EEP Project Closeout Summary

Project ID & Status

Project Name/Number:	Hammocks Beach
EEP ID	40
County:	Onslow
Project Type:	Wetland Restoration
Current Status:	5 Years of Monitoring complete

Project Setting

Basin:	White Oak
Physiographic Region:	Coastal Plain
Ecoregion:	Southern Outer Coastal Plain
USGS Hydro Unit:	03020106

Project Performers

WRP

Project Timeline

Milestone	Date
Construction Completed	2001
Monitoring Year-1	2001
Monitoring Year-2	June 2002
Monitoring Year-3	June 2003
Monitoring Year-4	June 2004
Monitoring Year-5	June 2005

Project Restoration Components and Mitigation Assets

Wetland		Asset Data				
	Restoration Component		Ratio			Wetland
		Level	Multip	Acres	WMU	Type
			0.00		0.0	
	Tidal Marsh	R	1.00	0.30	0.30	TM
			0.00		0.0	

Asset Summary

Level	Multip	Acres	WMU
R	1.00	0.30	0.30
E	0.50	0.00	0.00
C	0.33	0.00	0.00
P	0.20	0.00	0.00
		0.30	**0.30**

Standard Ratios

	Level	Ratio	Multiplier
Wetland	**R**	1	1.000
Wetland	**E**	2	0.500
Wetland	**C**	3	0.333
Wetland	**P**	5	0.200

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The Hammocks Beach shoreline stabilization project at Hammocks Beach State Park was designed with a rock sill for stability. It provided for the restoration of 0.30 acres of salt marsh planted with *Spartina alternaflora* and *Spartina patens*. Monitoring results show that the planted marsh is doing well. Both planted species have filled in the marsh area with little encroachment of other species.

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Note: For further information see the Hammocks Beach Monitoring Report following this page

P1 = Priority I Restoration
P2 = Priority II Restoration
P3 = Priority III Restoration

R = Restoration
E = Wetland Enhancement
EI = Stream Enhancement I
EII = Stream Enhancemnt II
C = Wetland Creation
P = Preservation

SMU =Stream Mitigation Units
WMU = Wetland Mitigation Units
P/I/E = Perennial, Intermittent, Ephemeral

Hammocks Beach Shoreline Stabilization and Wetland Restoration Project
Hammocks Beach State Park
Swansboro, Onslow County, North Carolina

2005 Annual Monitoring Report
Year 5 of 5

NCEEP Project Number: .00040
BLWI Project Number: 050033
NCDENR contract: D05056S

Original Design Firm:	BLUE: Land, Water, Infrastructure, PA 1271 Old Highway 1 Southern Pines, NC 28387
Submitted to:	NCDENR Ecosystem Enhancement Program 1652 Mail Service Center Raleigh, NC 27699
Prepared by:	BLUE: Land, Water, Infrastructure, PA 115 East First Street Clayton, NC 27520

1 December 2005

Ecosystem Enhancement PROGRAM

BLUE Land Water Infrastructure

Table of Contents

Tables

Appendix A – Vegetative Raw Data

I. Executive Summary

The Hammocks Beach shoreline stabilization and wetland restoration project is located at the Hammocks Beach State Park, in Onslow County, near Swansboro, N.C. It is at the site of the old visitor's center, near where the canoes and kayaks launch. The project was a co-operative effort between the State Parks of North Carolina, the NC Coastal Federation and the NC Ecosystem Enhancement Program (formally the NC Wetlands Restoration Program). The project demonstrated the use of a rock sill and provided for the restoration of 0.3 acres of regularly flooded salt marsh, *Spartina alterniflora* and *Spartina patens*. The site was planted in the year 2000. This report represents the fifth year of vegetative monitoring. The project was not designed to meet any specific mitigation requirements.

With no specific monitoring requirements to meet for either vegetation or hydrology, success is determined by vegetative growth and regular flooding of the vegetative zones. Growth in the marsh appears to be good. Stem counts of the *Spartina alterniflora* have doubled since the previous report. Height and % cover of both species are comparable. Observed hydrology is in accordance to maintaining the vegetation and is similar to the adjacent natural stands.

Problems areas are few. There is some presence of *Typha sp.* and *Phragmites australis* which could be controlled with spraying. Most impacts of vegetative loss are in the shrub/scrub zone during repairs to the bulkhead.

II. Project Background

a. Location and Setting

The project is located at Hammocks Beach State Park near Swansboro, NC. It is at the site of the old visitor's center, near where the canoes and kayaks launch.

