

# ANNUAL REPORT FOR 2004



**Ballance Farm Mitigation Site  
Currituck County  
Project No. 6.049008T  
TIP No. R-2228WM**



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North Carolina Department of Transportation  
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## **SUMMARY**

The following report summarizes the monitoring activities that have occurred in the past year at the Ballance Farm Mitigation Site. The site must demonstrate both hydrologic and vegetation success for a minimum of five years or until the site is deemed successful.

The Ballance Farm site contained twenty-eight groundwater-monitoring gauges and twelve surface gauges. The original seventeen gauges were placed subsequent to the site construction. The site was extremely wet and the gauges were installed in the drier, and therefore higher locations across the site. NCDOT installed an additional eleven groundwater gauges across the site at elevation-representative locations.

Success criteria are based on federal guidelines for wetland mitigation (as well as a comparison to the hydrology of an undisturbed coastal marsh reference ecosystem located along Tull Creek and an undisturbed forested wetland reference ecosystem referred to as the Richard's property). These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. Gauges were not installed on the Richard's property for the first two years of monitoring.

An onsite agency meeting was held in August 2004 to discuss the hydrologic success for the bottomland hardwood portion of the site. At that time, it was agreed that the site had five years of successful hydrology data, therefore all twenty-eight groundwater gauges were removed in August 2004. The surface water gauges located in the existing and created coastal marshes exhibited occasional inundation during the growing season.

There were twenty-one tree-planting plots (50' x 50') established within the 223 acres planted in trees on the site. 500 random plots were also established within the 48 acres of marsh grass planting. The bottomland hardwood area has been closed out and deemed a success, therefore, no monitoring was completed this year. For the marsh area, the percent frequency of target species is 87.3%, while the scale value is 3.9 for year 5. The site appears to be functioning as a brackish water marsh system.

NCDOT has discontinued hydrology monitoring (groundwater) and proposes to discontinue hydrology (surface) and marsh vegetation monitoring on the Ballance Farm Mitigation Site.

## **1.0 INTRODUCTION**

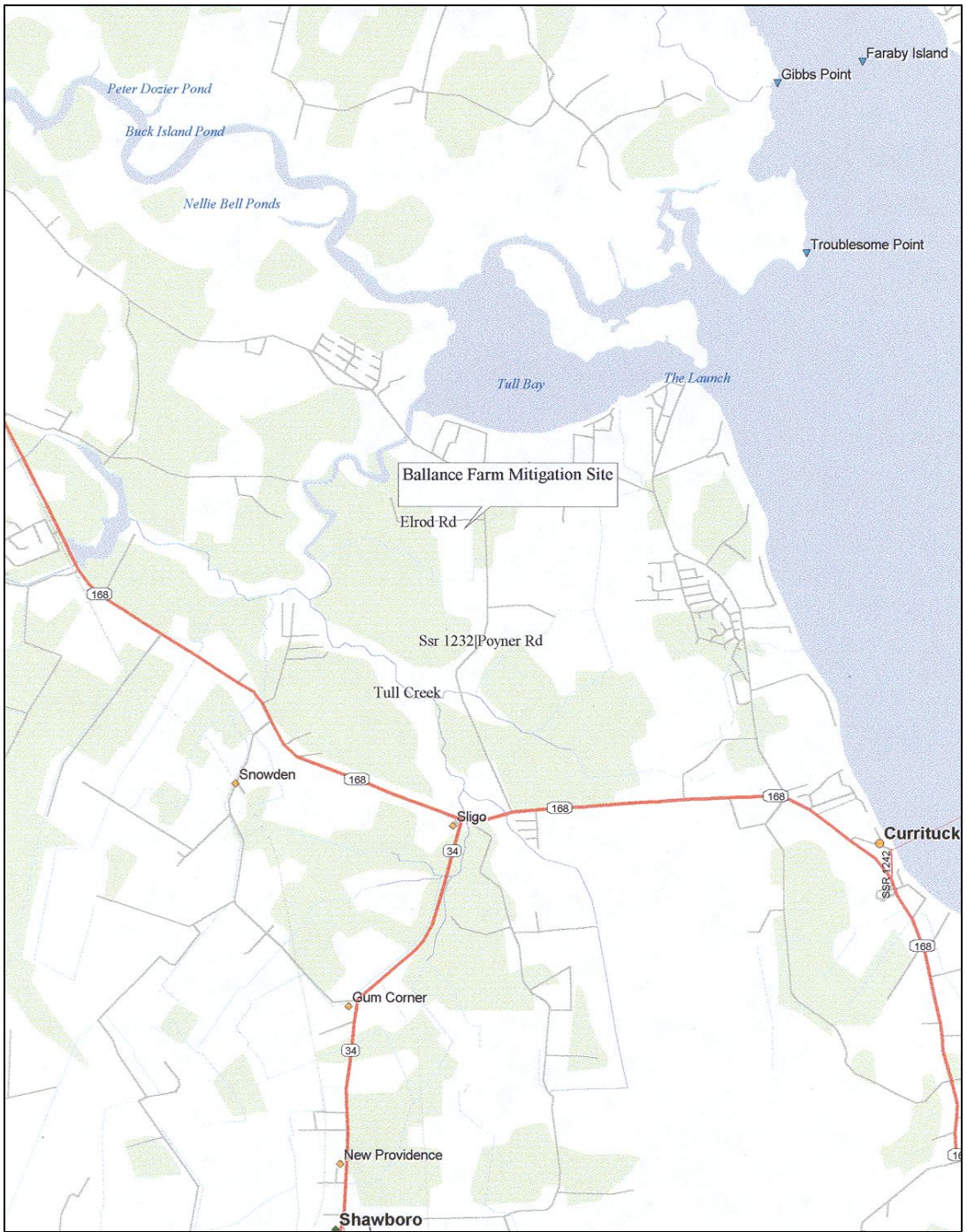
### **1.1 Project Description**

The Ballance Farm Mitigation Site is located in Currituck County (Figure 1). The property was originally a 469-acre site from which NCDOT purchased 430 acres. The mitigation site consisted of 297 acres of agricultural fields, 50 acres of tidal freshwater marsh, 51 acres of forested wetland, 5.3 acres of forested uplands, and 26 acres of roads and ditches. It was designed to mitigate for the widening of NC 168 (TIP Project R-2228); the project includes the creation of coastal marsh wetland and the preservation of forested wetlands and forested upland areas. According to the Ballance Farm Mitigation Plan, implementation of the site was to provide 61 acres of marsh creation, 236 acres of forested wetland restoration, 51 acres of forested wetland preservation, 50 acres of coastal marsh preservation, and 5.3 acres of upland habitat preservation. However, based on GPS data and ground observation, approximately 13 acres of the marsh creation area (zone C1) appears to have been graded incorrectly. NCDOT obtained controlled aerial photography of the mitigation site to determine the as-built condition of the site.

