State of Louisiana
Department of Natural Resources
Coastal Restoration Division

Monitoring Plan

for

Caernarvon Diversion Outfall Management

State Project Number BS-03a
Priority Project List 2

August 2003
Plaquemines Parish

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LDNR/Coastal Restoration and Management

MONITORING PLAN

CAERNARVON DIVERSION OUTFALL MANAGEMENT PROJECT (BS-03a)

ORIGINAL DATE: February 15, 2002
REVISED DATE: August 14, 2003

Preface

Pursuant to a CWPPRA Task Force decision on August 14, 2003 to adopt the Coastwide Reference Monitoring System (CRMS-*Wetlands*) for CWPPRA, this Monitoring Plan was reviewed to facilitate merging it with CRMS to provide more useful information for modeling efforts and future project planning while maintaining the monitoring mandates of the Breaux Act. The implementation plan included review of monitoring efforts on currently constructed projects for opportunities to 1) determine if current monitoring stations could be replaced by CRMS stations, 2) determine if monitoring could be reduced to evaluate only the primary objectives of each project and 3) determine whether monitoring should be reduced or stopped because project success had been demonstrated or unresolved issues compromised our ability to actually evaluate project effectiveness. The recommendations for modifying this Monitoring Plan are the result of a joint meeting with DNR, USGS, and the federal sponsor.

Specifically, the 6 sondes and discrete hydrologic sampling were replaced by the 6 CRMS stations; the 2000, 2006, and 2018 habitat mapping was changed to land:water analyses; vegetation sampling will be maintained through 2006 and then replaced by CRMS and Chabreck and Linscombe vegetation data; accretion sampling was dropped and will be conducted through CRMS. These recommendations have been incorporated into this revised Monitoring Plan in the Monitoring Elements section.

Project Description

The Caernarvon Diversion Outfall Management Project (BS-03a) was approved on the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) Second Priority Project List. The project is located in Plaquemines Parish, Louisiana, and lies to the south and west of Big Mar, a failed agricultural impoundment. The proposed project area totals 18,200 acres (7,365 ha; figure 1).

Breton Sound is an estuarine basin located within the Mississippi River deltaic plain in southeastern Louisiana. The marshes, barrier islands, and natural levees are the products of deltaic processes that have come about over the last 5,000 years. The mere existence of this land shows that the Mississippi River has the capability to build and maintain coastal wetlands faster than they can sink due to natural subsidence and erode due to marine processes. However, since the early 1900's the marshes in the Breton Sound basin have been isolated from direct riverine influxes by containment levees along the Mississippi River. Prior to these anthropogenic events, the basin was in a maintenance phase where land gain more or less countered land loss. However, human-induced landscape alterations have placed the deltaic wetlands of the Breton Sound basin in an abandonment phase where land loss now greatly exceeds land gain.

Figure 1. Upper Breton Sound Basin, with Caernarvon Outfall Management (BS-03a) project and reference areas.

In addition to the reduction of riverine inputs to the estuary, other anthropogenic alterations have increased the destructive role of marine processes on Breton Sound basin wetlands as well. Canals, dredged for navigation or in support of mineral extraction, have allowed saltwater to penetrate into previously fresh marshes. The placement of straight canals in areas previously drained by sinuous natural channels has increased the tidal prism in these wetlands, resulting in saltwater intrusion and increased tidal scouring. The negative effects of saltwater intrusion and erosion from tidal scouring are exacerbated by the natural process of subsidence. Subsidence rates in the Breton Sound basin have been estimated to be as great as 1 cm/yr (Penland et al. 1989).

Dunbar et al. (1992) determined that from 1932 to 1990, 5,546 acres (2,224 ha) of land were converted to open water in the Caernarvon Diversion Outfall Management Project area. Land loss rates peaked between 1958 and 1974, exceeding 270 acres/yr (109 ha/yr). The number of oil and gas pipeline canals increased dramatically during this time period, significantly increasing saltwater intrusion into the upper reaches of the basin. Most erosion occurred in the western portion of the project area, near the intersection of the Reggio and DP canals (figure 1). In another area west of Tigers Ridge, forested wetlands were once the dominant habitat. In 1965 however, Hurricane Betsy struck the Louisiana coast, and oil and gas canals allowed gulf waters brought in by the storm surge to penetrate into the upper reaches of the basin. Salt water was trapped behind the ridge, and ultimately the entire swamp became salt-stressed and was killed. Saltwater-tolerant species were not able to establish themselves because of the lack of a suitable substrate between the subsiding natural levee ridges and the presence of an adverse hydrologic regime (U. S. Department of Agriculture/Natural Resources Conservation Service [USDA/NRCS] 1996).