Directions from Raleigh: Take I-40 East to Exit 373 – NC24/NC903 East. Follow NC 24 through Jacksonville to Swansboro. Before reaching downtown Swansboro, turn right onto Hammocks Beach Road (SR1511). Near the end of the road turn right into the park entrance. Take the first left into the old visitor's center and maintenance area. The restoration areas are located on either side of the dock and boat ramp. (Figure 1. Vicinity Map)

b. Structure and Objectives

The Hammocks Beach Shoreline Stabilization and Wetland Restoration Project involved the installation of innovative shoreline stabilization measures and the associated restoration of salt marsh and a shrub/scrub buffer. The project was a co-operative effort between the State Parks of North Carolina, the NC Coastal Federation and the NC Ecosystem Enhancement Program (formally the NC Wetlands Restoration Program). Portion of a failing bulkhead was removed, a rock sill was placed along the shoreline and the marsh was established on the regarded site. The site doubles as a restoration area and as a demonstration of alternative shoreline stabilization techniques. Design of the rock sill was by the Coastal Federation with funding from the NC Clean Water Management Trust Fund. The project implementation was not necessary to meet any mitigation needs.

Exhibit Table I. Project Structure Table Project Number and Name 050033 Hammocks Beach Wetland	
Area	Acreage
Marsh – Ramp & Restroom Sides	0.3

Exhibit Table II. Project Objectives Table Project Number and Name 050033 Hammocks Beach Wetland			
Area	Objectives	Acreage	Comment
Marsh – Both Sides	Restoration	0.3	Provided habitat and vegetative zone.

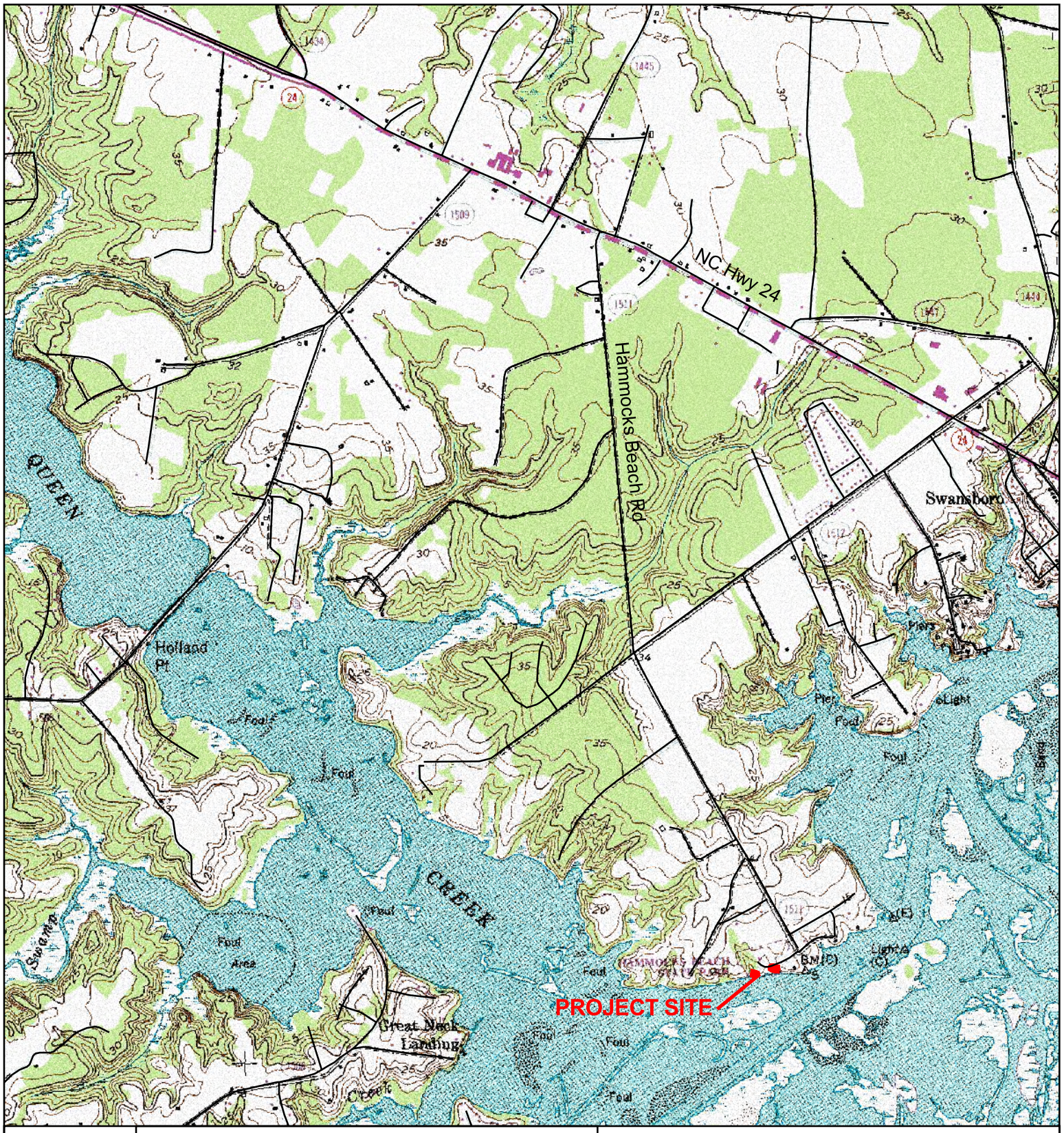

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Figure 1. Vicinity Map
Hammocks Beach Shoreline Stabilization and Wetland Restoration Project

