Coastal Protection and Restoration Authority
150 Terrace Avenue, Baton Rouge, LA 70802 | coastal@la.gov | www.coastal.la.gov

Swamp Community Wetland Value Assessment

PO-0029 River Reintroduction into Maurepas Swamp

Date: June 2019

Prepared By: K. LaCour-Conant, K. Ramsey, K. Bollfrass

Coastal Protection and Restoration Authority

This document was prepared in support of the PO-0029 River Reintroduction into Maurepas Swamp project by the Coastal Protection and Restoration Authority (CPRA). The CPRA was established by the Louisiana Legislature in response to Hurricanes Katrina and Rita through Act 8 of the First Extraordinary Session of 2005. Act 8 of the First Extraordinary Session of 2005 expanded the membership, duties, and responsibilities of the CPRA and charged the new Authority to develop and implement a comprehensive coastal protection plan, consisting of a Master Plan (revised every 5 years) and annual plans. The CPRA's mandate is to develop, implement and enforce a comprehensive coastal protection and restoration Master Plan, and while the River Reintroduction into Maurepas Swamp was first authorized in 2001 through the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), the project has since been included in both the 2012 and 2017 Coastal Master Plans (001.DI.21), and received RESTORE Pot 2 Funds in 2017 to sustain project momentum.

Suggested Citation:

LaCour-Conant, K., K. Ramsey, K. Bollfrass. 2019. River Reintroduction into Maurepas Swamp Wetland Value Assessment. Coastal Protection and Restoration Authority. Baton Rouge, LA. 171 pp with appendices.

Acknowledgements

The following experts were consulted for the preparation of this document:

- Richard F. Keim- Louisiana State University AgCenter
- Gary Shaffer- Southeastern Louisiana University
- Ranjit Jadhav- FTN Associates
- Bernard Wood- CPRA

The following project team assisted in the preparation of this document:

- Carol Parsons Richards- CPRA
- Brad Miller- CPRA
- Honora Buras- CPRA
- Thomas McLain- CPRA
- Danielle Richardi- CPRA

This effort was funded by the Coastal Protection and Restoration Authority (CPRA) of Louisiana under the Gulf Coast Ecosystem Restoration Council Comprehensive Plan Component Program (RESTORE) Act PO-0029 River Reintroduction into Maurepas Swamp project.

Executive Summary

The Coastal Protection and Restoration Authority (CPRA) conducted a Wetland Value Assessment (WVA) for the PO-0029 River Reintroduction into Maurepas Swamp project. Coastal forested wetlands like Maurepas swamp are of critical importance to wildlife species and provide valuable ecosystem services to humans, yet they are in grave decline along the northern Gulf of Mexico; Maurepas swamp is one of the largest and last remaining coastal forests in Louisiana. This project is intended to reestablish a hydrologic regime conducive to swamp habitat vigor and sustainability in approximately 44,683 acres in the southern region of Maurepas swamp. Historically, the swamp received inputs of oxygenated water, sediment, and nutrients from the Mississippi River during seasonal overbank flooding, and also from exchange via Bayou Manchac. These natural processes have been severely impacted by colonization of the area and subsequent modifications to the landscape, including levee construction, logging, and channelization. Furthermore, high rates of subsidence and sea level rise subject the region to chronic inundation, severely limiting forest growth and regeneration. This project proposes to reintroduce the Mississippi River into the southern region of Maurepas swamp to deliver much needed inputs of freshwater, sediment, and nutrients in order to reestablish sustainable hydrologic regimes, ameliorate the effects of increasing salinity levels, enhance forest productivity and integrity, and increase rates of soil surface elevation gain. Hydrologic modeling runs, the most recent data available through the Coastwide Reference Monitoring System (CRMS), relevant literature and reports, and recommendations from the Technical Advisory Group (TAG) were thoroughly analyzed to evaluate both Future Without Project and Future With Project scenarios. Project benefits were determined based on the above evaluations, expert opinion, and the WVA Swamp Community Model, which relies on seven habitat variables: 1) Stand Structure, 2) Stand Maturity, 3) Water Regime, 4) Mean High Salinity during the Growing Season, 5) Size of Contiguous Forested Area, 6) Suitability and Traversability of Surrounding Land Uses, and 7) Disturbance. Estimated project benefits, accounting for -84.9 Average Annual Habitat Units (AAHUs) of mitigation associated with project construction, for the proposed River Reintroduction into Maurepas Swamp are 7,667.5 AAHUs (Appendix F). For reference, the 2001 WVA completed by the Coastal Wetland Planning Protection and Restoration Act (CWPPRA) Environmental Workgroup estimated project benefits to be 8485.5 AAHUs. Included in this report are extensive reviews of project history, methodologies used in data acquisition and assessment, workflows narrating how each variable was evaluated in distinct subareas within the overall project area, and assumptions used to determine final project benefits in AAHUs.

Table of Contents

Appendices

Tables

Figures

Acronyms

1D	One-dimensional
2D	Two-dimensional
AAHU	Average Annual Habitat Units
ADCIRC	Advanced Circulation
cfs	Cubic Feet per Second
CIMS	Coastal Information Management System
CN RR	Canadian National Railroad
CPRA	Coastal Protection and Restoration Authority
CRMS	Coastwide Reference Monitoring System
CWPPRA	Coastal Wetlands Planning, Protection, and Restoration Act
DBH	Diameter at Breast Height
EEM	Emergent Estuarine and Marine
ESLR	Eustatic Sea Level Rise
FWP	Future With Project
FWOP	Future Without Project
GEBF	Gulf Environmental Benefit Fund
HEC-RAS	Hydrologic Engineering Center-River Analysis System
I-10	Interstate 10
I-55	Interstate 55
ICM	Integrated Compartment Model
KCS RR	Kansas City Southern Railroad
LA 44	Louisiana Highway 44
NFWF	National Fish and Wildlife Foundation

NWI	National Wetlands Inventory
OMMAM	Operations, Maintenance, Monitoring, and Adaptive Management
MRGO	Mississippi River Gulf Outlet
MRSNFR	Mississippi River Sediment, Nutrient, and Freshwater Redistribution
MR&T	Mississippi River and Tributaries
PEM	Palustrine Emergent
ppt	Parts per Thousand
RESTORE	Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies
RSLR	Relative Sea Level Rise
SI	Suitability Index
SELU	Southeastern Louisiana University
SWMM	Stormwater Management Model
TAG	Technical Advisory Group
TY	Target Year
URS	United Research Services
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WSLP	West Shore Lake Pontchartrain
WVA	Wetland Value Assessment

1.0 Introduction

1.1 Project Background

There are many ecological problems in the Maurepas swamp, stemming largely from the current hydrologic regime, which is no longer sustaining the baldcypress (*Taxodium distichum)*/water tupelo (*Nyssa aquatica)* swamp forest habitat of the area (Shaffer et al. 2009a, 2016). Historically, the swamp received oxygenated water, sediment, and nutrient inputs from the Mississippi River during seasonal overbank flooding and from exchange via Bayou Manchac. These processes were interrupted by anthropogenic changes made to the natural landscape following colonization, specifically the construction of local levees along the Mississippi River for flood control and the blockage of Bayou Manchac in the War of 1812, which was made permanent in 1828 (Walker and Davis 2002, Sternberg 2007). Federal control of the Mississippi River levee system by the U.S. Army Corps of Engineers (USACE) under the Mississippi River and Tributaries (MR&T) project after the Great Flood of 1927 prevented any further natural connection of the swamp to the river's waters, except via backwater flooding by means of the Bonnet Carre Spillway after its construction in 1931 (Camillo 2012). Reduced flow of fresh water through the swamp has created oxygen-poor, stagnant water conditions that impair swamp forest health and associated aquatic habitats (Buras et al. 2018).

In addition to the disconnection from the Mississippi River, the swamp's hydrology issues have been exacerbated by the construction of highways, pipelines, railroads, the Amite River Diversion Canal, navigation canals, and oil and gas exploration canals, along with the spoil banks associated with canal excavation. The channelization of local streams and the construction of local flood mitigation features such as weirs, levees, floodgates, and drainage ditches have also altered the area's hydrology (Buras et al. 2018). This altered hydrologic regime, especially the reduced freshwater input and connection of interior wetlands to the lake, has resulted in periodic introduction of brackish water from Lake Pontchartrain into Lake Maurepas and the swamp (Shaffer et al. 2009a, 2016). This brackish water introduction was exacerbated by the construction of the Mississippi River Gulf Outlet (MRGO), a deep draft shipping channel that created a saltwater and storm surge conduit from the Gulf of Mexico south of New Orleans, through Lake Pontchartrain, and into the Maurepas swamp (Poirrier 1978, 2013, Shaffer et al. 2009b). The MRGO was closed in 2009 and salinity in the Maurepas swamp has decreased, but the swamp is still a connected estuary system susceptible to saltwater intrusion via a combination of sea level rise, subsidence, and storm events. Impounding features, coupled with low soil surface elevations, have worsened saltwater intrusion by trapping saltwater from storm surge in the swamp. Increasing salinities in fresh and low salinity wetlands contribute to osmotic imbalances, salt toxicity, and the production of highly toxic sulfides, which is exacerbated in stagnant conditions without freshwater input to flush the system of salt and toxic metabolites; such conditions have resulted in the mortality or degradation of many trees in the Maurepas swamp (Shaffer et al. 2009b, 2016).

Anthropogenic modifications in the Maurepas swamp area have produced an unsustainable hydrologic regime, but disconnection from the Mississippi River has also deprived the swamp of nutrients and sediments, both of which are critically important for forest health, structure, function, and resilience (Keddy et al. 2007). Studies generally indicate that, in addition to suffering from altered hydrology and saltwater intrusion, swamps in southeastern Louisiana are severely nutrient limited due to disconnection from the Mississippi River, and existing trees could readily utilize and benefit from nutrient-laden river water accompanying diversions (Effler et al. 2006, Shaffer et al. 2015). Furthermore, without adequate sediment input, wetlands disconnected from the Mississippi River cannot achieve high enough accretion and organic soil formation rates to keep pace with sea level rise and subsidence, exacerbating issues of chronic inundation (Glick et al. 2013; Shaffer et al. 2016).

The near permanent flooding of much of the area prevents germination of baldcypress and water tupelo seeds, which when coupled with nutria herbivory of seedlings, has greatly reduced natural regeneration of the forest. Because the majority of old growth Maurepas swamp was clear-cut in the late 1800s and early 1900s, most of the current trees have been chronically subjected to degraded conditions. The harvest of second-growth trees continued to utilize non-sustainable forestry practices until harvesting was limited by conservation acquisitions and the regulatory recognition that harvesting coastal wetland forests largely resulted in conversion to non-forested habitats (Chambers et al. 2005). These factors, in addition to conversion of forests to urban, suburban, industrial, and agricultural land, have contributed to an overall reduction in coastal forest area, structural integrity, and resilience of what forest remains (Keddy et al. 2007). The combination of these factors has resulted in significant swamp habitat loss, with the degraded swamp in some areas converting to intermediate, floating, and freshwater marsh habitat, as well as open water (Buras et al. 2018).

This river reintroduction is being proposed as potential mitigation for swamp habitat impacts resulting from the West Shore Lake Pontchartrain (WSLP) Levee project. Habitat impacts from the WSLP Levee project that require mitigation include 1,090 Average Annual Habitat Units (AAHUs) of swamp habitat. To mitigate for these impacts, the mitigation plan includes restoration of 3,002 acres of swamp. In addition to its potential to offset impacts from the WSLP project, this WVA will quantify this project's ability to self-mitigate for potential forested wetland impacts associated with the construction of the proposed river reintroduction project. The river reintroduction project proposes impacts to 160 acres of swamp (84.86 AAHUs of swamp habitat). The estimated net project benefit, accounting for -84.9 AAHUs requiring mitigation to offset the project construction impacts, is approximately 7,667.5 AAHUs.

Over the last 25 years this project has received funding from a variety of sources— including the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), Louisiana State-only surplus funds, the Gulf Environmental Benefit Fund (GEBF) via the National Fish and Wildlife Foundation (NFWF), and Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies (RESTORE) [of the Gulf Coast States] Act— for planning, engineering, and design. Plans to reintroduce Mississippi River water into Maurepas swamp have existed since 1993. Studies were performed through CWPPRA Phase 0 and the River Reintroduction into Maurepas Swamp (PO-29) received its CWPPRA Phase I (engineering and design) funding through the CWPPRA in 2001. As 95% project design was nearing completion, the project costs for implementation were too large for traditional CWPPRA funding (URS 2014). Therefore, the Louisiana Coastal Protection and Restoration Authority (CPRA) began using state-only surplus and NFWF funds to maintain project momentum. In September 2017, CPRA received RESTORE fund from the Gulf Coast Ecosystem Restoration Council in the Council's Comprehensive Plan for Gulf Coast Ecosystem Restoration to complete outstanding tasks required to make the project ready for construction. These tasks included creating a new hydrodynamic and water quality model, continued engagement with the Technical Advisory Group (an assemblage of leading forest ecologists from academia and government contracted by CPRA to provide general operational plan guidance for project success and identify key monitoring elements to assess success of the project as it relates to its goals and objectives; TAG), ongoing permitting, environmental compliance, and land rights processes, creation of an Operations, Maintenance, Monitoring, and Adaptive Management (OMMAM) plan, and final design (Buras et al. 2018).

1.2 Problem

Since the construction of the Mississippi River flood control levees, the Maurepas swamp has received limited freshwater, sediment, and nutrient input. Thus, the only soil building has come from organic production within the wetlands, but evaluations suggest that productivity in the stressed Maurepas swamp may be substantially depressed compared to natural, pre-construction conditions (Shaffer et al. 2009a, 2016). The rate of subsidence in the Pontchartrain Basin is about 2.0 to 5mm/year (0.66 to 1.64 feet/century, Reed and Yuill 2017), and with minimal soil building and moderately high subsidence, there has been a net lowering of ground surface elevation in the basin. These conditions have led to a doubling in flood frequency over the last four decades (Thomson 2000), so that now the swamps are persistently flooded and only dry during prolonged growing season droughts. Additionally, a severe drought in 2000-2001 led to high salinities that killed large areas of baldcypress in the Pontchartrain Basin (Shaffer et al. 2009a, Day et al. 2012). Consistent input of fresh water is needed in freshwater wetlands to counter increasing salinities and ensure habitat sustainability (Shaffer et al. 2018).

Forest regeneration is generally hindered by the relatively low numbers of viable seeds observed in swamp seed banks, by herbivory, and by flooding (Conner et al. 1986). Baldcypress and water tupelo seeds cannot germinate when flooded, although seeds of both species remain viable when submerged and can germinate readily when floodwaters recede (Kozlowski 1984). Under natural spring drought conditions, there can be vast numbers of baldcypress seedlings in Maurepas swamp and almost no water tupelo seedlings; however, very few baldcypress seedlings survive fall flooding and herbivory, or they otherwise establish on floating mats and therefore never attach to the substrate, limiting their growth (B. Wood, personal communication 2019). With persistent flooding of the swamp and minimal ability to drain, the typical seasonal drying does not usually occur. Furthermore, the existing trees are highly stressed, which decreases productivity, increases mortality, and increases susceptibility to herbivory and parasites. While baldcypress and water tupelo trees can grow in flooded conditions, stagnant, permanently flooded wetlands with little to no external nutrient or water input have the lowest aboveground net productivity of southeastern forested wetlands (Day et al. 2006). Conversely, water tupelo trees are typically more competitive in permanently flooded conditions (Conner et al. 1981, Dicke and Toliver 1990), which may explain the recent dominance of water tupelo in the south Maurepas swamp. The most current CRMS station data indicate that water tupelo is the most dominant tree species in terms of basal area and percent cover in roughly 80% of the CRMS stations utilized for this WVA. However, water tupelo mortality rates are higher than those of baldcypress and water tupelo growth rates are lower than those of baldcypress in Maurepas swamp, and these trends will likely continue as salinity increases (Shaffer et al. 2016).

The majority of baldcypress/water tupelo swamps are functionally freshwater ecosystems with no seawater salinity influences, but salinity currently influences Maurepas swamp forests (Krauss et al. 2017). Saltwater intrusion has decreased recently following the closure of the MRGO in 2009 and a period of non-drought conditions, however, salinity levels are expected to increase in the future, in part due to the progressive combination of net subsidence, eustatic sea level rise (ESLR), and the lack of riverine freshwater inputs. Persistent saltwater intrusion events observed in 1999 and 2000 caused >97% mortality of tens of thousands of baldcypress seedlings planted as part of ongoing Southeastern Louisiana University (SELU) research (Dr. Gary Shaffer) in the northwestern portion of Maurepas swamp. In a South Carolina swamp, Conner (1993) observed 66% mortality of trees after one year of exposure to 2 parts per thousand (ppt) salinity trapped in the swamp after Hurricane Hugo; another portion of the swamp exposed only to a pulse of salinity after the hurricane experienced 41% tree mortality. Salinity of 3 ppt can reduce growth of both baldcypress and water tupelo saplings (Pezeshki 1990), and when combined with flooding stress, growth reduction in baldcypress was substantial. In contrast, Myers et al. (1995) observed high survival of baldcypress in 3 ppt salinity when trees were protected from grazing and overgrowth by vines. Water tupelo has a lower tolerance to salinity, rarely exceeding chronic concentrations of 1 ppt or higher in the field (Krauss et al. 2009). Salinity can be a significant factor contributing to swamp deterioration, especially combined with other stressors, such as prolonged flooding and nutrient limitation (Hoeppner et al. 2008, Shaffer et al. 2016).

The potential benefits of a river reintroduction are seen in swamp areas receiving sediments and nutrients via the Amite River Diversion Canal, including the areas at the confluence of the Blind River and the Diversion Canal, near the mouth of the river where the canal discharges into the lake, and north of the diversion canal where it spills into the Petite Amite during upland flooding (B. Wood, personal communication 2019). These areas are maintained in somewhat better condition than the remaining tracts of south Maurepas swamp, and also present an exception to the typical lack of regeneration observed in the rest of the swamp. Several cohorts of baldcypress seedlings have established in this area, demonstrating on a small scale the positive impacts to be expected from a proposed Mississippi River diversion into the south Maurepas swamp. The Integrated Compartment Model (ICM) developed for the CPRA 2017 Coastal Master Plan has estimated ~1,000 km^2 of fresh forested wetland could be maintained in Maurepas swamp over a 50-year period if restoration projects that increase freshwater flow are implemented, however, proposed Master Plan projects may not be sufficiently large in scale to fully counteract the impacts of future sea level rise (Baustian et al. 2018).

According to past observations made during field visits to the project area as part of the Mississippi River Sediment, Nutrient, and Freshwater Redistribution (MRSNFR) study (USACE 2000), the previous Wetland Value Assessment (WVA, USEPA 2001), as well as more recent research (Effler et al. 2007, Shaffer et al. 2009a, 2016), many interior areas of Maurepas swamp with overstory canopy that is stressed, dying, or substantially opened are dominated by green arrow arum (*Peltandra virginica*) and dotted smartweed (*Polygonum punctatum*) in the understory, which increase in cover as light penetration increases. Such understory indicators suggest there are some areas of stable intermediate marsh within larger regions of swamp that can be characterized as long-term features of the region. In many areas of south Maurepas these marsh regions have already converted to fragile spikerush (*Eleocharis* spp.) floatant. Factors contributing to this, as mentioned above, include the much greater tolerance of baldcypress and water tupelo trees compared to herbaceous understory vegetation for deeper flooding of longer duration, as well as the increasingly unconsolidated nature of the substrate in these swamps, due in part to decreased below-ground productivity. However, it is clear that not all or even most areas of dying swamp are converting to stable, healthy fresh marsh. Rather, it is expected that the vast majority of south Maurepas Swamp will degrade and eventually convert to emergent wetlands or open water without extensive restoration (Shaffer et al. 2016).

Maurepas swamp is one of the largest remaining tracts of coastal freshwater swamp in Louisiana, yet few swamp restoration projects have been implemented in Louisiana despite the critical decline of coastal forested wetlands (Barrow et al. 2005). One of the few swamp projects completed to date is the Hydrologic Restoration and Vegetative Planting in the Des Allemands Swamp (BA-34-2), which was significantly different in scope from the proposed project in Maurepas swamp and did not include a Mississippi River freshwater introduction component. The Des Allemands project was much smaller in scale and was comprised of eight, 400-foot long gaps cut into the northern Bayou Chevreuil spoil bank to relieve impoundment, which had reduced swamp structure and function. Although project construction has only been complete for one year, swamp impoundment has greatly decreased and productivity and canopy closure have increased significantly (Shaffer and Kandalepas 2019). The proximity of the south Maurepas swamp to the river represents a unique opportunity for useful redistribution of river resources to initiate restoration of the south Maurepas swamp, as recommended in the Coast 2050 plan (LCWCRTF 1998). The ongoing Hydrologic Restoration of the Amite River Diversion Canal (PO-0142) project aims to restore hydrological connectivity in the Maurepas swamp region via spoil bank gapping (Richardi 2018), but a reintroduction of the Mississippi River has not yet been attempted. Few, if any, other major tracts of coastal swamp offer a similar opportunity to apply large-scale restoration efforts and evaluate success in terms of ecological sustainability.

1.3 Project Specifications

1.3.1 Project Area

The project is proposed in the upper Pontchartrain Basin, Coast 2050 Region 1, Amite/Blind Rivers Mapping Unit; St. John the Baptist, St. James, and Ascension parishes (Figure 1). The 44,683 acre project area is divided into 11 subareas for WVA evaluation (Figure 2).

1.3.2 Project Subareas

The project subareas (Figure 2) are delineated by water bodies (Figure 3) as well as differences in existing conditions and differences in expected benefit from the project. These factors make it necessary to assess each subarea individually to accurately assess project benefits (AAHUs).

In the future without project, all subareas will have insufficient sediment and nutrient input for accretion of inorganic sediment to keep pace with subsidence and sea level rise.

<u>Subarea 1</u>. This subarea is located immediately east and west of Hope Canal, and is bounded to the south by Interstate 10 (I-10). Bayou Tent forms a portion of the northeast subarea boundary. It contains approximately 6,730 acres of baldcypress/water tupelo swamp that are less degraded than several other portions of the project area. This subarea of swamp is less productive than a healthy swamp, but has a somewhat higher productivity than the subareas more proximate to the lake. This subarea receives some stormwater runoff from Hope Canal. A portion of the remnant railroad embankment runs along the west side of Hope Canal through this subarea; the levee has existing gaps, and should be gapped further as part of project construction or as part of the adaptive management of the project. Though none of the subareas within the Maurepas project area are completely impounded, currently the Maurepas swamp is lower in elevation than the lake, rendering flooding semi-permanent, with low to very low water exchange and throughput. This subarea is expected to receive the highest influence from the project by receiving freshwater, nutrient, and sediment benefits.

<u>Subarea 2A</u>. This subarea is bounded by Blind River to the west and is bisected by Bayou Tent to the east. It totals approximately 4,807 acres of moderately degraded baldcypress/water tupelo swamp. This subarea experiences no direct water exchange with Lake Maurepas and is expected to receive moderate (freshwater and nutrient) influence from the project, because it will receive diverted water mainly from the high influenced area units immediately to its east and/or south. However, the area also will receive flow of diverted water from other “secondary recipient” areas, but may not get as much nutrient loading as in other areas.

<u>Subarea 2B</u>. Blind River forms the western boundary of this subarea, and is crossed by Bayou

Tent, the Bourgeois Canal, Number Twelve Canal, and Bayou Secret. The area is comprised of roughly 3,394 acres of degraded baldcypress/water tupelo swamp, which likely has direct water exchange with the lake due to the presence of large bayous and canals, as well as its continuous border with Blind River. This subarea is expected to receive moderate (freshwater and nutrient) influence from the project, because it will receive diverted water from the immediately adjacent highly influence areas.

Subarea 2C. This subarea is bounded to the northeast by Bayou Bec Croche, to the east by Mississippi Bayou, and by I-10 to the south. The subarea is approximately 3,438 acres of degraded baldcypress/water tupelo swamp, which likely has direct water exchange with the lake due to the presence of large bayous and canals. This subarea is expected to receive moderate (freshwater and nutrient) influence from the project, because it will receive diverted water from the immediately adjacent highly influence areas.

Subarea 3A. This subarea includes Alligator Island, is bordered to the north and west by Blind River, and is located approximately 0.25 miles west of Lake Maurepas. It totals about 6,400 acres of moderately degraded and degraded baldcypress/water tupelo swamp.

Subarea 3B. This subarea is comprised of roughly 8,867 acres of degraded baldcypress/water tupelo swamp located along the southwest portion of the lake rim. Bayou Bec Croche and Mississippi Bayou form the western boundary, the Reserve Relief Canal runs along the eastern boundary, and I-10 forms the southern boundary of this subarea.

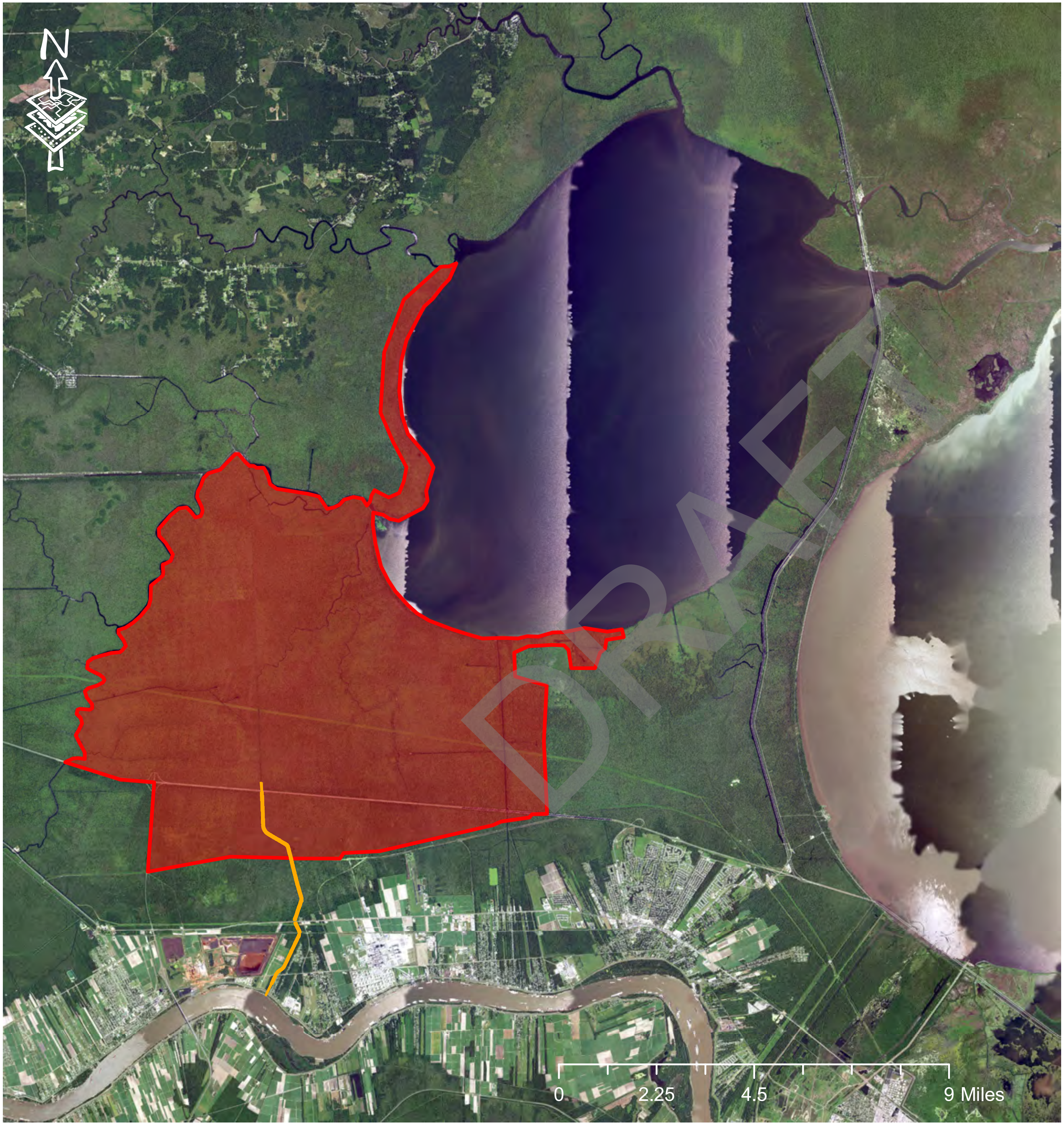
Subarea 4A. This subarea is an approximately 0.8 mile wide strip along the eastern bank of Reserve Relief Canal from I-10 to approximately 0.3 miles south of the lake. It is included because Reserve Relief Canal is not completely efficient at capturing diverted water moving east and transporting it to the lake. Therefore, it is expected that a small amount of freshwater will spill over into this area, especially in the areas nearest to the canal keyhole. This subarea includes about 1,859 acres of degraded baldcypress/water tupelo swamp.

Subarea 4B. This subarea is located along the southern shore of Lake Maurepas to the east of the Reserve Relief Canal. It is composed of 641acres of degraded swamp. Subareas near Lake Maurepas are more likely to be influenced by Pass Manchac, the main waterway between Lake Maurepas and Lake Pontchartrain. It is included because the loading of freshwater from the project to Lake Maurepas is expected to have a freshening effect on lake rim subareas according to Delft3D modeling projections near the southern and western shores. This subarea also contains areas of higher elevations which are potentially capable of regeneration under fresher hydrologic regimes (Henkel et al. 2017). This subarea is therefore defined as receiving only freshwater benefits.

Subarea 4C. This subarea is an approximately 0.5 mile wide strip along the western rim of Lake Maurepas from Blind River to the Amite River. It is comprised of 2,040 acres of moderately degraded swamp. It is included because it is anticipated that the loading of freshwater from the project to Lake Maurepas will have a freshening effect along the lake rim. This subarea is therefore defined as receiving only freshwater benefits.

Subarea 5A. This subarea is 3,514 acres of relatively healthy swamp located south of I-10 along the West Shore Lake Pontchartrain (WSLP) Hurricane Protection Levee alignment, and bounded to the east by Hope Canal. This area is included because lateral relief valves from the main conveyance channel will allow some Mississippi River water to flow into the subarea. Flap gated culverts will be installed beneath I-10 to prevent backflow from subareas north of I-10.

Subarea 5B. This subarea is located south of I-10, and is bordered to the west by HWY 641 and to the east by the Hope Canal. It is composed of roughly 2,993 acres of relatively healthy swamp. This area is included because lateral relief valves from the main conveyance channel will allow some Mississippi River water to flow into the subarea. Flap gated culverts will be installed beneath I-10 to prevent backflow from subareas north of I-10 to those south of I-10.



PO-0029 River Reintroduction into Maurepas Swamp Wetland Value Assessment

Figure 1: Project Overview Map

St. John the Baptist, St. James, and Ascension Parishes, Louisiana

LEGEND

- Project Infrastructure
- Project Area

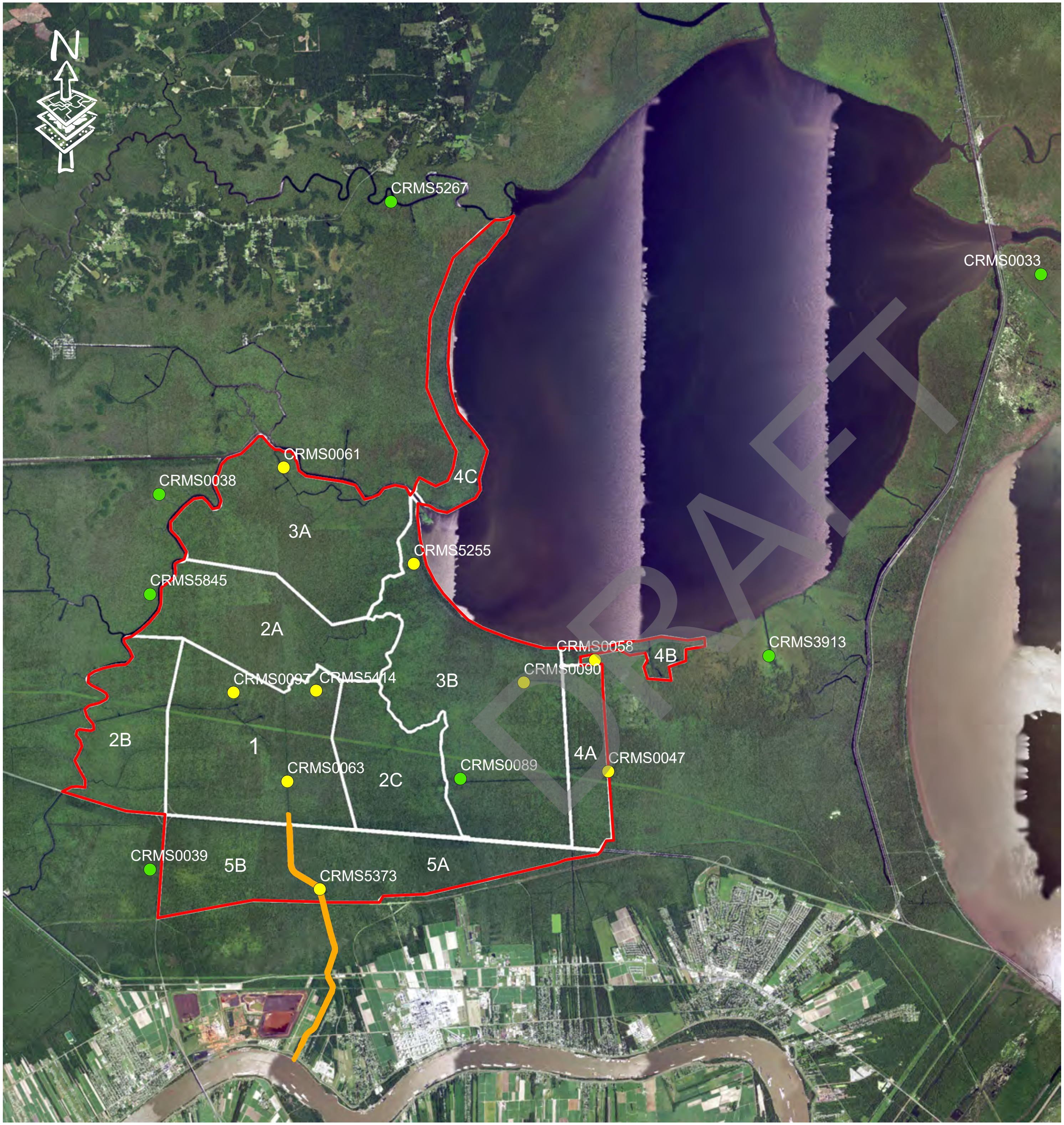
Coastal Protection and Restoration Authority

150 Terrace Avenue
Baton Rouge, LA 70802
Phone: 225.342.7308
Fax: 225.342.9417
www.coastal.la.gov

PO-0029
River Reintroduction into Maurepas Swamp Wetland Value Assessment

Figure 2: Project Area Map

St. John the Baptist, St. James, and Ascension Parishes, Louisiana



LEGEND

- Project Boundary
- Subareas

CRMS Data Utilized?

- No
- Yes

0 1.75 3.5 7 Miles

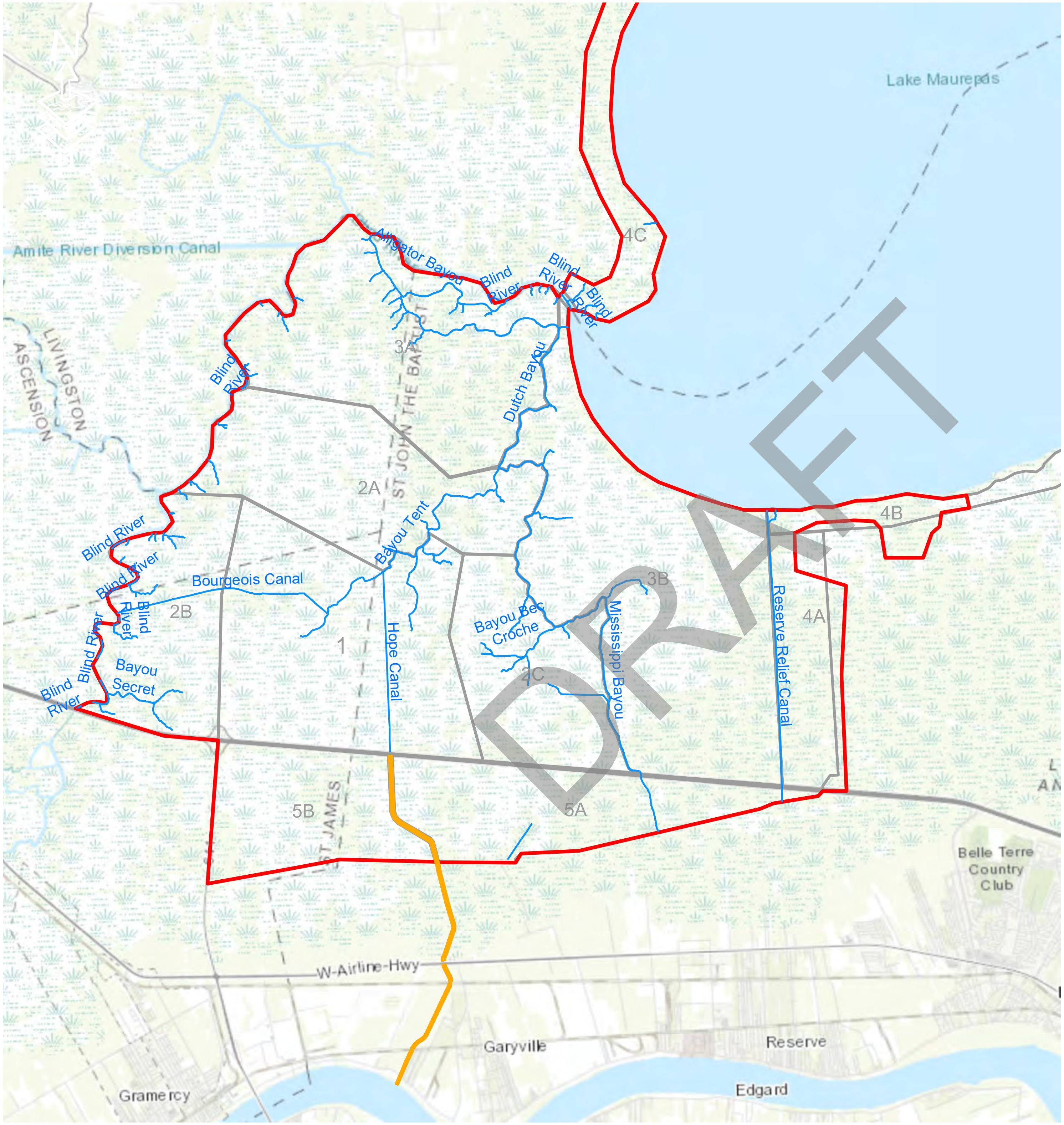
Coastal Protection and Restoration Authority

150 Terrace Avenue
Baton Rouge, LA 70802
Phone: 225.342.7308
Fax: 225.342.9417
www.coastal.la.gov

PO-0029
River Reintroduction into
Maurepas Swamp
Wetland Value Assessment

Figure 3:
Project Waterbodies Map

St. John the Baptist,
St. James, and Ascension
Parishes, Louisiana



LEGEND

- Project Boundary
- Subareas
- Diversion Infrastructure
- Waterbodies

0 | 1.25 | 2.5 | 5 Miles

Coastal Protection and
Restoration Authority

150 Terrace Avenue
Baton Rouge, LA 70802
Phone: 225.342.7308
Fax: 225.342.9417
www.coastal.la.gov

1.3.3 Project Purpose

The River Reintroduction into Maurepas Swamp project is intended to establish a hydrologic regime consistent with swamp forest sustainability that will introduce flowing oxygenated water; ameliorate salinity intrusion; facilitate nutrient uptake and retention; increase forest health and structural integrity; and increase rates of soil surface elevation gain to offset subsidence. If these objectives are achieved, swamp habitat structure, function, and resilience will increase, and conversion to non-forested habitats will be reduced.

The project is intended to restore the historical connection between the Mississippi River and the Maurepas swamp to increase swamp ecosystem health and function. Two major areas are being considered for WVA benefits: 1) areas that will directly receive diverted water and associated benefits of suspended sediments and nutrients and 2) areas that will receive benefits from reduced salinities in the project area.

1.3.4 Project Goal

The goal of the River Reintroduction into Maurepas Swamp project is to reduce or minimize future loss of coastal forest habitat in the project area through the introduction of Mississippi River water (Buras et al. 2018).

1.3.5 Project Objectives

The specific objectives recommended by the TAG as performance measures (Krauss et al. 2017), and which form the basis of the operations, monitoring, and adaptive management (Buras et al. 2018) of the project are to:

1. establish a hydrologic regime consistent with swamp forest sustainability that will introduce flowing oxygenated water;
2. ameliorate salinity intrusion;
3. facilitate nutrient uptake and retention;
4. increase forest health and structural integrity;
5. and increase rates of soil surface elevation gain.

1.3.6 Project Features

The project features are summarized below but are described more fully in the Preliminary Operations, Maintenance, Monitoring, and Adaptive Management Plan (OMMAM; Buras et al. 2018). The project's headworks include the intake features in the Mississippi River, a gated structure on the river side (batture) of the Mississippi River levee, with discharge culverts underneath the levee and River Road (LA 44) connecting to a sedimentation basin. The project intake will be located on the river side of the Mississippi River levee at River Mile 144.2 near Garyville, LA in St. John the Baptist Parish.

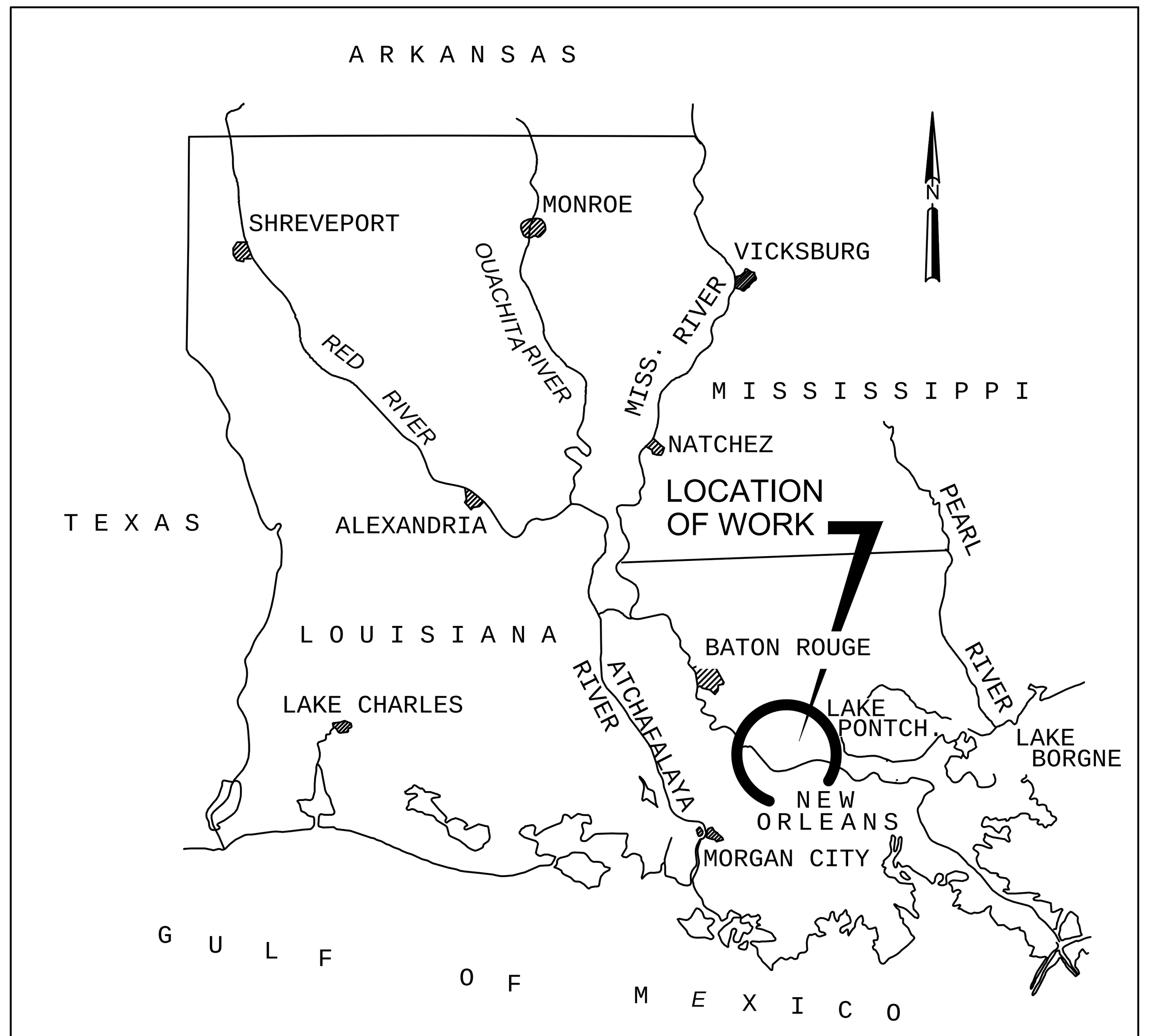
A rip-rap lined intake channel will be excavated and constructed in the batture area. Concrete U-channels will tie the intake channel to the intake structure. The intake structure will be comprised of three 10-ft x 10-ft cast iron vertical sluice gates, which will be hydraulically actuated to control the flow of water into the channel. Beyond LA 44, the culverts transition from a concrete U-channel into a large earthen sedimentation basin. Because this is a freshwater introduction project, the project is not intended to deliver coarse sediments from the Mississippi River, only the nutrients and finer suspended particles contained in the freshwater stream. The basin is designed to remove large sediment particles entrained in the diverted Mississippi River flowstream and prevent clogging of the conveyance channel.

