State of Louisiana
Department of Natural Resources
Coastal Restoration Division

Monitoring Plan

for

Brady Canal Hydrologic Restoration

State Project Number TE-28
Priority Project List 3

August 2003
Terrebonne Parish

Prepared by:

Todd Folse, Monitoring Section (CRD)
LDNR/Coastal Restoration and Management

MONITORING PLAN

PROJECT NO. TE-28 BRADY CANAL HYDROLOGIC RESTORATION

ORIGINAL DATE: May 29, 1996
REVISED DATES: July 23, 1998; August 14, 2003

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original plan was reduced in scope due to budgetary constraints. Specifically, vegetation will be monitored in years 2, 4, and 6, then every three years thereafter. SAV will be monitored at year 15 post-construction, rather than years 13 and 17. Two sondes with marsh mat movement recorders were added to monitor duration and frequency of flooding of floating marsh for years 1998-2004. Water level and salinity will be monitored continuously through 2004. Upon collection and evaluation of this data set, the Technical Advisory Group (TAG) will assist in development of a sampling plan based on an approximate 30% reduction of effort, if technically advisable.

Pursuant to a CWPPRA Task Force decision on August 14, 2003 to adopt the Coastwide Reference Monitoring System (CRMS-*Wetlands*) for CWPPRA, updates were made to this Monitoring Plan to merge 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. As the result of a joint meeting with DNR, USGS, and the federal sponsor, the recommendations for this Monitoring Plan were to use CRMS sites to replace the reference area sites and maintain all project specific monitoring except for submerged aquatic vegetation within the project area. Moreover, if the Penchant Basin Plan (TE-34) is constructed and the older structure, at the intersection of Brady Canal and Bayou Penchant, is widened and the levees are degraded, then the monitoring of TE-28 will be accomplished with the CRMS stations. The recommendations have been incorporated into this revised Monitoring Plan and are described in the Monitoring Elements section.

Project Description

The Brady Canal Hydrologic Restoration Project consists of 7,653 ac (3,097 ha) located in the Terrebonne Basin, within the Bayou Penchant-Lake Penchant watershed. The project is bounded by Bayou Penchant, Brady Canal, and Little Carencro Bayou to the north, Bayou de Cade and Turtle Bayou to the south, Superior Canal to the east, and Little Carencro Bayou and Voss Canal to the west (figure 1).

Historically, the Atchafalaya River has influenced the establishment of freshwater marsh plant species within the Brady Canal Hydrologic Restoration project area (USDA/NRCS 1995). In 1968 the vegetation in the project area was classified as freshwater, intermediate and brackish marsh (Chabreck et al. 1968) (figure 2). In 1978 the area was classified as intermediate marsh with a small area of brackish marsh in the southern portion of the project along Bayou de Cade (Chabreck and Linscombe 1988).

The Brady Canal Hydrologic Restoration project is bisected by the Mauvais Bois Ridge, resulting in different hydrologic regimes to the north and south of the ridge. The northern section of the project area still receives freshwater and sediments which is provided through overbank flow from Bayou Penchant, Little Carencro Bayou, and Brady Canal (USDA/NRCS 1995). The Mauvais Bois Ridge forms a barrier to reduce the outflow of freshwater. Freshwater and sediment retention has diminished in the southern portion of the project area due to unimpeded throughflow and tidal exchange combined with a decrease in freshwater and sediment (USDA/NRCS 1995).

The project area north of the Mauvais Bois Ridge is dominated by *Sagittaria lancifolia* (bulltongue), *Sacciolepis striata* (bagscale), *Ludwigia leptocarpa* (false loosestrife), *Hydrocotyle sp*. (pennywort) *Eleocharis sp*. (spikerush), and *Sagittaria latifolia* (duck potato). Submerged aquatic vegetation (SAV) in shallow ponds include *Nymphaea odorata* (white waterlily), *Utricularia sp*. (bladderwort), *Ceratophyllum demersum* (coontail), *Lemna sp*.(duckweed) and *Myriophyllum heterophyllum* (Eurasian watermilfoil). Flotant marsh formation is evident in some interior ponds and the abundance of *Eichornia crassipes* (water hyacinth) is providing a substrate for other species to colonize. The southern portion of the project below the Mauvais Bois Ridge is dominated by *Spartina patens* (marshhay cordgrass), *L. leptocarpa*, *S. lancifolia*, and *Scirpus americanus* (olney bulrush). The common SAV species are *C. demersum*, *M. heterophyllum*, and *Heteranthera dubia* (water stargrass) (USDA/NRCS 1995).