The Final Mitigation Plan for this site was issued on April 1, 1996. Initial construction was completed in late 1998. The site was planted and monitoring gauges were installed in early 1999.

### **1.2 Purpose**

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria are based on federal guidelines for wetland mitigation (as well as a comparison to the hydrology of an undisturbed coastal marsh reference ecosystem and an undisturbed-forested wetland reference ecosystem). These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of vegetative monitoring during the 2004-year and includes a brief description of surface water conditions on the Ballance Farm Mitigation Site.



**FIGURE 1: SITE LOCATION MAP**

### 1.3 Project History

Fall 1998	Site Constructed
Spring 1999	Site Planted
March-November 1999	Hydrology Monitoring (YEAR 1)
November 1999	Vegetation Monitoring (YEAR 1)
March-November 2000	Hydrology Monitoring (YEAR 2)
March 2000	Hardwood Herbicide Treatment
June 2000	Marsh Re-planted
October 2000	Hardwood Vegetation Monitoring (YEAR 2)
October-November 2000	Marsh Vegetation Monitoring (YEAR 1)
March-November 2001	Hydrology Monitoring (YEAR 3)
July 2001	Hardwood Vegetation Monitoring (YEAR 3)
July 2001	Marsh Vegetation Monitoring (YEAR 2)
October-November 2002	Hydrology Monitoring (YEAR 4)
July 2002	Hardwood Vegetation Monitoring (YEAR 4)
July 2002	Marsh Vegetation Monitoring (YEAR 3)
October-November 2003	Hydrology Monitoring (YEAR 5)
October 2003	Hardwood Vegetation Monitoring (YEAR 5)
October 2003	Marsh Vegetation Monitoring (YEAR 4)
August 2004	Hydrology Monitoring Discontinued
August 2004	On Site Agency Meeting
October 2004	Marsh Vegetation Monitoring (YEAR 5)

## **2.0 HYDROLOGY**

### **2.1 Success Criteria**

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology state that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Areas inundated or saturated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated or saturated between 5% - 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

The growing season in Currituck County begins March 20 and ends November 13. These dates correspond to a 50% probability that temperatures will drop to 28°F or lower after March 20 and before November 13.<sup>1</sup> The growing season is 239 days; therefore, optimum hydrology requires 12.5% of this season, or at least 30 consecutive days. Local climate must also represent average conditions for the area.

Based on the Ballance Farm Mitigation Plan, hydrologic success of the created coastal marsh is dependent on the groundwater levels occurring at depths concluded in the water budget analysis and similar to those in the adjoining reference coastal marsh. Success will also be determined by comparison of hydrology with the reference coastal marsh.

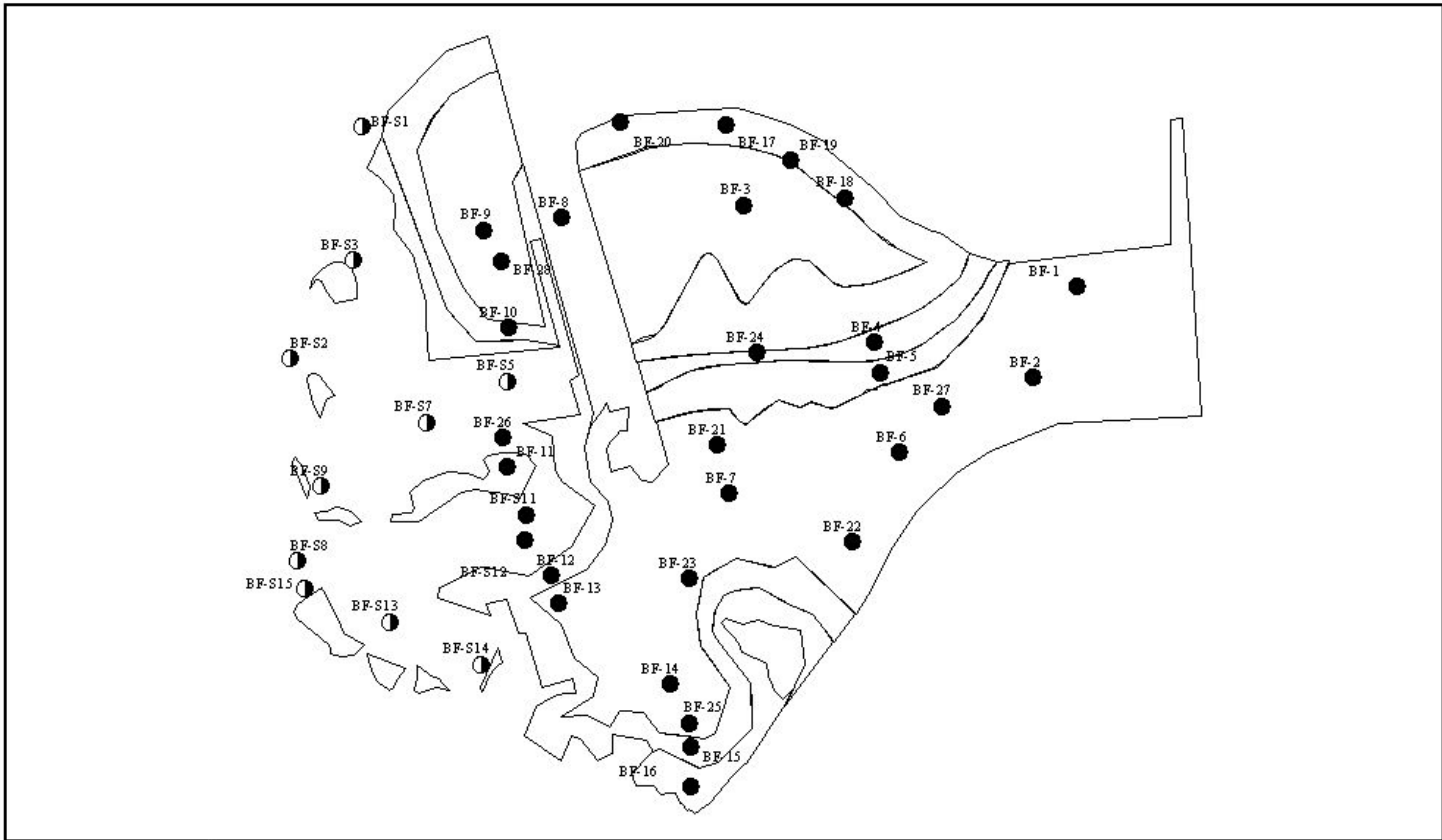
Based on coordination with the Corps of Engineers following the completion of the Ballance Farm Mitigation Plan, the restored forested wetland would be considered successful if hydrology onsite is consistent with the reference ecosystem referred to as the Richards' property. The plan also states that hydrologic success of the restored-forested wetland is dependent on the groundwater levels occurring at depths included in the water budget analysis.

