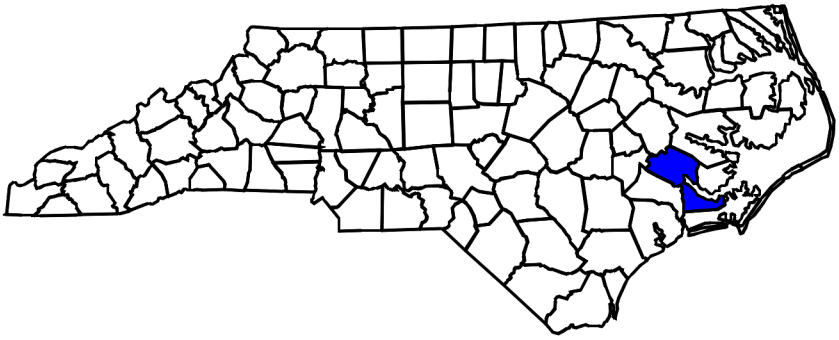
ANNUAL REPORT FOR 2003



Croatan Wetland Mitigation Bank

Craven County

Project No. 8.T170702

TIP No. R-1015-WM

Natural Systems Unit & Roadside Environmental Unit
North Carolina Department of Transportation
January 2004

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

Appendix A DEPTH TO GROUNDWATER PLOTS
Appendix B SITE PHOTOS
Appendix C 1999-2000 BASELINE DATA

SUMMARY

The following report summarizes the monitoring and construction activities that have occurred prior to and during 2003 at the 4035-acre Croatan Wetland Mitigation Bank (CWMB). The CWMB site is expected to provide compensatory wetland mitigation for several NCDOT projects in the Neuse River Basin (Hydrologic Unit 03020204). This site was designed and implemented in two phases, Phase I (1469.3 acres) and Phase II (2565.3 acres). Phase I construction was completed in the winter of 2001 and Phase II construction was completed in the spring of 2002. Each Phase has been divided into Management Units (MU) to aid in the report presentation. In 2003, hydrologic and vegetative monitoring in Phase II (MU 1-11) began and continued into the second year in Phase I (MU 12A-18).

The CWMB contains both non-riverine mitigation areas and riverine mitigation areas; non-riverine and riverine mitigation areas are tracked separately. In addition, per request of the Mitigation Banking Review Team, there are separate hydrologic monitoring success criteria for the non-riverine mineral and organic soils. Non-riverine mineral soils are expected to make jurisdictional hydrology for a minimum of 12.5 percent (%) of the growing season (Success Criterion 1) and be within 50% of the reference range for years one through three (and 20% of the reference range for years four and five)(Success Criterion 2). Non-riverine organic soils and riverine restoration/enhancement areas are expected to make jurisdictional hydrology for a minimum of 25% of the growing season and be within 50% of the reference range for years one through three (and 20% of the reference range for years four and five).

Prior to the beginning of the 2003 growing season 287 ground water monitoring gauges were installed throughout Phase I and II for monitoring success. A total of 33 reference gauges were installed either onsite or offsite in areas of minimal disturbance to provide a range of reference conditions for the ten hydric soil mapping units present on the CWMB. Three rain gauges spaced across the site were used for hydrologic analysis.

Hydrologic monitoring in 2003 showed 263 of 287 (91.6%) monitoring gauges in the CWMB met both respective hydrologic success criteria. Of the 205 monitoring gauges in non-riverine mineral soils, 184 met both hydrologic success criteria and six did not meet either hydrologic success criterion; the remaining fifteen gauges met Success Criterion 1 only. Of the 62 monitoring gauges in non-riverine organic soils, 61 met both hydrologic success criteria and the remaining gauge met Success Criterion 1 only. All twelve monitoring gauges in riverine organic soils met both hydrologic success criteria. Of the eight monitoring gauges in riverine mineral soils six met both hydrologic success criteria and the remaining two gauges met Success Criterion 1 only.

The high rate of hydrologic success criteria achievement during 2003 is attributed inpart to well above normal rainfall experienced throughout the 2003 growing season that allowed the drained areas to be re-hydrated. Overall, the rainfall for the 2003 growing season was well above normal, but low going into the beginning of the growing season.

Rainfall between November 2002 and January 2003 trended towards below normal. Rainfall from March through October 2003 was well above normal. The rainfall during the 2003 growing season was from approximately 60-80% above average. Phase I and II have shown trends towards re-hydration compared to baseline conditions (1998-2000 data). Assuming normal rainfall conditions, this trend is expected to continue into the 2004 growing season as the surficial aquifer is recharged.

The vegetative success criterion states that there must be a minimum of 320 trees per acre surviving for three consecutive years. NCDOT has agreed to monitor this site for 5 years or until success criteria are met. 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).

Of the 4,035 acres on this site, approximately 224.5 acres involved tree planting for Phase I and 466 acres of tree planting for Phase II. There were 25 vegetation monitoring plots established throughout the Phase I planting areas, and 23 vegetation monitoring plots established throughout the Phase II planting areas. The 2003 vegetation monitoring of the Phase I portion of the site revealed an average tree density of 449 trees per acre while the vegetation monitoring of the Phase II portion of the site revealed an average tree density of 393 trees per acre. These averages are above the minimum success criteria of 320 trees per acre.

NCDOT recommends that monitoring of Phase I and II continue into 2004. ESI documented that many of the gauges along transects 258-260 (MU 3/4A), 286-287 (MU 10C), 181-183 (MUs 12B /16), and 188-191 (MU 12B/18) made jurisdictional hydrology for at least 24% of the growing season, but did not meet hydrologic success criteria. Additional gauges may need to be installed along these transects in order to capture the zone of influence that may remain adjacent to the open areas of the ditch. ESI recommends that the above mentioned gauges be monitored for another year (normal rainfall) before installing additional gauges. Gauge 196 should be removed and no longer monitored due to safety concerns. ESI also recommends that additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 235, and 96) be re-evaluated for riverine function in years with normal rainfall. These areas showed prolonged surface flooding and flowing water throughout much of the growing season and may be considered riverine wetland due to the surface connection with the unnamed tributary to East Prong Brice Creek.

1.0 INTRODUCTION

1.1 Project Description

The Croatan Wetland Mitigation Bank (CWMB) is located in Craven County, North Carolina approximately 3.6 miles northwest of Havelock. The site is situated west of US 70 and south of Catfish Lake Road (SR 1100) (Figure 1). The CWMB was created to provide compensatory mitigation for several projects in the Neuse River Basin (Hydrologic Unit 03020204). The site encompasses approximately 4,035 acres and was designed and implemented in two phases (Phase I and Phase II). Each phase was divided into Management Units (MU) to aid in planning, and this is continued for presentation of monitoring results. Phase I is approximately 1469.3 acres and contains approximately 1446.5 acres targeted for a combination of non-riverine wetland restoration (311.6 acres), enhancement (1026.9 acres), and preservation (108.0 acres). The remaining 22.8 acres of Phase I consists of non-hydric soils (3.9 acres) and areas considered non-restorable (18.9 acres). Phase II is approximately 2565.3 acres and contains approximately 2333.5 acres targeted for a combination of non-riverine wetland restoration (1123.6 acres), enhancement (956.9 acres), and preservation (253.0 acres). Approximately 179 acres are targeted for a combination of riverine restoration (49.6 acres), enhancement (91.6 acres), and preservation (37.8 acres). The remaining 52.8 acres of Phase II consists of non-hydric soils (25.7 acres) and areas considered non-restorable (27.1 acres). In 2003, hydrologic and vegetative monitoring began for Phase II and continued for a second year in Phase I.

1.2 Purpose

In order to demonstrate successful mitigation, vegetative and hydrologic monitoring will be conducted for a minimum of five years. Success criteria were established by the Mitigation Bank Review Team (MBRT). The following report describes the results of the hydrologic and vegetation monitoring for Phase I and II during the 2003 growing season at the CWMB. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season, and site photographs.

1.3 Project History

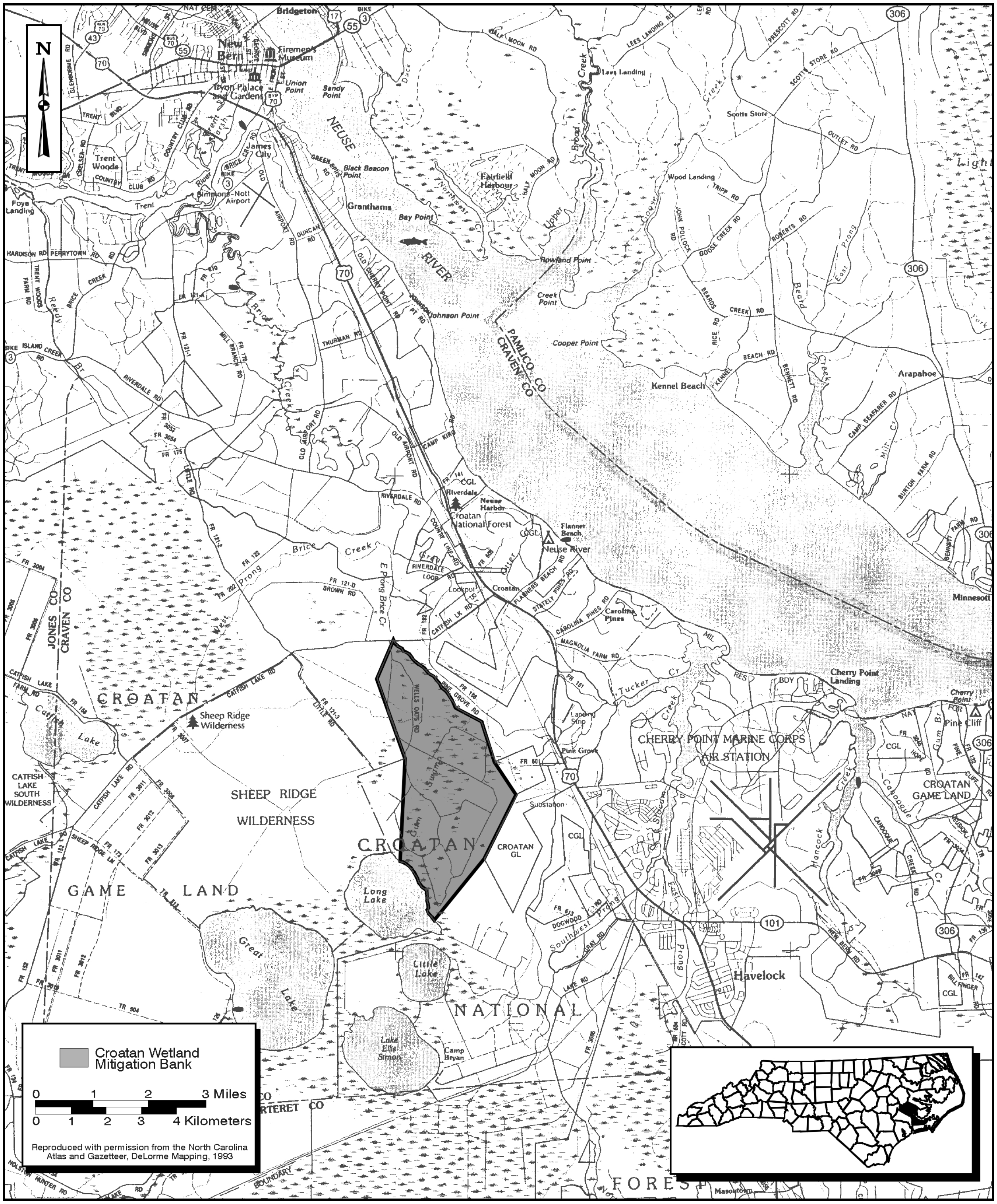
Phase I

1998-2000	Gauges Installed to Aid Delineation
November 2000	Drum-chopping of Phase I Planting Areas
December 2000	Herbicide of Phase I Planting Areas
February 2001	Planting of Phase I
September 2001 – February 2002	Construction of Phase I
February 2002	Additional Monitoring Gauges Installed
March – November 2002	Hydrologic Monitoring (1 yr.)
July 2002	Vegetation Monitoring (1 yr.)
March – November 2003	Hydrologic Monitoring (2 yr.)
August 2003	Vegetation Monitoring (2 yr.)

Phase II

1999-2000	Gauges Installed to Aid Delineation
August 2001	Drum-chopping of Phase II Planting Areas
December 2001 – June 2002	Construction of Phase II
July 2002	Herbicide of Phase II Planting Areas
February –March 2003	Additional Monitoring Gauges Installed
February 2003	Tree Planting
March - November 2003	Hydrologic Monitoring (1 yr.)
August 2003	Vegetative Monitoring (1 yr.)

