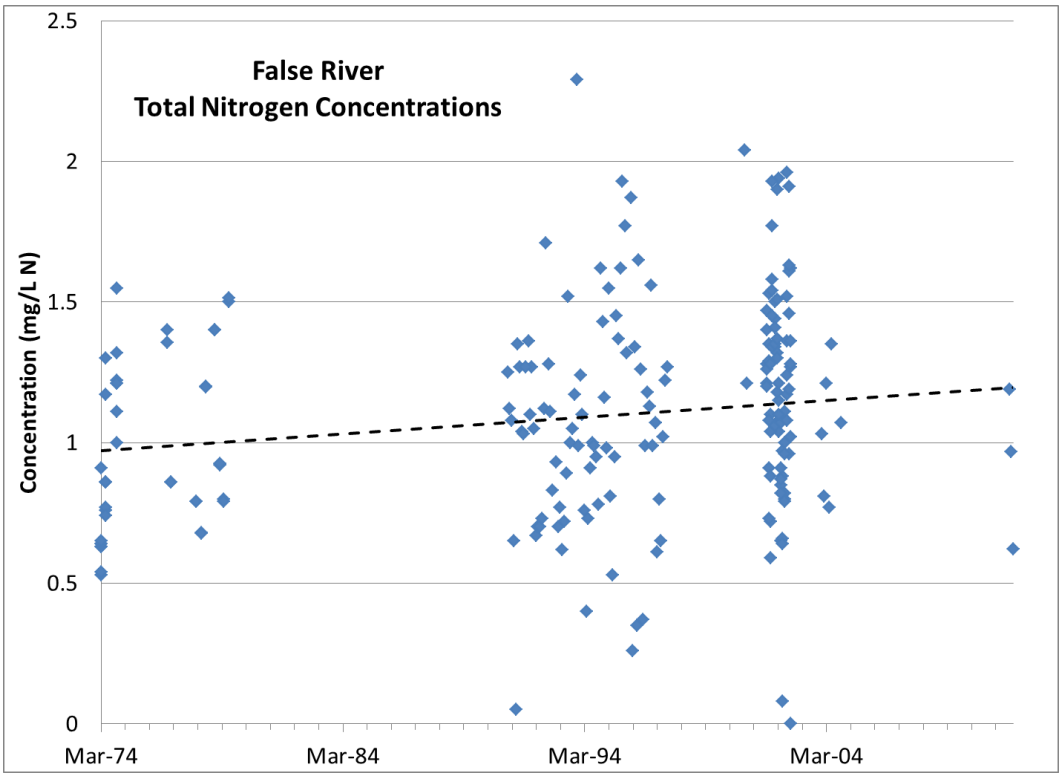


Figure 11: False River Total Nitrogen concentration

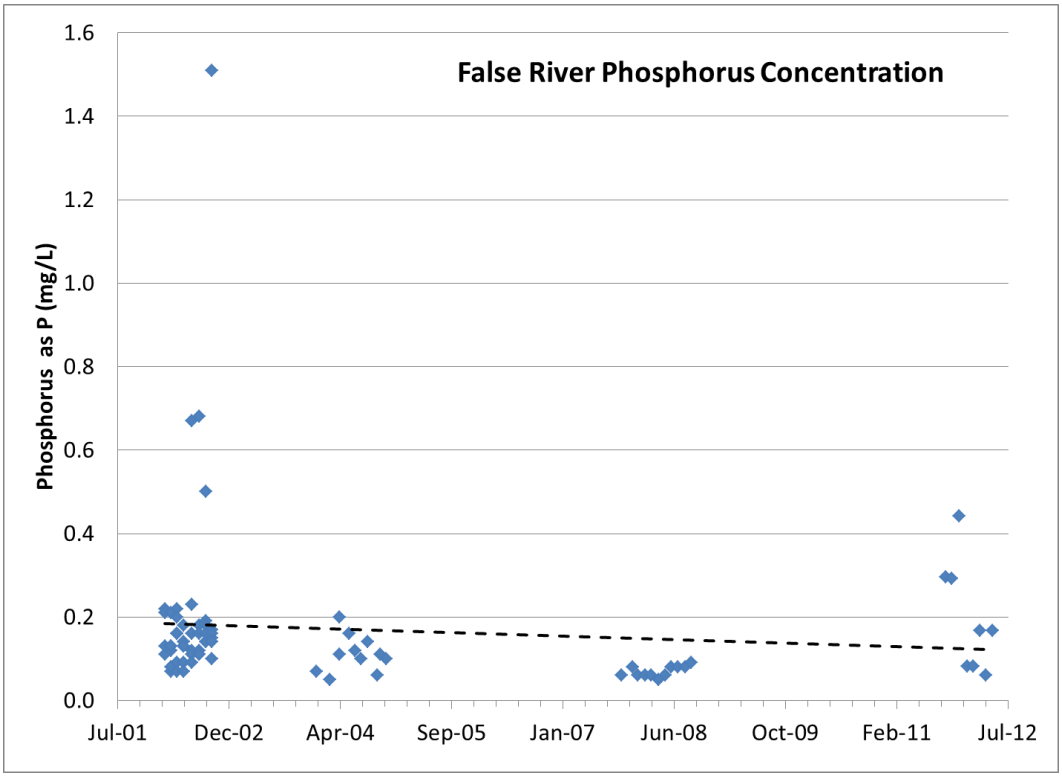


Figure 12: False River Total Phosphorus concentrations

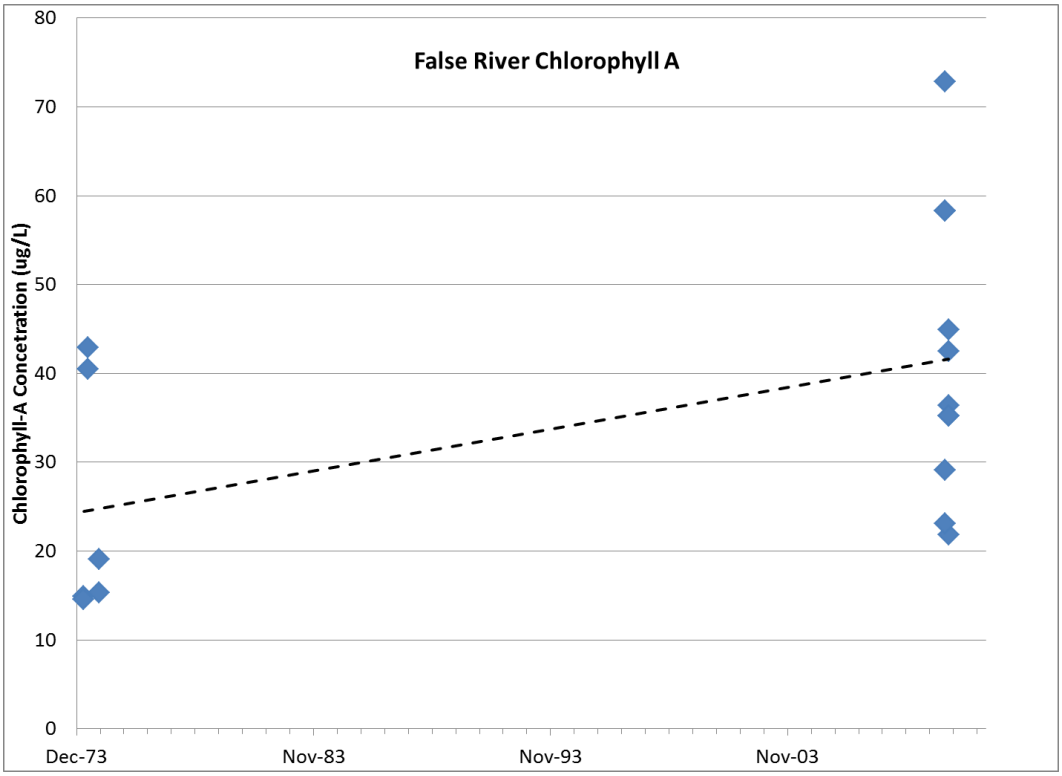


Figure 13: False River Chlorophyll-A concentrations

2.2.5 Pesticides

Pesticides have been detected in False River in very low concentrations sporadically. The Louisiana Department of Agriculture and Forestry (LDAF) tested lake water for traces of atrazine in May 1997. Results showed that atrazine levels in the lake were less than 1 ppb. This low level of herbicides from agricultural runoff would not have contributed to the disappearance of lake vegetation. LDAF attributes such vegetation loss at levels between 30 – 40 ppb.

2.2.6. Turbidity

Limited information is available regarding the flux of particulates into False River. Turbidity data, a common surrogate analysis, is available for the lake in the late 1970s, 1990s and sporadically since (Figure 14). Data are not available for the period during which the M-1 Canal was installed and The Island reached peak crop production. The data show that in the 1990s, after the M-1 Canal sediment basin was installed, a period of elevated turbidity and Total Suspended Solids sporadically remained. There are no standards associated with turbidity. However, the USEPA states that "higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria."

2.2.7. Sedimentation

The existing M-1 Canal sediment basin (Figure 1) is approximately 520 feet long, by 16 feet wide, and 7 feet deep. It was built by NRCS in 1981. Limited information is available regarding the flux of sediment into False River. Total Suspended Solids data are available for the lake in the late 1970s, 1990s and sporadically since (Figure 15). Data is not available for the period during which the M-1 Canal was installed, and The Island reached peak crop production. The data show that in the 1990s, after the M-1 Canal Sediment Basin was installed, a period of elevated turbidity and Total Suspended Solids sporadically remained. The PCPJ excavated a large amount of silt (>10,000 cubic yards – volume not recorded) from the sediment basin in 1999. In 2005, the NRCS surveyed the M-1 Canal sediment basin. In 2006 and 2010, the PCPJ excavated approximately 8,000 to 10,000 cubic yards and 1,200 to 1,500 cubic yards of silt from the sediment basin, respectively. Similar to turbidity (see previous Section), there are no standards associated with Total Suspended Solids. However, as indicated earlier, higher levels of Total Suspended Solids will most likely be associated with higher levels of disease-causing microorganisms, as those organisms are attached onto the particles.

In late 2012, Fenstermaker and Associates, under contract by the LDNR, placed five data sondes in the M-1 Canal and the Chenal to determine the hydrology of this portion of the watershed and the current level of sediment flux into the South Flats (Figure 16). A local surveyor has surveyed the channels profile and the data sonde housings. Six months of continuous data is being collected, and will be used to model the hydrologic conditions on The Island. Data is continuously being downloaded and processed (Figures 17 and 18). Local residents are assisting Fenstermaker and Associates, by collecting time sensitive water samples and precipitation data.

2.2.8 Temperature

Although the record is somewhat noisy and sporadic, the data collected suggests that lake water temperature shows an increasing trend for the last 50 years (Figure 19).

