

CS-31

Holly Beach Sand Management Summary Data and Graphics



Updated 8/26/03

Mouledous, M. 2003. *CS-31 Holly Beach Sand Management Summary Data and Graphics*, Louisiana Department of Natural Resources, Coastal Restoration Division, Baton Rouge, Louisiana. 24 pp.

Holly Beach Sand Management (CS-31)

Project Overview:

The Holly Beach Sand Management (CS-31) project area is located between the communities of Holly Beach and Constance Beach on the Gulf of Mexico shoreline of southwestern Louisiana, west of Calcasieu Pass in Cameron Parish. The project area is comprised of approximately 10,849 acres (4,426 ha), of which 8,900 acres (3,603 ha) are classified as wetlands (U.S. Geological Service, National Wetland Research Center [USGS-NWRC] 2001). The project area is divided into two areas separated by the Louisiana Highway 82 embankment. Area A includes approximately 8,600 acres (3,481 ha) of brackish and intermediate marsh located along the north side of the highway. Area B includes approximately 300 acres (121 ha) of beach dune and coastal chenier habitat located south of the highway along 8.0 miles (12.9 km) of beach between Holly Beach and Ocean View Beach.

Chronic erosion in this area is caused by a deficit of sand and sediment in the littoral transport system due to stabilization of the Mississippi River and regulation of the Atchafalaya River to the east (U.S. Department of Agriculture, Natural Resources Conservation Service and Louisiana Department of Natural Resources [USDA-NRCS and LDNR] 2001). In addition, the Calcasieu and Mermentau rivers are not supplying coarse grained sediment (sand) to the area, and the Cameron jetties associated with the Calcasieu Ship Channel deflect what little material that exists away from the project area (Byrnes et al. 1995, Byrnes and McBride 1995).

Today, this ridge is the only remaining hydrological barrier separating thousands of low energy, intermediate and brackish marsh along the southern boundary of Sabine National Wildlife Refuge (SNWR) from the high energy, saline waters of the Gulf of Mexico. The highway revetment has already been undermined in some sections, and the underlying chenier is in danger of being breached. A breach of this ridge would lead to direct wave erosion and saltwater intrusion into fragile, low energy wetlands to the north.

Construction of the sand-pumping portion of the project was initiated in July 2002 and was expected to be completed in November 2002. However, inclement weather and equipment problems delayed completion until March 2003. The sand fencing and vegetation planting portion of the project was completed in August 2003.



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Project Objectives

1. Protect approximately 8,600 acres (3,481 ha) of existing low energy, intermediate and brackish wetlands north of the chenier/beach ridge between Holly Beach and Constance Beach.
2. Protect approximately 300 acres (121 ha) of beach dune and coastal chenier habitat along the shoreline from erosion and degradation caused by high energy wave action from the Gulf of Mexico.

Project Strategies

The following strategies will be used to accomplish the above goals:

1. Modify the design of 18 existing breakwaters on the west end of the breakwater field and remove 6 experimental breakwaters located landward of existing breakwaters 35 through 40, to enhance their sediment trapping capability.
2. Re-establish a sub-aerial beach profile that will reduce the occurrence of wave over-wash of the chenier-beach ridge.



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Project Strategies (cont.)

3. Evaluate beach response to nourishment after 2 years to facilitate re-evaluation of the existing breakwater design. (Note: Dondrift of the 18 existing breakwaters to be modified, it will not be possible to determine if changes in beach response are the result of the beach nourishment or the breakwater modifications, or both.)
4. Refine the existing breakwater design and spacing, upgrade and/or repair existing breakwaters in order to enhance sediment trapping and shoreline protection in the project area.
5. Maintain the shoreline position (high water/rack line along beach ridge) seaward of its pre-nourishment position for the first 5 years (for breakwaters 10 through 72).
6. Maintain shoreline position (high water/rack line along beach ridge) seaward of its original pre-nourishment position for an additional 5 years, should the beach need re-nourishment.
7. Maintain water salinity in the project area north of the beach/ridge within a target range (3-12 ppt) suitable for intermediate and brackish marsh vegetation.
8. Maintain existing intermediate and brackish marsh vegetation in the project area north of chenier/beach ridge.





Figure 1. Holly Beach Sand Management (CS-31) project boundaries

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Monitoring Elements:

Aerial Photography: To measure marsh and open water areas, color-infrared aerial photography (1:12,000) will be acquired. The photography will be georectified using standard procedures as outlined in Steyer et al. (1995, revised 2000), and land:water ratios will be determined. The pre-construction photography was obtained in December 2001 and December 2002 (since project completion was delayed). Photography will also be obtained in post-construction at years 2005 and 2009. Additional photography may be obtained in response to storm events.

Bathymetry/Topography: To document both horizontal and vertical change along the project area shoreline, transect lines used to measure elevation will be established parallel and perpendicular to the breakwaters, and tied in to a known elevation datum by professional surveyors. These transect lines were surveyed incrementally pre-construction in 2002-2003, and immediately post-construction in March 2003 and will be surveyed in 2005.