Major changes to the hydrology of the Penchant Basin, both natural and human induced, have resulted in a complex hydrologic setting (USDA/NRCS 1995). Under natural hydrologic conditions, the Penchant Basin is confined by natural levee ridges and is open to the west and southwest where it connects with the lower Atchafalaya River, Atchafalaya Bay, and Fourleague Bay. Historically, this hydrologic setting produced an estuarine system created by freshwater introduction in the upper basin and tidal exchange with the bays. Over time hydrologic conditions in the Penchant Basin were altered by the construction of numerous canals, levees, local water management structures, and major public works projects. Some of the major projects that have helped to alter the hydrology in the basin are the Atchafalaya Basin Floodway, the Avoca Island levee along the lower Atchafalaya River, the Gulf Intracoastal Waterway (GIWW), the Bayou Chene, Boeuf, and Black Projects, the rock weir at Wax Lake, and the Houma Navigation Canal (USDA/NRCS 1995).

Historically, the Atchafalaya River provided freshwater and sediments to the Penchant Basin through the diversion of flood waters into Bayou Cocodrie via Bayou Boeuf at Morgan City, and into Bayou Penchant via Bayou Shaefer and Bayou Chene (USDA/NRCS 1995). Freshwater input and sediment retention from the Atchafalaya River diminished after the construction of the

