

BAYOU COCODRIE TMDL FOR DISSOLVED COPPER
SUBSEGMENTS 060201

Louisiana Department of Environmental Quality
Office of Environmental Assessment
Water Quality Assessment Division

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody.

Bayou Cocodrie flows from its headwaters, at the outlet of Cocodrie Lake in South Central Louisiana, to its confluence with the Bayou Boeuf / Cocodrie Diversion Canal. The Bayou Cocodrie subsegment 060201 is listed on the 1998 Section 303(d) List as not fully supporting the water quality standard for dissolved copper and dissolved lead. These parameters were assessed to be above the water quality standard, based on sampling and lab techniques that did not adhere to the "Clean Methods" guidelines. It was decided to retest the water body using the "Clean Method" procedures. Between the months of July and October in 1999, five metals samples were taken. The sample results showed that the dissolved copper exceeded the subsegment's water quality criteria **based on the equation then in effect**. The dissolved lead was meeting the water quality criteria. Thus a TMDL **was** developed for dissolved copper in Bayou Cocodrie. **Since publication of the final TMDL in 2000, revisions have been made in the regulations to the equation used to determine the copper criteria and the stream has been reassessed as meeting the criteria. The revisions duplicated the Federal regulatory requirements for determining copper criteria.**

For the purpose of TMDL development **in 2006**, the dissolved copper numerical criteria was calculated based on the freshwater chronic value for aquatic life protection using the minimum hardness of 25 from the LPDES Implementation Procedures and the equations and factors presented in the regulations. The **new** dissolved copper numerical criteria value was determined to be 3.757 ug/l. For the purpose of this TMDL, dissolved copper was considered to be a conservative parameter and was treated as such. The TMDL for dissolved Copper in Bayou Cocodrie has been set to the criteria concentration for all sources at all effluent flowrates (criteria is met at the end-of-pipe). **In the event future revisions to the criteria are made, the TMDL would remain set at the criteria at the end-of-pipe. The TMDL is a daily maximum value.**

1. Introduction

The Bayou Cocodrie subsegment 060201 was tested during July through October for metals using the “Clean Metals” techniques. The sample results showed an exceedance with dissolved copper thus requiring a TMDL for this parameter. A TMDL for dissolved copper was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. Since Copper is a conservative constituent, the TMDL was established for all sources to meet criteria at the end of pipe.

2. Study Area Description

2.1 Bayou Cocodrie, Subsegment 060201

Bayou Cocodrie flows from its headwaters at Cocodrie Lake through the town of St. Landry to the Bayou Bouef / Cocodrie Diversion Canal thence to Bayou Courtableau thence to Bayou Teche. A location map is shown as Attachment A.

Bayou Cocodrie is part of the Vermilion-Teche River Basin and lies in the Western Gulf Coastal Plain ecoregion. The Basin is characterized as plains/prairie, and the land is generally flat with a very gradual slope toward the Gulf of Mexico. The predominant land use in the Basin is agricultural.

Land use in Subsegment 060201, is shown in Table 1 and presented in a map in Attachment B. (LDEQ, GAP June 2000) Average annual rainfall in the Vermilion-Teche River Basin is near 60 inches, and average annual temperature is 68°F.

Table 1. Land use in Subsegment 060201

<i>Land Use</i>	<i>Area (Acres)</i>	<i>% Land Use</i>
Upland Forest Mixed	16120.20	15.48
Agriculture/Cropland/Grassland	14629.78	14.05
Wetland Forest Deciduous	13729.52	13.19
Upland Forest Evergreen	9644.14	9.26
Upland S/S Mixed	8449.17	8.11
Upland Forest Evergreen	7989.40	7.67
Wetland Forest Deciduous	7255.85	6.97
Upland Forest Deciduous	6354.26	6.10
Upland Forest Deciduous	6109.50	5.87
Upland Forest Mixed	3642.15	3.50
Upland S/S Mixed	2892.24	2.78
Agriculture/Cropland/Grassland	2308.83	2.22
Upland S/S Evergreen	1435.38	1.38
Wetland Forest Mixed	1023.48	0.98
Water	902.03	0.87
Dense Pine Thicket	639.03	0.61
Water	223.17	0.21
Vegetated Urban	197.62	0.19