Vegetation Plantings: The general condition of the *Panicum amarum* (Bitter Panicum) plantings will be documented using a generally accepted methodology similar to Mendelssohn and Hester (1988), Coastal Vegetation Project, Timbalier Island. Plots will be chosen by randomly selecting numbers based on the coordinates within the project area to represent a 10 percent sample of the plantings. The GPS coordinates will be used to mark one corner of a plot of 16 plants to determine % survival by counting live plants within each plot, dividing by the total number of plants, and multiplying by 100. Ocular estimates of percent canopy cover will also be recorded for each plot. The percent cover for each plot will be broken down into the percent cover provided by the *P. amarum* plantings, by other wetland species and by upland species. These criteria will be documented in the fall of 2003, the spring of 2004 and the fall of 2004 or until the original plants become indistinguishable. The possibility of herbivore damage is recognized and will be recorded if observed.



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Monitoring Elements (cont.):

Shoreline Change: To document shoreline movement between Holly Beach and Constance Beach, differential global positioning system (DGPS) surveys of unobstructed sections of the shoreline will be conducted using the high water/rack line as the vegetative edge. DGPS shoreline positions will be mapped and used to measure shoreline erosion/growth rates. Shoreline change rates will be used to calculate the total acres gained/lost along the project area shoreline. Surveys were conducted immediately post-construction in 2003, and will be conducted twice per year in the fall and spring of 2003, 2004, 2005, 2007, 2009, and 2011 post-construction.

Water Salinity: To assist in determining the frequency that high salinity water enters the interior marsh from wave overwash, three continuous recorders were installed to collect hourly salinity data, one at the southern end of Cowboy ditch, adjacent to the low section of La. Hwy 82 with concrete block revetment between Peveto Beach and Holly Beach, one in a marsh pond on the east side of the project area (figure 1). Data collected from these stations will be compared to hourly salinity data collected from the Sabine Refuge Structure Replacement (CS-23) project and the USGS realtime data recorder in Calcasieu Lake near Cameron, Louisiana to aid in determining the origin of high salinity water entering the project area. Hourly salinity data will be collected at these three stations from September 2002 through 2004.

Emergent Vegetation: To document the condition of the emergent vegetation in the project area over the life of the project, vegetation will be monitored at 30 sampling stations established along 3 transect lines within the project area. Using the Braun-Blanquet methodology outlined in Steyer et al. (1995), percent cover, species composition, and dominant plant height will be documented in replicate 2 m by 2 m sampling plot established at each station. A pole installed in one corner of each plot will allow for locating and reevaluating established plots over time. Descriptive observations of SAV will be noted during monitoring of emergent vegetation. Vegetation was monitored once pre-construction in 2002 and will be monitored in the fall of 2003, 2004, 2005, and 2009.



Holly Beach (CS-31) Aerial Photography

Figures:

- **Figures 2a - 2b.** Holly Beach Sand Management (CS-31) 1956-90 Habitat Analysis Section A.
- **Figures 3a – 3b.** Holly Beach Sand Management (CS-31) 1956-90 Habitat Analysis Section B.
- **Figure 4.** Preconstruction aerial photograph on the left taken July 2002 indicating the offshore breakwaters and shoreline condition and at Holly Beach before the sand pumping project . The postconstruction photography on the right, taken in March 2003, illustrating the shoreline extending to the breakwaters previously offshore.