The increasing effects of saltwater intrusion have transformed the project area from a primarily intermediate community in 1968 (Chabreck et al. 1968) to a primarily brackish marsh by 1978. By 1988, all but 3% of the project area was classified as brackish marsh. Pre-construction vegetation surveys for the Caernarvon Freshwater Diversion Project (BS-08) between 1988 and 1990 showed *Spartina patens* (marshhay cordgrass) to be the dominant vegetation in brackish communities. Less dominant species included *Baccharis halimifolia* (baccharis), *Scirpus olyneyi* (Olney bulrush), and *Spartina cynosuroides* (big cordgrass). In more saline areas, *Spartina alterniflora* (smooth cordgrass) dominated the community, and was often found with *Distichlis spicata* (saltgrass) and *Juncus roemerianus* (black needlerush). Submerged aquatic vegetation (SAV) was often found in open water areas, and common species were *Najas quadalupensis* (Southern naiad), *Myriophyllum spicatum* (Eurasian water-milfoil), and *Ruppia maritima* (widgeon-grass).

Soils in the project area are highly organic. A survey by NRCS revealed three primary types of soils present. Lafitte Muck soils exist principally within interdistributary basins and interior marshes. Gentilly Muck soils are found largely on subsiding ridges, and Clovelly Muck soils are found in between the ridges and interior marshes (USDA/NRCS 1996). The highly-organic, highly-oxidized nature of these soils are indicative of both the lack of mineral inputs the system receives and the lack of recent organic accretion that has occurred in regions of the project area where diversion waters cannot reach to nourish the interior marshes.

The intent of the project is to maximize benefits from the Caernarvon Freshwater Diversion Project to the marshes immediately south and west of Big Mar (figure 1). The Caernarvon diversion structure was constructed between 1988 and 1991 for the purpose of diverting fresh water from the Mississippi River into the marshes of the Breton Sound basin. The diversion project was funded under the Water Resources Development Act (WRDA) with the intent of increasing commercial and recreational fisheries and wildlife productivity, enhancing emergent marsh vegetation growth, and reducing marsh loss. The structure has a discharge capacity of 8000 cubic feet/second (cfs), and once diversion waters enter Big Mar, 66% of those waters exit to the southeast via Bayou Mandeville and flow into Lake Lery and ultimately Bayou Terre aux Boeufs. To the southwest and out through the Delacroix Canal flows another 33% of the total discharge, and the remaining 1% of Caernarvon discharge flows westward through the Forty Arpent Canal (van Beek et al. 1982). With only 34% of structure discharge going to the south and west, it is critical to optimally manage the structure's outfall in these regions. The overall purpose of the Caernarvon Outfall Management Project is to encourage the inundation of interior marshes south and west of Big Mar with Caernarvon diversion flows before the discharge is conveyed to the lower reaches of the basin by channelized flow through bayous and canals. That will be accomplished by installing culverts with either interior flap gates or exterior sluice gates into existing plugs and spoil banks. Once diversion waters are in the interior marshes, increased retention time is needed to facilitate distribution of the fresh water, deposition of suspended sediments, and assimilation of nutrients by the vegetation communities. That goal will be attained by enhancing existing spoil banks and installing plugs in key locations where introduced diversion waters are currently able to discharge from the interior marshes back into bayous and canals. Specifically, the following project features have been constructed:

1. Two 48-inch culverts with exterior (Caernarvon Diversion side) sluice gates will be installed in the earthen plugs at sites 25, 40, and 54. At site 26, installation will be the same as above except that the number of 48-inch culverts with exterior sluice gates will be increased to four. The structures will allow controlled introduction of Caernarvon flows into the west and southwest portions of the project area (figure 2). Incremental spoil degradation on the south bank of Promised Land Canal west of site 54 will be employed to allow distribution of diverted river water from the site 54 culverts into interior marshes to the south and southeast of that site.

2. Automatic flapgated culverts will be incorporated into the existing plugs at sites 13, 50, 52, and 60. Sites 13 and 50 will each have one 48-inch culvert installed with a flapgate on the interior side (distal to Caernarvon discharge) and sites 52 and 60 will each have two 36-inch culverts installed with interior flapgates. Sites 13 and 50 will replace existing structures on the west bank of Bayou Mandeville. Sites 52 and 60 are located adjacent to breached openings in the south spoilbank of DP Canal and the north spoilbank of Reggio Canal, respectively. Those structures will permit continuous, unimpeded inflows of Caernarvon Diversion waters into interior marshes when water levels on the outside are greater. Additionally, those structures will prohibit dewatering of interior marshes during periods of lower exterior water level, thus increasing retention time of Caernarvon Diversion waters in those interior marshes (figure 2).