### **2.2 Hydrologic Description**

In early 1999, seventeen monitoring gauges, one rain gauge, and fourteen surface water gauges were installed. In early 2000, eleven additional groundwater-monitoring gauges were installed, and seven surface water gauges were either removed or relocated to more adequately monitor the marsh area. There are twelve surface water gauges onsite (Figure 2). The surface gauges record daily readings of surface water depth. All twenty-eight of the groundwater gauges were removed in August 2004.

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<sup>1</sup> Natural Resources Conservation Service, Soil Survey of Currituck County, North Carolina, p.71.

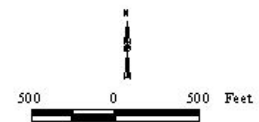


**Figure 2. Gauge Location Map**



**Hydrology Results**

- Groundwater Gauge
- ◐ Surface Gauge
- ⊕ Rain Gauge



The Ballance Farm site involved the construction and planting of a tidal marsh system by grading the site to match the topography of the existing system located along Tull Creek and by constructing large channels connecting Roland Creek, Tull Creek, and a tributary to Tull Creek. This connectivity will allow for tidal flushing of the constructed coastal marsh. This work created a 400-foot wide band of coastal marsh area that resulted in approximately 61 acres of coastal marsh created. In the existing agricultural fields, the field crowns were graded down, the field ditches were filled and plugged, and this area was planted resulting in the restoration of approximately 236 acres of forested wetlands.

### 2.3 Results of Hydrologic Monitoring

Hydrology monitoring was discontinued during 2004. No data or results pertaining to the groundwater monitoring on the site in 2004 are reported in this document. Table 1 provides a summary of hydrology monitoring results for the period spanning 1999 – 2003 (Years 1 –5).

**Table 1. Hydrologic Monitoring Results (1999- 2003)**

Monitoring Gauge	1999 Results	2000 Results	2001 Results	2002 Results	2003 Results
BF-1	27.9	93.7	18.8	32.2	37.7
BF-2	14.6	32.6	11.7	25.5	22.6
BF-3	2.5	9.6	8.8	17.9	23.0
BF-4	31.0	94.6	67	40.2	100
BF-5	6.7	10	13.4	24.7	22.6
BF-6	6.7	17.2	33.9	25.5	20.1
BF-7	2.9	9.2	2.1	24.7	23.4
BF-8	16.3	22.2	14.6	24.3	23.4
BF-9	4.2	9.6	27.6	23.9	18.0
BF-10	2.5	0	0	15.9	45.2
BF-11	2.5	9.6	5.9	25.1	44.4
BF-12	1.3	10	4.6	10	22.6
BF-13	4.6	30.2	36.4	27.2	43.9
BF-14	8.0	30.2	29.7	29.7	52.3
BF-15	7.1	100	49.3	31.4	100
BF-16	0	17.2	0	1.3	2.9
BF-17	13.9	32.6	17.6	26	24.3

BF-18	Not Installed	21.3	5.9	32.6	100
BF-19	Not Installed	33.9	2.5	13.8	23.8
BF-20	Not Installed	34.3	31.8	28.5	45.6
BF-21	Not Installed	17.2	30.1	28	46.4
BF-22	Not Installed	32.6	35.9	27.2	61.9
BF-23	Not Installed	Battery Problems	36	32.2	100
BF-24	Not Installed	35.6	36.4	30.1	47.3
BF-25	Not Installed	32.2	23	28	52.3
BF-26	Not Installed	96.2	98.7	100	76.6
BF-27	Not Installed	32.6	34.4	28.9	46.4
BF-28	Not Installed	36.8	31.8	30.1	52.3
BF-REF1	Not Installed	Not Installed	Not Installed	100	100
BF-REF 2	Not Installed	Not Installed	Not Installed	100	100
BF-REF 3	Not Installed	Not Installed	Not Installed	100	100
	Average to Below Average Rainfall	Average Rainfall	Average to Below Average Rainfall	Average Rainfall	Average Rainfall

Table 1 represents hydrologic data in percentages from previous years (1999-2003). The 2004 monitoring year reveals that the marsh area experiences wind tide fluctuations. Appendix A shows the results of the surface water gauges.

## 2.4 Conclusions

An onsite agency meeting was held in August 2004 to discuss the hydrologic success for the bottomland hardwood portion of the site. At this time, it was agreed that the site had five years of successful hydrology data, therefore all twenty-eight groundwater gauges were removed in August 2004. The surface water gauges located in the existing and created coastal marshes exhibited occasional inundation throughout the growing season.

NCDOT proposes to discontinue hydrology monitoring at the existing and created coastal marshes, based on the consistent hydrologic success.

### **3.0 VEGETATION: BALLANCE FARM MITIGATION SITE MARSH (YEAR 5 MONITORING)**

#### **3.1A Success Criteria (Bottomland Hardwood Area)**

NCDOT will monitor the site for five years. A 320-stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

#### **3.1B Success Criteria (Marsh Grass Area)**

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count toward the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met:

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

#### **3.2A Description of Planted Areas**

The following plant communities were planted in the Bottomland Hardwood Area:

##### **Zone 1: (approximately 44 acres)**

*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak  
*Fraxinus pennsylvanica*, Green Ash  
*Quercus lyrata*, Overcup Oak  
*Quercus michauxii*, Swamp Chestnut Oak  
*Quercus nigra*, Water Oak  
*Quercus phellos*, Willow Oak

##### **Zone 2: (approximately 67 acres)**

*Fraxinus pennsylvanica*, Green Ash  
*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak  
*Quercus michauxii*, Swamp Chestnut Oak  
*Quercus phellos*, Willow Oak  
*Quercus nigra*, Water Oak