Hammocks Beach State Park, Onslow County, NC
2005 Annual Monitoring - Year 5 of 5

EEP Project Number: .00040
BLWI Project Number: 050033

Ecosystem Enhancement Program

BLUE Land Water Infrastructure

2000 0 2000 Feet

Scale: 1" = 2000' November 2005

c. Project History and Background

Exhibit Table III. Project Activity and Reporting History Project Number and Name: 050033 Hammocks Beach Wetland		
Activity or Report	Calendar Year of Completion or Planned Completion	Actual Completion Date
Restoration Plan (plan set)	2000	7/12/2000
Mitigation Plan	none	none
Construction	2000	8/2000
Temporary S&E mix applied to entire project area	2000	8/2000
As-Built Report	none	none
Permanent seed mix applied to wetland areas	none	none
Marsh plantings	2000	8/18/2000
Reflectors installed	2000	12/6/2000
Containerized and B&B plantings for wetland buffer areas	2001	4/3/2001
Initial - Year 1 Monitoring (S&EC)	2001	11/27/2001
Year 2 Monitoring (S&EC)	2002	11/27/2002
Year 3 Monitoring (NCSU Water Quality Group)	2003	10/1/2003
Year 4 Monitoring (NCSU Water Quality Group)	2004	10/18/2004
Year 5 Monitoring (BLWI)	2005	9/20/2005

Exhibit Table IV. Project Contact Table Project Number and Name: 050033 Hammocks Beach Wetland	
Designer Primary project design POC	**BLUE: Land, Water, Infrastructure, PA** 1271 Old Highway 1, Southern Pines, NC 28387 Thomas S. Blue, PE, PLS (910) 692-6461 ext. 7
Secondary Designer Project design POC	**North Carolina Coastal Federation** 3609 Hwy 24 (Ocean), Newport, NC 28570 Todd Miller (252) 393-8185
Property Contact Park POC	**Hammocks Beach State Park** 1572 Hammocks Beach Road, Swansboro, NC 28584 Sam Bland (910) 326-4881
Construction Contractor (Stone Sill) Construction contractor POC	**Chadwick Construction** 327 Steamship Lane, Newport, NC 28570 Ronnie Chadwick (252) 728-4504
Construction Contractor (Bulkhead Demolition & Grading) Construction contractor POC	**Williams Construction Company** 1236 Piney Green Road, Jacksonville, NC 28546 John M Williams / Keith P Williams (910) 346-4036
Planting Contractor Planting contractor POC	**Cedar Point Nursery & Garden Center** 100 Commercial Court, Swansboro, NC 28584 volunteers (252) 393-8185
Seeding Contractor	none
Temporary Seed Mix Sources	Waters Ace Hardware, Swansboro, NC
Nursery Stock Suppliers	Campbell's Greenhouse, Raleigh, NC (marsh plants) Cedar Point Nursery & Garden Center, Swansboro, NC (container plants)
Monitoring Performers Monitoring POC	**BLUE: Land, Water, Infrastructure, PA** 115 East First Street Clayton, NC 27520 Amber L. Coleman (919) 553-8761 Larry Hobbs (919) 306-2410

Exhibit Table V. Project Background Table Project Number and Name: 050033 Hammocks Beach Wetland	
Project county	Onslow
Drainage area	n/a
Drainage impervious cover estimate (%)	n/a
Stream order	n/a
Physiographic region	coastal plain
Ecoregion	Carolinian Barrier Islands and Coastal Marshes (63G)
Rosgen classification of as-built	n/a
Cowardin classification	Intertidal persistant emergent wetland, regularly flooded
Dominant soil types	Wando fine sands
Reference site ID	Adjacent marsh to the west of restoration area
USGS HUC (project and reference)	3020106
NCDWQ subbasin (project and reference)	03-05-01
NCDWQ classification (project and reference)	SA HQW (Intracoastal Waterway)
Any portion of the project area 303d listed?	No
Any upstream portion 303d listed?	No
Reasons for 303d listing or stressor	n/a
% of project easement fenced	none

d. Monitoring Plan View (see Figure 2)

A total of seven 1M x 1M plots were monitored in the restored marsh area, five in the *Spartina alterniflora* and two in the *spartina patens.* Height, stem counts and % cover were recorded in each plot.