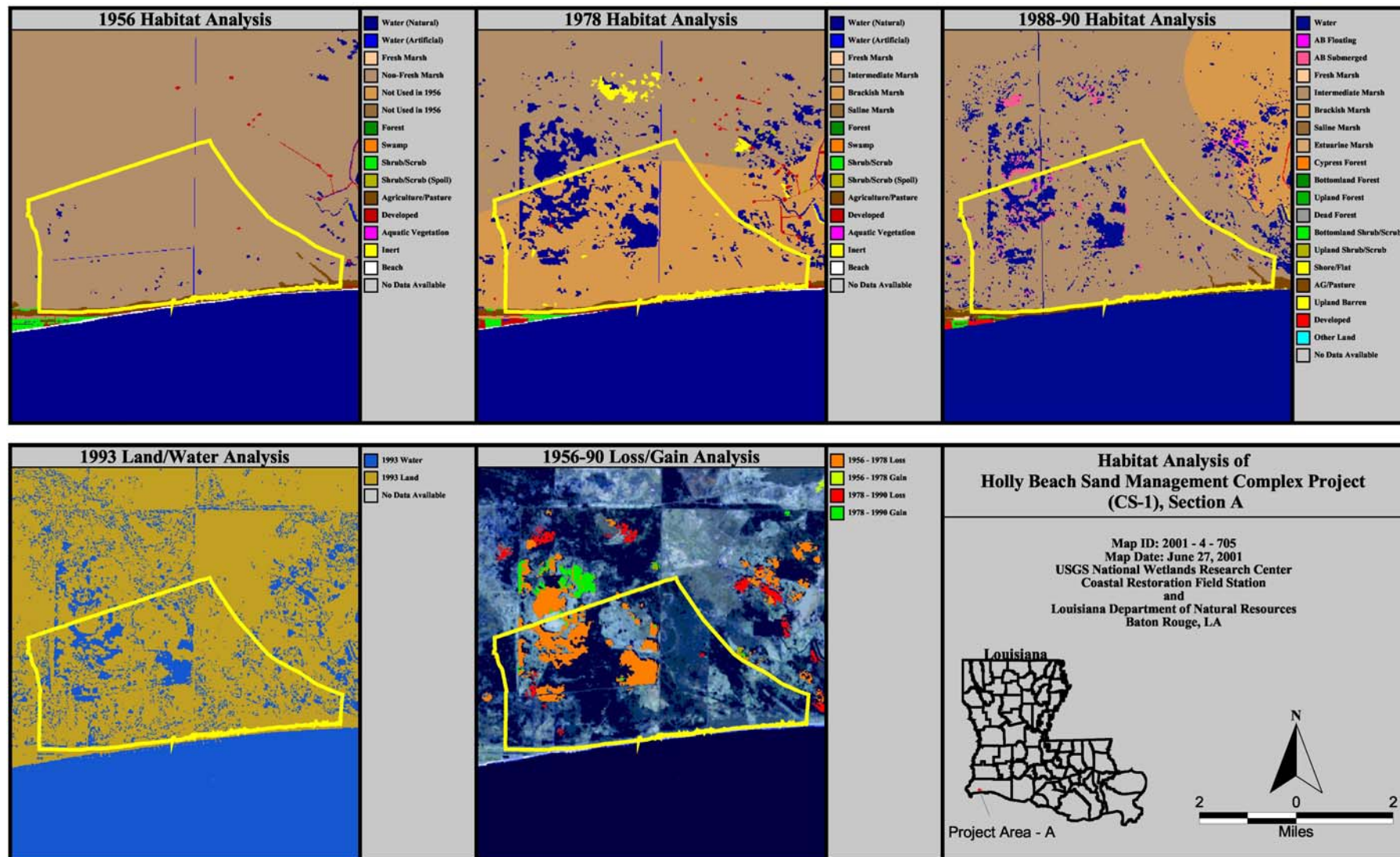


Figure 2a. Holly Beach Sand Management (CS-31) 1956-90 Habitat Analysis Section A.



1956 Habitat Analysis				1978 Habitat Analysis				1988-90 Habitat Analysis			
Class	Acres	Hectares	Percent	Class	Acres	Hectares	Percent	Class	Acres	Hectares	Percent
Water (Natural)	50.50	20.44	0.54	Water (Natural)	1194.14	483.25	12.83	Water	1080.47	437.25	11.61
Water (Artificial)	41.08	16.63	0.44	Water (Artificial)	31.97	12.94	0.34	AB Floating	17.76	7.19	0.19
Fresh Marsh	0.00	0.00	0.00	Fresh Marsh	0.00	0.00	0.00	AB Submerged	147.18	59.56	1.58
Non-Fresh Marsh	8872.94	3590.75	95.35	Intermediate Marsh	247.11	100.00	2.66	Fresh Marsh	0.00	0.00	0.00
Not Used in 1956	0.00	0.00	0.00	Brackish Marsh	7552.00	3056.19	81.15	Intermediate Marsh	7816.87	3163.37	84.00
Not Used in 1956	0.00	0.00	0.00	Saline Marsh	0.00	0.00	0.00	Brackish Marsh	0.00	0.00	0.00
Forest	0.00	0.00	0.00	Forest	0.00	0.00	0.00	Saline Marsh	0.00	0.00	0.00
Swamp	0.00	0.00	0.00	Swamp	0.00	0.00	0.00	Estuarine Marsh	0.00	0.00	0.00
Shrub/Scrub	2.16	0.88	0.02	Shrub/Scrub	0.00	0.00	0.00	Cypress Forest	0.00	0.00	0.00
Shrub/Scrub (Spoil)	0.00	0.00	0.00	Shrub/Scrub (Spoil)	3.40	1.38	0.04	Bottomland Forest	0.00	0.00	0.00
Agriculture/Pasture	335.75	135.88	3.61	Agriculture/Pasture	255.14	103.25	2.74	Upland Forest	0.00	0.00	0.00
Developed	3.40	1.38	0.04	Developed	5.25	2.13	0.06	Dead Forest	0.00	0.00	0.00
Aquatic Vegetation	0.00	0.00	0.00	Aquatic Vegetation	0.00	0.00	0.00	Bottomland Shrub/Scrub	0.00	0.00	0.00
Inert	0.00	0.00	0.00	Inert	16.83	6.81	0.18	Upland Shrub/Scrub	0.00	0.00	0.00
Beach	0.00	0.00	0.00	Beach	0.00	0.00	0.00	Shore/Flat	1.54	0.63	0.02
No Data Available	0.00	0.00	0.00	No Data Available	0.00	0.00	0.00	AG/Pasture	242.32	98.06	2.60
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	Upland Barren	0.00	0.00	0.00
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	Developed	0.00	0.00	0.00
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	Other Land	0.00	0.00	0.00
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	No Data Available	0.00	0.00	0.00
Totals	9305.84	3765.94	100.00	Totals	9305.83	3765.94	100.00	Totals	9306.14	3766.06	100.00

1993 Land/Water Analysis			
Class	Acres	Hectares	Percent
1993 Water	1866.57	755.38	20.06
1993 Land	7439.57	3010.69	79.94
No Data Available	0.00	0.00	0.00
Totals	9306.14	3766.06	100.00

1956-90 Loss/Gain Analysis				
Units	1956-78 Loss/Gain	1978-90 Loss/Gain	Totals	Percent
Acres	-1134.52	-19.31	-1153.83	12.40
Hectares	-459.13	-7.81	-466.94	12.40

Habitat Analysis of Holly Beach Sand Management Complex Project (CS-1), Section A

Production Date: June 27, 2001
Map ID: 2001 - 4 - 705
USGS National Wetlands Research Center
Coastal Restoration Field Station
and
Louisiana Department of Natural Resources
Baton Rouge, LA

