State of Louisiana
Department of Natural Resources
Coastal Restoration Division

Monitoring Plan

for

West Pointe a la Hache Siphon Construction

State Project Number BA-04
Priority Project List 3

August 2003
Plaquemines Parish

Prepared by:

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MONITORING PLAN

PROJECT NO. BA-04 WEST POINTE A LA HACHE FRESHWATER DIVERSION

ORIGINAL: MARCH 01, 1992
REVISED DATE: MAY 15, 1996
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, 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. 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, 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 and a subsequent decision to better coordinate monitoring with the BA-03c project, which is a similar project, but with outfall management. Based on those reviews an additional photography was added in 2017, emergent vegetation sampling and hydrologic sampling were extended through 2012, and the CRMS station in the project area will replace one of the project-specific sonde stations. These changes have been incorporated into this revised Monitoring Plan in the Monitoring Elements section.

Project Description

The West Pointe a la Hache project area contains approximately 9,300 acres of open-water and 7,600 acres of brackish marsh and is located within the Barataria Basin in Plaquemines Parish, Louisiana. The area includes Lake Judge Perez to the northwest, and is bound to the south by Bayou Grand Cheniere, to the southeast by the Socola Canal, and to the north by the Mississippi River back protection levee (figure 1). The freshwater diversion structure is located at river mile 48.9 (above head of passes) at West Pointe a la Hache, Louisiana, and consists of eight 72-in. diameter siphon tubes with a combined maximum discharge of 2,144 cubic feet per second (cfs). The siphon empties into a designated discharge pond, maintained by 2,500 cubic yards of riprap, with four outfall channels (Brown & Root, Inc. 1992). All operational changes are performed by Plaquemines Parish government (PPG). These changes are influenced by an operations scheme developed in 1992 by Brown and Root, Inc., based on an environmental model and subsequently revised by PPG and the Louisiana Department of Natural Resources, Coastal Restoration Division (LDNR/CRD). This revision calls for the siphon to be operated at 8 pipes in January and February, 2 pipes in March and April, and 8 pipes from May through December.

Vegetation is dominated by marshhay cordgrass *(Spartina patens)* and smooth cordgrass (*Spartina alterniflora*). Other common species include olney threesquare *(Scirpus olneyi)* and saltmarsh bulrush (*Scirpus maritimus*); widgeongrass (*Ruppia maritima*) is the most common submerged aquatic (Brown & Root, Inc. 1992). Chabreck and Linscombe characterized the area as brackish marsh in 1988.

The project area consists of the Gentilly muck, Lafitte-Clovelly muck, and Timbalier-Belle Pass soil types. The Gentilly muck is found mainly along the Grand Cheniere natural ridge system and is characterized as very poorly drained, very fluid mineral soils. The Lafitte-Clovelly muck is scattered throughout the inner marsh and is characterized as very poorly drained, very fluid, slightly saline and organic soils. The Timbalier-Belle Pass association is characterized as very poorly drained organic soils. The surface layer of all the soils within the project area is organic and very susceptible to erosion especially when not protected by vegetation (U.S. Soil Conservation Service 1991).

The project area, as is true with the rest of the Barataria Basin, suffers from a lack of fresh water and sediment resulting from construction of the flood control levee along the Mississippi River. Moreover, valuable nutrients have been reduced by stopping the annual cycle of flooding that occurred when the river was not levied (Brown and Root, Inc. 1992). Increased channelization in the area has resulted in the export and loss of much organic marsh soils from the project area. Natural subsidence in the area compounds the man-made causes of wetland loss mentioned above. Subsidence rate based on U.S. Army Corps of Engineers (USACE) tide gage readings (1947-78) at Bayou Rigaud, Grand Isle, La., is 0.80 cm/yr (Penland et al. 1989).

The average rate of change of marsh to non-marsh (including loss to both open water and commercial development) has been increasing since the 1930's. Marsh loss rates for the Pointe a la Hache quadrangle were 0.28mi^2/year between 1932 and 1958, 0.75 mi^2/year between 1958 and 1974, 0.71mi^2/year between 1974 and 1983, and 0.75mi^2/year between 1983 and 1990 (Dunbar et al. 1992).

Project Objectives

1. Protect the project area from continued degradation by introducing into the area freshwater from the west bank of the Mississippi River.

2. In doing so the project also seeks to increase the inflow of sediment and nutrients into the project area and to improve growing conditions for the target plant species (*Spartina patens*).