The sedimentation basin will be connected to the 5.5-mile-long earthen conveyance channel, which will re-introduce flow from the river into the Maurepas swamp. A new channel will be excavated to a point just north of Airline Highway (US 61). Box culverts will be installed to cross under the Canadian National Railroad (CN RR), a bridge will be constructed over the Kansas City Southern Railroad (KCS RR), and box culverts will be installed to cross under US 61. Just north of US 61, an improved channel will follow the existing Hope Canal alignment to ultimately distribute the diverted water into the forested wetlands 1,000 feet north of I-10. The channel will connect on either side of I-10 to the existing revetment-lined channel under I-10 at Hope Canal. No modification will be made to the I-10 bridge structure.

Numerous outfall management features will be constructed to improve retention and circulation of river water within the Maurepas swamp (Figure 4). The design includes lateral relief valves to be constructed off the water conveyance channel, south of I-10, each having pipes with knife gate valves to divert 125 cfs water to the west and east of the constructed channel into the swamp system. One-way check valves will be installed along the north side of I-10 on all culverts underneath I-10 from LA 641 to the Mississippi Bayou overpass to prevent backflow of diverted water from north to south. Weirs will be constructed in Bourgeois Canal and Bayou Secret at their intersections with Blind River. Cuts will be created in the abandoned railroad embankment north of I-10 and east of Blind River.

1.3.7 Project Operations

The operations regime is not yet finalized, but the general guidelines for operation are provided in the Preliminary OMMAM Plan (Buras et al. 2018). The project will be operated to facilitate the intermittent flow of river water over the surface of the swamp. Having periods of throughput will allow for the delivery of vital nutrients and fine sediments into the swamp, while flushing stagnant water and toxic metabolites out of the system. The retention and uptake of nutrients within the swamp is necessary for the full benefits of the project to be recognized. The project will be operated to ensure that the residence time of the water within the swamp allows for nutrient uptake, thereby limiting the addition of nutrients to Blind River or Lake Maurepas. The project operations will also be adaptively managed to ameliorate salinity intrusion, especially to attempt to maintain salinity within a range that supports the growth of baldcypress and water tupelo. Most importantly, the project may be operated to counteract the effects of a prolonged drought or to flush saline water from the swamp once flood waters have receded in instances of saltwater intrusion from weather events.



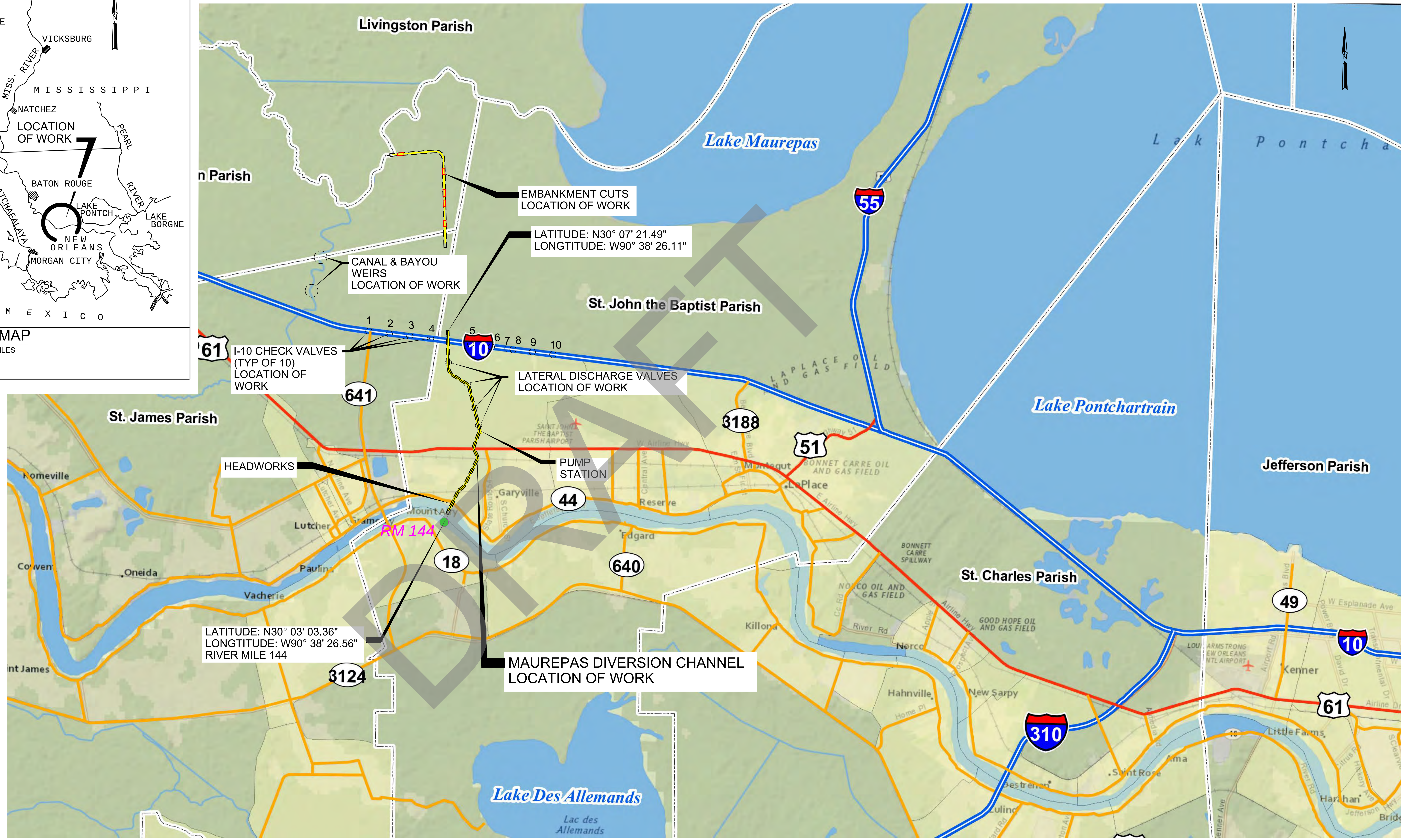
VICINITY MAP

SCALE OF MILES

PO-0029
River Reintroduction into Maurepas Swamp Wetland Value Assessment

Figure 2: Project Area Map

St. John the Baptist, St. James, and Ascension Parishes, Louisiana



PROJECT LOCATION MAP

GRAPHIC SCALE
7500 0 3750 7500 15000 30000
(IN FEET)
1 inch = 7,500 ft.

AT FULL SCALE THIS BAR IS 1" LONG

REV.	DATE	DESCRIPTION	BY

URS
3500 N. Causeway Blvd., Suite 900
Metairie, Louisiana 70002
(504) 837-6326

LOUISIANA COASTAL PROTECTION AND RESTORATION AUTHORITY
COASTAL ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70802

MISSISSIPPI RIVER REINTRODUCTION INTO MAUREPAS SWAMP
ST. JOHN THE BAPTIST PARISH, LOUISIANA

P.O.-29 URS PROJECT NUMBER: 10001801

95% SUBMITTAL

VICINITY AND LOCATION MAPS

DATE: SEPTEMBER 2013

DRAWN BY: APO | DESIGNED BY: | APPROVED BY: NC | SHEET AG-2.00

P:\OCPR\10001801 Final Design II\CAD\Current Drawings\Maurepas_AG-2.00 Vicinity and Location Maps.dwg, Sep 17, 2013 - 6:06:07PM, phillip_olivier

Project operations will also be conducted in a way that recognizes the occasional need for low water levels in the swamp; it is during these times that naturally-recruited baldcypress and water tupelo seedlings can germinate and grow. Additionally, if seedlings are planted in the swamp to supplement natural recruitment, low water levels will be desired both during and after the planting. The project may not be run or may be run at a reduced rate during these times to allow seedlings time to grow to a height above which they will not be completely inundated.

The project will be operated to best meet ecosystem needs by targeting the desired water, nutrient, and sediment flow into the project area. The operation of the project can reduce or shut off the volume of diverted flow based on variable operation of the sluice gates. Project operations will attempt to provide the seasonal and inter-annual variability of flows associated with restoring the health and function of the swamp, but is constrained by the current conditions of the swamp, limits of the project's influence area and other hydrologic factors. Operational adjustments will be based on a variety of factors including Mississippi River conditions, seasonal environmental trends, and weather patterns. In addition, operations will need to be flexible to meet the needs of the receiving area, including limiting flow at certain times to promote seedling establishment and adjusting the pulsing regime to maximize nutrient uptake and to minimize flood stress. It is expected that operations will vary seasonally and annually based on these factors. Operational changes may include timing, duration, and frequency of operations. A more detailed operational plan will be developed based on information obtained from the new Delft3D model outputs and input from the TAG, among other sources. For the purposes of this WVA it is assumed that the project will be operated at maximum flow of 2,000 cubic feet per second during appropriate times to increases swamp health, productivity, and sustainability, including drought and other high salinity periods such as post-tropical storm events, and the actual operations regime is expected to be dynamic throughout the project life.

1.3.8 Project OMMAM Plan

The preliminary OMMAM plan (Buras et al. 2018) was drafted by CPRA engineers and ecologists and utilized the extensive body of work that has been conducted over the last couple of decades during project development. The goal of the preliminary plan was to describe key project features along with management of their operations, maintenance, and monitoring. Additionally we contracted a Technical Advisory Group (TAG) of forest ecologists to provide general operational plan guidance for project success and identify key monitoring elements to assess success of the project as it relates to its goals and objectives (Krauss et al. 2017). A more detailed operational plan will be developed based on information obtained from the new Delft3D model outputs and input from the TAG, among other sources. This plan will assist in guiding the design, construction, and operation of the project throughout its project life. As is consistent with the principles of adaptive management, this plan will be a living document that can be modified during project implementation as conditions warrant.

2.0 Data Acquisition and Assessment

2.1 Study Methods

This project concept is generally widely endorsed because anticipated benefits of a freshwater introduction include enhanced productivity, enhanced accretion, reduced swamp loss, increased regeneration and associated self-maintenance, a relatively high nutrient assimilation capacity, and improved water quality. However, high natural variability and differences among wetland types that have previously been studied makes it imperative that decisions about such a large-scale project be based on site-specific information.

Activities within the scope of this study have included the following:

- Hydrologic modeling of existing conditions and basic freshwater introduction scenarios, which focused on assessing how much water could be diverted into swamps and projecting flow patterns;
- GIS and satellite imagery were analyzed in each subarea;
- Baseline ecological field data review, to provide preliminary information regarding swamp productivity and function to help estimate expected benefits from a freshwater introduction project; and
- Recent field investigations and other data (e.g., National Wetlands Inventory) were utilized to delineate habitat types within the project area.

In addition, there is a body of research on the baldcypress-water tupelo swamps in the Maurepas area by Dr. Gary Shaffer, and in the Barataria Basin, including works by Dr. Will Conner and by Dr. John W. Day, Jr. These studies have been incorporated, as appropriate, in evaluation and projection of benefits for the proposed project. Current literature was reviewed for current estimates on baldcypress and water tupelo basal area and DBH growth rates and species specific salinity tolerance rates, effects of flooding on tree growth and stand density (Allen et al. 2019, Keim et al. 2010), general trends in the decline of the Maurepas swamp (Shaffer 2016), and the ecological response of forested wetlands with and without large-scale Mississippi River input (Day et al. 2012). Performance metrics and their subsequent recommendations regarding establishing a hydrologic regime consistent with swamp forest sustainability, ameliorating salinity intrusion, increasing rates of soil surface elevation gain, increasing forest structural integrity, and facilitating nutrient uptake and retention were also reviewed (Krauss et al. 2017).

2.2 Numerical Modeling

In 2007, as part of the Engineering and Design Phase of the project, United Research Services (URS, now AECOM) developed two numerical models that were used in the project feasibility study and preliminary design. These models included a one-dimensional (1D) drainage model, EPA's Stormwater Management Model (SWMM), and a two-dimensional (2D) hydrodynamic model – the Advanced Circulation (ADCIRC) Model. SWMM was used to both verify Hydrologic Engineering Center-River Analysis System (HEC-RAS) model results of conveyance channel parameters from the CWPPRA Phase 1 efforts and determine the 250 cubic feet per second (cfs) capacity of the pump station required to maintain the current drainage characteristics post-construction. The pump station is now envisioned to be built as part of the USACE WSLP Project.

The ADCIRC model was employed to study the behavior of 2,000 cfs of fresh water within the Maurepas swamp watershed. Preliminary results of the ADCIRC model guided design of small water control features within the watershed to improve freshwater retention and circulation.

There have been advances in computing and modeling capabilities since the 2001 WVA was produced, therefore a new modeling effort was initiated in 2018. The purpose of the current numerical modeling effort is to support the hydraulic design of the proposed project and evaluate the effect of reintroducing fresh water from the Mississippi River on the water levels, velocity, and nutrient distribution throughout the Maurepas swamp. A 2D hydrodynamic model, Delft3D modeling software (Deltares 2014) was used to evaluate existing conditions and potential operational regimes to facilitate distribution of the introduced fresh water throughout the swamp. Delft3D can simulate water level and velocities throughout the modeled study area, and to address water quality, a nutrient module was developed to assess nitrogen and phosphorous (Buras et al. 2018). The Delft3D hydrologic modeling effort (Appendix A) was used for this WVA to compare existing conditions and hydrologic changes associated with the proposed river reintroduction. The Delft3D modeling effort, professional judgment, and associated hydrographic surveys informed the team of the magnitude of effects in project areas expected to receive diverted water and related benefits to the receiving swamps. Additionally, there are estimates based on water budget for the Lake Maurepas area that strongly suggest the proposed project with pulsed operation at 2,000 cfs could have a measurable capacity to freshen the lake system, especially along the southern and western shorelines. Such low head differences would rarely be expected to occur at the Maurepas structure site.

2.3 Target Year Selection

Typically, WVAs are conducted for a period of 50 years. Each project evaluation must include target years (TY) 0, 1, and 50. Target year 0 (TY0) represents baseline conditions in the project area, the inclusion of TY25 here recognizes the likelihood of an episodic drought, and TY50 represents the projected conditions at the end of the project life. The fifty year study period will begin in 2022 and continue to 2072. This will allow for construction of the project and for FWOP and FWP to include the WSLP levee system for the entirety of the study period.

In general, a linear progression was used to make projections, with the exception of storm events, changes in frequency and duration of flooding, salinity changes, and subsequent conversion of habitat. To account for the effects of those events a mid-range year was added (TY25) which allows for better representation of expected trends during different periods during the project life, the latter half of which is expected to experience much higher rates of relative sea level rise (RSLR) and related impacts.

Most of the influences on WVA variables are assumed to be occurring constantly throughout the project life between target years, therefore cumulative effects of those influences are represented in the TY inputs. Salinity levels are expected to increase yearly with SLR and this rate is higher from TY25 to TY50 compared to the rate from TY1 to TY25. Similarly, drought conditions are not consistent, as they typically occur on decadal to 50-year return periods, leading to severely reduced tree growth and singularly large mortality events (Day et al. 2012). While major drought conditions are expected during the project life, it is impossible to predict when these events will occur. As such, the team did not choose specific target years to capture decadal and 50-year drought conditions but rather incorporated the effects of a drought within the larger set of assumptions that variable inputs are derived from. For example, a major drought is expected to occur once during the project lifespan, with 25 years being around the expected time (Wood, B., G. Shaffer, R. Keim, personal communication 2019), therefore it was assumed that the effects of such an event would occur by TY25 rather than at TY25.

Tropical storm and hurricane frequencies for the Louisiana coast are variable, with runs of high storm frequency years as well as periods of reduced frequency present in the landfall records since 1901 (Stone et al. 1997). Landfall rates and spatial simulation models of hurricane circulation for the period of record from 1851-2006 indicate that southeast Louisiana experiences a major hurricane every five to eleven years (Doyle 2009), although hurricane return periods in the region can be as low as every three years (Keim et al. 2007). Major storm events are among the cumulative effects considered when generating variable inputs and are expected to occur within the project life, but are not assigned specific target years. Hurricanes are not expected to influence stand maturity (V2), water regime (V3), salinity (V4), surrounding land use (V6), or disturbance (V7) during the project life. Storm surges in Maurepas swamp are typically short temporal pulses on top of previously saturated soils, which limits diffusion of saltwater into soil pore water; however, if salt water introduced to the swamp by a storm event lingers long after the storm passes or occurs during a drought period, soil salinities could increase two- to threefold and contribute to delayed diebacks (Doyle et al. 2007). The project should be able to address salinity related storm surge issues by flushing the swamp with freshwater and alleviating salt stress. Wind damage associated with storms does not typically lead to increased mortality rates in baldcypress swamps, as baldcypress is resilient to hurricane winds (Doyle et al. 2007), but weak-wooded species like water tupelo are less resilient, therefore a storm event could still likely influence stand structure (V1) and potentially contiguous forest size (V5) during the project life. Temporary wind damage may decrease overstory coverage in the immediate term, yearly time scale but the majority of influence will be in potential mortality of understory species leading to decreased coverage in the short-term. Herbaceous species typically recover quickly but the duration to full recovery will be dependent on severity of the storm. Any immature baldcypress and water tupelo may be susceptible to mortality associated with storms, which along with other mortality considerations may reduce contiguous forest size.

Changes in flooding frequency and duration are expected to occur as RSLR continues. As RSLR continues, saltwater intrusion as well as flooding frequency and duration may increase which could result in habitat conversion and loss. Subsidence in the project area is predicted to be 6.7 mm per year or up to 0.33 m (1.08 ft) during the project life, according to USACE calculations of vertical land movement local to the long-term tide gauge station 85550 at Lake Pontchartrain Frenier Landing (USACE 2017). USACE predicted ESLR rate is 1.7 mm per year, and based on the USACE Intermediate Curve, which is computed from the modified National Research Council (NRC) Curve I considering both the most recent IPCC projections and modified NRC projections with local rate of vertical land movement added, RSLR is predicted to be 1 m (3.3 ft) over the project life (Appendix B).

Baseline (TY0) values were determined for each of the variable to describe existing conditions in the project area. Future values for those variables were projected to describe conditions in the area with and without the project. Projecting future values is the most complicated part of the process requiring the substantiation of assumptions with monitoring data, research findings, and scientific literature. Not all future projections can be substantiated by the results of monitoring or research, and some projections are based on best professional judgment.

2.4 Study Site and CRMS Station Data

Shaffer et al. (2009a) initiated a study in 2000 in which 20 sites in Maurepas swamp were established with paired 625-m^2 stations. Four additional sites were installed in 2004 to assess baseline conditions for a planned levee-gapping project on the Amite River Diversion Canal. The study characterized three habitat types by different hydrological regimes (Figure 5):

- Relict—stagnant, nearly permanently flooded interior sites, characterized by trees with broken canopies, few mid-story/ scrub-shrub species, a well-defined herbaceous community, and a complete lack of natural regeneration;

- Degraded—sites near Lake Pontchartrain or the margin of Lake Maurepas that are prone to severe saltwater intrusion events characterized by dead trees, sparsely dotted with baldcypress, and dominated by herbaceous species and open water; and

- Throughput—sites receiving reliable nonpoint sources of freshwater runoff, characterized by mature overstory and mid-story stands and little herbaceous cover.

Annually, from 2000 through 2010, a number of variables were assessed including soil bulk density, interstitial soil salinity, light penetration, understory primary productivity, tree primary productivity, sediment elevation change, and habitat type.

In addition to the 24 Shaffer et al. (2009a) sites, herbaceous vegetation, forested swamp vegetation, salinity, swamp surface elevation, hourly hydrographic, land/water, floristic quality index, and basal area data were analyzed from nine Coastwide Reference Monitoring System (CRMS) stations. The full period of record for each of these sites was utilized, with data collection at these sites beginning in 2007.

Wetland loss is the conversion of emergent habitat to open water. However, in many areas along the coast, the historic loss of swamp habitat has not resulted in a conversion to open water but rather a conversion to marsh. Because much of the historic loss of swamp has not resulted in a conversion to open water, United States Geological Survey (USGS) land/water data do not allow for the calculation of a loss rate for swamp habitat. Instead, habitat classification data were utilized to determine approximate conversion rates for swamp to marsh. Additionally, swamp habitat acreage was adjusted to the appropriate year and was weighted accordingly. Whether it is loss of habitat to open water or conversion to marsh, the team investigated the situation carefully and has provided as much supporting documentation as possible.

CRMS stations located within subareas were preferably chosen as representative data sources for some hydrological and vegetation data (Figure 2). In lieu of a CRMS station located within the subarea, a station near the subarea was chosen. Some CRMS stations were prioritized or avoided when considering habitat type or location within swamp (interior forest vs. lake-rim forest vs. canal adjacent forest, etc.) A summary of CRMS stations and study site habitat type data utilized in the assessment of each of the subareas can be found in Table 1.

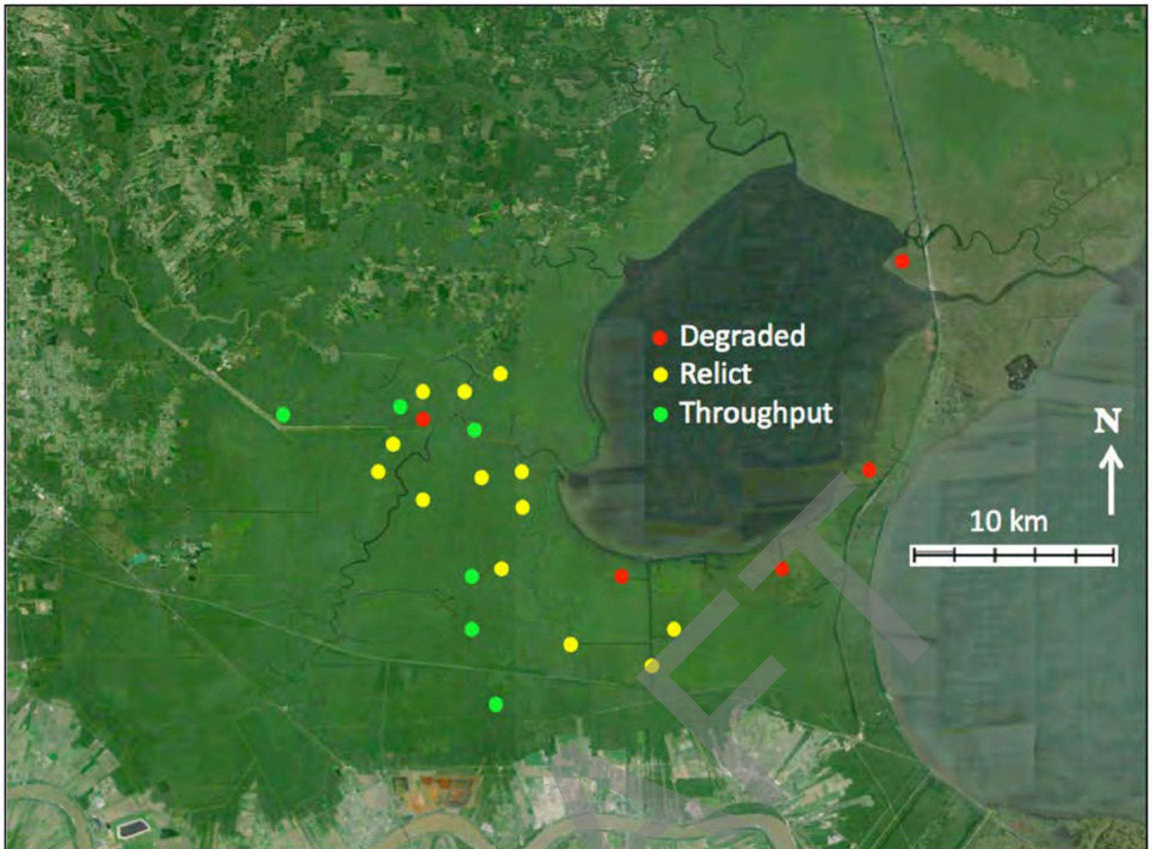


Figure 5: Twenty four sites, each with two 625 m² stations, were selected in south Maurepas swamp to represent three major habitat types— Throughput (green), Relict (yellow), and Degraded sites (red)— characterized by hydrological regime (Shaffer et al. 2016).

Table 1: CRMS Station Data by Subarea- Each WVA subarea was associated with a CRMS station within or adjacent to the subarea and was further evaluated based on habitat type as reported by Shaffer et al. (2016).

Reference Station Data		
Subarea	**CRMS Station**	**Habitat Type**
1	CRMS0063	Throughput
2A	CRMS5414	Relict
2B	CRMS0097	Relict
2C	CRMS5414	Relict
3A	CRMS0061	Relict
3B	CRMS0090	Degraded
4A	CRMS0047	Relict
4B	CRMS0058	Degraded
4C	CRMS5255	Relict
5A	CRMS5373	Throughput
5B	CRMS5373	Throughput

3.0 Variable Evaluation

3.1 V1- Stand Structure

This variable assigns the lowest suitability index (SI) rating to sites with a limited amount of all three stand structure components, and mid-range suitability to various combinations when one or two stand structure components are present. A mature stand dominated by overstory trees receives the highest suitability rating.

Review of current aerial imagery and the most current CRMS station data for overstory, mid-story / scrub-shrub, and herbaceous percent cover showed considerable variability among locations within the broad expanse of the south Maurepas swamp. Since some CRMS data is only collected once every three years, as with diameter at breast height (DBH), for instance, CRMS station percent canopy cover and DBH data by species are not available for most CRMS stations after 2015, however mid-story/ scrub-shrub and herbaceous percent cover data by species is available from as recently as 2018. The mean overstory, mid-story/ scrub-shrub, and herbaceous percent cover were calculated for each CRMS station and applied as TY0 values for the subarea associated with that station.

Data gathered from CRMS sites and study stations indicate V1 is variable among project subareas but overall reflects habitat degradation within the swamp. The magnitude of degradation is largely related to either interior impoundment or proximity to Lake Maurepas, Blind River, and passes. This is consistent with the idea that the primary controlling factors of swamp degradation are subsidence, saltwater intrusion, and lack of freshwater, sediment, and nutrient input. It was assumed that areas currently classified as relict would progressively degrade by FWOP TY25. As a general rule, areas currently characterized as throughput were considered to be sustainable despite projected future canopy species mortalities.

Subarea 1 is categorized as throughput swamp and one of the least degraded subareas, and accordingly has the most canopy cover amongst the subareas. The most recent CRMS data for this subarea were utilized as TY0 and TY1, and received a Class 6 rating with 83% overstory cover, 20% mid-story/ scrub-scrub, and 43% herbaceous cover. For the FWOP TY25 overstory was reduced to 42% cover, mid-story/ scrub-shrub was reduced to 16% , and the herbaceous percent cover was increased to 57% as the canopy opened, reducing the subareas to a Class 3 rating. In FWOP TY50 overstory was reduced to 33% cover, mid-story/ scrub-shrub was reduced to 11%, and the herbaceous percent cover was increased to 63% as the canopy continued to open, resulting in a Class 1 rating. In FWP TY25 overstory, mid-story/ scrub-shrub, and herbaceous cover are maintained at 83%, 20%, and 43% respectively, resulting in a Class 6 rating. In FWP TY50 overstory is increased to 95%, mid-story/ scrub-shrub and herbaceous cover are reduced to 15% and 34% respectively to account for the canopy closing, which results in a Class 6 rating.

Subarea 2A consists of relict swamp with a fragmented canopy, few mid-story/ scrub-shrub species, a well-defined herbaceous community, and a lack of natural regeneration (Shaffer et al. 2016). CRMS data was utilized for subarea 2A TY0 and TY1 to receive a Class 5 rating with 33% overstory cover, 34% mid-story/ scrub-shrub, and 65% herbaceous cover. For the FWOP TY25 overstory was reduced to 16% cover, mid-story/ scrub-shrub was reduced to 27% , and the herbaceous percent cover was increased to 86% as the canopy opened, reducing the subarea to a Class 1 rating. In FWOP TY50 overstory was reduced to 12% cover, mid-story/ scrub-shrub was reduced to 18%, and the herbaceous percent cover was increased to 95% as the canopy continued to open, resulting in a Class 1 rating. In FWP TY25 overstory, mid-story/ scrub-shrub, and herbaceous cover are maintained at 33%, 34%, and 65% respectively resulting in a Class 5 rating. In FWP TY50 overstory and mid-story/ scrub-shrub are reduced to 26% and 27% cover respectively, while herbaceous cover increases to 75% resulting in a Class 1 rating.

Subarea 2B consists of relict swamp similar to 2A. Current CRMS forested vegetation data indicate roughly 94% canopy cover, and while there are portions of subarea 2B which exhibit a high percent canopy cover, aerial imagery suggests that this value is vastly over exaggerated and generally not representative of the entire subarea. Percent canopy cover was determined using the most current satellite imagery and percent cover classes were weighted by percent occupancy of the larger subarea. Using this methodology, it was determined that the percent canopy cover for TY0 and TY1 of subarea 2B is approximately 46%. Current CRMS data were used for mid-story/ scrub-shrub and herbaceous cover TY0 and TY1 values of 25% and 62% cover respectively, resulting in a Class 3 rating. In FWOP TY25, overstory and mid-story/ scrub-shrub were reduced to 23% and 20% cover, while herbaceous cover was increased to 71%, resulting in a Class 1 rating. In FWOP TY50 overstory and mid-story/ scrub-shrub were reduced to 17% and 13% cover respectively, while herbaceous cover increased to 78%, maintaining a Class 1 rating. In FWP TY25 overstory, mid-story/ scrub-shrub, and herbaceous cover remained at 46%, 25%, and 62% respectively. In FWP TY50 overstory and mid-story/ scrub-shrub cover were reduced to 37% and 20% respectively, while herbaceous cover increased to 71%.

Subarea 2C is also considered relict swamp similar to subareas 2A and 2B. CRMS data report average canopy cover as 26%, but satellite imagery and forested vegetation surveys from neighboring CRMS stations suggest that this value is an underrepresentation of the entire subarea. Based on review of satellite imagery and nearby CRMS survey data, the TY0 overstory canopy cover value for this subarea was adjusted to 60%. Similarly, values reported for percent mid-story/ scrub-shrub (34%) and herbaceous (65%) cover in the most recent (2017) herbaceous vegetation survey do not align with expert opinion of the average stand structure of this subarea based on all available information. Therefore, percent mid-story/ scrub-shrub and herbaceous cover were both adjusted to 25% and 45% respectively to more accurately reflect forest composition in the majority of this subarea. These values result in a Class 4 rating for TY0, and these same values and class rating were maintained in TY1 for both FWOP and FWP. In FWOP TY25, subarea 2C overstory and mid-story/ scrub-shrub cover were reduced to 28% and 12% cover respectively. Herbaceous vegetation is projected to increase to 50% cover as the overstory canopy opens and the mid-story/ scrub-shrub layer is reduced, and overall the subarea is reduced to a Class 1 by this target year. For FWOP TY50, overstory and mid-story/ scrub-shrub are reduced to 9% and 4% cover. As overstory and mid-story/ scrub-shrub canopy cover decrease, herbaceous cover is predicted to increase to 75% for this target year, resulting in a Class 1 rating. In FWP TY25 overstory and mid-story/ scrub-shrub were reduced to 45% and 19% cover respectively, while herbaceous cover is predicted to increase to 50%, resulting in a class 3 rating for this target year. In FWP TY50 overstory and mid-story/ scrub-shrub were further reduced to 32% and 13% cover respectively, while herbaceous cover is predicted to increase to 60% and the subarea receives a Class 1 rating for this target year.

Subareas 3A is relict swamp, and most recent CRMS forested survey data report current stand structure is 78% overstory, 23% mid-story/ scrub-shrub, and 43% herbaceous cover, categorizing the subarea as a Class 6. However, aerial imagery of the subarea indicated that 78% overstory was unrepresentative of the entire subarea. An adjusted average overstory value of 72% was determined by weighting 78% canopy observed in roughly 80% of the subarea with 48% percent observed in roughly 20% of the subarea. CRMS mid-story/ scrub-shrub and herbaceous cover were sufficiently representative of the subarea, resulting in an adjusted TY0 rating of Class 4. In FWOP TY25, overstory and mid-story/ scrub-shrub cover are reduced to 33% and 11% respectively, while herbaceous cover increased to 65%, resulting in a Class 3. In FWOP TY50, overstory cover is reduced to 11% and mid-story/ scrub-shrub cover is reduced to 3%.

Herbaceous cover is predicted to increase to 85%, resulting in a Class 1 rating in this target year. In FWP TY25 overstory cover is reduced to 54% and mid-story/ scrub-shrub cover is reduced to 17%, while herbaceous cover is predicted to increase to 65%, resulting in a Class 4 rating. In FWP TY50 overstory cover is reduced to 38% and mid-story/ scrub-shrub cover is reduced to 12%, while herbaceous cover is increased to 80% and the subarea receives a Class 3 rating.

Subarea 3B is degraded swamp that is much less densely forested than 3A. Most recent CRMS survey data report stand structure in this area to be roughly 34% overstory, 0% mid-story/ scrub-shrub, and 74% herbaceous cover, and the subarea receives a Class 3 rating for both FWOP and FWP in TY0 and TY1. In FWOP TW25, overstory cover is reduced to 16%, mid-story/ scrub-shrub cover remains at 0%, while herbaceous cover will increase to 84%, reducing the stand to a Class 1. In FWOP TY50, overstory cover is reduced to 5%, mid-story/ scrub-shrub cover remains at 0%, and herbaceous cover is predicted to increase to 95%, and the subarea receives a Class 1 rating. In FWP TY25 overstory cover is reduced to 26%, mid-story/ scrub-shrub cover remains at 0%, while herbaceous cover is predicted to increase to 81%, resulting in a Class 1 rating. In FWP TY50 overstory cover is reduced to 21%, mid-story/ scrub-shrub cover remains at 0%, and herbaceous cover is predicted to increase to 90% and the subarea receives a Class 1 rating.

Subareas 4A, 4B, and 4C are the most degraded project subareas, with the most open canopy, and most herbaceous cover. Subarea 4A is a mosaic patch along Reserve Relief Canal consisting of sustainable, relict, and degraded swamp habitat (Shaffer et al. 2016). The CRMS station associated with this subarea is located in the most sustainable region of the subarea; therefore, the forested and herbaceous vegetation percent cover values reported for this station were adjusted based on aerial imagery, and knowledge of the area. Most recent (2018) CRMS survey data report overstory, mid-story/ scrub-shrub, and herbaceous canopy cover as 78%, 33%, and 37%, respectively. However, less than 40% of the subarea is so heavily forested, and roughly 60% of the subarea has 25% or less overstory canopy cover. To account for inconsistent cover across the subarea, the TY0 value for percent overstory was weighted according to relative area with an average of approximately 46% overstory canopy cover. TY0 values for percent mid-story/ scrub-shrub and herbaceous cover were correspondingly adjusted to 37% and 55% considering the adjusted percent overstory canopy, resulting in a Class 5 rating for TY0 and TY1. The proximity of subarea 4A to Lake Maurepas and Reserve Relief Canal makes it more susceptible to future impacts of sea level rise and saltwater intrusion. Additionally, the northern portion of this subarea is degraded swamp, which will likely convert to marsh or open water in FWOP. In FWOP TY25 overstory and mid-story/ scrub-shrub cover were reduced to 21% and 17% cover respectively while herbaceous cover increased to 70%. In FWOP TY50 overstory and mid-story/ scrub-shrub 7% and 6% cover respectively while herbaceous cover increased to 90%, reducing the subarea to a Class 1 for both target years.

For subarea 4A in FWP, overstory and mid-story/ scrub-shrub cover are reduced to 35% and 28% cover respectively, while herbaceous cover increases to 65%, reducing the subarea to a Class 3. In FWP TY50 overstory and mid-story/ scrub-shrub cover are reduced to 25% and 20% cover respectively, while herbaceous cover increases to 80% resulting in a Class 1 rating. This subarea is not predicted to receive substantial project benefits in terms of nutrient or sediment amendment but is modeled to receive freshwater input that will likely limit mortality related to drought or saltwater stress in FWP. Although the subarea is still predicted to be a Class 1 by TY50 in both scenarios, percent overstory canopy in FWP (25%) is much higher than FWOP (7%), indicating swamp degradation and transition to marsh or open water is less rapid in FWP.

Subarea 4B has the fewest number of trees and has progressed from swamp to emergent marsh more than any other subarea in the project area. In the 2001 WVA, canopy cover for this subarea was reported as 10%. According to the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI), subarea 4B has largely converted to semi-permanently flooded palustrine emergent (PEM) wetland with only three small, isolated stands of swamp remaining. East of Interstate 55 (I-55) both north and south of Pass Manchac, wetlands have converted from PEM to irregularly flooded intertidal emergent estuarine and marine (EEM) wetland and open water. As sea level rises, it is anticipated that this progression from PEM to EEM will continue along the lake rim in the FWOP. Most recent CRMS forested and herbaceous vegetation survey data for subarea 4B report percent cover is 59% overstory, 30% mid-story/ scrub-shrub, and 76% herbaceous. As in subarea 4A, these values were not considered to be wholly representative of the entire subarea, as the CRMS station referenced is located within the most intact forested region of this subarea. Using aerial imagery, published studies of the region (particularly Shaffer et al. 2016), and professional judgment, it was determined that this subarea is more accurately 39% overstory cover. Mid-story/ scrub-shrub and herbaceous cover of 39% and 76% reported in CRMS survey data were considered adequate and left unchanged, resulting in a Class 3 rating for this variable in TY0 and TY1 for FWOP and FWP scenarios.

In FWOP TY25 for subarea 4B, overstory and mid-story/ scrub-shrub cover decreased to 13% and 10% respectively, while herbaceous cover increased to 85%. In FWOP TY50 overstory and mid-story/ scrub-shrub cover decreased to 3% and 5% respectively, while herbaceous cover increased to 95%. In FWP TY25 overstory and mid-story/ scrub-shrub cover decreased to 29% and 20% cover respectively, while herbaceous cover increased to 80% resulting in a Class 1 rating for both target years. In FWP TY50 overstory and mid-story/scrub-shrub cover was decreased to 20% and 15% respectively, while herbaceous cover increased to 85% resulting in a Class 1 rating for both target years. Though the subarea is projected to be a Class 1 in both project scenarios by the end of project life, in FWOP only 3% overstory cover is predicted to remain intact by TY50, whereas 20% overstory cover is predicted to remain intact by TY50 in FWP. While this subarea will likely experience continued degradation due to its current state of deterioration, the river reintroduction project should decrease the transition rate of forest to marsh or open water.

Subarea 4C shares some similarities with 4B in terms of susceptibility to sea level rise and saltwater intrusion impacts as both subareas are adjacent to Lake Maurepas. However, whereas subarea 4B is largely degraded swamp with increasing areas of emergent marsh, subarea 4C consists of more relict swamp habitat. Most recent CRMS station data associated with this subarea was determined to be representative of the subarea, and reported survey values for percent overstory (55%), mid-story/ scrub-shrub (30%), and herbaceous (76%) cover were used for TY0 and TY1, resulting in a Class 4 for this subarea. In FWOP TY25 overstory and mid-story/ scrub-shrub cover decreased to 18% and 10% respectively, while herbaceous cover increased to 86%. In FWOP TY50 overstory and mid-story/ scrub-shrub cover decreased to 5% and 3% respectively, while herbaceous cover increased to 90% resulting in a Class 1 rating for both target years. In FWP TY25 overstory and mid-story/ scrub-shrub cover was decreased to 41% and 21% respectively, while herbaceous cover increased to 84% resulting in a Class 3 rating. In FWP TY50 overstory and mid-story/ scrub-shrub cover was decreased to 29% and 16% respectively, while herbaceous cover increased to 88% resulting in a Class 1 rating. As in subarea 4A, though TY50 class ratings are the same for FWOP and FWP, percent overstory cover in FWP is much higher, indicating project benefits will likely slow the transition of coastal forest to marsh or open water.

Subareas 5A and 5B were assessed using the same CRMS data and target year values are the same for both subareas. TY0 percent covers were 84% overstory, 10% mid-story/ scrub-shrub, and 12% herbaceous cover, categorizing these subareas as Class 4 forests. In FWOP TY25 overstory and mid-story/ scrub-shrub cover decreased to 46% and 6% respectively, while herbaceous cover increased to 45%, resulting in a Class 3 rating. In FWOP TY50 overstory and mid-story/ scrub-shrub cover decreased to 23% and 3% respectively, while herbaceous cover increased to 65% resulting in a Class 1 rating. In FWP TY25 overstory and mid-story/ scrub-shrub cover decreased to 67% and 8% respectively, while herbaceous cover increased to 25% resulting in a Class 3 rating. In FWP TY50 overstory and mid- story/ scrub-shrub cover decreased to 47% and 6% respectively, while herbaceous cover increased to 45% resulting in a Class 3 rating.

Table 2: V1 Stand Structure- Percent cover of all strata, with associated Class and SI ratings, for all subareas and target years in FWOP and FWP.

