ANNUAL MONITORING REPORT

WEST POINTE A LA HACHE
BA-4

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DNR Project No.: 21600-89-10

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BA-4 PLAQUEMINES PARISH

Project Description and Goals

The West Pointe a la Hache Diversion Siphons are located on the west bank of the Mississippi River at river mile 48.9 above Head of Passes in Plaquemines Parish, Louisiana (figure 1). This diversion structure should influence 9200 acres of marsh in the outfall area. The project area is bound by Lake Hermitage to the north, the Bayou Grande Cheniere ridge to the south and west, a forced drainage system levee to the east. The approximate outfall area center is at latitude 29°31'46" and longitude 89°48'27"

Greater than 95% of the marsh in the project area classified as brackish in 1949 by O'Neill (SCS 1991). This marsh was dominated by three-cornered grass (*Scirpus olneyi*) and marshhay cordgrass (*Spartina patens*). The remainder of the project area was classified as excessively drained saltmarsh, which was predominantly tidal influenced and composed of mainly black needlerush (*Juncus roemerianus*), marshhay cordgrass, and smooth cordgrass (*S. alterniflora*).

The project area classification by Chabreck and Linscombe in 1978 revealed a vegetation shift from the 1949 classification. In

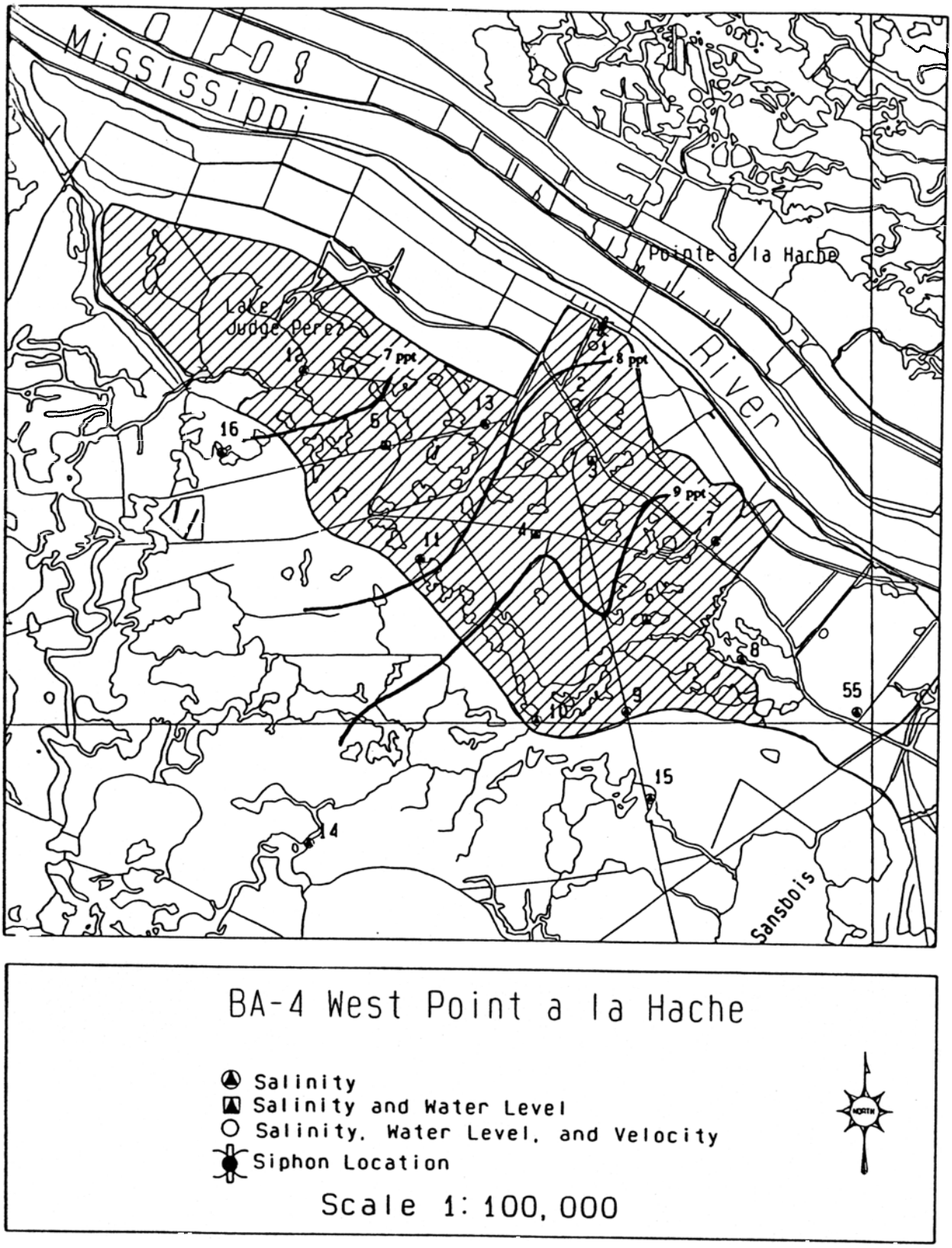

Figure 1. Location of project area, diversion siphons, and biweekly sampling stations near Pointe a la Hache, Louisiana. A real time Data Collection Platform (DCP) is located at station 2, approximately 1 mile from the discharge pond. Isohalines represent mean salinity from weekly and biweekly sampling between May 28 and December 29, 1992.

1978, approximately 66% of the area was classified as saline marsh, as brackish marsh, and 6% was non-marsh area. The vegetation change can be mainly attributed to saltwater intrusion via tidal exchange from the Gulf of Mexico through Barataria Bay. This was facilitated by canal dredging, stream channelization, and a freshwater infusion decrease

The West Pointe a la Hache Diversion Siphons are designed to divert a maximum of 2144 cubic feet per second (average 1050 cfs) of freshwater from the Mississippi River into the westbank wetlands to retard saltwater intrusion. This will stabilize the salinity environment, promote vegetational growth and enhance fish and wildlife productivity.