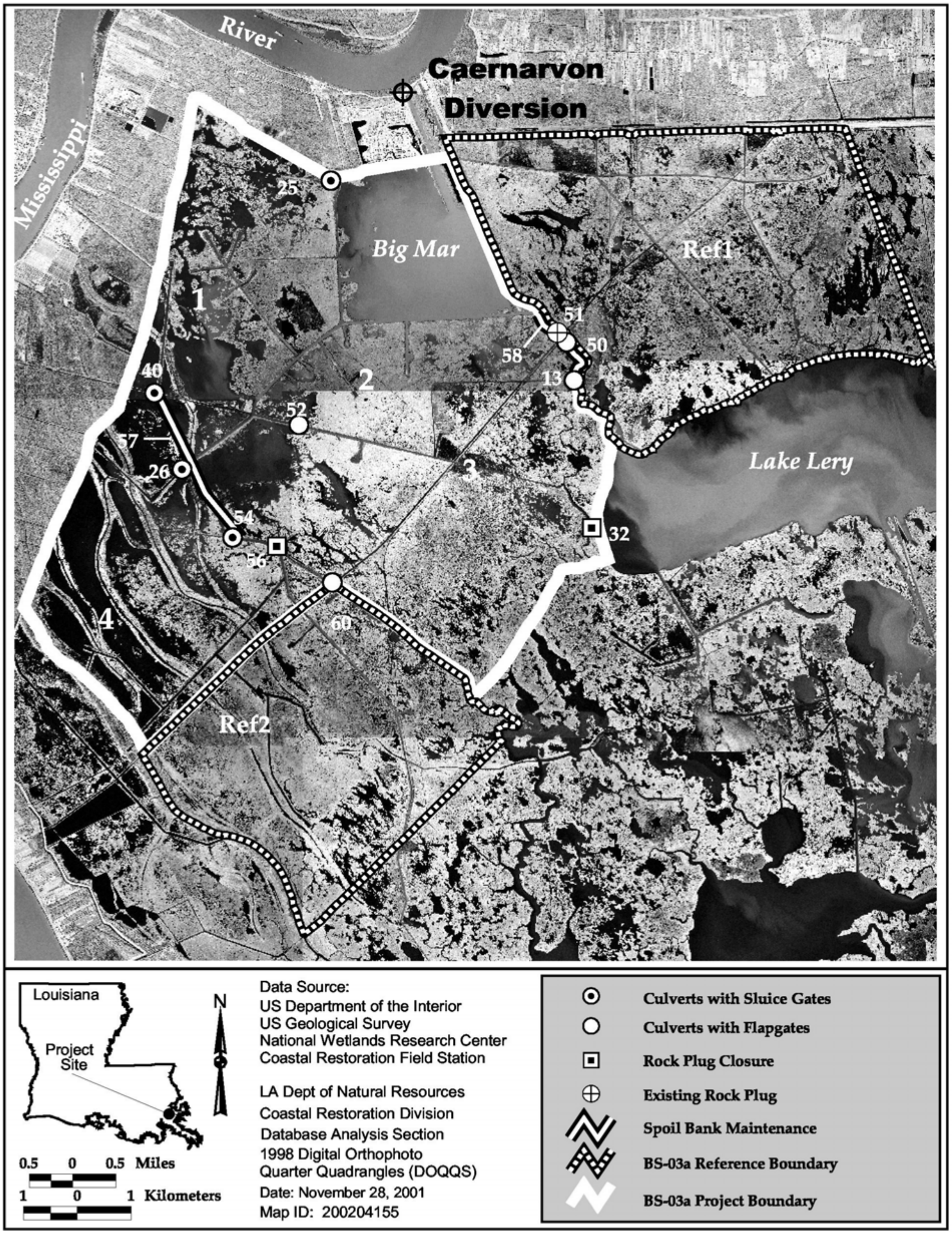

Figure 2. Caernarvon Outfall Management (BS-03a) project features.

3. Rock-armored plugs will be installed in the channel connecting Lake Lery to Le Blanc Bayou at site 32 and across the mouth of the oilfield canal at site 56. Those plugs will increase retention time of diversion waters within the interior marshes (figure 2).

4. Approximately 7,000 ft of spoil bank on the west side of Bayou Mandeville will be improved (site 58) to ensure that diversion waters entering the marsh through structures at sites 13 and 50 distribute throughout the interior, rather than simply breach the existing low spoil bank and drain into Bayou Mandeville. The spoil bank along the west side of Reggio Canal, between sites 40 and 54, has numerous breaches. To ensure that Caernarvon Diversion water introduced at sites 40, 26, and 54 does not simply re-enter Reggio Canal and bypass project area wetlands to the south, approximately 6,000 ft of spoil bank will be restored (site 57). The settled height of the embankments will be 2.5 ft above average marsh elevation (figure 2).