V1 – Stand Structure			% Cover Overstory	% Cover Mid-Story/ Shrub-scrub	% Cover Herbaceous	Class	SI
Area 1	TY0		83	20	43	6	1.0
	TY1	FWOP	83	20	43	6	1.0
		FWP	83	20	43	6	1.0
	TY25	FWOP	42	16	57	3	0.4
		FWP	83	20	43	6	1.0
	TY50	FWOP	33	11	63	3	0.4
		FWP	95	15	34	6	1.0
Area 2A	TY0		33	34	65	5	0.8
	TY1	FWOP	33	34	65	5	0.8
		FWP	33	34	65	5	0.8
	TY25	FWOP	16	27	86	1	0.1
		FWP	33	34	65	5	0.8
	TY50	FWOP	12	18	95	1	0.1
		FWP	26	27	75	1	0.1

V1 – Stand Structure			% Cover Overstory	% Cover Mid-Story/ Shrub-scrub	% Cover Herbaceous	Class	SI
Area 2B	TY0		46	25	62	3	0.4
	TY1	FWOP	46	25	62	3	0.4
		FWP	46	25	62	3	0.4
	TY25	FWOP	23	20	71	1	0.1
		FWP	46	25	62	3	0.4
	TY50	FWOP	17	13	78	1	0.1
		FWP	37	20	71	3	0.4
2C	TY0		60	25	45	4	0.6
	TY1	FWOP	60	25	45	4	0.6
		FWP	60	25	45	4	0.6
	TY25	FWOP	28	12	50	1	0.1
		FWP	45	19	50	3	0.4
	TY50	FWOP	9	4	75	1	0.1
		FWP	32	13	60	1	0.1
Area 3A	TY0		72	23	43	4	0.6

V1 – Stand Structure			% Cover Overstory	% Cover Mid-Story/ Shrub-scrub	% Cover Herbaceous	Class	SI
	TY1	FWOP	72	23	43	4	0.6
		FWP	72	23	43	4	0.6
	TY25	FWOP	33	11	65	3	0.4
		FWP	54	17	65	4	0.6
	TY50	FWOP	11	3	85	1	0.1
		FWP	38	12	80	3	0.4
Area 3B	TY0		34	0	74	3	0.4
	TY1	FWOP	34	0	74	3	0.4
		FWP	34	0	74	3	0.4
	TY25	FWOP	16	0	84	1	0.1
		FWP	26	0	81	1	0.1
	TY50	FWOP	5	0	95	1	0.1
		FWP	21	0	90	1	0.1
Area 4A	TY0		46	37	55	5	0.8
	TY1	FWOP	46	37	55	5	0.8

V1 – Stand Structure			% Cover Overstory	% Cover Mid-Story/ Shrub-scrub	% Cover Herbaceous	Class	SI
		FWP	46	37	55	5	0.8
	TY25	FWOP	21	17	70	1	0.1
		FWP	35	28	65	3	0.4
	TY50	FWOP	7	6	90	1	0.1
		FWP	25	20	80	1	0.1
Area 4B	TY0		39	30	76	3	0.4
	TY1	FWOP	39	30	76	3	0.4
		FWP	39	30	76	3	0.4
	TY25	FWOP	13	10	85	1	0.1
		FWP	29	20	80	1	0.1
	TY50	FWOP	3	5	95	1	0.1
		FWP	20	15	85	1	0.1
Area 4C	TY0		55	30	76	4	0.6
	TY1	FWOP	55	30	76	4	0.6
		FWP	55	30	76	4	0.6

V1 – Stand Structure			% Cover Overstory	% Cover Mid-Story/ Shrub-scrub	% Cover Herbaceous	Class	SI
	TY25	FWOP	18	10	86	1	0.1
		FWP	41	21	84	3	0.4
	TY50	FWOP	5	3	90	1	0.1
		FWP	29	16	88	1	0.1
Area 5A	TY0		84	10	12	4	0.6
	TY1	FWOP	84	10	12	4	0.6
		FWP	84	11	12	4	0.6
	TY25	FWOP	46	6	45	3	0.4
		FWP	67	8	25	3	0.4
	TY50	FWOP	23	3	65	1	0.1
		FWP	47	6	45	3	0.4
Area 5B	TY0		84	10	12	4	0.6
	TY1	FWOP	84	10	12	4	0.6
		FWP	84	10	12	4	0.6
	TY25	FWOP	46	6	45	3	0.4

V1 – Stand Structure			% Cover Overstory	% Cover Mid-Story/ Shrub-scrub	% Cover Herbaceous	Class	SI
		FWP	67	8	25	3	0.4
	TY50	FWOP	23	3	65	1	0.1
		FWP	47	6	45	3	0.4

3.2 V2- Stand Maturity

The SI for this variable is based upon the average diameter-at-breast height (DBH) for canopy-dominant and canopy codominant trees within the plot/sample and basal area of those trees. The suitability graph assumes optimal conditions are present when canopy-dominant and canopy-codominant trees have an average DBH above 16 inches for baldcypress and above 12 inches for water tupelo et al. and basal area is considered optimal when density is greater than 161 sq. ft./acre. For this project, the most current CRMS station data were used to estimate starting DBH and basal area values for TY0.

DBH and basal area data were obtained from nearby CRMS stations (Appendix C) and the most recent CRMS forested vegetation survey data was used. Initial (TY0) DBH was obtained from overstory layer tree diameter in centimeters and converted to inches. Low, Medium and High DBH growth rates (Shaffer and Kandalepas 2019 and personal communication; Table 3) were applied on a per year basis between target years to determine DBH in future target years. Factors such as stand density (competition), proximity to Lake Maurepas, proximity to the project outfall, salinity, and inundation influenced growth rate selections.

Basal area by species was also obtained from nearby CRMS stations and initial basal area (TY0) data from the most recent CRMS survey data. Low, Medium, and High basal area growth rates (Conner and Day 1992) were applied on a per year, per tree basis between target years to determine basal area in future target years. Mortality was also considered and applied at each target year for basal area calculations. The mortality rates for all subareas and target years ranged from 0.10 to 0.50 and were only applied at TY25 and TY50 to capture long term expected trends rather than mortality in any one year such as in TY1. Factors influencing basal area growth rate selections and mortality rates were initial stand density (competition), proximity to Lake Maurepas, and proximity to the project outfall, salinity, and inundation. Regeneration was also considered but not separately applied due to spatial, temporal, and magnitude related uncertainty of any potential regeneration events.

Table 3: Growth rates for diameter at breast height (derived from Shaffer and Kandalepas 2019 and personal communication) and basal area (derived from Conner and Day 1992) used to project stand maturity (V2) in FWOP and FWP.

Diameter Breast Height Growth (in/year)				Basal Area Growth (sq ft/ acre/ tree)			
	Low	Medium	High		Low	Medium	High
Baldcypress	0.010	0.123	0.236	Baldcypress	0.0185	0.0264	0.0378
Water Tupelo	0.016	0.096	0.177	Water Tupelo	0.0053	0.0110	0.0140

In the FWP, the river reintroduction is expected to stimulate tree productivity and growth. Therefore all subareas are expected to have higher DBH growth rates, higher basal area growth rates, and lower mortality rate in FWP. The amount of stimulation is assumed to be relative to the distance the subarea is from the project outfall and/or proximity to Lake Maurepas. In general DBH and basal area growth rates were higher and mortality rate were lowest in subareas nearest to the project outfall, although there are exceptions where initial stand density is high, leading to increased assumed mortality and lower selected growth rates. Conversely subareas near the Lake Maurepas rim generally had lower DBH and Basal area growth rates and high mortality rates to account for effects of saltwater intrusion and inundation caused by seal level rise.

Subarea 1 is categorized as Throughput Swamp which suggests mortality will be low and, based on basal area data, growth should not be limited based on competition. Mortality occurs in both FWOP and FWP but at a lower rate in FWP. Mortality rates in FWOP were 0.25 at TY25 to account for cumulative mortality including a severe (50-year return period) drought expected prior to TY25 and then decreased to 0.15 at TY50 to account for cumulative mortality associated with minor (10-year return period) droughts and saltwater intrusion. Mortality rates in FWP were 0.10 for TY25 and TY50 to account for the expected ability of the project to ameliorate drought conditions. While growth rates are not limited based on density it is assumed that trees in this subarea in FWP will have higher growth rates than FWOP. In FWOP the DBH and basal area growth rates are Medium at TY1 and TY25 and decrease to Low at TY50 whereas in FWP both growth rates are High at TY1 and TY25 and decrease to Medium at TY50.

Subareas 2A and 2C are categorized as Relict Swamp, which suggests they should experience some degradation over time in FWOP conditions. Mortality rates are expected to be higher than what is described for Throughput subareas except that basal area data from the CRMS site suggest that there is available capacity for growth based on a relative lack of competition. Therefore mortality rates were reduced in these subareas compared with other Relict Swamp subareas that are also located in the interior of Maurepas swamp. In FWOP, mortality rates were 0.25 at TY25 and 0.10 at TY50, whereas in FWP mortality was 0.10 for both TY25 and TY50. Both DBH and basal area growth rates in FWOP were Medium for TY1 and TY25 and Low for TY50, whereas both growth rates in FWP were High in FWP in TY1 and TY25 and Medium in TY50.

Subarea 2B is also Relict Swamp, however basal area data suggest competition will be greater in this subarea compared to 2A and 2C, so mortality rates were assumed to be higher. Mortality rates in FWOP were 0.30 at both TY25 and TY50, whereas in FWP mortality rates were 0.15 at both TY25 and TY50. Both DBH and basal area growth rates in FWOP were Medium at TY1 and TY25 and Low at TY50, while both growth rates were High at TY1 and TY25 and Medium in TY50.

Subareas 3A is categorized as Relict Swamp and forested vegetation surveys indicate that red maple (*Acer rubrum*) is a co-dominant species and therefore included in the water tupelo et al. calculations. As such, morality for water tupelo et al. was assumed higher in both FWOP and FWP than if the stand did not include red maple as a co-dominant species. This accounts for red maple being relatively sensitive to salinity and inundation compared to water tupelo. Mortality rates for baldcypress in FWOP were 0.25 at TY25 and 0.10 at TY50, while mortality rates for water tupelo et al. in FWOP were 0.40 at both TY25 and TY50 due to increased effects of sea level rise in the latter half of the project life. In FWP, mortality rates for baldcypress were 0.10 at both TY25 and TY50, and mortality rates for water tupelo et al. were 0.3 at both TY25 and TY50. Both DBH and basal area growth rates in FWOP were Medium at TY1 and TY25 and Low at TY50, whereas both growth rates in FWP were High at TY1 and TY25 and Medium at TY50.

Subarea 3B is categorized as Degraded Swamp and spans from directly adjacent to the Lake Maurepas rim to the interior portion of Maurepas swamp along the Interstate-10 corridor, which could be categorized as Relict Swamp. As such, mortality rates are higher than most Relict Swamp subareas but not as high as other Degraded Swamp subareas. In FWOP, mortality rates were 0.30 at TY25 and TY50, whereas in FWP, mortality rates were 0.10 at TY25 and TY50. Basal area data suggest there is available capacity for growth based on limited competition. Accordingly, both DBH and basal area growth rates in FWOP are Medium at TY1 and TY25 and Low at TY50, whereas both growth rates in FWP are High at TY1 and TY25 and Medium at TY50.

Subarea 4A and 4C are categorized as Relict Swamp but are located closer to Lake Maurepas than other Relict Swamp subareas. These subareas are also not expected to receive as much freshwater input from the project compared to other subareas (Appendix A), with subarea 4A only receiving freshwater input in the central portion of the subarea. Subarea 4C is expected to receive project benefits indirectly by being adjacent to the Lake Maurepas rim where some freshwater input from the project is expected to outflow. To account for proximity to Lake Maurepas and, therefore, the effects of saltwater intrusion, in both FWOP and FWP mortality rates are higher and growth rates are lower than other Relict Swamp subareas. Mortality rates in FWOP are 0.45 at TY25 and TY50, whereas mortality rates in FWP are 0.20 at TY25 and TY50. The DBH and basal area growth rates in FWOP are Low at TY1, TY25, and TY50, whereas both growth rates are Medium at TY1 and TY25 and Low at TY50.

Subarea 4B is categorized as Degraded Swamp, and is located along the Lake Maurepas rim. It is expected to receive only indirect freshwater input from the project, as is seen in 4C. As such the highest mortality is assumed for this subarea in FWOP and FWP. Mortality rates in FWOP are 0.50 at both TY25 and TY50, whereas mortality rates in FWP are 0.35 for both TY25 and TY50. The DBH and basal area growth rates in FWOP are Low at TY1, TY25, and TY50, whereas both growth rates are Medium at TY1 and TY25 and Low at TY50.

Subareas 5A and 5B are the only other subareas categorized as Throughput Swamp in the project area, and mortality will therefore likely be low. However current basal area data suggest that for growth to occur some thinning would also have to occur from mortality. As such, to allow for growth, some mortality is assumed at rate of 0.15 in FWOP compared to 0.10 in FWP at TY25 and TY50. To account for stand density and only limited mortality, the growth rates were assumed to be Medium for this subarea rather than High. In FWOP the growth rates for DBH and basal area were Medium at TY1 and TY25 and Low at TY50, whereas both growth rates in FWP were Medium at TY1, TY25, and TY50.

Table 4: V2- Diameter at breast height (in) and basal area (ft²/ac) for baldcypress and water tupelo et al., with associated SI rating, for all subareas and target years in FWOP and FWP.

V2 – Stand Maturity			Baldcypress DBH (in)	Baldcypress Basal Area (ft²/ac)	Water Tupelo et al. DBH (in)	Water Tupelo et al. Basal Area (ft²/ac)	Overall SI
Area 1	Year 0		17.0	82.3	11.0	117.0	0.94
	Year 1	FWOP	17.1	82.3	11.1	117.0	0.95
		FWP	17.2	82.3	11.2	117.0	0.95
	Year 25	FWOP	20.1	68.4	13.4	97.0	1.00
		FWP	22.9	85.5	15.4	119.0	1.00
	Year 50	FWOP	20.3	62.3	13.8	86.0	0.80
		FWP	26.0	84.5	17.8	117.0	1.00
Area 2A	Year 0		6.0	12.3	12.0	88.0	0.53
	Year 1	FWOP	6.1	12.3	12.1	88.0	0.53
		FWP	6.2	12.3	12.2	88.0	0.53
	Year 25	FWOP	9.1	16.4	14.4	82.0	0.53
		FWP	11.9	23.4	16.4	104.0	0.75
	Year 50	FWOP	9.3	19.4	14.8	81.0	0.52

V2 – Stand Maturity			Baldcypress DBH (in)	Baldcypress Basal Area (ft²/ac)	Water Tupelo et al. DBH (in)	Water Tupelo et al. Basal Area (ft²/ac)	Overall SI
		FWP	15.0	29.0	18.8	112.0	0.79
Area 2B	Year 0		13.0	78.9	14.0	87.0	0.90
	Year 1	FWOP	13.1	78.9	14.1	87.0	0.91
		FWP	13.2	78.9	14.2	87.0	0.91
	Year 25	FWOP	16.1	57.5	16.4	71.0	0.80
		FWP	18.9	71.0	18.4	90.0	1.00
	Year 50	FWOP	16.3	41.4	16.8	53.0	0.60
		FWP	22.0	62.7	20.8	87.0	0.80
Area 2C	Year 0		6.0	12.3	12.0	88.0	0.53
	Year 1	FWOP	6.1	12.3	12.1	88.0	0.53
		FWP	6.2	12.3	12.2	88.0	0.53
	Year 25	FWOP	9.1	16.4	14.4	82.0	0.53
		FWP	11.9	23.4	16.4	104.0	0.75
	Year 50	FWOP	9.3	19.4	14.8	81.0	0.52

V2 – Stand Maturity			Baldcypress DBH (in)	Baldcypress Basal Area (ft²/ac)	Water Tupelo et al. DBH (in)	Water Tupelo et al. Basal Area (ft²/ac)	Overall SI
		FWP	15.0	29.0	18.8	112.0	0.79
Area 3A	Year 0		22.2	55.6	5.8	123.0	0.50
	Year 1	FWOP	22.3	55.6	5.9	123.0	0.51
		FWP	22.4	55.6	6.0	123.0	0.52
	Year 25	FWOP	25.3	44.6	8.2	96.0	0.59
		FWP	28.1	55.0	10.2	119.0	0.88
	Year 50	FWOP	25.5	42.0	8.6	64.0	0.48
		FWP	31.2	52.7	12.6	102.0	0.80
Area 3B	Year 0		13.2	39.7	13.4	61.0	0.56
	Year 1	FWOP	13.3	39.7	13.5	61.0	0.56
		FWP	13.4	39.7	13.6	61.0	0.56
	Year 25	FWOP	16.3	33.6	15.8	48.0	0.60
		FWP	19.1	46.4	17.8	64.0	0.60
	Year 50	FWOP	16.5	26.4	16.2	35.0	0.40

V2 – Stand Maturity			Baldcypress DBH (in)	Baldcypress Basal Area (ft^2/ac)	Water Tupelo et al. DBH (in)	Water Tupelo et al. Basal Area (ft^2/ac)	Overall SI
		FWP	22.2	48.7	20.2	63.0	0.60
Area 4A	Year 0		12.6	83.4	5.7	95.0	0.50
	Year 1	FWOP	12.6	83.4	5.7	95.0	0.50
		FWP	12.7	83.4	5.8	95.0	0.51
	Year 25	FWOP	12.9	52.2	6.1	61.0	0.32
		FWP	15.7	79.9	8.1	101.0	0.77
	Year 50	FWOP	13.1	32.4	6.5	38.0	0.23
		FWP	15.9	71.6	8.5	91.0	0.80
Area 4B	Year 0		12.5	11.7	14.6	46.0	0.38
	Year 1	FWOP	12.5	11.7	14.6	46.0	0.38
		FWP	12.6	11.7	14.7	46.0	0.38
	Year 25	FWOP	12.8	6.5	15.0	25.0	0.19
		FWP	15.6	8.9	17.0	35.0	0.40
	Year 50	FWOP	13.0	3.6	15.4	14.0	0.19

V2 – Stand Maturity			Baldcypress DBH (in)	Baldcypress Basal Area (ft^2/ac)	Water Tupelo et al. DBH (in)	Water Tupelo et al. Basal Area (ft^2/ac)	Overall SI
		FWP	15.8	6.3	17.4	25.0	0.20
Area 4C	Year 0		6.7	10.7	5.6	81.0	0.14
		FWOP	6.7	10.7	5.6	81.0	0.14
	Year 1	FWP	6.8	10.7	5.7	81.0	0.15
		FWOP	7.0	7.8	6.0	54.0	0.11
	Year 25	FWP	9.8	12.6	8.0	93.0	0.35
		FWOP	7.2	5.4	6.4	35.0	0.13
	Year 50	FWP	10.0	12.5	8.4	86.0	0.37
Area 5A	Year 0		16.7	131.0	14.5	156.0	1.00
		FWOP	16.9	131.0	14.6	156.0	1.00
	Year 1	FWP	16.9	131.0	14.6	156.0	1.00
		FWOP	19.8	123.2	16.9	141.0	1.00
	Year 25	FWP	19.8	130.5	16.9	149.0	1.00
	Year 50	FWOP	20.1	112.1	17.3	124.0	1.00

V2 – Stand Maturity			Baldcypress DBH (in)	Baldcypress Basal Area (ft^2/ac)	Water Tupelo et al. DBH (in)	Water Tupelo et al. Basal Area (ft^2/ac)	Overall SI
		FWP	22.9	129.2	19.3	143.0	1.00
Area 5B	Year 0		16.7	131.0	14.5	156.0	1.00
	Year 1	FWOP	16.9	131.0	14.6	156.0	1.00
		FWP	16.9	131.0	14.6	156	1.00
	Year 25	FWOP	19.8	123.2	16.9	141.0	1.00
		FWP	19.8	130.5	16.9	149.0	1.00
	Year 50	FWOP	20.1	112.1	17.3	124.0	1.00
		FWP	22.9	129.2	19.3	143.0	1.00

3.3 V3- Water Regime

This variable accounts for both the duration of swamp flooding and the extent of water flow and exchange in the swamp. The optimal water regime is assumed to be seasonal flooding with abundant and consistent riverine or tidal input. Seasonal flooding with periodic drying cycles is assumed to contribute to increased nutrient cycling and increased recruitment of dominant overstory trees. In addition, a consistent, abundant source of freshwater is necessary to ensure wetland sustainability (Shaffer et al. 2018). Habitat suitability is assumed to decrease as water exchange between the swamp and adjacent systems is reduced. Areas that are permanently flooded, impounded, or have no water exchange are assumed to be the least suitable habitat.

The full period of record for CRMS hourly hydrology data was analyzed for stations associated with each subarea to determine flood duration classification. Water level hydrographs were produced from these data and compared to the swamp surface elevation and mean water level reported for each station (Appendix D). Flood duration classification was evaluated based on how frequently the hourly water level was below or above the swamp surface elevation for the full period of record at each station. Additionally, a 2D Delft3D hydrodynamic model simulating the effects of the proposed diversion on water levels and velocity were assessed to determine the level of through-flow and water exchange in each subarea (Appendix A).

The swamp surface elevations within the Maurepas swamp are already low. In the 2001 WVA, it was predicted in the FWOP, or within 20 years, that all of the subareas would become permanently flooded. After review of CRMS station swamp surface elevation and daily water level data, it has been determined that flood duration projections are not as dire as originally anticipated. Although subareas 3B and 4B have shifted from a Semi-Permanent flood duration to a Permanent flood duration since the 2001 WVA all other substations remain classified as having a Semi-Permanent flood duration. In FWOP, subsidence will continue and within 50 years it is assumed that these swamps will all move to a Permanent flood duration. The majority of subareas receive a Low flow/exchange rating for all target years in FWOP due to limited riverine input or tidal exchange and stagnant conditions. Subareas 4B and 4C along the lake edge are exceptions, however, and receive Moderate ratings for all FWOP target years to account for their increased exposure to lake wash-over and tidal exchange compared to interior sites. The level of water exchange was assumed to remain unchanged in the FWOP.

Currently subareas 1, 2A, and 2B are classified as Semi-Permanent flooded, with Low flow. Although these areas experience intermittent drying, the mean water elevation is above the mean swamp surface elevation for each of these sites. In the FWOP and FWP TY0 and TY1, it is expected that these subareas will remain classified as Semi-Permanent flooded. These subareas will likely transition to a Permanent flood duration by FWOP TY25 and will remain as such in TY50. In the FWOP, flow and exchange are anticipated to be Low throughout the project life. In FWP TY1 and continuing throughout the project life, these subareas are expected to have High rates of water through-flow. Due to its proximity to the outfall and relative potential for accretion, subarea 1 is the only subarea assumed to remain classified as Semi-Permanent flooded through FWP TY50. Subareas 2A and 2B are also expected to see improvements in accretion, substrate bulk density, and associated flooding duration, in proportion to the projected level of influence of the project. However, both subareas are expected to become permanently flooded by TY50 in FWP, and flow and exchange are expected to be Moderate.

Subarea 2C has Low flow/exchange for all target years in FWOP, as much of the Maurepas swamp region is currently inundated with stagnant water, and there is no riverine or tidal input in this subarea. For TY0 and TY1, the subarea is classified as Semi-Permanent flooded; there are sporadic dry periods (29% of the period of record is dry) but the mean water level is above the swamp surface level. With predicted relative sea level rise, the subarea will likely transition to a Permanent flood duration by TY25 and is classified as such in both TY25 and TY50. With the completion of the reintroduction project, this area is modeled to receive Moderate riverine input, and is therefore classified as Moderate flow/exchange in FWP TY1, TY25, and TY50. The subarea is predicted to remain Semi-Permanent flooded for TY0, TY1, and TY25 in FWP, as sediment from the project is expected to increase accretion in this subarea. However, sea level rise is likely to transition this subarea to a Permanent flood status by TY50.

Subareas 3A and 3B will likely have Low flow/exchange for all FWOP target years, as there is limited riverine or tidal influence in these subareas. In FWP, flow is predicted to become Moderate for TY1, TY25, and TY50, as these subareas are modeled to receive substantial freshwater input. Hydrology data indicate subarea 3A is flooded more than half of the period of record, including outside of the growing season, classifying the subarea as Semi-Permanent flooded. Subarea 3B is already classified as having a Permanent flood duration in TY0. In TY25 and TY50 for both project scenarios, subarea 3A is anticipated to move towards a classification of Permanent flooded due to sea level rise.

The project is not anticipated to introduce enough freshwater to subareas 4A-C to change the overall water regime classifications and FWOP and FWP inputs are the same at all target years within each subarea. 4A currently experience Low flow/exchange and both 4B and 4C experience Moderate flow due to tidal exchange from Lake Maurepas. Subarea 4B is already classified as Permanent flooded, and subareas 4A and 4C are predicted to transition from Semi-Permanent flooded to Permanent flooded by TY25 due to sea level rise. These subareas are expected to remain maintain Permanent flood duration through TY50.

Both subareas 5A and 5B are Semi-Permanent flooded at FWOP and FWP TY0. At TY25 and TY50 FWOP and FWP the subareas are expected to be Permanent flooded. In FWOP, these subareas experience limited throughput and are considered Low flow/exchange sites for all target years. In FWP, these subareas are modeled to receive freshwater input directly from the lateral release valve features and are therefore categorized as Moderate flow/exchange sites in TY1-50.

Table 5: V3- Flooding duration and flow exchange, with associated SI ratings, for all subareas and target years in FWOP and FWP.

V3 – Water Regime		FWOP			FWP		
		Flooding Duration	Flow Exchange	SI	Flood Duration	Flow Exchange	SI
Area 1	Year 0	Semi-permanent	Low	0.45	Semi-permanent	Low	0.45
	Year 1	Semi-permanent	Low	0.45	Semi-permanent	High	0.75
	Year 25	Permanent	Low	0.3	Semi-permanent	High	0.75
	Year 50	Permanent	Low	0.3	Semi-permanent	High	0.75
Area 2A	Year 0	Semi-permanent	Low	0.45	Semi-permanent	Low	0.45
	Year 1	Semi-permanent	Low	0.45	Semi-permanent	Moderate	0.65
	Year 25	Permanent	Low	0.3	Semi-permanent	Moderate	0.65
	Year 50	Permanent	Low	0.3	Permanent	Moderate	0.45
Area 2B	Year 0	Semi-permanent	Low	0.45	Semi-permanent	Low	0.45
	Year 1	Semi-permanent	Low	0.45	Semi-permanent	Moderate	0.65

V3 – Water Regime		FWOP			FWP		
		Flooding Duration	Flow Exchange	SI	Flood Duration	Flow Exchange	SI
	Year 25	Permanent	Low	0.3	Semi-permanent	Moderate	0.65
	Year 50	Permanent	Low	0.3	Permanent	Moderate	0.45
Area 2C	Year 0	Semi-permanent	Low	0.45	Semi-permanent	Low	0.45
	Year 1	Semi-permanent	Low	0.45	Semi-permanent	Moderate	0.65
	Year 25	Permanent	Low	0.3	Semi-permanent	Moderate	0.65
	Year 50	Permanent	Low	0.3	Permanent	Moderate	0.45
Area 3A	Year 0	Semi-permanent	Low	0.45	Semi-permanent	Low	0.45
	Year 1	Semi-permanent	Low	0.45	Semi-permanent	Moderate	0.65
	Year 25	Permanent	Low	0.3	Permanent	Moderate	0.45
	Year 50	Permanent	Low	0.3	Permanent	Moderate	0.45
Area 3B	Year 0 & 1	Permanent	Low	0.3	Permanent	Low	0.3

V3 – Water Regime		FWOP			FWP		
		Flooding Duration	Flow Exchange	SI	Flood Duration	Flow Exchange	SI
	Year 1	Permanent	Low	0.3	Permanent	Moderate	0.45
	Year 25	Permanent	Low	0.3	Permanent	Moderate	0.45
	Year 50	Permanent	Low	0.3	Permanent	Moderate	0.45
Area 4A	Year 0	Semi-permanent	Low	0.45	Semi-permanent	Low	0.45
	Year 1	Semi-permanent	Low	0.45	Semi-Permanent	Low	0.45
	Year 25	Permanent	Low	0.3	Permanent	Low	0.3
	Year 50	Permanent	Low	0.3	Permanent	Low	0.3
Area 4B	Year 0	Permanent	Moderate	0.45	Permanent	Moderate	0.45
	Year 1	Permanent	Moderate	0.45	Permanent	Moderate	0.45
	Year 25	Permanent	Moderate	0.45	Permanent	Moderate	0.65
	Year 50	Permanent	Moderate	0.45	Permanent	Moderate	0.45
Area 4C	Year 0	Semi-Permanent	Moderate	0.65	Semi-Permanent	Moderate	0.65

V3 – Water Regime		FWOP			FWP		
		Flooding Duration	Flow Exchange	SI	Flood Duration	Flow Exchange	SI
	Year 1	Semi-Permanent	Moderate	0.65	Semi-Permanent	Moderate	0.65
	Year 25	Permanent	Moderate	0.45	Permanent	Moderate	0.45
	Year 50	Permanent	Moderate	0.45	Permanent	Moderate	0.45
Area 5A	Year 0	Semi-Permanent	Low	0.45	Semi-Permanent	Low	0.45
	Year 1	Semi-Permanent	Low	0.45	Semi-Permanent	Moderate	0.65
	Year 25	Permanent	Low	0.3	Permanent	Moderate	0.45
	Year 50	Permanent	Low	0.3	Permanent	Moderate	0.45
Area 5B	Year 0	Semi-Permanent	Low	0.45	Semi-Permanent	Low	0.45
	Year 1	Semi-Permanent	Low	0.45	Semi-Permanent	Moderate	0.65
	Year 25	Permanent	Low	0.3	Permanent	Moderate	0.45
	Year 50	Permanent	Low	0.3	Permanent	Moderate	0.45

3.4 V4- Mean High Salinity during the Growing Season

Mean high salinity during the growing season (March 1 to October 31) is defined as the average of the upper 33% of salinity measurements taken during the specified period of record. Soil pore water salinities from each growing season throughout the full period of record of CRMS stations data were assessed for this variable (Figure 6). In general, it is expected that the closer each subarea is to the lake and the passes, and so to the source of saltwater intrusion, the higher the salinities will be. This is seen in comparisons of interstitial soil salinities in throughput, relict, and degraded swamp sites, as sites closer to the lakes and passes tend to be more degraded and have higher soil salinities (Figure 7). Additionally, target values for FWP porewater salinities were established in the performance measures for the proposed River Reintroduction project. Preferred porewater salinity ranges for baldcypress only is from 0 ppt to 1.3 ppt, with acceptable ranges between 1.3 ppt and 1.62 ppt, and unacceptable porewater salinity ranges between 1.62 and 2.0 ppt. Preferred porewater salinity ranges for water tupelo or baldcypress mixed with water tupelo is from 0 ppt to 0.8 ppt, with acceptable ranges between 0.8 ppt and 1.12 ppt, and unacceptable porewater salinity ranges between 1.12 and 2.0 ppt (Krauss et al. 2017).

The MRGO exacerbated saltwater intrusion and hypoxia in the Lake Pontchartrain Basin preceding its deauthorization (2008) and closure (2009); the impacts of the MRGO on aquatic habitats, adjacent wetlands, and coastal communities are well documented (Poirrier 1978, 2013; Shaffer et al. 2009b). Salinity has generally decreased since the closure of the MRGO, and there have not been any extreme drought conditions in recent decades, which has contributed to decreasing salinity trends. However, it is assumed that subsidence and sea level rise in FWOP will gradually increase the mean high growing season salinity in all subareas during the project life due to increased saltwater flow through existing passes, as well as through newly formed passes as wetlands continue to degrade, increasing tidal and sheet flow exchanges. Subareas closer to Lake Maurepas and associated tidal exchanges will likely experience greater salinity increases than interior subareas. In the FWP, it is anticipated that the project would ameliorate salinity levels through increased freshwater input. In general, it is expected that the closer each subarea is to the lake and the passes, and so to the source of saltwater intrusion, the higher the salinities will be. Existing salinities for TY0 and TY1 are summarized by subarea in Table 6 below.

For subareas 1 and 2A, current annual mean high salinities from CRMS data for these areas is 0.6 ppt. In FWOP mean high salinity is expected to increase due to sea level rise, subsidence, and may be exacerbated by droughts. This is lower than in 2007 when annual mean high salinities ranged from 0.85 to 1.67 ppt, and significantly lower than average annual salinities measured in the 2001 WVA which ranged from 1.57 to 1.68. However, with continued subsidence, it is assumed that the ability for saltwater to intrude farther and more frequently into the swamps will increase in the FWOP. Due to the proximity of these subareas to the project outfall, the mean high salinity was assumed to be the same as that of the Mississippi River, or approximately 0.2 ppt (USGS Mississippi River Gage 07374000), for all FWP scenarios.

FWOP TY0- 0.6 ppt	FWP TY0- 0.6 ppt
FWOP TY1- 0.6 ppt	FWP TY1- 0.2 ppt
FWOP TY25- 1.6 ppt	FWP TY25- 0.2 ppt
FWOP TY50- 2.0 ppt	FWP TY50- 0.2 ppt

Subarea 2B is similarly proximate to the project outfall but current annual mean high salinity is 0.2 ppt. In FWOP, mean high salinity is expected to increase due to sea level rise and subsidence, and may be exacerbated by droughts. In the FWP, the mean high salinity is expected to decrease to 0.2 ppt, which is typical of Mississippi River water, and is expected to remain at 0.2 ppt throughout the project life.

FWOP TY0- 0.2 ppt	FWP TY0- 0.2 ppt
FWOP TY1- 0.2 ppt	FWP TY1- 0.2 ppt
FWOP TY25- 1.2 ppt	FWP TY25- 0.2 ppt
FWOP TY50- 2.0 ppt	FWP TY50- 0.2 ppt

For subarea 2C mean high salinity is currently 0.6 ppt. In FWOP mean high salinity is expected to increase due to sea level rise and subsidence, and may be exacerbated by droughts. In FWP, the mean high salinity is expected to remain at 0.2 ppt throughout the project life.

FWOP TY0- 0.6 ppt	FWP TY0- 0.6 ppt
FWOP TY1- 0.6 ppt	FWP TY1- 0.2 ppt
FWOP TY25- 1.6 ppt	FWP TY25- 0.2 ppt
FWOP TY50- 2.0 ppt	FWP TY50- 0.2 ppt

For subarea 3A, mean high salinity is currently 0.1 ppt. In FWOP mean high salinity is expected to increase due to sea level rise and subsidence, and may be further exacerbated by droughts. This subarea is adjacent to Lake Maurepas and will receive less freshwater input from the project compared to more interior subareas (i.e. 1-2C). Therefore, salinity in this subarea is predicted to increase in FWP but at a lesser rate than FWOP.

FWOP TY0- 0.1 ppt	FWP TY0- 0.1ppt
FWOP TY1- 0.1 ppt	FWP TY1- 0.1 ppt
FWOP TY25- 1.0 ppt	FWP TY25- 0.5 ppt
FWOP TY50- 2.0 ppt	FWP TY50- 1.0 ppt

Subarea 3B was evaluated similarly to Subarea 3A due to relative proximity to Lake Maurepas and tidal exchanges. Current mean high salinity is 0.2 ppt. In FWOP mean high salinity is expected to increase due to sea level rise and subsidence, and may be exacerbated by droughts. In FWP mean high salinity in this subarea will likely increase but at a lesser rate than FWOP due to the proximity to Lake Maurepas.

FWOP TY0- 0.2 ppt	FWP TY0- 0.2 ppt
FWOP TY1- 0.2 ppt	FWP TY1- 0.2 ppt
FWOP TY25- 1.2 ppt	FWP TY25- 0.5 ppt
FWOP TY50- 2.0 ppt	FWP TY50- 1.0 ppt

Current mean high salinity in subarea 4A is 0.3 ppt. In FWOP, mean high salinity is expected to increase to sea level rise and subsidence, and may be exacerbated by droughts. In FWP, mean high salinity will increase but at a lesser rate than FWOP due to proximity to Lake Maurepas and less freshwater input compared to other subareas located in the swamp interior.

FWOP TY0- 0.3 ppt	FWP TY0- 0.3 ppt
FWOP TY1- 0.3 ppt	FWP TY1- 0.2 ppt
FWOP TY25- 1.5 ppt	FWP TY25-0.5 ppt
FWOP TY50- 2.5 ppt	FWP TY50- 1.0 ppt

Current mean high salinity for subarea 4B is 0.2 ppt. Salinity is predicted to increase in FWOP due to seal level rise and subsidence, and may be exacerbated by droughts. In FWP, mean high salinity will increase but at a lesser rate than FWOP due to proximity to Lake Maurepas and less freshwater input reaching the subareas along the lake rim.

FWOP TY0- 0.2 ppt	FWP TY0- 0.2 ppt
FWOP TY1- 0.2 ppt	FWP TY1- 0.2 ppt
FWOP TY25- 1.3 ppt	FWP TY25- 0.5 ppt
FWOP TY50- 3.0 ppt	FWP TY50- 1.0 ppt

Current mean high salinity for subarea 4C is 0.6 ppt. Salinity is predicted to increase in FWOP due to seal level rise and subsidence, and may be exacerbated by droughts. In FWP, mean high salinity will increase but at a lesser rate than FWOP due to proximity to Lake Maurepas and less freshwater input reaching the subareas along the lake rim.

FWOP TY0- 0.6 ppt	FWP TY0- 0.6 ppt
FWOP TY1- 0.6 ppt	FWP TY1- 0.6 ppt
FWOP TY25- 1.3 ppt	FWP TY25- 0.5 ppt
FWOP TY50- 3.0 ppt	FWP TY50- 1.0 ppt

Subarea 5A and 5B have a current mean high salinity of 0.5 ppt. In FWOP Salinity is predicted to increase in FWOP due to seal level rise and subsidence, and may be exacerbated by droughts. In FWP, mean high salinity is expected to decrease due to substantial freshwater input flowing from the lateral relief valves.

FWOP TY0- 0.5 ppt	FWP TY0- 0.5 ppt
FWOP TY1- 0.5 ppt	FWP TY1- 0.2 ppt
FWOP TY25- 0.8 ppt	FWP TY25- 0.2ppt
FWOP TY50- 1.2 ppt	FWP TY50- 0.2 ppt

Table 6: V4- Mean high salinity during the growing season, with associated SI ratings, for all subareas and target years in FWOP and FWP.

V4 – Mean High Salinity During Growing Season		FWOP		FWP	
		Salinity (ppt)	SI	Salinity (ppt)	SI
Area 1	Year 0	0.6	0.97	0.6	0.97
	Year 1	0.6	0.97	0.2	1.0
	Year 25	1.6	0.7	0.2	1.0
	Year 50	2.0	0.53	0.2	1.0
Area 2A	Year 0	0.6	0.98	0.6	0.98
	Year 1	0.6	0.98	0.2	1.0
	Year 25	1.6	0.7	0.2	1.0
	Year 50	2.0	0.52	0.2	1.0
Area 2B	Year 0	0.2	1.0	0.2	1.0
	Year 1	0.2	1.0	0.2	1.0
	Year 25	1.2	0.83	0.2	1.0
	Year 50	2.0	0.54	0.2	1.0
Area 2C	Year 0	0.6	0.96	0.6	0.96

V4 – Mean High Salinity During Growing Season		FWOP		FWP	
		Salinity (ppt)	SI	Salinity (ppt)	SI
	Year 1	0.6	0.96	0.2	1.0
	Year 25	1.6	0.66	0.2	1.0
	Year 50	2.0	0.5	0.2	1.0
Area 3A	Year 0	0.1	1.0	0.10	1.0
	Year 1	0.1	1.0	0.1	1.0
	Year 25	1.0	0.83	0.5	1.00
	Year 50	2.0	0.44	1.0	0.82
Area 3B	Year 0	0.2	1.0	0.2	1.0
	Year 1	0.2	1.0	0.2	1.0
	Year 25	1.2	0.85	0.5	1.0
	Year 50	2.0	0.58	1.0	0.9
Area 4A	Year 0	0.3	1.0	0.3	1.0
	Year 1	0.3	1.0	0.2	1.0
	Year 25	1.5	0.7	0.5	1.0

V4 – Mean High Salinity During Growing Season		FWOP		FWP	
		Salinity (ppt)	SI	Salinity (ppt)	SI
	Year 50	2.5	0.22	1.0	0.88
Area 4B	Year 0	0.2	1.0	0.2	1.0
	Year 1	0.2	1.0	0.2	1.0
	Year 25	1.3	0.77	0.5	1.0
	Year 50	3.0	0.19	1.0	0.87
Area 4C	Year 0	0.6	0.96	0.6	0.96
	Year 1	0.6	0.96	0.6	0.96
	Year 25	1.5	0.63	0.5	1.0
	Year 50	3.0	0.14	1.0	0.82
Area 5A	Year 0	0.5	1.0	0.5	1.0
	Year 1	0.5	1.0	0.2	1.0
	Year 25	0.8	0.93	0.2	1.0
	Year 50	1.2	0.83	0.5	1.0
Area 5B	Year 0	0.5	1.0	0.5	1.0

V4 – Mean High Salinity During Growing Season		FWOP		FWP	
		Salinity (ppt)	SI	Salinity (ppt)	SI
	Year 1	0.5	1.0	0.2	1.0
	Year 25	0.8	0.93	0.2	1.0
	Year 50	1.2	0.83	0.5	1.0

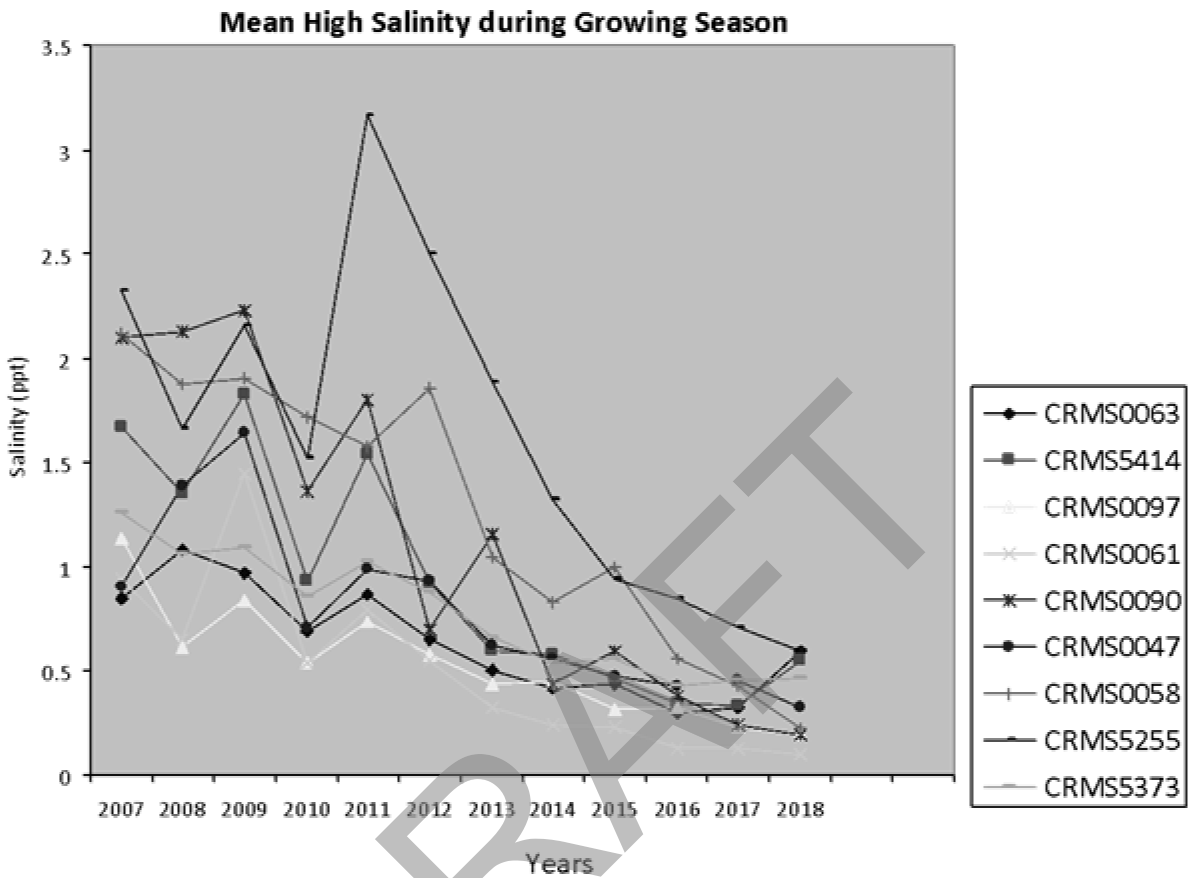


Figure 6: Full period of record mean high porewater salinity during growing season at all CRMS stations used for WVA determination.