Figure 2b. Holly Beach Sand Management (CS-31) 1956-90 Habitat Analysis Section A



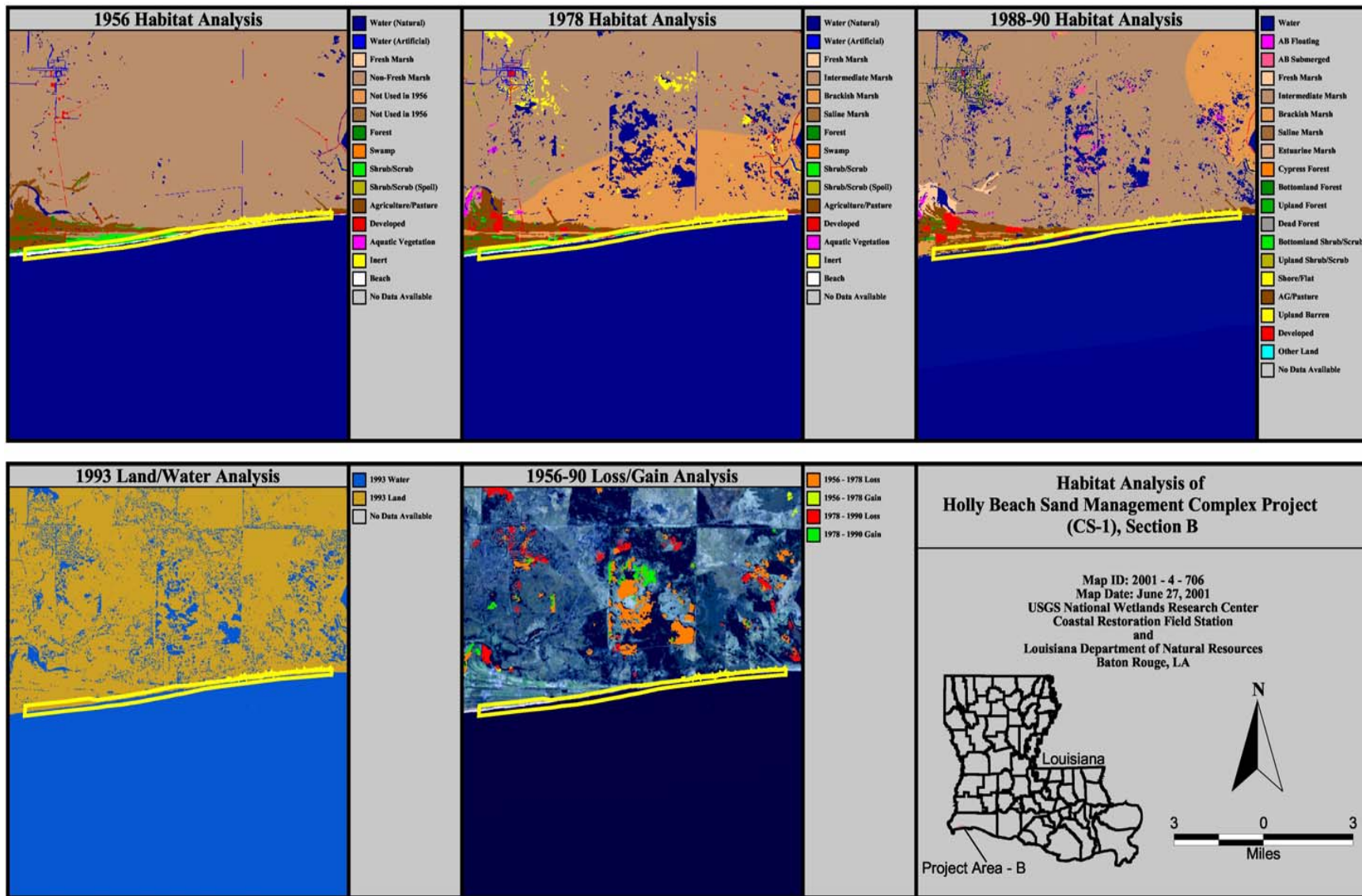


Figure 3a. Holly Beach Sand Management (CS-31) 1956-90 Habitat Analysis Section B