*Quercus laurifolia*, Laurel Oak  
*Quercus lyrata*, Overcup Oak

**Zone 3: (approximately 27 acres)**

*Taxodium distichum*, Baldcypress  
*Fraxinus pennsylvanica*, Green Ash  
*Quercus lyrata*, Overcup Oak  
*Nyssa aquatica*, Water Tupelo

**3.2B Description of Planted Areas**

The following plant communities were planted in the Marsh Grass Area:

**Zone 1: (approximately 44 acres in zone 1 and 2)**

*Scirpus cyperinus*, Woolgrass  
*Juncus effusus*, Soft rush

**Zone 2:**

*Cladium jamaicense*, Sawgrass  
*Juncus roemerianus*, Black Needle Rush  
*Scirpus americanus*, Swordgrass  
*Scirpus atrovirens*, Green Bulrush  
*Carex lurida*, Shallow Sedge  
*Carex vulpinoidea*, Fox Sedge  
*Scirpus robustus*, Saltmarsh Bulrush  
*Scirpus pungens*, Three-square Bulrush  
*Juncus gerardii*, Blackgrass  
*Distichlis spicata*, Spikegrass

**Zone 3: (approximately 4 acres)**

*Spartina cynosuroides*, Big Cordgrass

**3.3A Results of Vegetation Monitoring**

The bottomland hardwood area has been closed out and deemed a success, therefore, no monitoring was completed this year.

### 3.3B Results of Vegetation Monitoring (Year 5)

Table 2: Vegetation Monitoring Statistics (Marsh Grass Area)

Plot #	Scale Factor	<i>Juncus offusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus pungens</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium lamaricense</i>	<i>Juncus gerardi</i>	<i>Distichlis spicata</i>	<i>Carex lupida</i>	<i>Carex vulpinoidea</i>	<i>Spartina cnasuroides</i>	Frequency
1	3.0			■											■
2	3.0	■							■						■
3	4.0	■							■						■
4															OW
5	5.0	■					■								■
6															OW
7															OW
8	2.0														
9															OW
10	4.0			■											■
11	2.0									■					■
12	4.0	■							■						■
13	4.0	■													■
14	5.0												■		■
15	5.0	■													■
16	5.0	■													■
17	5.0	■							■	■					■
18															OW
19	4.0			■	■				■						■
20	4.0	■					■								■
21	3.0														
22	2.0	■													■
23	5.0	■							■						■
24	4.0								■						■
25	3.0			■											■
26	3.0														
27	3.0	■								■					■
28	4.0	■													■
29	5.0									■					■
30	2.0														
31	2.0									■					■
32	5.0		■		■					■					■
33															
34	5.0	■													■
35	3.0	■					■								■
36	5.0	■								■					■
37	4.0	■													■
38	3.0	■													■
39	2.0														
40															OW
41															OW
42	3.0									■					■
43	2.0			■											■
44	4.0														
45	5.0		■												■
46	3.0			■						■					■
47	5.0	■			■										■
48	5.0									■					■
49	3.0			■						■					■
50	5.0	■	■												■
51	4.0	■													■
52															OW
53	2.0	■													■
54	4.0	■													■
55	3.0			■	■										■
56	3.0									■					■
57	4.0	■								■					■
58	3.0			■						■					■
59	5.0		■		■					■					■
60	5.0									■					■

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus mucronatus</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium imajicense</i>	<i>Juncus gerardi</i>	<i>Distichlis spicata</i>	<i>Carex lupida</i>	<i>Carex waltina</i>	<i>Spartina cynosuroides</i>	Frequency
61															OW
62															OW
63	4.0				■										■
64	3.0			■											■
65	4.0	■													■
66	2.0									■					■
67	0.0														BG
68	4.0	■													■
69	5.0								■						■
70	2.0														
71	3.0									■					■
72	2.0														
73															OW
74	5.0			■						■					■
75	2.0			■											■
76	5.0	■							■	■					■
77	3.0	■							■						■
78	0.0														BG
79	0.0														BG
80	4.0														
81	3.0			■											■
82	2.0								■						■
83	3.0			■						■					■
84	4.0														
85	3.0			■											■
86	3.0			■											■
87	5.0				■				■		■				■
88	5.0														
89	4.0			■											■
90	4.0			■											■
91	4.0			■											■
92	3.0			■						■					■
93	2.0									■					■
94	5.0										■		■		■
95	5.0								■						■
96	3.0			■											■
97	2.0								■						■
98	5.0														
99	3.0			■											■
100	3.0			■											■
101	5.0								■						■
102	0.0														BG
103	5.0				■				■		■				■
104	2.0								■					■	■
105	5.0								■						■
106	3.0			■	■									■	■
107	5.0														
108	3.0								■						■
109	2.0														
110	4.0			■											■
111	3.0	■			■										■
112	5.0			■											■
113	4.0	■	■		■										■
114	3.0									■					■
115	4.0	■													■
116	4.0					■				■					■
117	5.0								■						■
118	3.0	■			■										■
119	3.0														
120	5.0	■													■

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus pungens</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium lamatense</i>	<i>Juncus gerardii</i>	<i>Distichlis spicata</i>	<i>Carex lupida</i>	<i>Carex vulpinoidea</i>	<i>Spartina cynosuroides</i>	Frequency
121	3.0														
122	4.0			■											■
123	5.0			■											■
124															OW
125	3.0														
126	4.0									■					■
127															OW
128	2.0								■						■
129	4.0				■										■
130	4.0	■													■
131	5.0														
132	3.0			■											■
133	4.0	■			■										■
134	4.0			■											■
135	5.0	■				■									■
136	4.0		■												■
137	4.0	■		■					■						■
138	5.0														
139	4.0								■						■
140	5.0								■				■		■
141	4.0	■				■									■
142	4.0		■		■	■									■
143	2.0														
144	5.0	■													■
145	3.0	■							■						■
146	3.0			■											■
147	4.0			■					■	■					■
148	3.0						■								■
149	5.0			■											■
150	5.0						■								■
151	5.0														
152	2.0														
153	2.0				■										■
154	5.0	■		■	■										■
155	4.0														
156	4.0								■						■
157	5.0	■				■									■
158	5.0			■						■					■
159	5.0			■											■
160	5.0	■													■
161	3.0														
162	3.0	■				■									■
163	3.0				■				■						■
164	5.0								■				■		■
165	5.0		■	■					■						■
166	5.0	■		■						■					■
167	2.0					■									■
168	5.0	■			■				■						■
169	5.0	■													■
170	4.0			■											■
171	3.0					■									■
172	4.0								■						■
173	5.0						■		■						■
174															OW
175	4.0			■						■					■
176	2.0														
177	3.0	■													■
178	4.0	■													■
179	4.0					■			■						■
180	5.0								■						■