The objectives of this diversion project are to stabilize salinities, promote growth of emergent and submergent vegetation increase overland flow distribution of freshwater. These objectives should be met by introducing freshwater, sediment, and nutrients from the Mississippi River

Project Status

The West Pointe a la Hache Freshwater Diversion project was included in the 1990-1991 Coastal Wetlands Conservation and Restoration Plan. A Feasibility Report was prepared by the USDA-Soil Conservation Service (SCS) on September 30, 1991, project construction was completed in April 1992, and water quality monitoring began in May 1992. The siphon structure has been operational since April 1992; however, it was not operated (other than tests) until January 1993. Plaquemines Parish is responsible

structure operations with technical and financial assistance from the Department of Natural Resources/Coastal Restoration Division (DNR/CRD). The implemented monitoring plan was cooperatively developed between Plaquemines Parish Government (PPG) DNR/CRD. The monitoring plan includes collecting water temperature, salinity, water level, siphon discharge, and spatial and temporal changes in vegetative community types. DNR/CRD has a real time Data Collection Platform (DCP) that has been collecting hourly data since March 1992 (figure 2). Salinity, water level, and fecal coliform data were collected weekly by Plaquemines Parish personnel between May 28 and November 19, 1992. DNR/CRD began collecting biweekly salinity and water level data on November 19, 1992.

DNR/CRD personnel currently collect salinity data at 17 stations in the outfall area using a YSI Model 33 Salinometer Water levels are monitored at five stations in the project area by reading staff gauges put in place by contracted surveyors. These staff gauges are calibrated to Cairo Datum (National Geodetic Vertical Datum (NGVD) + 20.43 ft). Baseline vegetative data were collected on June 23 and 24, 1992 with the use of color infrared photographic prints of the project area (1:12000 scale). Post-implementation water quality data collection will continue through 1993 to allow for project evaluation.