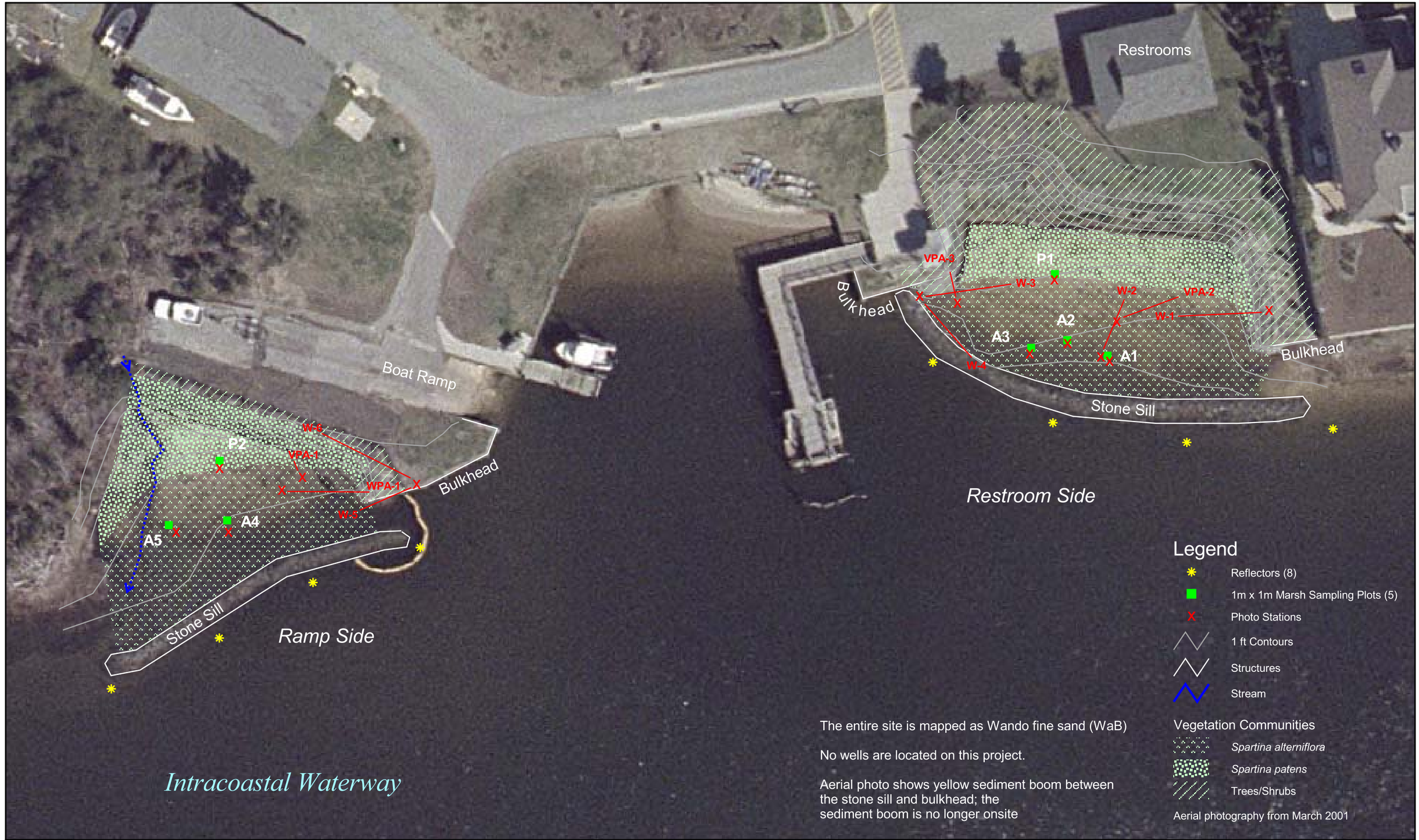

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Figure 2. Monitoring Plan View
Hammocks Beach Shoreline Stabilization and Wetland Restoration Project
Hammocks Beach State Park, Onslow County, NC
2005 Annual Monitoring - Year 5 of 5