Figure 1. Site Location Map



1.4 Croatan WMB Debit Ledger

Table 1. Croatan Wetland Mitigation Bank Debit Ledger

Date	Notes[a]	Type	Non-riverine Wetland Credits				Riverine Wetland Credits				Total Withdrawal	Total Balance
			Deposit	Withdrawal	Balance	In-kind (Y/N)	Deposit	Withdrawal	Balance	In-kind (Y/N)		
Feb 2003	1	Rest	215.2		215.2		7.4		7.4			
		Enh	148.8		148.8		6.9		6.9			
		Pres	72.2		72.2		7.6		7.6			
March 2003	2	Rest	31.2		246.4		0		7.4			
		Enh	51.4		200.2		0		6.9			
		Pres	0		72.2		0		7.6			
March 2004	3	Rest	143.6		390.0		5.0		12.4			
		Enh	99.1		299.3		4.5		11.4			
		Pres	0		72.2		0		7.6			
	4	Rest										
		Enh										
		Pres										
	5	Rest										
		Enh										
		Pres										
	6	Pres										
		Rest										
		Enh										

[a]Notes (documentation of authorization for deposits, authorization for debits)
1) Signature of MBI, USACE authorization, initial credit release.
2) Monitoring Report: Phase I first year – MBRT review and approval.
3) Monitoring Report: Phase I second year, Phase II first year – anticipated MBRT approval.
4)

2.0 HYDROLOGY

2.1 Success Criteria

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

The MBRT required additional conditions to the hydrologic monitoring requirements for the CWMB beyond the minimum established by the federal guideline for wetland mitigation success criteria.

Hydrologic success criteria will include both of the following:

> 1) inundation or saturation within 12 inches of the surface for at least 12.5% of the growing season for mineral soils and 25% of the growing season for organic soils and riverine restoration/enhancement areas (**Success Criterion 1**); and
>
> 2) the hydroperiod for restoration/enhancement areas shall be within 50% of reference saturation or inundation depth, duration and frequency for the first three years and shall be within 20% for years four and five (**Success Criterion 2**).

If the 50% and 20% reference goals are not attained, a site visit will be conducted by the MBRT to determine the viability of the site.

The growing season in Craven County begins March 18 and ends November 14. These dates correspond to a 50% probability that air temperatures will drop to 28° F or lower after March 18 and before November 14. Thus, the growing season is 242 days. A jurisdictional hydroperiod of 12.5% of the growing season is approximately 30 days. A jurisdictional hydroperiod of 25% of the growing season is approximately 60 days. However, the site must also experience average climatic conditions for the data to be valid. Use of reference gauge data collected concurrently with site data for evaluating success is expected to provide more meaningful means for evaluating success following initial site re-hydration regardless of rainfall conditions. Table 2 provides a summary of hydrologic success criteria.

Table 2. Expected Wetland Conditions

Wetland Type	Soil Mapping Unit	Success Criterion 1	Success Criterion 2	MUs with Representative Gauges
Non-riverine, Mineral	Bayboro (Ba)	≥ 12.5 %	50 –100 %	1, 2A, 2B, 3, 4A, 4B, 5, 6, 7, 8, 9, 10A, 10B, 11, 12A, 13A,13B, 14, 15, 17
	Leaf (La)	≥ 12.5 %	11.6 – 100 %	1, 2A, 2B, 3, 5, 6
	Leon (Ln)	≥ 12.5 %	11.8 – 36.0 %	13B, 16, 18
	Murville (Mu)	≥ 12.5 %	50 – 100 %	12A, 12B, 13A, 13B, 15, 16
	Pantego (Pa)	≥ 12.5 %	36.8 – 100 %	1, 2B, 4B, 5, 6, 7, 8, 10B, 10C, 11, 12A, 12B, 13A, 13B, 14, 15, 16, 17, 18
	Rains (Ra)	≥ 12.5 %	12.6 – 100 %	5, 6, 10B, 10C, 12A
Non-riverine, Organic	Croatan (CT)	≥ 25.0 %	50 – 100 %	4B, 6, 8, 9, 10A, 10B, 10C, 11, 12B, 13A, 15, 16, 17, 18
	Dare (DA)	≥ 25.0 %	50 – 100 %	16, 17
Riverine, Organic	Dorovan (DO)	≥ 25.0 %	50 – 100 %	6
	Masontown/Muckalee (MM)	≥ 25.0 %	50 – 100 %	5, 6

2.2 Hydrologic Description

Phase I construction was completed prior to the onset of the 2002 growing season. Phase I began monitoring for hydrologic success in 2002 continued into 2003. Phase II construction was completed in the spring of 2002 and hydrologic monitoring began in the spring of 2003. In 2003, 287 monitoring gauges were monitored (Figures 2a and 2b). Gauges consist of a combination of Remote Data Systems (RDS) WL-20, WL-40 and Ecotone monitoring gauges. In addition, three or four monitoring gauges were monitored per soil mapping unit in areas of minimal disturbance to provide reference conditions for the CWMB (for a total of 33 reference monitoring gauges located onsite and offsite); reference gauges are also either RDS WL-20, WL-40, or Ecotone monitoring gauges. Three rain gauges are spaced across the site; rain gauges are Infinity rain gauges. The automatic monitoring gauges record the depth to the groundwater level and duration of jurisdictional hydrology. Daily readings were taken throughout the growing season.

The CWMB is being tracked by riverine and non-riverine wetland restoration (R), enhancement (E), and preservation (P) areas (Figures 2a and 2b). The monitoring gauges installed throughout the CWMB between 1998 and 2000 were used to collect data in support of jurisdictional determinations and to assist in mitigation planning. The additional gauges installed in Phase I in 2002 and Phase II in 2003 prior to the onset of the growing season were used to supplement the previous gauges for monitoring success.

The new gauges established in Phase II in 2003 were installed in transects across the different mitigation treatments in order to monitor the success of these treatments in the major soil types present. These treatments can be summarized as areas where: 1) ditches have been reach-plugged and the road remains; 2) ditches have been point-plugged and the road remains; 3) ditches have been reach-plugged and the road removed; and 4) ditches have been point-plugged and the road removed. Reach-plugging is the back-filling of the entire ditch or extensive section of the ditch. Point-plugging involves shorter plugs of fill spaced along the length of the ditch to render the drainage system inoperable. Six additional gauges were installed in Phase I in 2003 to document hydrologic changes resulting from the removal of the road and/or ditch along the phase boundary during Phase II construction.

Table 3 provides a list of gauge locations within each MU and the number of gauges within each mitigation type.