1956 Habitat Analysis				1978 Habitat Analysis				1988-90 Habitat Analysis			
Class	Acres	Hectares	Percent	Class	Acres	Hectares	Percent	Class	Acres	Hectares	Percent
Water (Natural)	636.76	257.69	41.13	Water (Natural)	858.23	347.31	55.43	Water	819.15	331.50	52.91
Water (Artificial)	0.62	0.25	0.04	Water (Artificial)	0.00	0.00	0.00	AB Floating	0.00	0.00	0.00
Fresh Marsh	0.00	0.00	0.00	Fresh Marsh	0.00	0.00	0.00	AB Submerged	0.00	0.00	0.00
Non-Fresh Marsh	6.33	2.56	0.41	Intermediate Marsh	0.00	0.00	0.00	Fresh Marsh	1.39	0.56	0.09
Not Used in 1956	0.00	0.00	0.00	Brackish Marsh	11.89	4.81	0.77	Intermediate Marsh	17.76	7.19	1.15
Not Used in 1956	0.00	0.00	0.00	Saline Marsh	0.00	0.00	0.00	Brackish Marsh	47.26	19.13	3.05
Forest	0.00	0.00	0.00	Forest	0.00	0.00	0.00	Saline Marsh	0.00	0.00	0.00
Swamp	0.00	0.00	0.00	Swamp	0.00	0.00	0.00	Estuarine Marsh	0.00	0.00	0.00
Shrub/Scrub	290.35	117.50	18.75	Shrub/Scrub	189.65	76.75	12.25	Cypress Forest	0.00	0.00	0.00
Shrub/Scrub (Spoil)	2.32	0.94	0.15	Shrub/Scrub (Spoil)	0.00	0.00	0.00	Bottomland Forest	0.00	0.00	0.00
Agriculture/Pasture	264.40	107.00	17.08	Agriculture/Pasture	208.80	84.50	13.49	Upland Forest	0.00	0.00	0.00
Developed	51.58	20.88	3.33	Developed	111.97	45.31	7.23	Dead Forest	0.00	0.00	0.00
Aquatic Vegetation	0.00	0.00	0.00	Aquatic Vegetation	0.00	0.00	0.00	Bottomland Shrub/Scrub	20.70	8.38	1.34
Inert	0.00	0.00	0.00	Inert	0.00	0.00	0.00	Upland Shrub/Scrub	44.17	17.88	2.85
Beach	295.91	119.75	19.11	Beach	167.72	67.88	10.83	Shore/Flat	23.48	9.50	1.52
No Data Available	0.00	0.00	0.00	No Data Available	0.00	0.00	0.00	AG/Pasture	476.45	192.81	30.77
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	Upland Barren	0.00	0.00	0.00
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	Developed	57.30	23.19	3.70
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	Other Land	0.00	0.00	0.00
Not Used in 1956	0.00	0.00	0.00	Not Used in 1978	0.00	0.00	0.00	No Data Available	40.62	16.44	2.62
Totals	1548.27	626.56	100.00	Totals	1548.27	626.56	100.00	Totals	1548.27	626.56	100.00

1993 Land/Water Analysis			
Class	Acres	Hectares	Percent
1993 Water	863.94	349.63	55.80
1993 Land	684.33	276.94	44.20
No Data Available	0.00	0.00	0.00
Totals	1548.27	626.56	100.00

1956-90 Loss/Gain Analysis				
Units	1956-78 Loss/Gain	1978-90 Loss/Gain	Totals	Percent
Acres	-220.85	39.07	-181.78	11.74
Hectares	-89.38	15.81	-73.56	11.74

Habitat Analysis of Holly Beach Sand Management (CS-1), Section B

Production Date: June 27, 2001

Map ID: 2001 - 4 - 706

USGS National Wetlands Research Center
Coastal Restoration Field Station
and
Louisiana Department of Natural Resources
Baton Rouge, LA

Figure 3b. Holly Beach Sand Management (CS-31) 1956-90 Habitat Analysis Section B



Holly Beach (CS-31)



Figure 4. Preconstruction aerial photograph on the left taken July 2002 indicating the offshore breakwaters and shoreline condition and at Holly Beach before the sand pumping project . The postconstruction photography on the right, taken in March 2003, illustrating the shoreline extending to the breakwaters previously offshore.



Holly Beach (CS-31)

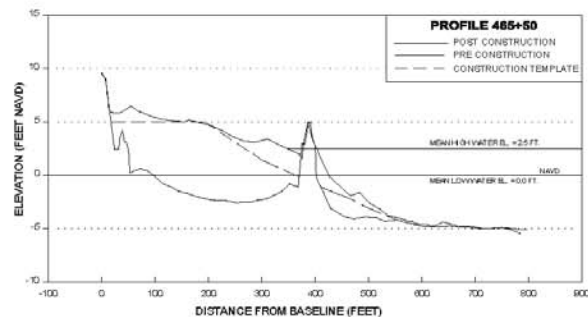
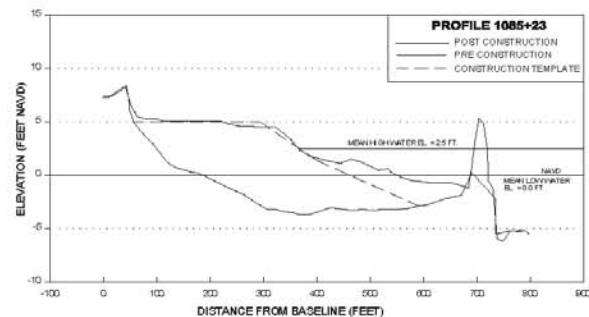
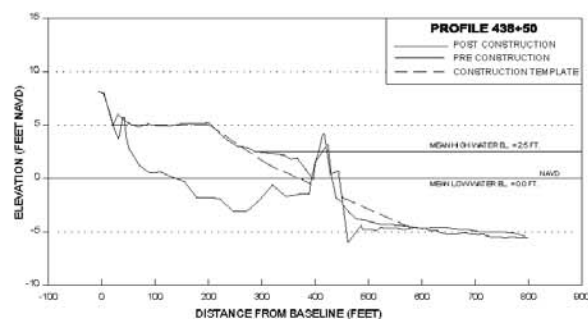
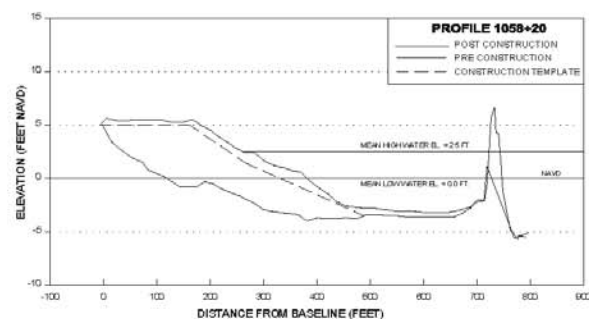
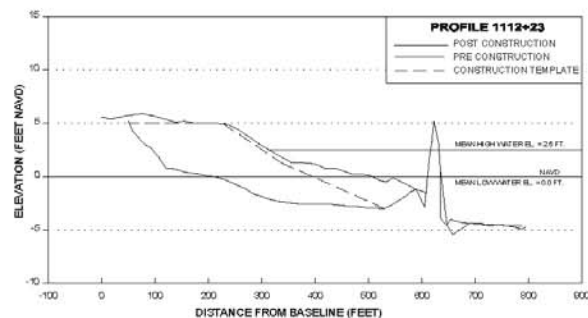
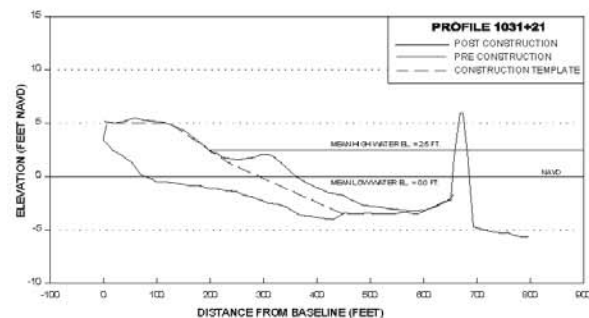
Bathymetry/Topography