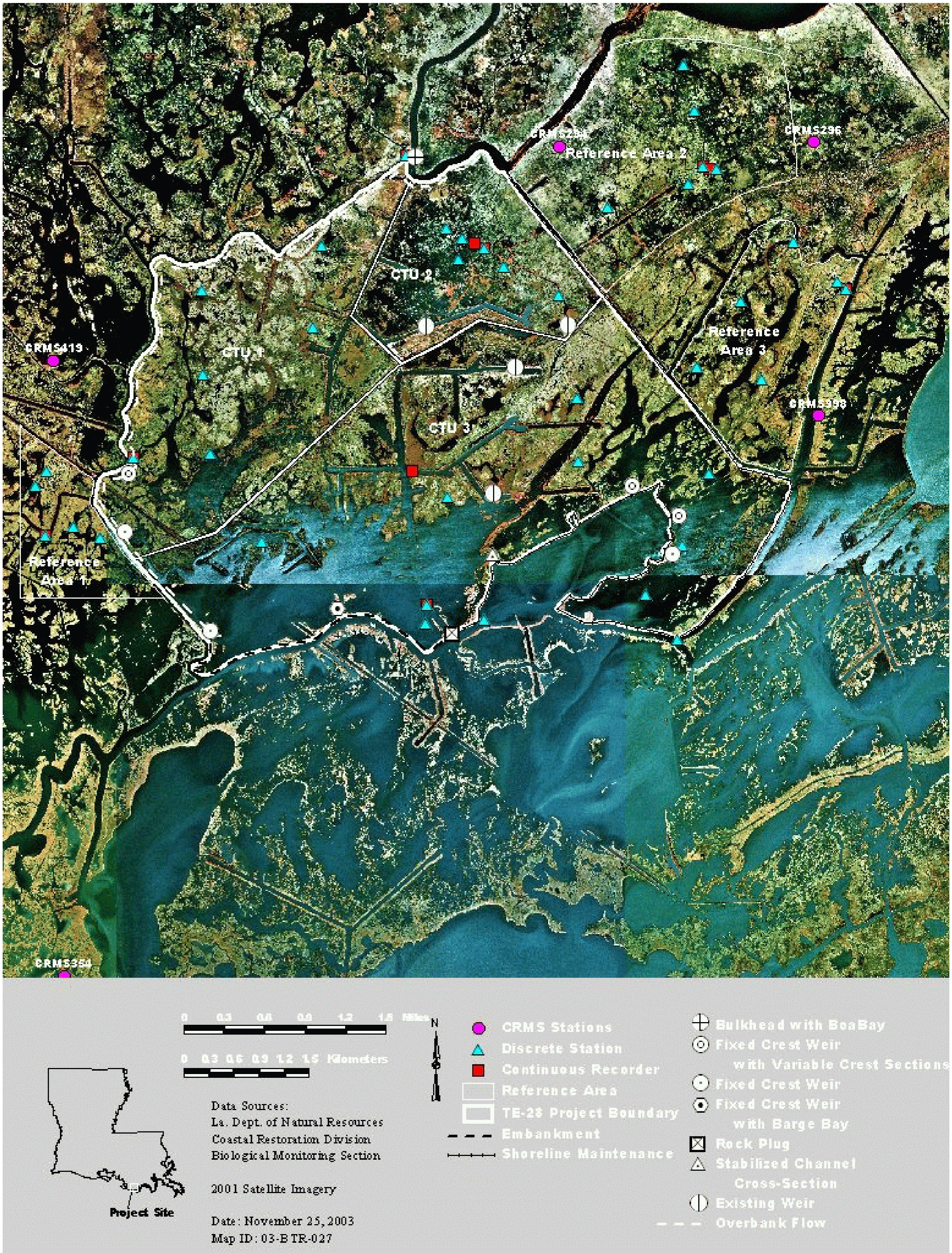

Figure 1. Brady Canal Hydrologic Restoration (TE-28) project boundaries and features.