Figure 2a. Hydrologic Monitoring Gauge Location Map, Phase II

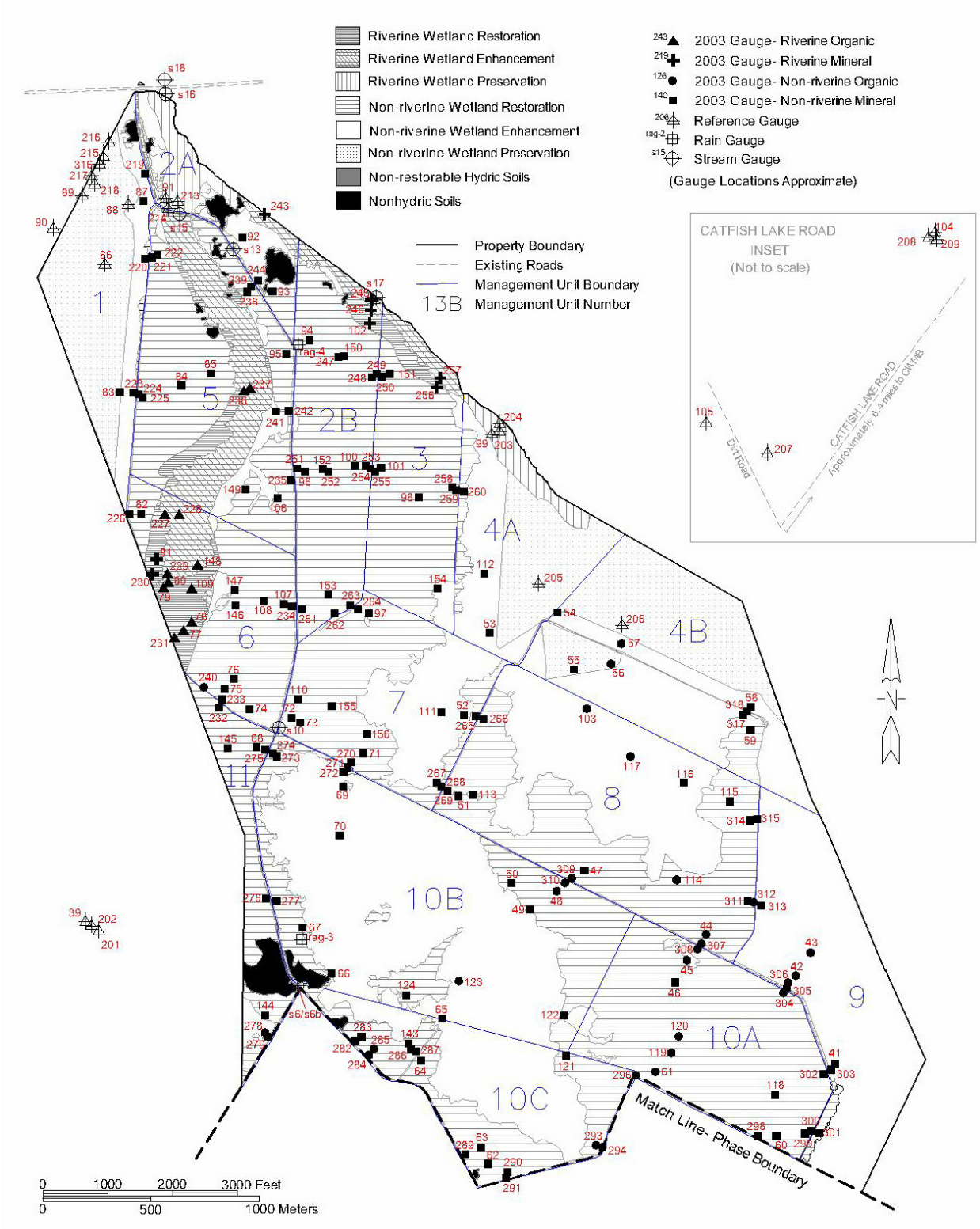


Figure 2b. Hydrologic Monitoring Gauge Location Map, Phase I

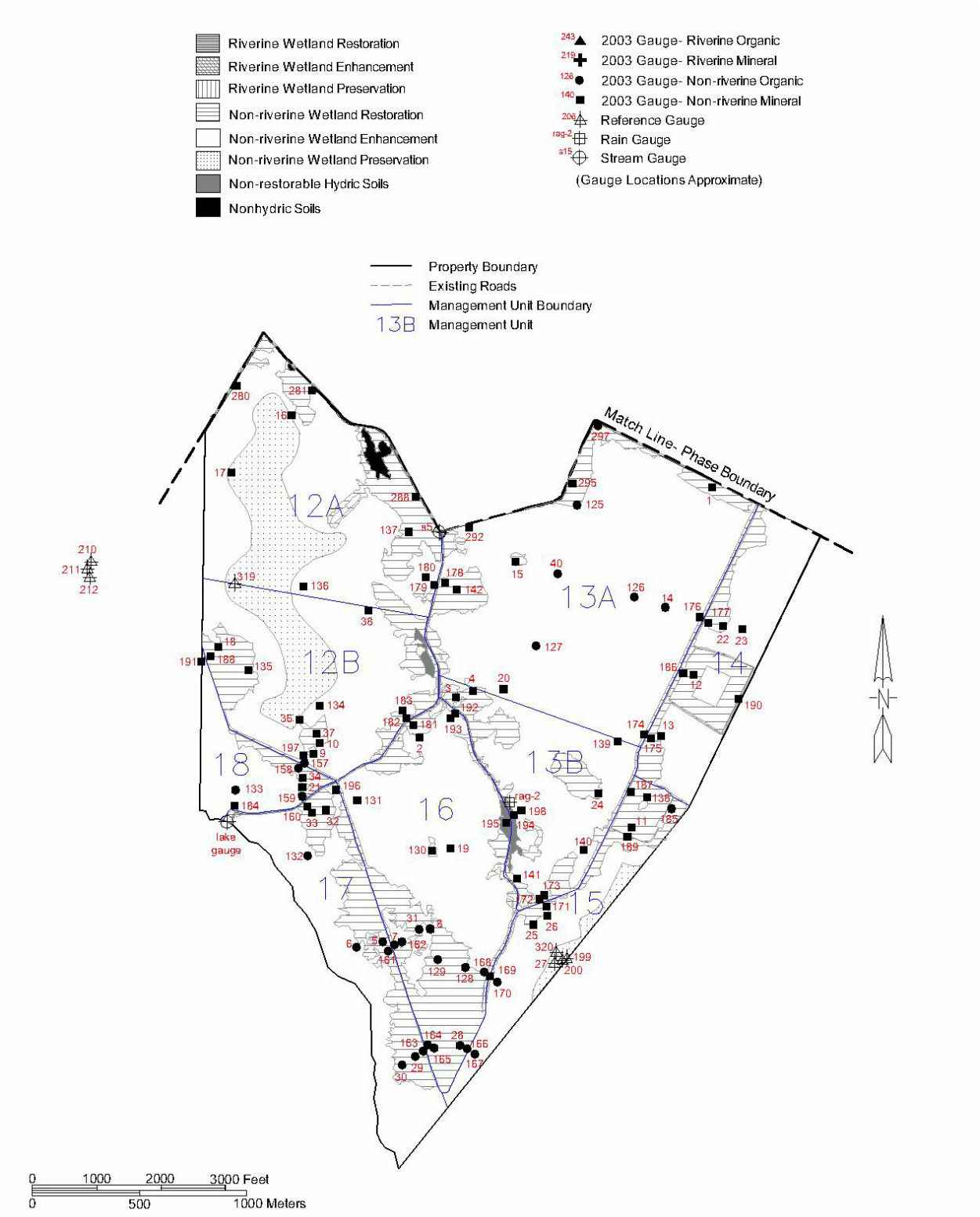


Table 3. Phase II (MU: 1-11) and I (MU: 12A-18) Gauge Locations

Phase II			
MU	**Location**	**Total # of Gauges**	**# of Gauges per Mitigation Type (NR, NE, NP,RR, RE, RP)[a]**
1	Northwestern portion of Phase II along western boundary	5 (+ 8 Reference)	NE–4, NP-1 + 8*
2A	Northern portion of Phase II adjacent to Catfish Lake Rd. and East Prong Brice Creek	4 (+3 Reference)	NR-1, NE-2, RE-1, and RP-3*
2B	North-central portion of Phase II east of 2A and west of 3	19	NR-17, RE-2
3	North-central portion of Phase II east of 2B and west of 4A	10	NR-7, NE-1, RE-1, RR-1
4A	North-central portion of Phase II east of 3 and west of 4B	3 (+4 Reference)	NR-1, NE-2, NP-1*, and RP-3*
4B	Northeastern portion of Phase II along the boundary north of transmission line	8 (+ 1 Reference)	NR-3, NE-3, and NP-2 + 1*
5	Northwestern portion of Phase II east of 1 and north of transmission line	16	NR-12, NE-2, RR-1, RE-1
6	West-central portion of Phase II south of the transmission lime along the western boundary	24	NR-11, NE-1 RR-8, RE-4
7	Central portion of Phase II east of 6 and west of 8	14	NR-11, NE-3
8	Central portion of Phase II east of 7 and west of 9	17	NR-11, NE-6
9	Southeastern portion of Phase II along the eastern boundary	8	NR-3, NE-5
10A	Southeastern portion of Phase II, along Phase boundary	14	NR-14
10B	Southern portion of Phase II, east of 11 and north of 10C	17	NR-13, NE-4
10C	Southern portion of Phase II, south of 10B and north of 13A	16	NR-16
11	Southwestern portion of Phase II, along western boundary	8	NR-7, NE-1

Table 3 Continues.

Table 3 Concluded.

Phase I			
MU	**Location**	**Total # of Gauges**	**# of Gauges per Mitigation Type (R, E, P)[a]**
12A	Northwestern portion of Phase I along western boundary	9	NR-4, NE-5, NP-1
12B	Western portion of Phase I south of 12A	13	NR-9, NE-4
13A	Center of Phase I adjacent to the northern Phase I Boundary	15	NR-9, NE-6
13B	Center of Phase I south of 13A	10	NR-4, NE-6
14	Northeastern portion of Phase I along eastern boundary	8	NR-7, NE-1
15	Southeastern portion of Phase I south of 14	10 (+ 4 Reference)	NR-8, NE-2, and NP-4*
16	Center of Phase I south of 13B	20	NR-17, NE-3
17	Southeastern portion of Phase I adjacent to the Lake	11	NR-8, NE-3
18	Southwestern portion of Phase I adjacent to the Lake	7	NR-3, NE-4

[a] Mitigation Type: NR = Non-riverine Restoration, NE = Non-riverine Enhancement, NP = Non-riverine Preservation, RR = Riverine Restoration, RE = Riverine Enhancement, RP = Riverine Preservation (* = Reference)

* Onsite Reference gauges

Appendix A contains a numerical list of all monitoring and references gauges monitored in 2003. Appendix A also contains a plot of the water depth for each of the monitoring gauges. Due to the number of gauges within the CWMB some gauges have been plotted on the same graph. The gauges that are plotted on the same graph are within the same MU and soil series. Reference gauges are plotted individually in the Reference section of Appendix A. Precipitation events are included on each graph as bars. Historical precipitation data used for establishing rainfall normalcy were obtained from the North Carolina State Climate Office rain gauge in New Bern, Craven County, North Carolina. Rainfall data for 2003 came from three onsite rain gauges.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

As described above each monitoring gauge must meet both of its respective hydrologic success criteria based on soil type in order to achieve hydrologic success. In order to achieve Success Criterion 2 each monitoring gauge must be within 50% of the reference range for its respective soil series.

Reference Gauges
Appendix A contains a table with the reference gauges within each soils series, the maximum number of consecutive days that jurisdictional hydrology was met, and the percentage of the 242-day growing season that jurisdictional hydrology was met. These reference gauges have been used to establish a reference range. Table 2 provides the 50% range from reference conditions in days and percentage of the growing season. This is the number of days in which each soil series must have jurisdictional hydrology in order to achieve Success Criterion 2. Success Criterion 2 is based on restoring the jurisdictional hydroperiod for each soil series to within 50% of the reference range for years one through three and 20% of the reference range for years four and five.

For example in 2003 all monitoring gauges within the Bayboro (mineral) soil series must have jurisdictional hydrology for 12.5% of the growing season in order to achieve Success Criterion 1. However, a gauge must also have jurisdictional hydrology between 121 and 242 days (50% to 100%) of the growing season to achieve Success Criterion 2. Thus, a gauge could achieve success for overall percentage of the growing season (Criterion 1), but not achieve 50% of the reference range (Criterion 2).

Monitoring Gauges
Phase II is broken into fifteen MUs, identified as MU 1 through 11 and Phase I is broken into nine MUs, identified as MU 12A through MU 18. Tables 4 through 27 and Figures 3a and 3b provide overviews of which monitoring gauges achieved hydrologic success. Each table lists gauges within each MU, the soil series in which the gauge is installed, mitigation type, expected jurisdictional hydroperiod, actual jurisdictional hydroperiod, and whether the gauge met both respective hydrologic success criteria.

Figure 3a. Hydrologic Monitoring Results, Phase II

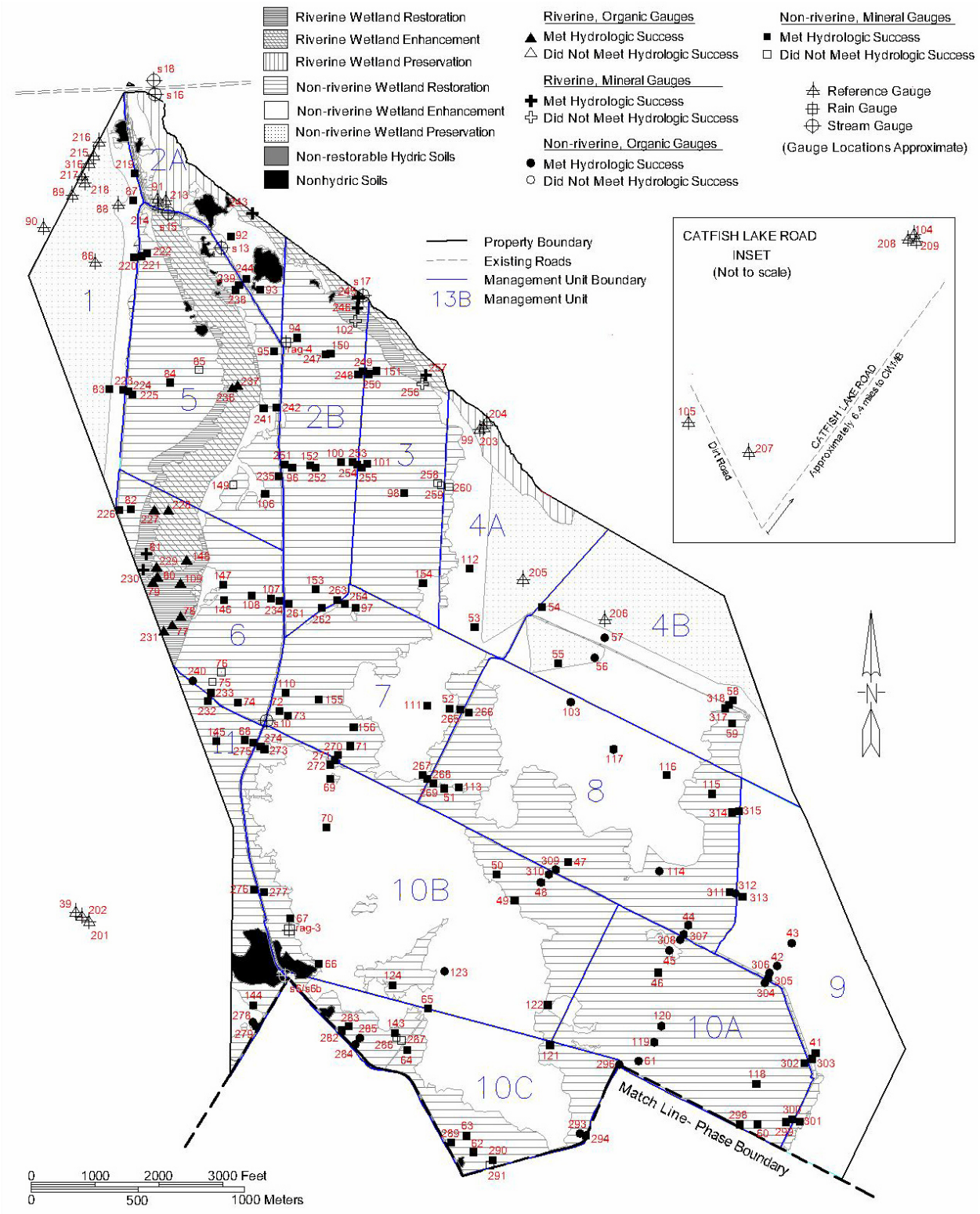


Figure 3b. Hydrologic Monitoring Results, Phase I

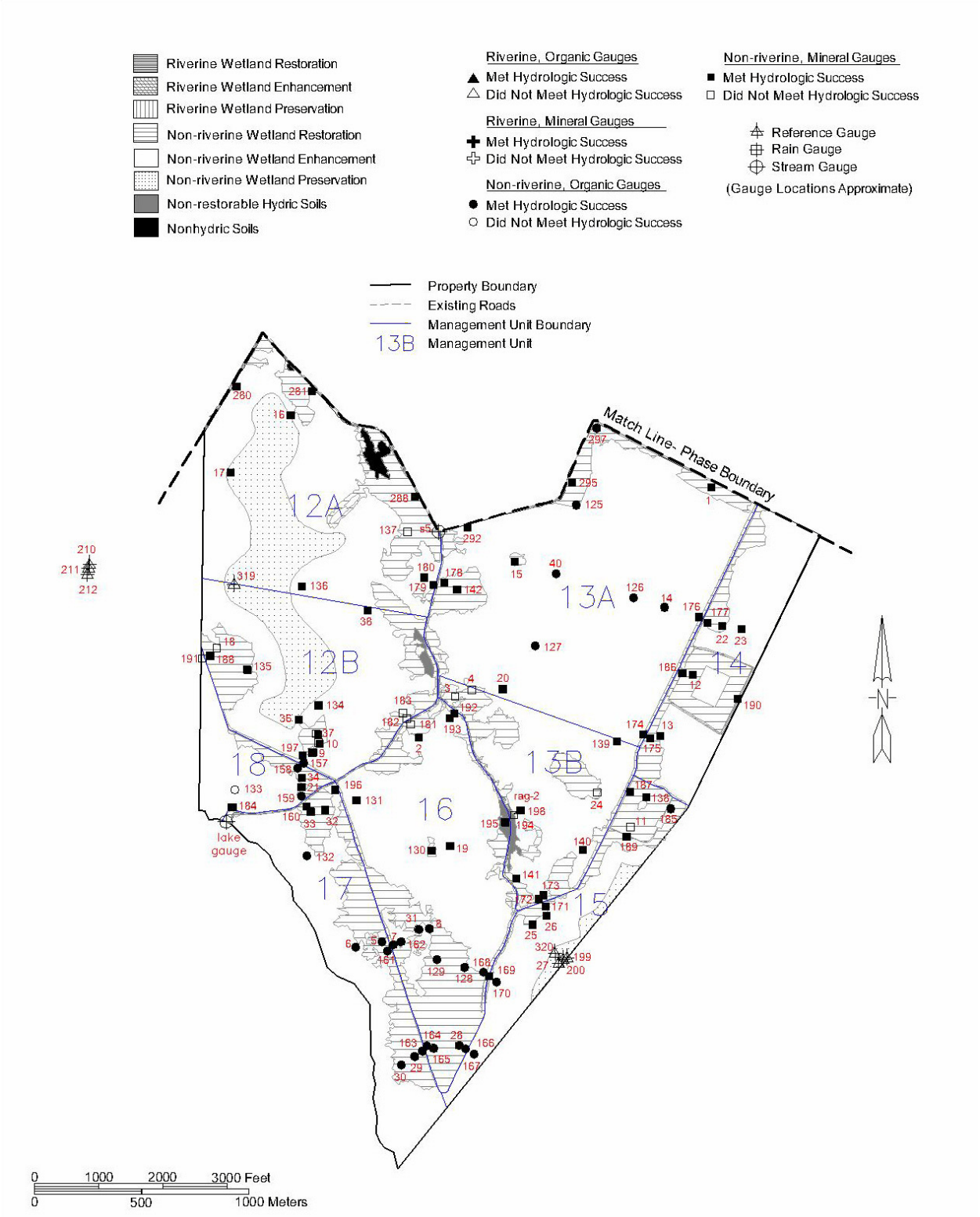


Table 4. Hydrologic Monitoring Results – MU 1

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
83	Pa/NP	100	√	√	√
87	La/NE	29.3	√	√	√
219	Ra/NE	100[b]	√	√	√
220	La/NE	100[b]	√	√	√
223	Pa/NE	100	√	√	√

[a] Soils: Pa – Pantego, La – Leaf, Ra – Rains.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual % : Missing data extrapolated from comparable gauges.