<i>Land Use</i>	<i>Area (Acres)</i>	<i>% Land Use</i>
Dense Pine Thicket	191.04	0.18
Wetland S/S Mixed	181.25	0.17
Wetland S/S Deciduous	54.26	0.05
Upland S/S Evergreen	52.26	0.05
Fresh Marsh	50.71	0.05
Wetland Barren	31.23	0.03
Upland Barren	9.30	0.01

2.2 Water Quality Standards

The designated uses for Bayou Cocodrie include primary contact recreation, secondary contact recreation, propagation of fish and wildlife and outstanding natural resource water. From Louisiana’s LPDES Implementation Plan: “Metals criteria for aquatic life protection are based on dissolved metals concentrations in ambient waters. They are a function of hardness (CaCO₃), which typically will be obtained from average two-year data compilations contained in the latest Louisiana Water Quality Data Summary (Units in mg/l). However, other comparable data compilations or reports or water body specific data provided by the applicant may be considered. The minimum hardness shall be 25 mg/l and the maximum hardness shall be 400 mg/l used in hardness dependent metal criteria calculations in accordance with 40 CFR 131.36 (c) (4) (i).” The hardness values from the ambient sampling record were less than 25 mg/l, so the minimum hardness of 25 mg/l was used. The resulting copper **criterion is 3.76 ug/l and is applied as a daily maximum**. The calculations are shown in Table 2.

Table 2. Revised Calculation of the WQ Criteria and Total Maximum Daily Load (TMDL) for dissolved Copper in Subsegment 060201:

$$\begin{aligned}
 &\text{Minimum Hardness per LPDES Permit Implementation Plan} = 25 \text{ mg/l} \\
 &\text{The dissolved Copper LADEQ WQ criteria} = \text{Freshwater Chronic criteria} = e^{(0.8545 \cdot \ln(\text{avg. hardness}) - 1.3860)} \times \text{CF} \\
 &\qquad \qquad \qquad \text{CF} = 0.960 \text{ for copper} \\
 &\text{The dissolved Copper LADEQ WQ criteria} \\
 &= 3.76 \text{ ug/l} = 0.003757 \text{ mg/l} \\
 &\text{TOTAL MAXIMUM DAILY LOAD FOR ALL SOURCES} = 0.003757 \text{ mg/l}
 \end{aligned}$$

2.3 Identification of Sources

The suspected major source is the CLECO Evangeline, LLC plant located near the town of St. Landry. The facility has multiple discharges associated with the operation of a steam electric generating plant. The facility has revamped their piping system to eliminate as many sources of copper as possible with today’s technology. Other point and non-point sources could also be contributing to the problem but none were located at this time. The discharger in this case is unique. Once through non-contact cooling water is withdrawn from Bayou Cocodrie and discharged to Mountain Bayou Lake. The water discharges from the Lake back to Bayou Cocodrie at two points as shown by the map. Both discharge points are upstream of the cooling water intake. The withdrawal is larger than the effluent discharge due to evaporative losses in the lakes. CLECO has no control over rainfall runoff that flows to Mountain Bayou Lake from the Lake’s watershed.

The effluent discharge is therefore a combination of plant effluent and stormwater runoff at various times. **The facility is planning to perform a Water Effects Ratio or similar sampling program to identify and quantify any remaining sources of copper in their effluent and measure the actual stream water quality. Current assessments show no copper problem in the stream.**

3. TMDL

The dissolved copper TMDL is established as the water quality criteria. In accordance with current regulations, the criteria value is 3.76 ug/l. Dissolved copper is treated as a conservative parameter and the criteria concentration will be applied as an end-of-pipe effluent limit to CLECO and any other future sources along the Bayou that may be identified. **In the event future revisions to the criteria are made, the TMDL would remain set at the criteria at the end-of-pipe. The TMDL is a daily maximum value.**

The TMDL established in 2000 treated CLECO as a “black box” having a net effect on Bayou Cocodrie. This approach proved impractical for implementation purposes since there was actually a small distance along the Bayou where the flow was the total of the plant effluent flow, any stormwater flow to Mountain Bayou Lake, and the headwater flow. The resulting copper load was increased accordingly in this small reach. In addition, the uncontrollable stormwater flow in to Mountain Lake Bayou from the watershed makes it inappropriate to establish mass limits. In this particular case, at critical low flow, the effluent concentration required to meet criteria is the criteria. A concentration TMDL can be effectively implemented and monitored.