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus bauxiensis</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium</i>	<i>Juncus jamaicense</i>	<i>Juncus gerardii</i>	<i>Distichlis spicata</i>	<i>Carex lupida</i>	<i>Carex vulpinoidea</i>	<i>Spartina cynosuroides</i>	Frequency
181	4.0	■				■										■
182	5.0		■	■					■							■
183	4.0				■					■						■
184																OW
185	4.0		■						■							■
186	5.0		■	■					■							■
187	3.0	■														■
188																OW
189	5.0		■	■												■
190	4.0			■												■
191	5.0				■											■
192	3.0				■											■
193																OW
194	4.0				■				■							■
195																OW
196	4.0			■												■
197	3.0															■
198	4.0			■												■
199	4.0			■												■
200	4.0	■														■
201	5.0	■	■							■						■
202	2.0															■
203	5.0			■						■						■
204	5.0			■												■
205																OW
206	3.0									■						■
207	4.0									■						■
208	5.0	■														■
209	5.0			■		■										■
210	5.0	■							■							■
211	5.0			■												■
212	4.0			■												■
213	5.0			■												■
214	4.0	■								■	■					■
215	3.0			■												■
216	4.0									■						■
217	5.0			■	■									■		■
218	5.0	■		■					■							■
219	5.0		■											■		■
220	4.0	■														■
221	3.0						■									■
222	5.0	■														■
223	4.0						■		■							■
224	5.0			■												■
225	4.0	■					■									■
226	4.0						■									■
227	3.0				■	■				■						■
228	5.0	■				■										■
229	2.0															■
230	4.0			■												■
231	5.0								■							■
232	3.0				■											■
233	4.0	■								■						■
234	4.0						■									■
235	4.0			■												■
236	3.0				■	■				■						■
237	3.0								■	■						■
238	5.0			■					■							■
239	4.0			■												■
240	5.0		■													■

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus pumilus</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium</i>	<i>Jamaicense</i>	<i>Juncus acrocarpi</i>	<i>Distichis spicata</i>	<i>Carex lupida</i>	<i>Carex vulpinoidea</i>	<i>Spartina cynosuroides</i>	Frequency
241	3.0	■														■
242	4.0															
243	4.0	■			■											■
244	4.0			■												■
245	4.0	■														■
246	4.0	■														■
247	5.0	■				■										■
248	4.0	■														■
249	4.0	■									■					■
250	3.0	■														■
251	5.0														■	■
252																OW
253	5.0	■			■											■
254	3.0	■				■										■
255	4.0			■		■			■							■
256	5.0									■						■
257	5.0			■												■
258	5.0			■												■
259	3.0			■							■					■
260	5.0						■									■
261	3.0				■				■							■
262	3.0					■					■					■
263																OW
264	4.0	■			■						■					■
265	5.0															■
266	3.0			■			■									■
267	3.0															■
268	3.0			■		■										■
269	4.0										■					■
270																OW
271	5.0	■														■
272	3.0															■
273	4.0	■		■	■	■										■
274																OW
275	4.0									■						■
276	4.0						■									■
277	4.0			■							■					■
278	3.0										■					■
279	4.0			■												■
280	4.0						■				■					■
281	3.0									■						■
282	4.0	■														■
283	5.0	■		■												■
284	5.0										■					■
285																OW
286	3.0	■														■
287	3.0	■														■
288	5.0		■	■			■									■
289	4.0			■							■					■
290	3.0				■	■										■
291	4.0	■														■
292	5.0				■											■
293																OW
294	3.0										■					■
295	3.0			■			■		■							■
296	2.0															■
297	3.0	■							■							■
298	5.0	■														■
299	3.0						■									■
300	4.0						■			■						■

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium laminaeense</i>	<i>Juncus acrocladii</i>	<i>Distichlis spicata</i>	<i>Carex lupida</i>	<i>Carex vulpina</i>	<i>Spartina cynosuroides</i>	Frequency
301	4.0	■												■
302	3.0			■										■
303	5.0			■										■
304	5.0			■										■
305	5.0			■				■					■	■
306	5.0	■				■								■
307	5.0				■			■						■
308														OW
309	5.0	■						■						■
310	3.0	■												■
311	2.0													
312														OW
313	4.0	■			■	■								■
314														OW
315	4.0	■												■
316	3.0													
317	4.0			■										■
318	5.0			■					■					■
319	5.0	■												■
320	4.0			■				■						■
321	3.0	■			■									■
322	4.0	■								■				■
323	4.0													
324	5.0												■	■
325	5.0	■												■
326	4.0	■			■				■					■
327	4.0	■												■
328	4.0					■			■					■
329	4.0	■			■									■
330	5.0	■				■			■					■
331	3.0					■			■					■
332	3.0							■						■
333														OW
334	4.0	■												■
335	4.0							■						■
336	3.0			■		■								■
337	4.0					■								■
338	4.0			■			■							■
339	3.0			■		■								■
340	3.0	■				■			■					■
341	3.0				■	■			■					■
342	4.0			■										■
343	3.0								■					■
344	3.0								■					■
345	5.0			■										■
346	5.0	■												■
347	4.0							■	■					■
348	1.0													
349	3.0					■								■
350	4.0	■							■	■				■
351	4.0	■												■
352	4.0	■												■
353	4.0				■				■					■
354														OW
355														OW
356	5.0	■												■
357	3.0							■						■
358	1.0													
359	3.0	■												■
360	4.0	■				■			■					■