Table 4 MU 1 Discussion

All five of the monitoring gauges in MU 1 met both of their expected hydrologic success criteria. Gauges 83, 219, 220, and 223 made jurisdictional hydrology for 100% of the growing season. Gauges 219 and 220 have missing data due to gauge malfunctions, but are projected to have made jurisdictional hydrology for 100% of the growing season. Projections were made by extrapolation from adjacent data points, comparison to nearby comparable gauges, and reference gauges.

Gauge 219 has recorded data for a minimum 120 consecutive days (49.6% of growing season) and two data gaps. The hydrograph for Gauge 219 and the nearby Rains Reference Gauge 215 respond closely to rainfall and draw down events. Using Gauge 215 to extrapolate the missing data for Gauge 219, it can be assumed that Gauge 219 would have made jurisdictional hydrology 100% of the growing season.

Gauge 220 only has recorded data for a minimum 205 consecutive days (84.7% of growing season) and one data gap. The hydrograph for Gauge 220, Gauge 87, and the nearby Leaf Reference Gauge 217 respond closely to rainfall and draw down events. Using Gauge 217 to extrapolate the missing data for Gauge 220, it can be assumed that Gauge 220 would have made jurisdictional hydrology 100% of the growing season.

Table 5. Hydrologic Monitoring Results – MU 2A

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
92	La/NE	19.0	√	√	√
93	La/NR	23.6	√	√	√
244	La/NE	73.6	√	√	√
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
243	Ba/RE	100	√	√	√

[a] Soils: Ba – Bayboro, La – Leaf.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.

Table 5 MU 2A Discussion

All four of the monitoring gauges in MU 2A met both of their expected hydrologic success criteria. Gauge 243 met jurisdictional hydrology for 100% of the growing season.

Gauges 92 and 93 met both of their hydrologic success criteria. However, both gauges met jurisdictional hydrology a small percentage of the growing season when compared to the majority of the CWMB site. In years with normal rainfall these areas may not make jurisdictional hydrology. Additional mitigative measures may need to be addressed if jurisdictional hydrology has not been restored in years with normal rainfall.

Table 6. Hydrologic Monitoring Results – MU 2B

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
94	Pa/NR	50.0	√	√	√
96	La/NR	100[b]	√	√	√
100	La/NR	100	√	√	√
150	La/NR	25.6	√	√	√
152	Ba/NR	100	√	√	√
153	Ba/NR	100	√	√	√
247	La/NR	25.6	√	√	√
248	La/NR	75.6	√	√	√
249	La/NR	100	√	√	√
251	Ba/NR	100	√	√	√
252	Ba/NR	100	√	√	√
253	Ba/NR	100[b]	√	√	√
254	Ba/NR	100	√	√	√
261	Ba/NR	100	√	√	√
262	Ba/NR	100[b]	√	√	√
263	Ba/NR	100	√	√	√
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
102	Ba/RR	17.8	√	–	–
245	Ba/RE	100	√	√	√
246	La/RE	45.5	√	√	√

[a] Soils: Pa – Pantego, Ba – Bayboro, La – Leaf.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP. [b]
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 6 MU 2B Discussion

Eighteen of the nineteen monitoring gauges in MU 2B met both of their expected hydrologic success criteria. Thirteen of the gauges met jurisdictional hydrology for 100% of the growing season. Gauge 102 made jurisdictional hydrology for 17.8% of the growing season, and therefore met Success Criterion 1 (12.5% of the growing season), but did not meet Success Criterion 2 (50% of reference). Gauges 96, 253, and 262 have missing data due to gauge malfunctions, but are projected to have made jurisdictional hydrology for 100% of the growing season. Projections were made by extrapolation from adjacent data points and comparison to nearby comparable gauges, and reference gauges in the same soil type.

Gauge 96 has recorded data for a minimum 80 consecutive days (33.1% of growing season) and three data gaps. The hydrograph for Gauge 96, nearby Gauge 100, and Leaf Reference Gauge 86 respond closely to rainfall and draw down events. Using Gauges 100 and 86 to extrapolate the missing data for Gauge 96, it can be assumed that Gauge 96 would have made jurisdictional hydrology 100% of the growing season.

Gauge 253 has recorded data for a minimum 225 consecutive days (93.0% of the growing season) and one data gap. Using Gauge 254 to extrapolate the missing data for Gauge 253, it can be assumed that Gauge 253 would have made jurisdictional hydrology 100% of the growing season.

Gauge 262 has recorded data for a minimum 132 consecutive days (54.6% of the growing season and two data gaps). Using Gauge 264 in MU 7 to extrapolate the missing data for Gauge 262, it can be assumed that Gauge 262 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 102 has a very flashy hydrograph and tends to drain rapidly after rainfall events. This gauge is located on the upper edge of the floodplain and may be on a topographic high. Mitigative measures at this gauge site may be enough to return jurisdictional hydrology, but may not be enough to return the site to within 50% of reference hydrology.

Table 7. Hydrologic Monitoring Results – MU 3

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
98	Ba/NR	100	√	√	√
101	Ba/NR	100	√	√	√
151	La/NR	75.2	√	√	√
154	Ba/NE	100	√	√	√
250	La/NR	75.2[b]	√	√	√
255	Ba/NR	100	√	√	√
258	Ba/NR	47.1	√	–	–
259	Ba/NR	47.1[b]	√	–	–
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
256	Ba/RR	25.6	√	–	–
257	Ba/RE	100	√	√	√

[a] Soils: Ba – Bayboro, La –Leaf, Masontown/Muckalee.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 7 MU 3 Discussion

Seven of the ten monitoring gauges in MU 3 met both of their expected hydrologic success criteria. Five of the gauges met jurisdictional hydrology for 100% of the growing season. Gauges 250 and 259 have missing data due to gauge malfunctions. Gauges 256, 258, 259 made jurisdictional hydrology for at least 12.5% of the growing season, and therefore met Success Criterion 1. None of the three gauges met Success Criterion 2 (50% of reference).

Gauge 250 has recorded data for a minimum 157 consecutive days (64.9% of the growing season) and one data gap. Using nearby gauges 151 and 248 in MU 2B to extrapolate the missing data for Gauge 250, it can be assumed that Gauge 250 would have made jurisdictional hydrology for approximately 75.2% of the growing season.

Gauge 259 has recorded data for a minimum 61 consecutive days (25.2% of the growing season) and one data gap. Using documented high water marks and nearby Gauge 258 to extrapolate the missing data for Gauge 259, it can be assumed that Gauge 259 would have made jurisdictional hydrology for approximately 47.1% of the growing season.

Gauges 258 and 259 are located adjacent to the north-south ditch that divides MU 3 from MU 4A. Point plugs instead of reach plugs were used to fill this ditch. The point plugs appear to be successful at returning jurisdictional hydrology within the zone of influence off the former ditch, but were not successful at returning these gauge sites to within 50% of reference conditions under the abnormally wet conditions in 2003.

Table 8. Hydrologic Monitoring Results – MU 4A

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
53	Ba/NE	100	√	√	√
112	Ba/NE	100	√	√	√
260	Ba/NR	47.1	√	–	–

[a] Soils: Ba – Bayboro.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.

Table 8 MU 4A Discussion

Two of the three monitoring gauges (53 and 112) in MU 4A met both of their expected hydrologic success criteria. Both of the gauges met jurisdictional hydrology for 100% of the growing season. Gauge 260 met jurisdictional hydrology for 47.1% of the growing season, and therefore met Success Criterion 1 (12.5% of the growing season), but did not meet Success Criterion 2 (50% of the growing season).

Gauge 260 and Reference Gauge 99 have similar responses to rainfall and drawn down events. However, Gauge 260 is located adjacent to the north-south ditch that divides MU 3 from MU 4A. As previously mentioned above, the point plugs appear to be successful at returning jurisdictional hydrology within the zone of influence off the ditch, but may not be successful at returning these gauge sites to within 50% of reference conditions.

Table 9. Hydrologic Monitoring Results – MU 4B

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
54	Pa/NP	100	√	√	√
55	Ba/NE	100	√	√	√
58	Ba/NE	100	√	√	√
59	Ba/NR	100	√	√	√
317	Ba/NR	100	√	√	√
318	Ba/NR	100[b]	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
56	CT/NP	100	√	√	√
57	CT/NE	100[b]	√	√	√

[a] Soils: Ba – Bayboro, CT - Croatan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 9 MU 4B Discussion

All eight of the monitoring gauges in MU 4B met both of their expected hydrologic success criteria. All of the gauges in MU 4B met jurisdictional hydrology for 100% of the growing season. Gauges 57 and 318 have missing data due to gauge malfunctions, but are projected to have made jurisdictional hydrology for 100% of the growing season.

Gauge 57 has recorded data for a minimum of 154 consecutive days (63.6%) and one data gap. Using nearby Gauge 56 to extrapolate the missing data for Gauge 57, it can be assumed that Gauge 57 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 318 has recorded data for a minimum of 128 consecutive days (52.9%) and one data gap. Using nearby Gauge 55 to extrapolate the missing data for Gauge 318, it can be assumed that Gauge 318 would have made jurisdictional hydrology for 100% of the growing season.

Table 10. Hydrologic Monitoring Results – MU 5

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
84	Ra/NR	100	√	√	√
85	Pa/NR	23.6	√	–	–
95	La/NR	46.7	√	√	√
106	Ba/NE	100[b]	√	√	√
149	Pa/NR	≥15.3[b]	√	–	–
221	La/NR	100	√	√	√
222	La/NR	25.2	√	√	√
224	Pa/NR	100	√	√	√
225	Pa/NR	100	√	√	√
235	Ba/NR	100	√	√	√
238	Ra/NR	24.0	√	√	√
239	Ra/NR	24.0	√	√	√
241	Ra/NE	100	√	√	√
242	La/NR	100	√	√	√
Riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
236	MM/RR	100	√	√	√
237	MM/RE	100	√	√	√

[a] Soils: Ra – Rains, Pa – Pantego, Ba – Bayboro, La –Leaf, M/M –Masontown/Muckalee.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 10 MU 5 Discussion

Fourteen of the sixteen monitoring gauges in MU 5 met both of their expected hydrologic success criteria. Ten of the gauges in MU 5 met jurisdictional hydrology for 100% of the growing season. Gauges 85 and 149 made jurisdictional hydrology for at least 12.5% of the growing season, and therefore met Success Criterion 1. Neither of the gauges met Success Criterion 2 (50% of reference) for Pantego soils. Gauges 106 and 149 have missing data due to gauge malfunctions.

Gauge 106 has recorded data for a minimum of 213 consecutive days (88.0%) and two data gaps. Using nearby Gauge 235 to extrapolate the missing data for Gauge 106, it can be assumed that Gauge 106 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 149 has recorded data for a minimum of 37 consecutive days (15.3%) and one data gap. Using nearby Gauge 85 to extrapolate the missing data, Gauge 149 would not meet Success Criterion 2 (50% of reference). It can be assumed that Gauge 149 would have made jurisdictional hydrology for less than the 23.6% of the growing season recorded for Gauge 85.