3.1 Seasonal Variability

The water quality criterion for dissolved copper is a year-round value thus the TMDL is applicable year round. No seasonal variability is expected or observed for copper in ambient waters.

3.2 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. In this TMDL for dissolved copper, conservative assumptions have been used and therefore, there is also an implicit margin of safety.

4. Monitoring Plan

LDEQ has developed this TMDL to be consistent with the state antidegradation policy (LAC 33:IX.1109.A).

LDEQ will work with other agencies such as local Soil Conservation Districts to implement agricultural best management practices in the watershed through the 319 programs. LDEQ will also continue to monitor the waters to determine whether standards are being attained.

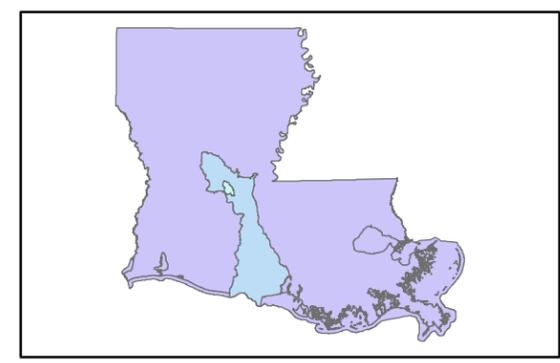
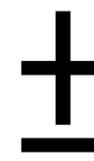
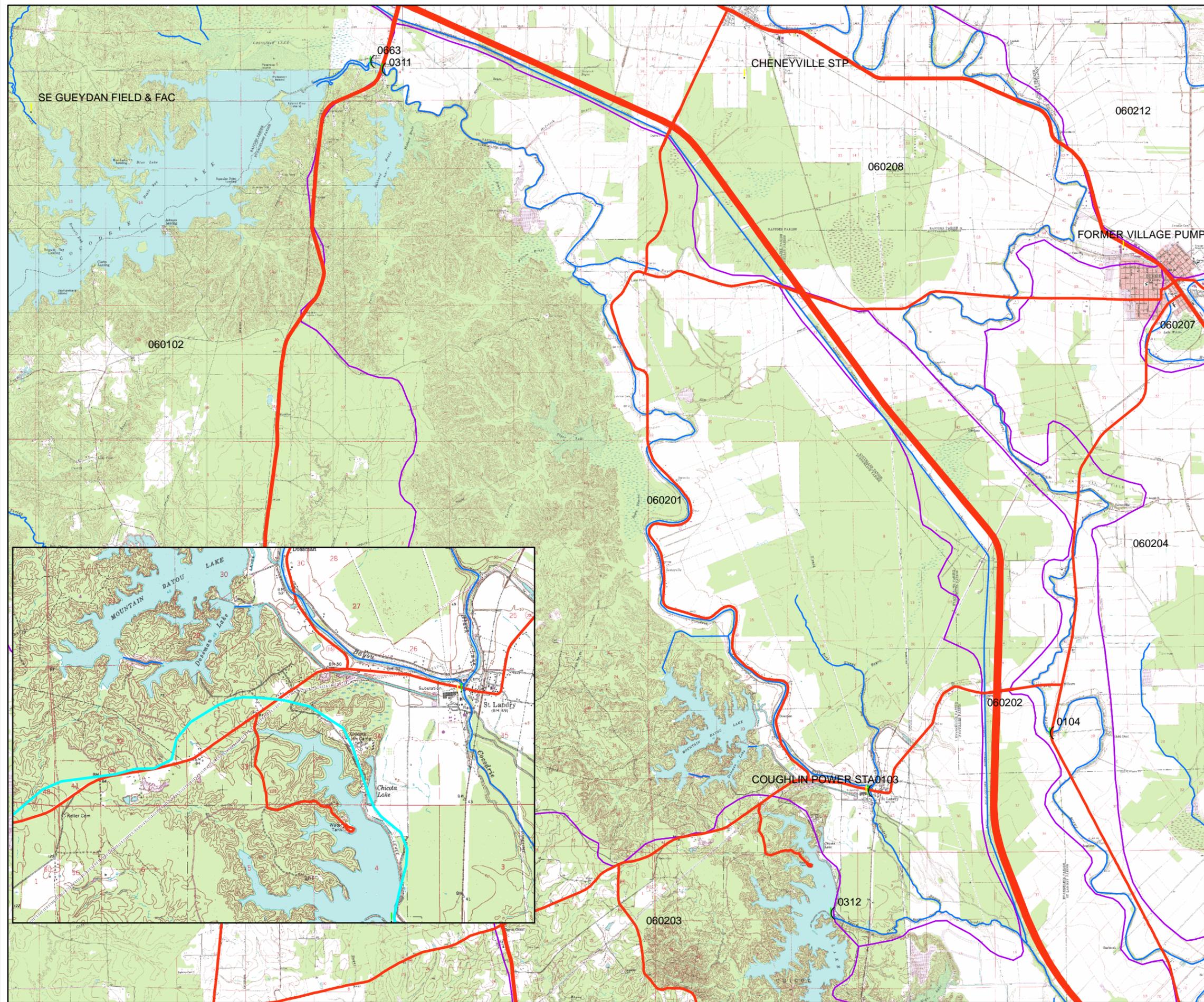
In accordance with Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act, the LDEQ has established a comprehensive program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term database for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ is continuing to implement a watershed approach to surface water quality monitoring. In 2004 a four year sampling cycle replaces the previous five year cycle. Approximately one quarter of the states watersheds will be sampled each year so that all of the state's watersheds will be sampled within the four year cycle. This will allow LDEQ to determine whether there has been any improvement in water quality following implementation of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list.