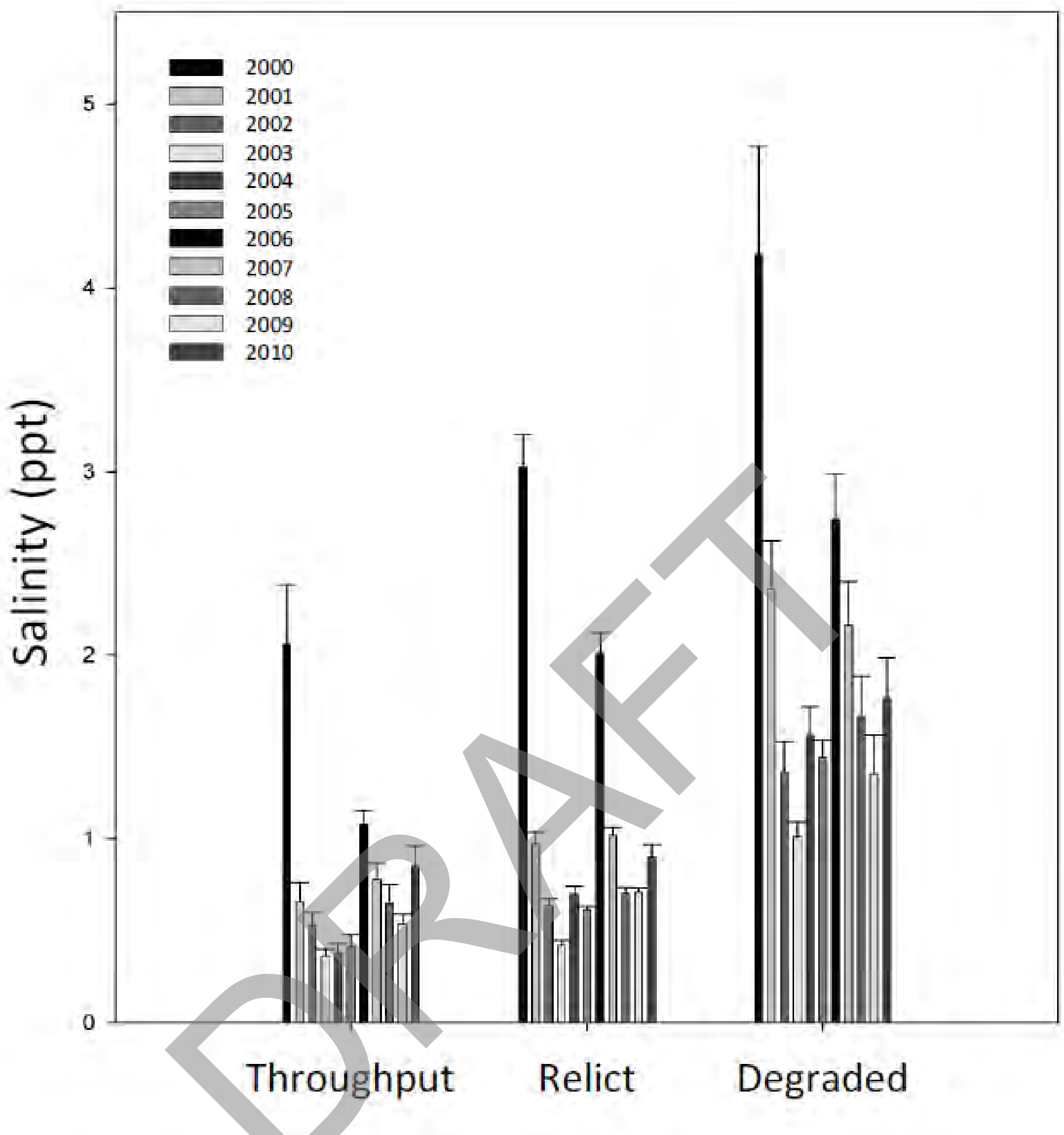


Figure 7: Average observed interstitial soil salinity in the Maurepas swamp from 2000 through 2010 (Shaffer et al. 2016)

3.5 V5- Size of Contiguous Forested Area

For this WVA model, tracts greater than 500 aces are considered optimal. Use of GIS and satellite photographs was the primary method of determining the size of the contiguous forested area. Corridors including all canals, right of ways, roadways, waterways, waterbodies, and forest openings were evaluated in each subarea, those that are less than 75 feet wide do not constitute a break in the forested area contiguity.

Subareas 1, 2A, and 2B have an approximately 300 foot wide utility corridor running east to west and bisecting the subareas into northern and southern contiguously forested areas. The subareas which were divided by the corridor were assessed as two separate contiguously forested areas with two SI values and class ratings. These values were then weighted by the percent of the larger subarea that they occupy. Subarea 1 occupies approximately 6,730 acres of swamp split by the utility easement into a northern segment of roughly 2,300 acres, and a southern parcel of approximately 4,250 acres. Mortality rate assumptions for previous WVA variables were applied, and the sizes of the contiguously forested areas were reduced proportionally. It is understood that forested areas would typically thin out rather than retain current stand density and experience reductions in acreage, however the method for quantifying this thinning would be unnecessarily complicated, and the thinning effect has been captured in the reduction of basal area in V2. Despite high mortality rates at FWOP TY25 which dropped the smaller northern parcel to a Class 4, subarea 1 was able to maintain a Class 5 rating through all FWOP and FWP target years due to the weighted acreages and the ability of the larger southern tract to keep its Class 5 rating. Subarea 2A falls north of the corridor without interruptions from canals, rights-of-way (ROWs), or other breaks, and was assessed as 4,807 acres of contiguous forest. This subarea received a Class 5 rating in all FWOP and FWP scenarios. Subarea 2B is located within 3,394 acres of swamp divided by the transmission line corridor into a northern tract occupying approximately 1,100 acres and a southern parcel of roughly 2,200 acres. This subarea was able to maintain its Class 5 rating through the FWOP TY25 however it falls to a Class 4 classification by the FWOP TY50.

Subarea 2C is roughly 3,438 acres of forest divided into a northern stretch of 1,172 acres and a southern stretch of 2,256 acres, bisected by the utility corridor mentioned above. In TY0 and TY1 for FWOP and FWP, the subarea receives a Class 5 rating. FWOP TY25 and TY50 predictions for the northern and southern stretches with applied mortality result in the same ratings for both sections, Class 5 for TY25 and Class 4 for TY50, so no adjustments are required based on weighted acreage. In FWP, the subarea is expected to maintain a Class 5 rating for all target years.

Subarea 3A is 6,400 acres of contiguous forest categorizing it as a Class 5. Assuming the same FWOP mortality rates used in previous subareas, the subarea maintains a Class 5 rating in TY25 and TY50. In FWP, mortality rates are expected to be less than in FWOP and the subarea is likely to maintain a Class 5 rating for all target years.

Subarea 3B was evaluated similarly to subareas 1, 2B, 2C, and 4A to accommodate the right of way bisecting these subareas. The northern subsection of 3B is 1,169 acres and the southern subsection is 690 acres. Assuming same mortality rates applied in subarea 3A, the northern subsection will maintain a Class 5 rating in FWOP TY25, but the southern subsection will reduce to a Class 4. Weighting these class ratings based on the relative size of each subsection, an adjusted rating of Class 4 is assigned to FWOP TY25. For FWOP TY50, the subarea is predicted to have a Class 4 rating. In FWP, the subarea will likely maintain a Class 5 rating for all target years.

Subarea 4A is also bisected by the right-of-way mentioned above, but in both FWOP and FWP the subarea is predicted to remain a Class 4 forest for all target years. Subarea 4B is not affected by the right-of-way as 4A is, but 4B has two distinct patches of forest in the western and central portions of the subarea, making it a Class 4. Using FWOP mortality projects reported in V1, subarea 4B is likely to reduce to a Class 3 in FWOP TY25 and TY50. Subarea 4B will likely maintain a Class 4 status in FWP TY25, but will reduce to a Class 3 in TY50. Subarea 4C has more contiguous forested area than 4A or 4B, earning a Class 5 rating at TY0. In FWOP, a Class 5 rating will be maintained until TY50, at which point mortality will likely reduce the subarea to a Class 4. Subarea 4C is predicted to maintain a Class 5 status for all target years in FWP.

Subareas 5A and 5B are both large swaths (>3000 acres) of contiguous, Class 5 forests in TY0. Subarea 5A will likely remain a Class 5 for all target years in both FWOP and FWP, but subarea 5B is predicted to become a Class 4 forest in FWOP TY50 due to predicted mortality.

Table 7: V5- Contiguous forest size, with associated Class and SI ratings, for all subareas and target years in FWOP and FWP.

V5 – Size of Contiguous Forested Area		FWOP		FWP	
		Class	SI	Class	SI
Area 1	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	5	1.0	5	1.0
Area 2A	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	5	1.0	5	1.0
Area 2B	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	4	0.8	5	1.0
Area 2C	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	4	0.8	5	1.0
Area 3A	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	5	1.0	5	1.0
Area 3B	Year 0 & 1	5	1.0	5	1.0
	Year 25	4	0.8	5	1.0
	Year 50	4	0.8	5	1.0
Area 4A	Year 0 & 1	4	0.8	4	0.8
	Year 25	4	0.8	4	0.8

V5 – Size of Contiguous Forested Area		FWOP		FWP	
		Class	SI	Class	SI
	Year 50	4	0.8	4	0.8
Area 4B	Year 0 & 1	4	0.8	4	0.8
	Year 25	3	0.6	4	0.8
	Year 50	3	0.6	3	0.6
Area 4C	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	4	0.8	5	1.0
Area 5A	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	5	1.0	5	1.0
Area 5B	Year 0 & 1	5	1.0	5	1.0
	Year 25	5	1.0	5	1.0
	Year 50	4	0.8	5	1.0

3.6 V6- Suitability and Traversability of Surrounding Land Uses

Swamp habitat is more valuable to a cadre of wildlife species when surrounding land uses encourage or support wildlife movement between adjacent habitats. To assess the traversability of land bordering the project area, land uses of the surrounding area were analyzed. Use of GIS, current satellite imagery, and habitat/land classification databases were the primary methods used to determine the suitability and traversability of the surrounding areas. A 0.5 mile buffer was delineated around the perimeter of each subarea, and land use types were identified within that buffer (Appendix E). The percent of buffer area that was occupied by each of land use type was determined and multiplied by the suitability weighting factor. The adjusted percentages were then added together and divided by 100 to obtain the Suitability Index for this variable. The weighting factor assigned to various land uses reflects their estimated potential to meet specific needs and allow movement between more desirable habitats. For this WVA model, bottomland hardwood, swamp, and marsh habitat received the highest weighting factor, followed by abandoned agriculture, pasture, active agriculture and open water, with residential, commercial or industrial development receiving the lowest weighting factor. Land loss and/or habitat conversion rates were applied to buffer areas in FWOP and FWP target years.

According to the Coastal Information Management System (CIMS) medium scenario land change projections without the Master Plan implementation, the most land loss is anticipated to occur along the shores of Lake Maurepas, while more interior areas of the Maurepas swamp show relatively insignificant future land loss. Currently (TY0), all the lands surrounding subareas 1, 2A, and 2B are classified as swamp, marsh, or other forested areas and received SI values of 1.0. Surrounding land coverage is not predicted to change in TY1 for FWOP or FWP. In the FWOP TY25 in subareas 1 and 2B, it was assumed that approximately 2% of current habitat would convert from swamp or marsh to open water, reducing the SI to 0.98. In the FWOP TY50 scenario, it was assumed that roughly another 3% of remaining swamp or marsh habitat would convert to open water, further reducing the SI to 0.96. The northwestern portion of the 0.5 mile perimeter of subarea 2A is closer to the lake rim; therefore, higher rates of conversion to open water are expected in FWOP TY 25 and TY50, respectively. This higher rate of open water conversion resulted in an SI of 0.96 in the FWOP TY25 and an SI of 0.88 in the FWOP TY50. In all of the FWP scenarios, it was assumed that no land would be converted to open water or lost to development, and the any conversion would be from swamp to marsh. In the FWP, therefore, subareas 1, 2A, and 2B would all maintain an SI of 1.0 throughout the project life.

For subarea 2C, current (TY0/TY1) conditions indicate 1% of the perimeter is open water and 1% is non-habitat development, resulting in an SI of 0.98. To account for predicted effects of sea level rise and subsidence, open water increases to 5% at FWOP TY25 while non-habitat (I-10) is maintained at 1%, reducing SI to 0.95. At FWOP TY50, open water is increased to 10% while non-habitat is maintained at 1%, further reducing SI to 0.91. In FWP, the effects of sea level rise and subsidence are predicted to impact the perimeter of the subarea less than in the FWOP scenario due to anticipated project benefits. In FWP, open water increases only to 2% in TY25 and 4% in TY50, resulting in SI values if 0.97 and 0.96 for these respective target years. Development is anticipated to remain at 1% for all FWP target years, as is predicted in FWOP.

In TY0/TY1 for subarea 3A, 95% of the perimeter is forest/marsh, and 5% is open water, resulting in an SI value of 0.96 for FWOP and FWP. In FWOP TY25, open water will increase to 10% due to sea level rise and subsidence, with an SI value of 0.92. Similarly in FWOP TY50, open water is predicted to increase to 37%, reducing SI to 0.70. For FWP TY25, open water is predicted to increase to 8%, with an SI of 0.94, and in FWP TY50 will increase to 26%, reducing SI to 0.79.

For subarea 3B at TY0 and TY1, 90% of the perimeter is forest/marsh and 10% open water in both FWOP and FWP, resulting in a starting SI value of 0.92. Open water will likely increase to 15% in FWOP TY25 and 49% in FWOP TY50, resulting in SI values of 0.88 and 0.61 for these respective target years. Alternatively in FWP, open water is predicted to increase to 13% in TY25 and 30% in TY50, with associated SI values of 0.90 and 0.76 in these target years.

For subarea 4A in TY0 and TY1 for FWOP and FWP, the perimeter is 95% forest/marsh habitat and 5% is open water, resulting in a starting SI value of 0.96. In FWOP, percent open water will likely increase to 10% by TY25 and 46% by TY50, resulting in SI values of 0.92 and 0.63 for these respective target years. In FWP, open water is only anticipated to increase to 8% by TY25, and 26% in TY50, reducing SI to 0.94 and 0.79 respectively.

Subareas 4B and 4C are lake rim sites projected to rapidly transition from forest to marsh and open water in the future without restoration. In TY0, both subarea perimeters are 55% forest/marsh and 45% open water with SI values of 0.64; in FWOP TY25 both subareas are projected to transition to 50% forest/marsh and 50% open water, reducing SI to 0.60. In FWOP TY50, 4B will likely transition to 25% forest/ marsh habitat and 75% open water with an SI value of 0.40, and 4C will likely transition to 30% forest/marsh habitat and 70% open water with an SI value of 0.44. In FWP TY25, both subarea perimeters are expected to be 52% forest/marsh habitat and 48% open water, reducing SI to 0.62. In FWP TY50, the 4B perimeter will likely transition to 35% forest/marsh habitat and 65% open water with an SI value of 0.48, and the 4C perimeter will likely transition to 42% forest/marsh habitat and 58% open water, with an SI value of 0.54.

The perimeter of subarea 5A is 88% forest/marsh, 2% open water, and 10% development in TY0 and TY1 for FWOP and FWP, with an SI value of 0.89. Surrounding land use is projected to change to 82% forest/marsh, 5% open water, and 13% development in FWOP TY25, reducing SI to 0.83. After completion of the WSLP levee system, the area south of the levee will likely be developed. In FWOP TY50, surrounding forests will continue to convert to open water as canal and bayou shorelines subside and sea level rises, resulting in 75% forest/marsh, 10% open water, and 15% development, and an SI value of 0.77. In FWP TY25, there is projected to be 83% forest/marsh, 4% open water, and 13% development, with an SI of 0.84. By TY50, forest/marsh will be 80%, open water will increase to 5%, and development will increase to 15%, reducing SI to 0.81.

The subarea 5B perimeter at TY0 and TY1 is 95% forest/marsh, 1% open water, and 4% development for FWOP and FWP, resulting in an SI value of 0.95. This is projected to change to 89% forest/marsh, 3% open water, and 8% development in FWOP TY25, with an SI value of 0.90. In FWOP TY50, surrounding forests will likely continue to transition to open water, resulting in 86% forest/marsh, 6% open water, and 8% development, reducing SI to 0.87. In FWP TY25 there is projected to be 91% forest/marsh, 1% open water, and 8% development, with an associated SI value of 0.91. By TY50, forest/marsh will likely decrease to 90%, open water will increase to 2%, and development will remain at 8%, reducing SI to 0.90.

Table 8: V6- Surrounding land use by type and percent cover, with associated SI ratings, for all subareas and target years in FWOP and FWP.

V6 – Suitability and Traversability of Surrounding Land Uses		FWOP		FWP	
		Surrounding Land Use (Value %)	SI	Surrounding Land Use (Value %)	SI
Area 1	Year 0 & 1	100% forest / marsh	1.0	100% forest / marsh	1.0
	Year 25	98% forest / marsh 2% open water	0.98	100% forest / marsh	1.0
	Year 50	95% forest / marsh 5% open water	0.96	100% forest / marsh	1.0
Area 2A	Year 0 & 1	100% forest / marsh	1.0	100% forest / marsh	1.0
	Year 25	95% forest / marsh 5% open water	0.96	100% forest / marsh	1.0
	Year 50	85% forest / marsh 15% open water	0.88	100% forest / marsh	1.0
Area 2B	Year 0 & 1	100% forest / marsh	1.0	100% forest / marsh	1.0
	Year 25	98% forest / marsh 2% open water	0.98	100% forest / marsh	1.0
	Year 50	95% forest / marsh 5% open water	0.96	100% forest / marsh	1.0
Area 2C	Year 0 & 1	98% forest / marsh 1% open water 1% development	0.98	98% forest / marsh 1% open water 1% development	0.98
	Year 25	94% forest / marsh 5% open water 1% development	0.95	97% forest / marsh 2% open water 1% development	0.97

V6 – Suitability and Traversability of Surrounding Land Uses		FWOP		FWP	
		Surrounding Land Use (Value %)	SI	Surrounding Land Use (Value %)	SI
	Year 50	89% forest / marsh 10% open water 1% development	0.91	95% forest / marsh 4% open water 1% development	0.96
Area 3A	Year 0 & 1	95% forest / marsh 5% open water	0.96	95% forest / marsh 5% open water	0.96
	Year 25	90% forest / marsh 10% open water	0.92	92% forest / marsh 8% open water	0.94
	Year 50	63% forest / marsh 37% open water	0.70	74% forest / marsh 26% open water	0.79
Area 3B	Year 0 & 1	90% forest / marsh 10% open water	0.92	90% forest / marsh 10% open water	0.92
	Year 25	85% forest / marsh 15% open water	0.88	87% forest / marsh 13% open water	0.90
	Year 50	51% forest / marsh 49% open water	0.61	70% forest / marsh 30% open water	0.76
Area 4A	Year 0 & 1	95% forest / marsh 5% open water	0.96	95% forest / marsh 5% open water	0.96
	Year 25	90% forest / marsh 10% open water	0.92	92% forest / marsh 8% open water	0.94
	Year 50	54% forest / marsh 46% open water	0.63	74% forest / marsh 26% open water	0.79
Area 4B	Year 0 & 1	55% forest / marsh 45% open water	0.64	55% forest / marsh 45% open water	0.64
	Year 25	50% forest / marsh 50% open water	0.60	52% forest / marsh 48% open water	0.62

V6 – Suitability and Traversability of Surrounding Land Uses		FWOP		FWP	
		Surrounding Land Use (Value %)	SI	Surrounding Land Use (Value %)	SI
	Year 50	25% forest / marsh 75% open water	0.40	35% forest / marsh 65% open water	0.48
Area 4C	Year 0 & 1	55% forest / marsh 45% open water	0.64	55% forest / marsh 45% open water	0.64
	Year 25	50% forest / marsh 50% open water	0.60	52% forest / marsh 48% open water	0.62
	Year 50	30% forest / marsh 70% open water	0.44	42% forest / marsh 58% open water	0.54
Area 5A	Year 0 & 1	88% forest / marsh 2% open water 10% development	0.89	88% forest / marsh 2% open water 10% development	0.89
	Year 25	82% forest / marsh 5% open water 13% development	0.83	83% forest / marsh 4% open water 13% development	0.84
	Year 50	75% forest / marsh 10% open water 15% development	0.77	80% forest / marsh 5% open water 15% development	0.81
Area 5B	Year 0 & 1	95% forest / marsh 1% open water 4% development	0.95	95% forest / marsh 1% open water 4% development	0.95
	Year 25	89% forest / marsh 3% open water 8% development	0.90	91% forest / marsh 1% open water 8% development	0.91

V6 – Suitability and Traversability of Surrounding Land Uses		FWOP		FWP	
		Surrounding Land Use (Value %)	SI	Surrounding Land Use (Value %)	SI
	Year 50	86% forest / marsh 6% open water 8% development	0.87	90% forest / marsh 2% open water 8% development	0.90

3.7 V7- Disturbance

This variable attempts to quantify the effects of human disturbances. If the source of disturbance is located beyond 500 feet from the perimeter of the site or if the Type Class of disturbance is considered "insignificant", the effects of disturbance are assumed to be negligible and SI = 1.0. If the source of disturbance is located within 50 feet of the perimeter of the site and the disturbance is "Constant or Major", the effects of disturbance are assumed to be maximum and SI = 0.1. The use of GIS and satellite imagery is the primary method used to determine the Type Class of possible disturbances (highways, industrial areas, waterways, agriculture, residential use, etc.) and the Distance Class of possible disturbances in or around the project area.

Most project subareas have at least one major disturbance, such as Interstate 10, Highway 641, or active waterways, along their boundaries. While these are acknowledged as possible Class 1 or Class 2 type disturbances, they are greater than 500 feet from the majority of the subarea acreage and therefore considered to be negligible (Table 9). Because those disturbances are greater than 500 feet from the vast majority of subarea acreage they are considered a Distance Class 3 Rating and receive an SI value of 1.0. Other disturbances present in the project area are considered Type Class 4, which are insignificant and have an SI of 1.0 regardless of Distance Class. All subareas are expected to have either a Distance Class 3 rating, a Type Class 4, or both, which equates to an SI of 1.0 at all target years in FWOP and FWP. Additionally, regardless of Type or Distance Class, the conditions are not expected to be different with or without the project at any time during the project life in any project subarea.

Table 9: Potential disturbances in project area by Type Class, name, and percent of each subarea within 500 feet of disturbance.

Subarea	Disturbance Type Class	Disturbance Name	% of Subarea Within 500 ft. of Disturbance
Area 1	1	I-10	3%
Area 2A	2	Blind River	3%
Area 2B	1	I-10	4%
	1	Hwy 641	< 1%
	2	Blind River	11%
Area 2C	1	I-10	3%
Area 3A	4	Hunting/fishing camps	6%
Area 3B	4	Hunting/fishing camps	6%
Area 4A	1	I-10	2%
	4	Reserve Relief Canal	13%
	4	WSLP	3%
Area 4B	4	Reserve Relief Canal and other canals	5%
Area 4C	2	Amite River	1%
	2	Blind River	3%
	4	Hunting/fishing camps	2%
Area 5A	1	I-10	15%
	4	WSLP	20%
Area 5B	1	Hwy 641	4%
	1	I-10	6%

Table 10: V7- Disturbance Type and Distance Class, with associated SI ratings, for all subareas and target years in FWOP and FWP.

V7 – Disturbance		FWOP			FWP		
		Disturbance Type Class	Disturbance Distance Class	SI	Disturbance Type Class	Disturbance Distance Class	SI
Area 1	Year 0 & 1	4	3	1.0	4	3	1.0
	Year 25	4	3	1.0	4	3	1.0
	Year 50	4	3	1.0	4	3	1.0
Area 2A	Year 0 & 1	4	3	1.0	4	3	1.0
	Year 25	4	3	1.0	4	3	1.0
	Year 50	4	3	1.0	4	3	1.0
Area 2B	Year 0 & 1	4	3	1.0	4	3	1.0
	Year 25	4	3	1.0	4	3	1.0
	Year 50	4	3	1.0	4	3	1.0
Area 2C	Year 0 & 1	4	3	1.0	4	3	1.0
	Year 25	4	3	1.0	4	3	1.0
	Year 50	4	3	1.0	4	3	1.0
Area 3A	Year 0 & 1	4	1	1.0	4	1	1.0
	Year 25	4	1	1.0	4	1	1.0
	Year 50	4	1	1.0	4	1	1.0
Area 3B	Year 0 & 1	4	1	1.0	4	1	1.0
	Year 25	4	1	1.0	4	1	1.0
	Year 50	4	1	1.0	4	1	1.0

V7 – Disturbance		FWOP			FWP		
		Disturbance Type Class	Disturbance Distance Class	SI	Disturbance Type Class	Disturbance Distance Class	SI
Area 4A	Year 0 & 1	1	3	1.0	1	3	1.0
	Year 25	1	3	1.0	1	3	1.0
	Year 50	1	3	1.0	1	3	1.0
Area 4B	Year 0 & 1	4	3	1.0	4	3	1.0
	Year 25	4	3	1.0	4	3	1.0
	Year 50	4	3	1.0	4	3	1.0
Area 4C	Year 0 & 1	4	2	1.0	4	2	1.0
	Year 25	4	2	1.0	4	2	1.0
	Year 50	4	2	1.0	4	2	1.0
Area 5A	Year 0 & 1	1	3	1.0	1	3	1.0
	Year 25	1	3	1.0	1	3	1.0
	Year 50	1	3	1.0	1	3	1.0
Area 5B	Year 0 & 1	1	3	1.0	1	3	1.0
	Year 25	1	3	1.0	1	3	1.0
	Year 50	1	3	1.0	1	3	1.0

4.0 Net Change in AAHUs by Subarea

Table 11 – River Reintroduction into Maurepas Swamp AAHU Totals for all subareas in both FWOP and FWP scenarios.

Subarea 1

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	6,730	0.82	5515.60	
1	6,730	0.82	5522.20	5518.90
25	6,730	0.59	3948.80	113651.94
50	6,730	0.54	3648.98	94972.24
			Total CHUs	214143.07
			Total AAHUs	**4282.86**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	6,730	0.82	5515.60	
1	6,730	0.93	6239.73	5877.66
25	6,730	0.94	6297.72	150449.31
50	6,730	0.94	6297.72	157442.89
			Total CHUs	3135769.86
			Total AAHUs	**6275.40**

Net Change in AAHUs Due to Project	
FWP AAHUs	6275.40
FWOP AAHUs	4282.86
Net Change (FWP – FWOP) =	**1992.54**

Subarea 2A

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	4,807	0.70	3358.00	
1	4,807	0.70	3356.42	3357.21
25	4,807	0.37	1781.97	61660.64
50	4,807	0.35	1689.52	43393.62
			Total CHUs	108411.47
			Total AAHUs	**2168.23**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	4,807	0.70	3358.00	
1	4,807	0.76	3662.26	3510.13
25	4,807	0.81	3915.65	90934.90
50	4,807	0.47	2245.34	77012.32
			Total CHUs	171457.36
			Total AAHUs	**3429.15**

Net Change in AAHUs Due to Project	
FWP AAHUs	3429.15
FWOP AAHUs	2168.23
Net Change (FWP – FWOP) =	**1260.92**

Subarea 2B

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	3394	0.66	2241.32	
1	3394	0.66	2242.61	2241.97
25	3394	0.42	1414.23	43882.12
50	3394	0.37	1245.24	33243.44
			Total CHUs	79367.52
			Total AAHUs	**1587.35**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	3394	0.66	2241.32	
1	3394	0.72	2442.87	2342.10
25	3394	0.73	2487.17	59160.51
50	3394	0.64	2188.85	58450.21
			Total CHUs	119952.81
			Total AAHUs	**2399.06**

Net Change in AAHUs Due to Project	
FWP AAHUs	2399.06
FWOP AAHUs	1587.35
Net Change (FWP – FWOP) =	**811.71**

Subarea 2C

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	3438	0.65	2237.86	
1	3438	0.65	2237.96	2237.91
25	3438	0.37	1267.88	42070.12
50	3438	0.35	1190.87	30734.38
			Total CHUs	75042.42
			Total AAHUs	**1500.85**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	3438	0.65	2237.86	
1	3438	0.71	2447.52	2342.69
25	3438	0.69	2381.72	57950.83
50	3438	0.47	1600.60	49779.00
			Total CHUs	110072.53
			Total AAHUs	**2201.45**

Net Change in AAHUs Due to Project	
FWP AAHUs	2201.45
FWOP AAHUs	1500.85
Net Change (FWP – FWOP) =	**700.60**

Subarea 3A

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	6400	0.65	4134.20	
1	6400	0.65	4145.00	4139.60
25	6400	0.54	3457.93	91235.16
50	6400	0.35	2222.10	71000.38
			Total CHUs	166375.14
			Total AAHUs	**3317.50**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	6400	0.65	4134.20	
1	6400	0.71	4523.73	4328.96
25	6400	0.72	4589.60	109359.99
50	6400	0.62	3979.66	107115.80
			Total CHUs	220804.76
			Total AAHUs	**4416.10**

Net Change in AAHUs Due to Project	
FWP AAHUs	4416.10
FWOP AAHUs	3327.50
Net Change (FWP – FWOP) =	**1088.59**

Subarea 3B

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	8867	0.54	4824.07	
1	8867	0.54	4826.72	4825.40
25	8867	0.38	3401.62	98740.03
50	8867	0.33	2902.84	78805.79
			Total CHUs	182371.22
			Total AAHUs	**3647.42**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	8867	0.54	4824.07	
1	8867	0.60	5303.05	5063.56
25	8867	0.48	3896.26	110391.67
50	8867	0.43	3787.46	96046.45
			Total CHUs	21151.65
			Total AAHUs	**4230.03**

Net Change in AAHUs Due to Project	
FWP AAHUs	4230.03
FWOP AAHUs	3647.42
Net Change (FWP – FWOP) =	**582.61**

Subarea 4A

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	1859	0.68	1258.99	
1	1859	0.68	1258.99	1258.99
25	1859	0.34	628.98	22655.65
50	1859	0.28	516.30	14315.95
			Total CHUs	38230.57
			Total AAHUs	**764.61**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	1859	0.68	1258.99	
1	1859	0.68	1263.81	1261.40
25	1859	0.57	1060.85	27895.91
50	1859	0.41	753.95	22685.04
			Total CHUs	51842.34
			Total AAHUs	**1036.85**

Net Change in AAHUs Due to Project	
FWP AAHUs	1036.85
FWOP AAHUs	764.61
Net Change (FWP – FWOP) =	**272.24**

Subarea 4B

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	641	0.53	340.22	
1	641	0.53	340.22	340.22
25	641	0.32	202.66	6514.60
50	641	0.26	163.71	4579.60
			Total CHUs	11434.43
			Total AAHUs	**228.69**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	641	0.53	340.22	
1	641	0.53	340.36	340.29
25	641	0.39	248.56	7067.11
50	641	0.32	204.13	5658.67
			Total CHUs	13066.07
			Total AAHUs	**261.32**

Net Change in AAHUs Due to Project	
FWP AAHUs	261.32
FWOP AAHUs	228.69
Net Change (FWP – FWOP) =	**32.63**

Subarea 4C

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	2040	0.53	1088.23	
1	2040	0.53	1088.23	1088.23
25	2040	0.29	591.99	20162.62
50	2040	0.24	492.15	13551.69
			Total CHUs	34802.54
			Total AAHUs	**696.05**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	2040	0.53	1088.23	
1	2040	0.54	1095.97	1092.10
25	2040	0.53	1079.48	26105.30
50	2040	0.38	765.41	23061.12
			Total CHUs	50258.51
			Total AAHUs	**1005.17**

Net Change in AAHUs Due to Project	
FWP AAHUs	1005.17
FWOP AAHUs	696.05
Net Change (FWP – FWOP) =	**309.12**

Subarea 5A

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	3514	0.73	2573.34	
1	3514	0.73	2573.34	2573.34
25	3514	0.60	2105.63	56147.81
50	3514	0.43	1501.89	45094.26
			Total CHUs	103815.41
			Total AAHUs	**2076.31**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	3514	0.73	2573.34	
1	3514	0.80	2801.24	2687.29
25	3514	0.66	2333.94	61622.15
50	3514	0.66	2321.48	58192.70
			Total CHUs	122502.15
			Total AAHUs	**2450.04**

Net Change in AAHUs Due to Project	
FWP AAHUs	2450.04
FWOP AAHUs	2076.31
Net Change (FWP – FWOP) =	**373.73**

Subarea 5B

Future Without Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	2,993	0.74	2,204.21	
1	2,993	0.74	2,204.21	2,204.21
25	2,993	0.60	1,803.95	48097.95
50	2,993	0.42	1,269.44	38417.32
			Total CHUs	88719.48
			Total AAHUs	**1774.39**

Future With Project				
		X HSI	**Total HUs**	**Cumulative HUs**
TY	Acres			
0	2,993	0.74	2204.21	
1	2,993	0.80	2399.43	2301.82
25	2,993	0.67	2000.78	52802.45
50	2,993	0.67	1999.42	50002.47
			Total CHUs	105106.74
			Total AAHUs	**2102.13**

Net Change in AAHUs Due to Project	
FWP AAHUs	2102.13
FWOP AAHUs	1774.39
Net Change (FWP – FWOP) =	**327.75**

5.0 References

Allen, S.T., R.F. Keim, T. J. Dean. 2019. Contrasting effects of flooding on tree growth and stand density determine aboveground production in baldcypress forests. Forest Ecology and Management 432:345-355.

Barrow, W.C., L.J. Randall, M.S. Woodrey, J. Cox, C.M. Riley, R.B. Hamilton, and C. Eberly. 2005. Coastal forests of the Gulf of Mexico: a description and some thoughts on their conservation. in C.J. Ralph and T.D. Rich (eds.), Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference. 2002 March 20-24; Asilomar, CA. General Technical Report PSW-GTR-191. Albany, CA: USDA, Forest Service, Pacific Southwest Research Station, Vol. 191.

Baustian, M.M., R.F. Clark, A.S. Jerabek, W. Wang, H.C. Bienn, E.D. White. 2018. Modeling current and future freshwater inflow needs of a subtropical estuary to manage and maintain forested wetland ecological conditions. Ecological Indicators 85:791-807.

Buras, H.S., McLain, T., Miller, B., Richardi, D., Richards, A.C.P. 2018. River Reintroduction into Maurepas Swamp Project (PO-0029) Preliminary Operations, Maintenance, Monitoring, and Adaptive Management Plan. Coastal Protection and Restoration Authority. Baton Rouge, LA. 30 pp. plus appendices.

Camillo, C.A. 2012. Divine Providence: The 2011 Flood in the Mississippi River and Tributaries Project. U.S. Army Corps of Engineers. 142.

Chambers, M.S., W.H. Conner, J.W. Day, S.P. Faulkner, E.S. Gardiner, M.S. Hughes, R.F. Keim, K.W. McLeod, C.A. Miller, J.A. Nyman, and G.P Shaffer. 2005. Protection and utilization of Louisiana's coastal wetland forests: Final report to the Governor of Louisiana from the Coastal Wetland Forest Conservation and Use Working Group. Louisiana Governor's Office for Coastal Activities, Baton Rouge, LA. 121 pp.

Conner, W.H., J.G. Gosselink, and R.T. Parrondo. 1981. Comparison of the vegetation of three Louisiana swamp sites with different flooding regimes. American Journal of Botany 68: 320-331.

Conner, W.H., J.R. Toliver, and F.H. Sklar. 1986. Natural regeneration of baldcypress (*Taxodium distichum* (L.) Rich) in a Louisiana swamp. Forest Ecology and Management 14:305-317.

Conner, W.H., and J.W. Day. 1992. Diameter Growth of Taxodium distichum (L.) Rich. and Nyssa aquatica L. From 1979-1985 in Four Louisiana Swamp Stands. American Midland Naturalist 127:290-299.

Conner, W.H. 1993. Artificial regeneration of baldcypress in three South Carolina forested wetland areas after Hurricane Hugo. In Proceedings of the Seventh Biennial Southern Silvicultural Research Conference, Mobile, Alabama. USDA Southern Forest Experiment Station, New Orleans, General Technical Report SO-93.

Day, J.W., W.H. Conner, and G.P. Shaffer. 2006. The importance of pulsed physical events for sustainability of Louisiana coastal forested wetlands. Hydrology and Management of Forested Wetlands Proceedings of the International Conference 8-12 April 2006. American Society of Agricultural and Biological Engineers Publication No. 701P0406.

Day, J., R. Hunter, R.F. Keim, R. DeLaune, G. Shaffer, E. Evers, D. Reed, C. Brantley, P. Kemp, J. Day, and M. Hunter. 2012. Ecological response of forested wetlands with and without large-scale Mississippi River input: implications for management. Ecological Engineering 46:57-67.

Deltares. 2014. Delft3D-FLOW: Simulation of multi-dimensional hydrodynamic flows and transport phenomena, including sediments. User Manual.

Dicke, S.G. and J.R. Toliver. 1990. Growth and development of baldcypress-water tupelo stands under continuous versus seasonal flooding. Forest Ecology and Management 33/34:523-530.

Doyle, T.W., W.H. Conner, R.H. Day, K.W. Krauss, and C.M. Swarzenski. 2007. Wind damage and salinity effects of Hurricanes Katrina and Rita on coastal baldcypress forests of Louisiana in G.S. Farris, G.J. Smith, M.P. Crane, C.R. Demas, L.L. Robbins, and D.L. Lavoie (eds.), Science and the Storms—The USGS Response to the Hurricanes of 2005. United States Geological Survey. pp.163-168.

Doyle, T.W. 2009. Hurricane frequency and landfall distribution for coastal wetlands of the Gulf Coast, USA. Wetlands 29:35-43.

Effler, R.S., R.A. Goyer, and G.J. Lenhard. 2006. Baldcypress and water tupelo responses to insect defoliation and nutrient augmentation in Maurepas Swamp, Louisiana, USA. Forest Ecology and Management 236:295-304.

Effler, R.S., G.P. Shaffer, S.S. Hoeppner, and R.A. Goyer. 2007. Ecology of the Maurepas Swamp: effects of salinity, nutrients, and insect defoliation. In W.H. Conner, T.W. Doyle, K.W. Krauss. (eds.), Ecology of tidal freshwater forested wetlands of the Southeastern United States, 349-384. Springer, Dordrecht.

Glick, P., J. Clough, A. Polaczyk, B. Couvillion, and B. Nunley. 2013. Potential effects of sea-level rise on coastal wetlands in southeastern Louisiana. Journal of Coastal Research, 63:211-233.

Henkel, T.K., E.R. Hillmann, K. Butcher, D.B. Baker, and J.A. Lopez. 2017. Potential occurrence of natural swamp regeneration on the Maurepas Lad Bridge, Southeast Louisiana. Lake Pontchartrain Basin Foundation. 24pp.

Hoeppner, S.S., G.P. Shaffer, and T.E. Perkins. 2008. Through droughts and hurricanes: Tree mortality, forest structure, and biomass production in a coastal swamp targeted for restoration in the Mississippi River Deltaic Plain. Forest Ecology and Management 256:937-948.

Keddy, P.A., D. Campbell, T. McFalls, G.P. Shaffer, R. Moreau, C. Dranguet, and R. Heleniak. 2007. The wetlands of lakes Pontchartrain and Maurepas: Past, present and future. Environmental Reviews 15:43-77.

Keim, B.D., R.A. Muller, and G.W. Stone. 2007. Spatiotemporal patterns and return periods of tropical storm and hurricane strikes from Texas to Maine. Journal of Climate 20:3498-3509.

Keim, R.F., T.J. Dean, J.L. Chambers, W.H. Conner. 2010. Stand Density Relationships in Baldcypress. Forest Science 56:336-343.

Kozlowski, T.T. 1984. Plant responses to flooding of soil. BioScience 34:162-167.

Krauss, K.W., J.A. Duberstein, T.W. Doyle, W.H. Conner, R.H. Day, L.W. Inabinette, and J.L. Whitbeck. 2009. Site condition, stand structure, and growth of baldcypress along tidal/non-tidal salinity gradients. Wetlands 29:505-519.

Krauss, K.W., G.P. Shaffer, R.F. Keim, J.L. Chambers, W.B. Wood, and S.B. Hartley. 2017. Performance measures for a Mississippi River reintroduction into the forested wetlands of Maurepas Swamp: U.S. Geological Survey Scientific Investigations Report 2017-5036, 56 pp.,

Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF). 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Baton Rouge, LA. 161 pp.

Myers, R.S., G.P. Shaffer, and D.W. Llewellyn. 1995. Baldcypress (*Taxodium distichum* (L.) Rich) restoration in southeast Louisiana - the relative effects of herbivory, flooding, competition, and macronutrients. Wetland 15:141-148.

Pezeshki, S.R. 1990. A comparative study of the response of *Taxodium distichum* and *Nyssa aquatica* to soil anaerobiosis and salinity. Forest Ecology and Management 33/34:531-541.

Poirrier, M.A. l979. Studies of salinity stratification in Southern Lake Pontchartrain near the Inner Harbor Navigation Canal. Proceedings of the Louisiana Academy of Sciences 4:26-35.

Poirrier, M.A. 2013. Effects of closure of the Mississippi River Gulf Outlet on saltwater intrusion and bottom water hypoxia in Lake Pontchartrain. Gulf and Caribbean Research 25:105-109.

Reed, D. and B. Yuill. 2017. *2017 Coastal Master Plan: Attachment C2-2: Subsidence*. Version Final. (p. 15). Baton Rouge, Louisiana: Coastal Protection and Restoration Authority.

Richardi, D.C. 2018. Monitoring Plan for Hydrologic Restoration of the Amite River Diversion Canal (PO-0142). Coastal Protection and Restoration Authority, New Orleans Regional Office, New Orleans, LA.

Shaffer, G.P., W.B. Wood, S.S. Hoeppner, T.E. Perkins, J. Zoller, and D. Kandalepas. 2009a. Degradation of baldcypress–water tupelo swamp to marsh and open water in southeastern Louisiana, USA: an irreversible trajectory? Journal of Coastal Research 54:152-165.

Shaffer, G.P., J.W. Day, S. Mack, G.P. Kemp, I. van Heerden, M.A. Poirrier, K.A. Westpahl, D. FitzGerlad, A. Milanes, C. Morris, R. Bea, and P.S. Penland. 2009b. The MRGO navigation project: a massive human-induced environmental, economic, and storm disaster. Journal of Coastal Research. 54:206-224.

Shaffer, G.P., J.W. Day, R.G. Hunter, R.R. Lane, C.J. Lundberg, W.B. Wood, E.R. Hillmann, J.N. Day, E. Strickland, and D. Kandalepas. 2015. System response, nutria herbivory, and vegetation recovery of a wetland receiving secondarily-treated effluent in coastal Louisiana. Ecological Engineering 79:120-131.

Shaffer, G.P., J.W. Day, D. Kandalepas, W.B. Wood, R.G. Hunter, R.R. Lane, and E.R. Hillmann. 2016. Decline of the Maurepas Swamp, Pontchartrain Basin, Louisiana, and approaches to restoration. Water 8:101.

Shaffer, G.P., J.W. Day, and R.R. Lane. 2018. Optimum use of freshwater to restore baldcypress–water tupelo swamps and freshwater marshes and protect against saltwater intrusion: a case study of the Lake Pontchartrain Basin. In J.W. Day and J.A. Erdman (eds.), Mississippi Delta Restoration, 61-76. Springer.

Shaffer, G.P. and D. Kandalepas. 2019. Monitoring of the Lac des Allemands Swamp (BA-34-2) Hydrologic Restoration Project. 2018 Final Report. CPRA. 14pp.

Sternberg, M.A. 2007. Winding Through Time: The Forgotten History and Present-day Peril of Bayou Manchac. LSU Press, Baton Rouge, LA.

Stone, G.W., J.M. Grymes III, J.R. Dingler, and D.A. Pepper. 1997. Overview and significance of hurricanes on the Louisiana coast, USA. Journal of Coastal Research 13:656-669.

Thomson, D.A. 2000. The influence of hydrological alterations upon wetland hydrodynamics and plant growth on the Manchac Landbridge, Southeastern Louisiana, USA. Master's Thesis, Southeastern Louisiana University, Hammond, LA. 90 pp.

United Research Services (URS). 2014. 95% Design report for Mississippi River diversion into Maurepas Swamp (PO-29 Contract No. 2503-11-63). Prepared for the Coastal Protection and Restoration Authority. 149 pp. plus appendices.

U.S. Army Corps of Engineers (USACE). 2004. Louisiana Coastal Area (LCA) Restoration Study. Volume 1: LCA Study - Main Report. Attachment 5 - Additional Information on Five Near-Term Critical Restoration Features for Conditional Authorization. New Orleans, LA.

U.S. Army Corps of Engineers (USACE). 2017. Sea-Level Calculator for Non-NOAA Long-Term Tide Gauges. corpsmapu.usace.army.mil/rccinfo/slc/slcc_nn_calc.html. Accessed 28 May 2019.

U.S. Environmental Protection Agency (USEPA). 2001. Wetland Value Assessment Revised Project Information Sheet. Attachment G – In Diversion into Maurepas Swamps: Complex Project. Coastal Wetlands, Planning, Protection, and Restoration Act. U.S. Environmental Protection Agency, Region 6, Dallas, TX. Report WA #5-02. 58 pp.

Walker, H.J. and D.W. Davis. 2002. The Mississippi river: Engineered routes to the sea. in J. Chen, D. Eisma, K. Hotta, and H.J. Walker (eds.), Engineered Coasts, 61-83. Springer, Dordrecht.