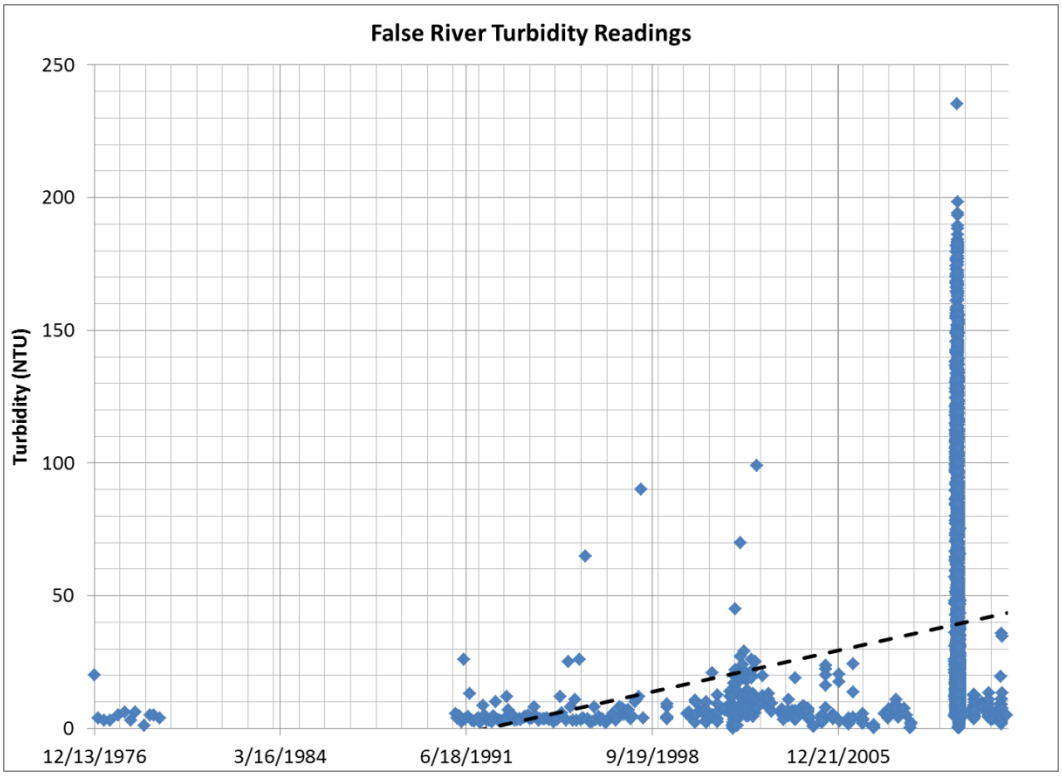


Figure 14: False River turbidity readings

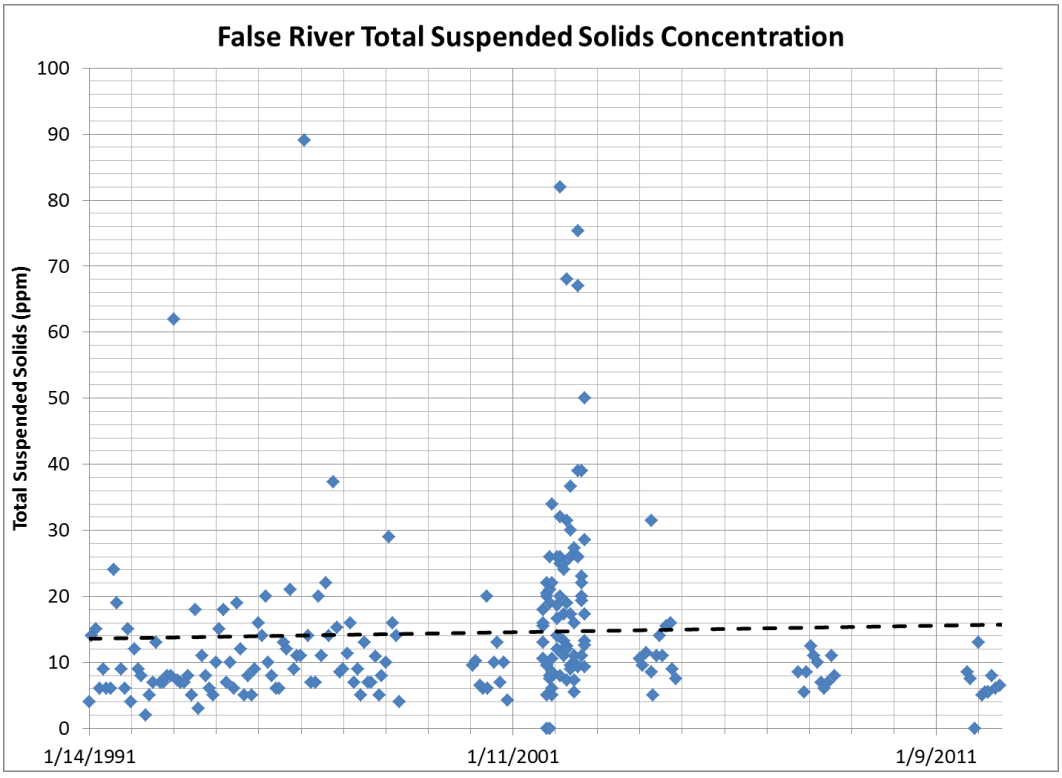


Figure 15: False River Total Suspended Solids concentrations

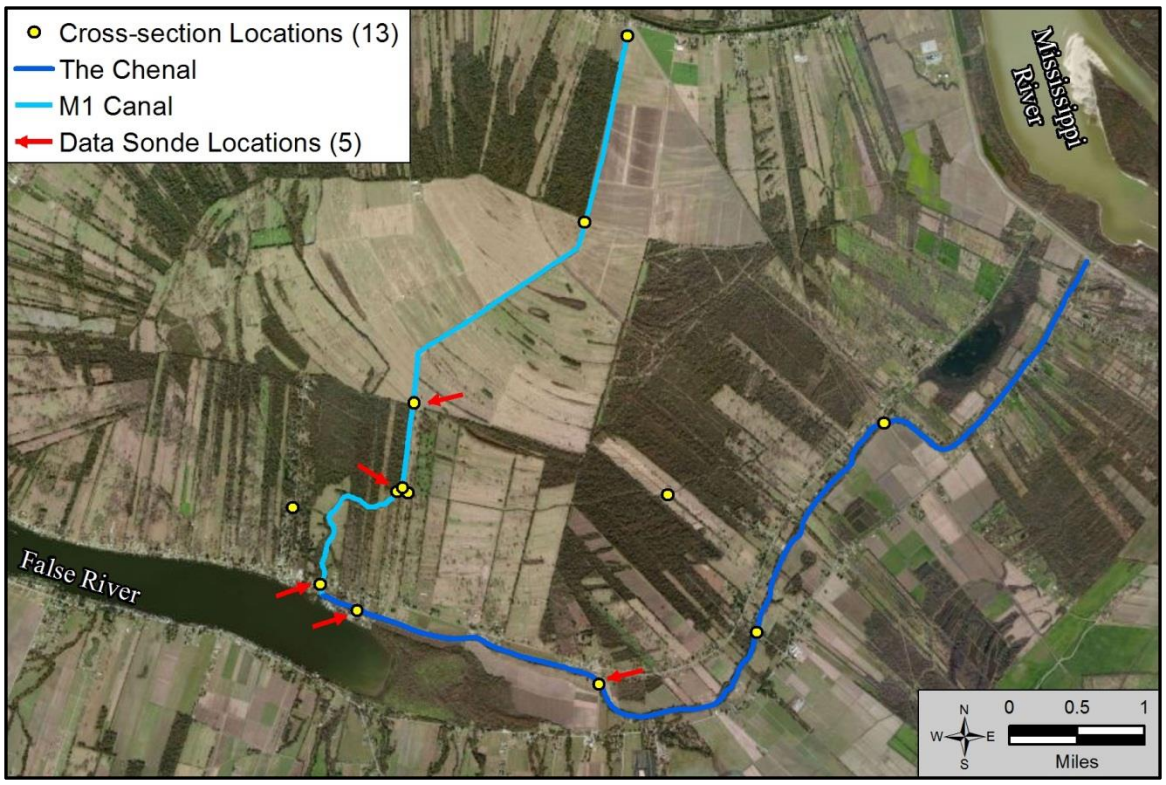


Figure 16: Location of data sondes

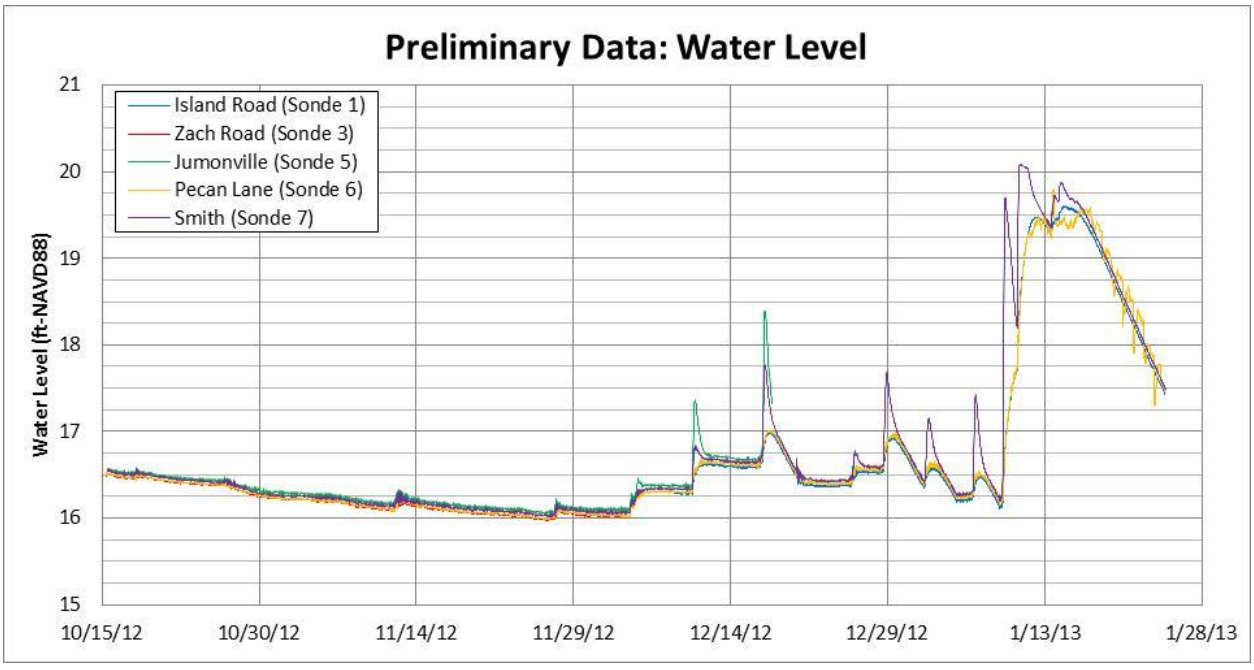


Figure 17: Current study preliminary hydrograph

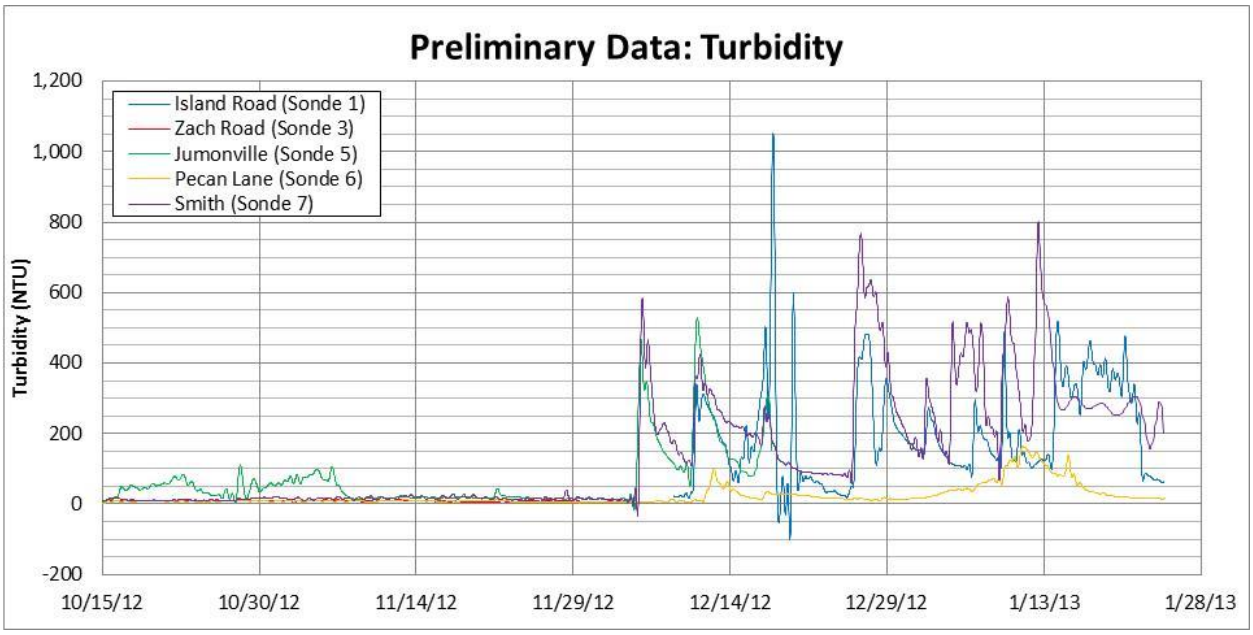


Figure 18: Current study preliminary turbidity data

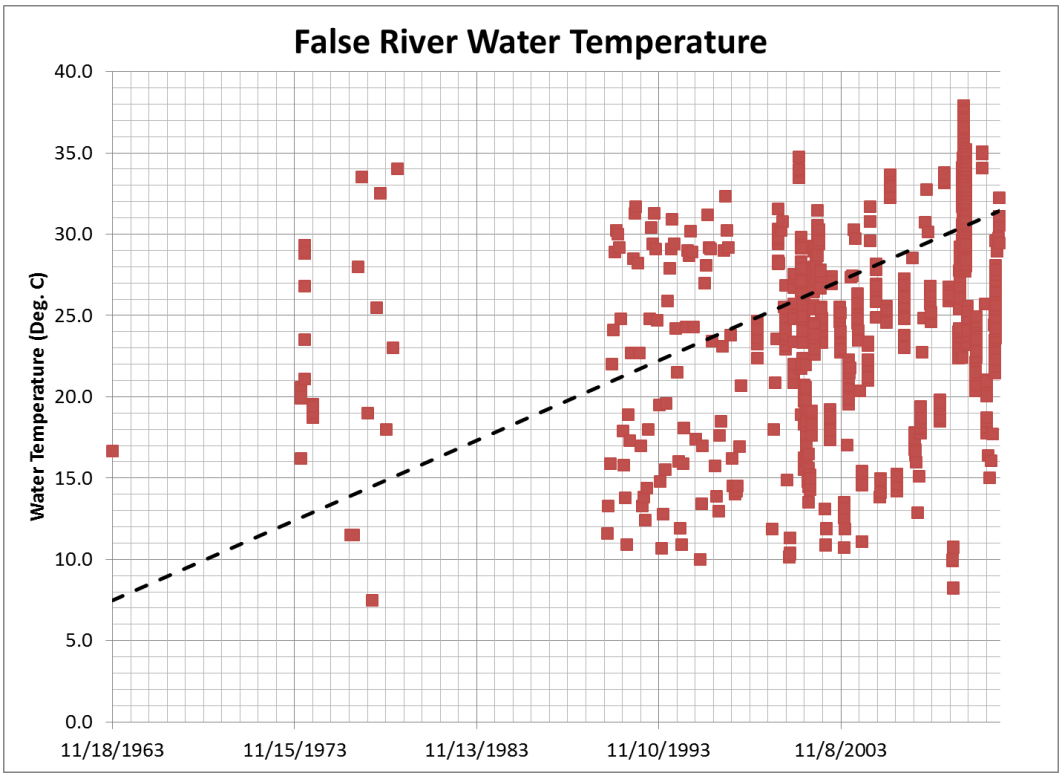


Figure 19: False River water temperature readings

2.3 Fisheries

2.3.1 Non-native Fish

Due to habitat degradation that has occurred over the years, and the increase in rough fish, particularly carp species (Figure 20), there is a need for control of these invasive fish populations. Asian carp (i.e., common carp) are present in False River. Gillnet data depicted in Figure 20 has shown an increase in carp catches, especially since 2000 [reported in spring catch-per-unit-effort (CPUE)]. This is probably due to the increase of soft sediments, and the commercial netting ban that was in place until 2012.

The presence of grass carp has been documented since the late 1980s. The introduction of the invasive fish has not been authorized by LDWF. It has yet to be determined if the fish are diploid or triploid. Due to the reproductive biology of grass carp, the carp may spawn, but subsequent egg development will be unsuccessful, due to the lack of current in False River. It is speculated that the presence of the herbivorous fish is contributing to the loss of aquatic vegetation. Capture records of grass carp in the lake are as follows:

May 1989	a grass carp weighing approximately 52 pounds is captured near the Lighthouse Canal.
February 1991	during routine gillnet sampling, a grass carp is netted in the south end of the lake. The fish escapes capture by tearing the net.
December 2005	during routine gillnet sampling, a grass carp is netted in the north end of the lake.
January 2010	during routine gillnet sampling, two grass carp are netted, one in the south end, and one near the Lighthouse Canal.

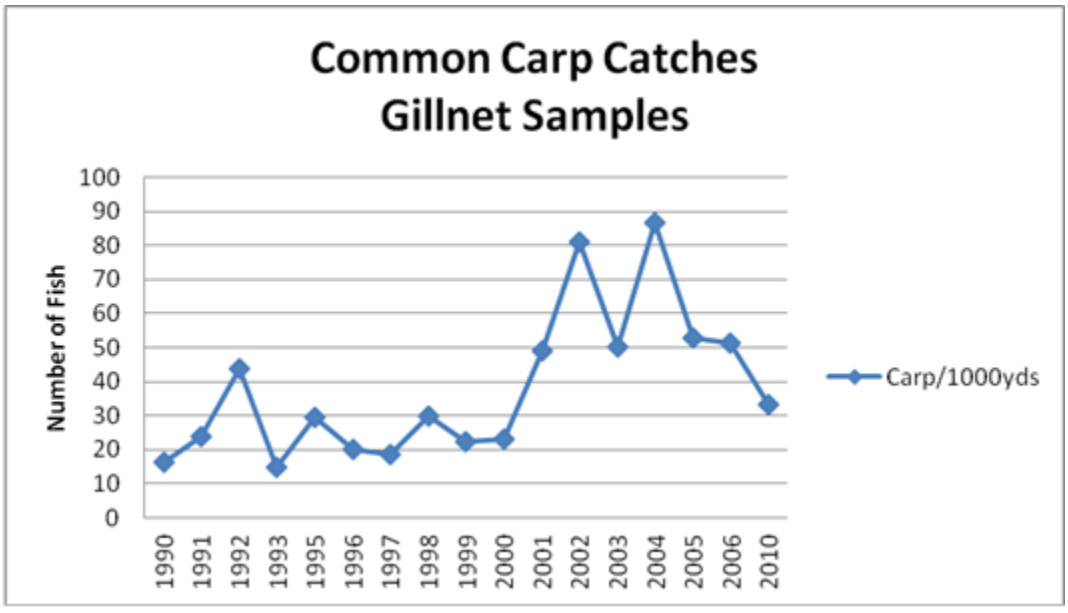


Figure 20: Common carp CPUE from gillnet samples on FR (1990 to 2010)

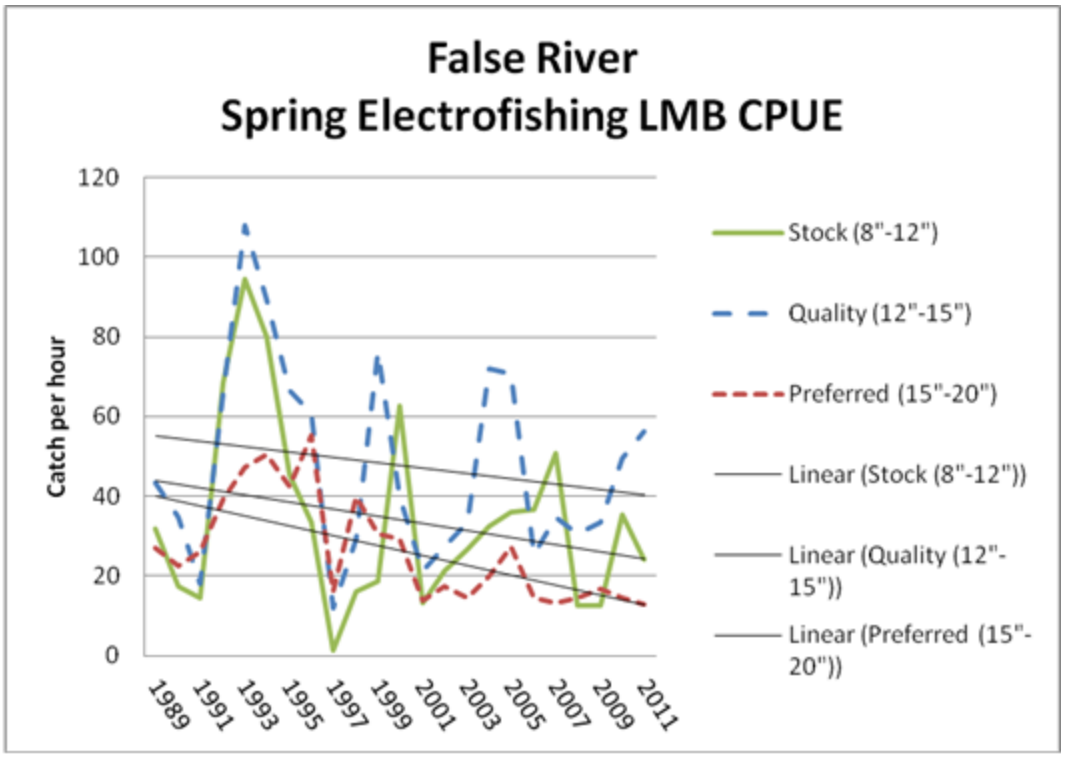


Figure 21: CPUE values for largemouth bass on FR (1989 to 2011)

2.3.2 Declining Stock

Due to the overall declining bass population, trophy lake status for False River was rescinded in 1998. This decline followed the completion of the Bayou Grosse Tete Watershed Project. The additional drainage lead to heavy sedimentation on the north and south ends of the lake. Consequently, this resulted in loss of spawning habitat, and virtual elimination of submersed aquatic vegetation. Since 2000, total spring electrofishing catch rate has fluctuated widely between 26 and 154 bass per hour (Figure 21). Work done to reduce erosion in the M-1 canal in 2005 and clean out of the sediment trap in 2006 was followed by a rise in quality size fish. These higher numbers indicate that more habitats are available for successful spawns. Contrary to other fish populations in the region, the fish populations of False River did not suffer from hypoxia-induced fish kills following Hurricanes Katrina (2005) and Gustav (2008).