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cypripinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus pungens</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium jamaicense</i>	<i>Juncus gerardi</i>	<i>Distichlis spicata</i>	<i>Carex lupida</i>	<i>Carex vulpinoidea</i>	<i>Spartina cynosuroides</i>	Frequency
361	5.0		■	■					■						■
362	5.0	■				■					■				■
363	4.0			■	■										■
364	5.0								■						■
365	5.0			■											■
366	3.0	■													■
367															OW
368	4.0	■													■
369	4.0	■		■	■										■
370	4.0			■											■
371	3.0	■				■									■
372	2.0									■					■
373	5.0	■													■
374	5.0	■				■									■
375	4.0														■
376	4.0	■			■										■
377	4.0			■											■
378	5.0								■						■
379	5.0			■											■
380	3.0	■			■										■
381	2.0								■						■
382	5.0								■						■
383	3.0					■									■
384	5.0			■											■
385	5.0	■							■						■
386	4.0		■												■
387	4.0						■								■
388	4.0	■	■		■				■					■	■
389	3.0	■				■			■						■
390	5.0	■							■						■
391	1.0														
392	4.0			■											■
393	4.0			■					■						■
394	5.0			■											■
395	4.0														
396	5.0			■											■
397	4.0	■													■
398	4.0			■											■
399	3.0					■									■
400	5.0	■					■								■
401	5.0						■								■
402	5.0														
403	4.0	■			■										■
404	5.0	■													■
405															OW
406	4.0					■			■	■					■
407	3.0														
408	4.0			■											■
409	3.0														
410	5.0	■		■					■						■
411															OW
412	4.0			■											■
413	4.0			■											■
414	5.0								■				■		■
415	5.0								■						■
416	3.0	■				■			■						■
417	4.0	■								■					■
418	4.0	■			■		■								■
419	5.0								■	■					■
420	5.0	■							■						■

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus robustus</i>	<i>Scirpus aupeus</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>Cladium iamaicense</i>	<i>Juncus gerardi</i>	<i>Distichlis spicata</i>	<i>Carex lupida</i>	<i>Carex vulpinoidea</i>	<i>Spartina cynosuroides</i>	Frequency
421	5.0														■
422	3.0														■
423	5.0			■											■
424	3.0														
425	4.0	■													■
426	4.0			■					■						■
427	3.0					■									■
428	3.0								■						■
429	4.0						■		■						■
430	4.0	■		■						■					■
431	3.0			■											■
432	4.0	■		■	■										■
433	5.0	■											■		■
434															OW
435	4.0	■													■
436	5.0	■													■
437	2.0														
438	4.0	■				■									■
439	4.0	■			■										■
440	2.0	■													■
441	5.0			■											■
442	5.0			■											■
443															OW
444	4.0	■				■									■
445	4.0	■			■										■
446	4.0	■													■
447	3.0								■						■
448	4.0								■	■					■
449	3.0								■						■
450	4.0		■												■
451	5.0			■											■
452	5.0								■				■		■
453	4.0					■									■
454	3.0				■	■									■
455															OW
456	4.0			■					■						■
457															OW
458															OW
459	5.0			■											■
460															OW
461	3.0						■								■
462	4.0				■					■			■		■
463	3.0	■													■
464	3.0	■							■						■
465	5.0			■											■
466	5.0	■													■
467	4.0			■											■
468	4.0			■					■						■
469	5.0	■							■	■					■
470	3.0					■									■
471															OW
472	1.0														OW
473															OW
474	4.0														■
475	4.0		■		■										■
476	3.0								■				■		■
477	4.0	■				■									■
478															OW
479	5.0	■													■
480	5.0	■		■		■									■

Plot #	Scale Factor	<i>Juncus</i>	<i>Juncus</i>	<i>Scirpus</i>	<i>Juncus</i>	<i>poermerianus</i>	<i>Scirpus</i>	<i>robustus</i>	<i>Scirpus</i>	<i>pungens</i>	<i>Scirpus</i>	<i>americanus</i>	<i>Scirpus</i>	<i>atrovirens</i>	<i>Cladium</i>	<i>jamaicense</i>	<i>Juncus</i>	<i>gerardii</i>	<i>Dischelis</i>	<i>spicata</i>	<i>Carex lupida</i>	<i>Carex</i>	<i>pulpinoides</i>	<i>Spartina</i>	<i>cynosuroides</i>	Frequency	
481	5.0	■					■																			■	
482	3.0																										
483	3.0																										
484	2.0																										
485	4.0	■							■																		■
486	5.0	■								■																	■
487	5.0		■		■						■																■
488	4.0	■		■																							■
489	3.0	■																									■
490	3.0																										
491	5.0																										
492	5.0										■																■
493	5.0	■			■																						■
494	4.0					■												■						■			■
495	2.0																	■						■			■
496	3.0																	■									■
497	5.0	■																									■
498	4.0																										■
499	3.0										■																■
500	3.0				■										■												■
Frequency/Percentage Plots with Desired Species		33.5	4.8	26.7	12.0	10.7	7.4	0.0	20.4	16.4	1.5	0.0	0.0	3.9													
Sum Scale Value																										1760	
Total Number of Plots																										457	
Vegetative Cover (Scale Value)																										3.9	

**Key: Open Water = OW  
Bare Ground = BG**

**Site Notes:** The following species were also noted in the monitoring plots. The number of plots the species was found in is following the species in parentheses (i.e. goldenrod was noted in 219 plots):

Goldenrod (219), *Baccharis halimifolia* (27), *Juncus acuminatus* (42), smartweed (137), *Pluchea* sp. (112), *Panicum* sp. (130), broomsedge (53), pennywort (28), *Cyperus* sp. (128), cattail (38), baldcypress (49), phragmites (16), foxtail (19), water grass (9), pine (19), *Sagittaria* sp. (63), indian grass (12), *Juncus coriaceus* (8), fennel (2), green ash (1), tear-thumb (2), patens (3), and wax myrtle (2).

### 3.4A Conclusions

Trees were planted on approximately 223 acres. There were twenty-one plots established throughout the planting areas, encompassing all plant communities. The bottomland hardwood area has been closed out and deemed a success, therefore, no monitoring was completed this year.

### 3.4B Conclusions

- Percent Frequency of Target Species (planted species) **87.3%**  
Frequency of 70% required.
- Vegetative Cover Scale Value **3.9**  
Scale Value of 5 required for year 5.

Marsh grass was planted in approximately 48 acres. There were 500 random plots established throughout the planting areas, encompassing all plant communities. These plots were located with GPS. The marsh was replanted in June of 2000. The plantings are continuing to increase in cover.

NCDOT proposes to discontinue marsh grass monitoring at the Ballance Farm Mitigation Site.

## 4.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS

An onsite agency meeting was held in August 2004 to discuss the hydrologic success of Ballance Farm for the bottomland hardwood portion of the site. At this time it was agreed that the site had five years of successful hydrology data, therefore all twenty-eight groundwater gauges were removed in August 2004. The surface water gauges located in the existing and created coastal marshes exhibited occasional inundation throughout the growing season.