6.0 Appendices

6.1 Appendix A: Delft3D Model Run Results

water resources / environmental consultants
7648 Picardy Ave, Suite 100 ☐ Baton Rouge, LA 70808 ☐(225) 766-0586 ☐ Fax (225) 766-0561

TECHNICAL MEMORANDUM

DATE: March 5, 2019

TO: Brad Miller
Louisiana Coastal Protection and Restoration Authority

FROM: Ranjit Jadhav, PhD, PE, D.WRE RSJ and Philip Massirer PHM
FTN Associates, Ltd.

SUBJECT: Re-introduction of Mississippi River Water to Maurepas Swamp (PO-0029)
Water Quality Modeling
FTN No. R05540-1567-001

1.0 INTRODUCTION

FTN Associates, Ltd. (FTN) previously developed and calibrated a two-dimensional Delft3D hydrodynamic and water quality model to simulate effects of the proposed diversion on water levels, velocity, total nitrogen (TN), and total phosphorus (TP) in the Maurepas swamp project area (FTN 2018; called the "2018 Draft Report" hereafter). The major water bodies in the study area and the model domain are shown in Figures 1 and 2 respectively. This Technical Memorandum (TM) summarizes results from application of this model for one simulation requested by CPRA.

2.0 MODEL SETUP AND SIMULATION

The details of model geometry (mesh and bathymetry) development are described in the 2018 Draft Report. The overall geometry was developed using the LIDAR elevations from the 2012 and 2017 data sets. The bathymetry of the primary streams was based on the field topographic surveys. In the regions where LIDAR elevations were not consistent, maximum swamp floor elevations were set to 1.0 ft NAVD88 based on first-hand observations and experience of CPRA and its Technical Advisory Group (TAG) members.

Similar to the scenarios described in the 2018 Draft Report, the model simulated 31 days of 2000 cfs continuous diversion flow from the Mississippi River. As in the previous scenarios, the normal tidal water surface elevations were specified for Lake Maurepas (at Pass Manchac) and historical mean discharge input boundaries were specified for other streams such as the Blind River and the Amite River. A controlled 7-day release, each of 140 cfs was specified from the diversion canal to the eastern and western adjacent swamps between Interstate 10 and US Highway 61.

3.0 MODEL RESULTS AND DISCUSSION

The model results are shown in Figures 3 and 4. Figure 3 shows water surface elevation in the study area at the end of 7, 10, 20, and 31 days of continuous diversion flow. The highest water surface elevation is observed in Hope Canal. Immediately north of I-10, in Hope Canal, the water surface elevation steadily increases to about 3 ft NAVD88. From there to Lake Maurepas, the water surface elevation shows a gradual spatial decrease. Most of the swamp is inundated by 20 days, showing only slight increases thereafter. Note the swamp areas seen as blank (suggesting dry areas) between the Blind River and Lake Maurepas are likely to get flooded in reality. The model shows these areas dry due to the numerical limitation in simulating very shallow flooding.

Further, the model shows that the diversion water reaching the Reserve Relief Canal continues to travel to Lake Maurepas with negligible spreading into the areas east of this canal in spite of added gaps on the east bank of this canal.

Figure 4 shows spatial distribution of the diversion water (percent Mississippi River water) in the study area at the end of 7, 10, 20, and 31 days of continuous diversion flow. In the swamp areas, the majority of the water is from the diversion (i.e., from the Mississippi River). The southern area of Lake Maurepas starts seeing the diversion water within 7 days and significantly in 20 days.

4.0 REFERENCE

FTN. 2018. Re-introduction of Mississippi River Water to Maurepas Swamp (PO-0029) Water Quality Modeling Initial Simulations. Draft Interim Technical Report dated October 22, 2018. Prepared by FTN Associates for the Coastal Protection and Restoration Agency, Baton Rouge, Louisiana.

We appreciate the opportunity to work with you on this project. If you have any questions or comments regarding this project, please do not hesitate to contact me at (225) 766-0586 or Philip Massirer at (501) 225-7779.

RSJ/tas

Figure 1. Maurepas swamp water quality model study area.

.

Figure 2. Maurepas swamp water quality model domain and locations of boundary conditions.

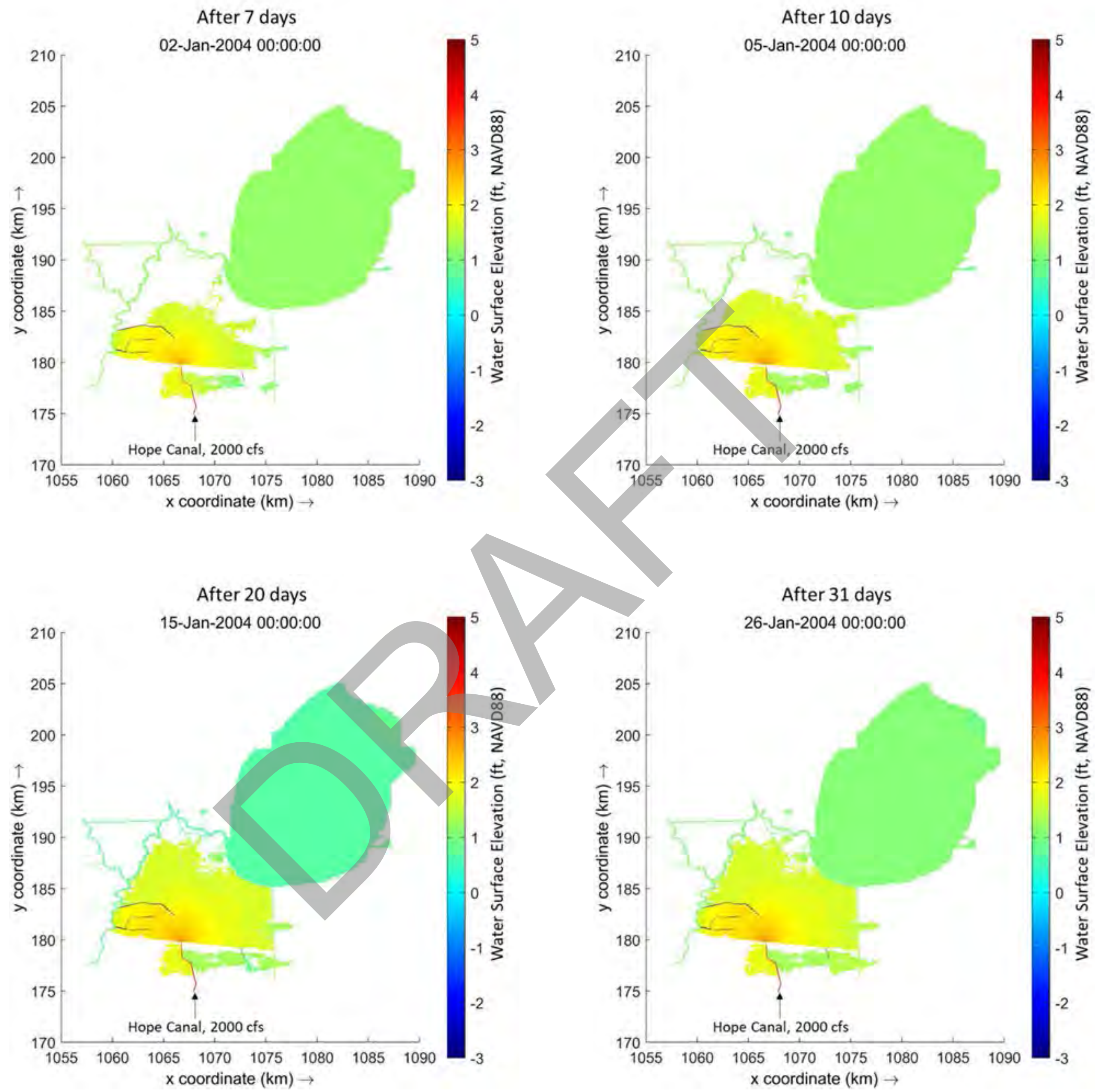


Figure 3. Predicted water surface elevation after 7, 10, 20, and 31 days of continuous diversion flow.

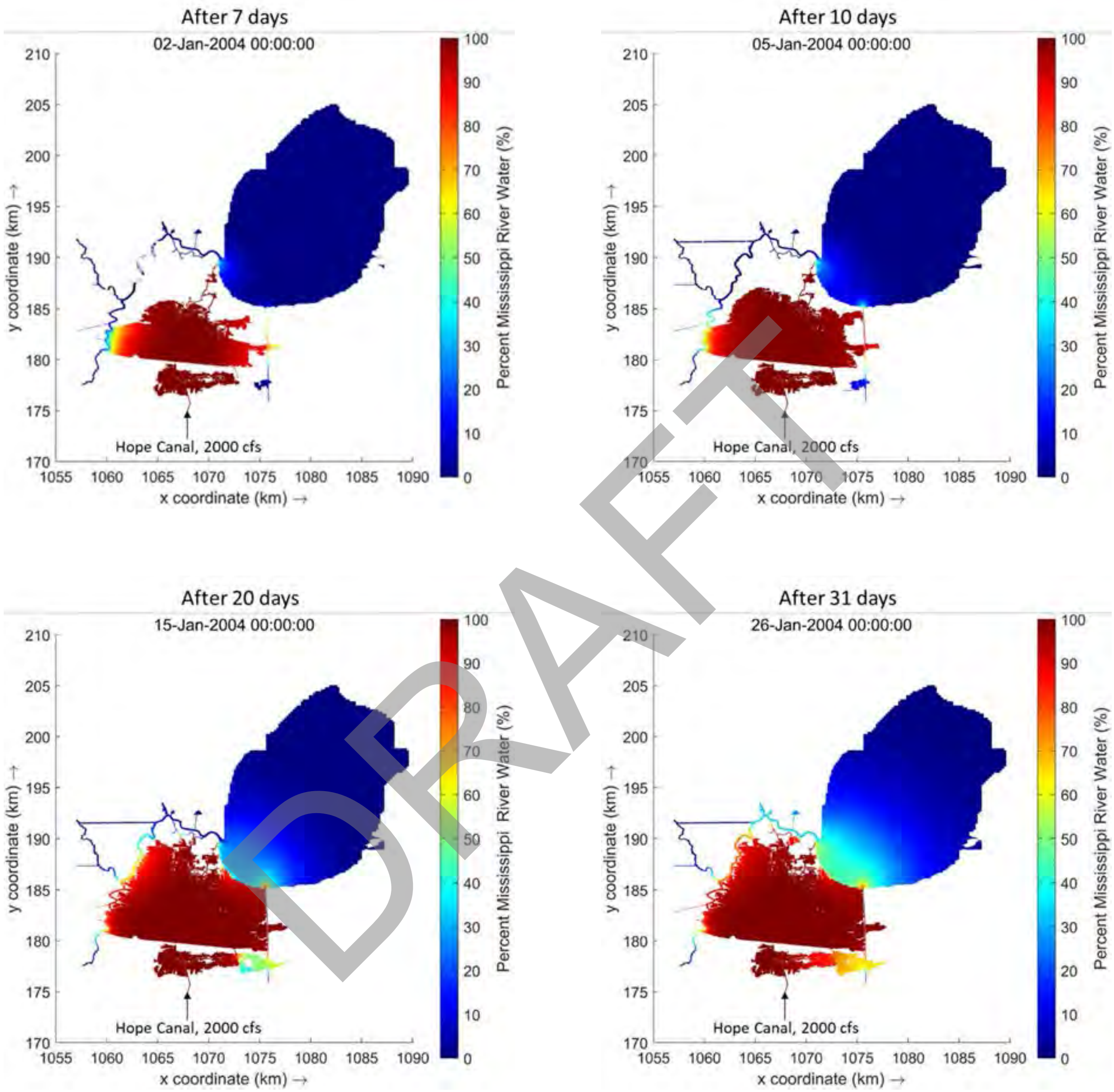


Figure 4. Predicted percentage Mississippi River water after 7, 10, 20, and 31 days of continuous diversion flow.

6.2 Appendix B: Relative Sea Level Rise Calculation Spreadsheets

Sea-Level Calculator for Non-NOAA Long-Term Tide Gauges

Consideration of future sea level change has been a requirement for USACE projects at coastal sites since 1986. EC 1165-2-212 and its successor ER 1100-2-8162 specify the equations to be used in computation of possible future sea level scenarios, based on an observed historical rate of sea level change. This rate of change has been established for NOAA tide gauges, and a web tool has been established to facilitate computations using these gauges.

For areas without a nearby NOAA tide gauge, establishing a historical rate of sea level change for the purpose of generating future sea level scenarios may be difficult due to changing datums, riverine influences, and intermittent data records. This on-line Sea Level Change Calculator computes the amount of predicted sea level change using constants from EC 1165-2-212 and its successor ER 1100-2-8162 using a base year of 1992, which is the midpoint of the most recent (1983-2001) National Tidal Datum Epoch, for those non-NOAA tide gauges where historical rates have been established

The historical rate of sea-level change is the rate for the "USACE Low Curve." The rate for the "USACE Intermediate Curve" is computed from the modified NRC Curve I considering both the most recent IPCC projections and modified NRC projections with the local rate of vertical land movement added. The rate for the "USACE High Curve" is computed from the modified NRC Curve III considering both the most recent IPCC projections and modified NRC projections with the local rate of vertical land movement added. The three local relative sea level change scenarios updated from EC 1165-2-212 and its successor ER 1100-2-8162 , Equation 2 are depicted in the Figure to the right of the table.

Engineering and Construction Bulletin (ECB) 2013-27 was issued on September 9, 2013 to provide guidance related to the use of non-NOAA tide gauge records for computing relative sea level change. Detailed procedures for computing relative sea level change at non-NOAA tide gauges can be found in the Atlas of U.S. Army Corps of Engineers Historic Daily Tide Data in Coastal Louisiana. As historical rates of relative sea level change are computed for additional (non-NOAA) tide gauges, those gauges will be added to this calculator, creating an increasingly comprehensive tool for sea level scenario projections.

This calculator has been updated to reflect the 2015 calculated rates contained in the Updated Atlas of U.S. Army Corps of Engineers Historic Daily Tide Data in Coastal Louisiana MRG&P Report No. 14 • November 2017 to reflect the newest reference document.

Equation Used by this Calculator

EC 1165-2-212, Equation 2 is as follows:

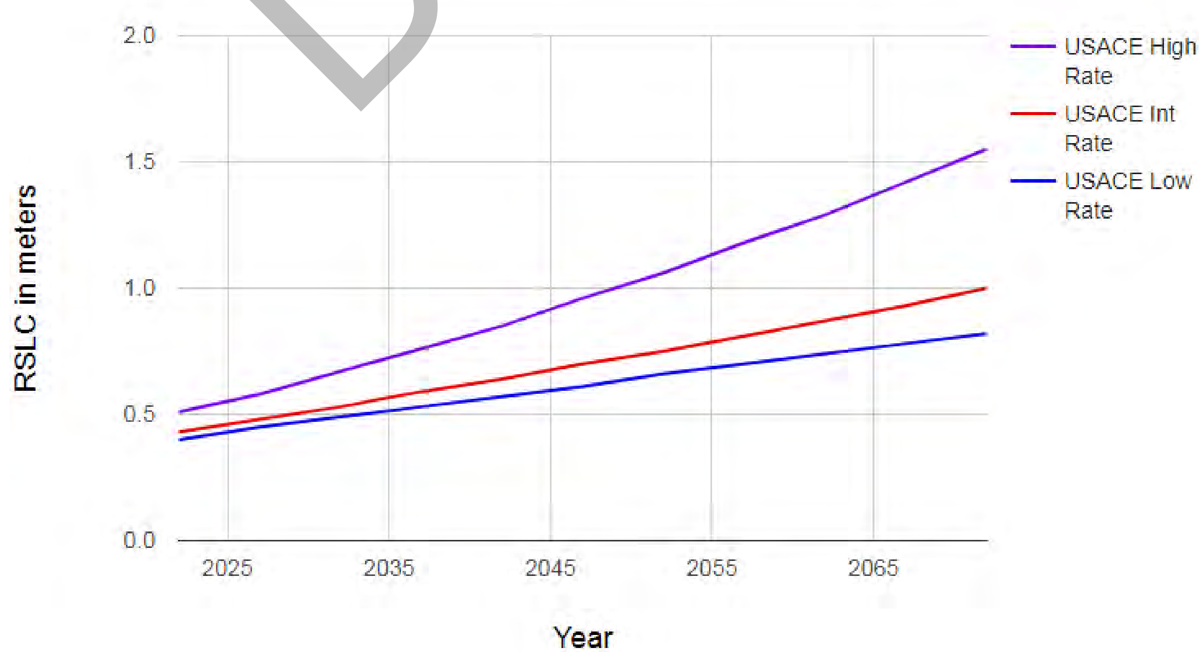
$$E(t) = (0.0017+M)t + bt^2$$

The year 1992 is used as the base year because that is the midpoint of the most recent tidal epoch for which mean sea level has been established (1983-2001). If scenarios of projected relative sea level change between two future years are needed, the difference in change since 1992 for those two years should be subtracted.

USACE Curves computed using criteria in USACE EC 1165-2-212

Gauge 85550: Lake Pontchartrain at Frenier: Jan 1950 to Dec 2002 All values are in meters			
Year	USACE Low	USACE Int	USACE High
2022	0.4	0.4	0.5
2027	0.4	0.5	0.6
2032	0.5	0.5	0.7
2037	0.5	0.6	0.8
2042	0.6	0.6	0.9
2047	0.6	0.7	1.0
2052	0.7	0.8	1.1
2057	0.7	0.8	1.2
2062	0.7	0.9	1.3
2067	0.8	0.9	1.4
2072	0.8	1.0	1.5

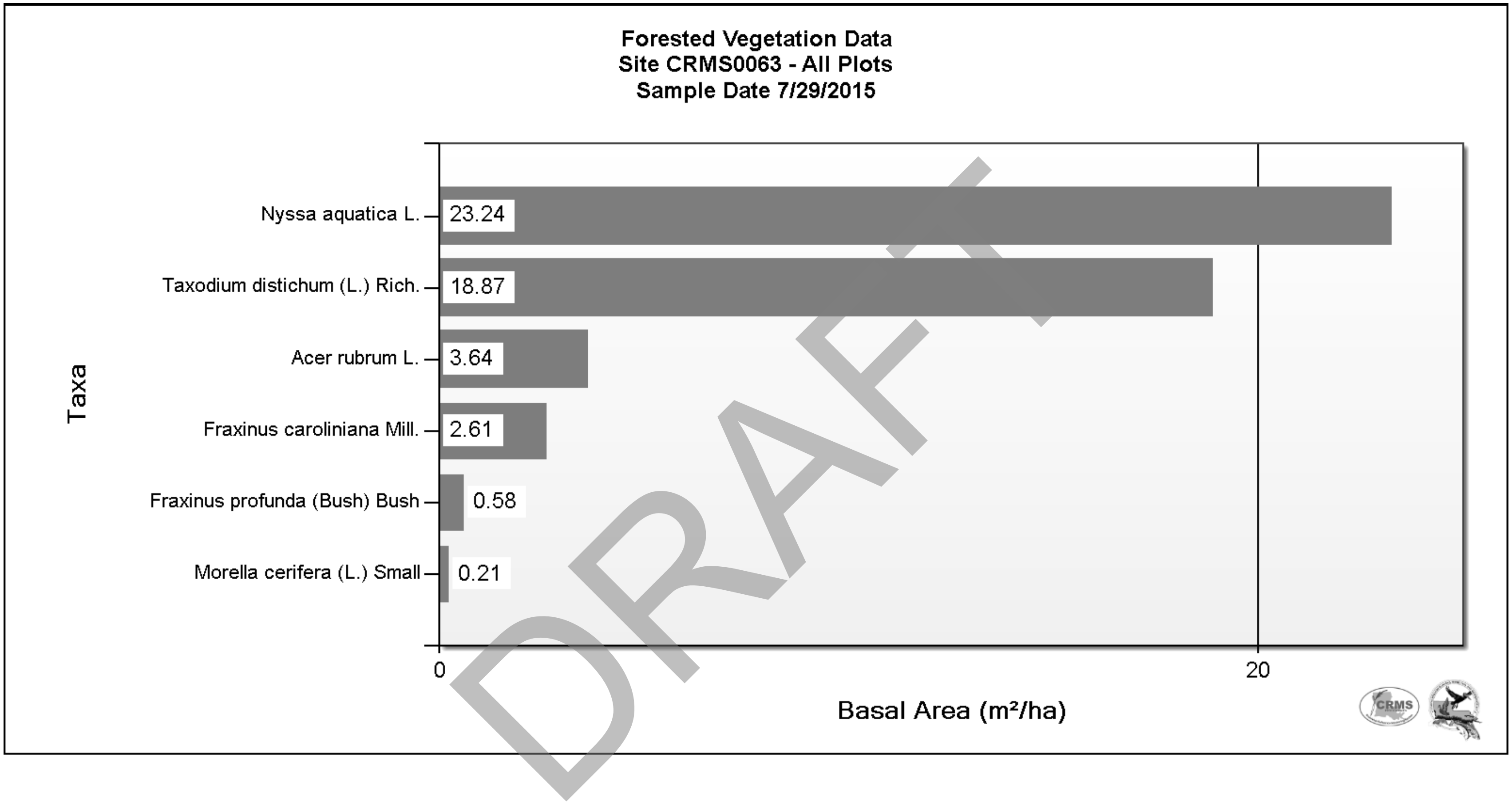
USACE SLC Curves - Gauge 85550: Lake Pontchartrain at Frenier: Jan 1950 to Dec 2002
USACE Curves computed using criteria in EC 1165-2-212

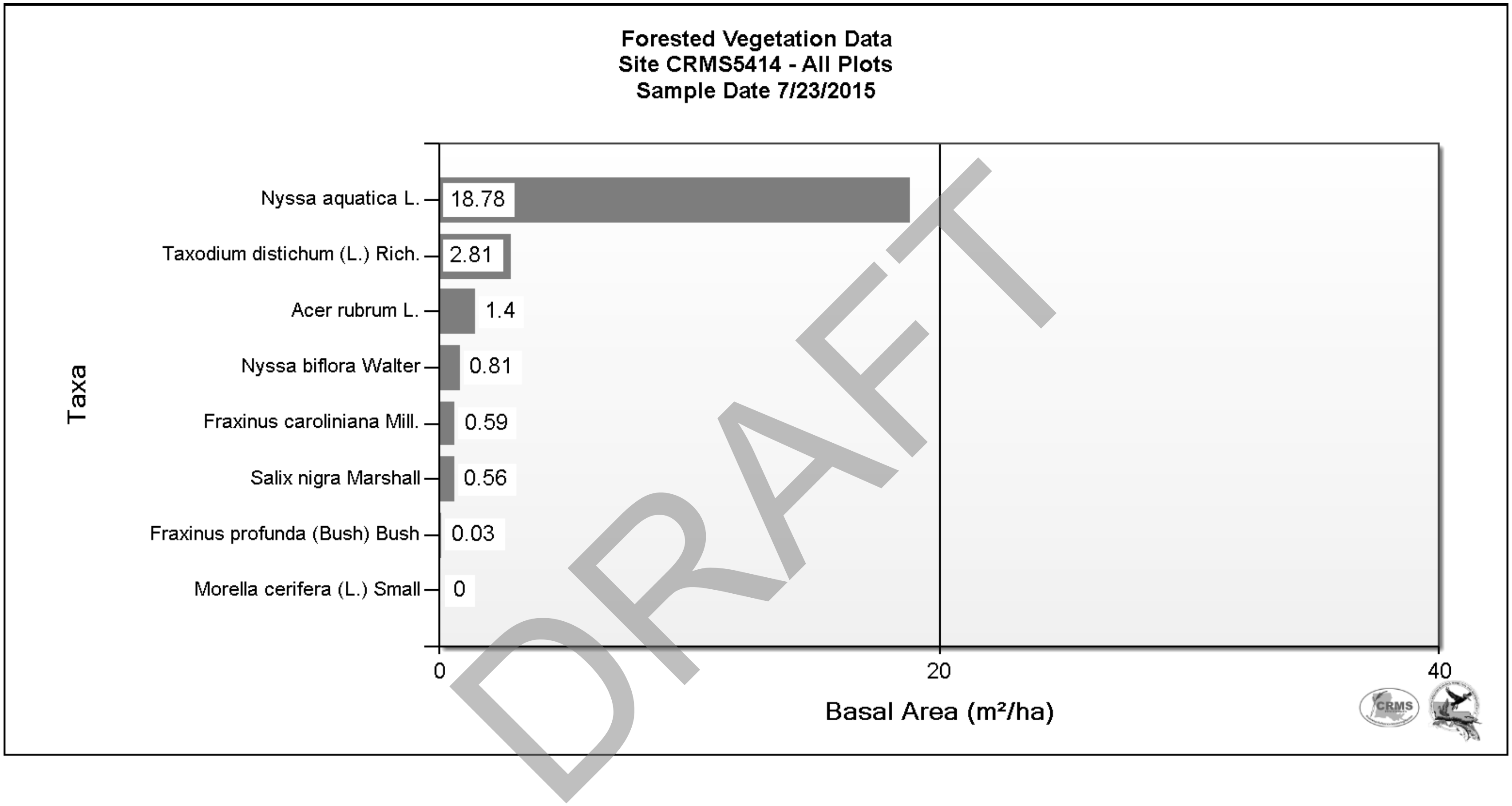


85550: Lake Pontchartrain at Frenier: Jan 1950 to Dec 2002

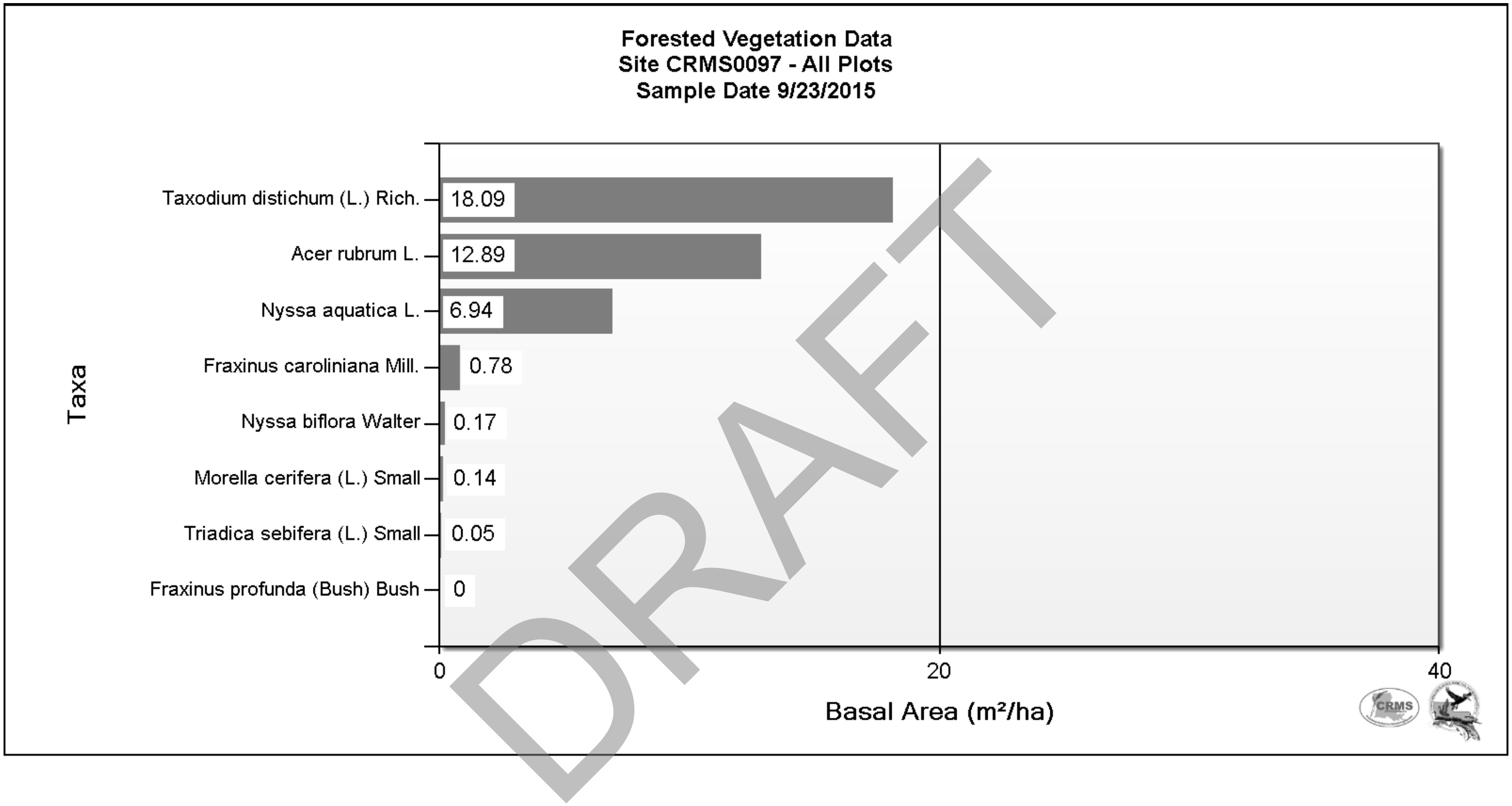
6.3 Appendix C: CRMS Station Basal Area and DBH Data

Subarea 1 - CRMS 0063

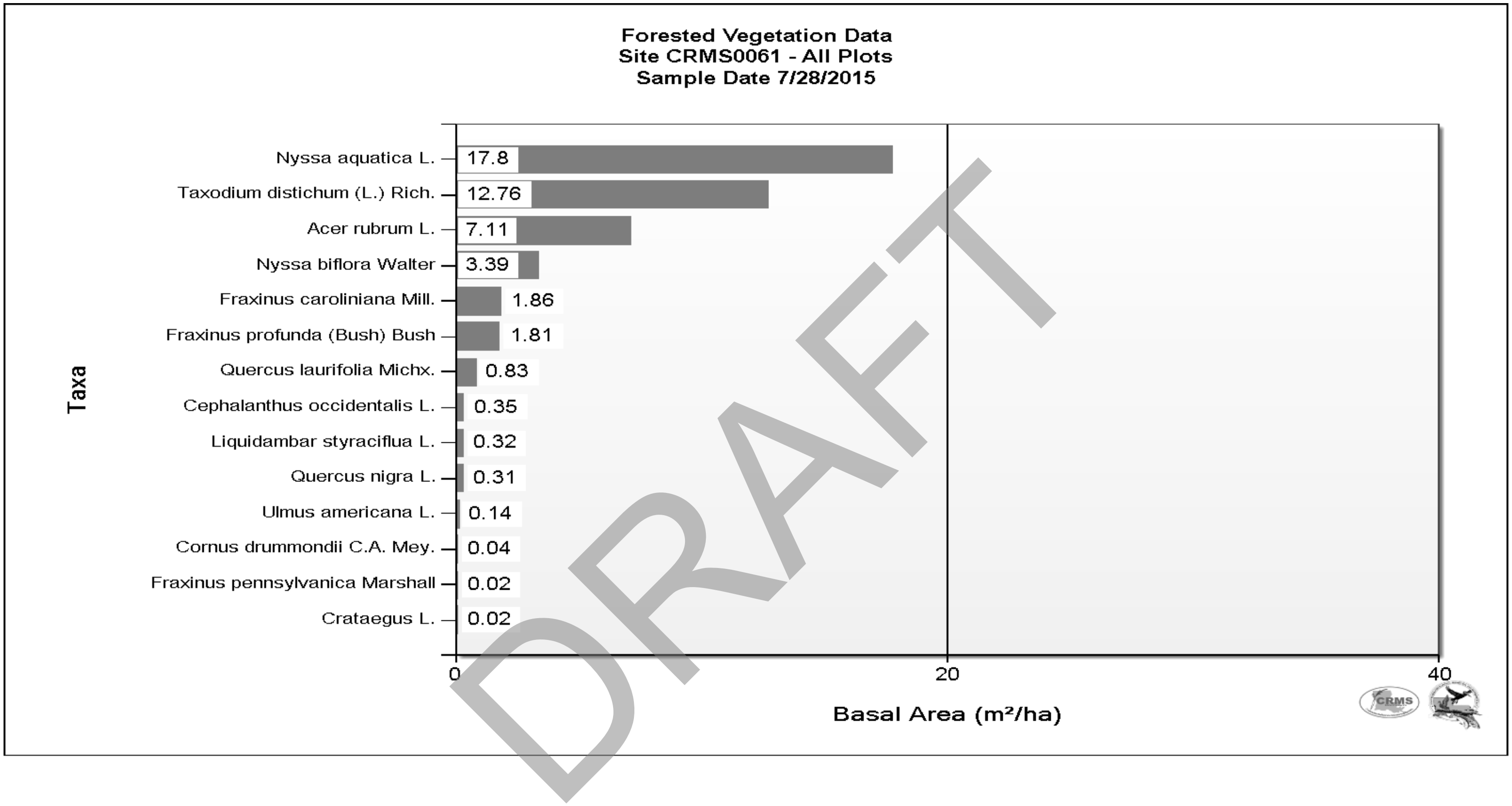




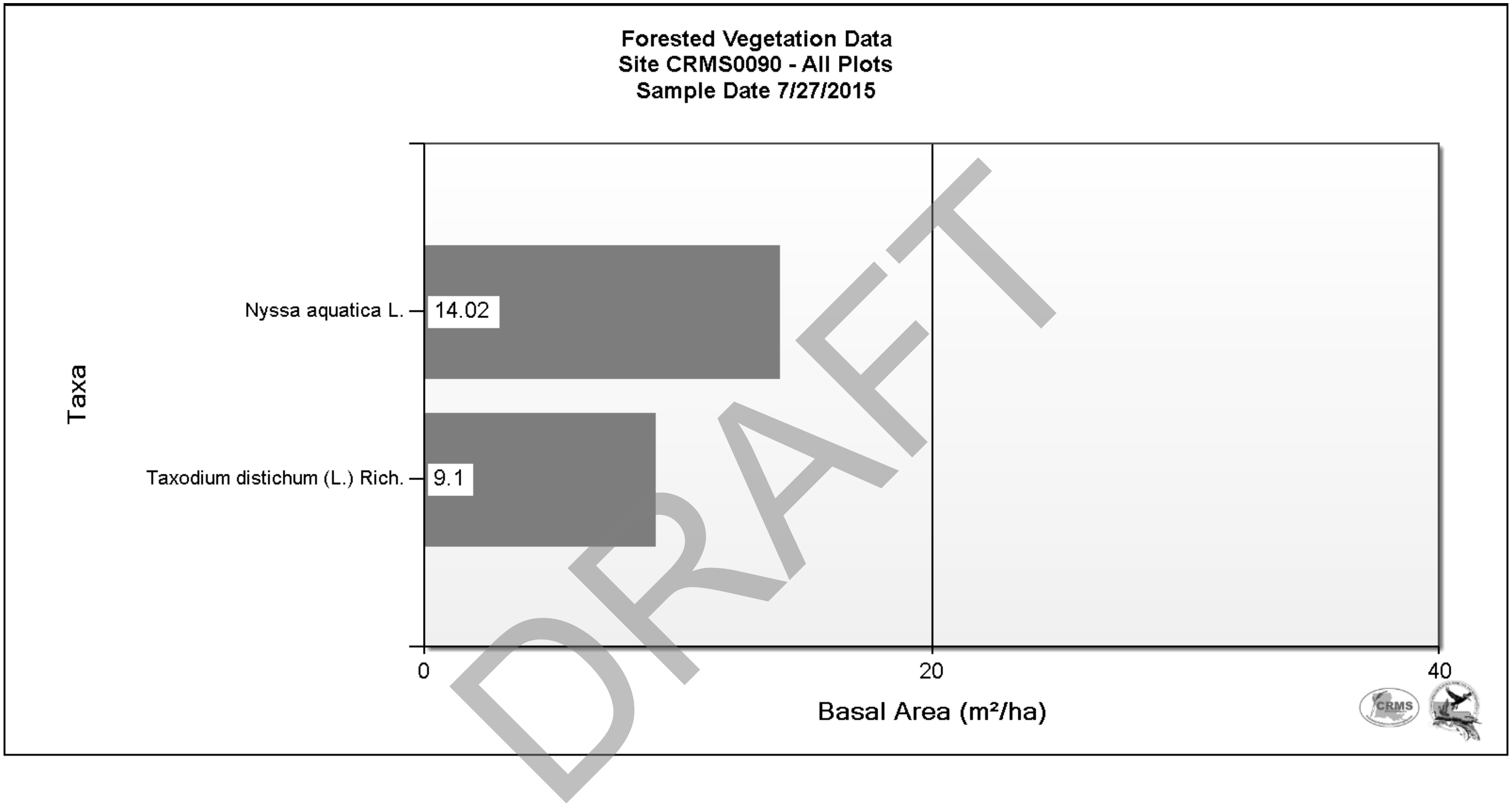
Forested Vegetation Data
Site CRMS5414 - All Plots
Sample Date 7/23/2015
Taxa
Nyssa aquatica L.
18.78
Taxodium distichum (L.) Rich.
2.81
Acer rubrum L.
1.4
Nyssa biflora Walter
0.81
Fraxinus caroliniana Mill.
0.59
Salix nigra Marshall
0.56
Fraxinus profunda (Bush) Bush
0.03
Morella cerifera (L.) Small
0
0
20
40
Basal Area (m²/ha)

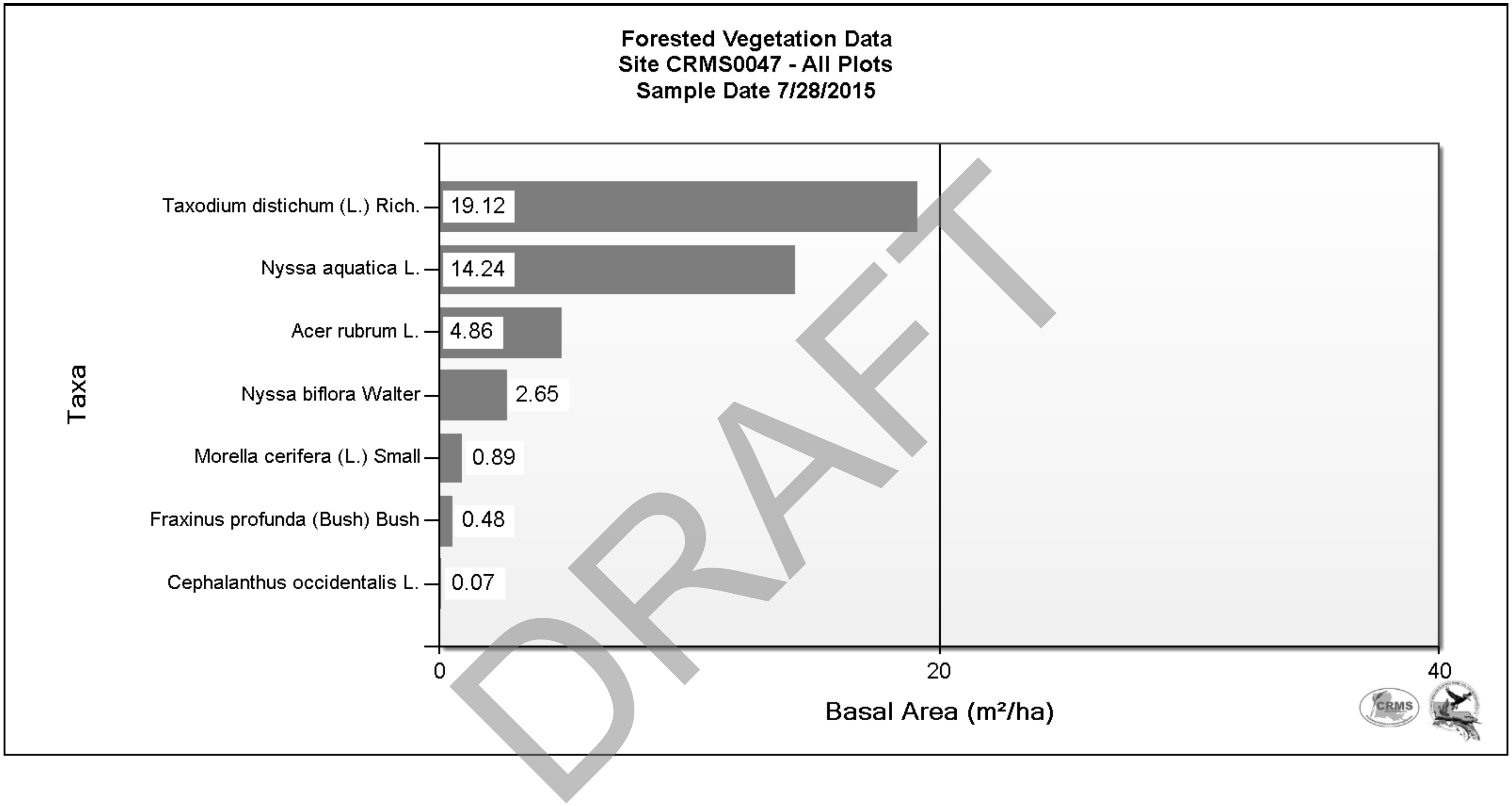


Forested Vegetation Data
Site CRMS0097 - All Plots
Sample Date 9/23/2015
Taxa
Taxodium distichum (L.) Rich.
18.09
Acer rubrum L.
12.89
Nyssa aquatica L.
6.94
Fraxinus caroliniana Mill.
0.78
Nyssa biflora Walter
0.17
Morella cerifera (L.) Small
0.14
Triadica sebifera (L.) Small
0.05
Fraxinus profunda (Bush) Bush
0
0
20
40
Basal Area (m²/ha)
DRAFT

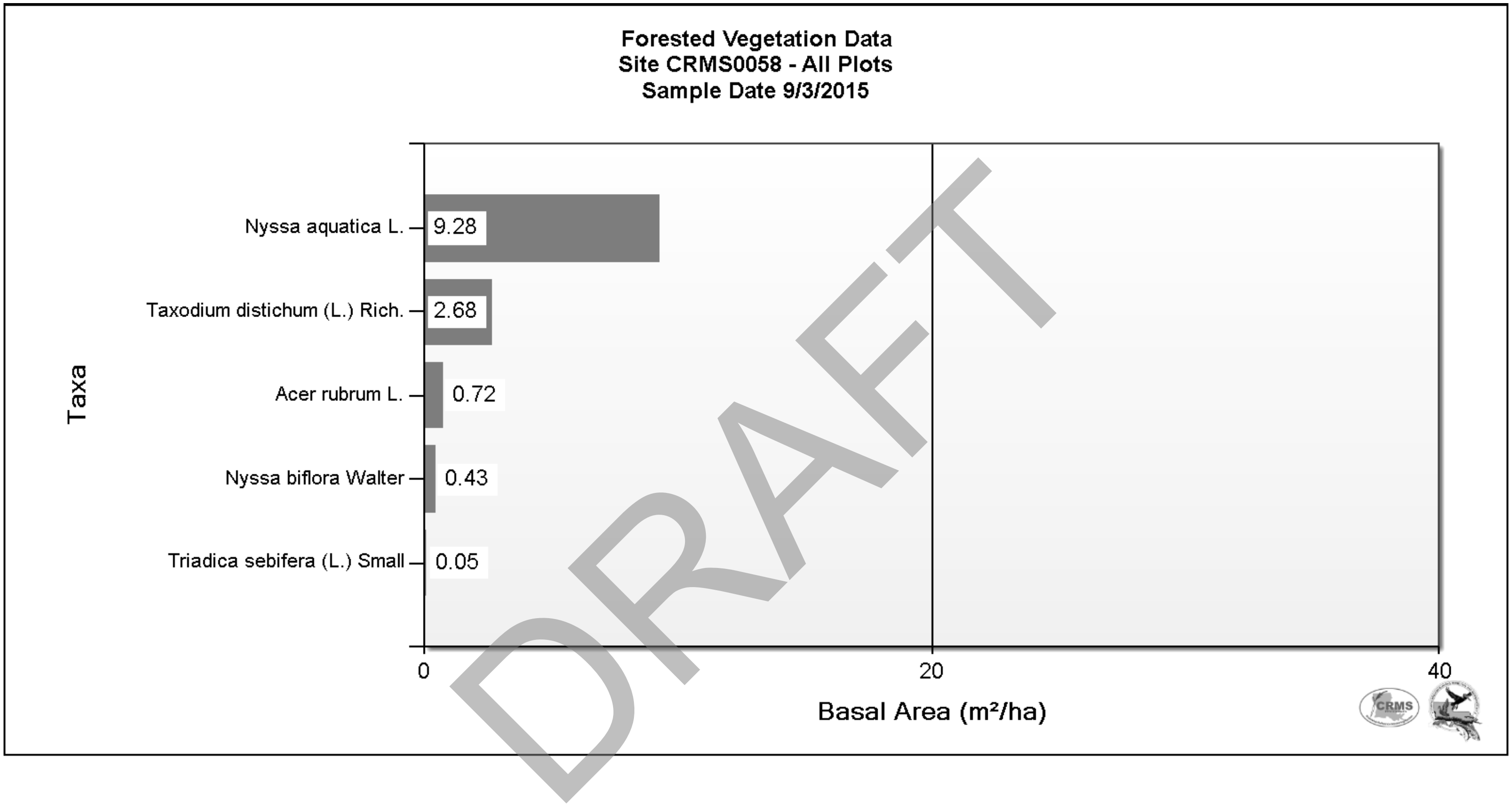


Forested Vegetation Data
Site CRMS0061 - All Plots
Sample Date 7/28/2015
Taxa
Nyssa aquatica L.
17.8
Taxodium distichum (L.) Rich.
12.76
Acer rubrum L.
7.11
Nyssa biflora Walter
3.39
Fraxinus caroliniana Mill.
1.86
Fraxinus profunda (Bush) Bush
1.81
Quercus laurifolia Michx.
0.83
Cephalanthus occidentalis L.
0.35
Liquidambar styraciflua L.
0.32
Quercus nigra L.
0.31
Ulmus americana L.
0.14
Cornus drummondii C.A. Mey.
0.04
Fraxinus pennsylvanica Marshall
0.02
Crataegus L.
0.02
0
20
40
Basal Area (m²/ha)
DRAFT

