ANNUAL REPORT FOR 2000

Bogue Sound (Weeks Property) Mitigation Site
Carteret County
Project No. 6169005T
TIP No. R-2105 WM

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Executive Summary

The Bogue Sound Mitigation Site (BSMS) was designed as compensation for permitted estuarine wetland losses due to transportation infrastructure improvements in the region. The final plan for the BSMS was submitted to the U. S. Army Corps of Engineers (USACE) and the North Carolina Division of Coastal Management (NCDCM) in February 1998 and the project was subsequently approved. Construction and planting were completed by June 1998 and the first annual monitoring report was completed in December 1998. The Final plan requires at least three (3) years of annual monitoring. The vegetative success criterion was defined as "coverage of native salt marsh species within the wetland restoration area will be at least 85% of the vegetative coverage recorded within the reference marsh ecosystem."

Comments were received from the USACE (December 14, 1998 letter) and NCDCM (October 15, 1998 letter) following completion of construction. Correspondence from the USACE and NCDCM contained requests for additional information including "as-built" plans and specific information regarding the location and extent of marsh communities. An "as-built" survey was completed in July 1999 by Powell Surveying, P.A. and specific information regarding the location and extent of marsh communities is contained in this report or depicted on the "as-built" survey. Additional maintenance activities were completed in 1999 to repair storm damage associated with 1998 hurricanes and replant marsh and dune areas as necessary.

Growth and survival of smooth cordgrass following three growing seasons were excellent and a variety of native fauna have been observed within the marsh. Estimated coverage of smooth cordgrass increased from 37.5% in 1999 to 42.4% in 2000. Overall plant species coverage within the BSMS increased from 45.4% in 1999 to 55.4% in 2000. Natural regeneration of native marsh species such as glasswort, marsh fimbristylis, sea lavender, and salt marsh aster indicate recruitment of species from the adjacent reference marsh.

A variety of planted and naturally regenerating plant species are present on the dune slope adjacent to the marsh restoration area. The developing plant community has stabilized the dune slope and no evidence of erosion was noted during 2000.

Surface gauge data indicate regular tidal flooding above 2.0 ft (NCDOT datum) during the growing season. Mean high tides recorded during the 1998, 1999, and 2000 growing seasons were 2.15 ft, 2.31 ft, and 2.51 ft, respectively. Since the hydrology within the restoration area has been well documented and the required monitoring period has expired, it does not appear that continued hydrologic monitoring is necessary or relevant. Therefore, we propose to remove the automatic hydrologic monitoring devices from the site.

1.0 Introduction

1.1 Project Description

The Bogue Sound Mitigation Site (Weeks Property) is located in Cedar Point, Carteret County, NC (Figure 1). Following extensive review and comment, the Final Plan for the Bogue Sound Mitigation Site was submitted and approved by the regulatory agencies in February 1998. The plan provides details for the establishment of 3.56 acres of estuarine wetland types including low intertidal marsh dominated by smooth cordgrass (*Spartina alterniflora*) and high intertidal marsh dominated by black needlerush (*Juncus roemerianus*) and saltmeadow cordgrass (*Spartina patens*). An "as-built" topographic survey of the project was completed following remediation of damage caused by hurricane Bonnie in August 1998.

The project was intended to offset permitted estuarine wetland impacts associated with several NCDOT projects (Table 1). The permitted impacts include 0.96 acre of high marsh dominated by black needlerush and 0.82 acre of low marsh dominated by smooth cordgrass.

Table 1: Summary of Permitted Estuarine Wetland Impacts to be Compensated for by the Bogue Sound Mitigation Site (Weeks Property), Carteret Co., NC

Project	Wetland Type	Wetland Impact (ac)	Mitigation Ratio	Mitigation Required
TIP No. R-2105 AA	Low marsh	0.58	2:1	1.16 – low marsh
TIP No. R-2105 AB	High marsh	0.34	2:1	0.68 – high marsh
TIP No. B-1098 [1]	High marsh	0.62	2:1	1.24 – high marsh
Bridge No. 86 over Culley Creek on SR1316 [2]	Low marsh	0.18	2:1	0.36 – low marsh
Bridge No. 3 over Back Creek on SR1300 [3]	Low marsh	0.06	2:1	0.12 – low marsh
Total compensatory mitigation	Low/high marsh	1.78	2:1	1.92 – high marsh 1.64 – low marsh

[1] See 1998 annual monitoring report Appendix A for documentation
[2] CAMA permit no. 38-95
[3] CAMA permit no. 133-95

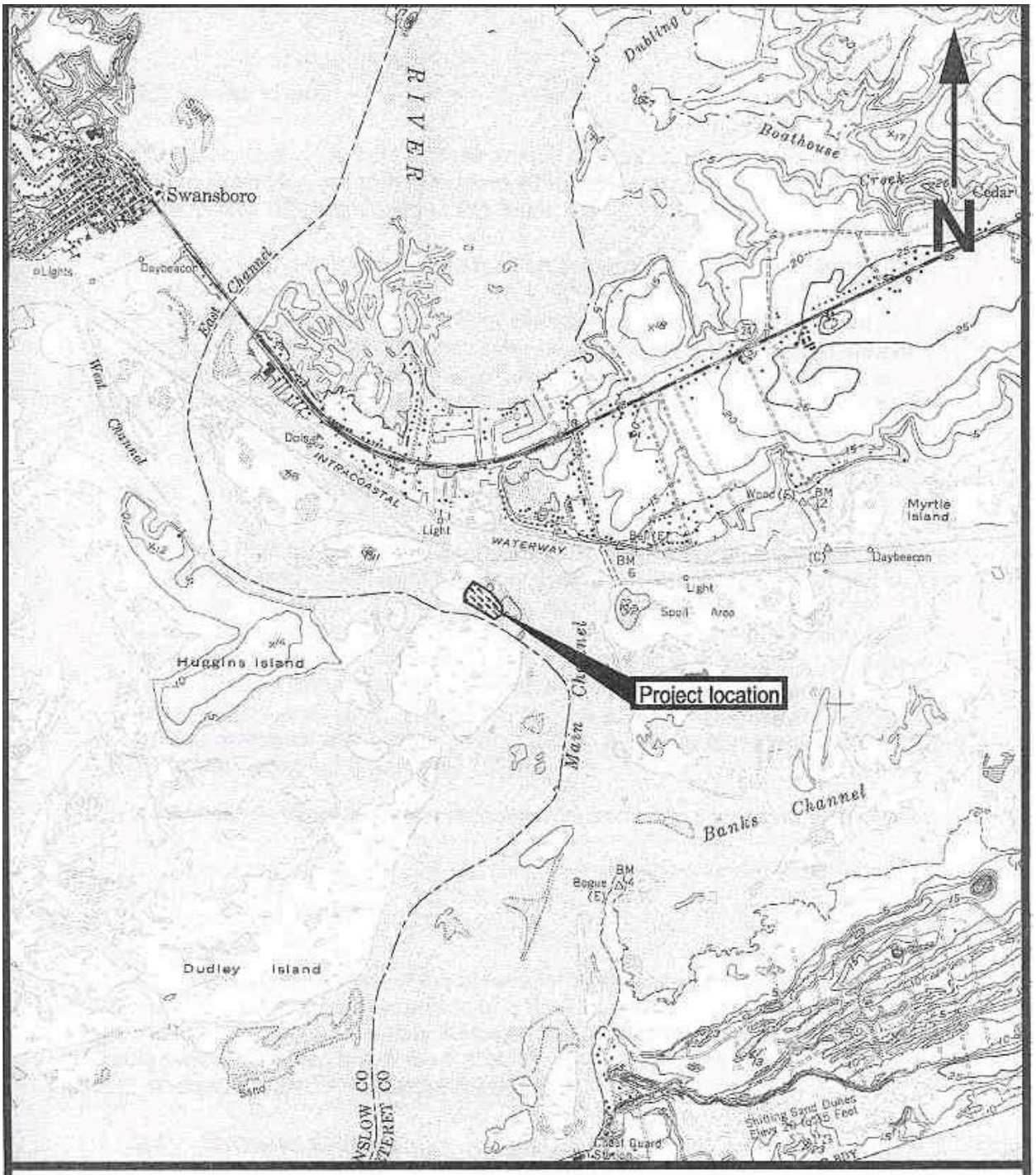


FIGURE 1: PROJECT LOCATION MAP
Bogue Sound (Weeks Property) Mitigation Site
Project No. 6169005T, TIP No. R-2105 WM, Carteret County, NC

Base map source: Swansboro, NC USGS 7.5 minute quadrangle SCALE: 1:24,000

1.2 Purpose

This document is the third of three annual monitoring reports planned for the Bogue Sound Mitigation Site (Weeks Property) located in Cedar Point, Carteret County, NC. The objectives of this report are to:

- Quantify and document plant species composition within the marsh restoration area;
- Document plant species survival and composition on the dune slope;
- Document the hydrologic characteristics of the marsh restoration area and determine the extent of wetland hydrology;
- Provide a visual record of marsh development by color photographs from permanent stations.