- The pre-construction survey was performed incrementally over the construction period and completed in January 2003. The post-construction survey was completed in March 2003. The next survey will be done in 2005. The contractor experienced problems controlling the fill and overpumped many sections. At completion of the work, it was determined that the contractor placed 22% additional fill above the pay volume (CPE project completion report). It is expected that the shoreline will degrade back to the pay volume, washing away the overfill, soon after construction is complete (personal communication, Herbert Juneau). This was an anticipated loss that will appear on the shoreline surveys and will be taken into consideration when analyzing these data. Presented here are cross-sections taken at eleven selected stations along the project indicating pre-construction conditions, as-built surveys, and the construction template.

Figures:

- **Figure 5a - 5b.** Holly Beach Sand Management (CS-31) selected as-built beach cross sections.

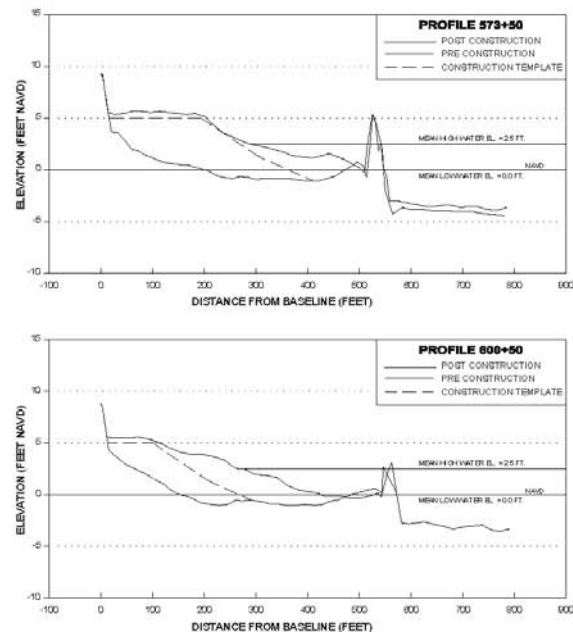
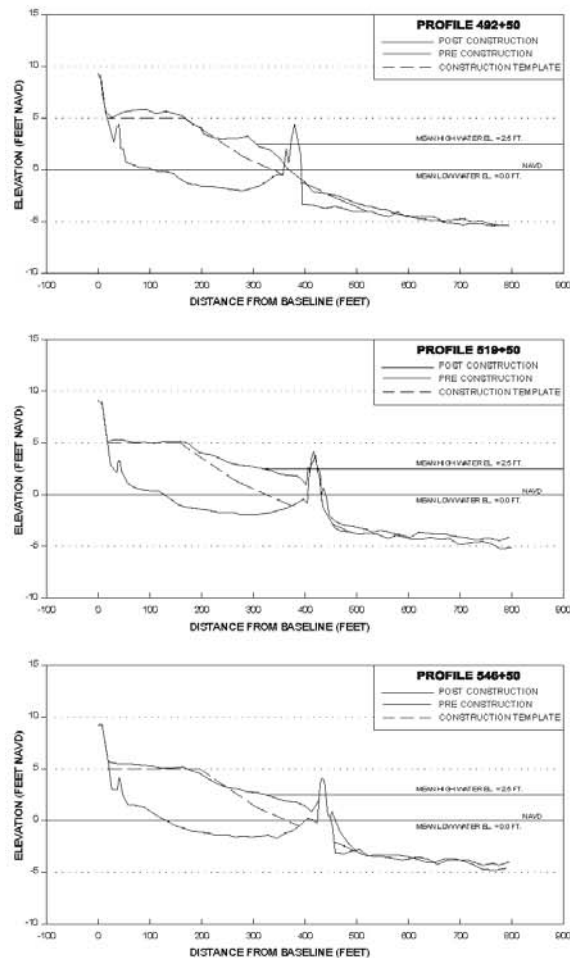




SCALE: 1" = 100' HORIZONTAL
 1" = 5' VERTICAL

Figure 5a. Holly Beach Sand Management (CS-31) selected as-built beach cross sections





SCALE: 1" = 100' HORIZONTAL
1" = 5' VERTICAL

Figure 5b. Holly Beach Sand Management (CS-31) selected as-built beach cross-sections



Holly Beach (CS-31)

Vegetation Plantings

- Construction of 18,797 linear ft of sand fencing was completed March 26, 2003 (figure 6), and installation of *Panicum amarum* was completed on August 7, 2003. The first vegetative survey will be conducted in fall 2003. The data will be presented in the next update.