Each of the project features will influence one of four distinct polygons that are bound by high ridges or spoil banks within the project area, and therefore the project area will be subdivided into four strata (figure 3). Stratum 1 will receive fresh water from culverts with exterior sluice gates (site 25). Stratum 2 will be influenced by project features 13, 50, and 51, and restoration of the western spoil bank along Bayou Mandeville (site 58). Stratum 3 will receive fresh water from culverts 52 and 60,
and plugs at sites 32 and 56 will be installed in spoil bank breaches to help that region retain the water brought in by the two culverts. Stratum 4 will consist of the project area west of the Reggio canal, where culverts with exterior sluice gates (sites 26, 40, and 54) will nourish the area with fresh water. A 6,000-ft section of the western spoil bank between sites 40 and 54 will be restored to help retain the water that area will receive.

Currently, an abundance of additional data is being collected in the upper Breton Sound basin for other studies (Twilley and Nyman 1997, DeLaune and Patrick 1997, Day, Jr. et al. 1999). Any data generated from these studies that may be useful for the purposes of monitoring the outfall management project will be examined.

Because different regions of the project area are under the influence of different project features, it is anticipated that a significant amount of variation in response to the project will be attributable to location within the project area. To account for this variation, a stratified design will be employed. Each region will serve as a stratum, and the factor, “strata”, will serve as a blocking factor in the ensuing data analysis.