The bottomland hardwood area has been closed out and deemed a success, therefore no monitoring was completed this year. For the marsh area, the percent frequency of target species is 87.3%, while the scale value is 3.9 for Year 5. The site appears to be functioning as a brackish water marsh system.

NCDOT proposes to discontinue hydrology (surface) and marsh vegetation monitoring at the Ballance Farm Mitigation Site.

**APPENDIX A**  
**SURFACE GAUGE GRAPHS**

**APPENDIX B**  
**SITE PHOTOGRAPHS**

## Ballance Farm



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

**APPENDIX C**

**PHOTO AND PLOT LOCATIONS**

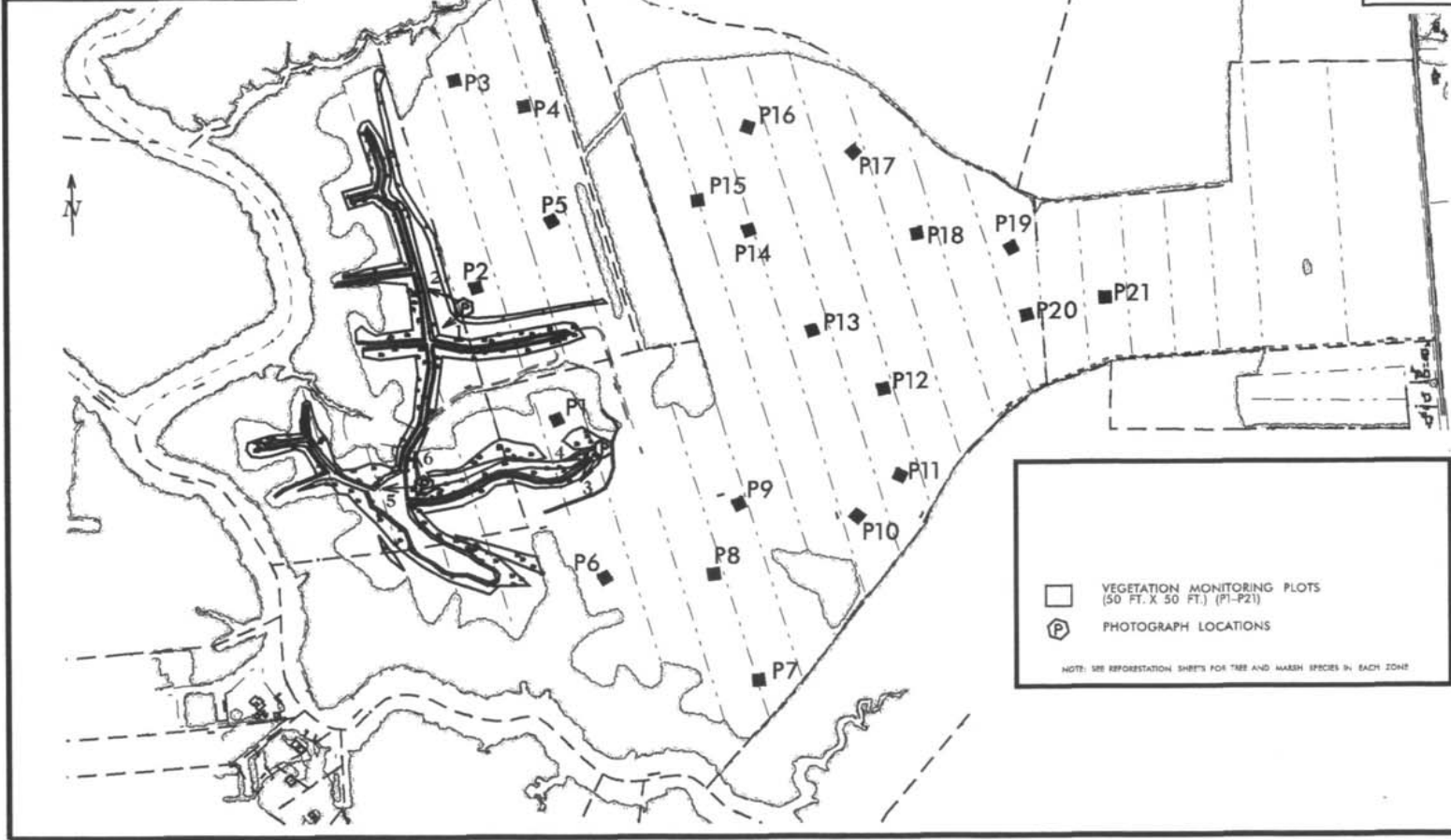
**MARSH GRASS RANDOM PLOT LOCATIONS**

**PLANTING PLAN**

REV'S	DATE