30 0 30 60 90 Feet

Scale: 1" = 30'
November 2005

EEP Project Number: .00040
BLWI Project Number: 050033

Ecosystem Enhancement Program

BLUE Land Water Infrastructure

III. Project Condition and Monitoring Results

a. Vegetation Assessment

i. Soil Data

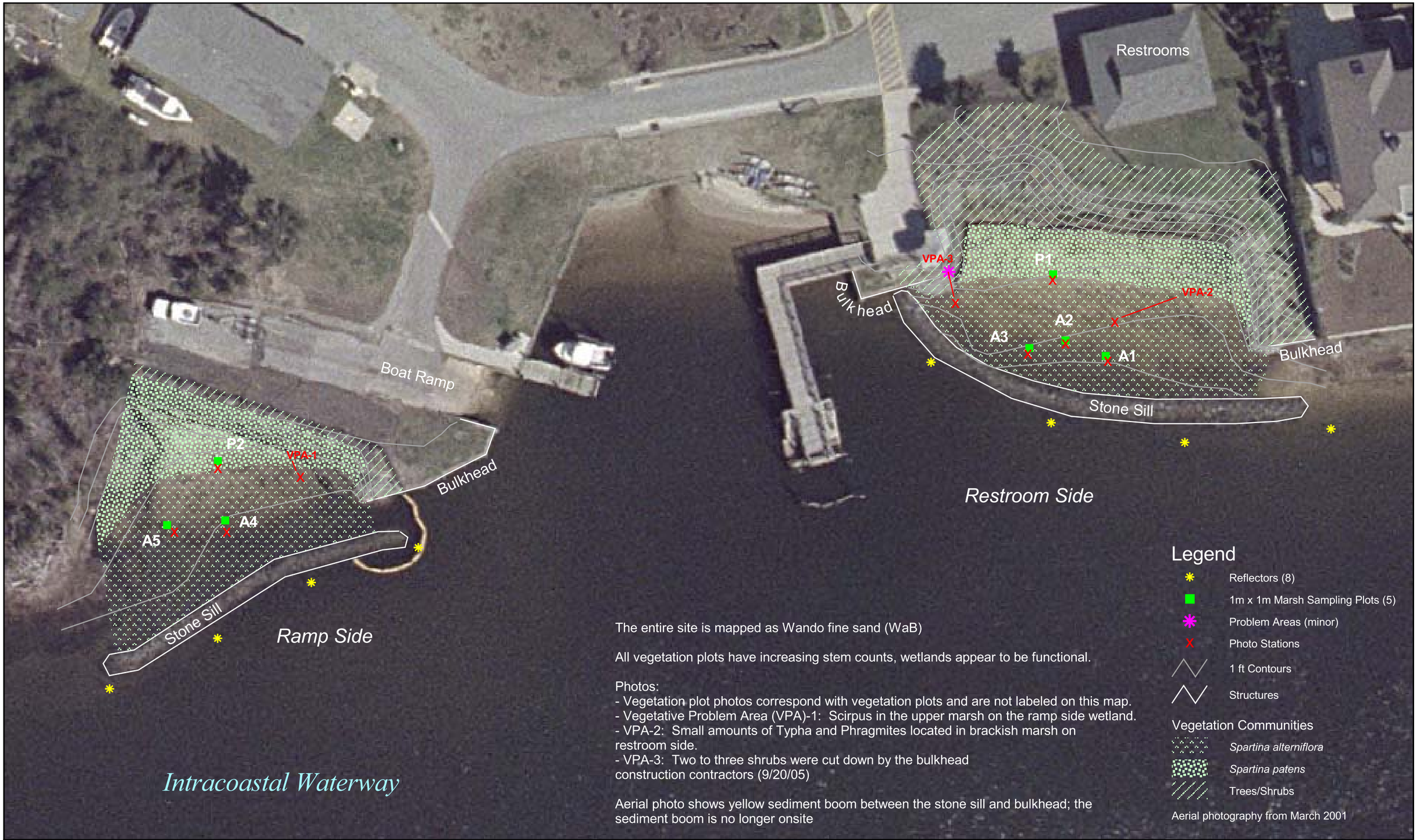
Exhibit Table VI. Preliminary Soil Data Project Name and Number: 050033 Hammocks Beach Wetland					
Series	Max Depth (in)	% Clay on Surface	K	T	OM %
Wando (WaB)	85	1	0.10	5	<1

ii. Vegetative Problem Areas

Exhibit Table VII. Vegetative Problem Areas Project Number and Name: 050033 Hammocks Beach Wetland			
Feature/Issue	Area	Probable Cause	Photo #
Volunteer Species	Ramp Side	*Scirpus* prolific within upper marsh area	VPA-1
	Restroom Side	Minor amount of *Typha* and *Phragmites* located in marsh	VPA-2
Vegetation Removal	Shrubs-Restroom Side	A few shrubs removed due to bulkhead construction	VPA-3
Vegetation Damage	Shrubs-Ramp Side	Minor shrub damage likely due to bulkhead construction equip.	
Wetland Impact	Ramp Side	Fill placed in small area at the end of the bulkhead	VPA-4

iii. Problem Area Plan View (see Figure 3)

The plan view shows the location of the noted problems.



The entire site is mapped as Wando fine sand (WaB)

All vegetation plots have increasing stem counts, wetlands appear to be functional.

Photos:
- Vegetation plot photos correspond with vegetation plots and are not labeled on this map.
- Vegetative Problem Area (VPA)-1: Scirpus in the upper marsh on the ramp side wetland.
- VPA-2: Small amounts of Typha and Phragmites located in brackish marsh on restroom side.
- VPA-3: Two to three shrubs were cut down by the bulkhead construction contractors (9/20/05)

Aerial photo shows yellow sediment boom between the stone sill and bulkhead; the sediment boom is no longer onsite

Legend

- Reflectors (8)
- 1m x 1m Marsh Sampling Plots (5)
- Problem Areas (minor)
- Photo Stations
- 1 ft Contours
- Structures