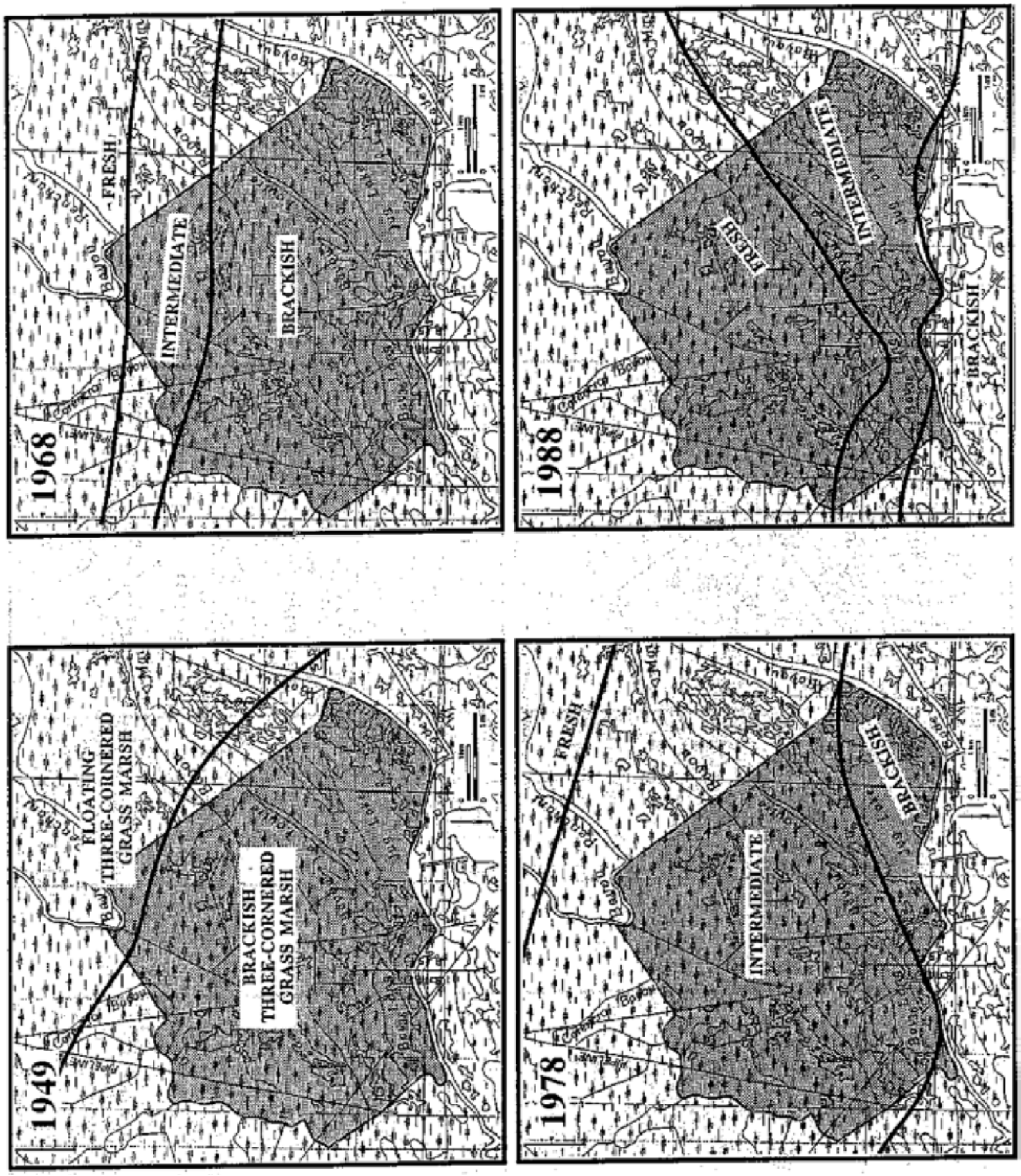

Figure 2. Typical vegetation communities within the project area in A) 1949, B) 1968, C) 1978, and D) 1988 (O'neil 1949, Chabreck and Linscombe 1978, and Chabrack and Linscombe 1988.

Atchafalaya Basin Floodway, the Bayou Boeuf Lock on the GIWW, and the construction of the Avoca Island Levee. Additionally, the dredging of numerous canals in the basin has resulted in the breaching of natural hydrologic barriers allowing for a strong tidal influence. These anthropogenic changes have resulted in an acceleration of tidal exchange between freshwater distribution channels and tidal channels thus reducing freshwater retention, accelerating erosion, and facilitating saltwater intrusion (USDA/NRCS 1995).

The natural levee ridge of Bayou DeCade has eroded to below marsh elevation over several thousand feet along the southern project boundary. This has created a direct hydrological connection between the higher salinity waters from the south and the project area as well as decreasing protection from storm surges and tidal scouring. In addition, oilfield access canals extending from within the project area to the Bayou DeCade levee ridge have also increased tidal exchange and provided direct routes for saltwater intrusion and reduced freshwater and sediment retention (USDA/NRCS 1995).

Land loss data shows that during the period from 1932 to 1990, about 1,818 ac (736 ha) of land were converted to open water in the Brady Canal Hydrologic Restoration project area. Approximately 52% of the loss occurred over a 16 year period between 1958 and 1974. The average loss per year between 1932 and 1958 was approximately 18 ac (7.3 ha) per year. The average loss of 31 ac (12.5 ha) per year from 1983 to 1990 illustrates an increase in land loss rates for the project area (Dunbar et al. 1992). Land loss data in the project area indicates that losses were greatest in the southwest portion of the project (USDA/NRCS 1995).

The Brady Canal Hydrologic Restoration project involves the installation and maintenance of canal plugs, the repair, construction, and maintenance of levees, and the placement of stabilized channel cross-sections. The structures are designed to reduce adverse tidal effects in the project area as well as to better utilize available freshwater and sediments.