2.4 Aquatic Habitat

2.4.1 Loss of Edge Habitat

False River's watershed is comprised of 34,453 acres of mostly agricultural pastureland in the interior of the island, and mixed woodlands and pasture-land northeast of New Roads. Peak crop

production was reached in the 1980s, with approximately 75% of the island under agricultural use. Currently, the total watershed area consists of 2,300 acres cropland, 1,700 acres residential/commercial, 27,353 acres of pasture and woodland, and the remaining acreage comprising the surface area of the lake. There are two main drainages in the watershed that flow into the lake: (1) Patin Dyke Slough (M-2 Canal) on the north end drains 25% of the watershed; and (2) Discharge Bayou (M-1 Canal) on the south end drains the remaining 75%. The NRCS installed a sediment trap on the M-1 Canal. NRCS also fenced many of the canals in pastureland areas to reduce bank erosion. Efforts to decrease the amount of sediment discharging into False River, although difficult to quantify, are evident. Since the maintenance of the sediment trap and bank stabilization efforts, the sediment trap is apparently collecting less material, and largemouth bass stocks have increased. Also, native vegetation is starting to establish in the south flats.

2.4.2 Loss of Submerged Aquatic Vegetation

In the 1980s, prior to completion of the Bayou Grosse Tete Watershed Project, there were dense stands of submersed aquatic vegetation on both the north and south flats of False River. There was also a fringe of submersed vegetation along the shoreline, as well as a small stand of lotus near the south flat. By 1990, after completion of the first phase of the Project, the north flat became void of vegetation. The lake's vegetation was in steep decline for the next couple of years except for the lotus stand. Upon completion of the project, most of the lake had become void of vegetation except for some floating plants and the expanding stand of lotus. In 1993, hydrilla first appeared in the lake. Hydrilla heavily infested the shoreline on the Island side from mid-lake to the south flat and on the LA 1 side from the south flats to 1.5 miles north near the Bonaventure landing. In 1997, aquatic vegetation was again in steep decline.

The Lewisville Aquatic Ecosystem Research Facility was funded by PCPJ to attempt to establish submersed native vegetation in 2000. It was reported in a vegetation survey by LDWF in 2003 that there was no survival of introduced vegetation, even in the enclosures that protected the plants from herbivory. Currently, there is less than 5% coverage of aquatic vegetation on the lake. There was a stand of lotus on the south flats of at least 40 acres annually. The lotus was most likely able to survive the conditions of the lake due to its ability to grow to the surface for sunlight and its substantial root system. Since 2009, lotus is no longer present in the lake.

Soil samples were collected from the littoral zones of the lake in January 2010. Analysis of sample nutrients and alkalinity suggest that soil conditions are suitable for plant growth. However, the instability of the soil and the continuous input of silt are not conducive to re-establishment of vegetation.

A survey of the lake in 2011 found that there is a 15 acre stand of southern naiad located in the south flats. This marks the first evidence of submerged aquatic vegetation, besides lotus, in the lake since 2001. The establishment of southern naiad is evidence that lake conditions may now

be more conducive to vegetation establishment. These improvements are since the work on the M-1 Canal in 2005, and the 2010 work done on the M-2 Canal on the north end of the lake.

There is currently a lack of complex cover in False River. The deficiency is primarily due to the lack of submersed vegetation. A range of 15-30% areal coverage of complex cover is considered optimal for sportfish habitat. False River currently supports no more than 5% total aquatic plant coverage. Complex cover in False River is entirely limited to man-made structures, including piers and structures placed in the lake by anglers. In an effort to increase future angler success rate, the addition of artificial complex cover will be considered.

2.4.3 Boat Wake

Elevated turbidity and sediment resuspension, particularly on the north and south ends, has been associated with boat traffic and can result into minimized spawning habitat for nesting fish. Old shell beds that once served as excellent substrate for redear sunfish spawning can become silted over. During the carp spawning season, residents along the lake complain that thousands of fish root around in the loose sediments muddying the water. These fish are also contributing to the loose sediment issues. Average depth of the flats is less than 5 feet and the loose sediments are easily stirred by boat traffic and wave action. Soil samples collected in January of 2010 showed that the flats' substrate is high in organic matter in relation to the rest of the lake's littoral zone.

2.5 Land Use Development

2.5.1 Shoreline Development

The natural shoreline of any lake in south Louisiana is usually a very gentle slope with vegetation at the water's edge and up the slope. This situation allows wave energy to be gradually dissipated both incoming and returning to the lake. As the developments around False River continue to increase, the value of the waterfront real estate has escalated. This has led to a situation where property owners, either in an effort to protect their structures or to increase their land area have constructed vertical bulkheads. These bulkheads are becoming more and more prevalent on the False River shoreline.

2.5.2 Bulkheads

As the length of vertical bulkhead shoreline has increased it has created an unintended erosional and turbidity problem. In short, vertical bulkheads cause increased erosion of the lake bottom seaward of the bulkhead. Waves, especially breaking waves, impacting a vertical surface have a large portion of their energy directed downward to the mudline. This downward moving water

erodes the bottom sediments as it retreats from the bulkhead. The eroded sediments increase the turbidity in False River while increasing the water depths seaward of the bulkheads.

2.5.3 Piers, Boathouses and Boatlifts

There are numerous piers, boathouses and boatlifts along the False River shoreline, including abandoned pier and structures in disrepair. These structures and the boat traffic associated with them create shade and disturbance which can limit aquatic plant growth and reduce fish habitat. In addition, construction and maintenance activities can cause the loss of shoreline vegetation and an increase in turbidity.

2.5.4 Sewerage Systems

There are numerous camps and residences along False River serviced by individual sewerage system. In the late 1990s and early 2000s, the PCPJ investigated the source of elevated fecal coliform counts measured in the lake's water (Figure 8). The PCPJ and other stakeholders remedied the sources identified by repairing and extending sewers. In addition, the LDHH is requiring the update of individual waste treatment systems when a property transfer occurs. Recently the PCPJ has made an application to LDHH in order to finance the expansion of sewer service around the lake.

2.5.5 Drainage Systems

LDNR obtained and reviewed the 2012 Pointe Coupee Parish Drainage Master Plan. The 2012 Plan is consistent with the mandate of the FRWC. LDNR is evaluating impacts to the False River Watershed and will discuss any suggestions with Parish officials and the FRWC as the various projects are implemented.

3 Management Strategies

3.1 Flooding

3.1.1 Lake Level Management

3.1.1.1 Natural Cycle

False River is an inactive oxbow of the Mississippi River. Current lake levels are stabilized at 16'MSL with limited seasonal fluctuations (Figure 2). Historically the lake was connected to the main river channel and water levels are reported to have fluctuated upwards of 30 feet annually. To improve the health of the lake, consideration should be given to manage water

levels to the extent practical to mimic more natural seasonal fluctuations. Fluctuating water levels are dependent on the capacity of the control structure at the Lighthouse Canal. Typical annual Mississippi River fluctuations are low water levels in the late summer and winter months (July–January), and high water levels in the spring and early summer months (February– June).

3.1.1.2 Tropical Storm/Flooding Event

In order to increase the volume of water that False River can store during large rain events such as tropical storms, the short-term lake level management has been addressed by the PCPJ by preemptively opening the gates of the Lighthouse Canal structure. In addition, the spillway on Bayou Sere has been recently renovated to allow for additional discharge from the lake at stages above 16.5 feet, although an obstruction remains that needs to be addressed. This management procedure is consistent with recommendations made by a local civic association, although the rate at which the lake is lowered may need to be further addressed.

As indicated earlier, an engineering firm, under contract by the LDNR is collecting hydrologic data along Discharge Bayou, including the M-1 Canal and its tributaries, and the Chenal (Figure 1) to assess the hydrologic response of this portion of the watershed to storm events and model the current hydrologic conditions on The Island. The model will be used to evaluate potential hydromodifications along the drainage canals and bayous to retard flow, increase storage capacity and decrease sediment influx into the lake. A similar assessment will need to be complete for the remaining portions of the watershed not covered by the current study to evaluate similar modifications.

3.1.1.3 Other Lake Level Management Issues

Lake level management can be a useful tool to improve water quality. Exposure of shallow water areas have the beneficial effect of hardening the lake substrate resulting in improvement in lake water quality from decreased turbidity, and improvement in fish habitat. Similarly, periods of low water level can be used by camp and home owners to perform shoreline maintenance on piers and bulkheads.

3.2 Water quality

3.2.1 Nutrient Run-off Management

As indicated in Section 2.2 of this report, there has been quite a bit of interest in False River over the years, resulting in other agencies and organizations collecting water quality data in the lake. PCPJ, LDWF, USGS, USEPA, Gulf Engineers & Consultants, Inc. (GEC) and LDHH have each collected water quality data at various locations and times over the years. GEC collected water quality and sediment data during July, August and September 2010 at several locations.

LDEQ has collected water quality data on False River (subsegment 120108) from January 1991 through September 2012, at an ambient site south of New Roads. These data were collected

annually between January 1991 and May 1998, and then on a cyclic schedule from 2000 through 2011/2012, including 2000, 2004, 2007/2008 and 2011/2012. Nitrogen as nitrite-nitrate ($N0_2/N0_3$) exhibits seasonal patterns with higher values (0.2-0.6 mg/L) from November through February and lower values below 0.2 mg/L from March through October. Average annual $N0_2/N0_3$ values have increased during the 2007/2008 and 2011/2012 ambient sampling cycles. Total Kjeldahl Nitrogen remains relatively consistent throughout the year with values of 1.0-1.5 mg/L, and with one extreme value of 57.6 mg/L on August 1, 2000. Similarly total phosphorus (TP) concentrations remained relatively consistent, with values below 0.2 mg/L, with a few exceptions and one extreme value of 24.44 mg/L on August 1, 2000. Average annual TP values have also remained relatively constant except during 2000, due to the high value in August.

LDEQ's Nonpoint Source Program (NPS) has developed a Management Plan that includes types of best management practices (BMPs) that could be utilized to reduce $N0_2/N0_3$, TP and turbidity from agricultural activities such as crops and pastures. Appendix B includes a set of BMPs designed by USDA to reduce sediment, nutrients, pesticides, organic material and bacterial concerns in surface waters from croplands and a set of BMPs to reduce these pollutants from pasturelands. In addition, the hydrologic model currently being prepared by an engineering firm for LDNR to identify potential hydromodification of the Discharge Bayou watershed will evaluate methods to reduce nitrogen loading into False River by fostering nutrients assimilation in vegetation buffer/filter zone, grassed bench, as well as other vegetative edge/riparian habitats, and retarding surface water runoff and stream flow by drainage network modification.

3.2.2 Sediment Run-off Management

LDEQ's data reflected concentrations of Total Suspended Solids (TSS) which fluctuate throughout the year, with values typically ranging from 5-20 mg/L, and a few extreme values of more than 60 and 90 mg/L during January and February, respectively. Average annual concentrations of TSS have fluctuated from 1991–2011/2012, but have declined since 2004. Turbidity values in False River have typically remained below 10 nephelometric turbidity units (NTU), with only five (5) exceedances above the state's NTU guideline of 25 for fresh water lakes. Similar to TSS, average annual NTU values have fluctuated from 1991-2011/2012 but have declined since 2004.