REFERENCES

- Louisiana Department of Environmental Quality. *Permitting Guidance Document For Implementing Louisiana Surface Water Quality Standards Water Quality Management Plan Volume 3*. Louisiana Department of Environmental Quality, Office of Environmental Services, Baton Rouge, 2001.
- Louisiana Department of Environmental Quality. *Environmental Regulatory Code, Part IX. Water Quality Regulations*. Louisiana Department of Environmental Quality, 2005
- Lowflow on Streams in Louisiana*. Fred N. Lee. Louisiana Department of Environmental Quality, Water Quality Assessment Division, WQ Modeling Section, 2000.
- Bayou Cocodrie Watershed TMDL Report*. ftn Associates, Ltd., December 22, 1999.

ATTACHMENT A



BAYOU COCODRIE

SUBSEGMENT 060201

Legend

-  VECTOR.la_ldeq_pts_07_2002
-  VECTOR.la_ldeq_wqn_05_2003
-  VECTOR.fed_usgs_dlg_perstrm_clip
-  VECTOR.gdt_uh_us_highway
-  VECTOR.gdt_ih_interstate_highway
-  VECTOR.gdt_sh_state_highway
-  VECTOR.la_ldeq_subsegments_2004

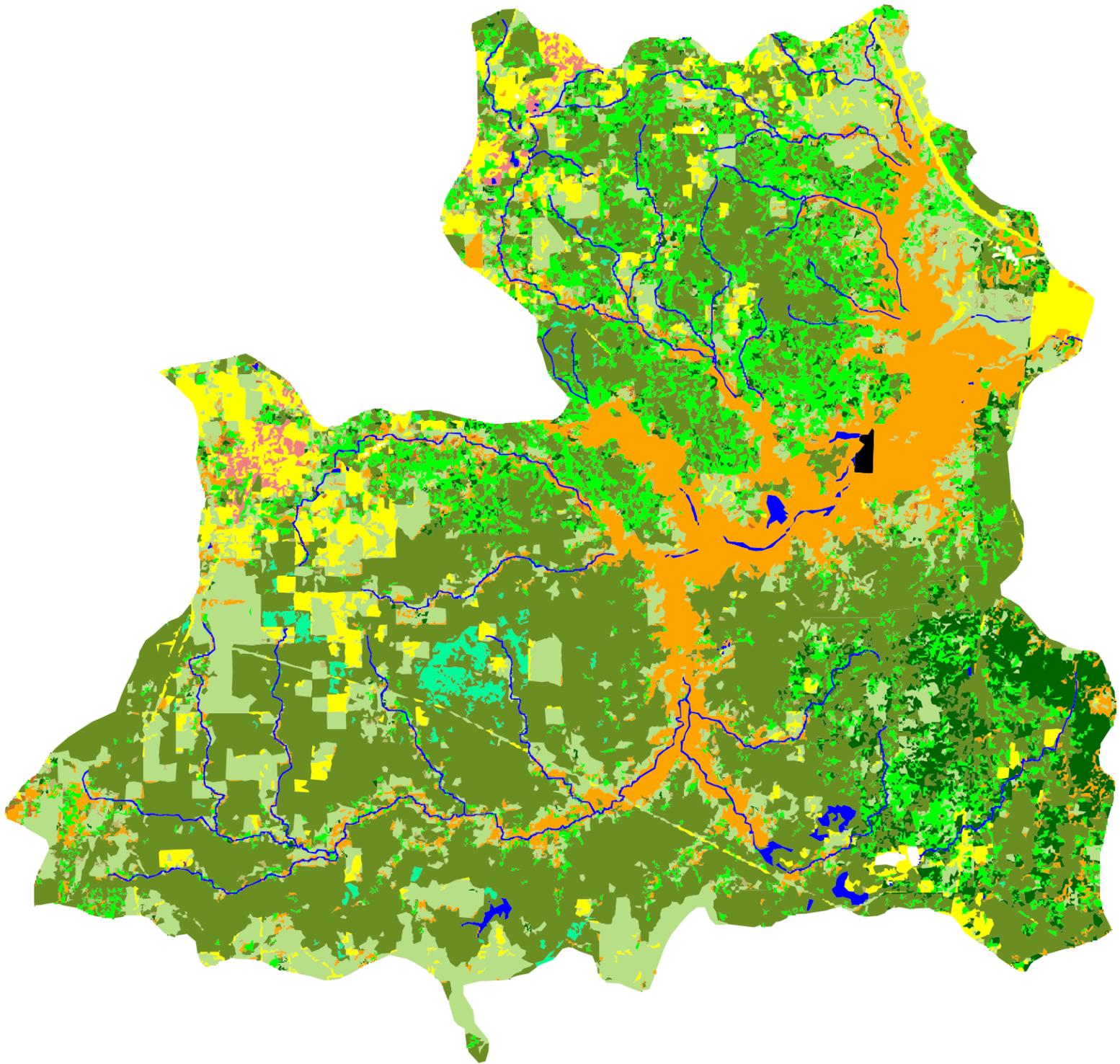