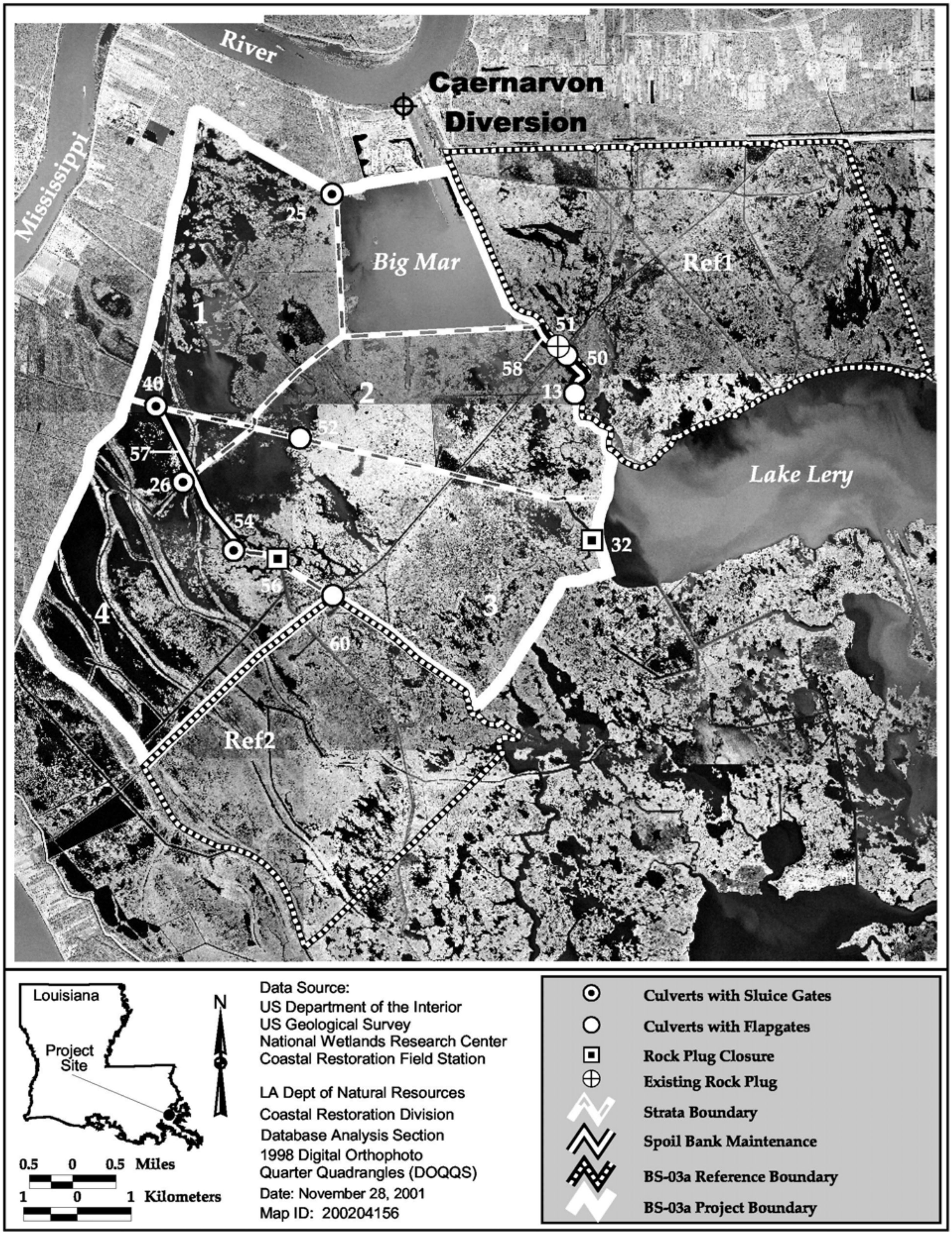

Figure 3. Caernarvon Outfall Management (BS-03a) project features and project area strata.

Project Objectives

1. Increase freshwater dispersion into interior marshes that are currently isolated from Caernarvon Diversion flow during low discharge periods by incorporating culverts into existing plugs and spoil banks, particularly stratum 4.

2. Promote better distribution and retention of available freshwater and nutrients from the Caernarvon Diversion through use of spoil bank restoration and plugs.

Specific Goals

1. Reduce marsh loss rates.

2. Increase occurrence and abundance of fresh/intermediate marsh type plant species.

3. Increase the occurrence of submerged aquatic vegetation (SAV) in shallow open-water areas.

4. Reduce salinity variation in the interior marshes.

Reference Area

Two reference areas will be monitored for this project to help distinguish random changes through time from project-induced changes within the project area. Reference area 1 is located east of Bayou Mandeville and north of Lake Lery (figure 1) where water exchange in and out of the bayou will occur unimpeded by project structures such as flap gates. Reference area 2 is located in the area south of the intersection of Steinberg and Manuel's canals. Prior to project construction, these sites exhibit vegetation communities and soil and hydrologic conditions similar to the project area. All variables monitored in the project area will also be monitored in the reference areas. Pre-construction monitoring data will be examined to determine which reference area will be most appropriate for comparison with each stratum for all variables.

CRMS will provide a pool of reference sites within the same basin and across the coast to evaluate project effects. At a minimum, every project will benefit from basin-level satellite imagery and land:water analysis every 3 years, and supplemental vegetation data collected through the periodic Chabreck and Linscombe surveys. Other CRMS parameters which may serve as reference include Surface Elevation Table (SET) data, accretion (measured with feldspar), hourly water level and salinity, and vegetation sampling. A number of CRMS stations are available for each habitat type within each hydrologic basin to supplement project-specific reference area limitations.

Interpretation Limitations

The Caernarvon Outfall Management project area lies within the area of influence of the Caernarvon Freshwater Diversion project. Currently, operation of the structure is highly variable from year to year with regard to discharge regime, and it is possible that the operations plan for the structure will change several times over the 20-year duration of the outfall management project. Consequently, it may be difficult to differentiate between responses specifically due to the outfall management project from those of the diversion project itself.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. Land:Water analysis — To determine ratios of marsh to open water and land loss rates, and also changes in vegetation community structure, color-infrared aerial photography (1:24,000 scale, with ground control markers) will be obtained by the National Wetlands Research Center (NWRC) for each stratum in the project area and each reference area. The photography will be georectified, photo interpreted, mapped, ground-truthed, and analyzed with Geographic Information Systems (GIS) by NWRC personnel using techniques described in Steyer et al. (1995). The photography was obtained prior to construction in 2000 and will be obtained after construction in 2006 and 2018. Post-construction aerial photography acquisition may vary by one or two years as we will try to obtain the photography in conjunction with that obtained for the Caernarvon Freshwater Diversion.

   As originally proposed, the 2000, 2006, and 2018 photography was to be processed via habitat mapping. However, based on the CRMS review, this was changed to land:water analysis.

2. Vegetation — Species composition and relative abundance will be evaluated in the project and reference areas using techniques described in Steyer et al. (1995). Specifically, a modification of the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974) will be used. Six plots ($4m^2$ each) will be located in each sampling stratum of the project area, and six additional plots will be established in each reference area (figure 4). These plots were sampled once prior to construction in 2000, and will subsequently be sampled in 2003 and 2006.

   Based on the CRMS review, vegetation samples originally scheduled for 2009, 2012, 2015, 2018, and 2020 will be replaced with vegetation sampling at the CRMS stations within the project and reference areas. Vegetation will be supplemented with Chabreck and Linscombe vegetation survey data.