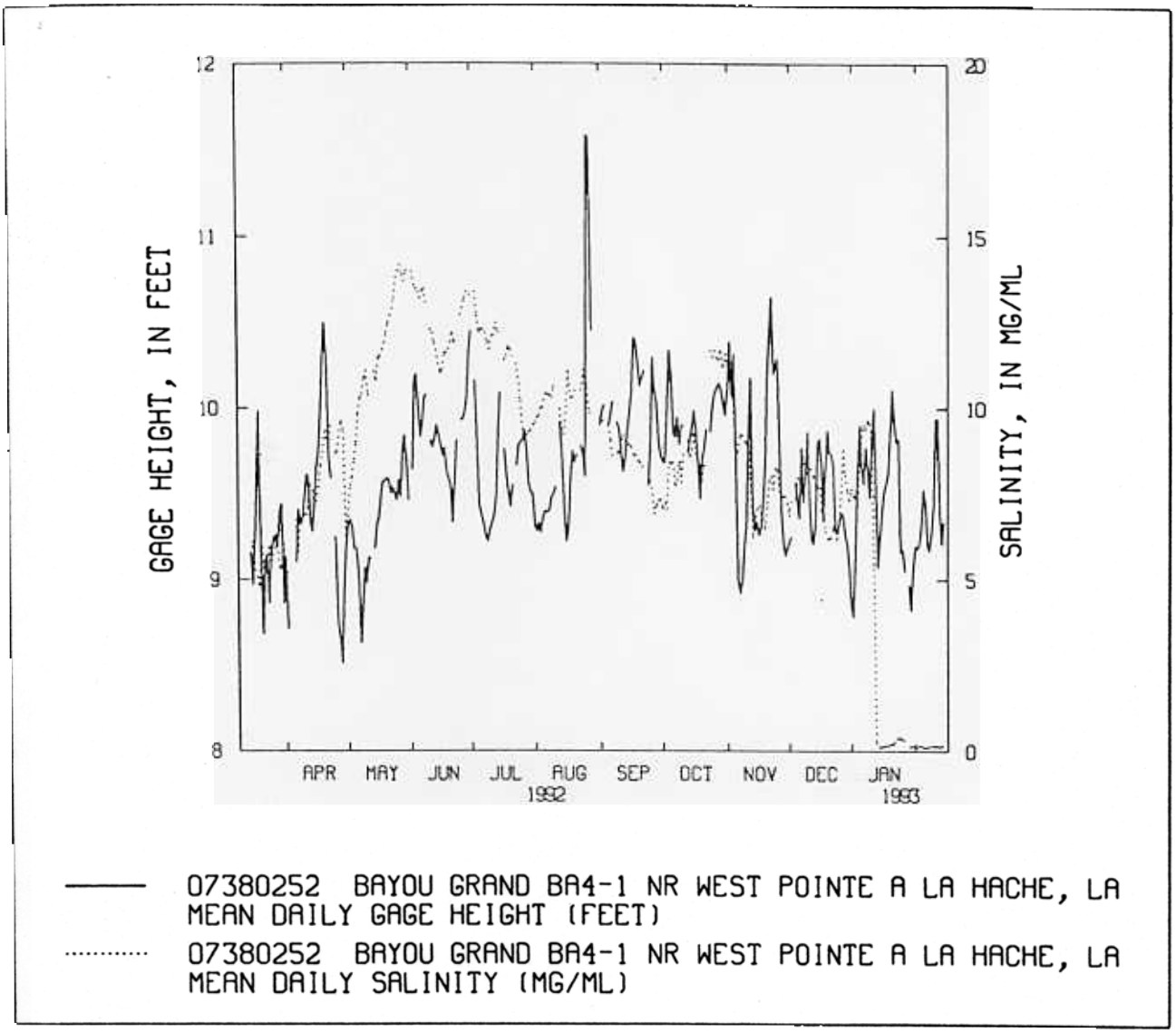

Figure 2. Daily mean salinity and water level at the real time Data Collection Platform (DCP) within the West Pointe a la Hache project area. The DCP is located at station 2 on Figure 1, approximately 1 mile from the discharge pond. Notice the drastic drop in salinity on January 12, 1993 when the diversion siphons were opened.

INTRODUCTION

Subsidence and saltwater intrusion are two of the most important factors contributing to environmental changes in the Barataria Basin. Additional processes accelerate these adverse changes and create subsequent wetland loss. Substantial documentation exists that relates the loss of fresh and intermediate marsh acreage to marine influences. According to Sasser et al. (1986), "Marsh loss rates have been highest (in Barataria Basin) where freshwater marshes have been subject to saltwater intrusion." With the wetland loss and the associated tidal exchange increase and freshwater retention decrease, the major estuarine resources of the area will also be adversely affected. Sediment and freshwater inputs are important for maximizing estuarine productivity (including fish and wildlife).

The West Pointe a la Hache freshwater diversion system was designed to divert freshwater, sediment, and nutrients from the Mississippi River into the adjacent marshes to reduce wetland loss in the Barataria Basin. The structure is located on the west bank of the Mississippi River in Plaquemines Parish, Louisiana at river mile 48.9 Above Head of Passes (AHP; figure 1). This project should influence 9200 acres of marsh in the outfall area which is bound by Lake Hermitage to the north, the Bayou Grande Cheniere ridge to the south and west, and a forced drainage system levee to the east. The approximate outfall area center is located at latitude 29°31'46" and longitude 89°48'27" Existing soils,

hydrology, salinity, plant community, and wetland type data for this area are presented in a September 30, 1991 feasibility report prepared by the USDA-Soil Conservation Service (SCS) and in a July 1992 management, operation, and monitoring plan compiled for Plaquemines Parish by Brown & Root, Inc.