GEC also collected turbidity data from July 12, 2010 through September 20, 2010, with high values over 100 NTU at site FRS-2 on July 20, 21, and above 40-50 on July 22 and from 50-150 on July 23-26, but returned to a normal range below 20 NTU by July 27th, followed by a few high values on August 5th and 8th, with one extreme value of 235.2 NTU on March 8th. A few values above 40 NTU on August 9th and 10th were observed from August 11th - 30th , two sites, FRS-2 and FRN-1, had values above 100 NTU, but dropped by August 31st and returned to normal by September 1, 2010. LDEQ's ambient water quality data collected south of New Roads from October 2011 through August 2012, indicated NTU values below 10.

3.2.2.1 Sediment Control Ordinance

A sediment control ordinance is currently being drafted, based on a model ordinance obtained from the USEPA, to address soil disturbing activities within the watershed and provide for measures to decrease the sediment flux to the lake. The draft ordinance developed will be submitted to the Pointe Coupee Police Jurors for their consideration.

3.2.2.2 Servitude Ordinance

The PCPJ has a 100-foot easement on both sides of the channels they maintain. Currently agricultural activities occur within this easement. An ordinance is being drafted to change land use in part of this easement and allow for a buffer zone between agricultural activities and the drainage channel. NRCS or other conservation funds will be considered to offset any impact to the landowner.

3.2.2.3 Operation and Maintenance Plan

The PCPJ is planning to implement the routine cleaning of the M-1 Canal sediment basin and to continue making improvements to reduce erosion and sediment runoff into False River. They plan to continue with the routine maintenance and inspection of False River's drainage network. A draft Operation and Maintenance Plan developed by LDNR has been submitted to the Pointe Coupee Police Jurors for their consideration.

3.2.2.4 Land-Use Management

Two companies have indicated plans to establish mitigation banks in the watershed and are currently in discussions with the USACE, but the mitigation bank projects have not been approved to date. The Ponderosa Ranch is currently on public notice and the Grand Swamp is currently in draft prospectus status.

3.2.2.5 Channel Hydromodification

To address the changes that were made by the SCS to the watershed, Fenstermaker and Associates, under contract by the LDNR, is currently collecting data on the M-1 Canal and the Chenal to determine the hydrology of this portion of the watershed and the current level of sediment flux into the South Flats. The data is being used to model the hydrology of The Island and determine the most appropriate engineered method to modify the drainage network to address sediment flux into the Lake. A similar project is planned for the M-2 Canal and False Bayou and the North Flats.

3.2.3 Private/Public Sanitary Effluent Management

Currently, LDHH is requiring the update of individual waste treatment systems when a property transfer occurs, and many of the outdated systems have been replaced by newer units. In addition, the PCPJ has a grant application in with LDEQ for $100,000 for evaluation of The Island sanitary sewer system. The implementation is projected at $5-6 million and is not

currently funded. LDNR is working with LDHH to make information on its website available regarding when new sewer systems are required and BMPs for existing individual waste water treatment systems. Information obtained to date has been placed on the LDNR website (http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=924).

3.2.4 Storm Flow Management

3.2.4.1 Sediment Control Ordinance

A sediment control ordinance is currently being drafted, based on a model ordinance obtained from the USEPA, to address soil disturbing activities within the watershed and provide for measures to decrease the sediment flux to the lake. The draft ordinance developed will be submitted to the Pointe Coupee Police Jurors for their consideration. In addition, the FRWC proposed the development of BMPs for False River Watershed in collaboration with LDEQ related to home construction and other items that may cause runoff issues and provide to PCPJ for consideration to use as part of building permit process or to otherwise make available.

3.2.4.2 Servitude ordinance

The PCPJ has a 100-foot easement on both sides of the channel they maintain. Currently agricultural activities occur within this easement. An ordinance is being drafted to change land use in part of this easement and allow for a buffer zone between agricultural activities and the drainage channel. NRCS or other conservation funds should be considered to offset any impact to the landowner.

3.2.4.3 Operation and Maintenance Plan

The PCPJ is planning to implement the routine cleaning of the M-1 Canal sediment basin and to continue making improvements to reduce erosion and sediment runoff into False River. They plan to continue with the routine maintenance and inspection of False River's drainage network. A draft Operation and Maintenance Plan developed by LDNR for the FRWC has been submitted to the Pointe Coupee Police Jurors for their consideration.

3.2.4.4 Channel Hydromodification

To address the changes that were made by the SCS to the watershed, Fenstermaker and Associates, under contract by the LDNR, is currently collecting data on the M-1 Canal and the Chenal to determine the hydrology of this portion of the watershed and the current level of sediment flux into the South Flats. The data is being used to model the hydrology of The Island and determine the most appropriate engineered method to modify the drainage network to address stormflow into the Lake, including sediment and nutrients fluxes. A similar project is planned for the M-2 Canal and False Bayou, and the North Flats.

3.2.5 Shoreline Modification Management

Shoreline modifications are prevalent along most of False River, in the form of shoreline hardening and bulkheads. The vertical aspect of bulkheads causes erosion, turbidity and wave within the lake. Mitigation of wave energy from vertical bulkheads can be accomplished by multiple methods including the following treatments:

(1) placement of a debris fence (commonly referred to as Christmas tree fences), these are easy and relatively inexpensive to construct and can be very effective in removing wave energy from the shoreline (Figure 22). These structures could be built seaward of the bulkhead, approximately 10-15 yards in front to remove the wave energy from the bulkhead. They also have the potential to create a fish habitat that currently does not exist. These fences have been used for many years by coastal parishes in their coastal restoration efforts. The debris fences allow water to filter through while eliminating the wave energy.

(2) placement of rip-rap in front of the vertical bulkhead to create a porous sloped surface. This would allow the wave to gently run up the slope while dissipating energy on the irregular surface. Prior to doing this, we suggest the property owner have their bulkhead evaluated by a Professional Engineer to insure that the material's placement will not have an adverse impact on their bulkhead or any adjacent structure.

Any shoreline treatment that mimics the lake's natural shoreline and prove edge habitat would be a huge advantage over vertical bulkheads. There are several methods to "harden" a shoreline while having it appear to be natural. This method uses gentle slopes and vegetation to dissipate wave energy.

Figure 22: Examples of shoreline mitigation treatments

The FRWC proposes to address shoreline modifications issues through three actions as follows:

(1) EDUCATE. The vast majority of False River property owners are not aware of the harmful effects that vertical bulkheads have on their lake's environment. FRWC proposes an educational outreach effort to make property owners aware of the current conditions. A handout illustrating the harmful effects would be created and copies provided at local government offices, fairs and other public events. Many property owners, once aware of the issue will take steps to mitigate the situation on their property.
(2) ENTICE. While many owners will undertake effort and expense to correct an issue once aware of the problem, others may choose not to mitigate or not be financially able to make the changes. FRWC suggests that an enticement or incentive program be created to assist property owners that wish to perform mitigation efforts, such as making equipment, labor or materials available at no or minimal charge.
(3) ENFORCE. Draft an ordinance for consideration by the Pointe Coupee Police Jurors that prevents construction of vertical bulkheads, unless they include vertical bulkheads with a permanent mitigation measure, such as a debris fence or sloped rip-rap, included in the permit.

FRWC and PCPJ plan on addressing the matter of ownership of water bottoms with the State Land Office. It is likely that debris fences and rip-rap placed in front of the bulkheads may be constructed on State-owned water bottoms. Once those issues are resolved, the shoreline policy should be implemented.

3.2.6 Watershed Conservation Measures

Over the last several years, there has been an intensive effort to implement watershed conservation measures within the False River Watershed. These measures are part of an ongoing effort between LDAF through the Soil and Water Conservation Districts (SWCD) and NRCS. Conservation practices in the False River watershed implemented through USDA/SWCD cost-share, incentive, and easement programs from 2008 to present, include the following:

(1) Environmental Quality Incentives Program (EQIP) that allows producers to implement conservation practices to address natural resource concerns on eligible land. Primary practices include cross fencing, waterlines for livestock, watering systems/troughs, heavy use area protection, pasture planting, water wells for livestock and well decommissioning.
(2) Wetland Reserve Program (WRP) allows producers to implement practices intended to restore, protect, and enhance wetlands on eligible lands. Primary practices include bottomland hardwood reestablishment and hydrologic restoration.
(3) Grasslands Reserve Program (GRP) works with producers to restore and protect rangeland, pastureland, and other grasslands while maintaining the land's suitability

for grazing on eligible land. Primary practices include grazing land/grassland management, rotational grazing, cross fencing and critical area planting.

A considerable number of outreach efforts have been conducted in the False River Watershed. These include the following:

(1) Upper Delta Soil & Water Conservation District. Locally-led natural resource needs identification meetings in New Roads, LA. These locally-led meetings are not specific to the False River watershed, but are public meetings designed to assess and prioritize natural resource concerns across Point Coupee Parish. At these meetings, the False River watershed is occasionally listed. Previous meetings occurred during the spring of 1997, 2002, 2008, 2009, 2010, 2011, 2012 and 2013.
(2) False River Watershed Informational Public Meetings and Feasibility Report and Environmental Assessment. Included public involvement, review, and consultation with the USACE (fall 2002 and 2011), the False River Civic Association (1999), the Farming and Rural Conservation Agency, LDNR, LDWF, PCPJ (2011 and 2012).

In addition, the LSU AgCenter has developed agricultural BMP manuals for each Louisiana commodity. Commodity manuals applicable to commodities in the False River watershed are included in Appendix C.

3.2.7 Habitat Restoration

3.2.7.1 Artificial Reefs

Due to shoreline modifications and the absence of aquatic vegetation, False River has minimal complex cover available for fishes. FRWC recommends developing and implementing an artificial reef project. The addition of artificial structures will provide needed cover for sportfish and increase angler success. Work with local sponsors to secure funds, materials and labor.

3.2.7.2 Spawning Beds

Siltation has covered most of the natural hard bottoms (i.e. shell beds) in False River. A recent survey of the lake bottom by LDWF has identified a 40 acres shell bed hard bottom in the vicinity of the North Flats. Hard bottoms serve as spawning habitat for nesting sportfish. The objective is to enhance spawning habitat in the lake by the addition of gravel beds. Gravel beds shall be created in locations that were either historic sites of natural shell beds or deemed suitable by LDWF Inland Fisheries biologists. Once spawning bed locations are identified and funds are available, FRWC will proceed with the installation of multiple gravel beds to provide spawning habitat for nesting sportfish. FRWC will identify incentives to encourage camp and home owners to assist in the placement of beds.

3.2.7.3 Vegetation Planting

Siltation issues and habitat degradation from undesirable fish species (e.g. the unauthorized introduction of grass carp) has led to the almost complete absence of aquatic vegetation in the lake. Native aquatic plant species suitable for establishment in False River, along with suitable lake conditions and locations for planting, shall be identified. Once all criteria are identified and satisfied, plantings shall begin as funds are available.