3. SAV

The frequency of occurrence of submerged aquatic vegetation (SAV) will be documented during the spring of 2000 (pre-construction) and in 2003, 2006, 2009, 2012, 2015, 2018, and 2021. Methods described in Nyman and Chabreck (1996) will be used to determine the frequency of occurrence of SAV. Two transects will be established in each of two ponds in each project stratum and in each reference area (figure 4). Those transects will cross each pond on the long axis and will be parallel to each other. Transects will be placed so that they are separated by approximately one third the pond's width. Frequency of occurrence will be determined for at least 50 locations along each transect.

4. Salinity

Salinity will be measured hourly at one station inside each project area stratum and at one station in each reference area (figure 5) with continuous recorders using techniques described according to Steyer et al. (1995). In addition to those 6 continuous recorder stations, 12 stations in the project area and 6 stations in the reference areas will be established and salinity at those stations will be measured monthly to help spatially characterize project-induced changes. Salinity data will be collected from 2000-2015.

Based on the CRMS review, discrete sampling will be discontinued and sondes will be replaced by CRMS stations in 2005.

5. Water Level

To assist in determining if the project objective of increased freshwater distribution into and retention within interior marshes is being met, hourly water level data will be collected at the same six sites as where hourly salinity data is being taken (figure 5) with the same continuous recorders. Within the vicinity of each recorder, average marsh elevation will be determined, and all recorders will be surveyed to the North American Vertical Datum (NAVD 88). That will enable assessment of frequency, duration, and intensity of marsh inundation, and will allow for analyses to determine if inundation regimes exceed levels optimal for wetland benefit. Water level data will be collected from 2000-2015.

Based on the CRMS review, sondes will be replaced by CRMS stations in 2005.