In these documents, the soils are characterized as subject to erosion when not protected by vegetation and subject to subsidence when dry. The soil types identified include Gentilly Muck, Lafitte Muck, Clovelly Muck, Timbalier Muck, and Bellpass Muck. All of these soil types are typically very poorly drained and have low strength for supporting structures.

The hydrology was described as modified from the natural Grande Cheniere Bayou and Grand Bayou systems by construction of the Texaco Pipeline channel, of oil field channels and slips, and of the Mississippi River flood protection levee. These modifications caused increased tidal influences and have deprived the area of annual sediment-laden freshwater flooding from the Mississippi River. These modified conditions are conducive to increased erosion and subsidence rates.

This area has converted from approximately 10% open water in 1958 to approximately 42% in 1984. Also during this time, the ratio of water to land increased from 10.41% to 43.28% (Ensminger 1992). Greater than 95% of the marsh was classified as brackish in 1949 by O'Neill (SCS 1991) This marsh was dominated by three-cornered grass (*Scirpus olneyi*) and marshhay cordgrass (*Spartina patens*). The remainder of the project area was classified as

excessively drained saltmarsh, which was predominantly tidal influenced and composed of mainly black needlerush (*Juncus roemerianus*), marshhay cordgrass, and smooth cordgrass *alterniflora*).

The project area classification by Chabreck and Linscombe in 1978 revealed a vegetation shift from the 1949 classification (>95% brackish). In 1978, approximately 66% of the area was classified as saline marsh, 28% as brackish marsh, and 6% as non-marsh area. The vegetation change is mainly from saltwater intrusion via tidal exchange caused by canal dredging, stream channelling, and a freshwater infusion decrease. Salinities in the southern end of the project area average over 15 ppt. These high salinities coincide with the greatest vegetational change.

The objectives of this diversion project are to stabilize salinities, promote growth of emergent and submergent vegetation, and increase overland flow distribution of freshwater. These objectives should be met by introducing freshwater, sediment, nutrients from the Mississippi River.

The specific diversion system design consists of an intake structure, eight 6-ft diameter welded steel siphon pipes, a vacuum pipe, a discharge pond lined with 38,000 ft^2 of riprap, and four outfall channels. The structure can deliver approximately 2,144 cu. ft of water per second (cfs) during high river stages. The monthly discharge will be regulated using an operating plan as a guide to achieve optimal benefits. DNR/CRD may modify the

discharge scheme, with agreement from Plaquemines Parish, as operating environment changes

The West Pointe a la Hache structure is a controlled siphon diversion. The operation schedule has been developed to achieve year-round flow (river stage permitting) while balancing the need for freshwater/nutrient introduction and the need to limit adverse effects often created when introducing a large volume of fresh water to existing resources. The siphons' operational scheme based on vegetation tolerances to sustained inundations in immediate outfall area. Consideration was also given to major periods of the year that the marsh is used by aquatic organisms Although the maximum discharge rate is 2144 cfs, the siphons will operate at various rates depending on the time of year. Through proper operation of the diversion structure, approximately 9200 acres of wetlands will be protected and enhanced from potential degradation.

The Corps of Engineers issued the construction permit for the diversion structures to Plaquemines Parish Government on October 13, 1989; construction was completed in April 1992; and water quality monitoring began in May 1992. The siphon structure has been operational since April 1992. It was not operated (other than tests), however, until January 12, 1993. Plaquemines Parish is responsible for structure operations (with financial assistance from DNR). To evaluate the success of the diversion siphons, a monitoring plan, developed between Plaquemines Parish Government (through Brown & Root) and DNR/CRD, has been implemented. This

monitoring plan includes the collection of temperature, salinity, water level, siphon discharge, vegetative species composition, and land/water ratios over time. DNR/CRD also has a DCP which has been collecting water level, conductance, salinity, velocity, and water temperature since March 1992.