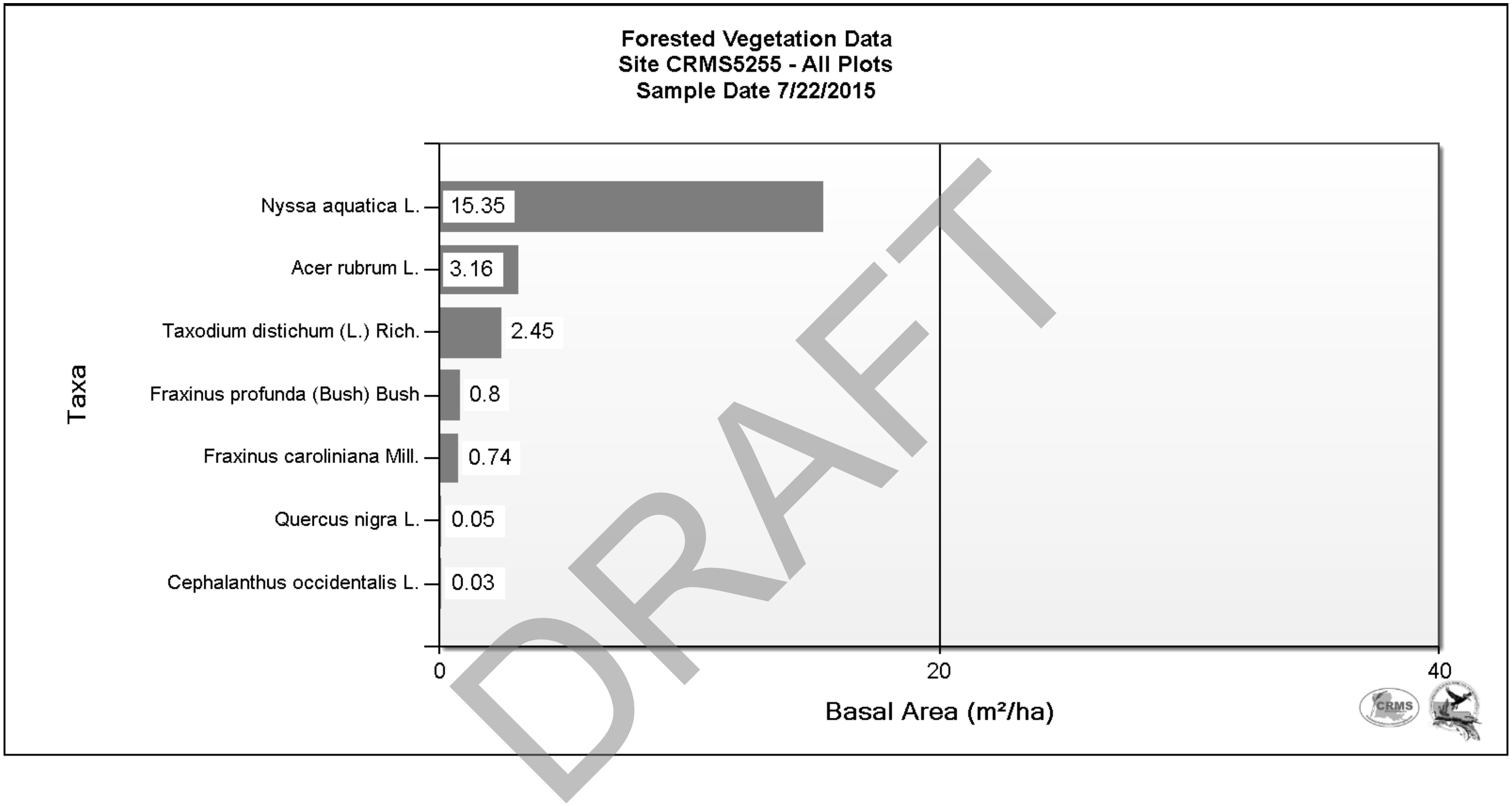

Forested Vegetation Data
Site CRMS0090 - All Plots
Sample Date 7/27/2015
Taxa
Nyssa aquatica L.
14.02
Taxodium distichum (L.) Rich.
9.1
0
20
40
Basal Area (m²/ha)
DRAFT
CRMS



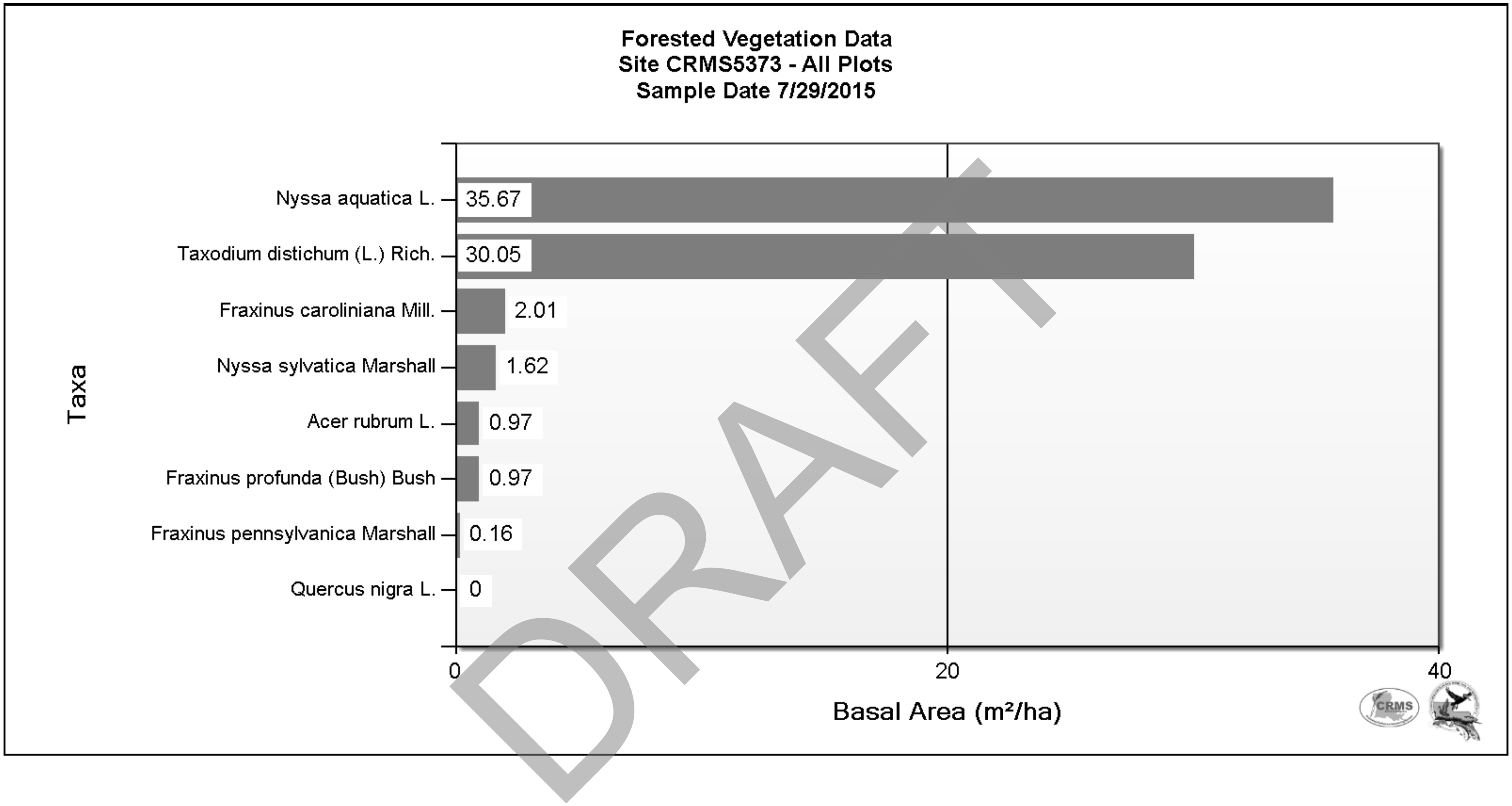
Forested Vegetation Data
Site CRMS0047 - All Plots
Sample Date 7/28/2015
Taxa
Taxodium distichum (L.) Rich.
19.12
Nyssa aquatica L.
14.24
Acer rubrum L.
4.86
Nyssa biflora Walter
2.65
Morella cerifera (L.) Small
0.89
Fraxinus profunda (Bush) Bush
0.48
Cephalanthus occidentalis L.
0.07
0
20
40
Basal Area (m²/ha)
DRAFT

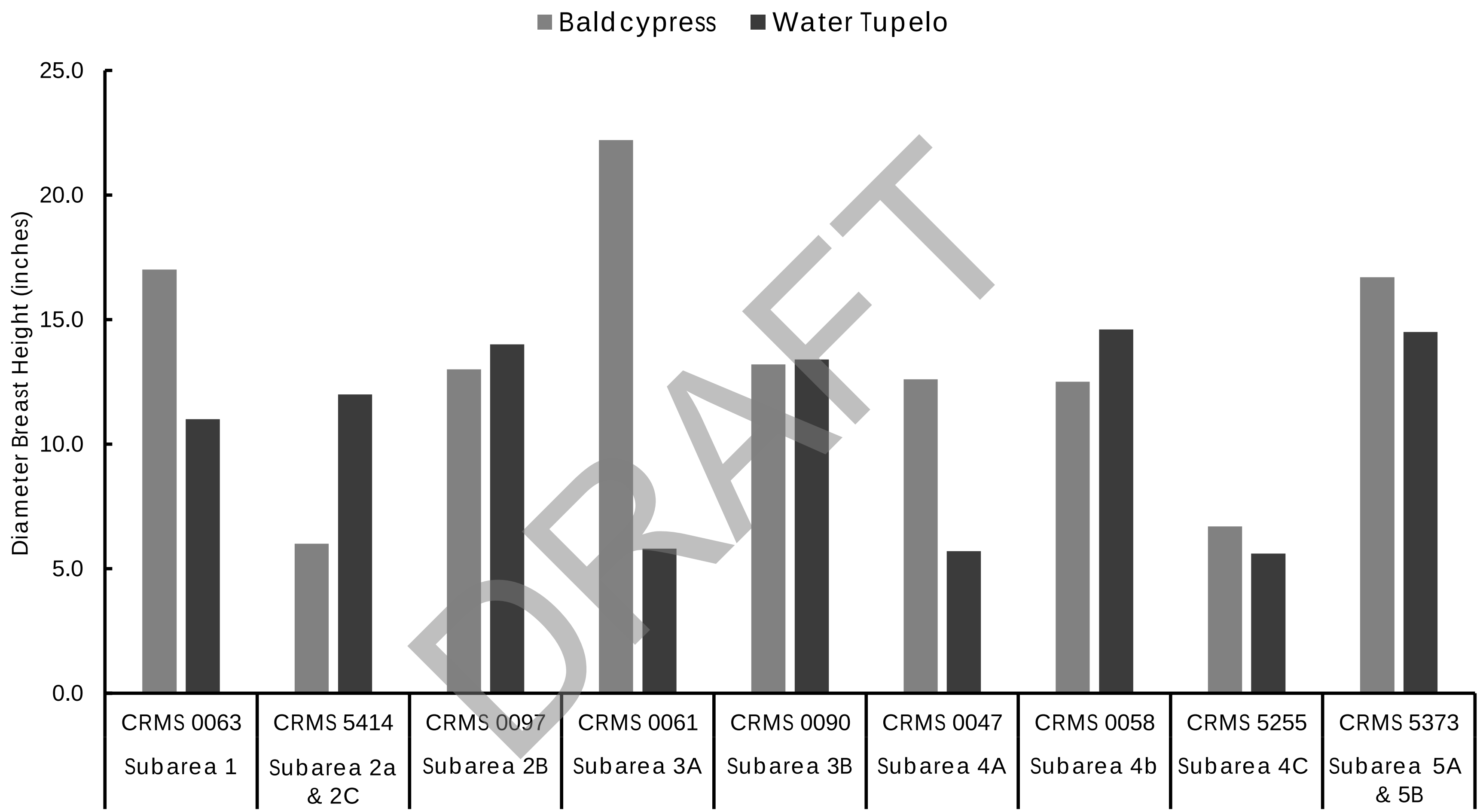


Forested Vegetation Data
Site CRMS0058 - All Plots
Sample Date 9/3/2015
Taxa
Nyssa aquatica L.
9.28
Taxodium distichum (L.) Rich.
2.68
Acer rubrum L.
0.72
Nyssa biflora Walter
0.43
Triadica sebifera (L.) Small
0.05
0
20
40
Basal Area (m²/ha)
DRAFT
CRMS



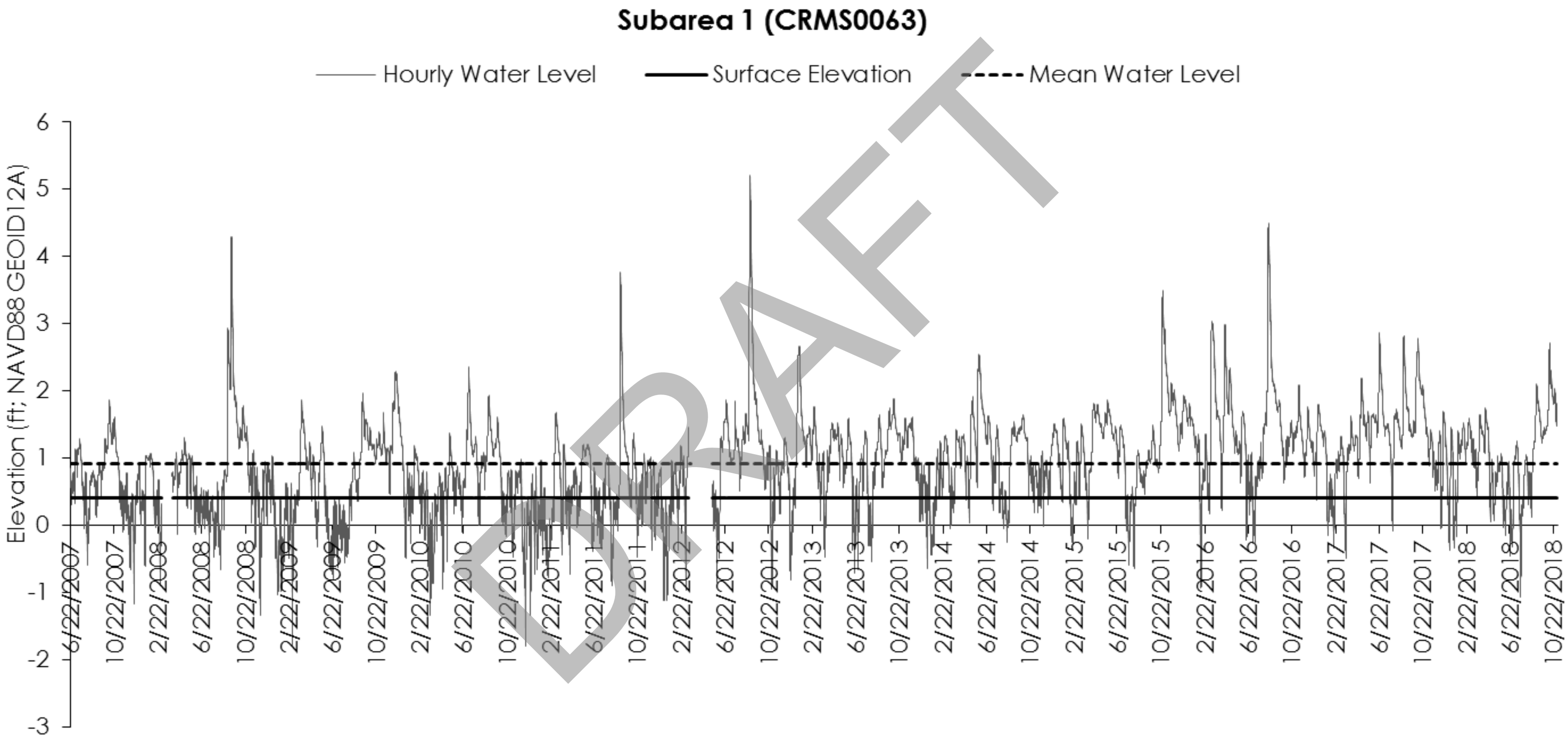
Forested Vegetation Data
Site CRMS5255 - All Plots
Sample Date 7/22/2015
Taxa
Nyssa aquatica L.
15.35
Acer rubrum L.
3.16
Taxodium distichum (L.) Rich.
2.45
Fraxinus profunda (Bush) Bush
0.8
Fraxinus caroliniana Mill.
0.74
Quercus nigra L.
0.05
Cephalanthus occidentalis L.
0.03
0
20
40
Basal Area (m²/ha)
DRAFT


Forested Vegetation Data
Site CRMS5373 - All Plots
Sample Date 7/29/2015
Taxa
Nyssa aquatica L.
Taxodium distichum (L.) Rich.
Fraxinus caroliniana Mill.
Nyssa sylvatica Marshall
Acer rubrum L.
Fraxinus profunda (Bush) Bush
Fraxinus pennsylvanica Marshall
Quercus nigra L.
35.67
30.05
2.01
1.62
0.97
0.97
0.16
0
0
20
40
Basal Area (m²/ha)
DRAFT
CRMS

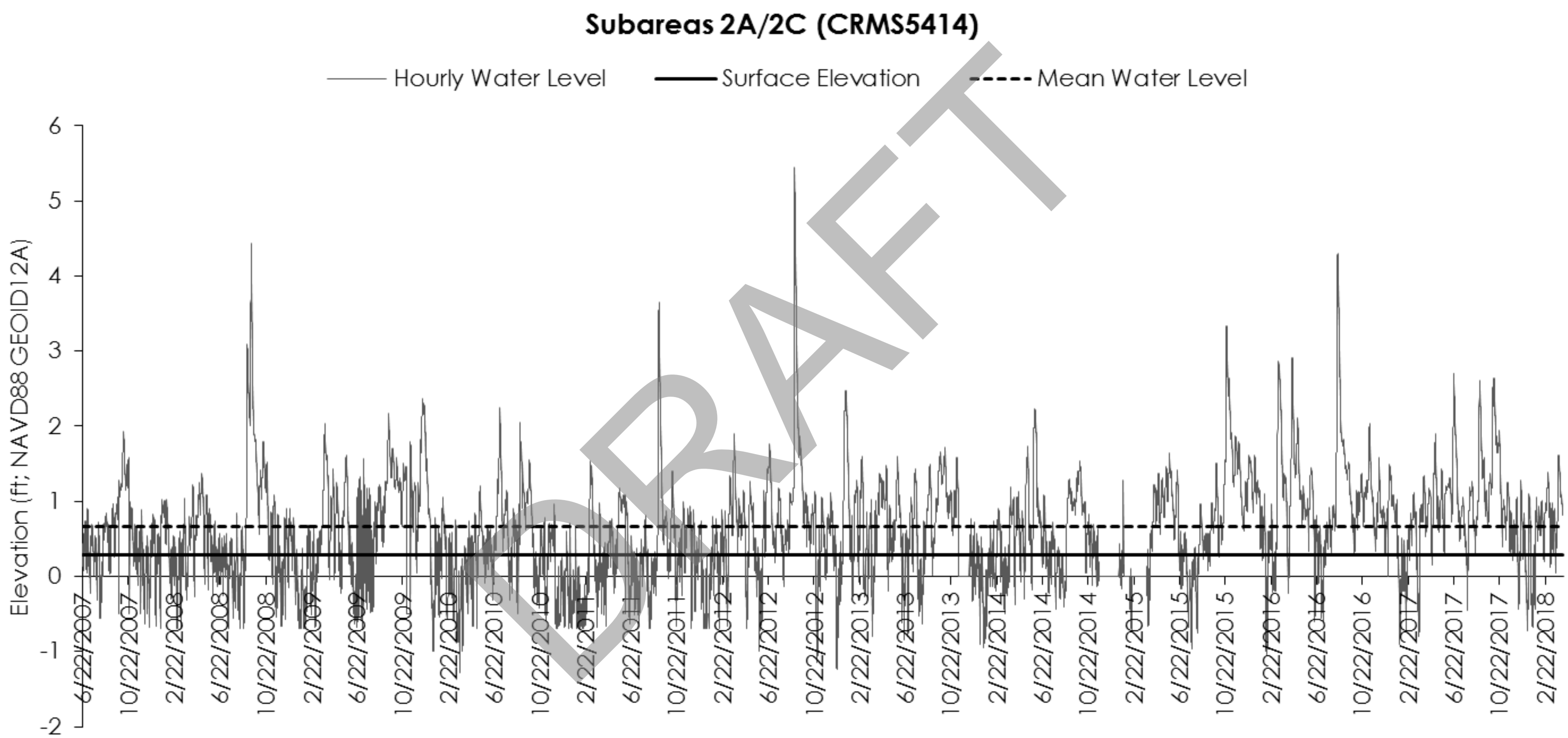


Target Year 0 DBH (in) of baldcypress and water tupelo trees at CRMS sites associated with each subarea.

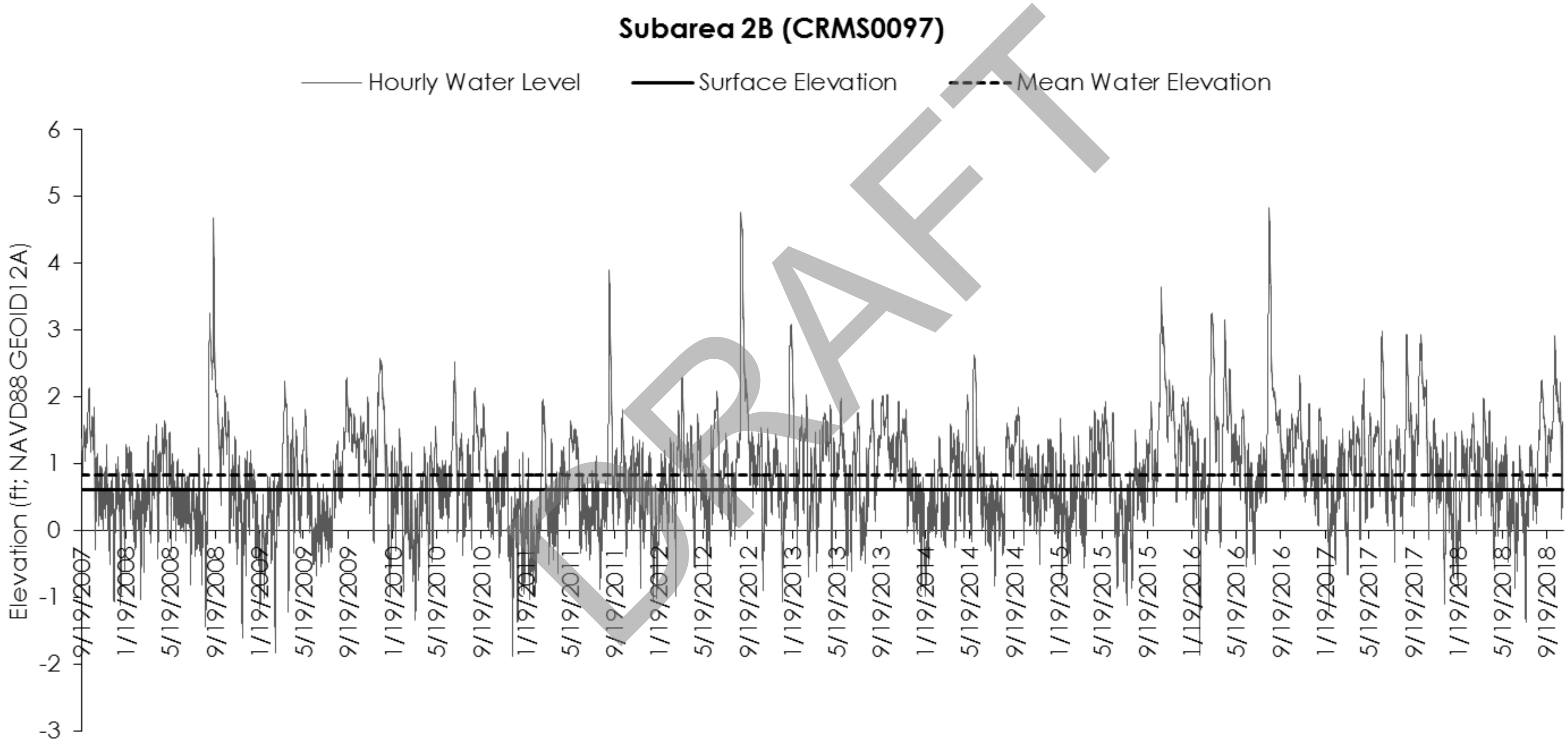
6.4 Appendix D: CRMS Station Hydrographs



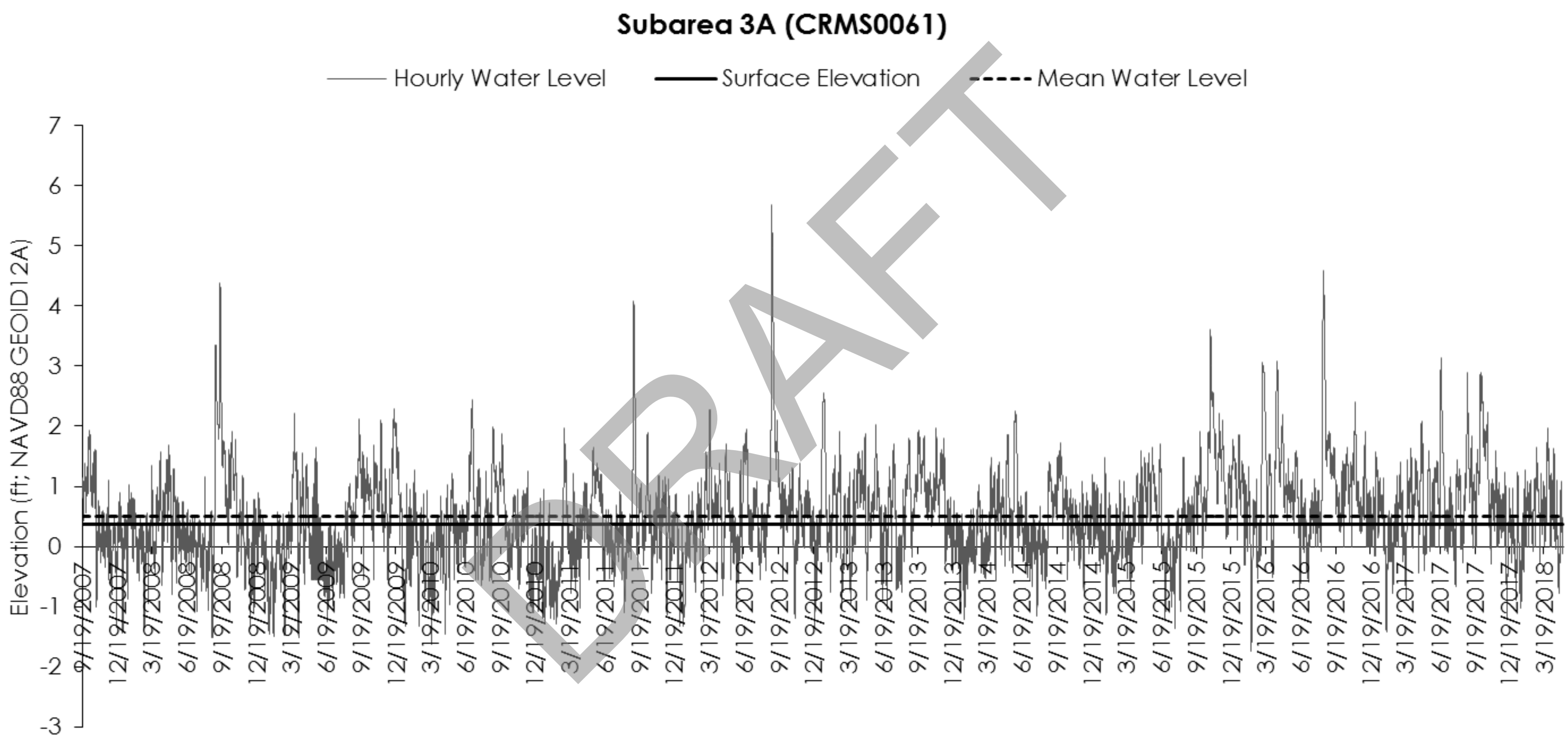
Subarea 1 (CRMS0063)
Hourly Water Level
Surface Elevation
Mean Water Level
Elevation (ft; NAVD88 GEOID12A)
6
5
4
3
2
1
0
-1
-2
-3
6/22/2007
10/22/2007
2/22/2008
6/22/2008
10/22/2008
2/22/2009
6/22/2009
10/22/2009
2/22/2010
6/22/2010
10/22/2010
2/22/2011
6/22/2011
10/22/2011
2/22/2012
6/22/2012
10/22/2012
2/22/2013
6/22/2013
10/22/2013
2/22/2014
6/22/2014
10/22/2014
2/22/2015
6/22/2015
10/22/2015
2/22/2016
6/22/2016
10/22/2016
2/22/2017
6/22/2017
10/22/2017
2/22/2018
6/22/2018
10/22/2018
DRAFT



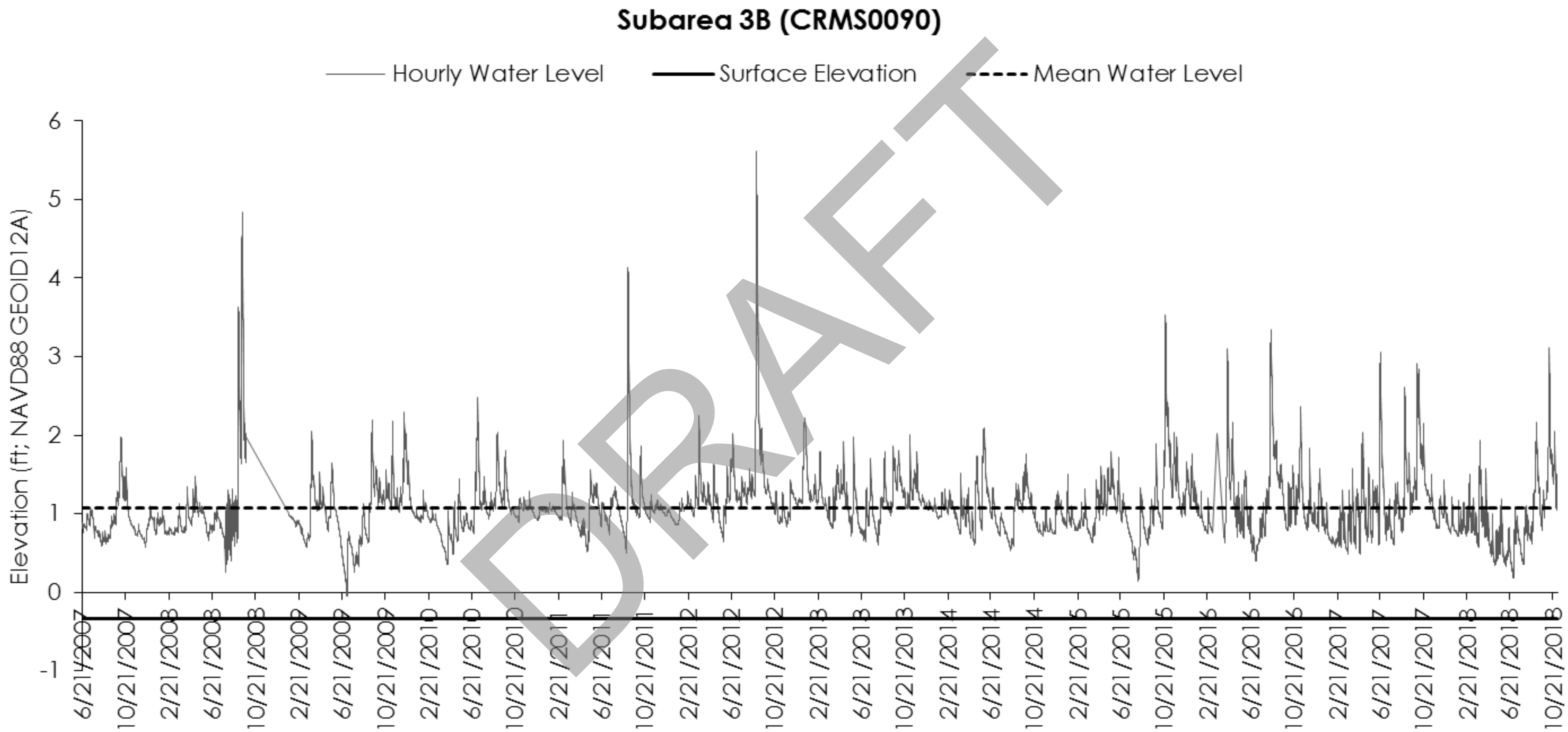
Subareas 2A/2C (CRMS5414)
Hourly Water Level
Surface Elevation
Mean Water Level
Elevation (ft; NAVD88 GEOID12A)
6
5
4
3
2
1
0
-1
-2
6/22/2007
10/22/2007
2/22/2008
6/22/2008
10/22/2008
2/22/2009
6/22/2009
10/22/2009
2/22/2010
6/22/2010
10/22/2010
2/22/2011
6/22/2011
10/22/2011
2/22/2012
6/22/2012
10/22/2012
2/22/2013
6/22/2013
10/22/2013
2/22/2014
6/22/2014
10/22/2014
2/22/2015
6/22/2015
10/22/2015
2/22/2016
6/22/2016
10/22/2016
2/22/2017
6/22/2017
10/22/2017
2/22/2018
DRAFT



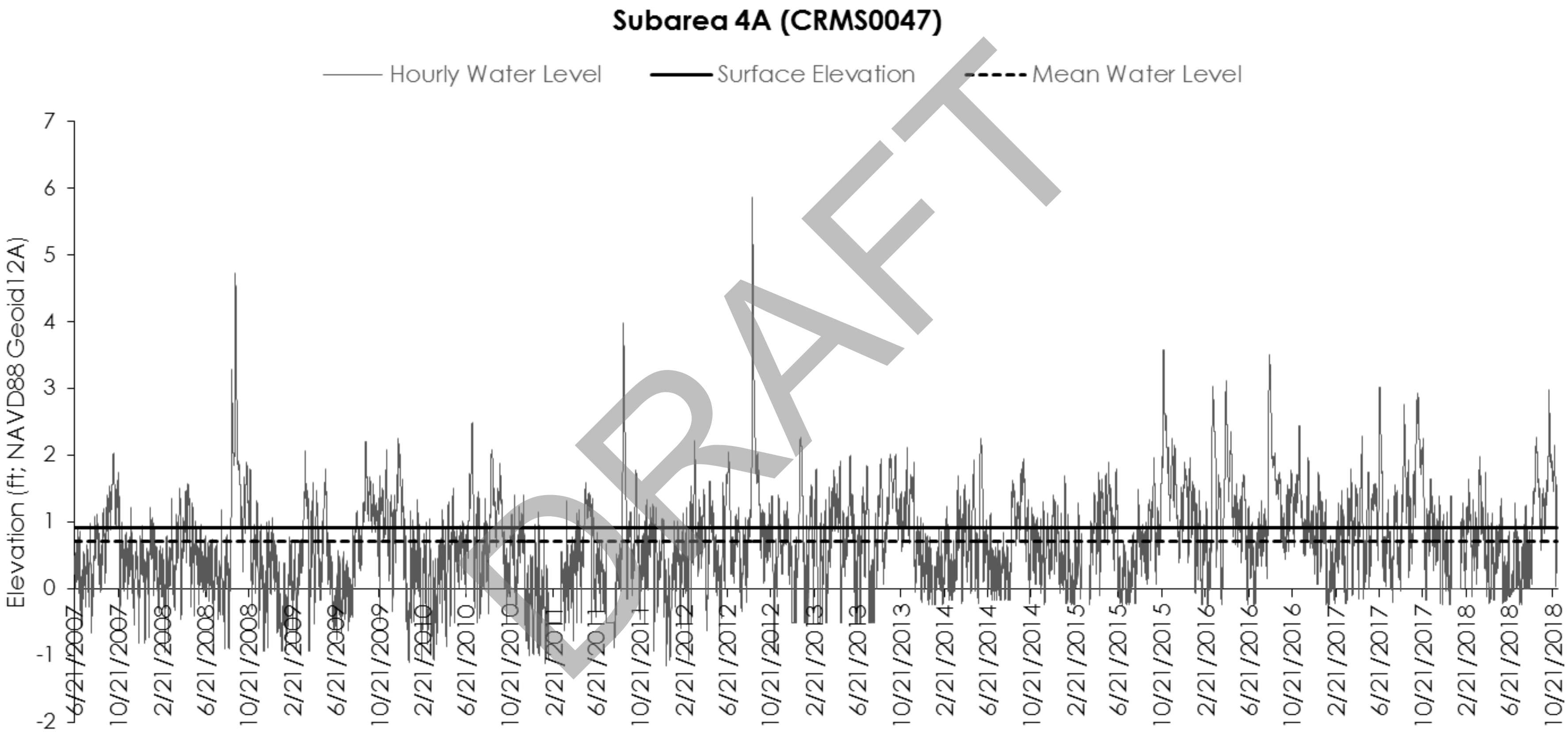
Subarea 2B (CRMS0097)
Hourly Water Level
Surface Elevation
Mean Water Elevation
Elevation (ft; NAVD88 GEOID12A)
6
5
4
3
2
1
0
-1
-2
-3
9/19/2007
1/19/2008
5/19/2008
9/19/2008
1/19/2009
5/19/2009
9/19/2009
1/19/2010
5/19/2010
9/19/2010
1/19/2011
5/19/2011
9/19/2011
1/19/2012
5/19/2012
9/19/2012
1/19/2013
5/19/2013
9/19/2013
1/19/2014
5/19/2014
9/19/2014
1/19/2015
5/19/2015
9/19/2015
1/19/2016
5/19/2016
9/19/2016
1/19/2017
5/19/2017
9/19/2017
1/19/2018
5/19/2018
9/19/2018
DRAFT



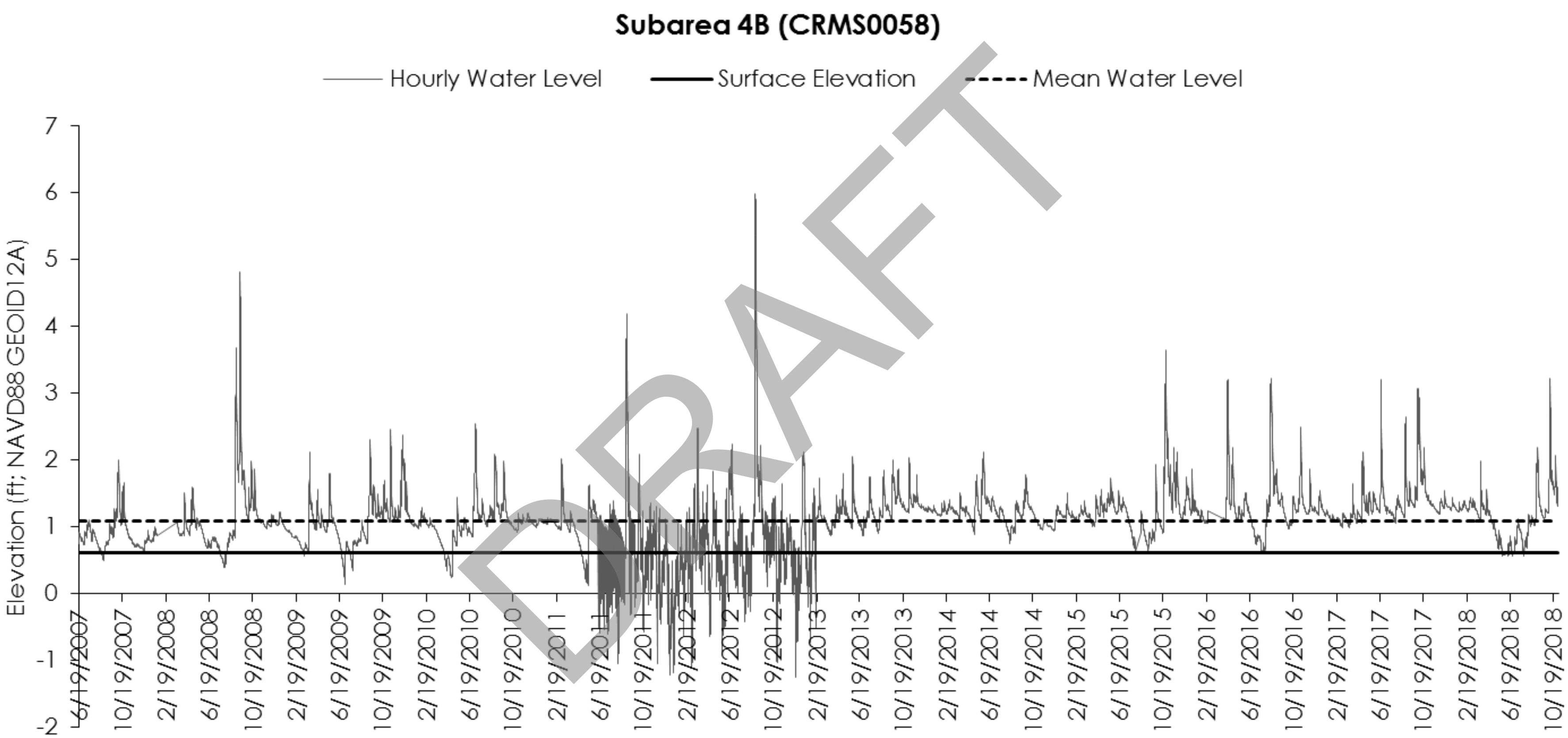
Subarea 3A (CRMS0061)
Hourly Water Level
Surface Elevation
Mean Water Level
Elevation (ft; NAVD88 GEOID12A)
7
6
5
4
3
2
1
0
-1
-2
-3
9/19/2007
12/19/2007
3/19/2008
6/19/2008
9/19/2008
12/19/2008
3/19/2009
6/19/2009
9/19/2009
12/19/2009
3/19/2010
6/19/2010
9/19/2010
12/19/2010
3/19/2011
6/19/2011
9/19/2011
12/19/2011
3/19/2012
6/19/2012
9/19/2012
12/19/2012
3/19/2013
6/19/2013
9/19/2013
12/19/2013
3/19/2014
6/19/2014
9/19/2014
12/19/2014
3/19/2015
6/19/2015
9/19/2015
12/19/2015
3/19/2016
6/19/2016
9/19/2016
12/19/2016
3/19/2017
6/19/2017
9/19/2017
12/19/2017
3/19/2018
DRAFT