1.3 Project History

The Final Plan for the Bogue Sound Mitigation Site was submitted and approved by the regulatory agencies in February 1998. Construction stakeout and survey work were completed by Powell Surveying, P.A. during March-May 1998. Construction activities on the site commenced in March 1998. Grading and earthwork were completed in May 1998 and the site was planted in May-June 1998. Erosion damage associated with hurricane Bonnie in August 1998 was remediated in April 1999. Portions of the marsh were replanted in April 1999 and the adjacent dune was planted in April 1999. An “as-built” survey was completed by Powell Surveying P.A. in July 1999.

No additional maintenance or remedial work has been conducted since April 1999.

2.0 Hydrology

An “as-built” topographic survey of the restoration area was completed in 1999 by Powell Surveying, P.A. (“Topographic survey for Triangle Wetland Consultants dated July 8, 1999”). The “as-built” survey indicates that the total marsh restoration area was 3.60 acres with 3.06 acres below the 2.3 foot contour, 2.83 acres below the 2.0 foot contour, and 0.56 acres below the 0.2 foot contour.

2.1 Success Criteria

The success criteria as approved by the regulatory agencies and defined in the Final Plan for Bogue Sound Tidal Marsh Restoration Project dated February 1998 [a.k.a. Bogue Sound Mitigation Site (Weeks Property)] is “The project will be deemed to be successful if after a period of three (3) years following the

completion of planting wetland hydrology has been documented through well data and/or direct observations."

The growing season within Carteret County generally begins on March 1 and ends November 30 (275 days).

2.2 Hydrologic Description

Hydrologic characteristics within the wetland restoration area were documented by visual observations and automatic surface gauge data (Figure 2). Automatic surface gauge #1 and the marsh reference surface gauge were installed in late June 1998. Restoration area surface gauge #2 was installed in October 1998. The marsh reference surface gauge was placed within a transitional marsh community dominated by smooth cordgrass at an elevation of 2.10 ft (NCDOT datum). The restoration area monitoring surface gauge #1 was placed adjacent to the tidal channel at an elevation of 0.80 ft (NCDOT datum) and restoration area monitoring surface gauge #2 was placed in an area planted with smooth cordgrass at an elevation of 2.25 ft (NCDOT datum) (Figure 2). The automatic surface gauges used at this project record tidal data within a range of 40 inches. Automatic surface gauges (RDS WL-40) were programmed to record surface water data at 3-hour intervals.

Data plots for the calendar year were prepared in Microsoft Excel and are contained in Appendix A.

2.3 Results of Hydrologic Monitoring

Measured high tides within the restoration area during 2000 ranged from 1.40 to 3.8 feet (Appendix A). Within the restoration area, high tides during the growing season routinely exceeded 2.0 feet (i.e. high marsh / low marsh boundary) and mean high tide was 2.51 feet (Table 2). High tides at the marsh reference surface gauge ranged from 1.70 to 4.00 feet (Appendix A). Mean high tide during the growing season at the marsh reference surface gauge was 2.87 feet.

Table 2: Summary of the Mean High Tide Elevation (NCDOT datum) Recorded During the Growing Season at the Bogue Sound Mitigation Site

Surface Gauge	1998 [1]	1999 [2]	2000
Restoration area surface gauge #1	2.15 ft	2.31 ft	2.51 ft
Restoration area surface gauge #2	-----	2.63 ft	2.74 ft
Marsh reference surface gauge	2.65 ft	2.67 ft	2.87 ft

[1] partial data set from June 1998 – Nov. 1998
[2] missing data for portions of growing season (See Appendix A)

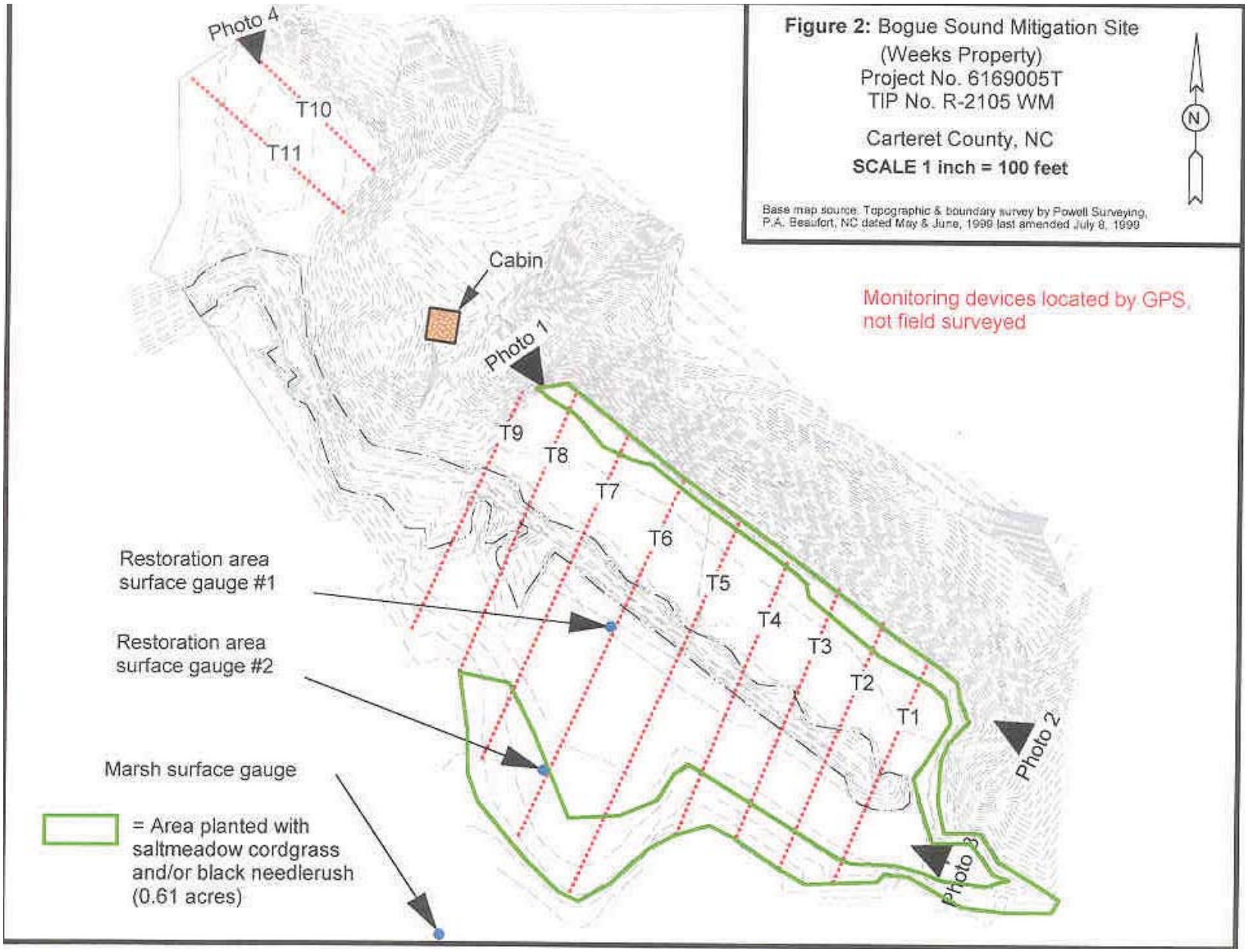


Figure 2: Bogue Sound Mitigation Site
(Weeks Property)
Project No. 6169005T
TIP No. R-2105 WM
Carteret County, NC
SCALE 1 inch = 100 feet
Base map source: Topographic & boundary survey by Powell Surveying, P.A. Beaufort, NC dated May & June, 1999 last amended July 8, 1999
N
Monitoring devices located by GPS, not field surveyed
Photo 4
T10
T11
Cabin
Photo 1
T9
T8
T7
T6
T5
T4
T3
T2
T1
Photo 2
Photo 3
Restoration area surface gauge #1
Restoration area surface gauge #2
Marsh surface gauge
= Area planted with saltmeadow cordgrass and/or black needlerush (0.61 acres)

The recorded mean high tides differed from year to year and between surface gauges. The annual differences can be explained by the period of record for 1998, 1999, and 2000 and the programmed data collection interval. In 1998, the surface gauges were not installed until late June. Therefore, the period of record for 1998 did not include the entire growing season (i.e. March 1 to November 30). The data collection interval during 1998 was 15 minutes. In 1999, there were maintenance problems with the surface gauges. Therefore, there was an incomplete record or data gaps for the growing season (See 1999 hydrographs – Appendix A). The data collection interval during 1999 was 90 minutes and the data collection interval during 2000 was 180 minutes.