METHODS

Construction Methods

The specifications and contracts for the diversion structure construction were completed by Prescott Follett & Associates Incorporated (June 29, 1990) and construction was subcontracted to River Road Construction, Inc. by Plaquemines Parish. Actual construction began in December 1990. This construction included the placing of eight 72-in. diameter siphon pipes, river structures, levee, discharge pond and canals, and other site work as per the design plans submitted by Prescott Follett & Associates Incorporated. The only necessary plan modification was to shorten outfall channels because right-of-way was denied

Aztec Development Company dredged the diversion canals using a Jet Spray channel excavation system. This technique is a relatively new method of thinlift aerial placement of well-slurried dredged material through horizontally and vertically controlled and elevated directional nozzles. This method of canal dredging provides near-vertical placement of dredge spoil (generally 2 in. or less) on top of existing marsh without creating spoilbanks that impede water movement over the marsh (Deal 1990).

Monitoring Methods

DNR/CRD personnel currently collect salinity data at 17 stations in the outfall area. Salinity data are collected at 20% and 80% of the water depth using a YSI Model 33 Salinometer.

Water levels are monitored at five stations by reading staff gauges put in place by contracted surveyors. These staff gauges are calibrated to Cairo Datum (National Geodetic Vertical Datum (NGVD) + 20.43 ft).

DNR/CRD has a real time DCP in the outfall area which has been collecting continuous water level, conductance, salinity, water velocity, and water temperature data since March 1992

Baseline vegetative data were also collected on June 23 and 24, 1992 by using color infrared photographic prints of the project area (1:12,000 scale). The vegetative zones were ground truthed by identifying species, landmarks, waterways, etc. in the field at different stations. The project area was then mapped with vegetative zones, stations, and landmarks in place. For a more detailed description of methods see Appendix B

RESULTS

The West Pointe a la Hache freshwater diversion siphons were not operated until January 12, 1993. Consequently, all the data collected to this point have been pre-project monitoring. Therefore, the results of the monitoring efforts at this time must be limited to descriptive statistics of the baseline data.

An extensive effort was made to document vegetative communities at each section of the outfall management area. Some sites were beyond the diversion siphon's expected limits of influence; however, these sites should serve as comparative areas for future investigations (figure 1

Wetlands in the outfall area are typically brackish and low salinity saline marsh. The dominant plant species observed were smooth cordgrass (*Spartina alterniflora*) and marshhay cordgrass (*S. patens*). Salt grass (*Distichlis spicata*) is common along pond margins and natural waterways where the elevation is slightly higher. Widgeongrass (*Ruppia maritima*) is the dominant aquatic vegetation throughout the study area. One small area of coontail (*Ceratophyllum demersum*) was noted in the discharge canal of a pumping station

Sparse stands of three-cornered grass (*Scirpus olneyi*) and saltmarsh bullrush (*S. maritimus*) were observed in several sections; however, these species were not dominant in any areas. Nutria and muskrat feeding was evident in areas containing these two plant species. For a more detailed description of each vegetative site see Appendix B

Results from the baseline salinity data indicate that overall salinities are lower in the northwest and higher towards the southeast (table 1 and figure 1). Mean salinities between May 28 and December 29, 1992 ranged from 6.8 ppt at station 12 to 10.0 at station 55. The high variability in bottom salinities suggests this area is influenced by tidal fluctuations (figure 3). Minimum salinities ranged from 2.4 ppt at station 12 to 6.5 ppt at stations 10 and 15. Maximum salinities ranged from 14.4 ppt at station 12 to 18.1 ppt at station 4.

Salinity data from the real time DCP support the findings from the weekly and biweekly salinity data. Real time data have been collected since March 1992 and indicate that highest seasonal salinities were found in June and July and lower salinities were recorded in March and April 1992 (figure 2).

Water levels between May and December 1992 had small variability. Surface water elevation at all five of the staff gauge locations was typically between 21.0 and 22.0 ft Cairo Datum (figure 4). Elevations were slightly higher in September and October 1992 (when salinities were low) and showed a decreasing trend through December.

Water level undulations from real time DCP data suggest that water levels in this area are periodically influenced by frontal passages (figure 2). Elevated water levels from Hurricane Andrew are also apparent in August 1992 (figure 2); however, it should be noted that salinities at this site were not drastically affected by the hurricane.

Table 1. Mean, minimum, maximum salinities and standard deviations by station at West Pointe a la Hache (BA-4) between May 28 and December 29, 1992.