Measure effectiveness with data from monitoring element #	Specific Goals
	The following goals will contribute to the evaluation of the above objectives:

1	1.	Increase marsh to open-water ratio.
2	2.	Reduce mean project area salinity.
2, 3, 4	3.	Improve growing conditions for and increase relative abundance of target plant species (*Spartina patens*).

Monitoring Elements

1) Aerial Photography- To document marsh to open-water ratios and marsh loss rates color-infrared aerial photography (1:12,000) will be obtained. Photography was obtained prior to construction in 1993 and in 1999 post-construction, and land-water analyses were completed. Additional photography will be obtained in 2009 and 2017.

2) Salinity- Salinity will be measured monthly at 16 stations in the project area where both a surface and a bottom reading will be obtained. In addition, five continuous recorders will be located within the project area that will measure salinity hourly. Salinity data will be collected from 1992-2012.

As a result of the CRMS review, station BA04-17 was replaced by CRMS-258. However, the four other project-specific recorders will be maintained, for a total of 5 recorders.

3) Water level- Water level will be sampled monthly at five staff gauge stations located in the project area. In addition, five continuous recorders (same as for salinity) will be located within the project area that will monitor water level hourly. staff gauges and continuous recorders will be surveyed to the North American Vertical Datum of 1988. Marsh elevation will also be surveyed at each site and used to determine duration and frequency of flooding. Water level data will be collected from 1992-2012 at the same stations as those for salinity.

4) Vegetation- Species composition and relative abundance will be evaluated using techniques described in Steyer et al (1995). More specifically, the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974) will be utilized. Vegetation was surveyed before construction in 1992 and in post-construction years 1995, 1997, 2001, and 2003. Additional surveys will be conducted in 2006, 2009, and 2012.

Anticipated Statistical Tests and Hypotheses

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

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

   Goal: Increase marsh to open-water ratio.

2) The primary method of analysis will be to determine differences in mean salinity as evaluated by an 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. This additional information may be evaluated through analysis such as: correlation, trend, multiple comparisons, and interval estimation. Exploratory data analysis will be used to determine appropriate variable for hypothesis testing (e.g. daily, weekly intervals).

   Goal: 1) Reduce mean project area salinity.
   2) Improve growing conditions for and increase relative abundance of target plant species (Spartina patens).

   Hypothesis:

   H_o: Mean salinity within the project area postoperation **WILL NOT** be significantly lower than the mean salinity within the project area preoperation.

   H_a: Mean salinity within the project area at postoperation **WILL** be significantly lower than the mean salinity within the project area preoperation.

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

3) Descriptive and summary statistics on historical data (1956, 1978, 1988) and data collected during both pre- and postoperation will be used to evaluate project area water levels. Marsh elevation will be used with continuous recorder data to calculate frequency and duration of flooding within the project area. This information will aid the assessment of the area for suitability of growing conditions for the target plant species.

   Goal: Improve growing conditions for and increase relative abundance of target plant species (Spartina patens).

4) The primary method of analysis will be to determine differences in relative abundance of vegetation as evaluated by an ANOVA that will consider *both* spatial and temporal variation and interaction. The ANOVA approach may include terms in the model to adjust for station/transect locations, proximity to structures, and seasonal fluctuations. Ancillary data (i.e. herbivory, 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: Improve growing conditions for and increase relative abundance of target plant species (Spartina patens).

Hypothesis:

H_o: Mean relative abundance of target vegetation within the project area postoperation **WILL NOT** be significantly greater than the mean relative abundance of target vegetation within the project area preoperation.

H_a: Mean relative abundance of target vegetation within the project area postoperation **WILL** be significantly greater than the mean relative abundance of target vegetation within the project area preoperation.

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

Notes

1) Planned Implementation:

Start construction	January 28, 1991
End construction	April 30, 1992
Initially Opened	January 12, 1993

2)

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3) All plans and implementations will be mutually developed and completed with Plaquemines Parish Government.

4) The project area was last flown for color infrared aerial photography (1:12,000) by Gulf Coast Aerial Mapping on November 10, 1993 for LDNR/CRD.

5) 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.

6) Any additional sources of data (i.e. LDWF, Corps of Engineers, LDHH, etc.) will be used to better develop monitoring protocol and in evaluation of project effectiveness.

7) All health related monitoring will be performed by Plaquemines Parish Government (PPG) (i.e. fecal coliform levels).

8) In addition to the aforementioned monitoring elements, the following parameters will also be measured and/or observed:
    a) Daily discharge rates and volumes
    b) Monthly visual inspection of turbidity plume

References

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