Table 11. Hydrologic Monitoring Results – MU 6

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
74	Ba/NR	73.1	√	√	√
75	Ba/NR	7.9	–	–	–
76	Ba/NR	13.2	√	–	–
82	Pa/NR	100	√	√	√
107	Ba/NR	100	√	√	√
108	Ba/NR	100	√	√	√
146	La/NR	72.7	√	√	√
147	Ba/NE	100	√	√	√
226	Pa/NR	100	√	√	√
233	Ra/NR	100[b]	√	√	√
234	Ba/NR	100[b]	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
240	CT/NR	99.2	√	√	√
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
81	Ba/RR	100	√	√	√
230	Ba/RR	100 [b]	√	√	√

Table 11 Continues

Table 11 Concluded.

Riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
Gauge	**Soil Series and Mitigation Type[a]**	**Actual %**	**Criterion 1 Met (% of Growing Season)**	**Criterion 2 Met (% of Reference Range)**	**Hydrologic Success Met**
77	CT/RE	100[b]	√	√	√
78	MM/RR	100[b]	√	√	√
79	Do/RR	100	√	√	√
80	Do/MM/RR	100	√	√	√
109	MM/RR	100	√	√	√
148	MM/RE	100	√	√	√
227	MM/RR	100	√	√	√
228	MM/RE	100[b]	√	√	√
229	CT/RE	100	√	√	√
231	CT/RR	100	√	√	√

[a] Soils: Ra – Rains, Pa – Pantego, Ba – Bayboro, La –Leaf, M/M –Masontown/Muckalee.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 11 MU 6 Discussion

Twenty-two of the twenty-four monitoring gauges in MU 6 met both of their expected hydrologic success criteria. Nineteen of the gauges in MU 6 met jurisdictional hydrology for 100% of the growing season. Gauges 77, 78, 228, 230, 233, and 234 are missing data due to gauge malfunctions. Gauges 75 and 76 did not meet Hydrologic Success.

Gauge 75 did not meet either of its expected hydrologic success criteria. Loblolly pine (*Pinus taeda*) and braken fern (*Pteridium aquilinum*) dominate the small area adjacent to this gauge site which may be an indication that the topography may be a little higher than the surrounding landscape. This gauge site and a small area around it may not be returned to jurisdictional status due to its location. Gauge 76 made jurisdictional hydrology for 13.2% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (50% of reference) for Bayboro soils (50 - 100% of the growing season).

Table 11 MU 6 Discussion Continued

Gauge 77 has recorded data for a minimum of 127 consecutive days (52.5%) and one data gap due to high water conditions. This gauge was replaced with a gauge measuring surface water as well as ground water. Using nearby Gauges 229 and 231 to extrapolate the missing data for Gauge 77, it can be assumed that Gauge 77 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 78 has recorded data for a minimum of 141 consecutive days (58.3%) and one data gap. Using nearby Gauges 109 and 148 to extrapolate the missing data for Gauge 78, it can be assumed that Gauge 78 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 228 has recorded data for a minimum of 73 consecutive days (30.2%) and two data gaps. High water was noted at this gauge site throughout the growing season. Using Reference Gauge 91 to extrapolate the missing data for Gauge 228, it can be assumed that Gauge 228 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 230 has recorded data for a minimum of 77 consecutive days (31.8%) and two data gaps. High water was noted at various times throughout the growing season. All of the gauges surrounding Gauge 230, including Gauge 229 (Croatan soil) made jurisdictional hydrology for 100% of the growing season. It can be assumed that Gauge 230 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 233 has recorded data for a minimum of 211 consecutive days (87.2%) and two data gaps. Using nearby Gauge 232 in MU 11 to extrapolate the missing data for Gauge 233, it can be assumed that Gauge 233 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 234 has recoded data for a minimum of 219 consecutive days (90.5%) and one data gap. Using the adjacent data points and the large rainfall event during the missing data, is can be assumed that Gauge 234 would have made jurisdictional hydrology for 100% of the growing season.

Table 12. Hydrologic Monitoring Results – MU 7

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
52	Ba/NE	100[b]	√	√	√
71	Ba/NR	100[b]	√	√	√
72	Ba/NR	100	√	√	√
73	Pa/NR	100	√	√	√
97	Ba/NR	100	√	√	√
110	Pa/NR	100	√	√	√
111	Ba/NE	100[b]	√	√	√
155	Ba/NR	100[b]	√	√	√
156	Ba/NR	100[b]	√	√	√
264	Ba/NR	100	√	√	√
265	Ba/NR	100[b]	√	√	√
267	Ba/NE	100[b]	√	√	√
268	Ba/NR	100[b]	√	√	√
270	Ba/NR	100[b]	√	√	√

[a] Soils: Pa – Pantego, Ba – Bayboro.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 12 MU 7 Discussion

All fourteen of the monitoring gauges in MU 7 met both of their expected hydrologic success criteria. All fourteen of the gauges in MU 7 met jurisdictional hydrology for 100% of the growing season. Most of the gauges in MU 7 had between 2 and 5 inches of surface water for the entire growing season. Gauges 52, 71, 111, 155, 156, 265, 267, 268, and 270 have missing data due to gauge malfunctions.

Table 12 MU 7 Discussion Continued
Gauge 52 has recorded data for a minimum of 209 consecutive days (86.4%) and one data gap. Using adjacent data points and rainfall data to extrapolate the missing data for Gauge 52, it can be assumed that Gauge 52 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 71 has recorded data for a minimum of 141 consecutive days (58.3%) and two data gaps. Using nearby Gauges 155 and 156 to extrapolate the missing data for Gauge 71, it can be assumed that Gauge 71 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 111 has recorded data for a minimum of 155 consecutive days (64.1%) and one data gap. Using nearby Gauge 52 to extrapolate the missing data for Gauge 111, it can be assumed that Gauge 111 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 155 has recorded data for a minimum of 127 consecutive days (52.5%) and one data gap. Using nearby Gauge 156 to extrapolate the missing data for Gauge 155, it can be assumed that Gauge 155 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 156 has recorded data for a minimum of 184 consecutive days (76.0%) and two data gaps. Using nearby Gauge 155 to extrapolate the missing data for Gauge 156, it can be assumed that Gauge 156 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 265 has recorded data for a minimum of 81 consecutive days (33.5%) and multiple data gaps. Using nearby Gauges 52 and 266 in MU 8 to extrapolate the missing data for Gauge 265, it can be assumed that Gauge 265 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 267 has recorded data for a minimum of 100 consecutive days (41.3%) and one data gap. Using nearby Gauges 269 in MU 8 and 268 in MU 7 to extrapolate the missing data for Gauge 267, it can be assumed that Gauge 267 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 268 has recorded data for a minimum of 81 consecutive days (33.5%) and one data gap. Using nearby Gauge 269 in MU 8 to extrapolate the missing data for Gauge 268, it can be assumed that Gauge 268 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 270 has recorded data for a minimum of 220 consecutive days (90.9%) and one data gap. Using adjacent data points and rainfall events to extrapolate the missing data for Gauge 270, it can be assumed that Gauge 270 would have made jurisdictional hydrology for 100% of the growing season.

Table 13. Hydrologic Monitoring Results – MU 8

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
47	Ba/NR	100	√	√	√
51	Ba/NE	100	√	√	√
113	Ba/NE	100	√	√	√
115	Pa/NR	100	√	√	√
116	Pa/NE	100[b]	√	√	√
266	Ba/NR	100	√	√	√
269	Ba/NE	100	√	√	√
311	Ba/NR	100	√	√	√
314	Ba/NR	100	√	√	√
315	Ba/NR	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
44	CT/NR	100	√	√	√
103	CT/NE	100	√	√	√
114	CT/NR	100[b]	√	√	√
117	CT/NE	100	√	√	√
307	CT/NR	100[b]	√	√	√
309	CT/NR	100	√	√	√
312	CT/NR	100	√	√	√

[a] Soils: Pa – Pantego, Ba – Bayboro, CT - Croatan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 13 MU 8 Discussion

All seventeen of the monitoring gauges in MU 8 met both of their expected hydrologic success criteria. All seventeen of the gauges in MU 8 met jurisdictional hydrology for 100% of the growing season. Most of these gauges in MU 8 had between 2 and 10+ inches of surface water for the entire growing season. Gauges 114, 116, and 307 have missing data due to gauge malfunctions.

Gauge 114 has recorded data for a minimum of 151 consecutive days (62.4%) and two data gaps. Using nearby Gauge 117 to extrapolate the missing data for Gauge 114, it can be assumed that Gauge 114 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 116 has recorded data for a minimum of 197 consecutive days (81.4%) and one data gap. Using nearby Gauge 115 to extrapolate the missing data for Gauge 116, it can be assumed that Gauge 116 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 307 has recorded data for a minimum of 50 consecutive days (20.7%) and three data gaps. Using nearby Gauge 44 to extrapolate the missing data for Gauge 307, it can be assumed that Gauge 307 would have made jurisdictional hydrology for 100% of the growing season.

Table 14. Hydrologic Monitoring Results – MU 9

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
41	Ba/NE	100	√	√	√
301	Ba/NR	100	√	√	√
303	Ba/NR	100	√	√	√
313	Ba/NE	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
42	CT/NE	100	√	√	√
43	CT/NE	100	√	√	√
305	CT/NR	100	√	√	√
306	CT/NE	100[b]	√	√	√

[a] Soils: Ba – Bayboro, CT - Croatan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 14 MU 9 Discussion

All eight of the monitoring gauges in MU 9 met both of their expected hydrologic success criteria. All eight of the gauges in MU 9 met jurisdictional hydrology for 100% of the growing season. Many of the gauges in MU 8 had between 2 and 5 inches of surface water for the entire growing season. Gauge 306 has missing data due to gauge malfunction.

Gauge 306 has recorded data for a minimum of 155 consecutive days (64.1%) and one data gap. Using nearby Gauge 305 to extrapolate the missing data for Gauge 306, it can be assumed that Gauge 306 would have made jurisdictional hydrology for 100% of the growing season.

Table 15. Hydrologic Monitoring Results – MU 10A

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
46	Ba/NR	100	√	√	√
60	Ba/NR	100	√	√	√
118	Ba/NR	100[b]	√	√	√
298	Ba/NR	100	√	√	√
299	Ba/NR	100[b]	√	√	√
300	Ba/NR	100	√	√	√
302	Ba/NR	100[b]	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
45	CT/NR	100	√	√	√
61	CT/NR	100	√	√	√
119	CT/NR	100	√	√	√
120	CT/NR	100	√	√	√
296	CT/NR	100	√	√	√
304	CT/NR	100	√	√	√
308	CT/NR	100	√	√	√

[a] Soils:, Ba – Bayboro, CT – Croatan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 15 MU 10A Discussion
All fourteen of the monitoring gauges in MU 10A met both of their expected hydrologic success criteria. All fourteen of the gauges in MU 10A met jurisdictional hydrology for 100% of the growing season. Many of the gauges in MU 10A had between 2 and 10 inches of surface water for the entire growing season. Gauges 118, 299, and 302 have missing data due to gauge malfunctions.

Gauge 118 has recorded data for a minimum of 234 consecutive days (96.7%) and one data gap. Using adjacent data points and rainfall data to extrapolate the missing data for Gauge 118, it can be assumed that Gauge 118 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 299 has recorded data for a minimum of 144 consecutive days (59.5%) and three data gaps. Using nearby Gauges 300 and 302 to extrapolate the missing data for Gauge 299, it can be assumed that Gauge 299 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 302 has recorded data for a minimum of 226 consecutive days (93.4%) and one data gap. Using nearby Gauge 300 and the rainfall data to extrapolate the missing data for Gauge 302, it can be assumed that Gauge 302 would have made jurisdictional hydrology for 100% of the growing season.

Table 16. Hydrologic Monitoring Results – MU 10B

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
49	Ba/NR	100[b]	√	√	√
50	Ba/NR	100	√	√	√
65	Pa/NE	100	√	√	√
66	Ra/NE	100[b]	√	√	√
67	Pa/NR	100	√	√	√
69	Ba/NR	100	√	√	√
70	Ba/NE	100[b]	√	√	√
122	Pa/NR	100[b]	√	√	√
124	Pa/NR	73.1	√	√	√
271	Ba/NR	100[b]	√	√	√
272	Ba/NR	100[b]	√	√	√
273	Ba/NR	100	√	√	√
274	Ba/NR	100	√	√	√
277	Ra/NR	43.0	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
48	CT/NR	100	√	√	√
123	CT/NE	100	√	√	√
310	CT/NR	100	√	√	√

[a] Soils:, Ba – Bayboro, CT – Croatan, Ra – Rains.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table16 MU 10B Discussion
All of the seventeen monitoring gauges in MU 10B met both of their expected hydrologic success criteria. Fourteen of the gauges in MU 10B met jurisdictional hydrology for 100% of the growing season. Many of the gauges in MU 10B had 2 inches of surface water for the entire growing season. Gauges 271 and 272 had between 8 and 15 inches of surface water for the entire growing season. Gauges 49, 66, 70, 122, 271, 272 are missing data due to gauge malfunctions.