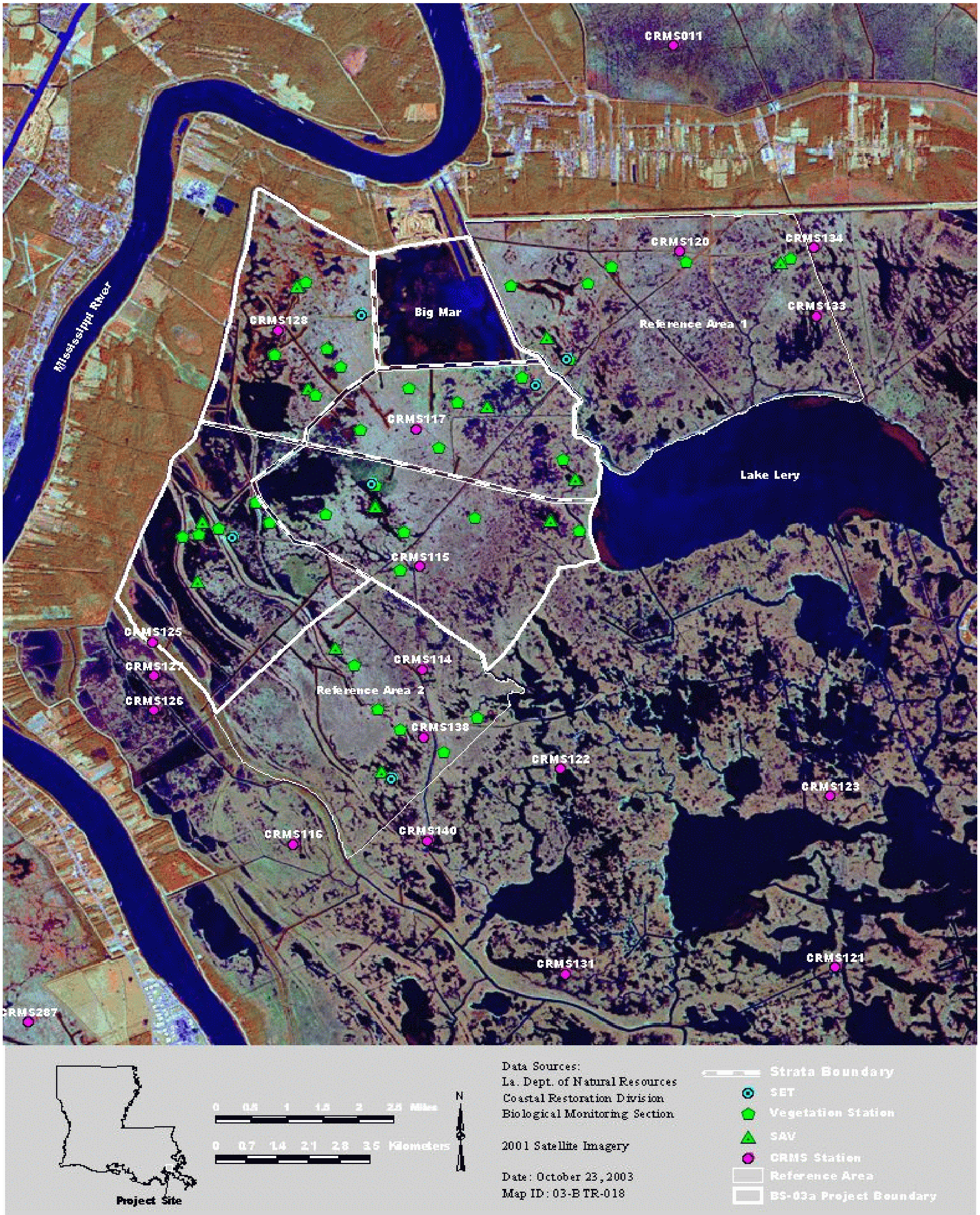

Figure 4. Caernarvon Outfall Management (BS-03a) vegetation, SAV, and SET/feldspar sampling stations.

Figure 5. Caernarvon Outfall Management (BS-03a) continuous recorder and monthly discrete salinity stations.

6. Accretion

Although not an explicit goal of the outfall management project, vertical accretion and subsequent surface elevation change is an important response to freshwater re-introduction projects and it will be monitored in this project according to Steyer et al. 1995. To monitor surface elevation change, one sediment erosion table (SET) will be installed in each stratum in the project area, and an additional SET will be installed in each reference area (figure 4). Feldspar marker horizon stations will be established at the same locations as the SET's to monitor vertical accretion and sediment deposition.

These stations will be sampled twice yearly during pre-construction, and every subsequent year until 2003.

Based on the CRMS review, accretion sampling at these stations (originally proposed through 2016) will be discontinued after 2004. Accretion sampling will be conducted through CRMS after 2004.

<u>Anticipated Hypotheses and Statistical Analyses</u>

The following hypotheses will be tested to determine if project goals have been accomplished.

1. Descriptive and summary statistics from color-infrared aerial photography collected pre- and post-construction will be used to evaluate marsh to open water ratios and changes in the rate of marsh loss/gain in the project area. Changes in the rates of marsh loss/gain will also be compared between the project and reference areas. Within the project area, loss/gain rates will be compared across strata to determine if certain regions within the project area are responding more favorably to the project than others. Habitat analysis will be employed to determine if a shift in vegetation community toward one of fresher habitat conditions occurs.

   Goal: Reduce marsh loss rates.

2. Analysis of Variance (ANOVA) will be used to determine if differences in occurrence of

fresh and intermediate marsh type plant species exist between the project and reference areas, and also if these differences are observed through time after the project has been implemented. In the ANOVA model, blocking may occur on the factor, "stratum", as we suspect region of project area to be a significant source of within variation. In particular, we would like to examine how inundation regimes in each stratum relate to changes in emergent marsh vegetation, and how the inundation regime in the reference area differs from project area regimes.

Goal: Increase mean percent occurrence and abundance of fresh/intermediate marsh type plant species.

Hypothesis A:

H_O: After project implementation at time i, mean percent occurrence and abundance of fresh/intermediate marsh type plant species will not be significantly greater than before project implementation.

H_A: After project implementation at time i, mean percent occurrence and abundance of fresh/intermediate marsh type plant species will be significantly greater than before project implementation.

Hypothesis B:

H_O: After project implementation at time i, mean percent occurrence and abundance of fresh/intermediate marsh type plant species in the project area will not increase through time at a rate greater than that observed in the reference area.

H_A: After project implementation at time i, mean percent occurrence and abundance of fresh/intermediate marsh type plant species in the project area will increase through time at a rate greater than that observed in the reference area.

3. Submerged aquatic vegetation (SAV) data will be evaluated with ANOVA. Strata will be used as a blocking factor and variation in SAV abundance will be investigated both between the project and reference area, and also within the project area through time.

Goal: Increase mean percent occurrence of SAV in shallow open-water areas.

Hypothesis A:

H_O: After project implementation at time i, mean project area SAV percent occurrence will not be significantly greater than before project implementation

H_A: After project implementation at time i, mean project area SAV percent occurrence will be significantly greater than before project implementation.

Hypothesis B:

H_O: After project implementation at time i, mean SAV percent occurrence will not increase through time at a rate greater than those observed in the reference area.

H_A: After project implementation at time i, mean SAV percent occurrence will increase through time at a rate greater than those observed in the reference area.