The principle project features include (figure 1):

1. Bulkhead with boat bay and two flapgated variable crest sections (1)
2. Fixed crest weir with barge bay (1)
3. Fixed crest weir with variable crest section(s) (3)
4. Fixed crest weir (1)
5. Rock plug (1) (315 ft)
6. Stabilized channel cross-section (rock) (2)
7. Earthen embankment (15,000 ft)
8. Maintenance of existing overflow bank (21,600 ft)
9. Maintenance of shore and earthen embankment
10. Maintenance of existing structures

Project Objectives

1. Maintain and enhance existing marshes in the project area by reducing the rate of tidal exchange.

2. Improve the retention of introduced freshwater and sediment.

Specific Goals

The following goals will contribute to the evaluation of the above objectives:

1. Decrease the rate of marsh loss.

2. Maintain or increase the abundance of plant species typical of a freshwater and intermediate marsh.

3. Decrease variability in water level within the project area.

4. Decrease variability in salinities in the southern portion of the project.

5. Increase vertical accretion within the project area.

6. Increase the frequency of occurrence of SAV within the project area.

Reference Areas

The importance of using appropriate reference areas cannot be overemphasized. Monitoring on both project and reference areas provides a means to achieve statistically valid comparisons, and is therefore the most effective means of evaluating project success. The evaluation of sites was based on the criteria that both project and reference areas have a similar vegetative community, soil type, and hydrology.

In addition to the above criteria, reference areas were chosen to pair with the three Conservation Treatment Units (CTU) within the project area. Three reference areas were chosen. Reference area 1 is located south of Little Carencro Bayou and west of Voss Canal and is the reference area for CTU 1. The reference area for CTU 2 is located east of Superior Canal and south of Bayou Penchant. The reference area for CTU 3 is located east of Superior Canal and north of Turtle Bayou (figure 1). Both the project area and the reference areas are classified as freshwater marsh to intermediate marsh (Chabreck and Linscombe 1988) and contain mainly the Allemands Muck and Clovelly Muck soils (USDA/NRCS 1995). Reference areas will be used in the evaluation of all monitoring elements. Although the reference areas have many similarities to the project site, we recognize that interpretation of reference data can be limited or confounded by natural or anthropogenic processes.

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.

Monitoring Elements

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

1. Habitat Mapping — To document vegetated and non-vegetated areas, color infrared aerial photography (1:12,000 scale with ground controls) will be obtained. The photography will be photointerpreted, scanned, mosaicked, georectified, and analyzed by National Wetlands Research Center (NWRC) personnel according to the standard operating procedure described in Steyer et al. (1995). The photography will be obtained in 1998 (pre-construction), and in 2002, 2008, and 2017 (post-construction).

2. Vegetation — Species richness and relative abundance will be evaluated in the project and reference areas using techniques described in Steyer et al. (1995). More specifically, the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974) will be utilized. Five stations were chosen within each CTU and reference area and replicate samples will be collected at each station. Relative abundance will be documented in permanent plots to allow revisiting over time. Plot size will be determined after a field investigation. Sites were sampled once in 1996 (pre-construction) and 1999 (as-built), and in 2002 (post-construction).

   Based on the CRMS review, CRMS stations 419, 294, and 398 will replace the reference area vegetation sampling originally scheduled for 2004, 2006, 2009, 2012, and 2015. Vegetation sampling will occur within the project area using the protocols set forth prior to the development of CRMS in 2004, 2006, 2009, 2012, and 2015 unless TE-34 is constructed.

3. Water Level — To monitor water level variability, one continuous recorder will be located within each CTU and one recorder located in each reference area. One additional recorder will be located outside the project area on Bayou Penchant near the

northern most water control structure. Mean daily water level variability and duration and frequency of flooding prior to construction will be compared to mean daily water level variability and duration and frequency of flooding after construction within the project area. Mean daily water level variability and duration and frequency of flooding will also be compared between the project and reference areas. Water level will be monitored in 1996-2000 (pre-construction) and in 2001-2006 (post-construction). Upon collection of this data set, the TAG will assist the CRD Monitoring Manager with evaluation of the data and development of a sampling plan based on an approximate 30% reduction of effort, if technically advisable.