Gauge 49 has recorded data for a minimum of 196 consecutive days (81.0%) and one data gap. Using nearby Gauge 50 to extrapolate the missing data for Gauge 49, it can be assumed that Gauge 49 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 66 has recorded data for a minimum of 220 consecutive days (90.9%) and one data gap. Using adjacent data points and rainfall data to extrapolate the missing data for Gauge 66, it can be assumed that Gauge 66 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 70 has recorded data for a minimum of 155 consecutive days (64.1%) and one data gap. Using nearby Gauge 69 to extrapolate the missing data for Gauge 70, it can be assumed that Gauge 70 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 122 has recorded data for a minimum of 87 consecutive days (36.0%) and multiple data gaps. Using nearby Gauge 121 in MU 10C to extrapolate the missing data for Gauge 122, it can be assumed that Gauge 122 would have made jurisdictional hydrology for 100% of the growing season.

Gauges 271 and 272 each have recorded data for a minimum of 220 consecutive days (90.9%) and one data gap. Using adjacent data points and rainfall data to extrapolate the missing data for Gauges 271 and 272, it can be assumed that these gauges would have made jurisdictional hydrology for 100% of the growing season.

Table 17. Hydrologic Monitoring Results – MU 10C

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
62	Ra/NR	25.2	√	√	√
63	Pa/NR	100	√	√	√
64	Ra/NR	100	√	√	√
121	Pa/NR	100	√	√	√
143	Pa/NR	100	√	√	√
282	Pa/NR	100	√	√	√
283	Pa/NR	100	√	√	√
286	Ra/NR	8.3	–	–	–
287	Ra/NR	5.0	–	–	–
289	Pa/NR	74.0 [b]	√	√	√
290	Pa/NR	100 [b]	√	√	√
291	Pa/NR	25.2	√	–	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
284	CT/NR	100 [b]	√	√	√
285	CT/NR	100	√	√	√
293	CT/NR	100	√	√	√
294	CT/NR	100	√	√	√

[a] Soils:, Pa - Pantego, CT – Croatan, Ra – Rains.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation - RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 17 MU 10C Discussion

Thirteen of the sixteen monitoring gauges in MU 10C met both of their expected hydrologic success criteria. Eleven of the gauges in MU 10C meet jurisdictional hydrology for 100% of the growing season. Gauges 293 and 294 had between 8 and 12 inches of surface water for the entire growing season. Gauges 286, 287, and 291 did not met Hydrologic Success. Gauges 284, 289, and 290 have missing data due to gauge malfunctions.

Gauge 284 has recorded data for a minimum of 65 consecutive days (26.9%) and two gaps. Using nearby Gauge 285 and noted high water to extrapolate the missing data for Gauge 284, it can be assumed that Gauge 284 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 289 has recorded data for a minimum of 100 consecutive days (41.3%) and one data gap. Using nearby Gauge 290 and Reference Gauge 319 to extrapolate the missing data for Gauge 289, it can be assumed that Gauge 289 would have made jurisdictional hydrology for at least 74.0% of the growing season.

Gauge 290 has recorded data for a minimum of 154 consecutive days (63.6%) and two gaps. Using nearby Gauge 289 extrapolate the missing data for Gauge 284, it can be assumed that Gauge 289 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 291 made jurisdictional hydrology for 25.2% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (50% of reference) for Pantego soils (50 - 100% of the growing season). Gauges 286 and 287 did not meet either of their expected hydrologic success criteria. These gauges are located on either side of the ditch adjacent to the removed roadbed. Point plugs instead of reach plugs were used to fill this ditch. The point plugs do not appear to be successful at returning jurisdictional hydrology within the zone of influence off the western side of the former ditch.

Table 18. Hydrologic Monitoring Results – MU 11

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
68	Ba/NR	100	√	√	√
144	Pa/NR	70.3	√	√	√
145	Ba/NR	100 [b]	√	√	√
232	Ra/NR	100	√	√	√
275	Ba/NR	100	√	√	√
276	Ra/NR	70.3	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
278	CT/NE	100	√	√	√
279	CT/NR	100	√	√	√

[a] Soils: Pa – Pantego, Ba – Bayboro, Ra – Rains, CT - Croatan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP
[b] Actual %: Missing data extrapolated from comparable gauges

Table 18 MU 11 Discussion

All eight of the monitoring gauges in MU 11 met both of their expected hydrologic success criteria. Six of the gauges in MU 11 met jurisdictional hydrology for 100% of the growing season. Gauges 278 and 279 had 8 and 15 inches of surface water for the entire growing season. Gauge 145 has missing data due to gauge malfunctions.

Gauge 145 has recorded data for a minimum of 141 consecutive days (58.3%) and one data gap. Using nearby Gauge 68 and Reference Gauge 99 to extrapolate the missing data for Gauge 145, it can be assumed that Gauge 145 would have made jurisdictional hydrology for at least 100% of the growing season.

Table 19. Hydrologic Monitoring Results – MU 12A

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 50% of Reference Range)					
16	Pa/NE	100	√	√	√
17	Pa/NP	100[b]	√	√	√
136	Mu/NE	100	√	√	√
137	Mu/NR	24.0	√	–	–
179	Pa/NR	100	√	√	√
180	Ba/NE	100	√	√	√
280	Pa/NE	100	√	√	√
281	Ra/NE	100[b]	√	√	√
288	Ra/NR	72.7	√	√	√

[a] Soils: Pa – Pantego, Mu – Murville, Ba – Bayboro, Ra - Rains.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges

Table 19 MU 12A Discussion

Eight of the nine monitoring gauges in MU 12A met both of their expected hydrologic success criteria. Seven of the gauges in MU 12A met jurisdictional hydrology for 100% of the growing season. Gauges 280 and 281 had between 10 and 25 inches of surface water for the entire growing season. Gauges 17 and 281 have missing data due to gauge malfunctions.

Gauge 17 has recorded data for a minimum of 214 consecutive days (88.4%) and two data gaps. Using nearby Gauge 16 and Reference Gauge 90 to extrapolate the missing data for Gauge 17, it can be assumed that Gauge 17 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 281 has recorded data for a minimum of 22 consecutive days (9.1%) and multiple data gaps due to high water conditions. Using rainfall data and noted high water throughout the growing season to extrapolate the missing data for Gauge 281, it can be assumed that Gauge 281 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 137 made jurisdictional hydrology for 24.0% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (50% of reference) for Murville soils (50 - 100% of the growing season).

Table 20. Hydrologic Monitoring Results – MU 12B

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
9	Pa/NR	46.7	√	√	√
10	Pa/NR	100	√	√	√
18	Pa/NR	24.8	√	–	–
36	Pa/NE	100	√	√	√
37	Pa/NR	47.9	√	√	√
38	Mu/NE	100	√	√	√
134	Pa/NE	47.9	√	√	√
135	Pa/NR	≥45.5	√	√	√
182	Mu/NR	24.0	√	–	–
183	Mu/NR	9.9	–	–	–
188	Pa/NR	47.9	√	√	√
197	Pa/NE	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
157	CT/NR	100	√	√	√

[a] Soils: Pa – Pantego, Mu – Murville, CT – Croatan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.

Table 20 MU 12B Discussion

Ten of the thirteen monitoring gauges in MU 12B met both of their expected hydrologic success criteria. Five of the gauges in MU 12B met jurisdictional hydrology for 100% of the growing season. Gauges 18 and 182 made jurisdictional hydrology for at least 12.5% of the growing season, and therefore met Success Criterion 1. Neither of the gauges met Success Criterion 2 (50% of reference). Gauge 183 did not meet either of its expected hydrologic success criteria. Gauge 135 has missing data due to gauge malfunctions.

Gauge 135 has recorded data for approximately 110 consecutive days (45.5%) and three data gaps. However, data could not be extrapolated because the missing data occurs during two critical periods were hydrology may have dropped below 12 inches (early July and early September) based on hydrograph trends for data adjacent to the data gaps.

Gauges 182 and 183 are located adjacent to the north-south ditch that maintains the main access road. Point plugs instead of reach plugs were used to fill this ditch. The point plugs may be successful at returning jurisdictional hydrology to some areas within the zone of influence of the ditch and not in others. Gauge 182 is actually closer to the ditch than Gauge 183. Gauge 183 may be a little higher in the landscape than 182, which may account for the difference in number of jurisdictional days. The ditch adjacent to 182 and 183 may still have a zone of influence extending a greater distance off the ditch than can be measured with existing gauges. Another gauge installed along the same transect may capture the zone of influence. In a year with normal rainfall the area represented by these gauges may not be restored to jurisdictional status.

Table 21. Hydrologic Monitoring Results – MU 13A

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
1	Ba/NR	100	√	√	√
15	Pa/NR	100	√	√	√
20	Pa/NE	100	√	√	√
142	Pa/NR	100[b]	√	√	√
174	Ba/NR	100	√	√	√
176	Ba/NR	100	√	√	√
178	Mu/NR	100[b]	√	√	√
292	Pa/NE	100	√	√	√
295	Pa/NR	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
14	CT/NE	100	√	√	√
40	CT/NE	100[b]	√	√	√
125	CT/NR	100	√	√	√
126	CT/NE	100	√	√	√
127	CT/NE	100	√	√	√
297	CT/NR	100[b]	√	√	√

[a] Soils: Ba – Bayboro, Pa – Pantego, Mu – Murville, CT – Croatan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges

Table 21 MU 13A Discussion

All fifteen of the monitoring gauges in MU 13A met both of their expected hydrologic success criteria. All of the gauges in MU 13A met jurisdictional hydrology for 100% of the growing season. Most of the gauges had at least 1 to 2 inches of surface water for the entire growing season. Gauges 40, 142, 178, and 297 have missing data due to gauge malfunctions.

Gauge 40 has recorded data for a minimum of 59 consecutive days (24.4%) and very large data gaps. Using nearby Gauge 125 and Reference Croatan Gauges to extrapolate the missing data for Gauge 40, it can be assumed that Gauge 40 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 142 has recorded data for a minimum of 214 consecutive days (88.4%) and one data gap. Using Gauge 295 to extrapolate the missing data for Gauge 142, it can be assumed that Gauge 142 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 178 has recorded data for a minimum of 92 consecutive days (38.0%) and one data gap. Using Reference Gauge 199 to extrapolate the missing data for Gauge 178, it can be assumed that Gauge 178 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 297 has recorded data for a minimum of 234 consecutive days (96.7%) and one data gap. Using adjacent data points and rainfall data to extrapolate the missing data for Gauge 297, it can be assumed that Gauge 297 would have made jurisdictional hydrology for 100% of the growing season.

Table 22. Hydrologic Monitoring Results – MU 13B

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
3	Mu/NR	9.5	–	–	–
4	Mu/NR	25.2	√	–	–
24	Mu/NR	10.3	–	–	–
139	Ba/NE	100[b]	√	√	√
140	Pa/NE	100	√	√	√
141	Pa/NE	47.9	√	√	√
172	Ba/NR	100	√	√	√
173	Ba/NE	100	√	√	√
194	Mu/NE	25.2	√	–	–
198	Ln/NE	46.7	√	√	√

[a] Soils: Ba – Bayboro, Pa – Pantego, Mu – Murville, Ln - Leon.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 22 MU 13B Discussion

Six of the ten monitoring gauges in MU 13B met both of their expected hydrologic success criteria. Four of the gauges in MU 13B met jurisdictional hydrology for 100% of the growing season. Gauges 24 and 139 are missing data due to gauge malfunctions.

Gauge 139 has recorded data for a minimum of 207 consecutive days (85.5%) and one data gap. Using adjacent data points and rainfall data to extrapolate the missing data for Gauge 139, it can be assumed that Gauge 139 would have made jurisdictional hydrology for 100% of the growing season.

Gauges 4 and 194 made jurisdictional hydrology for at least 12.5% of the growing season, and therefore met Success Criterion 1. Neither of the gauges met Success Criterion 2 (50% of reference) for Murville soils (50 to 100% of the growing season).

Gauges 3 and 24 did not meet either of their expected hydrologic success criteria. It is difficult to extrapolate missing data for Gauge 24 due to the large degree of fluctuation. Bracken fern dominates the area adjacent to these gauge sites which may be an indication that the topography may be a little higher than the surrounding landscape. These gauge sites and a small area around them may not be returned to jurisdictional status due to their location.

Table 23. Hydrologic Monitoring Results – MU 14

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
12	Pa/NR	100[b]	√	√	√
13	Ba/NR	100	√	√	√
22	Pa/NR	100[b]	√	√	√
23	Pa/NE	100	√	√	√
175	Ba/NR	100	√	√	√
177	Pa/NR	100	√	√	√
186	Pa/NR	100[b]	√	√	√
190	Pa/NR	100	√	√	√

[a] Soils: Ba – Bayboro, and Pa – Pantego.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 23 MU 14 Discussion

All eight of the monitoring gauges in MU 14 met both of their expected hydrologic success criteria. All of the gauges in MU 14 met jurisdictional hydrology for 100% of the growing season. Most of the gauges had at least 1 to 2 inches of surface water for the entire growing season. Gauges 12, 22, and 186 have missing data due to gauge malfunctions.