The differences in recorded mean high tide between surface gauges can be explained by the location of the surface gauges. Restoration area surface gauge #1 is located adjacent to the tidal slough in open water. The restoration area #2 and marsh reference surface gauges are partially buried below the marsh surface. Therefore, during normal tide cycles where the daily high tide elevation does not reach the elevation of the marsh surface the recorded data may be skewed due to subsurface water retention within the marsh substrate. High tides at the marsh reference surface gauge were somewhat higher as compared with high tides at the restoration area #2 surface gauge. The marsh reference surface gauge is located on the southwest side of the project facing Bogue Inlet. Due to the direct exposure of the marsh at this location to the prevailing winds and wave action, the tides are somewhat higher than those recorded in less exposed marsh locations.

2.4 Conclusions

Mean high tide during the 2000 growing season within the restoration area was 2.51 ft (as recorded on open water by restoration area #1 surface gauge). High tides routinely exceeded 3.0 feet within the restoration area and tidal flushing is evident throughout the entire restoration area. Drift lines and wrack were observed along the base of the dune and maritime shrub perimeter surrounding the restoration area.

Based on three years of recorded tide data, the mean high tide during the growing season consistently exceeded the 2.0 ft elevation contour (i.e. the elevation boundary between high/low marsh suggested by regulatory agency personnel). Tide data and field observations indicate that the entire marsh restoration area is subject to periodic tidal inundation during the growing season. Therefore, we conclude that the required hydrologic success criteria have been achieved within the entire restoration area and further hydrologic monitoring is not necessary.

3.0 Vegetation

Plant community development and survival were documented by the establishment of eleven (11) permanent monitoring transects within the marsh restoration area. Transects were oriented in a northeast-southwest direction perpendicular to the long axis of the restoration area (Figure 2).

Approximately 3% of the restoration area was sampled (i.e. 4,652 ft^2 [434 m^2]). Vegetative coverage by species was recorded within uniformly spaced 42ft^2 (2m x 2m) quadrats at approximately 112 locations along the established transect lines (Appendix A). Transects were located parallel to each other at relatively uniform intervals through the restoration area. At each 42ft^2 quadrat location, vegetative coverage was estimated at two scales. Vegetative coverage for each species was estimated using discrete cover classes (i.e. 1-5%, 5-10%, 10-25%, etc.) within each quadrat and the elevation was recorded (NCDOT datum). Fine scale sampling was conducted to evaluate the presence or absence of each vegetative species within sixteen (16) 2.6ft^2 (0.25m^2) square subsamples nested within each quadrat. Importance values were generated for each recorded species using relative values of cover and frequency.

At the request of regulatory agency personnel, additional vegetation data were collected to describe the developing plant communities on the south facing dune slope adjacent to the marsh restoration area. Data collection protocols were similar to those described for the restoration area.

Photographs were obtained at four (4) permanent photographic points adjacent to the marsh restoration area (Appendix B) (Figure 2).

3.1 Success Criteria

The success criteria as approved by the regulatory agencies and defined in the Final Plan for Bogue Sound Tidal Marsh Restoration Project dated February 1998 [a.k.a. Bogue Sound Mitigation Site (Weeks Property)] is “The project will be deemed to be successful if after a period of three (3) years following the completion of planting vegetative coverage of native salt marsh species within the wetland restoration area is at least 85% of the vegetative coverage recorded within the RME.”

Vegetative coverage within the reference marsh ecosystem (RME) was determined by sampling in 1998. Estimated plant species coverage within the RME was 81%. Therefore, the minimum required plant species coverage for success within the restoration area is approximately 69% [i.e. 85% of RME coverage (81%)].

3.2 Description of Species

Smooth cordgrass (*Spartina alterniflora*) was planted throughout 2.95 acres of the BSMS. Saltmeadow cordgrass (*Spartina patens*) and black needlerush (*Juncus roemerianus*) were planted along the perimeter of the restoration area throughout 0.61 acres of the site (Figure 2). The adjacent dune (approximately 2 acres) was planted with American beachgrass (*Amophila brevigulata*), bayberry (*Myrica pennsylvanica*), and groundsel tree (*Baccharis halimifolia*).

Smooth cordgrass, saltmeadow cordgrass, and black needlerush were obtained in 2-inch peatpots and planted at an average density of 11,000 stems per acre. Each peatpot was individually fertilized with a slow release N-P-K formulation.

3.3 Results of Vegetation Monitoring

The RME adjacent to the restoration area was sampled in 1998 according to the monitoring protocols discussed in Section 3.0 of this report. Data were obtained from 50 quadrats located along six transects on the northwest and southwest sides of the restoration area. Mean plant species coverage within the reference marsh was approximately 81% and the mean elevation of sample points or quadrats was 1.72 feet (Table 3). Additional plant community composition data from the RME were not obtained during 1999 or 2000.

The restoration area was sampled according to the monitoring protocols discussed in the Final Plan for Bogue Sound Tidal Marsh Restoration Project dated February 1998 [a.k.a. Bogue Sound Mitigation Site (Weeks Property)]. Data were obtained from 112 quadrats located along eleven transects evenly distributed throughout the restoration area (Figure 2). Mean plant species coverage within the restoration area was approximately 55% and the mean elevation of sample points or quadrats was 2.04 feet.

Based on importance values, the restoration area was dominated by smooth cordgrass between elevations ranging from 1.00 and 2.50 feet (NCDOT datum). Estimated cover of smooth cordgrass was reduced at elevations less than 1.00 and elevations greater than 2.50. At elevations below 0.70 feet within the restoration area and reference marsh, smooth cordgrass cover was negligible. Elevations below 0.70 feet were classified as tidal flats with exposed substrate and open water. Saltmeadow cordgrass dominated the restoration area at elevations from 2.20 to 3.00 feet. Following three growing seasons, the distribution of the marsh species within the restoration area continues to reflect planting placement instead of ecological gradients. However, regeneration of smooth cordgrass within planted stands of saltmeadow cordgrass and regeneration of saltmeadow cordgrass along the base of the dune has been documented. The natural regeneration of these species and other native marsh species suggests that the plant communities within the restoration area are beginning to reflect natural, ecological gradients. Based on importance values,

smooth cordgrass was the dominant species within the restoration area (IV = 0.617) and saltmeadow cordgrass was the codominant species (IV = 0.116).

Table 3: 1998 Plant Species Coverage Data from the Reference Marsh Ecosystem, Bogue Sound Mitigation Site, Carteret Co., NC

Plant Species (common name)	Range of Occurrence (ft) (NCDOT datum)	Mean Est. Plant Cover (%) (n = 50)	Mean Est. Frequency (% 0.25 m^2)	IV [1]
Spartina alterniflora (smooth cordgrass)	0.73 – 2.39	49.282	0.785	0.489
Spartina patens (saltmeadow cordgrass)	1.77 - 3.19	14.100	0.236	0.143
Aster tenuifolius (saltmarsh aster)	1.61 – 2.59	3.670	0.285	0.092
Juncus roemerianus (black needlerush)	1.61 – 2.39	8.700	0.126	0.083
Limonium carolinianum (sea lavender)	1.59 – 2.37	1.542	0.268	0.075
Borrichia frutescens (sea ox-eye)	1.61 – 3.19	2.812	0.195	0.065
Salicornia europaea (slender glasswort)	1.71 – 1.97	0.212	0.069	0.018
Panicum sp. (panic grass)	3.19	0.350	0.011	0.005
Distichlis spicata (saltgrass)	1.97 - 2.01	0.090	0.018	0.005
Juniperus virginiana (Eastern redcedar)	3.19	0.150	0.003	0.002
Iva frutescens (marsh elder)	2.75	0.060	0.001	0.001
Open Water / Tidal Flat	0.73 – 0.95	2.350	0.038	0.023
Totals	**μ = 1.72** **0.73 – 3.19**	**83.318** **80.968** [2]	**2.034**	**1.00**

[1] IV = importance value based on relative cover and frequency values
[2] includes plant species coverage only

Based on importance values, saltgrass was ranked third again in 2000 (IV = 0.101). Although the saltgrass noted within sample plots originated from contaminated planting stock, saltgrass continues to survive as a minor component of the plant community within the restoration area.