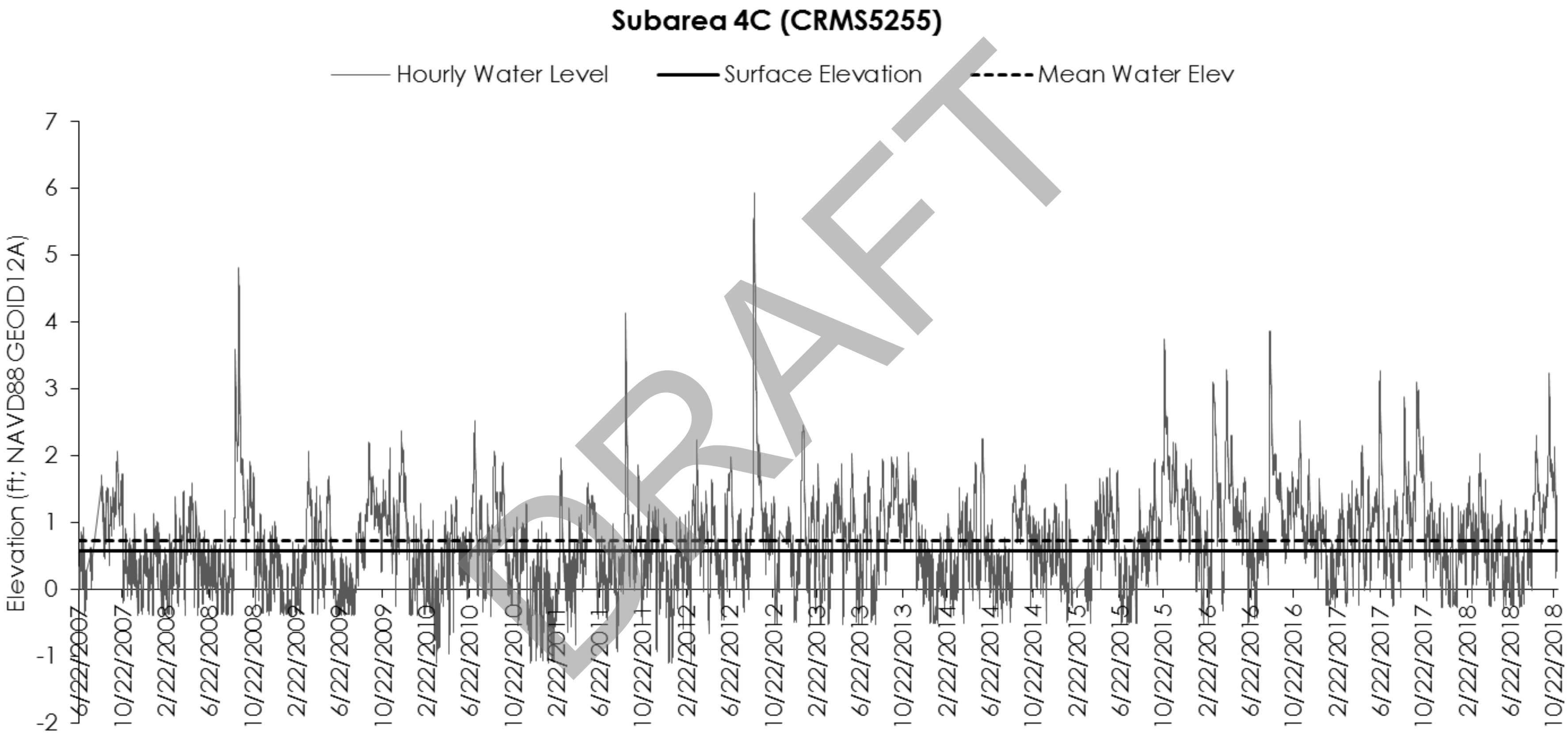


Subarea 3B (CRMS0090)
Hourly Water Level
Surface Elevation
Mean Water Level
Elevation (ft; NAVD88 GEOID12A)
6
5
4
3
2
1
0
-1
6/21/2007
10/21/2007
2/21/2008
6/21/2008
10/21/2008
2/21/2009
6/21/2009
10/21/2009
2/21/2010
6/21/2010
10/21/2010
2/21/2011
6/21/2011
10/21/2011
2/21/2012
6/21/2012
10/21/2012
2/21/2013
6/21/2013
10/21/2013
2/21/2014
6/21/2014
10/21/2014
2/21/2015
6/21/2015
10/21/2015
2/21/2016
6/21/2016
10/21/2016
2/21/2017
6/21/2017
10/21/2017
2/21/2018
6/21/2018
10/21/2018
DRAFT

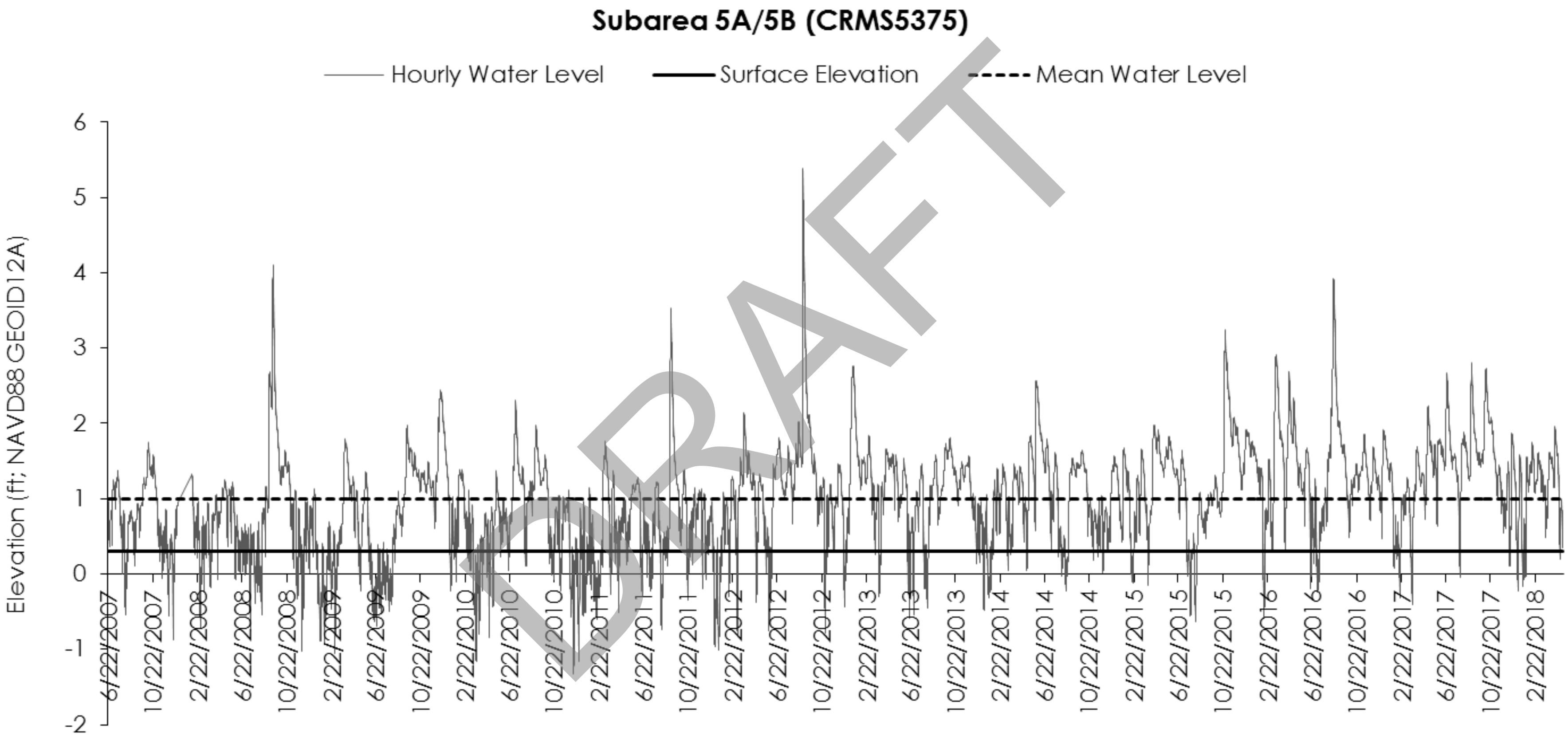


Subarea 4A (CRMS0047)
Hourly Water Level
Surface Elevation
Mean Water Level
Elevation (ft; NAVD88 Geoid12A)
7
6
5
4
3
2
1
0
-1
-2
6/21/2007
10/21/2007
2/21/2008
6/21/2008
10/21/2008
2/21/2009
6/21/2009
10/21/2009
2/21/2010
6/21/2010
10/21/2010
2/21/2011
6/21/2011
10/21/2011
2/21/2012
6/21/2012
10/21/2012
2/21/2013
6/21/2013
10/21/2013
2/21/2014
6/21/2014
10/21/2014
2/21/2015
6/21/2015
10/21/2015
2/21/2016
6/21/2016
10/21/2016
2/21/2017
6/21/2017
10/21/2017
2/21/2018
6/21/2018
10/21/2018

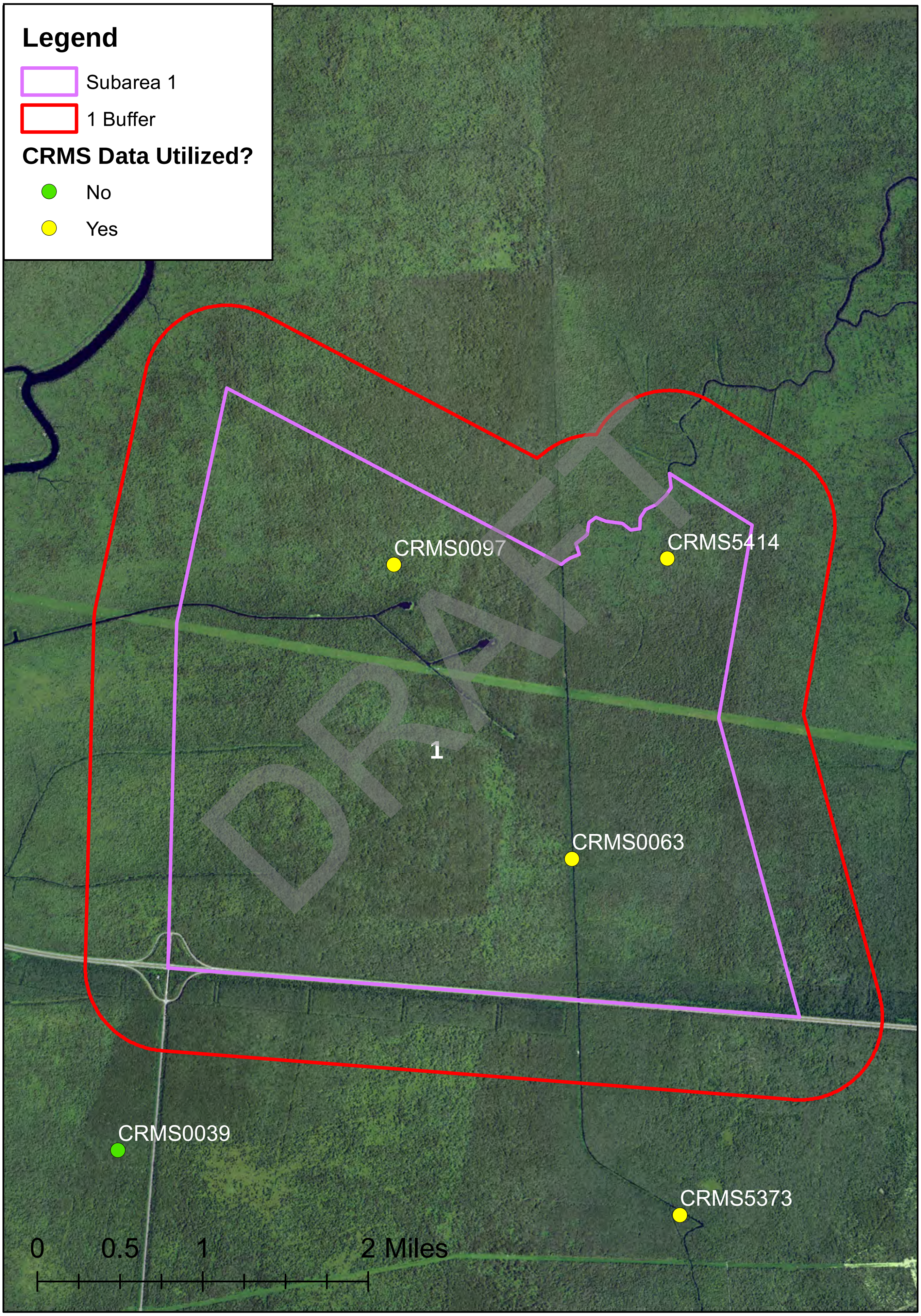

Subarea 4B (CRMS0058)
Hourly Water Level
Surface Elevation
Mean Water Level
Elevation (ft; NAVD88 GEOID12A)
7
6
5
4
3
2
1
0
-1
-2
6/19/2007
10/19/2007
2/19/2008
6/19/2008
10/19/2008
2/19/2009
6/19/2009
10/19/2009
2/19/2010
6/19/2010
10/19/2010
2/19/2011
6/19/2011
10/19/2011
2/19/2012
6/19/2012
10/19/2012
2/19/2013
6/19/2013
10/19/2013
2/19/2014
6/19/2014
10/19/2014
2/19/2015
6/19/2015
10/19/2015
2/19/2016
6/19/2016
10/19/2016
2/19/2017
6/19/2017
10/19/2017
2/19/2018
6/19/2018
10/19/2018

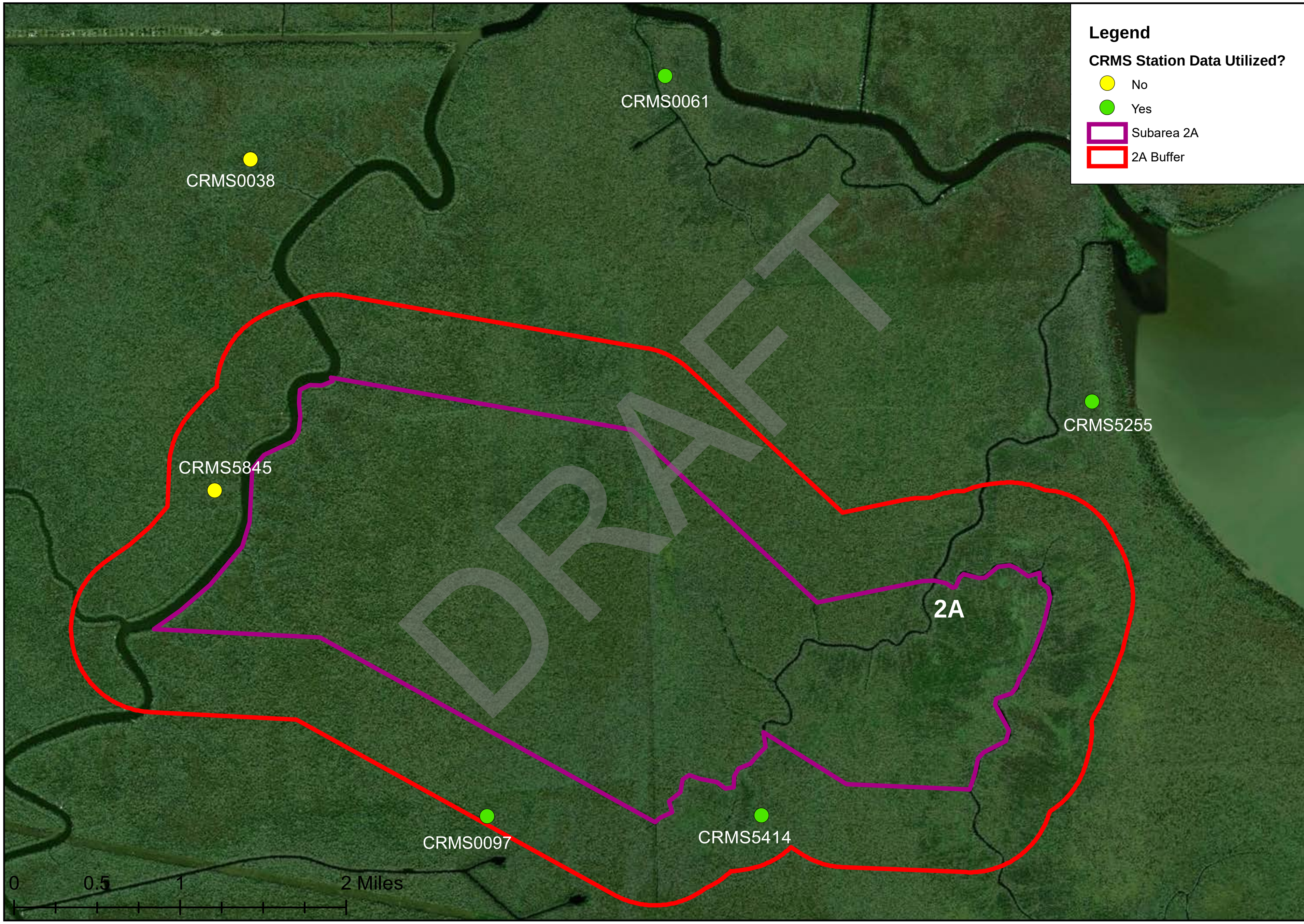


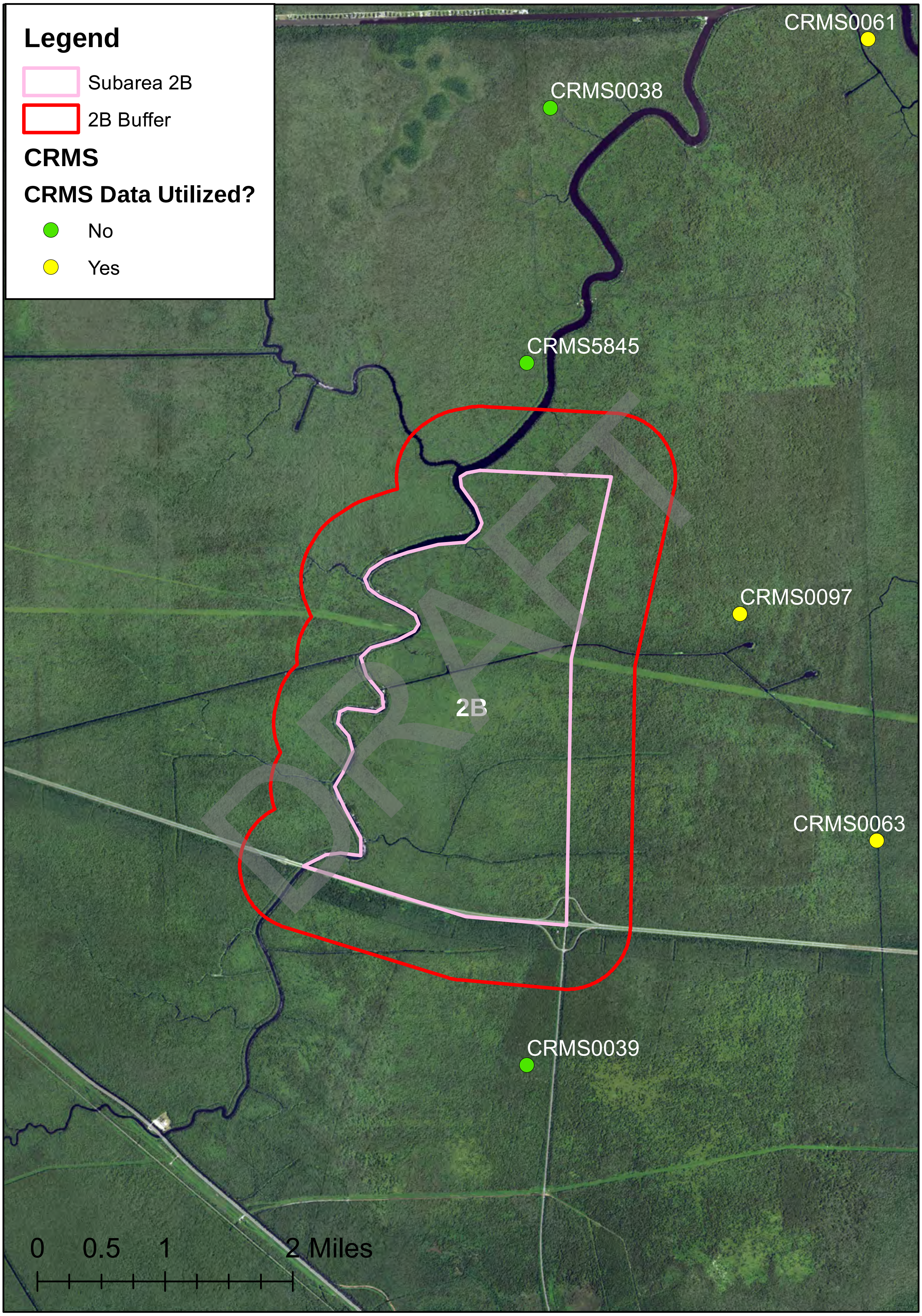
Subarea 4C (CRMS5255)
Hourly Water Level
Surface Elevation
Mean Water Elev
Elevation (ft; NAVD88 GEOID12A)
7
6
5
4
3
2
1
0
-1
-2
6/22/2007
10/22/2007
2/22/2008
6/22/2008
10/22/2008
2/22/2009
6/22/2009
10/22/2009
2/22/2010
6/22/2010
10/22/2010
2/22/2011
6/22/2011
10/22/2011
2/22/2012
6/22/2012
10/22/2012
2/22/2013
6/22/2013
10/22/2013
2/22/2014
6/22/2014
10/22/2014
2/22/2015
6/22/2015
10/22/2015
2/22/2016
6/22/2016
10/22/2016
2/22/2017
6/22/2017
10/22/2017
2/22/2018
6/22/2018
10/22/2018


Subarea 5A/5B (CRMS5375)
Hourly Water Level
Surface Elevation
Mean Water Level
Elevation (ft; NAVD88 GEOID12A)
6
5
4
3
2
1
0
-1
-2
6/22/2007
10/22/2007
2/22/2008
6/22/2008
10/22/2008
2/22/2009
6/22/2009
10/22/2009
2/22/2010
6/22/2010
10/22/2010
2/22/2011
6/22/2011
10/22/2011
2/22/2012
6/22/2012
10/22/2012
2/22/2013
6/22/2013
10/22/2013
2/22/2014
6/22/2014
10/22/2014
2/22/2015
6/22/2015
10/22/2015
2/22/2016
6/22/2016
10/22/2016
2/22/2017
6/22/2017
10/22/2017
2/22/2018
DRAFT

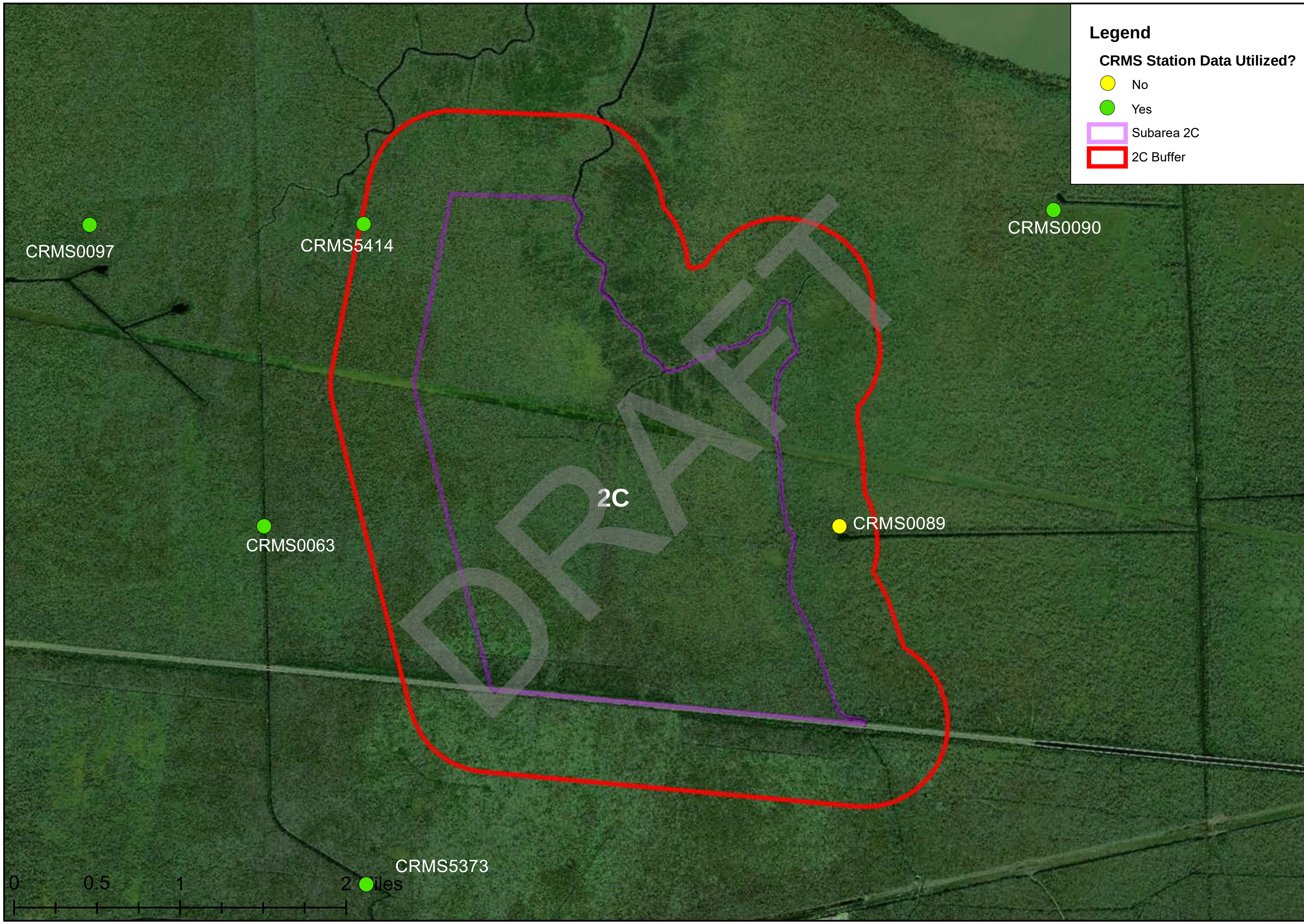
6.5 Appendix E: Suitability and Traversability of Surrounding Land Use Maps

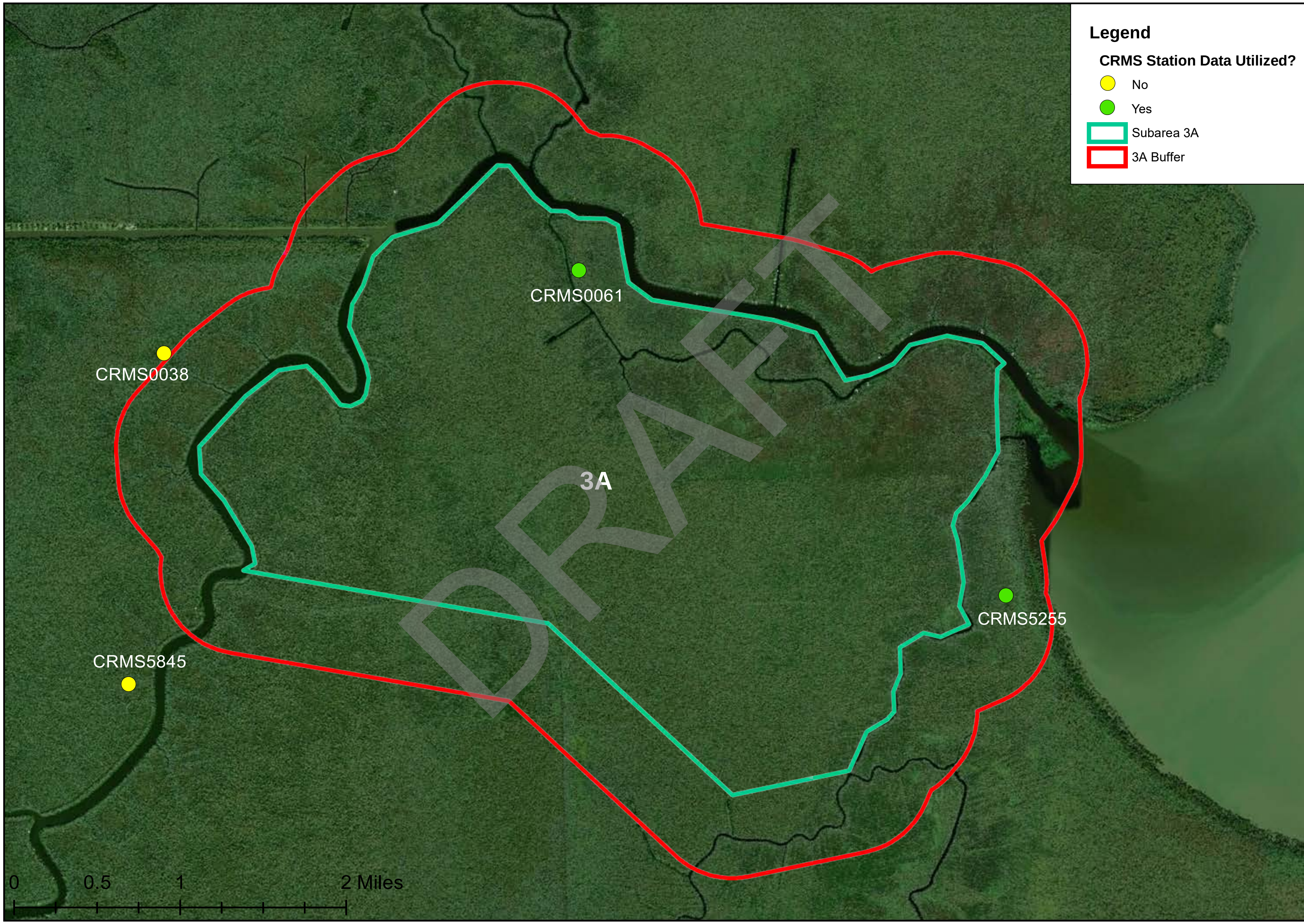

Legend
Subarea 1
1 Buffer
CRMS Data Utilized?
No
Yes
CRMS0097
CRMS5414
1
CRMS0063
CRMS0039
CRMS5373
0
0.5
1
2 Miles
DRAFT


Legend
CRMS Station Data Utilized?
No
Yes
Subarea 2A
2A Buffer
CRMS0061
CRMS0038
CRMS5255
CRMS5845
2A
CRMS0097
CRMS5414
0
0.5
1
2 Miles
DRAFT

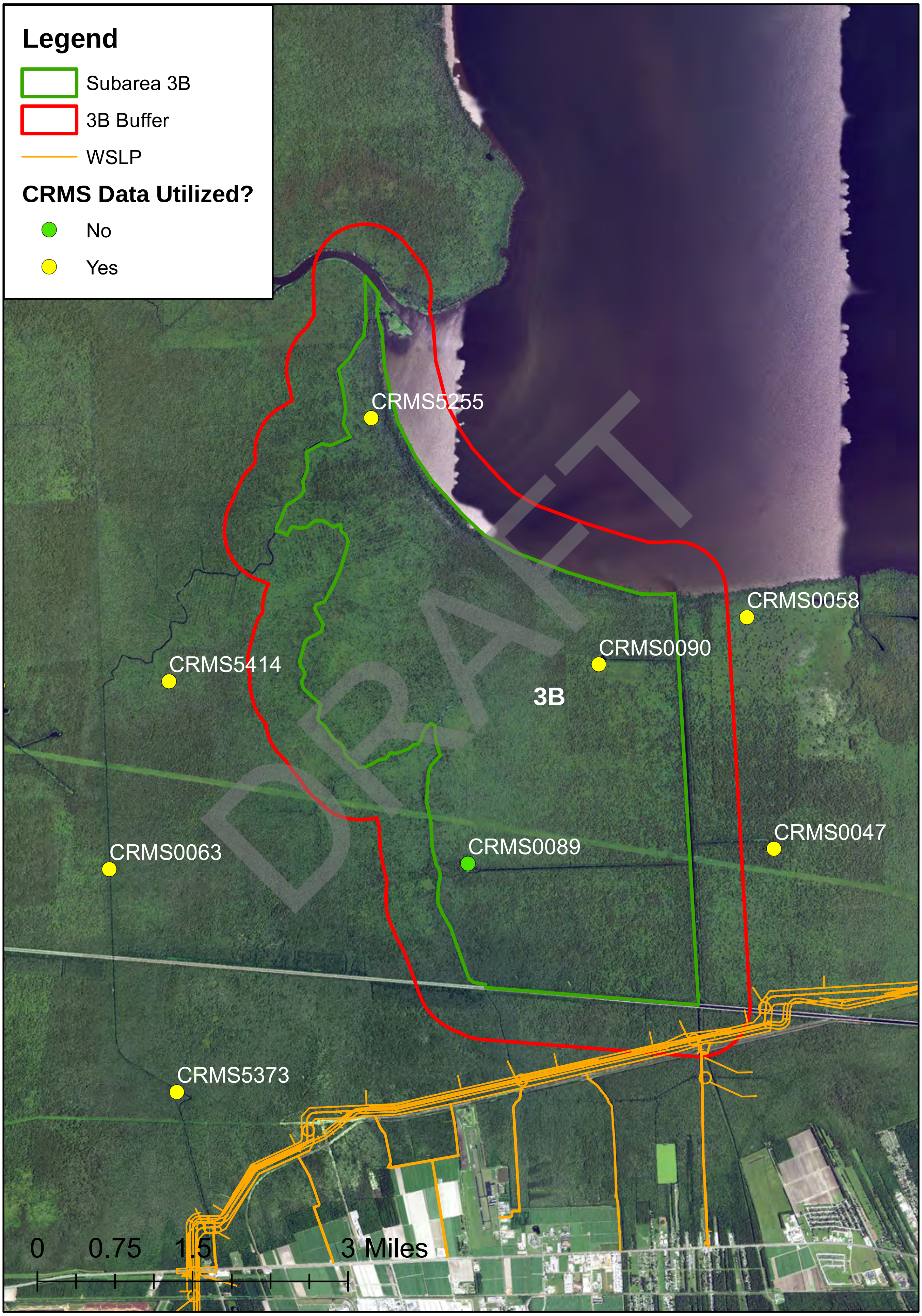


Legend
Subarea 2B
2B Buffer
CRMS
CRMS Data Utilized?
No
Yes
CRMS0061
CRMS0038
CRMS5845
CRMS0097
2B
CRMS0063
CRMS0039
DRAFT
0 0.5 1 2 Miles

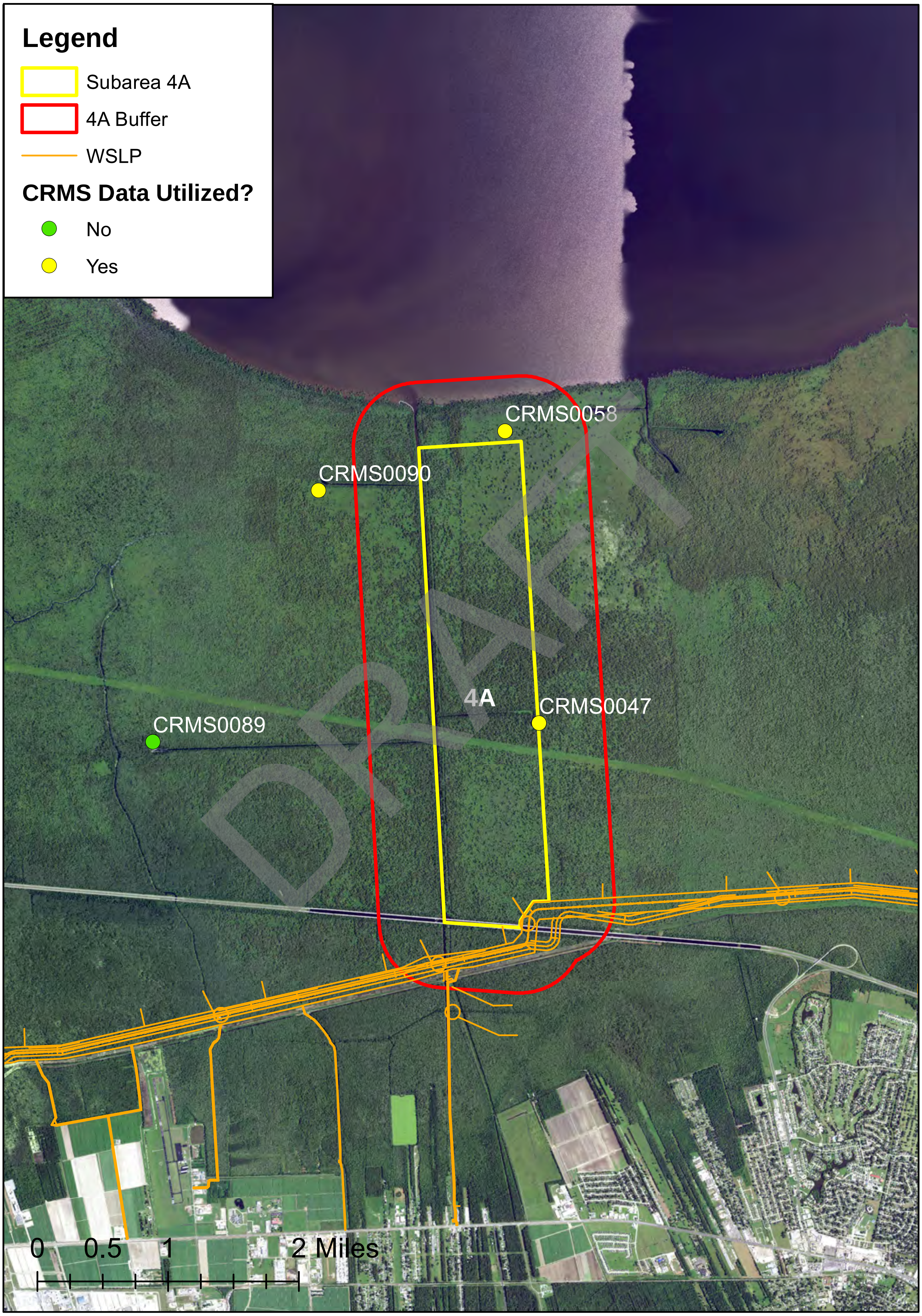

Legend
CRMS Station Data Utilized?
No
Yes
Subarea 2C
2C Buffer
CRMS0097
CRMS5414
CRMS0090
CRMS0089
CRMS0063
CRMS5373
2C
DRAFT
0
0.5
1
2 Miles



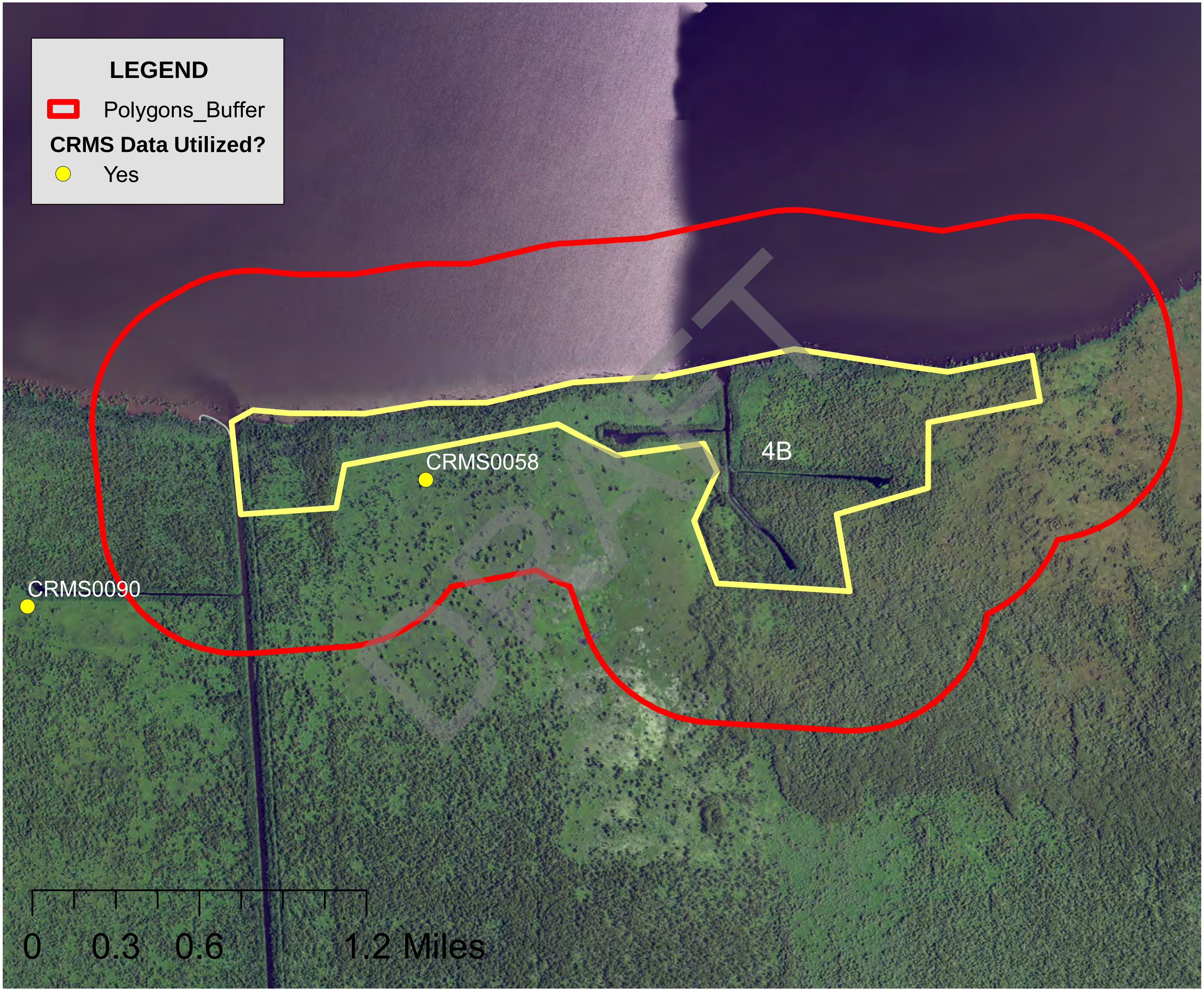
Legend
CRMS Station Data Utilized?
No
Yes
Subarea 3A
3A Buffer
CRMS0061
CRMS0038
CRMS5845
CRMS5255
3A
DRAFT
0
0.5
1
2 Miles



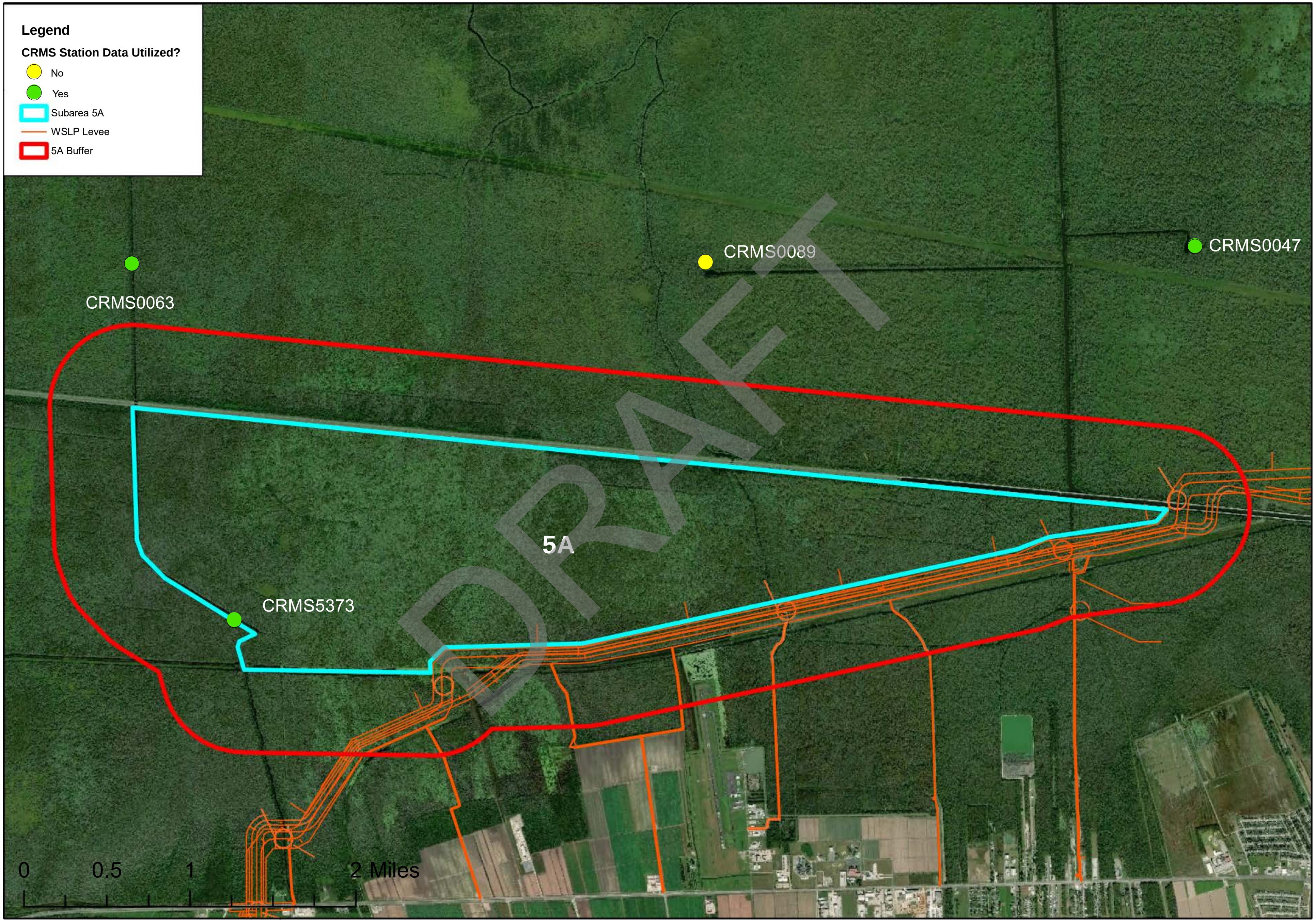
Legend
Subarea 3B
3B Buffer
WSLP
CRMS Data Utilized?
No
Yes
CRMS5255
CRMS0058
CRMS0090
CRMS5414
3B
CRMS0047
CRMS0063
CRMS0089
CRMS5373
0
0.75
1.5
3 Miles
DRAFT