Map date: 07/24/2006
 Map number: 200603035
 Map sources: USGS 7.5 minute quad raster maps
 Map sources (cont): DOQQ raster maps
 Map projection: UTM Zone 15
 Map datum: NAD83
 DEQ/OEA/WQAD/WQM

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ATTACHMENT B

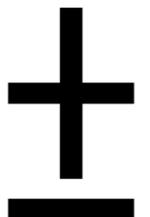
Bayou Cocodrie Land Cover Subsegment 060201

U.S. Hwy. 167 to the Bayou Boeuf- Cocodrie Diversion Canal



Legend

Fresh Marsh	Upland Forest Evergreen	Upland S/S Mixed
Intermediate Marsh	Upland Forest Mixed	Agriculture/Cropland/Grassland
Brackish Marsh	Dense Pine Thicket	Vegetated Urban
Saline Marsh	Wetland S/S Deciduous	Non-Vegetated Urban
Wetland Forest Deciduous	Wetland S/S Evergreen	Wetland Barren
Wetland Forest Evergreen	Wetland S/S Mixed	Upland Barren
Wetland Forest Mixed	Upland S/S Deciduous	Water
Upland Forest Deciduous	Upland S/S Evergreen	



Map Number: 200603048
 Map Date: 09/15/06
 Map Projection: UTM, NAD 83
 Map Source: LDEQ, USGS

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