Vegetation Communities

- *Spartina alterniflora*
- *Spartina patens*
- Trees/Shrubs

Aerial photography from March 2001

N

Figure 3. Vegetative Problem Area Plan View
Hammocks Beach Shoreline Stabilization and Wetland Restoration Project
Hammocks Beach State Park, Onslow County, NC
2005 Annual Monitoring - Year 5 of 5

30 0 30 60 90 Feet

Scale: 1" = 30'
November 2005

EEP Project Number: .00040
BLWI Project Number: 050033

Ecosystem Enhancement Program

BLUE Land Water Infrastructure

iv. Stem Counts

Marsh vegetation was assessed in five *Spartina alterniflora* 1m x 1m plots and in two *Spartina patens* 1m x 1m plots (Exhibit 8). Methodology from previous monitoring visits was followed and stems were not counted in the *S. patens* plots. Opposite corners of each vegetation plot were marked with half inch metal conduit and coordinates were obtained via GPS.

Monitoring results show that the planted marsh is doing well. Both species are surviving with minimal invasion from non-planted species. *Scirpus americanus, Aster sp. and Limonium sp.* are present in the transition zone, but this is a common occurrence within natural marshes. The range for the number of stems counted in the *S. alterniflora* plots doubled from 2004 to 2005. Recorded heights and % cover of both species are comparable to the previous years.

Small patches of *Typha sp.* and *Phragmites australis* were noted on the east/restroom side. An application of a herbicide may be necessary if these areas increase in size.

Except for those shrubs removed during recent bulkhead repair, there is good growth and survival of the planted species.

Exhibit VIII. Stem Counts (Marsh Transects)
Project Number and Name: 050033 Hammocks Beach Wetland

Transect 1 – East – Restroom Side

Species	**Plot**	**Count**	**Height (m)**	**Cover%**
Spartina alterniflora	A1	423	0.5-0.9	65
	A2	295	0.6-1.1	40
	A3	303	0.5-1.0	55
Spartina patens	P1	n/a	0.9-1.2	90

Transect 2 – West – Ramp Side

Species	**Plot**	**Count**	**Height (m)**	**Cover%**
Spartina alterniflora	A4	317	0.7-1.5	45
	A5	274	0.7-1.2	45
Spartina patens	P2	n/a	0.9-1.1	85

Exhibit IX. Vegetation Trends Project Number and Name: 050033 Hammocks Beach Wetland				
		Lower Salt Marsh (S. alterniflora) Data Range		
Monitoring Year	Firm	Stem Count	Height (m)	Cover %
2001/2002	S&EC	48-61	not available	not available
2003	NCSU	98-149	0.75-2.5	40-70
2004	NCSU	113-165	0.3-1	30-70
2005	BLWI	274-423	0.5-1.5	40-65
		Upper Salt (S. patens) Marsh Data Range		
Monitoring Year	Firm	Stem Count	Height (m)	Cover %
2001/2002	S&EC	not available	not available	not available
2003	NCSU	n/a	0.75-1.5	100
2004	NCSU	n/a	0.75-1.5	100
2005	BLWI	n/a	0.9-1.2	85-90

v. Vegetation Plot Photos (see Appendix A)

b. Wetland Assessment

i. Problem Areas Plan View (wetland) Exhibit (see Figure 4)