	Salinity			
Station	Mean	Minimum	Maximum	Standard Deviation
1	7.7	3.8	15.4	3.101
2	8.2	4.4	17.7	3.556
3	8.7	4.3	16.0	3.405
4	8.9	5.6	18.1	3.493
5	7.2	3.9	15.0	3.210
6	9.6	6.1	17.2	3.110
7	9.4	5.1	17.8	3.730
8	9.8	6.3	17.8	3.591
9	9.4	6.3	18.0	3.473
10	9.6	6.5	16.8	3.261
11	7.8	5.0	15.9	2.974
12	6.8	2.4	14.4	3.449
13	7.6	4.4	15.1	3.240
14	9.5	5.8	17.6	3.808
15	9.8	6.5	17.5	3.360
16	7.3	3.6	15.7	3.489
55	10.0	5.9	17.5	3.393

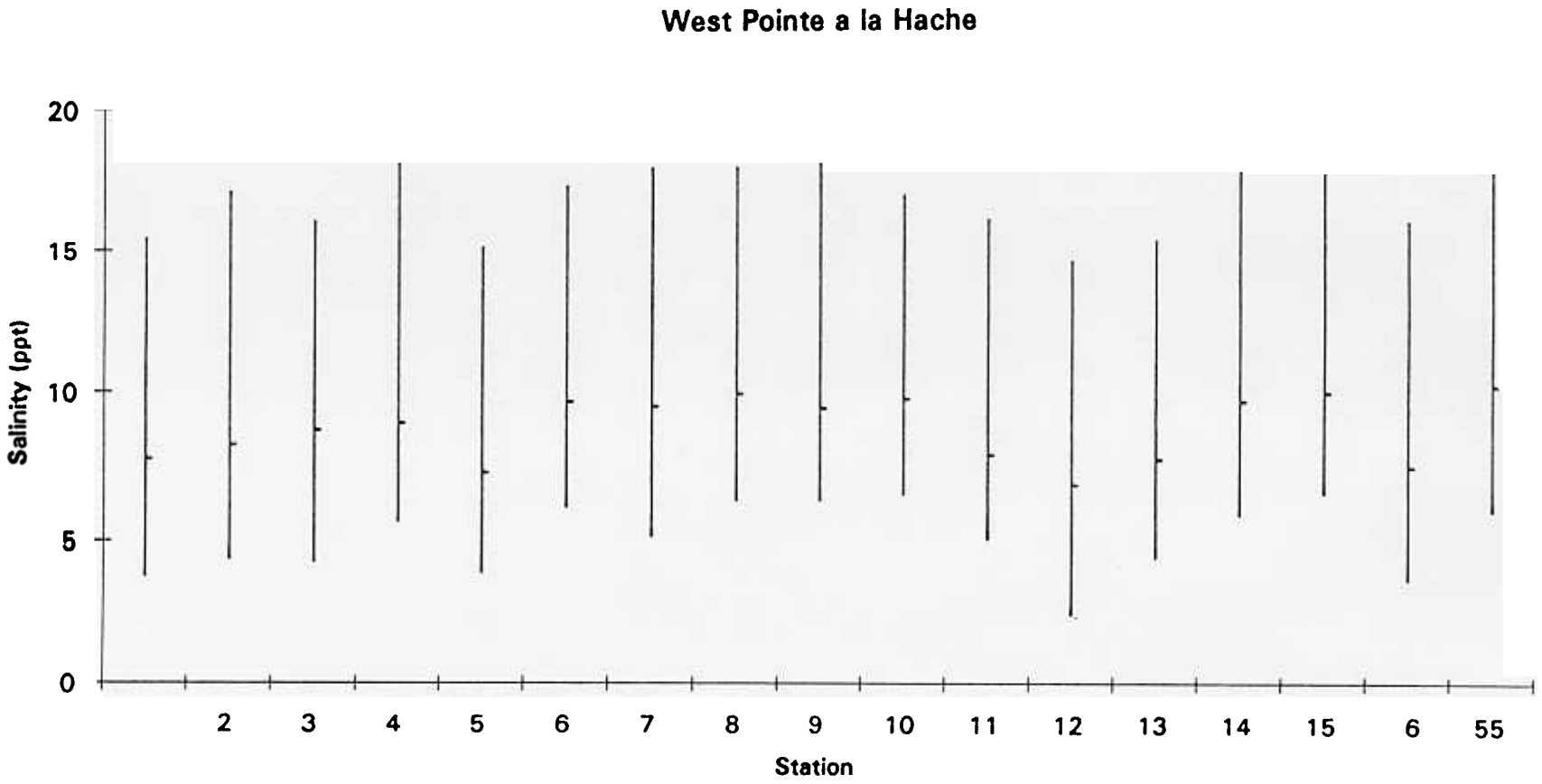

Figure 3. Mean, minimum, and maximum salinities from weekly and biweekly sampling trips for each station between May 28 and December 29, 1992.