Gauge 22 has recorded data for a minimum of 234 consecutive days (96.7%) and one data gap. Using nearby Gauge 23 to extrapolate the missing data for Gauge 22, it can be assumed that Gauge 22 would have made jurisdictional hydrology for 100% of the growing season.

Gauges 12 and 186 each also have recorded data for a minimum of 234 consecutive days (96.7%) and one data gap. Using these gauges to extrapolate the missing data for the opposite gauge, it can be assumed that Gauges 12 and 186 would have made jurisdictional hydrology for 100% of the growing season.

Table 24. Hydrologic Monitoring Results – MU 15

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
11	Pa/NR	17.8	√	–	–
25	Pa/NR	100	√	√	√
26	Mu/NR	100	√	√	√
138	Pa/NR	100	√	√	√
171	Ba/NR	100[b]	√	√	√
187	Ba/NR	100	√	√	√
189	Pa/NR	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
167	CT/NE	100	√	√	√
170	CT/NE	100 [b]	√	√	√
185	CT/NR	100	√	√	√

[a] Soils: Ba – Bayboro, CT – Croatan, Mu – Murville, Pa – Pantego.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 24 MU 15 Discussion

Nine of the ten monitoring gauges in MU 15 met both of their expected hydrologic success criteria. Nine of the gauges in MU 15 met jurisdictional hydrology for 100% of the growing season. Gauges 167, 170, 185, 187, and 189 had at least 1 to 2 inches of surface water for the entire growing season. Gauges 170 and 171 are missing data due to gauge malfunctions.

Gauge 170 has recorded data for a minimum of 207 consecutive days (85.5%) and one data gap. Using nearby Gauges 167 and 169 in MU 16 to extrapolate the missing data for Gauge 170, it can be assumed that Gauge 170 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 171 has recorded data for a minimum of 130 consecutive days (53.7%) and one data gap. Using nearby Gauge 172 in MU 13B to extrapolate the missing data for Gauge 171, it can be assumed that Gauge 171 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 11 made jurisdictional hydrology for 17.8% of the growing season, and therefore met Success Criterion 1, but did not meet Success Criterion 2 (50% of reference) for Pantego soils.

Table 25. Hydrologic Monitoring Results – MU 16

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
2	Mu/NE	100	√	√	√
19	Pa/NE	100	√	√	√
130	Pa/NR	100	√	√	√
131	Mu/NE	100	√	√	√
169	Pa/NR	100	√	√	√
181	Mu/NR	25.2	√	–	–
192	Mu/NR	100	√	√	√
193	Mu/NR	100	√	√	√
195	Ln/NR	16.1	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
7	CT/NR	100	√	√	√
8	CT/NR	100	√	√	√
28	DA/NR	100	√	√	√
31	CT/NR	100	√	√	√
128	CT/NR	100	√	√	√
129	CT/NR	100	√	√	√
162	CT/NR	100	√	√	√
164	CT/NR	100	√	√	√
165	CT/NR	100	√	√	√
166	DA/NR	100	√	√	√
168	CT/NR	100[b]	√	√	√

[a] Soils: DA – Dare, CT – Croatan, Ln – Leon, Mu – Murville, Pa – Pantego.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 25 MU 16 Discussion

Nineteen of the twenty monitoring gauges in MU 16 met both of their expected hydrologic success criteria. Eighteen of the gauges in MU 16 met jurisdictional hydrology for 100% of the growing season. Many of the gauges had at least 1 to 2 inches of surface water for the entire growing season. Gauges 168 and 195 have missing data due to gauge malfunctions.

Gauge 168 has recorded data for a minimum of 129 consecutive days (53.3%) and one data gap. The missing data at Gauge 168 is due to high water at the beginning of the growing season. Water remained at or above ground surface for the entire growing season, therefore it can be assumed that Gauge 168 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 195 has recorded data for a minimum of 39 consecutive days (16.1%) and one data gap. The missing data for Gauge 195 is difficult to extrapolate due to large degree of fluctuation throughout the hydrograph. As a result, the hydroperiod reported is the longest for which data are available.

Gauge 181 made jurisdictional hydrology for 25.2% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (50% of reference) for Murville soils (50 - 100% of the growing season).

Table 26. Hydrologic Monitoring Results – MU 17

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
32	Ba/NR	100[b]	√	√	√
33	Ba/NR	100	√	√	√
160	Ba/NR	100	√	√	√
196	Pa/NE	100[b]	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
5	DA/NR	100	√	√	√
6	DA/NE	100	√	√	√
29	CT/NR	100	√	√	√
30	DA/NR	100	√	√	√
132	CT/NE	100	√	√	√
161	CT/NR	100	√	√	√
163	CT/NR	100	√	√	√

[a] Soils: Ba – Bayboro, DA – Dare, CT – Croatan, Pa - Pantego.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.
[b] Actual %: Missing data extrapolated from comparable gauges.

Table 26 MU 17 Discussion

All eleven of the monitoring gauges in MU 17 met both of their expected hydrologic success criteria. All of the gauges in MU 17 met jurisdictional hydrology for 100% of the growing season. Most of the gauges had at least 1 to 2 inches of surface water for the entire growing season. Gauge 32 and 196 have missing data due to gauge malfunctions.

Gauge 32 has recorded data for a minimum of 187 consecutive days (77.3%) and one data gap. Using nearby Gauge 33 to extrapolate the missing data for Gauge 32, it can be assumed that Gauge 32 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 196 was under water for the majority of the year, and it can be assumed that Gauge 196 made jurisdictional hydrology for 100% of the growing season. This gauge site is guarded by an alligator. The monitoring of Gauge 196 should be discontinued and removed when possible.

Table 27. Hydrologic Monitoring Results – MU 18

Gauge	Soil Series and Mitigation Type[a]	Actual % [b]	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 50% of Reference Range)					
21	Pa/NE	100	√	√	√
34	Pa/NR	100	√	√	√
184	Ln/NE	25.2	√	√	√
191	Pa/NE	25.2	√	–	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 50% of Reference Range)					
133	CT/NE	25.2	√	–	–
158	CT/NR	100	√	√	√
159	CT/NR	100	√	√	√

[a] Soils: CT – Croatan, Ln – Leon, Pa – Pantego.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Non-riverine Preservation – NP, Riverine Restoration – RR, Riverine Enhancement – RE, Riverine Preservation – RP.

Table 27 MU 18 Discussion

Five of the seven monitoring gauges in MU 18 met both of their expected hydrologic success criteria. Four of the gauges in MU 18 met jurisdictional hydrology for 100% of the growing season.

Gauge 191 made jurisdictional hydrology for 25.2% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (50% of reference) for Pantego soils (50 - 100% of the growing season). Point plugs were used to fill the adjacent ditch and the ditch is open on the adjacent U.S. Forest Service property. The point plugs appear to be successful at returning jurisdictional hydrology within the zone of influence off the ditch, but may not be successful at returning the area represented by this gauge site to within 50% of reference conditions.

Gauge 133 made jurisdictional hydrology for 25.2% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (50% of reference) for Croatan soils (50 - 100% of the growing season). This area may represent a hummock, or area of slightly higher elevation than the surrounding landscape.

2.3.2 Climatic Data

Figure 4 is a comparison of 2003 monthly rainfall to historical precipitation for the area. The two lines represent the 30th and 70th percentiles of monthly precipitation for Craven County, North Carolina. The bars are monthly rainfall totals for the 2003 growing season as well as the rainfall for November and December of 2002. The historical data was collected from the North Carolina State Climate Office rain gauge in Craven County, North Carolina. Three onsite rain gauges provided 2003 rainfall data.

Overall, rainfall for the 2003 growing season was well above normal, but low going into the beginning of the growing season. Rainfall between November and January 2002 trended towards below normal. Rainfall from March through October 2003 was well above normal. The rainfall during the 2003 growing season was from approximately 60% above average for Rain Gauge 2 and 80% above average for Rain Gauge 3. Rain Gauge 4 malfunctioned three separate times during the 2003 growing season, and therefore was not used to determine normal rainfall due to incomplete data.

2.4 Conclusions

Hydrologic monitoring in 2003 showed 263 of 287 (91.6%) monitoring gauges in the CWMB met both respective hydrologic success criteria. Of the 72 monitoring gauges in Phase I located in non-riverine mineral soils, 61 (84.7%) met both hydrologic success criteria and three did not meet either hydrologic success criterion; the remaining eight gauges met Success Criterion 1 only. Of the 32 monitoring gauges in Phase I in non-riverine organic soils, 31 (96.8%) met both hydrologic success criteria and the remaining gauge met Success Criterion 1 only.

Of the 133 monitoring gauges in Phase II located in non-riverine mineral soils, 123 (92.5%) met both hydrologic success criteria and three did not meet either hydrologic success criterion; the remaining seven gauges met Success Criterion 1 only. All 30 (100.0%) of the monitoring gauges in Phase II in non-riverine organic soils met both hydrologic success criteria. All 12 (100.0%) monitoring gauges in Phase II located in riverine organic soils met both hydrologic success criteria. Of the eight monitoring gauges in Phase II located in riverine mineral soils, six (75.0%) met both hydrologic success criteria and the remaining two gauges met Success Criterion 1 only.

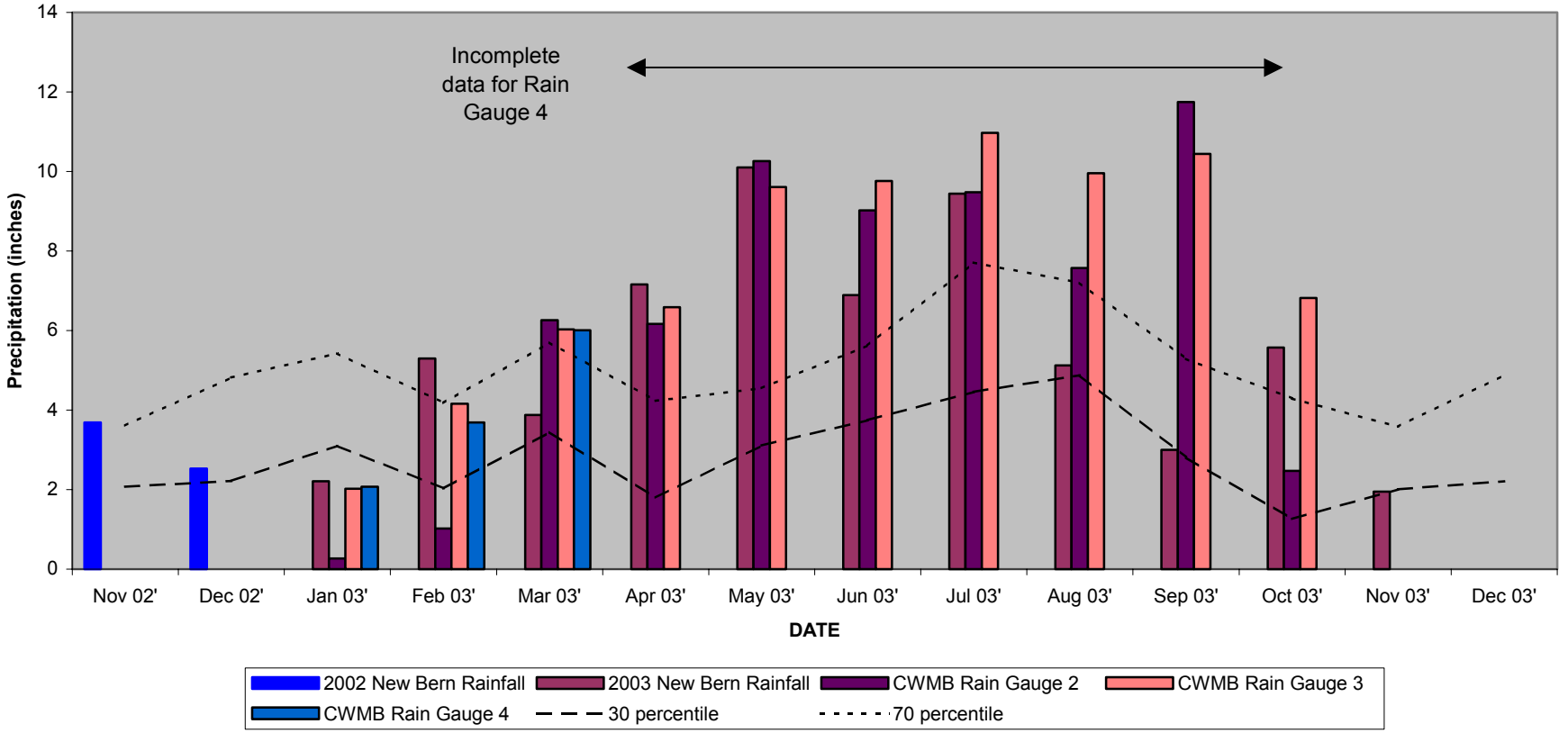
Of the 20 monitoring gauges in riverine areas, two (Gauges 102 and 227) did not show evidence of surface water throughout much of the growing season. These gauge sites may be too high in the landscape to function as riverine influenced wetlands. However, additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 235, and 96) showed prolonged surface flooding and flowing water throughout much of the growing season. These areas are headwater wetlands that have a surface connection to the unnamed tributary to East Prong Brice Creek and should be re-evaluated for riverine function in years with normal rainfall.