Based on the CRMS review, the reference area sondes will be replaced by CRMS stations 419, 294, and 398. Project sondes will remain unless TE-34 is constructed.

4. Salinity

To monitor salinities one continuous recorder will be located in each CTU and reference area. Descriptive and summary statistics will be used to compare salinities in the project area prior to construction to salinities in the project area after construction. Also, salinities will be compared between the project and reference area. Discrete salinities will be determined monthly at five sites within each CTU and reference area. Salinity will be monitored in 1996-2000 (pre-construction) and in 2001-2006 (post-construction). Upon collection of this data set, the TAG will assist the CRD Monitoring Manager with evaluation of the data and development of a sampling plan based on an approximate 30% reduction of effort, if technically advisable.

Based on the CRMS review, the reference area sondes will be replaced by CRMS stations 419, 294, and 398. Project sondes will remain unless TE-34 is constructed.

5. Accretion

Vertical Accretion will be determined in triplicity at each of the five representative stations within each CTU and reference area using techniques described in Steyer et al. (1995). The location of vertical accretion sites will correspond with the location of vegetation sampling sites. Sites will be sampled twice in 1996 and 1999 (pre-construction), and in 2002, 2004, 2006, 2009, 2012, and 2015 (post-construction).

Based on the CRMS review, CRMS stations 419, 294, and 398 will replace the reference area accretion sampling originally scheduled for 2004, 2006, 2009, 2012, and 2015. Project stations will remain unless TE-34 is constructed.

6. Submerged Aquatic Vegetation (SAV)

The frequency of occurrence of SAV will be compared between project and reference areas. Within the project (by CTU) and reference areas, 5 ponds will be sampled during Fall (October or November) twice in 1996 and 1999 (pre-construction) and in 2002 (post-construction). Methods described in Nyman and Chabreck (in press) will be used to determine the frequency of occurrence of SAV. Within each pond sampled, the presence/absence of SAV will be determined at 25 random points. Frequency of occurrence will be determined for each pond from the number of points at which SAV occurred and the total number of points sampled. When SAV occurs at a point, the species occurring will be listed.

Based on the CRMS review, SAV sampling originally scheduled for 2006, 2012, and 2015 was eliminated.

7. Marsh Mat Movement

To monitor marsh mat movement, one continuous recorder will be located within CTU #1 and one recorder located in CTU #1 reference area. Mean daily water level variability and duration and frequency of flooding of floating marshes will be determined by comparison to mean daily water level variability and duration and frequency of flooding after construction within the project area. Mean daily water level variability and duration and frequency of flooding of floating marshes will also be compared between the project and reference areas. Marsh mat movement will be monitored in 1998-2000 (pre-construction) and in 2001-2006 (post-construction).

Data obtained from CRMS stations 419, 294, and 398 will be used to compare the mean daily water level variability and duration and frequency of flooding of floating marshes.

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

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goals.

1. Descriptive and summary statistics on historical data (NBS 1956, 1978, 1988) and data from aerial photography and GIS interpretation collected during post-project implementation will be used to evaluate marsh to open water ratios and marsh loss rates. If sufficient historical information is available, regression analyses will be done to examine changes in slope between pre- and post conditions.

   Goal: Decrease rate of marsh loss.

2. The basic model of a repeated measures ANOVA will be BACI type model (Before-After-Control-Impact). This model will determine if there is a detectable impact (for example, in relative abundance of vegetation) in the project area after construction. Multiple comparisons will be used to compare individual means across different treatment levels. All original data will be analyzed and transformed (if necessary) to meet the assumptions of ANOVA.

Goal: Increase species richness and relative abundance of plant species typical of a freshwater and intermediate marsh.

Hypothesis A:

H_0: Species richness of vegetation within CTU (a) at time i will not be significantly greater than the species richness of vegetation within reference area (a) at time i.

H_a: Species richness of vegetation within the CTU (a) at time i will be significantly greater than the species richness of vegetation within reference area (a) at time i.