Naturally regenerating, native salt marsh species noted within the restoration area in 2000 included saltmarsh aster, sea lavender, marsh fimbristylis, and two species of glasswort. The importance values for all of these species continues to increase annually, reflecting an increase in cover and frequency of the species (Table 4).

Table 4: Estimated 1998, 1999, and 2000 Plant Species Coverage within Marsh Restoration Area, Bogue Sound Mitigation Site, Carteret Co., NC					
Plant Species (common name)	2000 Mean Cover (%) (n=122)	2000 Mean Frequency (% 0.25m^2)	1998 IV [1]	1999 IV [1]	2000 IV [1]
Spartina alterniflora (smooth cordgrass)	42.38	13.80	0.716	0.721	0.617
Spartina patens (saltmeadow cordgrass)	8.54	2.32	0.095	0.114	0.116
Distichlis spicata (saltgrass)	2.32	4.28	0.034	0.049	0.101
Salicornia europea (glasswort)	0.53	2.39	-----	0.004	0.050
Fimbristylis spadicea (marsh fimbristylis)	0.41	0.40	0.005	0.009	0.011
Juncus roemerianus (black needlerush)	0.35	0.34	0.021	0.007	0.009
Borrichia frutescens (sea oxeye)	0.37	0.27	-----	0.001	0.008
Limonium carolinianum (sea lavender)	0.07	0.29	-----	0.004	0.006
Scirpus americanus (American three square)	0.04	0.19	0.033	0.002	0.004
Iva frutescens (marsh elder)	0.16	0.06	-----	-----	0.003
Salicornia virginica (glasswort)	0.08	0.07	-----	-----	0.002
Stophostyles helvolva (wild bean)	0.03	0.07	-----	-----	0.002
Aster tenuifolius (saltmarsh aster)	0.01	0.06	-----	< 0.001	0.001
Baccharis halimifolia (high tide bush)	0.07	0.04	-----	0.002	0.001
Parthenocissus quinequifolia (Virginia Creeper)	0.03	0.04	-----	-----	0.001
Cyperus sp. (flatsedge)	0.03	0.04	0.001	-----	0.001
Hydrocotyle bonariensis (pennywort)	0.01	0.03	-----	-----	0.001
Suaeda linearis (sea-blite)	0.01	0.02	-----	-----	< 0.001
Atriplex patula (orach)	0.01	0.02	-----	-----	< 0.001
Solidago sempervirens (seaside goldenrod)	0.01	0.02	-----	-----	< 0.001
Open Water	4.66	1.32	0.040	0.069	0.064
Totals	**60.09**	**26.06**	**1.000**	**1.000**	**1.000**

[1] IV = importance value based on relative cover and frequency values [2] includes only plant species coverage

Stabilization of the adjacent dune has been accomplished by natural regeneration and plantings. Planted species included American beachgrass, bayberry, and groundsel tree. Overall vegetative coverage on the lower slope of

the dune was moderate and American beachgrass was the dominant species (See color photo #7 – Appendix B). Stabilization of the lower dune slope was slowed by storm surges associated with hurricanes in 1998 and 1999. However, native and planted species are well established on the dune slope and total vegetative coverage is expected to increase.

3.4 Conclusions

Visual estimates indicated that aboveground biomass and estimated coverage of smooth cordgrass and saltmeadow cordgrass continued to increase through 2000. Overall, survival and growth of black needlerush was moderate. Much of the black needlerush planting along the base of the dune was excavated and replaced with smooth cordgrass during maintenance operations in 1999.

Smooth cordgrass and saltmeadow cordgrass have exhibited excellent growth and survival through 2000. Average cover values for these two species consistently increased from 1998 to 2000 (Appendix A). Average cover values for smooth cordgrass were 28%, 37%, and 42% in 1998, 1999, and 2000 respectively. Average cover values for saltmeadow cordgrass were 3%, 6%, and 9% in 1998, 1999, and 2000 respectively.

Total vegetative coverage within the restoration area continues to increase (Appendix A). Although the restored salt marsh communities do not yet meet the success criterion (i.e. 69% coverage), total estimated vegetative coverage increased 39% from 1998 to 1999 (32.7% to 45.4%) and 22% from 1999 to 2000 (45.4% to 55.4%). Assuming a 10-15% annual increase in total vegetative cover, the salt marsh communities should meet the vegetative success criteria within the next two growing seasons.

Since the vegetative success criterion has not been achieved, we will continue vegetative monitoring through 2001 or until the vegetative success criterion has been achieved. Vegetative coverage within the RME will be re-assessed in 2001 to determine if any changes have occurred.

4.0 Overall Conclusions / Recommendations

Hydrologic monitoring at the BSMS indicates that wetland hydrology is present throughout the 3.56 acre restoration area during the growing season. The duration and periodicity of tidal inundation within the restoration area is dependent upon monthly and seasonal fluctuations in the elevation of the high tide and the elevation of the marsh surface. The three years of existing hydrologic data are sufficient to demonstrate hydrologic success and further hydrologic monitoring is not likely to provide additional relevant data. Therefore, we propose to remove the surface water gauges and cease all hydrologic monitoring at the site.

The restored marsh plant communities exhibit increasing cover and diversity and appear to be developing toward stable low, mixed, and high marsh communities. Throughout most of the restoration area, smooth cordgrass coverage continues to increase at an annual rate of greater than 20%. Planted and naturally regenerating species are well established along the base of the dune adjacent to the restoration area. Additional vegetation monitoring data will be collected within the marsh restoration area and RME to determine trends in cover, diversity, and stability.

The recommendations for 2001 include:

- Remove surface gauges and provide a summary of hydrologic data in the 2001 annual report
- Continue vegetative monitoring of the restored marsh and RME