3.2.7.4 Creation of Island/Terrace Habitat

The USACE, in their proposed restoration strategy for the lake, has indicated they would rely on dredging the lake sediments to create one or more island/terrace and promote the establishment of aquatic "edge" habitat as a potential restoration measure. Aquatic habitat establishment would provide beneficial complex fish environments which have been lost due to siltation and shoreline modifications. The construction of the island/terrace would coincide with a limited drawdown of the lake to promote hardening of the lake substrate and reduce turbidity.

FRWC recommends using Capital Outlay funds for the creation of islands/terraces. These islands/terraces will improve wildlife habitat, wave attenuation, water temperature cooling, turbidity reduction and water quality improvement within the South Flats and can be scheduled to be constructed in one event or over a two-year period (two events) based upon an estimate of funding that may become available yearly. Limited funding has been obtained to initiate the process. Once sufficient funding has becomes available contracting, project engineering, permitting and public bidding must occur prior to construction.

3.2.8 Fisheries Management

3.2.8.1 Seasonal commercial harvest of rough fishes

FRWC recommends continuing to implement a recurring commercial net season to allow for the take of rough fishes, and to continue to monitor rough fish populations through seasonal gill netting.

3.2.8.2 Stocking

FRWC recommends continuing to evaluate the fisheries and make recommendations to LWDF for fish stockings. In 2012 with the help of LDWF the lake was restocked with redear sunfish in addition to its regular scheduled stocking by the agency.

3.2.8.3 Standardized Sampling

FRWC recommends continuing standardized sampling of fish populations to evaluate the conditions of the stock and evaluate nesting species success. This includes a three-year age and growth study of largemouth bass. Collection of samples for study was completed spring 2012. Results of data analysis will be available fall 2013. Results will allow for informed consideration of harvest regulations.

3.2.8.4 Siltation

FRWC recommends determining the current conditions of lake siltation and turbidity. Work with PCPJ, LDNR, NRCS, LDEQ and USACE to secure funds for projects to address these problems. LDNR has currently a project researching the contribution of sediment to the lake from The Island and evaluating solutions to address the contributions, as necessary.

3.2.8.5 Monitor Grass Carp

FRWC recommends continuing to monitor grass carp populations in the lake, to work with USGS to determine ploidy of the population, and to investigate other potential herbivores and exotic species in the lake.

3.2.8.6 Limnological Survey

Purpose is to monitor lake health and productivity. FRWC recommends that this work be performed in conjunction with Louisiana State University. Proposal for project has been submitted. Project will begin once funding is secured.

3.2.9 Coordination of Federal, State, and Local Efforts to Improve and Protect Water Quality; Surface Water Resource Management and Protection Policies

The PCPJ has modified the extent of the no wake zones in the North and South Flats. Surveying has been completed and information provided to the PCPJ and FRWC to review and determine proper placement. A public hearing on the amendment to Sub-section (a) of Section 15-6 of Chapter 15 of the Code of Ordinances re-defining the width of such zones and establish a six (6) feet [at pool stage (i.e. lake level at 16 ft.MSL)] buoy protection on the North and South Flats of False River was held, and the amendment passed by the PCPJ on September 25, 2012. The amendment became effective in late October and new GIS locations of the buoys were provided to the Kiwanis Club for relocation. It is expected that the buoys will be relocated during the spring 2013. This will reduce boat traffic and turbidity in the North and South Flats, and provide low wake areas for recreational fishing.

3.2.10 Education and Outreach

Documents and presentations have been placed on the False River Ecosystem Restoration Initiative site on the LDNR web site along with FRWC agendas and minutes, news articles and frequently asked questions. The website is updated with a list of actions completed and in progress. Press releases are issued as actions are taken. E-Mails, flyers and talks at various nonprofit meetings are held to keep communities informed. Information generated by agencies or obtained to date has been placed on the LDNR website (http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=924).

4. Funding Strategies

4.1 Capital Outlay for Ecosystem Restoration

House Bill 2 (HB 2) approved by the Legislature in the 2012 Regular Session included $500,000 in Priority 2 funding and $2.2 million in Priority 5 for the False River Ecosystem Restoration Project. The Bond Commission granted a line of credit at their November 15, 2012 meeting for the priority 2 funds. HB 2 of 2013 moves $1 million (of the previous $2.2 million in Priority 5) to Priority 1 with 1.2 million remaining in Priority 5. This project funding is critical in order to keep the project moving as scheduled (Figure 23).

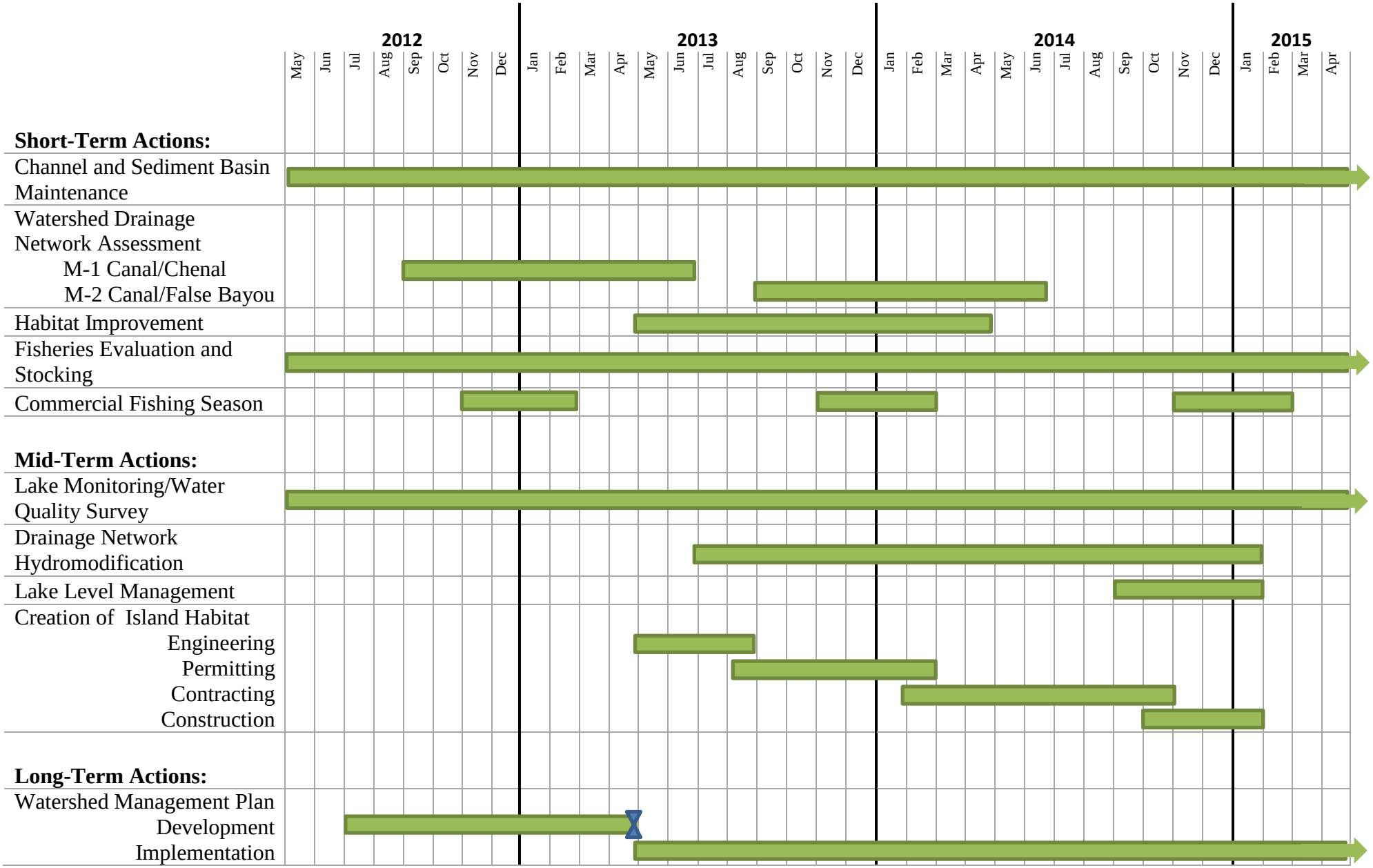
4.2 False River Restoration Fund

The False River Restoration Fund was established with the help of The Baton Rouge Area Foundation as a repository for monetary donations from individuals, groups, industry, other Foundations and businesses interested in the work being done to restore and enhance False River and its surrounding watershed and habitat. The Fund is a vital part of the coalition of citizens, local governments, Federal Agencies and State Agencies working to implement House Concurrent Resolution 123 of the 2012 Regular Session of the Louisiana Legislative. The Fund may be used to pay for services and materials to further the restoration of the watershed and habitat of False River, and to provide matching contributions that are required for state and/or federal funds provided.

4.3 Other Funding Opportunities

The FRWC is continuing to pursue funding avenues to ensure that the management strategies proposed in this report are implemented and that a plan to maintain the improvements is set in motion. In 2012, LDNR submitted on behalf of the PCPJ a request to the Apache Corporation for a tree planting and habitat restoration program. The request was not funded by the Apache Corp. program this year. A grant application will be prepared and submitted to Apache Corp. in the next grant cycle and additional partners for habitat improvement will be identified. Similarly, in 2012 LDNR approached the Baton Rouge Green Foundation to find out whether it could provide trees for the project. Baton Rouge Green Foundation relies on donations to fund their efforts and concentrates its efforts in East Baton Rouge Parish. They did offer to potentially conduct a reduced-price tree sale as a source of tree, and/or to potentially work with a Pointe Coupee area donor (if donors can be identified) as a way to promote tree planting. In addition, a NRCS grant application for channel landowners to reduce erosion was identified as a funding mechanism. NRCS has received four applications for EQIP for livestock producers within the Island portion of the False River Watershed. These applications are for fences, waterlines, water troughs, and heavy use area protection. FRWC proposes to remain in contact

Figure 23: Proposed Short-Term Implementation Schedule



with state agencies such as LDEQ and LADF for 319/NPS, and LDHH to seek future funding for the False River watershed, and to pursue partnership with local industries and other stakeholders.

5 Recommendations

This plan takes a multifaceted approach to address issues within the watershed, including engineered, education, enticement and enforcement solutions. The plan draws from the expertise of many parish, state and federal agencies, including LDNR, LDWF, LDEQ, LDHH, LDAF, NRCS, as well as other local stakeholders. The plan also incorporated the findings and recommendations presented in a Feasibility Study previously performed by the USACE. The first solution is to educate the public and parish officials to take a short and long term view of the maintenance of aquatic habitat and water quality of the lake. This requires the stakeholders to voluntarily maintain and/or modify their shoreline, bulkhead, sewerage system, land-use/farming practices and runoff in a manner consistent with best management practices. These common sense activities would be achieved through community information releases and outreach. The second solution would be to provide enticement to stakeholders not readily willing or able to make limited modifications to their property in the form of available material, and other non-monetary assistance, and assist landowners in taking full advantage of programs supported by the state, the U.S. government and others. Finally, to present future deterioration of the lake shoreline, fisheries, aquatic habitat and water quality, implementation and enforcement of new ordinances will be sought to address these shortcomings.