If we fail to reject the null hypothesis, any possible negative effects will be investigated

Hypothesis B:

H_0: After project implementation at time i, species richness of vegetation will not be significantly greater than before project implementation.

H_a: After project implementation at time i, species richness of vegetation will be significantly greater than before project implementation.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

Hypothesis A_1

H_0: Relative abundance of vegetation within CTU (a) at time i will not be significantly greater than the relative abundance of vegetation within reference area (a) at time i.

H_a: Relative abundance of vegetation within CTU (a) at time i will be significantly greater than the relative abundance of vegetation within the reference area (a) at time i.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

Hypothesis B_1:

H_0: After project implementation at time i, relative abundance of vegetation will not be significantly greater than before project implementation.

H_a: After project implementation at time i, relative abundance of vegetation will be significantly greater than before project implementation.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

3. The primary method of analysis will be to determine differences in daily mean water level variability by descriptive and summary statistics between the project and reference area. Ancillary data (i.e., precipitation, historical) will be included as covariables when available. This additional information may be evaluated through analysis such as correlation, trend, multiple comparisons, and interval estimation. In addition, duration and frequency of flooding in relation to marsh elevation will be determined within the project and reference areas. These analyses will allow for the evaluation of goal 2.

Goal: Decrease mean daily water level variability within the project area.

Hypothesis A:

H_0: Mean daily water level variability within CTU (a) will not be significantly less than the mean daily water level variability within reference area (a) at time i.

H_a: Mean daily water level variability within CTU (a) will be significantly less than the mean daily water level variability within reference area (a) at time i.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

Hypothesis B:

H_0: After project implementation at time i, mean daily water level variability Will not be significantly less than before project implementation.

H_a: After project implementation at time i, mean daily water level variability will be significantly less than before project implementation.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

4. The primary method of analysis will be to determine differences in salinity levels using descriptive and summary statistics between the project and reference area. Ancillary data (i.e., precipitation, historical) will be included as covariables when available. This additional information may be evaluated through analysis such as correlation, trend, multiple comparisons, and interval estimation.

Goal: Decrease mean variability of salinities in the southern portion of the project area.

Hypothesis A:

H_0: Mean variability of salinity within CTU 3 at time i will not be significantly less than the mean variability of salinity within reference area 3 at time i.

H_a: Mean variability of salinity within CTU 3 at time i will be significantly less than the mean variability of salinity within reference area 3 at time i.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

Hypothesis B:

H_0: After project implementation at time i, mean variability of salinity within CTU 3 will not be significantly less than before project implementation.

H_a: After project implementation at time i, mean variability of salinity within CTU 3 will be significantly less than before project implementation.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

5. The primary method of analysis for vertical accretion will be to determine differences in mean vertical accretion rate as evaluated by a repeated measures ANOVA that will consider both spatial and temporal variation and interaction. The basic model of ANOVA will be BACI type model (Before-After-Control-Impact). This model will determine if there is a detectable impact (for example, increase in vertical accretion rate) in the project area after construction. All original data will be analyzed and transformed (if necessary) to meet the assumptions of ANOVA (e.g. normality). This analysis will allow for the evaluation of goal 5.

Goal: Increase vertical accretion rate.

Hypothesis A:

H_0: The mean vertical accretion rate within CTU (a) at time i will not be significantly greater than the mean vertical accretion rate within reference area (a) at time i.

H_a: The mean vertical accretion rate within CTU (a) at time i will be significantly greater than the mean vertical accretion rate within reference area (a) at time i.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

Hypothesis B:

H_0: After project implementation at time i, mean vertical accretion within each CTU will not be significantly greater than before project implementation.

H_a: After project implementation at time i, mean vertical accretion within each CTU will be significantly greater than before project implementation.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

6. The primary method of analysis for SAV occurrence will be to determine the mean frequency of SAV in the project and reference areas as evaluated by a repeated measures ANOVA that will consider both spatial and temporal variation and interaction. The basic model of ANOVA will be the BACI type model (Before-After-Control-Impact). This model will determine if there is a detectable impact (for example, decrease in SAV occurrence) in the project area after construction. Multiple comparisons will be used to compare individual means across different treatment levels. All original data will be analyzed and transformed (if necessary) to meet the assumption of ANOVA (e.g. normality). These analyses will allow for the evaluation of goal 6.