APPENDIX A

Graphs & Figures

FIGURE 3: 2000 Hydrograph for Restoration Area Surface Gauge #1

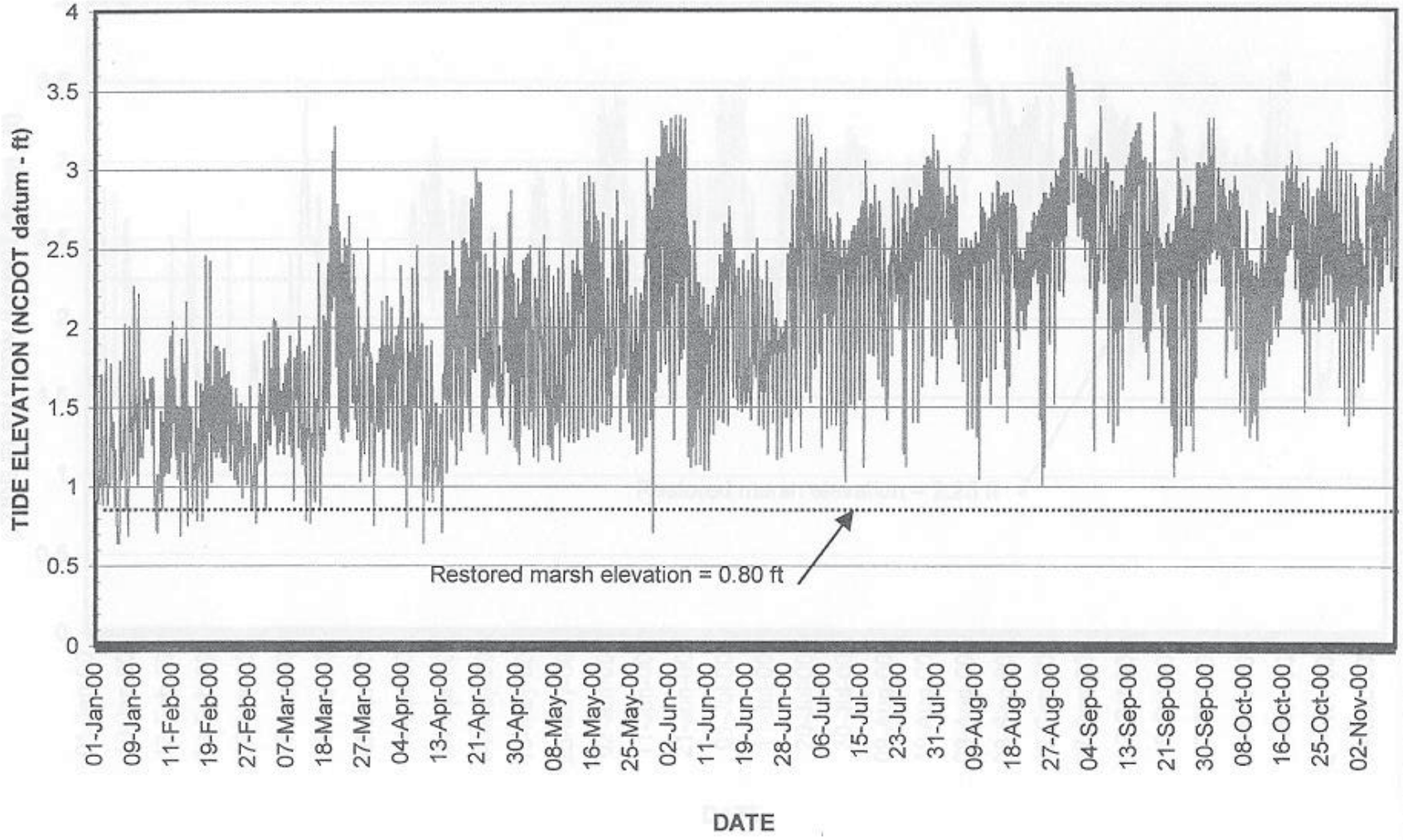


Figure 4: 2000 Hydrograph for Restoration Area Surface Gauge #2

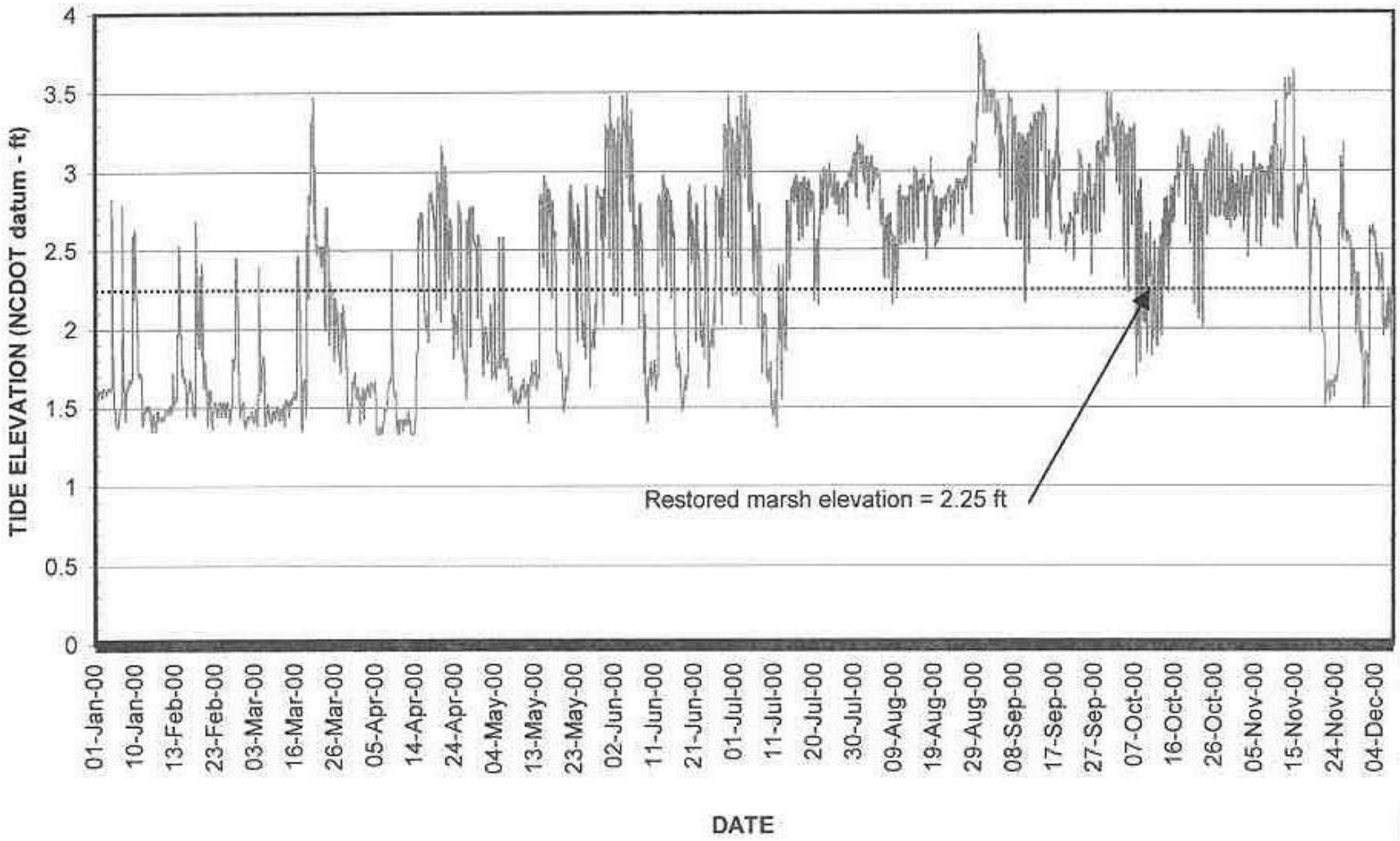
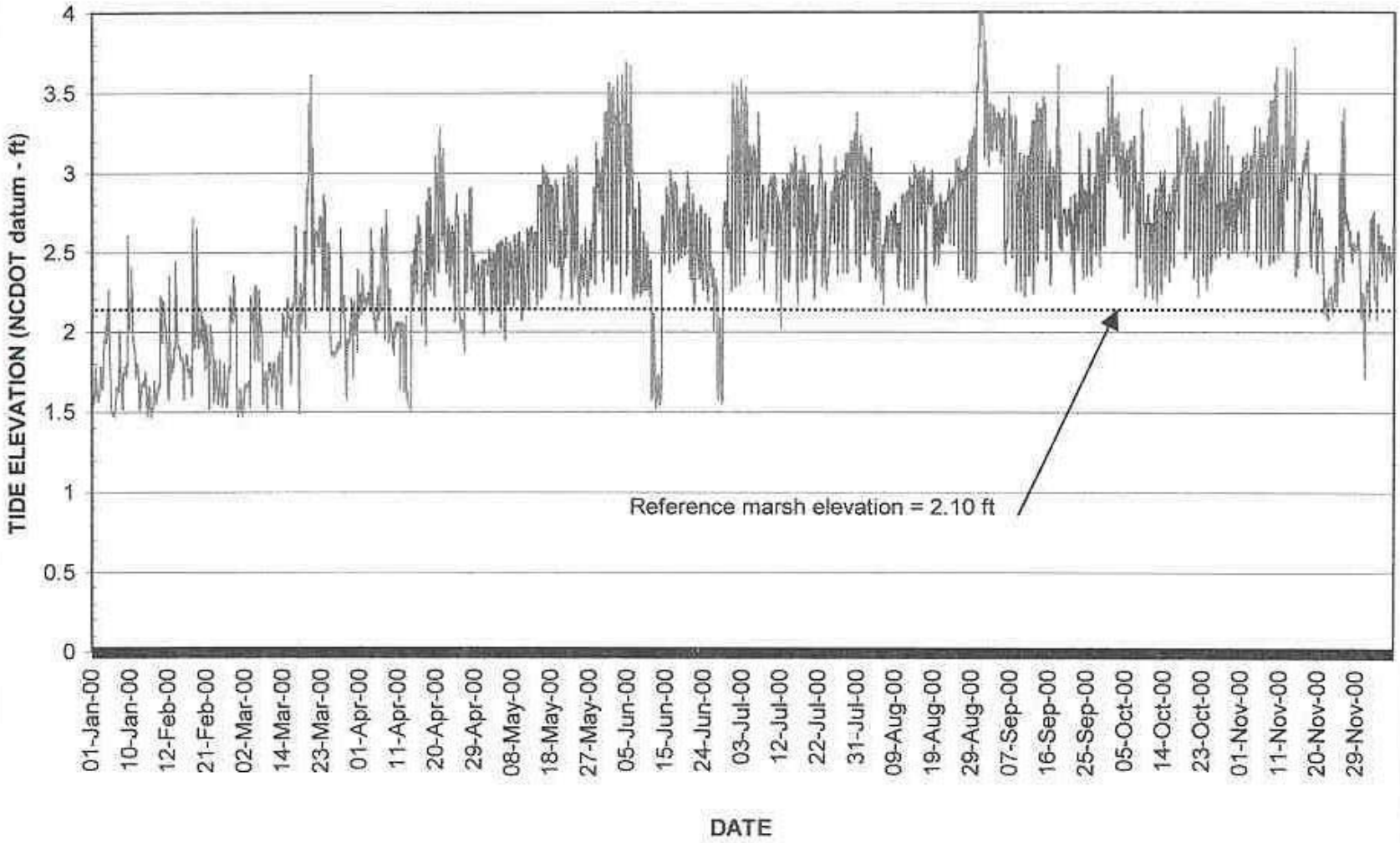