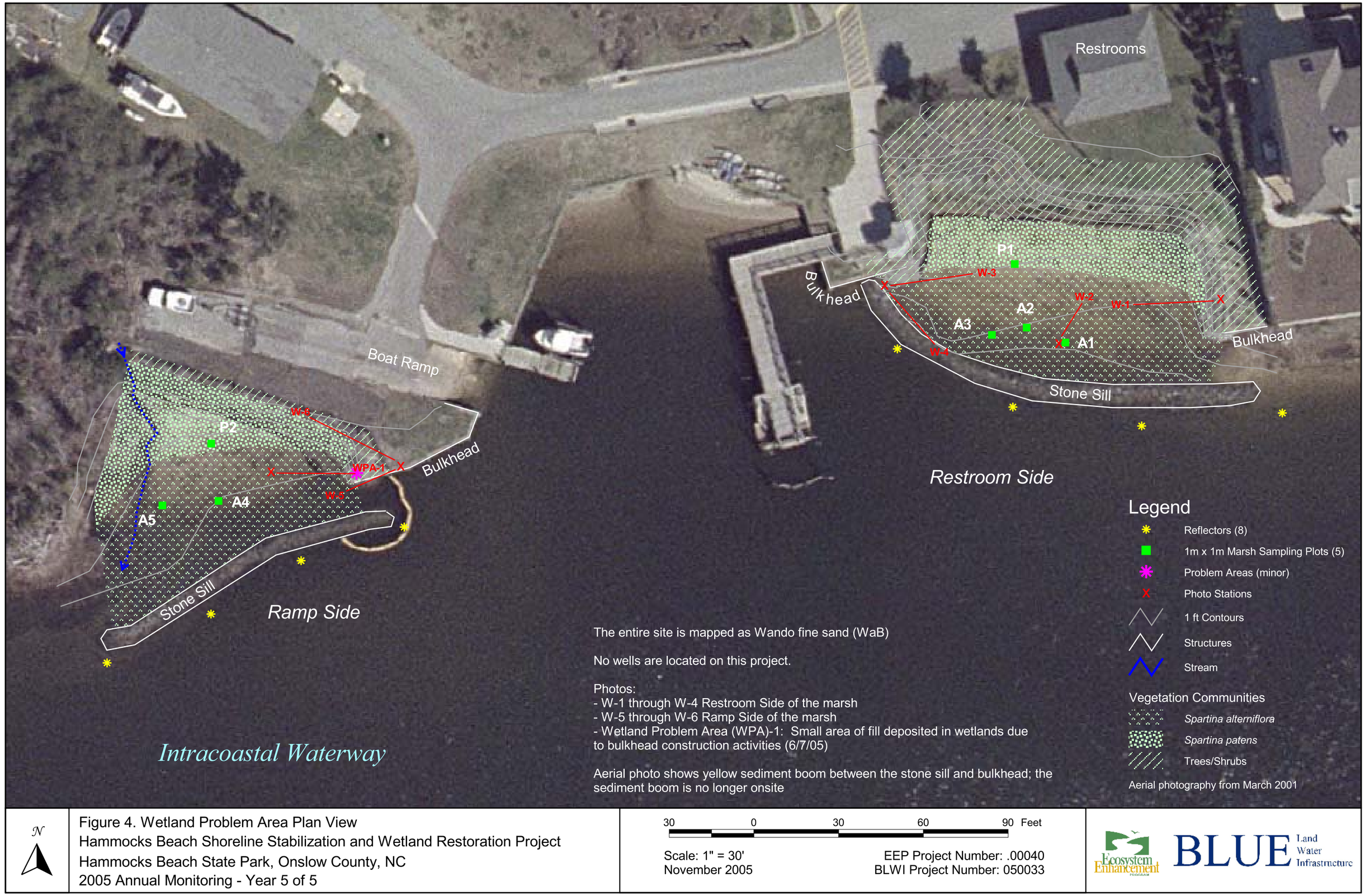


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Figure 4. Wetland Problem Area Plan View
Hammocks Beach Shoreline Stabilization and Wetland Restoration Project
Hammocks Beach State Park, Onslow County, NC
2005 Annual Monitoring - Year 5 of 5

30 0 30 60 90 Feet

Scale: 1" = 30'
November 2005

EEP Project Number: .00040
BLWI Project Number: 050033

Ecosystem Enhancement Program

BLUE Land Water Infrastructure

ii. Wetland Criteria Attainment

There are no wells present on the Hammocks Beach project. The salt marsh appears to exhibit appropriate hydrology to support the targeted marsh grass species.

IV. Methodology Section

Methodology from previous monitoring visits was followed to enable data comparison between monitoring years. Exact replication of monitoring plots was not possible due to the previous removal of the PVC plot boundary markers.