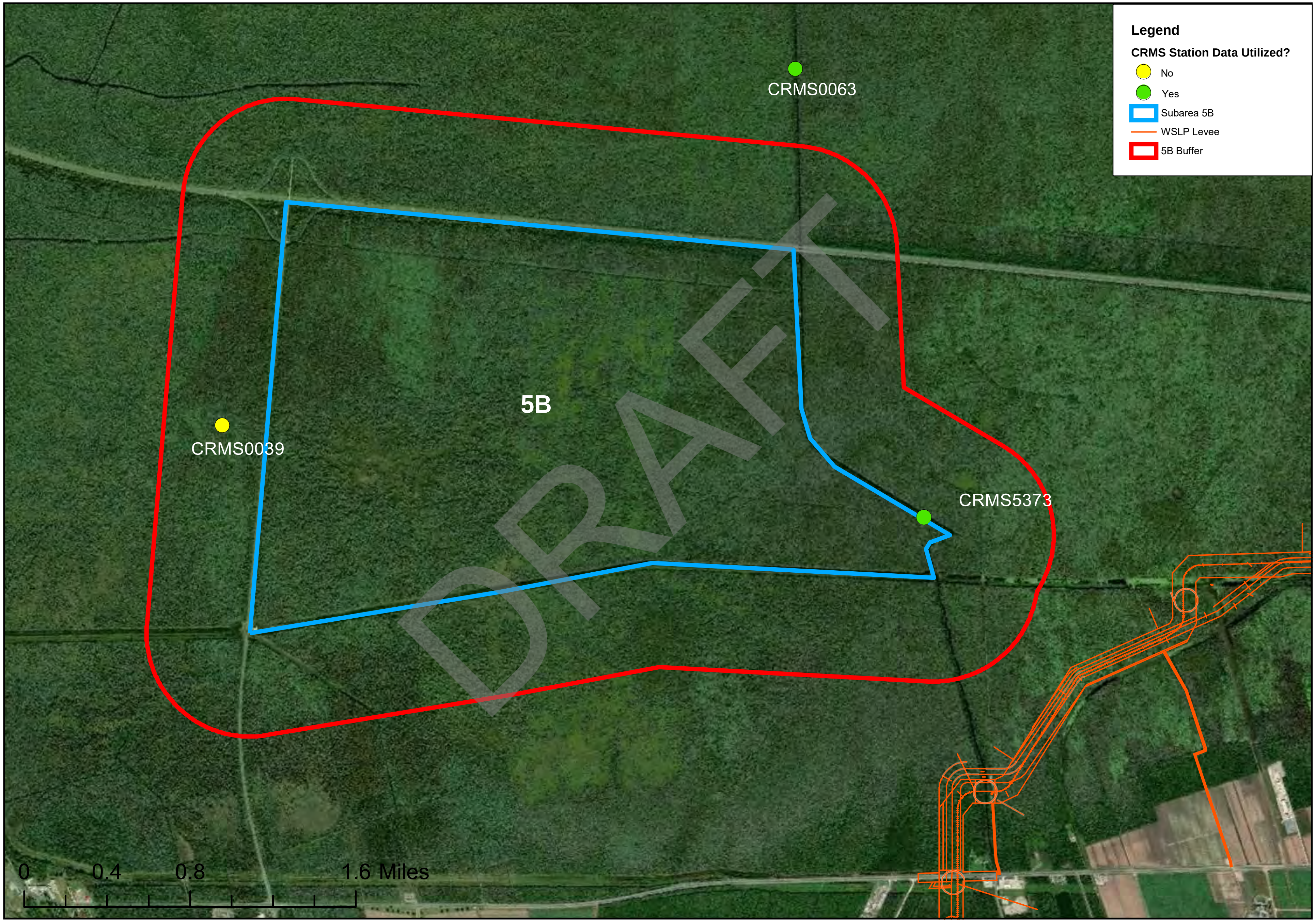
Legend
Subarea 4A
4A Buffer
WSLP
CRMS Data Utilized?
No
Yes
CRMS0058
CRMS0090
4A
CRMS0047
CRMS0089
DRAFT
0
0.5
1
2 Miles


LEGEND
Polygons_Buffer
CRMS Data Utilized?
Yes
CRMS0058
CRMS0090
4B
DRAFT
0
0.3
0.6
1.2 Miles

Legend
Subarea 4C
4C Buffer
WSLP
CRMS Data Utilized?
No
Yes
CRMS5267
4C
CRMS0061
CRMS5255
0 0.5 1 2 Miles
DRAFT



Legend
CRMS Station Data Utilized?
No
Yes
Subarea 5A
WSLP Levee
5A Buffer
CRMS0089
CRMS0047
CRMS0063
CRMS5373
5A
DRAFT
0
0.5
1
2 Miles



Legend
CRMS Station Data Utilized?
No
Yes
Subarea 5B
WSLP Levee
5B Buffer
CRMS0063
CRMS0039
CRMS5373
5B
DRAFT
0
0.4
0.8
1.6 Miles

6.6 Appendix F: Subarea WVA Spreadsheets

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 1** Project Area: 6,730 **AAHUs = 1992.54**

Condition: Future Without Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		83		83		42		33			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		20		20		16		11			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		43		43		57		63			
		Class		Class		Class		Class		Class	
		6	1.00	6	1.00	3	0.40	3	0.40		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		17		17.1		20.1		20.3			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		82.3		82.3		68.4		62.3			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		11		11.1		13.4		13.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		117	0.94	117	0.95	97	1.00	86	0.80		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.6	0.97	0.6	0.97	1.6	0.69	2.0	0.51		
V5	Forest Size	Class		Class		Class		Class		Class	
		5	1.00	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	100	1.00	100	1.00	98	0.98	95	0.96		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	0		0		2		5			
	Development	0		0		0		0			
V7	Disturbance										
	Type	Class		Class		Class		Class		Class	
		4	1.00	4	1.00	4	1.00	4	1.00		
	Distance	Class		Class		Class		Class		Class	
		3		3		3		3			
		HSI =	0.82	HSI =	0.82	HSI =	0.59	HSI =	0.54	HSI =	

Intermediate Calculations

Class				
0	0	0	0	
0	0	3	3	
0	0	0	0	
6	6	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
0.9	0.91	1	1	0
Tupelo/Cypress Basal Area				
0.94129	0.947165	1	1	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	0.955	0.775	0
0.955	0.955	0.505	0.325	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 1** Project Area: 6,730

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		83		83		83		95			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		20		20		20		15			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		43		43		43		34			
		Class		Class		Class		Class		Class	
		6	1	6	1.00	6	1.00	6	1.00		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		17		17.2		22.9		26			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		82.3		82.3		85.5		84.5			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		11		11.2		15.4		17.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		117	0.941294531	117	0.95	119	1.00	117	1.00		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		low		High		High		High			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.75	Semi-Permanent	0.75	Semi-Permanent	0.75		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.6	0.973582539	0.2	1.00	0.2	1.00	0.2	1.00		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	100	1	100	1.00	100	1.00	100	1.00		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	0		0		0		0			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.82	HSI =	0.93	HSI =	0.94	HSI =	0.94	HSI =	

Intermediate Calculations

Class				
0	0	0	0	
0	0	0	0	
0	0	0	0	
6	6	6	6	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
0.9	0.92	1	1	0
Tupelo/Cypress Basal Area				
0.94129	0.953036	1	1	
Water Regime				
0	0.75	0.75	0.75	
0.45	0	0	0	
0	0	0	0	
Salinity				
1	1	1	1	0
0.955	1	1	1	0

AAHU CALCULATION

Project: Maurepas Swamp Subarea 1

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	6730	0.82	5515.60	
1	6730	0.82	5522.20	5518.90
25	6730	0.59	3948.80	113651.94
50	6730	0.54	3648.98	94972.24
Max TY=	50		Total	
			CHUs =	214143.07
			AAHUs =	4282.86

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	6730	0.82	5515.60	
1	6730	0.93	6239.73	5877.66
25	6730	0.94	6297.72	150449.31
50	6730	0.94	6297.72	157442.89
Max TY=	50		Total	
			CHUs =	313769.86
			AAHUs =	6275.40

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	6275.40
B. Future Without Project AAHUs =	4282.86
Net Change (FWP - FWOP) =	1992.54

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 2a** Project Area: 4,807 **AAHUs =** **1260.92**

Condition: Future Without Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		33		33		16		12			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		34		34		27		18			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		65		65		86		95			
		Class		Class		Class		Class		Class	
		5	0.80	5	0.80	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		6		6.1		9.1		9.3			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		12.3		12.3		16.4		19.4			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		12		12.1		14.4		14.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		88	0.53	88	0.53	82	0.53	81	0.52		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.6	0.98	0.6	0.98	1.6	0.60	2.0	0.41		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	100	1.00	100	1.00	95	0.96	85	0.88		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	0		0		5		15			
	Development	0		0		0		0			
V7	Disturbance										
	Type	Class		Class		Class		Class		Class	
		4	1.00	4	1.00	4	1.00	4	1.00		
	Distance	Class		Class		Class		Class		Class	
		3		3		3		3			
		HSI =	0.70	HSI =	0.70	HSI =	0.37	HSI =	0.35	HSI =	

Intermediate Calculations

Class				
0	0	1	1	
0	0	0	0	
0	0	0	0	
5	5	0	0	
Tupelo/Cypress dbh				
0.083	0.0847	0	0	0
0.083	0.0847	0.315	0.345	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.88755	0.887755	0.885833	0.873436	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	0.9775	0.775	0
0.9775	0.9775	0.5275	0.325	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 2a** Project Area: 4,807

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		33		33		33		26			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		34		34		34		27			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		65		65		65		75			
		Class		Class		Class		Class		Class	
		5	0.8	5	0.80	5	0.80	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		6		6.2		11.9		15			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		12.3		12.3		23.4		29			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		12		12.2		16.4		18.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		88	0.532527817	88	0.53	104	0.75	112	0.79		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.65	Semi-Permanent	0.65	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.55	0.980259222	0.2	1.00	0.2	1.00	0.2	1.00		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	100	1	100	1.00	100	1.00	100	1.00		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	0		0		0		0			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.70	HSI =	0.76	HSI =	0.81	HSI =	0.47	HSI =	

Intermediate Calculations

Class				
0	0	0	1	
0	0	0	0	
0	0	0	0	
5	5	5	0	
Tupelo/Cypress dbh				
0.083	0.0864	0	0	0
0.083	0.0864	0.69	0.933	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.88755	0.887963	0.943061	0.98622	
Water Regime				
0	0	0	0	
0.45	0.65	0.65	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
0.9775	1	1	1	0

AAHU CALCULATION

Project: **Maurepas Swamp Subarea 2a**

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	4807	0.70	3356.27	
1	4807	0.70	3356.42	3356.34
25	4807	0.37	1781.97	61660.64
50	4807	0.35	1689.52	43393.62
Max TY=	50		Total CHUs =	108410.61
			AAHUs =	2168.21

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	4807	0.70	3356.27	
1	4807	0.76	3662.26	3509.26
25	4807	0.81	3915.65	90934.90
50	4807	0.47	2245.34	77012.32
Max TY=	50		Total CHUs =	171456.49
			AAHUs =	3429.13

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	3429.13
B. Future Without Project AAHUs =	2168.21
Net Change (FWP - FWOP) =	1260.92

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 2b** Project Area: 3,394 **AAHUs =** **811.71**

Condition: Future Without Project

		TY	0	TY	1	TY	25	TY	50	TY	
Variable		**Class/Value**	**SI**	**Class/Value**	**SI**	**Class/Value**	**SI**	**Class/Value**	**SI**	**Class/Value**	**SI**
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		46		46		23		17			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		25		25		20		13			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		62		62		71		78			
		Class		Class		Class		Class		Class	
		3	0.40	3	0.40	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		13		13.1		16.1		16.3			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		78.9		78.9		57.5		41.4			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14		14.1		16.4		16.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		87	0.90	87	0.91	71	0.80	53	0.60		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.2	1.00	0.2	1.00	1.2	0.83	2.0	0.52		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	5	1.00	4	0.80		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	100	1.00	100	1.00	98	0.98	95	0.96		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	0		0		2		5			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1.00	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.66	HSI =	0.66	HSI =	0.42	HSI =	0.37	HSI =	

Intermediate Calculations

Class				
0	0	1	1	
3	3	0	0	
0	0	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.8	0.8057	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.90488	0.907593	1	1	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	0.775	0
1	1	0.685	0.325	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 2b** Project Area: 3,394

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		46		46		46		37			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		25		25		25		20			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		62		62		62		71			
		Class		Class		Class		Class		Class	
		3	0.4	3	0.40	3	0.40	3	0.40		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		13		13.2		18.9		22			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		78.9		78.9		71		62.7			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14		14.2		18.4		20.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		87	0.904882459	87	0.91	90	1.00	87	0.80		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.65	Semi-Permanent	0.65	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.2	1	0.2	1.00	0.2	1.00	0.2	1.00		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	100	1	100	1.00	100	1.00	100	1.00		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	0		0		0		0			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.66	HSI =	0.72	HSI =	0.73	HSI =	0.64	HSI =	

Intermediate Calculations

Class				
0	0	0	0	
3	3	3	3	
0	0	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.8	0.8124	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.90488	0.91078	1	1	
Water Regime				
0	0	0	0	
0.45	0.65	0.65	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	1	0

AAHU CALCULATION

Project: **Maurepas Swamp Subarea 2b**

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	3394	0.66	2241.32	
1	3394	0.66	2242.61	2241.97
25	3394	0.42	1414.23	43882.12
50	3394	0.37	1245.24	33243.44
Max TY=	50		Total	
			CHUs =	79367.52
			AAHUs =	1587.35

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	3394	0.66	2241.32	
1	3394	0.72	2442.87	2342.10
25	3394	0.73	2487.17	59160.51
50	3394	0.64	2188.85	58450.21
Max TY=	50		Total	
			CHUs =	119952.81
			AAHUs =	2399.06

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	2399.06
B. Future Without Project AAHUs =	1587.35
Net Change (FWP - FWOP) =	811.71

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 2c** Project Area: 3,438 **AAHUs =** 700.63

Condition: Future Without Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		60		60		28		9			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		25		25		12		4			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		45		45		50		75			
		Class		Class		Class		Class		Class	
		4	0.60	4	0.60	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		6		6.1		9.1		9.3			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		12.3		12.3		16.4		19.4			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		12		12.1		14.4		14.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		88	0.53	88	0.53	82	0.53	81	0.52		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.6	0.96	0.6	0.96	1.6	0.58	2.0	0.41		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	5	1.00	4	0.80		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	98	0.98	98	0.98	94	0.95	89	0.91		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	1		1		5		10			
	Development	1		1		1		1			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1.00	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.65	HSI =	0.65	HSI =	0.37	HSI =	0.35	HSI =	

Intermediate Calculations				
Class				
0	0	1	1	
0	0	0	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0.083	0.0847	0	0	0
0.083	0.0847	0.315	0.345	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.88755	0.887755	0.885833	0.873436	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	0.955	0.775	0
0.955	0.955	0.505	0.325	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 2c** Project Area: 3,438

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		60		60		45		32			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		25		25		19		13			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		45		45		50		60			
		Class		Class		Class		Class		Class	
		4	0.6	4	0.60	3	0.40	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		6		6.2		11.9		15			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		12.3		12.3		23.4		29			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		12		12.2		16.4		18.8			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		88	0.532527817	88	0.53	104	0.75	112	0.79		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.65	Semi-Permanent	0.65	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.6	0.960518445	0.2	1.00	0.2	1.00	0.2	1.00		
V5	Forest Size	Class		Class		Class		Class		Class	
		5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	98	0.9821	98	0.98	97	0.97	95	0.96		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	1		1		2		4			
	Development	1		1		1		1			
V7	Disturbance	Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.65	HSI =	0.71	HSI =	0.69	HSI =	0.47	HSI =	

Intermediate Calculations				
Class				
0	0	0	1	
0	0	3	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0.083	0.0864	0	0	0
0.083	0.0864	0.69	0.933	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.88755	0.887963	0.943061	0.98622	
Water Regime				
0	0	0	0	
0.45	0.65	0.65	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
0.955	1	1	1	0

AAHU CALCULATION

Project: Maurepas Swamp Subarea 2c

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	3438	0.65	2237.86	
1	3438	0.65	2237.96	2237.91
25	3438	0.37	1267.88	42070.12
50	3438	0.35	1190.87	30734.38
Max TY=	50		Total CHUs =	75042.42
			AAHUs =	1500.85

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	3438	0.65	2237.86	
1	3438	0.71	2447.63	2342.75
25	3438	0.69	2381.72	57952.16
50	3438	0.47	1600.60	49779.00
Max TY=	50		Total CHUs =	110073.91
			AAHUs =	2201.48

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	2201.48
B. Future Without Project AAHUs =	1500.85
Net Change (FWP - FWOP) =	700.63

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 3a** Project Area: 6,400 **AAHUs = 1088.59**

Condition: Future Without Project

Variable		TY 0		TY 1		TY 25		TY 50		TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		72		72		33		11			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		23		23		11		3			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		43		43		65		85			
		Class		Class		Class		Class		Class	
		4	0.60	4	0.60	3	0.40	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		22.2		22.3		25.3		25.5			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		55.6		55.6		44.6		42			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		5.8		5.9		8.2		8.6			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		123	0.50	123	0.51	96	0.59	64	0.48		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.1	1.00	0.1	1.00	1.0	0.85	2.0	0.50		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	95	0.96	95	0.96	90	0.92	63	0.70		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	5		5		10		37			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1.00	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	1		1		1		1			
		HSI =	0.65	HSI =	0.65	HSI =	0.54	HSI =	0.35	HSI =	

Intermediate Calculations				
Class				
0	0	0	1	
0	0	3	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
0.28	0.29	0.62	0.66	0
Tupelo/Cypress Basal Area				
0.50414	0.51103	0.740541	0.794717	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	0.775	0
1	1	0.775	0.325	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 3a** Project Area: 6,400

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		72		72		54		38			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		23		23		17		12			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		43		43		65		80			
		Class		Class		Class		Class		Class	
		4	0.6	4	0.60	4	0.60	3	0.40		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		22.2		22.4		28.1		31.2			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		55.6		55.6		55		52.7			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		5.8		6		10.2		12.6			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		123	0.504143337	123	0.52	119	0.88	102	0.80		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.65	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.1	1	0.1	1.00	0.5	1.00	1.0	0.85		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	95	0.96	95	0.96	92	0.94	74	0.79		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	5		5		8		26			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	1		1		1		1			
		HSI =	0.65	HSI =	0.71	HSI =	0.72	HSI =	0.62	HSI =	

Intermediate Calculations

Class				
0	0	0	0	
0	0	0	3	
4	4	4	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
0.28	0.3	0.82	1	0
Tupelo/Cypress Basal Area				
0.50414	0.517917	0.876897	1	
Water Regime				
0	0	0	0	
0.45	0.65	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	0.775	0

AAHU CALCULATION

Project: Maurepas Swamp Subarea 3a

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	6400	0.65	4134.20	
1	6400	0.65	4145.00	4139.60
25	6400	0.54	3457.93	91235.16
50	6400	0.35	2222.10	71000.38
Max TY=	50		Total	
			CHUs =	166375.14
			AAHUs =	3327.50

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	6400	0.65	4134.20	
1	6400	0.71	4523.73	4328.96
25	6400	0.72	4589.60	109359.99
50	6400	0.62	3979.66	107115.80
Max TY=	50		Total	
			CHUs =	220804.76
			AAHUs =	4416.10

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	4416.10
B. Future Without Project AAHUs =	3327.50
Net Change (FWP - FWOP) =	1088.59

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 3b** Project Area: 8,867 **AAHUs =** 582.61

Condition: Future Without Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		34		34		16		5			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		0		0		0		0			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		74		74		84		95			
		Class		Class		Class		Class		Class	
		3	0.40	3	0.40	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		13.2		13.3		16.3		16.5			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		39.7		39.7		33.6		26.4			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		13.4		13.5		15.8		16.2			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		61	0.56	61	0.56	48	0.60	35	0.40		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Permanent	0.30	Permanent	0.30	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.2	1.00	0.2	1.00	1.2	0.81	2.0	0.52		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	4	0.80	4	0.80		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	90	0.92	90	0.92	85	0.88	51	0.61		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	10		10		15		49			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1.00	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	1		1		1		1			
		HSI =	0.54	HSI =	0.54	HSI =	0.38	HSI =	0.33	HSI =	

Intermediate Calculations				
Class				
0	0	1	1	
3	3	0	0	
0	0	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.8124	0.8191	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.92604	0.928682	1	1	
Water Regime				
0	0	0	0	
0.3	0.3	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	0.775	0
1	1	0.685	0.325	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 3b** Project Area: 8,867

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		34		34		26		21			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		0		0		0		0			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		74		74		81		90			
		Class		Class		Class		Class		Class	
		3	0.4	3	0.40	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		13.2		13.4		19.1		22.2			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		39.7		39.7		46.4		48.7			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		13.4		13.6		17.8		20.2			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		61	0.55562431	61	0.56	64	0.60	63	0.60		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Permanent	0.3	Permanent	0.45	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.2	1	0.2	1.00	0.5	1.00	1.0	0.87		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	90	0.92	90	0.92	87	0.90	70	0.76		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	10		10		13		30			
	Development	0		0		0		0			
V7	Disturbance	Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	1		1		1		1			
		HSI =	0.54	HSI =	0.60	HSI =	0.44	HSI =	0.43	HSI =	

Intermediate Calculations

Class				
0	0	1	1	
3	3	0	0	
0	0	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.8124	0.8258	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.92604	0.931323	1	1	
Water Regime				
0	0	0	0	
0.3	0.45	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	0.775	0

6/10/2019

AAHU CALCULATION

Project: Maurepas Swamp Subarea 3b

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	8867	0.54	4824.07	
1	8867	0.54	4826.72	4825.40
25	8867	0.38	3401.62	98740.03
50	8867	0.33	2902.84	78805.79
Max TY=	50		Total CHUs =	182371.22
			AAHUs =	3647.42

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	8867	0.54	4824.07	
1	8867	0.60	5303.05	5063.56
25	8867	0.44	3896.26	110391.67
50	8867	0.43	3787.46	96046.45
Max TY=	50		Total CHUs =	211501.68
			AAHUs =	4230.03

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	4230.03
B. Future Without Project AAHUs =	3647.42
Net Change (FWP - FWOP) =	582.61

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 4a** Project Area: 1,859 **AAHUs = 272.24**

Condition: Future Without Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		46		46		21		7			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		37		37		17		6			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		55		55		70		90			
		Class		Class		Class		Class		Class	
		5	0.80	5	0.80	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		12.6		12.6		12.9		13.1			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		83.4		83.4		52.2		32.4			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		5.7		5.7		6.1		6.5			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		95	0.50	95	0.50	61	0.32	38	0.23		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.3	1.00	0.3	1.00	1.5	0.76	2.5	0.31		
		Class		Class		Class		Class		Class	
V5	Forest Size	4	0.80	4	0.80	4	0.80	4	0.80		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	95	0.96	95	0.96	90	0.92	54	0.63		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	5		5		10		46			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	1	1.00	1	1.00	1	1.00	1	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.68	HSI =	0.68	HSI =	0.34	HSI =	0.28	HSI =	

Intermediate Calculations

Class				
0	0	1	1	
0	0	0	0	
0	0	0	0	
5	5	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.76	0.76	0.79	0.8057	0
0.27	0.27	0.315	0.375	0
Tupelo/Cypress Basal Area				
0.49907	0.49907	0.534037	0.57322	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	0.55	0
1	1	0.55	0.1	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 4a** Project Area: 1,859

Condition: Future With Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		46		46		35		25			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		37		37		28		20			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		55		55		65		80			
		Class		Class		Class		Class		Class	
		5	0.8	5	0.80	3	0.40	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		12.6		12.7		15.7		15.9			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		83.4		83.4		79.9		71.6			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		5.7		5.8		8.1		8.5			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		95	0.499069507	95	0.51	101	0.77	91	0.80		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.33	1	0.2	1.00	0.5	1.00	1.0	0.87		
		Class		Class		Class		Class		Class	
V5	Forest Size	4	0.8	4	0.80	4	0.80	4	0.80		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	95	0.96	95	0.96	92	0.94	74	0.79		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	5		5		8		26			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	1	1	1	1.00	1	1.00	1	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.68	HSI =	0.68	HSI =	0.57	HSI =	0.41	HSI =	

Intermediate Calculations

Class				
0	0	0	1	
0	0	3	0	
0	0	0	0	
5	5	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.76	0.77	0.9799	0.9933	0
0.27	0.28	0.61	0.65	0
Tupelo/Cypress Basal Area				
0.49907	0.50907	0.773378	0.80117	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	0.775	0

AAHU CALCULATION

Project: Maurepas Swamp Subarea 4a

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	1859	0.68	1258.99	
1	1859	0.68	1258.99	1258.99
25	1859	0.34	628.98	22655.65
50	1859	0.28	516.30	14315.92
Max TY=	50		Total	
			CHUs =	38230.57
			AAHUs =	764.61

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	1859	0.68	1258.99	
1	1859	0.68	1263.81	1261.40
25	1859	0.57	1060.85	27895.91
50	1859	0.41	753.95	22685.04
Max TY=	50		Total	
			CHUs =	51842.34
			AAHUs =	1036.85

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	1036.85
B. Future Without Project AAHUs =	764.61
Net Change (FWP - FWOP) =	272.24

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 4b** Project Area: 641 **AAHUs = 32.63**

Condition: Future Without Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		39		39		13		3			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		30		30		10		5			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		76		76		85		95			
		Class		Class		Class		Class		Class	
		3	0.40	3	0.40	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		12.5		12.5		12.8		13			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		11.7		11.7		6.5		3.6			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.6		14.6		15		15.4			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		46	0.38	46	0.38	25	0.19	14	0.19		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Moderate		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Permanent	0.45	Permanent	0.45	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.2	1.00	0.2	1.00	1.3	0.71	3.0	0.15		
		Class		Class		Class		Class		Class	
V5	Forest Size	4	0.80	4	0.80	3	0.60	3	0.60		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	55	0.64	55	0.64	50	0.60	25	0.40		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	45		45		50		75			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1.00	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.53	HSI =	0.53	HSI =	0.32	HSI =	0.26	HSI =	

Intermediate Calculations

Class				
0	0	1	1	
3	3	0	0	
0	0	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.75	0.75	0.78	0.8	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.94931	0.949307	0.954603	0.959091	
Water Regime				
0	0	0	0	
0.45	0.45	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	0.325	0
1	1	0.64	0.1	0

6/10/2019

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 4b** Project Area: 641

Condition: Future With Project

		TY	0	TY	1	TY	25	TY	50	TY	
Variable		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		39		39		29		20			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		30		30		20		15			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		76		76		80		85			
		Class		Class		Class		Class		Class	
		3	0.4	3	0.40	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		12.5		12.6		15.6		15.8			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		11.7		11.7		8.9		6.3			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.6		14.7		17		17.4			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		46	0.379722704	46	0.38	35	0.40	25	0.20		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Moderate		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Permanent	0.45	Permanent	0.45	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.2	1	0.2	1.00	0.5	1.00	1.0	0.82		
		Class		Class		Class		Class		Class	
V5	Forest Size	4	0.8	4	0.80	4	0.80	3	0.60		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	55	0.64	55	0.64	52	0.62	35	0.48		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	45		45		48		65			
	Development	0		0		0		0			
V7	Disturbance	Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.53	HSI =	0.53	HSI =	0.39	HSI =	0.32	HSI =	

Intermediate Calculations

Class				
0	0	1	1	
3	3	0	0	
0	0	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
0.75	0.76	0.9732	0.9866	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
0.94931	0.951334	0.994567	0.997303	
Water Regime				
0	0	0	0	
0.45	0.45	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	0.775	0

Project: **Maurepas Swamp Subarea 4b** Project Area: 641

AAHU CALCULATION

Project: Maurepas Swamp Subarea 4b

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	641	0.53	340.22	
1	641	0.53	340.22	340.22
25	641	0.32	202.66	6514.60
50	641	0.26	163.71	4579.60
Max TY=	50		Total	
			CHUs =	11434.43
			AAHUs =	228.69

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	641	0.53	340.22	
1	641	0.53	340.36	340.29
25	641	0.39	248.56	7067.11
50	641	0.32	204.13	5658.67
Max TY=	50		Total	
			CHUs =	13066.07
			AAHUs =	261.32

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	261.32
B. Future Without Project AAHUs =	228.69
Net Change (FWP - FWOP) =	**32.63**

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 4c** Project Area: 2,040 **AAHUs = 309.12**

Condition: Future Without Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		55		55		18		5			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		30		30		10		3			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		76		76		86		90			
		Class		Class		Class		Class		Class	
		4	0.60	4	0.60	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		6.7		6.7		7		7.2			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		10.7		10.7		7.8		5.4			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		5.6		5.6		6		6.4			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		81	0.14	81	0.14	54	0.11	35	0.13		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Moderate		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.65	Semi-Permanent	0.65	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.6	0.96	0.6	0.96	1.5	0.61	3.0	0.13		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	5	1.00	4	0.80		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	55	0.64	55	0.64	50	0.60	30	0.44		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	45		45		50		70			
	Development	0		0		0		0			
V7	Disturbance	Class		Class		Class		Class		Class	
	Type	4	1.00	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	2		2		2		2			
		HSI =	0.53	HSI =	0.53	HSI =	0.29	HSI =	0.24	HSI =	

Intermediate Calculations				
Class				
0	0	1	1	
0	0	0	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0.0949	0.0949	0.1	0.12	0
0.0949	0.0949	0.1	0.12	0
0.26	0.26	0.3	0.36	0
Tupelo/Cypress Basal Area				
0.24074	0.240735	0.274757	0.327921	
Water Regime				
0	0	0	0	
0.65	0.65	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	0.325	0
0.955	0.955	0.55	0.1	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 4c** Project Area: 2,040

Condition: Future With Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		55		55		41		29			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		30		30		21		16			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		76		76		84		88			
		Class		Class		Class		Class		Class	
		4	0.6	4	0.60	3	0.40	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		6.7		6.8		9.8		10			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		10.7		10.7		12.6		12.5			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		5.6		5.7		8		8.4			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		81	0.1444412	81	0.15	93	0.35	86	0.37		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Moderate		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.65	Semi-Permanent	0.65	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.6	0.960250818	0.6	0.96	0.5	1.00	1.0	0.80		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	55	0.64	55	0.64	52	0.62	42	0.54		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	45		45		48		58			
	Development	0		0		0		0			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	4	1	4	1.00	4	1.00	4	1.00		
		Class		Class		Class		Class		Class	
	Distance	2		2		2		2			
		HSI =	0.53	HSI =	0.54	HSI =	0.53	HSI =	0.38	HSI =	

Intermediate Calculations				
Class				
0	0	0	1	
0	0	3	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0.0949	0.0966	0	0	0
0.0949	0.0966	0.42	0.45	0
0.26	0.27	0.6	0.64	0
Tupelo/Cypress Basal Area				
0.24074	0.249767	0.578523	0.615888	
Water Regime				
0	0	0	0	
0.65	0.65	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
0.955	0.955	1	0.775	0

AAHU CALCULATION

Project: Maurepas Swamp Subarea 4c

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	2040	0.53	1088.23	
1	2040	0.53	1088.23	1088.23
25	2040	0.29	591.99	20162.62
50	2040	0.24	492.15	13551.69
Max TY=	50		Total CHUs =	34802.54
			AAHUs =	696.05

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	2040	0.53	1088.23	
1	2040	0.54	1095.97	1092.10
25	2040	0.53	1079.48	26105.30
50	2040	0.38	765.41	23061.12
Max TY=	50		Total CHUs =	50258.51
			AAHUs =	1005.17

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	1005.17
B. Future Without Project AAHUs =	696.05
Net Change (FWP - FWOP) =	309.12

6/10/2019

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Swamp 2.0

Project: **Maurepas Swamp Subarea 5a** Project Area: 3,514 **AAHUs = 373.73**

Condition: Future Without Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		84		84		46		23			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		10		10		6		3			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		12		12		45		65			
		Class		Class		Class		Class		Class	
		4	0.60	4	0.60	3	0.40	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		16.7		16.9		19.8		20.1			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		131		131		123.2		112.1			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.5		14.6		16.9		17.3			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		156	1.00	156	1.00	141	1.00	124	1.00		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.5	1.00	0.5	1.00	0.8	0.93	1.2	0.83		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	88	0.89	88	0.89	82	0.83	75	0.77		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	2		2		5		10			
	Development	10		10		13		15			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	1	1.00	1	1.00	1	1.00	1	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.73	HSI =	0.73	HSI =	0.60	HSI =	0.43	HSI =	

Intermediate Calculations

Class				
0	0	0	1	
0	0	3	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
1.00000	1	1	1	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	0.865	0.685	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 5a** Project Area: 3,514

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		84		84		67		47			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		10		10		8		6			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		12		12		25		45			
		Class		Class		Class		Class		Class	
		4	0.6	4	0.60	3	0.40	3	0.40		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		16.7		16.9		19.8		22.9			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		131		131		130.5		129.2			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.5		14.6		16.9		19.3			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		156	1	156	1.00	149	1.00	143	1.00		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.65	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.47	1	0.2	1.00	0.2	1.00	0.6	0.98		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	88	0.885	88	0.89	83	0.84	80	0.81		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	2		2		4		5			
	Development	10		10		13		15			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	1	1	1	1.00	1	1.00	1	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.73	HSI =	0.80	HSI =	0.66	HSI =	0.66	HSI =	

Intermediate Calculations

Class				
0	0	0	0	
0	0	3	3	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
1.00000	1	1	1	
Water Regime				
0	0	0	0	
0.45	0.65	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	0.955	0

AAHU CALCULATION

Project: **Maurepas Swamp Subarea 5a**

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	3514	0.73	2573.34	
1	3514	0.73	2573.34	2573.34
25	3514	0.60	2105.65	56147.81
50	3514	0.43	1501.89	45094.26
Max TY=	50		Total	
			CHUs =	103815.41
			AAHUs =	2076.31

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	3514	0.73	2573.34	
1	3514	0.80	2801.24	2687.29
25	3514	0.66	2333.94	61622.15
50	3514	0.66	2321.48	58192.70
Max TY=	50		Total	
			CHUs =	122502.15
			AAHUs =	2450.04

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	2450.04
B. Future Without Project AAHUs =	2076.31
Net Change (FWP - FWOP) =	373.73

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Swamp 2.0

Project: **Maurepas Swamp Subarea 5b** Project Area: 2,993 **AAHUs = 327.75**

Condition: Future Without Project

Variable		TY	0	TY	1	TY	25	TY	50	TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		84		84		46		23			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		10		10		6		3			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		12		12		45		65			
		Class		Class		Class		Class		Class	
		4	0.60	4	0.60	3	0.40	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		16.7		16.9		19.8		20.1			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		131		131		123.2		112.1			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.5		14.6		16.9		17.3			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		156	1.00	156	1.00	141	1.00	124	1.00		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.5	1.00	0.5	1.00	0.8	0.93	1.2	0.83		
V5	Forest Size	Class		Class		Class		Class		Class	
		5	1.00	5	1.00	5	1.00	4	0.80		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	95	0.95	95	0.95	89	0.90	86	0.87		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	1		1		3		6			
	Development	4		4		8		8			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	1	1.00	1	1.00	1	1.00	1	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.74	HSI =	0.74	HSI =	0.60	HSI =	0.42	HSI =	

Intermediate Calculations				
Class				
0	0	0	1	
0	0	3	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
1.00000	1	1	1	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	0.865	0.685	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Maurepas Swamp Subarea 5b** Project Area: 2,993

Condition: Future With Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		84		84		67		47			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		10		11		8		6			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		12		12		25		45			
		Class		Class		Class		Class		Class	
		4	0.6	4	0.60	3	0.40	3	0.40		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		16.7		16.9		19.8		22.9			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		131		131		130.5		129.2			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.5		14.6		16.9		19.3			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		156	1	156	1.00	149	1.00	143	1.00		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.65	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.5	1	0.2	1.00	0.2	1.00	0.5	1.00		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	95	0.9524	95	0.95	91	0.91	90	0.90		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	1		1		1		2			
	Development	4		4		8		8			
V7	Disturbance										
		Class		Class		Class		Class		Class	
	Type	1	1	1	1.00	1	1.00	1	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.74	HSI =	0.80	HSI =	0.67	HSI =	0.67	HSI =	

Intermediate Calculations				
Class				
0	0	0	0	
0	0	3	3	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
1.00000	1	1	1	
Water Regime				
0	0	0	0	
0.45	0.65	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	1	0

AAHU CALCULATION

Project: **Maurepas Swamp Subarea 5b**

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	2993	0.74	2204.21	
1	2993	0.74	2204.21	2204.21
25	2993	0.60	1803.95	48097.95
50	2993	0.42	1269.44	38417.32
Max TY=	50		Total CHUs =	88719.48
			AAHUs =	1774.39

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	2993	0.74	2204.21	
1	2993	0.80	2399.43	2301.82
25	2993	0.67	2000.78	52802.45
50	2993	0.67	1999.42	50002.47
Max TY=	50		Total CHUs =	105106.74
			AAHUs =	2102.13

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	2102.13
B. Future Without Project AAHUs =	1774.39
Net Change (FWP - FWOP) =	327.75

WETLAND VALUE ASSESSMENT COMMUNITY MODEL

Swamp 2.0

Project: **Canal Construction Acreage** Project Area: 160 **AAHUs = -84.86**

Condition: Future Without Project

Variable		TY 0 Class/Value	SI	TY 1 Class/Value	SI	TY 25 Class/Value	SI	TY 50 Class/Value	SI	TY Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		84		84		46		23			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		10		10		6		3			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		12		12		45		65			
		Class		Class		Class		Class		Class	
		4	0.60	4	0.60	3	0.40	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		16.74		16.9		19.8		20.1			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		131		132		123		112			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.48		14.6		16.9		17.3			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		156	1.00	156	1.00	141	1.00	124	1.00		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Low		Low		Low			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.45	Permanent	0.30	Permanent	0.30		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.5	1.00	0.5	1.00	0.8	0.93	1.2	0.83		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1.00	5	1.00	5	1.00	5	1.00		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	88	0.89	88	0.89	82	0.83	75	0.77		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	2		2		5		10			
	Development	10		10		13		15			
V7	Disturbance	Class		Class		Class		Class		Class	
	Type	1	1.00	1	1.00	1	1.00	1	1.00		
		Class		Class		Class		Class		Class	
	Distance	3		3		3		3			
		HSI =	0.73	HSI =	0.73	HSI =	0.60	HSI =	0.43	HSI =	

Intermediate Calculations

Class				
0	0	0	1	
0	0	3	0	
4	4	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0	0	0	0
1	1	1	1	0
1	1	1	1	0
Tupelo/Cypress Basal Area				
1.00000	1	1	1	
Water Regime				
0	0	0	0	
0.45	0.45	0.3	0.3	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	0.865	0.685	0

WETLAND VALUE ASSESSMENT COMMUNITY MODEL
Swamp 2.0

Project: **Canal Construction Acreage** Project Area: 160

Condition: Future With Project

		TY	0	TY	1	TY	25	TY	50	TY	
Variable		**Class/Value**	**SI**	**Class/Value**	**SI**	**Class/Value**	**SI**	**Class/Value**	**SI**	**Class/Value**	**SI**
V1	Stand Structure	% Cover		% Cover		% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory		Overstory		Overstory	
		84		0		0		0			
		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		10		0		0		0			
		Herbaceous		Herbaceous		Herbaceous		Herbaceous		Herbaceous	
		12		0		0		0			
		Class		Class		Class		Class		Class	
		4	0.6	1	0.10	1	0.10	1	0.10		
V2	Stand Maturity	Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh		Cypress dbh	
		16.74		0.1		0.1		0.1			
		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area		Cypress Basal Area	
		131		0.1		0.1		0.1			
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		14.48		0.1		0.1		0.1			
		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area		Tupelo et al. Basal Area	
		156	1	1	0.00	1	0.00	1	0.00		
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Low		Moderate		Moderate		Moderate			
		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.45	Semi-Permanent	0.65	Permanent	0.45	Permanent	0.45		
V4	Salinity	Salinity		Salinity		Salinity		Salinity		Salinity	
		0.47	1	0.2	1.00	0.2	1.00	0.6	0.96		
		Class		Class		Class		Class		Class	
V5	Forest Size	5	1	1	UNUSED	1	UNUSED	1	UNUSED		
V6	Surrounding Land Use	Values %		Values %		Values %		Values %		Values %	
	Forest / marsh	88	0.885	88	0.89	83	0.84	80	0.81		
	Abandoned Ag	0		0		0		0			
	Pasture / Hay	0		0		0		0			
	Active Ag	2		2		4		5			
	Development	10		10		13		15			
V7	Disturbance	Class		Class		Class		Class		Class	
	Type	1	1	1	0.01	1	0.01	1	0.01		
		Class		Class		Class		Class		Class	
	Distance	3		1		1		1			
		HSI =	0.73	HSI =	0.06	HSI =	0.05	HSI =	0.05	HSI =	

Intermediate Calculations

Class				
0	1	1	1	
0	0	0	0	
4	0	0	0	
0	0	0	0	
Tupelo/Cypress dbh				
0	0.001	0.001	0.001	0
1	0.001	0.001	0.001	0
1	0.001	0.001	0.001	0
Tupelo/Cypress Basal Area				
1.00000	0.001	0.001	0.001	
Water Regime				
0	0	0	0	
0.45	0.65	0.45	0.45	
0	0	0	0	
Salinity				
1	1	1	1	0
1	1	1	0.955	0

AAHU CALCULATION

Project: **Canal Construction Acreage**

Future Without Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	160	0.73	117.17	
1	160	0.73	117.17	117.17
25	160	0.60	95.87	2556.52
50	160	0.43	68.38	2053.22
Max TY=	50		Total	
			CHUs =	4726.92
			AAHUs =	94.54

Future With Project			Total	Cummulative
TY	Acres	x HSI	HUs	HUs
0	160	0.73	117.17	
1	160	0.06	9.24	63.20
25	160	0.05	8.39	211.56
50	160	0.05	8.32	208.93
Max TY=	50		Total	
			CHUs =	483.69
			AAHUs =	9.67

NET CHANGE IN AAHUs DUE TO PROJECT	
A. Future With Project AAHUs =	9.67
B. Future Without Project AAHUs =	94.54
Net Change (FWP - FWOP) =	-84.86