Figure 5: 2000 Hydrograph for Marsh Reference Surface Gauge



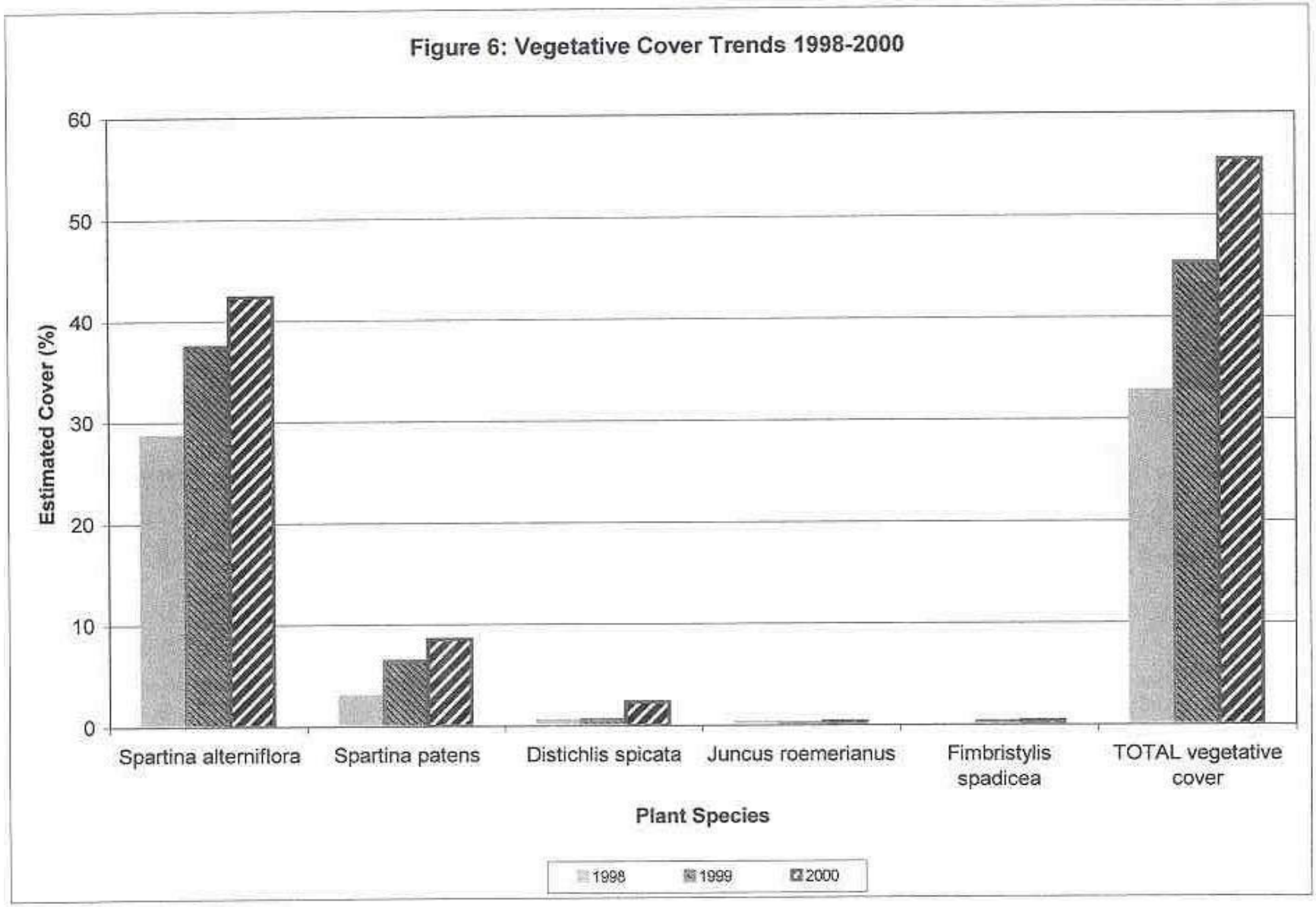


Figure 6: Vegetative Cover Trends 1998-2000
Estimated Cover (%)
60
50
40
30
20
10
0
Spartina alterniflora
Spartina patens
Distichlis spicata
Juncus roemerianus
Fimbristylis spadicea
TOTAL vegetative cover
Plant Species
1998
1999
2000