V. References

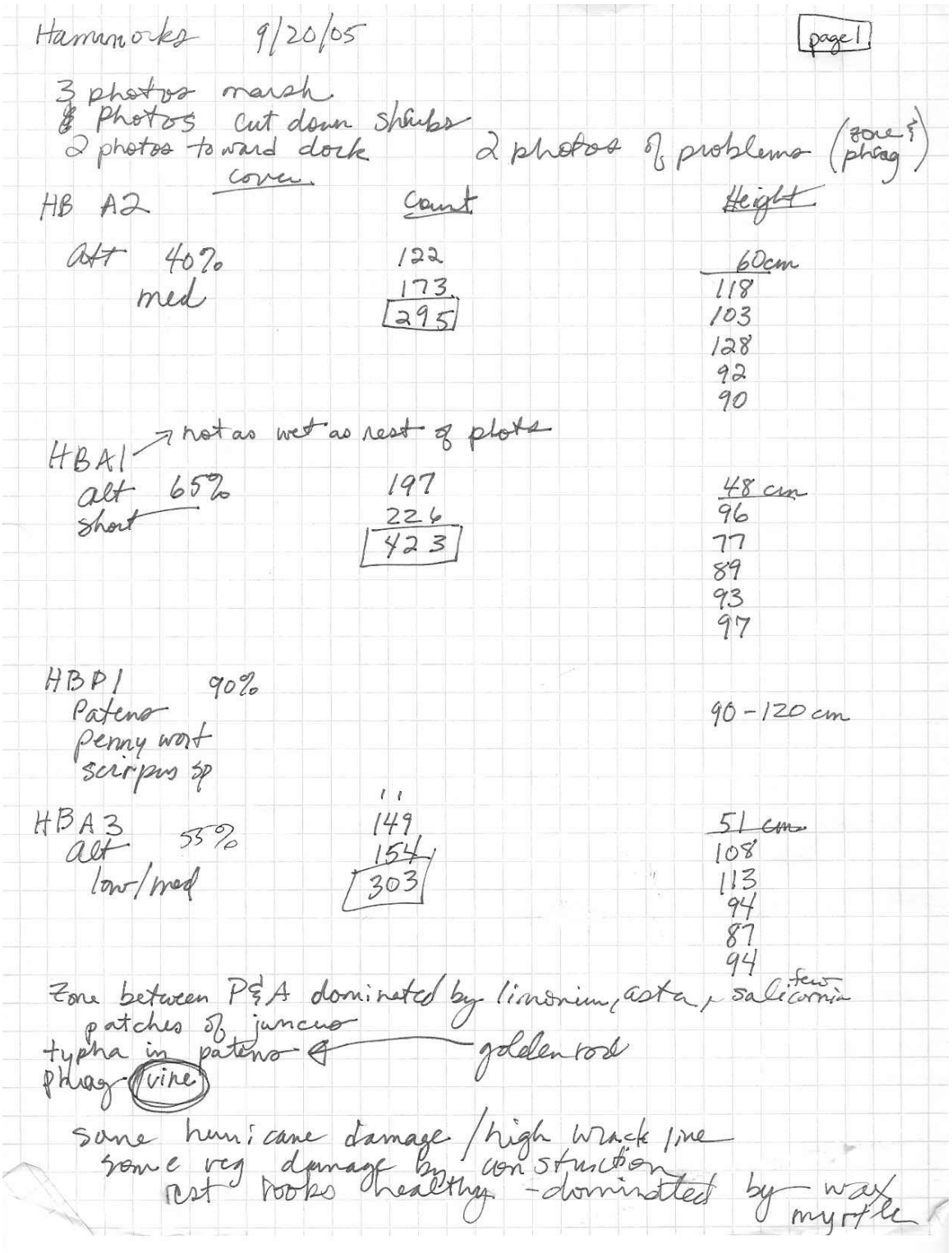
NCSU Water Quality Group. "Hammocks Beach Shoreline Stabilization and Wetland Restoration Project, 2003 Annual Monitoring Report." North Carolina State University, Biological and Agricultural Engineering, WRRI, March 2004.

NCSU Water Quality Group. "Hammocks Beach Shoreline Stabilization and Wetland Restoration Project, 2004 Annual Monitoring Report." North Carolina State University, Biological and Agricultural Engineering, WRRI, December 2004.

BLUE: Land, Water, Infrastructure. Hammocks Beach Shoreline Stabilization and Wetland Restoration Project in-house planning and design files.

APPENDIX A

Vegetative Raw Data



Hammocks 9/20/05 page 1

3 photos marsh
8 Photos cut down shrubs
2 photos toward dock
2 photos of problems (zone 5 phrag)
cover

	Count	Height
HB A2		
alt 40%	122	60cm
med	173	118
	295	103
		128
		92
		90
HBA1 → not as wet as rest of plots		
alt 65%	197	48 cm
short	226	96
	423	77
		89
		93
		97
HBP1 90%		
Patens		90-120 cm
penny wort		
scirpus sp		
HBA3	11	
alt 55%	149	51 cm
low/med	154	108
	303	113
		94
		87
		94

Zone between P&A dominated by limonium, aster, salicornia (few)
patches of juncus
typha in patens ← goldenrod
phrag (vine)

some hurricane damage / high wrack line
some veg damage by construction
rest looks healthy - dominated by wax myrtle

page 2

Hammocks 9/20/05

4 photos water to shrubs - Ramp side

2 photos looking towards bulkhead - Ramp side

HBA4 - Cover

Alt. → 45% cover

Stems

168 T 32 S

81 I 36 S

249 T 68 S

68

317

Height

1468 cm 092cm

153

168

155

142

HBA5

Alt → 45% cover

136 everything

138 everything

274

139 cm 66 cm

131 cm short

124 cm

111

114

tall

HBP2

Patens → 85% cover

Limoniam a little

Alt 1 stem

86 - 109 cm

Goldenrod coming in in Patens

Juncus " "

Pennywort " "

Scirpus

Marsh is med in height

less stems more height less coverage than adj.

looks comparable to marsh @ similar elevation

85% (short) ← existing marsh

Shrubs - some damage from construction

Wax myrtle - great

Ilex & Youpon doing ok

Bacch.

Vegetative Problem Area Photos

VPA-1 *Scirpus americanus*

VPA-2 Invasive species – *Typha* and *Phragmites*

VPA-3 Shrubs removed during bulkhead replacement

VPA-4 Fill in wetland during bulkhead replacement

Vegetation Monitoring Plot Photos

Plot 1 *S. alterniflora*

Plot 2 *S. alterniflora*

Plot 3 *S. alterniflora*

Plot 4 *S. alterniflora*

Plot 5 *S. alterniflora*

Plot 1 *S. patens*

Plot 2 *S.patens*

Site photos

W-1

W-2

W-3

W-4

W-5

W-6