The high rate of hydrologic success criteria achievement during the 2003 is attributed to well above normal rainfall experienced throughout the 2003 growing season that allowed the mitigation areas to become re-hydrated. Overall, the rainfall for the 2003 growing season was well above normal, but low going into the beginning of the growing season. Rainfall between November 2002 and January 2003 trended towards below normal. Rainfall from March through October 2003 was well above normal. The rainfall during the 2003 growing season was from approximately 60-80% above average. Phase I and II have shown trends towards re-hydration compared to baseline conditions (1998-2000 data). Assuming normal rainfall conditions, this trend is expected to continue into the 2004 growing season as the surficial aquifer is recharged.

Four gauges (Gauges 4, 11, 181, and 194) that made hydrologic success in 2002, a drier year, did not make hydrologic success in 2003, a wetter year. Three of these gauges (Gauges 4, 181, and 194) are located in Murville soils. All of these gauges made jurisdictional hydrology for 17.8 to 25.2% of the growing season and met **Success Criterion 1** for non-riverine mineral soils. None of these gauges met **Success Criterion 2** (within 50% of reference conditions). .

ESI documented that many of the gauges along transects 258-260 (MU 3/4A), 286-287 (MU 10C), 181-183 (MUs 12B /16), and 188-191 (MU 12B/18) made jurisdictional hydrology for at least 24% of the growing season, but did not meet hydrologic success criteria. Additional gauges may need to be installed along these transects in order to capture the zone of influence that may remain adjacent to the open areas of the ditch. ESI recommends that the above mentioned gauges be monitored for another year (normal rainfall) before installing additional gauges. Gauge 196 should be removed and no longer monitored due to safety concerns. ESI also recommends that additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 235, and 96) be re-evaluated for riverine function in years with normal rainfall. These areas showed prolonged surface flooding and flowing water throughout much of the growing season and may be considered riverine wetland due to the surface connection with the unnamed tributary to East Prong Brice Creek. ESI recommends that rain gauges be checked particularly Rain Gauge 4, to determine if maintenance repairs or replacement is required. For 2004 and subsequent years, ESI recommends that additional follow-up trips be scheduled after routine gauge downloads to check gauges that malfunction, particularly reference gauges, and take appropriate measures to avoid extended and frequent data gaps.

Figure 4. Croatan WMB 30-70 Percentile Graph



3.0 VEGETATION: CROATAN MITIGATION SITE

3.1 Success Criteria

Success Criteria states that there must be a minimum of 320 trees per acre surviving for three consecutive 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).

3.2 Description of Species

The listing below provides a listing of tree species that were planted in each mitigation area. Specific information regarding tree counts in each plot is provided in Tables 1 and 2 associated with Section 3.3. Other observations concerning each zone are presented in Section 3.4.

Phase I

Zone 1: Wet Pine Flat (63.2 acres)
Pinus taeda, Loblolly Pine
Pinus palustris, Longleaf Pine
Pinus serotina, Pond Pine

Zone 2: Pond Pine Woodland (89.3 acres)
Pinus taeda, Loblolly Pine
Pinus serotina, Pond Pine

Zone 3: Non-Riverine Wet Hardwood (60.6 acres)
Quercus falcata var*. pagodifolia*, Cherrybark Oak
Quercus laurifolia, Laurel Oak
Quercus lyrata, Overcup Oak
Nyssa aquatica, Water Tupelo
Quercus michauxii, Swamp Chestnut Oak
Quercus nigra, Water Oak
Quercus phellos, Willow Oak

Zone 4: Non-Riverine Swamp Forest (11.4 acres)
Taxodium distichum, Bald Cypress
Fraxinus pennsylvanica, Green Ash
Nyssa aquatica, Water Tupelo
Pinus serotina, Pond Pine
Chamaecyparis thyoides, Atlantic White Cedar

Phase II

Zone 1: Wet Pine Flat

Pinus taeda, Loblolly Pine
Pinus palustris, Longleaf Pine
Pinus serotina, Pond Pine

Zone 2: Mesic Pine Flat

Pinus palustris, Longleaf Pine

Zone 3: Non-Riverine Wet Hardwood Forest (Type A)

Quercus falcata var*. pagodifolia*, Cherrybark Oak
Quercus laurifolia, Laurel Oak
Quercus lyrata, Overcup Oak
Nyssa sylvatica var*. biflora,* Swamp Blackgum
Quercus nigra, Water Oak
Quercus phellos, Willow Oak

Zone 4: Non-Riverine Wet Hardwood Forest (Type B)

Quercus falcata var*. pagodifolia*, Cherrybark Oak
Quercus laurifolia, Laurel Oak
Quercus lyrata, Overcup Oak
Nyssa sylvatica var*. biflora,* Swamp Blackgum
Quercus nigra, Water Oak
Quercus phellos, Willow Oak
Pinus serotina, Pond Pine

Zone 5: Coastal Plain Small Stream Swamp

Nyssa sylvatica var*. biflora,* Swamp Blackgum
Pinus serotina, Pond Pine
Quercus laurifolia, Laurel Oak
Taxodium distichum, Bald Cypress
Fraxinus pennsylvanica, Green Ash

3.3 Results of Vegetation Monitoring

Table 1. Phase I Vegetation Monitoring Statistics, by Plot

	Plot No.	Cherrybark Oak	Laurel Oak	Overcup Oak	Water Tupelo	Swamp Chestnut Oak	Water Oak	Willow Oak	Pond Pine	Longleaf Pine	Bald Cypress	Green Ash	Pond/Loblolly Pine	Atlantic White Cedar	Total 2003 (Year 1)	Total (at planting)	Current Density (Trees/Acre)
Zone 1	6												26		26	36	491
	8									7			33		41	42	664
	10												28		28	30	635
	12												22		22	31	483
	14												15		15	28	364
	19												35		35	35	680
	20												28		28	33	577
	25												40		40	44	618
														Average Zone 1			**564**
Zone 2	3												17		17	24	482
	4												7		7	22	216
	5												6		6	12	340
	7												15		15	21	485
	9												24		24	36	453
	11												14		14	30	317
	13												30		30	40	510
	15												23		23	23	680
	18												31		31	32	659
														Average Zone 2			**460**
Zone 3	16	3		9		1	3	10							26	30	589
	17	3		3		2	3								11	16	468
	21			3		4									7	27	176
	22			11	1		1	10							23	30	521
	23	4		19		21	6	5							55	76	492
	24					3	2	2					1		8	40	136
															Average Zone 3		**397**
Zone 4	1								2		2				4	40	68
	2				1				2		3	1			7	37	129
															Average Zone 4		**98.5**
															Phase I Total Average Density		**449**

Notes: The counts for pond pine and loblolly pine have been combined due to the difficulty in differentiating between the two species at such an early age. Longleaf pine was only planted in the higher areas of Zone 1. Density calculations were completed by taking the number of trees counted in 2003, dividing by the total number of trees planted in the plot, and multiplying by 680. Specific information regarding each zone is presented after the tables.

Table 2. Phase II Vegetation Monitoring Statistics 2003, by Plot

	Plot No.	Cherrybark Oak	Laurel Oak	Overcup Oak	Water Tupelo	Water Oak	Willow Oak	Pond Pine	Longleaf Pine	Bald Cypress	Green Ash	Pond/Loblolly Pine	Total 2003 (Year 1)	Total (at planting)	Current Density (Trees/Acre)
Zone 1	26											36	36	39	628
	34	2		1						1		14	18	39	314
	47								4			35	39	39	680
												Average Zone 1			**541**
Zone 3	31	5		2	11		1					4	23	39	401
	33			4									4	39	70
	45			4	7							2	10	39	174
	46			5	11					1		1	18	39	314
												Average Zone 3			**240**
Zone 4	27		4	4	1			4			9		22	39	383
	28	9	2	13			4	7			4		39	39	680
	29	8		6	2	1				3	5		25	39	436
	30	1		10	1	1	5	12			2		32	39	558
	35			2			1	15					18	39	314
	36	3	2	7	7		2	15			3		39	39	680
	37	1	1	1			2				1		6	39	105
	38		2		5		1	7			2		17	39	296
	39		1	4				1			4		11	39	192
	40				39								39	39	680
	41				2		4						6	39	105
	42		4					4			3		11	39	192
	43				7						2		9	39	157
	44		2	3	6			7			1		19	39	331
												Average Zone 4			**365**
Zone 5	32				7			13		17	2		39	39	680
	48			15				12	12				39	39	680
												Average Zone 5			**680**
												Phase II Total Average Density			**393**

Notes: The counts for pond pine and loblolly pine have been combined due to the difficulty in differentiating between the two species at such an early age. Longleaf pine was only planted in the higher areas of Zone 1. Density calculations were completed by taking the number of trees counted in 2003, dividing by the total number of trees planted in the plot, and multiplying by 680. Specific information regarding each zone is presented after the tables. No "at-planting counts" were conducted for Phase II since no consultants were under contract during that period. Therefore, it is assumed that 39 total stems were planted in each plot. Any counts above 39 stems are represented by a maximum density of 680 trees per acre.

3.4 Plot Descriptions

The Phase I assessment included first year vegetation surveys associated with the existing 25 total plots. Standing water was commonly observed scattered within and immediately outside the areas of nearly all of the plots. Water levels averaging one to three feet deep were noted in Plot Nos. 1, 2, and 25. Commonly observed species in addition to the planted species were sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), wax myrtle (*Myrica cerifera*), American holly (*Ilex opaca*), redbay (*Persea borbonia*), titi (*Cyrilla racemiflora*), winged sumac (*Rhus copallina*), Johnson grass (*Sorghum halepense*), bracken fern (*Pteridium aquilinum*), dog fennel (*Eupatorium* sp.), greenbrier (*Smilax* sp.), and blackberry (*Rubus* sp.). Other site specific species included: volunteer pines (*Pinus taeda* and *P. serotina*), giant cane (*Arundinaria gigantea*), wiregrass (*Aristida* sp.), fetterbush (*Lyonia* sp.), meadow beauty (*Rhexia* sp.) and cinnamon fern (*Osmunda cinnamomea*) in Zone 1; volunteer pines, blueberry (*Vaccinium* sp.), sedge (*Carex* sp.), and grape (*Vitis* sp.) in Zone 2; volunteer oaks (*Quercus* spp.), aster (*Aster* sp.), and huckleberry (*Gaylussacia* sp.) in Zone 3.

The Phase II assessment included first year vegetation surveys associated with 23 newly established plots covering four of five planted zones. Standing water was also commonly observed within the majority of these plots. Water levels exceeding one foot were noted in Plot Nos. 34, 36, 39, 41, 42, and 43. Commonly observed species in addition to the planted species were sweetgum, red maple, wax myrtle, American holly, redbay, titi, winged sumac, Johnson grass, bracken fern, dog fennel, greenbrier, and blackberry. Other site specific species included: volunteer pines, bulrush (*Scirpus* sp.), spike-rush (*Eleocharis* sp.), and sphagnum moss (*Sphagnum* sp.) in Zone 1; pepperbush (*Clethra alnifolia*), fetterbush, lambkill (*Kalmia angustifolia*), iris (*Iris* sp.) in Zone 3; rush (*Juncus* sp.), sedge, ragweed (*Ambrosia artemisiifolia*), aster, bulrush, iris, horse nettle (*Solanum carolinense*), and smartweed (*Polygonum* sp.) in Zone 4; and, bulrush, bluestem (*Andropogon* sp.), pepperbush, iris, giant cane, and huckleberry in Zone 5.

3.5 Conclusions

Of the 4,035 acres on this site, approximately 224.5 acres involved tree planting for Phase I and 466 acres of tree planting for Phase II. There were 25 vegetation monitoring plots established throughout the Phase I planting areas, and 23 vegetation monitoring plots established throughout the Phase II planting areas. The 2003 vegetation monitoring of the Phase I portion of the site revealed an average tree density of 449 trees per acre while the vegetation monitoring of the Phase II portion of the site revealed an average tree density of 393 trees per acre. These averages are above the minimum success criteria of 320 trees per acre.

NCDOT will continue vegetation monitoring at the Croatan (Phase I & II) Mitigation Site.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

Monitoring of Phase I hydrology and vegetation will continue in 2004 (year 2) and Phase II hydrology and vegetation will continue in 2004 (year 3). Monitoring will continue for a minimum of 5 years in each phase.