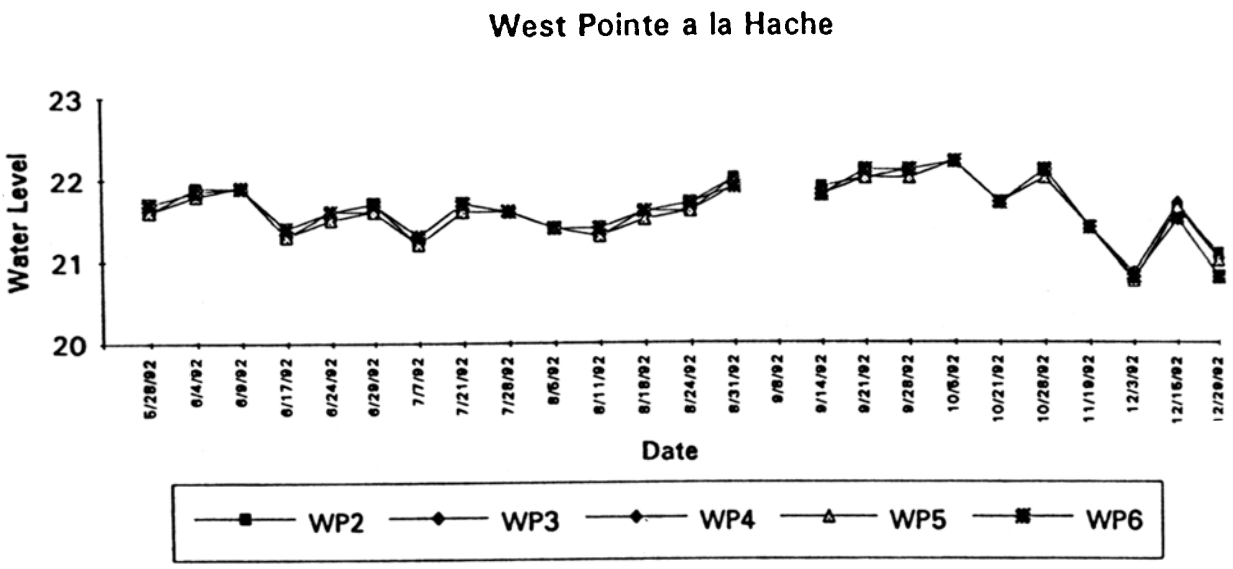

Figure 4. Water levels from bi-weekly sampling trips in the outfall area of the West Point a la Hache diversion siphons from stations WP 2-6.

DISCUSSION

DNR/CRD personnel are sampling the outfall area from the West Pointe a la Hache diversion siphons at 17 stations every two weeks. Salinity, temperature, and water level values are recorded to monitor freshwater introduction effects. In addition, vegetative monitoring stations have been established and are monitored twice each year to qualify diversion effects on the vegetative communities. Near-vertical color infrared photography was taken in December 1990 and in November 1991 (1:12,000 scale) and will be taken every five years to assess the change in land:water ratios and vegetative communities on a large scale. The current monitoring plan was designed to assess whether or not the freshwater diversion can satisfy the goals and objectives identified by the project plan. The type of data collected will be sufficient to evaluate the project success; however, at this time, evaluation is not possible because the diversion structure has only been operating since January 1993. The data collected to this point have been baseline data and can be used to characterize the project area prior to diversion siphon operation.

The project area is brackish and lower saline marsh. The dominant vegetative species are smooth cordgrass and marshhay cordgrass. Mean salinities from May through December 1992 were between 6.8 and 10 ppt and increased from north to south. Water levels appear to be fairly stable (21-22 ft Cairo Datum). Evidence of tidal influence is apparent near the southern boundary where salinities are generally higher

By properly operating the diversion siphons, this 9200-acre area will benefit from decreased salinities and increased sediment deposition. The dominant vegetative types should reflect the freshwater influence and sediment deposition should minimize subsidence effects. The long-term siphon effects, however, will remain to be seen.

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