BALLANCE FARM MITIGATION SITE  
PHOTO AND PLOT LOCATIONS

PROJECT NUMBER	DATE
R-100000	MAP 1
DRAWN BY	CHECKED BY
ENG-EXT	



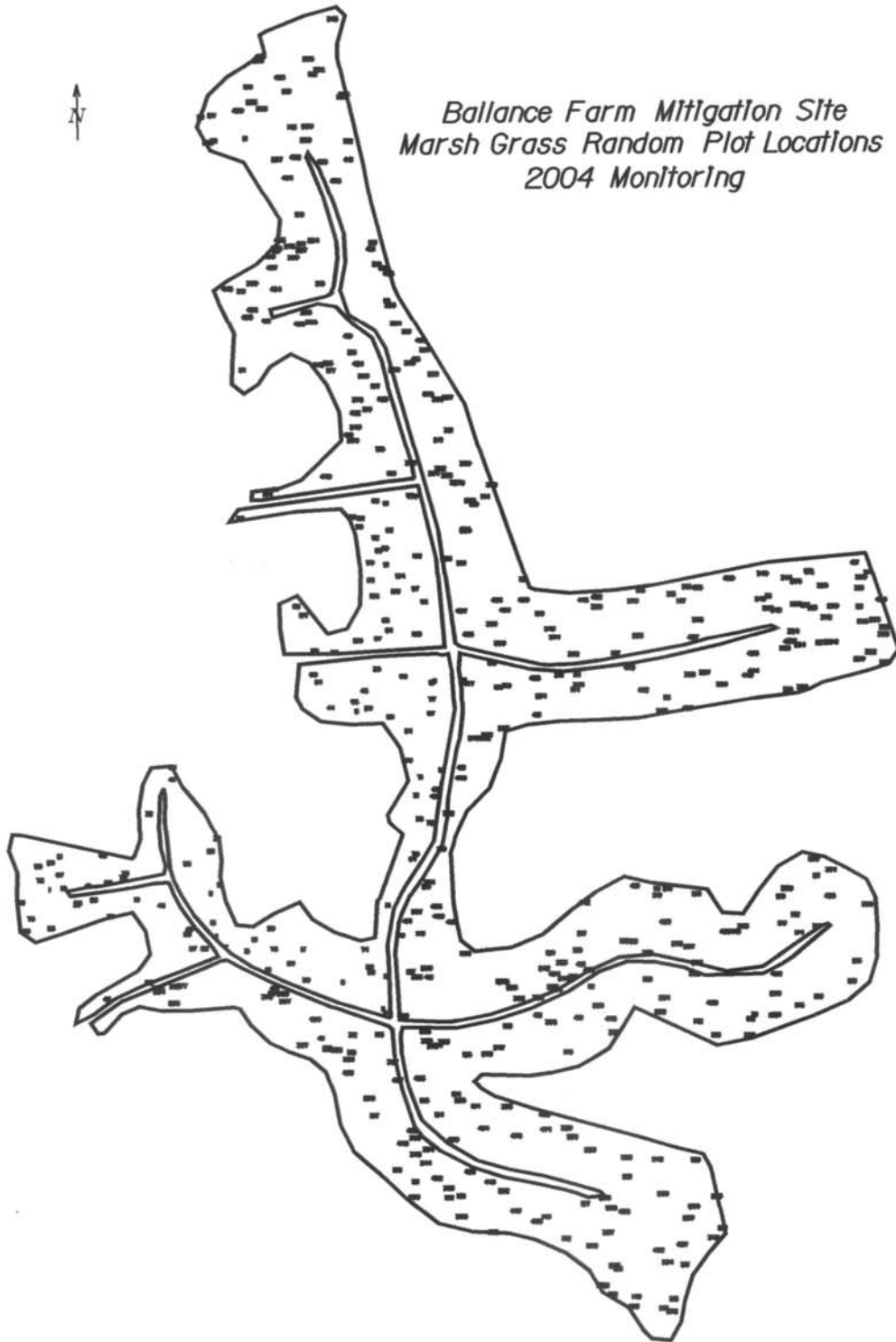
VEGETATION MONITORING PLOTS  
 (50 FT. X 50 FT.) (P1-P21)

PHOTOGRAPH LOCATIONS

NOTE: SEE REFORESTATION SHEETS FOR TREE AND MARSH SPECIES IN EACH ZONE

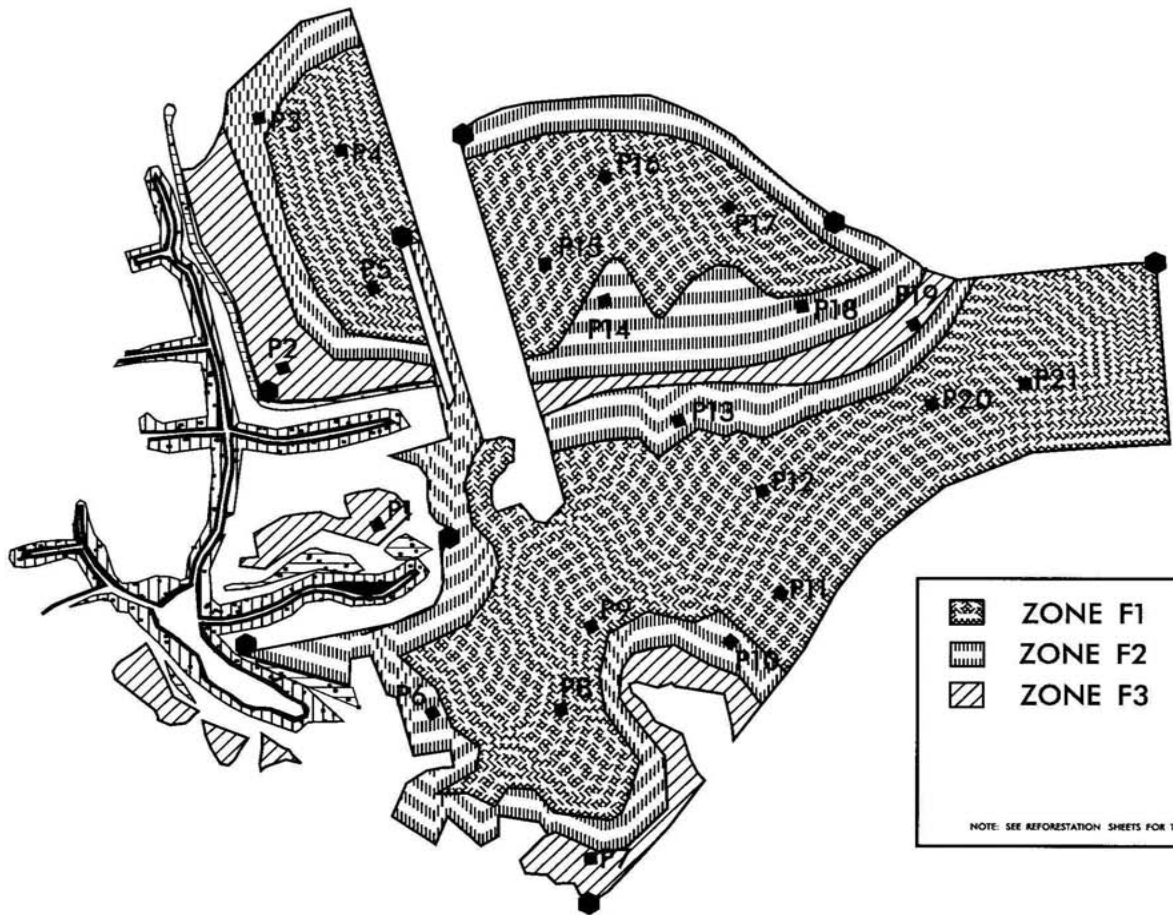


*Ballance Farm Mitigation Site  
Marsh Grass Random Plot Locations  
2004 Monitoring*



CURRITUCK COUNTY, NORTH CAROLINA  
 BALLANCE FARM MITIGATION PLANTING PLAN

PROJECT REFERENCE NO. R-2228WM	SHEET NO. WM-1
SW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



	ZONE F1		ZONE M1
	ZONE F2		ZONE M2
	ZONE F3		ZONE M3

NOTE: SEE REFORESTATION SHEETS FOR TREE AND MARSH SPECIES IN EACH ZONE