Goal: Increase frequency of occurrence of SAV.

Hypothesis A:

H_0: Mean SAV occurrence in CTU (a) at time i will not be significantly higher than the mean SAV occurrence in reference area (a) at time i.

H_a: Mean SAV occurrence in CTU (a) at time i will be significantly higher than the mean SAV occurrence in reference area (a) at time i.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

Hypothesis B:

H_0: Mean SAV occurrence in each CTU at time i will not be higher than the mean SAV occurrence in each CTU area at preconstruction.

H_a: Mean SAV occurrence in each CTU at time i will be significantly higher than the mean SAV occurrence in each CTU at preconstruction.

If we fail to reject the null hypothesis, any possible negative effects will be investigated.

NOTE: Available ecological data, including both descriptive and quantitative data, will be evaluated in concert with the statistical analysis to aid in determination of overall project success. This includes ancillary data collected in the monitoring project but not used directly in statistical analysis, as well as data available from other sources (USACE, NWRC, DNR, LSU, etc.).

<u>Notes</u>

1.	Implementation:	Start Construction:	February 27, 1998
		End Construction:	June 27, 1999
2.	NRCS Point of Contact	Marty Floyd	(318) 473-7690
3.	DNR Project Manager:	Hilary Thibodaux	(985) 449-5105
	DNR Monitoring Manager:	Todd Folse	(985) 447-0996

4. The twenty year monitoring plan development and implementation budget for this project is $1,084,338. Pursuant to the CRMS review, it was authorized by the Task Force to maintain $1,026,513 with the project, and utilize $57,825 to support CRMS. Progress reports will be available in 2001, and 2002. Periodic comprehensive reports on coastal restoration efforts in the Terrebonne hydrologic basin will describe the status and effectiveness of the project as well as cumulative effects of restoration projects in the basin.

5. DNR staff conducted a field investigation of the project area and reference area on December 17,1995.

6. DNR/CRD staff conducted a field trip in March, 1996 with NBS and NRCS personnel to determine location of sampling stations.

7. Specific goals will be analyzed by project area and CTU units.

8. References:

Chabreck R. H. 1968. Vegetative type map of the Louisiana coastal marshes. Louisiana Department of Wildlife and Fisheries, New Orleans.

Chabreck, R. H., and G. Linscombe 1978. Vegetative type map of the Louisiana coastal marshes. Louisiana Department of Wildlife and Fisheries, New Orleans.

Chabreck,R. H., and G. Linscombe 1988. Vegetative type map of the Louisiana coastal marshes. Louisiana Department of Wildlife and Fisheries, New Orleans.

Dunbar, J. R., L. D. Britsch, and E. B. Kemp III 1992. Land loss rates: Louisiana Coastal Plain. Technical Report GL-90-2 U.S. Army Corps of Engineers.

Knauss, R. M., and D. R. Cahoon 1990. Improved cryogenic coring device for measuring soil accretion and bulk density. Journal of sedimentary Petrology, 60:622-23.

Mueller-Dombois, D., and H. Ellenberg 1974. Aims and Methods of Vegetation Ecology. New York: John Wiley and Sons, Inc. 547 pp.

Nyman, J. A., and R. H. Chabreck n.d. Some effects of 30 years of weir management on coastal marsh aquatic vegetation implications to waterfowl management. Gulf of Mexico Science. (in press)

Steyer, G. D., R. C. Raynie, D.L. Steller, D. Fuller and E. Swenson 1995. Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no.95-01. Baton Rouge: Louisiana Department of Natural Resources, CRD.

United States Department Of Agriculture Natural Resources Conservation Service 1995. Project Plan and Environmental Assessment for Brady Canal Hydrologic Restoration. Terrebonne Parish, Louisiana.

TE28mp2003-08-14.wpd