The previously mentioned solutions address small scale issues that can be dealt with at the property level. For watershed scale issues designed to address the alterations performed in the 1970s and 1980s by the SCS, an engineered solution is needed. Hydromodifications of channels, canals and sediment trap, and the accumulation of loose sediment in the lake's flats needs to be modeled/tested, designed and implemented. Hydromodification of the two principal drainage systems would address the sediment and nutrient flux into the lake and result in improved water quality, aquatic habitat and fisheries, and assist in flood control/mitigation. Loose sediment accumulations are expected to be consolidated by lowering the lake's water level and can be reused as part of aquatic habitat creation through the installation of islands or terraces in the North and South Flats. It is also recommended that a more natural fluctuation of the lake level would be beneficial over the long term. In addition, these changes will need to be maintained in the long term by the PCPJ using BMPs.

Specifically, the plan recommends the installation of the such measures/solutions as the following: artificial reefs to provide cover for sportfish; gravel spawning beds; aquatic and shoreline vegetation planting; hydromodification of drainage channels to provide for sediment retention; vegetation buffer/filter zone, grassed bench, as well as other vegetative edge/riparian habitats within the watershed to improve water quality; retarding surface water runoff and stream

flow by drainage network modification to provide for flood control; redesign and modification of bulkheads and piers to provide for wave attenuation; continued stocking of sportfish; maintaining the commercial fishing season to harvest roughfish stock; and the promulgation of ordinances to address future physical changes in the watershed. The plan also recommends long term monitoring of the lake's health and evaluates progress associated with the proposed mitigation efforts.

The solutions described in this report compliment the ongoing effort to maintain and improve the lake currently underway by the PCPJ, state agencies and others. The PCPJ has been maintaining the M-1 Canal sediment basin, as well as with the assistance of the NRCS and local landowners, making improvement along drainage canals. In addition, the PCPJ, as part of their Master Drainage Plan, has made numerous drainage improvements along The Island road and the Bayou Sere outfall. Local legislators have secured a $500,000 line of credit from State Capital Outlay to begin engineering and construction of aquatic habitat, artificial reefs and spawning beds. Efforts have been made to secure donations to restore shoreline vegetation and create artificial reefs. The FRWC is pursuing partnership with local industries, NRCS and landowners to further improve drainage canals and the overall hydrology of the watershed. A study and flow model of the M-1 Canal, Discharge Bayou and the Chenal, funded through the LDNR, will be completed in May 2013. Recent monitoring results by the LDEQ, LDWF and others are being used to establish a baseline to evaluate future progress.

6 References

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Appendix A

EPA's Numeric Nutrient Water Quality Criteria for Florida

Numeric criteria for lakes. A lake is a freshwater body that is not a stream or other water course, with some open water free from vegetation above the water surface. For a given lake, the annual geometric mean of chlorophyll a, Total N, or Total P concentrations shall not exceed the applicable criterion concentration more than once in a 3-year period.

A	B	C	D	E	F
		Baseline criteria		Modified criteria[a]	
	Chlorophyll *a* (mg/L)[b]	Total N (mg/L)	Total P (mg/L)	Total N (mg/L)	Total P (mg/L)
Colored lakes[c]	0.020	1.27	0.050	1.27 – 2.23	0.05 – 0.16
Clear lakes, high alkalinity[d]	0.020	1.05	0.030	1.05 – 1.91	0.03 – 0.09
Clear lakes, low alkalinity	0.006	0.51	0.010	0.51 – 0.93	0.01 – 0.03

[a]If chlorophyll *a* is below the criterion in column B and there are representative data to calculate ambient-based, lake-specific, modified TP and TN criteria, then DEP may calculate such criteria within these bounds from ambient measurements to determine lake-specific, modified criteria.

[b]Chlorophyll *a* is an indicator of phytoplankton biomass (microscopic algae) in a water body, with concentrations reflecting the integrated effect of many of the water quality factors that may be altered by human activities.

[c]Colored lakes are distinguished from clear lakes based on the amount of dissolved organic matter they have free from turbidity. Dissolved organic matter concentration is reported in Platinum Cobalt Units (PCU). Colored lakes have values greater than 40 PCU and clear lakes have values less than or equal to 40 PCU.

[d]Alkaline lakes are distinguished from acid lakes based on their concentration of $CaCO_3$. Alkaline lakes have greater than 20 mg/L $CaCO_3$, while acid lakes have values less than or equal to 20 mg/L $CaCO_3$.

Appendix B

Water Quality Best Management Practices

Cropland Best Management Practices (1)- Sediment Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Mulch Till	slight	1, 2, 4-6	Land clearing
No Till	moderate	1, 2, 4-6	
Ridge Till	slight-moderate	1,-3, 5, 6	Access roads
Contour farming	moderate	1,2,5,6	Clearing & snagging
Grassed waterway	slight-moderate	1-6	
Residue Mgt., Seasonal	slight	1-6	
Grade stab strut.	slight-moderate	1-6	
Cons. crop. rot.	slight-moderate	1-6	
Waste utilization	na	1-6	
Irrig.Water mgt. (5)	moderate	1-6	
Tailwater rec. (5)	slight	1-6	
Irrig. system (5)	na	1-6	
Struct. water cont.	slight	1-6	
Water & sed. basin	moderate-substantial	1,2,5,6	
Sediment basin	substantial	1,2,5,6	
Irrig. leveling (5)	slight	1-6	
Field border	slight-moderate	1, 2, 5, 6(6)	
Cover crop	slight-moderate	1-6	
Deep Tillage	slight-moderate	1-6	
Filter strips/buffers	substantial	1, 2, 4-6(6)	
Diversion	medium	1,2,5,6	

PROBLEM: Sediment in a water body can smother organisms, interfere with photosynthesis by reducing light penetration, and may fill in waterways, hindering navigation and increasing flooding. Sediment particles often carry nutrients, pesticides, and other organic compounds into water bodies. Sediments can be resuspended in a water column and act as an uncontrolled source of pollution.

PROCESSES: Soil movement in water.

CAUSES: Precipitation on unprotected soil, flowing runoff water, and irrigation water applied at erosive rates.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Fields not artificially drained.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Pesticide Concerns in Surface Water

Favorable BMPs (2)	Favorable BMPs for: Soluble P/Adsorbed P	Crops(3)	Practices Which May Be Unfavorable (4)
Pest management	Sub Substantial	1-6	Land clearing
Irrig.Water mgt. (5)	Slight Substantial	1-6	Surface drainage(6)
Tailwater rec. (5)	slight moderate	1-6	Subsurface drain (6)
Land leveling (5)	slight moderate	1-6	
Irrig. system (5)	slight substantial	1-6	
Struct. water cont.	na na	1-6	
Field border	slight moderate	1-6(9)	
Cover crop	slight moderate	1-6	
Deep Tillage	slight substantial	1-6	
Cons. crop. rot.	slight moderate	1-6	
Mulch till	mod substantial	1, 2, 4-6	
No till	mod substantial	1, 2, 4-6	
Ridge Till	mod substantial	1-6	
Crop residue, Seasonal	slight moderate	1-6	
Grade stab. struct.	na na	1-6	
Water & sed. basin	slight moderate	1,2,5,6	
Terrace	slight substantial	1,2,5,6	
Sediment basin	slight moderate	1,2,5,6	
Filter strip/buffers	slight substantial	1-6(9)	
Contour farming	slight moderate	1,2,5,6	
Strip-cropping	slight moderate	1,2,5,6	
Diversion	slight slight	1,2,5,6	
Channel vegetation	na na	1-6 (7)	
Grassed waterway	slight moderate	1-6 (7)	

PROBLEM: Pesticides by their nature are toxic substances. Many are highly toxic to fish, other aquatic fauna, and warm-blooded animals. Some persist in the aquatic environment for long periods of time so that even at very low level concentrations, they are a serious environmental concern in runoff water.

PROCESSES: Runoff of soluble pesticides in water and movement of pesticides combined with soil and organic matter from site.

CAUSES: Excess pesticide, applied pesticides with affinity for soil and organic matter, persistent pesticides, runoff water and interflow, excess irrigation water, improper pesticide application or irrigation timing, and improper mixing and handling of pesticides and pesticide containers.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effect on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Chemical maintenance of vegetation may adversely affect the quality of runoff water.
8. Where drainage practices already exist.
9. Fields not artificially drained.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Nutrient Concerns in Surface Water

Favorable BMPs (2)	Favorable BMPs for: Soluble N/Adsorbed N	Crops(3)	Practices Which May Be Unfavorable (4)
Nutrient Mgt.	substantial	1-6	Land clearing
Waste utilization	slight moderate	1-6	Surface drainage(6)
Irrig.Water mgt. (5)	Slight substantial	1-6	Subsurface drain (6)
Tailwater rec. (5)	slight moderate	1-6	
Land leveling (5)	slight moderate	1-6	
Irrig. system (5)	slight substantial	1-6	
Struct. water cont.	na na	1-6	
Field border	slight moderate	1-6(8)	
Cover crop	slight moderate	1-6	
Deep tillage	slight substantial	1-6	
Cons. crop. rot.	slight moderate	1-6	
Mulch till	slight moderate	1, 2, 4-6	
No till	slight slight	1, 2, 4-6	
Ridge till	slight slight	1-6	
Crop residue, Seasonal	slight slight	1-6	
Grade stab. struct.	na na	1-6	
Water & sed. basin	slight moderate	1,2,5,6	
Terrace	slight moderate	1,2,5,6	
Sediment basin	substantial	1,2,5,6	
Filter strips/buffers	substantial	1-6(8)	
Contour farming	slight substantial	1,2,5,6	
Strip-cropping	Slight substantial	1,2,5,6	
Diversion	na na	1,2,5,6	
Channel vegetation	na na	1-6 (7)	
Grassed waterway	slight moderate	1-6 (7)	

PROBLEM: Excess nitrogen and phosphorus in a water body causes excessive plant and alga growth, an imbalance of natural nutrient cycles, and a decline in the number of desirable fish species. High nitrate levels can be hazardous to warm-blooded animals under conditions that are favorable to reduction to nitrite.

PROCESSES: Runoff of soluble nitrogen and phosphorus in water and movement of nitrogen and phosphorus combined with soil and organic matter from site.

CAUSES: Excess amounts of surface-applied nitrogen and phosphorus, runoff water and interflow, improperly managed irrigation systems, and erosion of soil and organic wastes.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Chemical maintenance of vegetation may adversely affect the quality of runoff water.
8. Fields not artificially drained.
9. Where drainage practices already exist.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Minerals or Salinity Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Crops(3)	Practices Which May Be Unfavorable (4)
Irrig.Water mgt. (5)	slight-moderate	1-6	Land clearing
Tailwater rec. (5)	slight	1-6	Surface drainage(6)
Water convey. (5)	slight	1-6	Subsurface drain (6)
Land leveling (5)	neutral	1-6	
Irrig. system (5)	slight-substantial	1-6	
Deep Tillage	slight-moderate	1-6	
Cons. crop. rot.	slight-moderate	1-6	
Waste utilization	slight-moderate	1-6	

PROBLEM: Excessive concentrations of salts/minerals in surface waters can render the waters unfit for human and animal consumption and impair the growth of plants. It can also reduce or restrict the water's value for industrial use, irrigation and for propagation of fish and wildlife. The toxic effect of certain chemicals can be enhanced in saline waters, and the saturation levels of dissolved oxygen decrease with increasing salinity. Excessive salts can adversely alter the permeability of soils. The U.S. Public Health Service has established the maximum allowable concentrations of chlorides and sulfates in water for human consumption at 250 mg/l each. Excessive salt intake can produce minor to serious effects.