Figure 7: 1999 Hydrograph for Restoration Area Surface Gauge #1

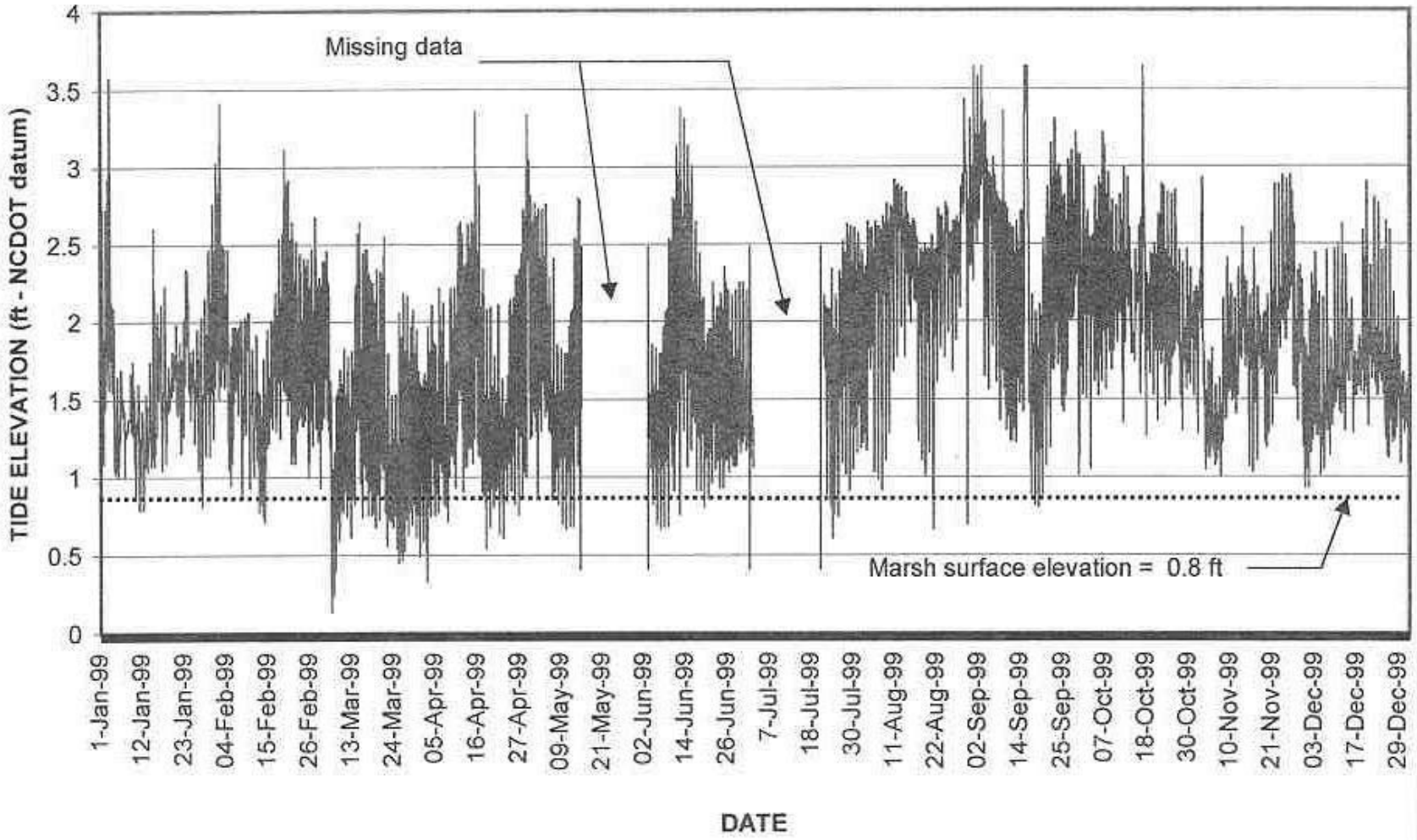


Figure 8: 1999 Hydrograph for Restoration Area Surface Gauge #2

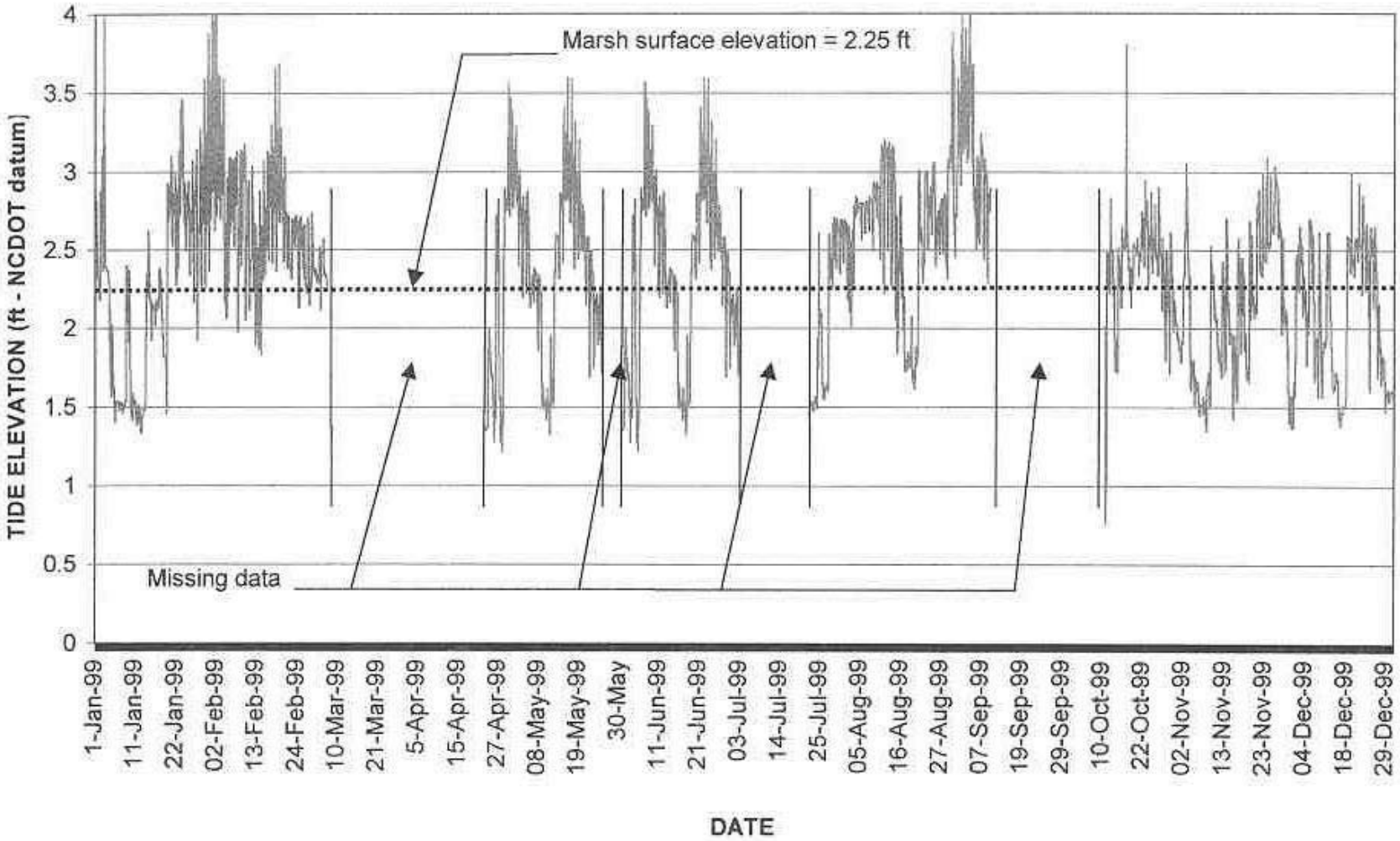


Figure 9: 1999 Hydrograph for Marsh Reference Surface Gauge

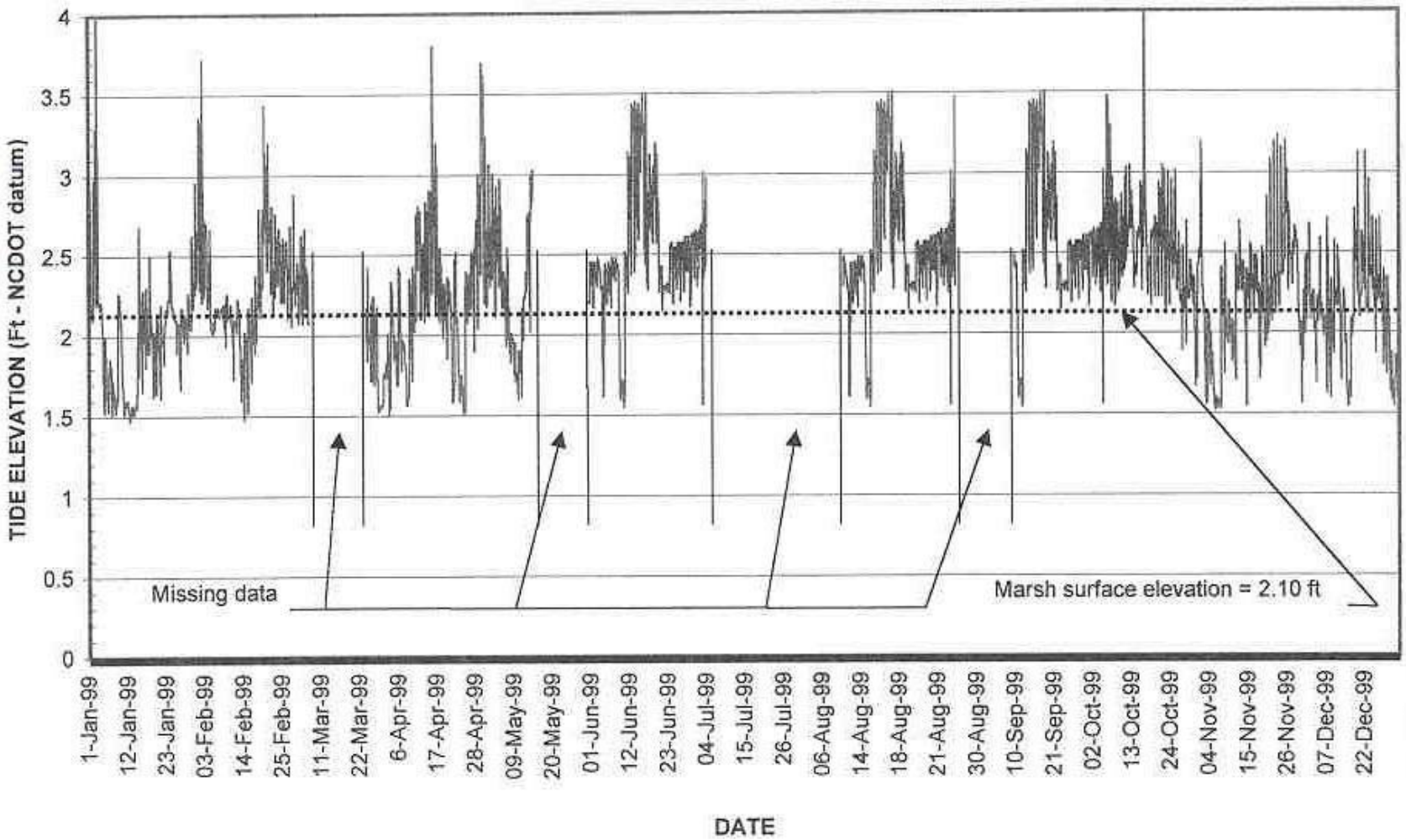


Figure 10: 1998 Hydrograph for Restoration Area Surface Gauge #1

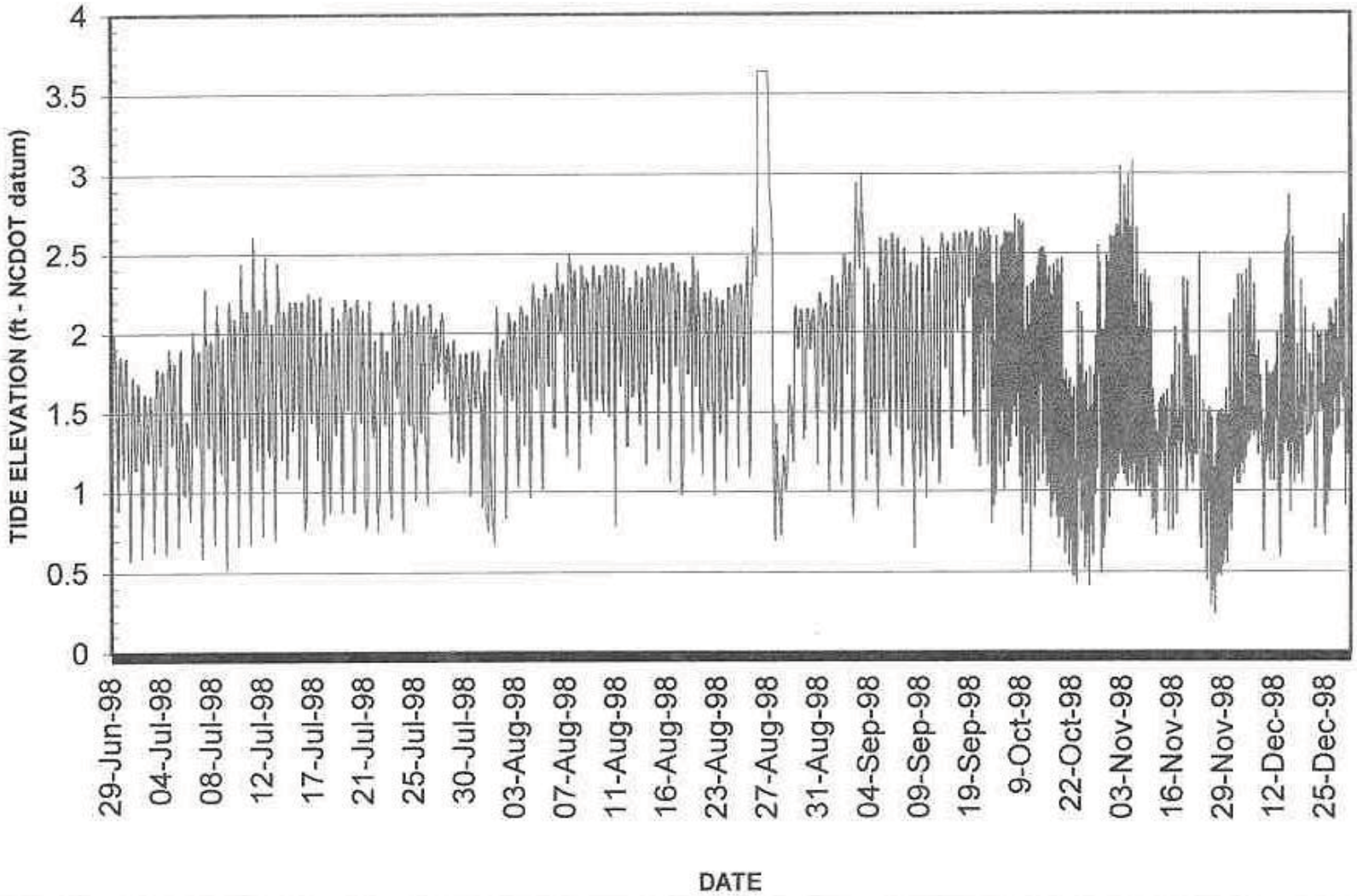
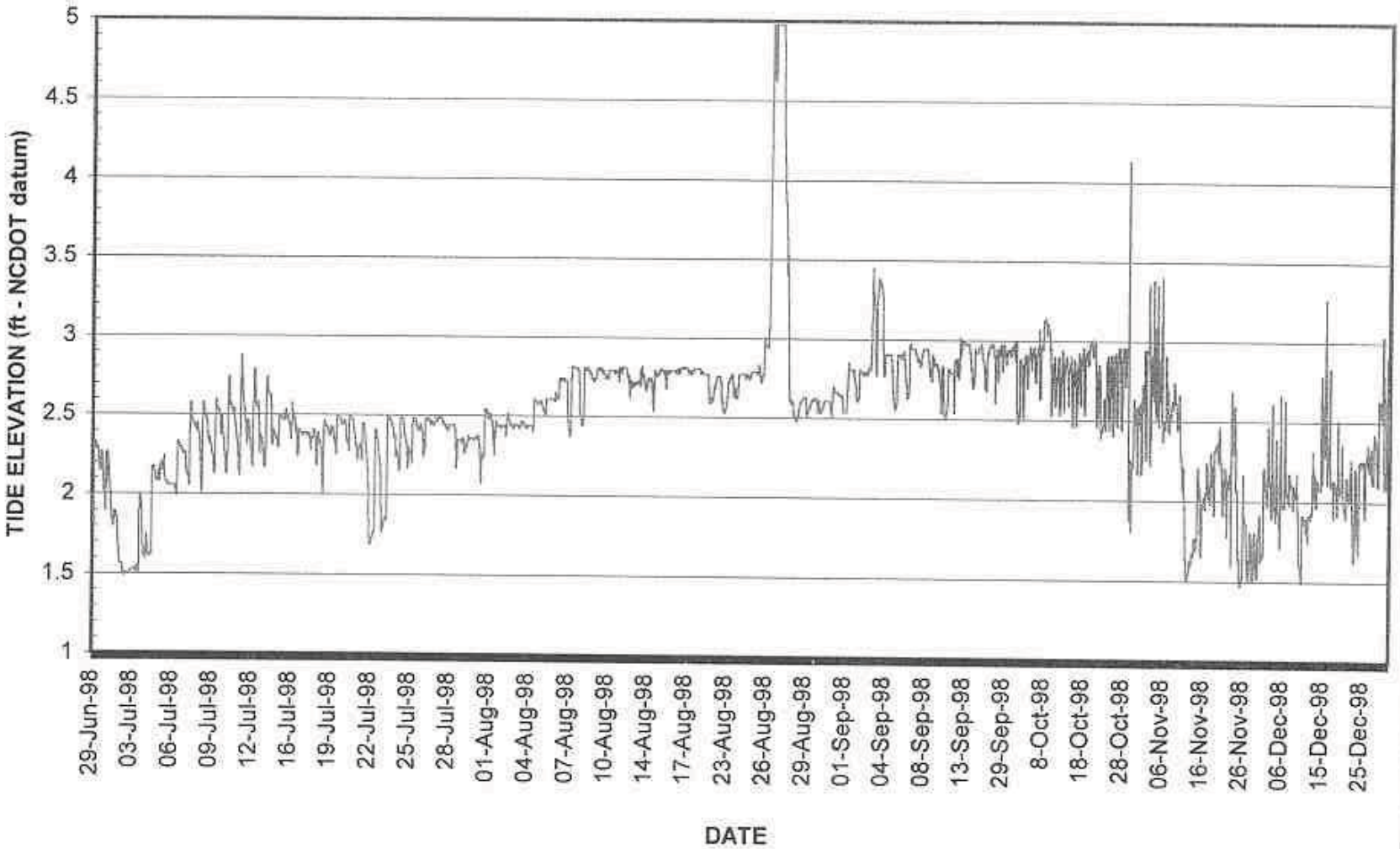


Figure 11: 1998 Hydrograph for Marsh Reference Surface Gauge



APPENDIX B

Color Photographs

Photo #1: Permanent monitoring point #1, looking SE at marsh restoration area (10/11/00)

Photo #2: Permanent monitoring point #2, looking NW at marsh restoration area (10/10/00)

Photo #3: Permanent monitoring point #3, looking NW at marsh restoration area (10/10/00)

Photo #4: Permanent monitoring point #4, looking S at marsh restoration area (10/11/99)

Photo #5: Aerial view of eastern portion of restored marsh and dune. Areas of low vegetative coverage are evident on the south side of the tidal slough (left side of photo) (10/10/00)

Photo #6: Sample point with relatively low vegetative coverage on south side of tidal slough (10/10/00)

Photo #7: Looking NW along base of dune. The dominant plant species is American beachgrass (10/10/00)

Photo #8: Naturally regenerating glasswort (*Salicornia europea*) in restoration area (10/10/00)

APPENDIX C

Field Data Sheets