4. The primary method of analysis will be to determine differences in salinity variability as evaluated by an analysis of variance (ANOVA) that will consider *both* spatial and temporal variation and interaction. The ANOVA approach may include terms in the model to adjust for station locations, proximity to structures, and seasonal fluctuations. Ancillary data (i.e., precipitation, historical) will be included as covariables when available. That additional information may be evaluated through analysis such as correlation, trend, multiple comparisons, and interval estimation. Exploratory data analysis will be used to determine an appropriate variable for hypothesis testing (e.g. daily, weekly intervals).

Goal: Reduce salinity variation in the interior marshes.

Hypothesis A:

H_O: After project implementation at time i, project area salinity variability will not be significantly less than before project implementation.

H_A: After project implementation at time i, project area salinity variability will be significantly less than before project implementation.

Hypothesis B:

H_O: After project implementation at time i, salinity variability in the project area will not decrease through time at a rate greater than that observed in the reference area.

H_A: After project implementation at time i, salinity variability in the project area will decrease through time at a rate greater than that observed in the reference area.

5. Although not a goal of the project, an explicit objective of the project is to increase freshwater dispersion into interior marshes in the project area. As a result, it is necessary to determine if inundation regimes are being altered by the project. This can be examined

by monitoring water levels and characterizing the resulting inundation regimes. ANOVA will be employed to characterize inundation frequency, duration, and intensity through space and time.

Hypothesis A:

H_O: After project implementation at time i, mean duration of project area inundation events will be not be greater than before project implementation.

H_A: After project implementation at time i, mean duration of project area inundation events will be greater than before project implementation.

Hypothesis B:

H_O: After project implementation at time i, mean intensity of project area inundation events will not be greater than before project implementation.

H_A: After project implementation at time i, mean intensity of project area inundation events will be greater than before project implementation.

Hypothesis C:

H_O: After project implementation at time i, mean duration of project area inundation events will not exhibit a greater increase than those observed in the reference area.

H_A: After project implementation at time i, mean duration of project area inundation events will exhibit a greater increase than those observed in the reference area.

Hypothesis D:

H_O: After project implementation at time i, mean intensity of project area inundation events will not exhibit a greater increase than those observed in the reference area.

H_A: After project implementation at time i, mean intensity of project area inundation events will exhibit a greater increase than those observed in the reference area.

6. Although not an explicit goal of this project, it is understood that one of the primary functions of freshwater diversion projects is to increase vertical accretion rates. As a result, accretion rates and net elevation gains will be monitored. Summary statistics and ANOVA will be used to determine differences in vertical accretion and sediment deposition between

pre- and post-construction periods and between project and reference areas.

Goal: Increase vertical accretion and sedimentation rates.

Hypothesis A:

H_O: After project implementation at time i, mean accretion and sedimentation rates will not be greater than before project implementation.

H_A: After project implementation at time i, mean accretion and sedimentation rates will be greater than before project implementation.

Hypothesis B:

H_O: After project implementation at time i, mean accretion and sedimentation rates will not be greater in the project area than in the reference area.

H_A: After project implementation at time i, mean accretion and sedimentation rates will be greater in the project area than in the reference area.

<u>Notes</u>

1.	Implementation	Start Construction:	6/11/2001
		End Construction:	4/5/2002
2.	NRCS Point of Contact:	Loland Broussard	(337) 291-3060
	NRCS Monitoring Manager:	Marty Floyd	(318) 473-7690
3.	DNR Project Manager:	Clark Allen	(225) 342-6738
	DNR Monitoring Manager:	Brady Carter	(504) 280-4069

4. The twenty-year monitoring plan development and implementation budget for this project is $837,103. Pursuant to the CRMS review, it was authorized by the Task Force to maintain $471,327 with the project, and utilize $365,776 to support CRMS. Comprehensive reports on coastal restoration efforts in the Breton Sound hydrologic basin will be available in 2005, 2008, 2011, 2014, and 2017. These reports will describe the status and effectiveness of the project as well as cumulative effects of restoration projects in the basin.

5. Water levels and existing marsh levels will be evaluated and used to characterize inundation regimes.

6. Water levels will be evaluated to ensure that excessive inundation resulting in detrimental effects to vegetation will not occur as a result of the project.

7. Available ecological data, both descriptive and quantitative, will be evaluated in concert with all of the above data and with statistical analysis to aid in determination of the overall project success.

8. Any additional sources of data (i.e., LDWF, USACE, LSU/CEI, etc.) will be used to better develop monitoring protocol and in evaluation of project effectiveness.

9. A power analysis will be employed on all data after pre-construction data is collected to determine if a sufficient number of data points are being collected. If pre-construction monitoring data indicate that an inadequate number of stations is being monitored (e.g. too few stations to detect variability in monitoring variables), the TAG will be consulted.

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