PROCESSES: Natural processes and movement (surface runoff and interflow) of dissolved minerals and salts from soil and organic waste by irrigation or storm water.

CAUSES: High content of minerals and salt concentration in soil and underlying geology, excess irrigation water, high content of minerals and salt concentration in irrigation water, and over-application of waste with high salt content.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Where drainage practices already exist.

CROPLAND BEST MANAGEMENT PRACTICES (1) - Organic Matter & Bacteria Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Oxy. Demand/Bacteria	Crops(3)	Practices Which May Be Unfavorable (4)
Waste utilization	Slight neutral	1-6	Land clearing
Struct. water cont.	na na	1-6	Surface drainage(6)
Field border	mod slight	1, 2, 5, 6(7)	Subsurface drain (6)
Filter strips/buffers	sub slight	1, 2, 5, 6(7)	
Terrace	mod moderate	1,2,5,6	
Contour farming	mod slight	1,2,5,6	
Strip-cropping	mod slight	1,2,5,6	
Water & sed. basin	mod slight	1,2,5,6	
Sediment basin sub	mod	1,2,5,6	
Diversion	neutral slight	1,2,5,6	
Irrig Water mgt. (5)	slight substantial	1-6	
Irrig. system (5)	slight slight	1-6	
Deep tillage	slight slight	1-6	

PROBLEM: Animal waste and crop debris are the major organic pollutants resulting from agricultural activities. They place an oxygen demand on receiving waters during decomposition, which can result in stress or the death of fish and other aquatic species. Certain bacteria can cause disease in humans such as infectious hepatitis, typhoid fever, dysentery, and other forms of diarrhea.

PROCESSES: Movement of organic waste, bacteria, and organic matter in soil from the site and excess irrigation water.

CAUSES: Over-application of waste or irrigation water, application of waste on unsuitable sites, improper timing of waste or irrigation application, and storm runoff.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. 1 = cotton, 2 = soybeans, 3 = sugarcane, 4 = rice, 5 = corn, 6 = truck crops.
4. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
5. Irrigated fields.
6. Where water table control or regulating water in drainage systems is not applied.
7. Fields not artificially drained.
8. Where drainage practices already exist.

BEST MANAGEMENT PRACTICES (1) - Sediment Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Pasture & hayland planting	substantial	Land clearing
Irrigation water management (4)	substantial	
Critical area planting	substantial	
Use Exclusion (5)	na	
Fencing (6)	neutral	
Prescribed Grazing	substantial	
Mechanical Forage Harvest	moderate	
Irrigation water conveyance (4)	moderate	
Appropriate irrigation system (4)	moderate	
Filter strip/buffer	moderate	
Pond (6)	slight-substantial	
Well (6)	na	
Spring development (6)	slight	
Pipeline (6)	na	
Brush management	slight	

PROBLEM: Sediment in a water body can smother benthic organisms, interfere with photosynthesis by reducing light penetration, and may fill in waterways, hindering navigation and increasing flooding. Sediment particles often carry nutrients and pesticides and other organic compounds into water bodies. Sediments can be resuspended in a water column and act as an uncontrolled source of pollution.

PROCESS: Movement of sediment from site.

CAUSES: Concentration of livestock in or near watercourses leading to instability and overuse of vegetation.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Irrigated fields.
5. To exclude livestock from streams.
6. To distribute grazing.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Nutrient Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Soluble N./ Adsorbed N.	Practices Which May Be Unfavorable (3)
Nutrient management	substantial	Subsurface drain (4)
Waste Utilization	substantial	Subsurface drain (4)
Irrigation water management (5)	substantial	
Pasture & hayland planting	substantial	
Use Exclusion (6)	neutral	
Pond	slight-moderate	
Buffers	slight-substantial	
Fencing (7)	neutral	
Well (7)	na	
Pipeline (7)	na	
Prescribed Grazing	moderate	
Forage harvest mgt.	slight-moderate	
Spring development	na	

PROBLEM: Excess nitrogen and phosphorus in a water body causes excessive plant and algae growth, an imbalance of natural nutrient cycles, and a decline in the number of desirable fish species. High nitrate levels can be hazardous to warm-blooded animals under conditions that are favorable to reduction to nitrite.

PROCESSES: Runoff of soluble nitrogen and phosphorus in water and movement of nitrogen and phosphorus combined with soil and organic matter from site.

CAUSES: Excess surface applied nitrogen and phosphorus, runoff water and interflow, erosion of soil and organic waste, cattle congregating in or near streams, and excess irrigation water application beyond root zone.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Where water table control or regulating water in drainage systems is not applied.
5. Irrigated fields.
6. To exclude livestock from streams.
7. To distribute grazing.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Pesticide Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Soluble P./ Adsorbed P.	Practices Which May Be Unfavorable (3)
Pasture & hayland planting	substantial	Subsurface drain (4)
Irrigation water management (5)	substantial	Surface drainage (4)
Prescribed grazing	moderate	
Forage harvest management	slight-moderate	
Filter strips/buffers	moderate	
Pest Management	substantial	

PROBLEM: Pesticides by their nature are toxic substances. Many are highly toxic to fish, other aquatic fauna, and warm-blooded animals. Some persist in the aquatic environment for long periods of time so that even at very low concentrations, they are a serious environmental concern in runoff water.

PROCESSES: Runoff of soluble pesticides in water and movement of pesticides combined with soil and organic matter from site.

CAUSES: Excess pesticide, applied pesticides with affinity for soil and organic matter, persistent pesticides, runoff water and interflow, improper pesticide application and/or timing, improper mixing and handling of pesticides and pesticide containers, and excess irrigation water application beyond root zone.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Where water table control or regulating water in drainage systems is not applied.
5. Irrigated fields.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Organic Matter & Bacteria Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs for: Oxygen Demand/ Bacteria	Practices Which May Be Unfavorable (3)
Waste utilization	mod neutral	Surface drainage (4)
Pond	slight sl. worsening	Subsurface drain (4)
Nutrient management	Sub slight	
Use Exclusion (5)	slight-moderate	
Fencing (6)	neutral	
Filter strip/buffers	sub. slight	
Prescribed grazing	slight	
Forage harvest mgt.	slight	
Pasture and hayland planting	slight	
Well (6)	na	
Pipeline (6)	na	
Spring development (6)	na slight	
Irrigation water management (7)	slight substantial	

PROBLEM: Animal waste and plant debris is the major organic pollutant from pastureland. They place an oxygen demand on receiving waters during decomposition, which can result in stress or the death of fish and other aquatic species. Certain bacteria can cause disease in humans such as infectious hepatitis, typhoid fever, dysentery, and other forms of diarrhea.

PROCESS: Movement of organic waste, bacteria, and organic matter in soil and water from the site.

CAUSES: Over application of waste, application of waste on unsuitable sites, improper timing of waste application, storm runoff, and concentration of livestock in or near watercourses.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Where water table control or regulating water in drainage systems is not applied.
5. To exclude livestock from streams.
6. To distribute grazing.
7. Irrigated fields.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Minerals or Salinity Concerns in Surface Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Irrigation water management (4)	slight-moderate	Land clearing
Nutrient management	slight	Subsurface drain (5)
Irrigation water conveyance (4)	slight	Surface drainage (5)
Irrigation system (4)	neutral to moderate	
Forage harvest management	slight	
Prescribed grazing	slight-moderate	
Waste utilization	slight-moderate	

PROBLEM: Excessive concentrations of salts/minerals in surface waters can render the waters unfit for human and animal consumption and impair the growth of plants. It can also reduce or restrict the water's value for industrial use, irrigation and for propagation of fish and wildlife. The toxic effect of certain chemicals can be enhanced in saline waters. Excessive salts can adversely alter the permeability of soils. The U.S. Public Health Service has established the maximum allowable concentrations of chlorides and sulfates in water for human consumption at 250 mg/l each. Excessive salt intake can produce minor to serious effects.

PROCESSES: Natural processes, movement of organic waste, sheet flow from surface runoff and interflow from ground water as influenced by human activities.

CAUSES: High content of minerals and salt concentration in soil and underlying geology, over application of waste with high salinity content, movement of minerals and salinity in soil from the site by precipitation runoff and interflow (saline seeps), high content of minerals and salt concentration in irrigation water, and excess irrigation water.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Irrigated fields.
5. Where water table control or regulating water in drainage systems is not applied.

PASTURELAND BEST MANAGEMENT PRACTICES (1) - Minerals or Salinity Concerns in Ground Water

Favorable BMPs (2)	Effectiveness of Favorable BMPs	Practices Which May Be Unfavorable (3)
Irrigation water management (4)	slight-substantial	Irr. field ditch (4)
Surface drainage	slight-moderate	Irr. canal/lateral (4)
Subsurface drain	slight-moderate	Soil salinity mgt
		Toxic salt reduction
Irrigation conveyance (4)	slight	
Irrigation system (4)	slight-moderate	
Nutrient management	slight	
Waste utilization	slight-moderate	
Prescribed grazing	slight	
Forage harvest mgt.	slight	
Pasture/hayland planting	slight	
Fencing	neutral	
Pond	na	
Spring development	na	
Pipeline	na	

PROBLEM: Excessive concentrations of salts/minerals can render ground water unfit for human and animal consumption. It can reduce or restrict the water's value for industrial and municipal use and irrigation. The toxic effect of certain chemicals can be enhanced in saline waters, and the saturation levels of dissolved oxygen decreases with increasing salinity. The U. S. Public Health Service has established the maximum allowable concentrations of chlorides and sulfates in water for human consumption at 250 mg/l each. Excessive salt intake can produce minor to serious effects.

PROCESSES: Natural processes and leaching of minerals or salt concentrations.

CAUSES: Naturally occurring, excess water moving downward from human activity of concentrating water or changing evapotranspiration, and irrigation water contains high concentration of dissolved solids.

1. There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed.
2. This list is not ranked in an order, which would indicate preference in installation.
3. An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed.
4. Irrigated fields.

Appendix C

Commodity Manual Best Management Practices

Beef Cattle Best Management Practices

http://www.lsuagcenter.com/NR/rdonlyres/55BE3063-E11C-483E-BF86-40DB68705270/87569/pub2884beefbmppubLOWRES.pdf

Agronomic Crops Best Management Practices

http://www.lsuagcenter.com/NR/rdonlyres/CB67F3CD-CE73-4C39-B6E4-52F772F970CF/84012/pub2807AgronomicCropsBMPLOWRES.pdf

Sugarcane Best Management Practices

http://www.lsuagcenter.com/NR/rdonlyres/27AA7189-F3AC-4FEA-A51D-E5D8E2B16505/82493/pub2833_SugarcaneBMP.pdf

Outreach efforts have been developed to address residential nonpoint source pollution. The La Yards and Neighborhoods Program was developed by the LSU AgCenter to encourage homeowners to create and maintain landscapes in ways that minimize environmental damage/impact through educational programs and outreach activities. This program can be offered to residents of the False River community. The program link as well as home source best management practice manuals are below:

http://www.lsuagcenter.com/NR/rdonlyres/BC916876-1D8F-4F4D-83FC-F86A1BE5DDF4/57407/Pages17.pdf

Home Source Best Management Practices

http://www.lsuagcenter.com/NR/rdonlyres/3A849060-4119-48B7-9771-A0DE16A6A623/39935/Pub2994NPSmanual2.pdf