Figures:

- **Figure 6.** Views of the sand fencing on the shoreline at Holly Beach taken in August 2003. Note the dune formation already developing on the shoreline adjacent to the fences. The photograph on the left is facing west, and on the right is facing southwest.



Holly Beach (CS-31)



Figure 6. Views of the sand fencing on the shoreline at Holly Beach taken in August 2003. Note the dune formation already developing on the shoreline adjacent to the fences. The photograph on the left is facing west, and on the right is facing southwest.



Holly Beach (CS-31)

Shoreline Change Data

- Shoreline position was mapped using DGPS in March 2003 to document conditions immediately following construction. The data will be presented in the next update.



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Salinity Data

Collected hourly at 1 station September 2002 – present. Two additional stations were installed in February 2003.

Figures:

- **Figure 7.** Location of continuous recorder stations at Holly Beach Sand Management (CS-31) project.
- **Figure 8.** Hourly salinity data from station CS31-01 for 2002.



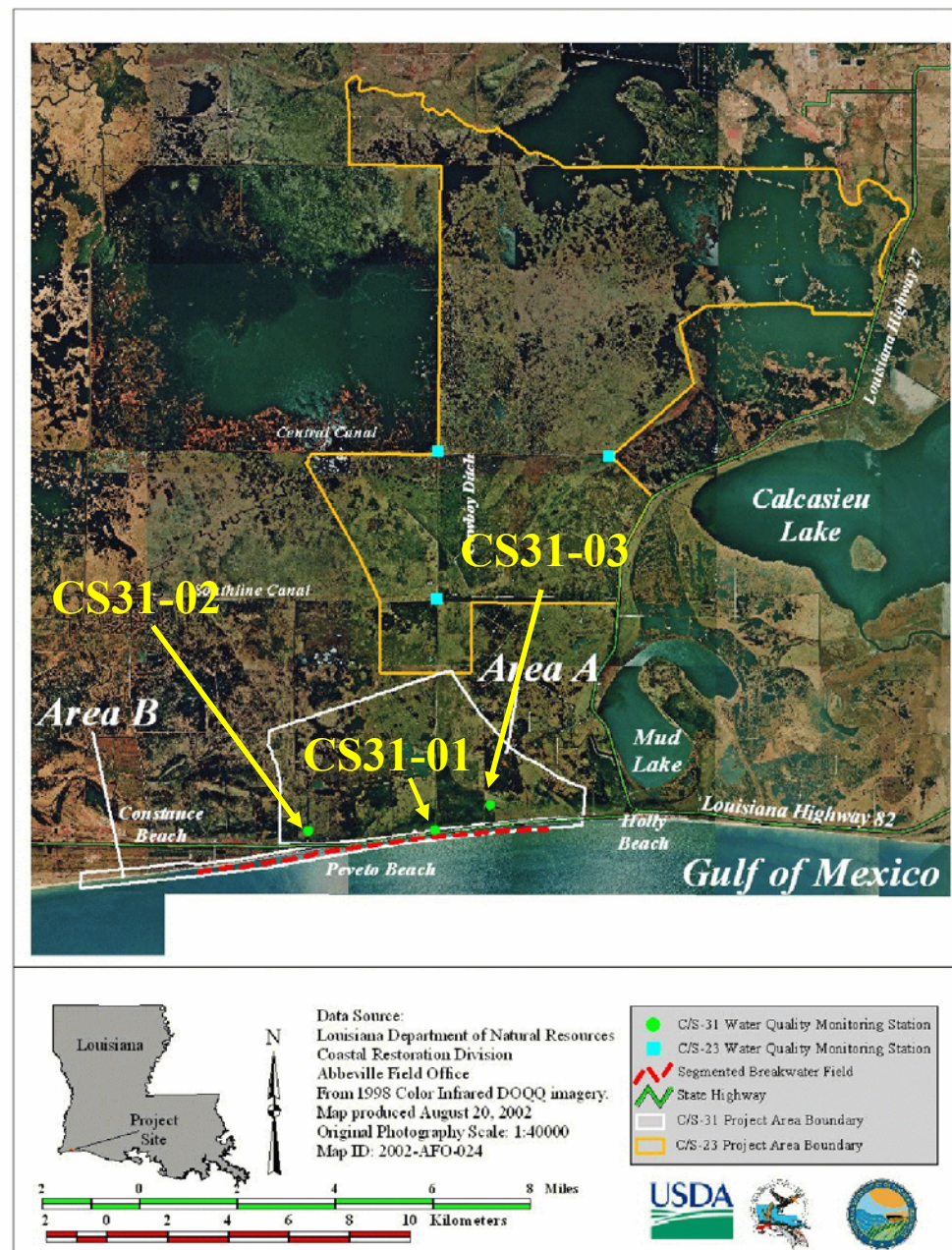


Figure 7. Location of continuous recorder stations at Holly Beach Sand Management (CS-31) project.

Holly Beach Sand Management (CS-24) Project

Station CS31-01 (9/10/02 - 12/17/02)

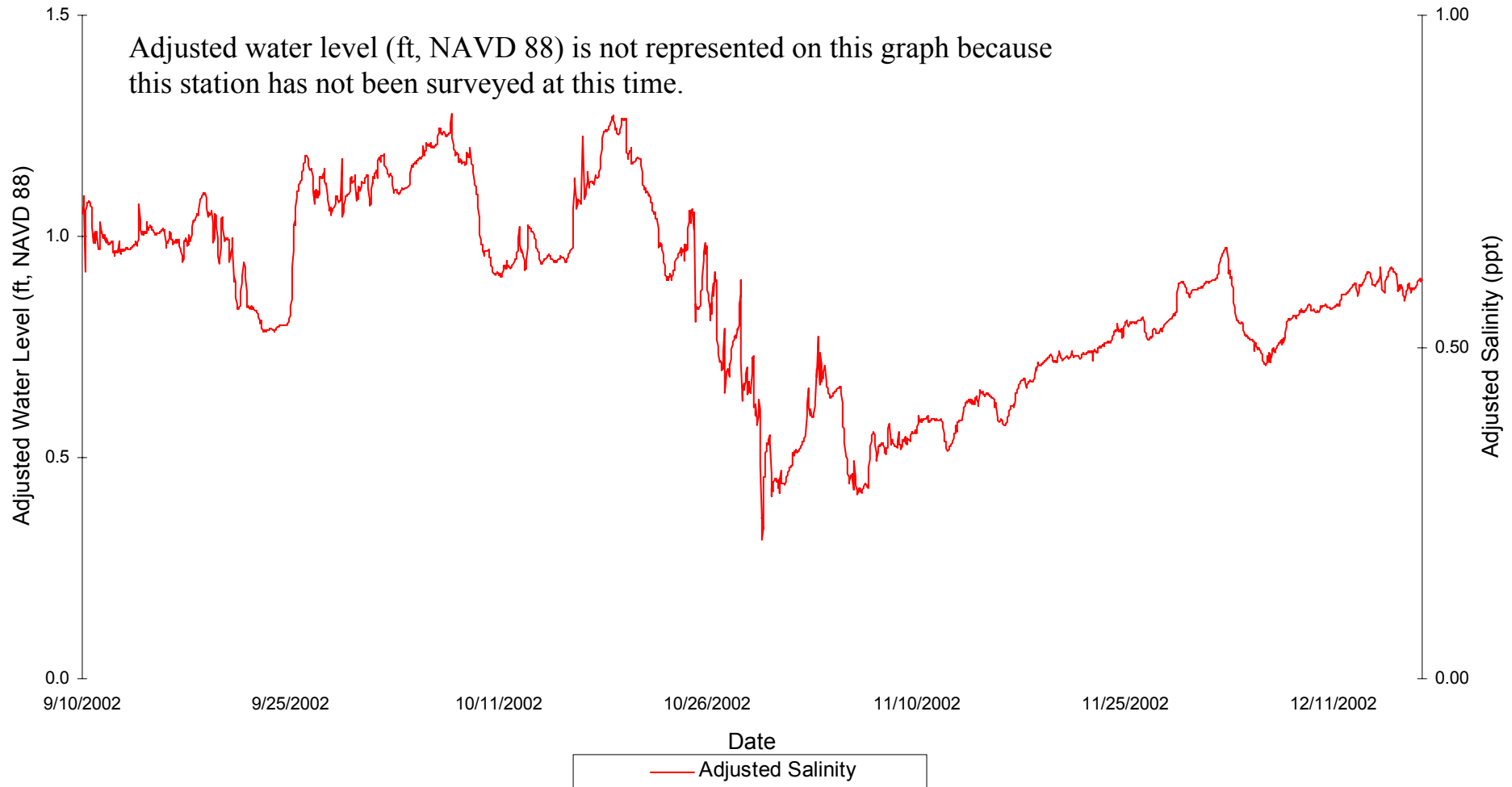


Figure 8. Hourly salinity data from Station CS31-01 for 2002.



Holly Beach (CS-31)

Emergent Vegetation Data

- Emergent Vegetation Data were collected in October 2002, however these data are not presented in this report. They are currently being processed and will be presented in the next update.



Holly Beach (CS-31)

Preliminary Findings

Aerial Photography:

- Pre-construction classification indicated 20.06% water and 79.94% land within Section A and 55.80% water and 44.20% land within Section B. Approximately 84% of Section A was classified as intermediate marsh while 53% and 31% of Section B was classified as water and Ag/pasture, respectively.

Bathymetry/Topography:

- Pre-construction survey was completed in January 2003. The post-construction survey was completed in March 2003 immediately following construction. The next survey is scheduled for 2005.

Vegetation Plantings:

- Plantings were completed in August 2003. First survey to take place in the fall of 2003. The data will be presented in the next update.

Shoreline Change:

- Data were collected in 2003 (immediately following construction). The data will be presented in the next update.

Salinity:

- Data have been collected at one station since September 2002. Two additional stations were installed in February 2003. Salinity stayed below one ppt at Station CS31-01 during the entire collection period.

Emergent Vegetation:

- Data were collected in 2002 (pre-construction), however were not presented. These data are currently being processed and will be presented in the next update.

