FINAL
ANNUAL REPORT FOR 2007

Croatan Wetland Mitigation Bank
Craven County, North Carolina

Prepared for:

The Ecosystem Enhancement Program
EEP Project No. 103

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SUMMARY

The following report summarizes the monitoring and construction activities that have occurred prior to and during 2007 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. Hydrologic and vegetative monitoring for Phase I (MU 12A-18) was completed in 2006. In 2007, hydrologic and vegetative monitoring in Phase II (MU 1-11) continued into the fifth year.

The CWMB contains both non-riverine mitigation areas and riverine mitigation areas; non-riverine and riverine mitigation areas are tracked separately. In addition, pursuant to the request of the Mitigation Banking Review Team (MBRT), 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.

One hundred and eighty-four ground water monitoring gauges were installed throughout Phase 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 Infinity rain gauges were spaced across the site to capture onsite rainfall events.

Phase II - Entire Growing Season (March-November)
Hydrologic monitoring in 2007 showed 152 of 184 (82.6%) monitoring gauges in Phase II met both respective hydrologic success criteria [$\geq$ 12.5 % (mineral soils) or $\geq$ 25 % (organic/riverine soils) of the growing season and within 20% of Reference Range] (Figure 3). Of the 32 gauges that did not meet both respective success criteria, 11 made jurisdictional hydrology for $\geq$ 12.5% of the growing season, 14 made jurisdictional hydrology between 5 and 12.5% of the growing season, and only seven (Gauges 75, 76, 93, 102, 149, 286, and 287) did not make jurisdictional hydrology for at least 5% of the growing season.

Of the 133 monitoring gauges in non-riverine mineral soils, 108 met both hydrologic success criteria and 19 did not meet either hydrologic success criterion; the remaining six gauges met Success Criterion 1 only. Of the 31 monitoring gauges in non-riverine organic soils, 30 met both hydrologic success criteria, and the remaining gauge (Gauge 119) met Success Criterion 1 only. All five monitoring gauges in riverine organic soils, met both hydrologic success criteria. Of the 15 monitoring gauges in riverine mineral soils, nine met both hydrologic success criteria, two gauges (Gauges 102 and 256) did not meet either hydrologic success criterion, and the remaining four gauges met either Criterion 1 or Criterion 2 only.

The CWMB has a high rate of success even in years with lower rainfall conditions. However, in years with normal rainfall there may be small areas in Phase II that may not be returned to jurisdictional hydrology. The areas represented by these gauges should be reviewed to determine the extent of the non-jurisdictional areas around these gauge sites and develop a contingency plan for the areas that have not been returned to jurisdictional status.

Rainfall
Overall, the rainfall for the 2007 growing season trended towards below normal to the low end of the normal range (24.0 to 30.8 inches onsite compared to normal 26.7 to 46.1 inches for March through October). Rainfall between November and December 2006 trended towards normal to above normal (4.6 to 10.6 inches on-site compared to normal 4.1 to 8.3 inches). The rainfall between January and February 2007 was well below normal (.64 to 4.7 inches onsite compared to normal 6.13 to 10.1 inches).

Vegetation
The vegetative success criterion 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 288 stems per acre for Year 4, and 260 stems per acre for Year 5), such that there are 260 5-year old planted stems per acre at the end of Year 5.

Approximately 466.0 acres were involved in tree planting for Phase II. There were 23 vegetation monitoring plots established throughout the Phase II planting areas. The 2007 vegetation monitoring of Phase II revealed an average tree density of 466 trees/acre, which exceeds the minimum success criterion of 260 trees/acre for Year 5. Individual plots within Target Communities and overall Target Communities may not meet minimum success criteria. The overall average for the Wet Pine Flat and Coastal Plain Small Stream Swamp Target Communities exceed the 260 stems/acre requirement for Year 5. Both Type A and Type B of the Non-Riverine Wet Hardwood Forest Target Community, have an average of 248 and 243 trees/acre and do not meet minimum success criteria.

Areas of Concern

Phase II - Overall 2003-2007
Overall, mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of Phase II. Jurisdictional hydrology has been restored in areas that are located adjacent to point plugged ditches that maintain the access roads. However, these measures have not been successful at returning these gauge sites to within 20% of reference conditions under normal rainfall conditions.

The areas of concern in Phase II are the areas represented by the following:

- Gauges 74, 85, 94, 95, 154, 222, 227, 236, 243, 244, 247, 256, 258, 259, 260, and 291 have consistently met jurisdictional hydrology, but have not consistently met Success Criterion 2 (20% of Reference Range).
- Gauges 75, 76, 102, and 149 which have not met jurisdictional hydrology ($\geq$12.5% of the growing season).
- Gauges 92, 93, 150, 239, 286, 287 which have not consistently met jurisdictional hydrology ($\geq$12.5% of the growing season).

The mitigative measures for areas represented by Gauges 74, 85, 94, 95, 154, 222, 227, 236, 243, 244, 247, 256, 258, 259, 260, and 291 have been successful at returning jurisdictional hydrology to these areas, but these gauges may never meet Success Criterion 2 (20% of reference) for their respective soil series because of their location adjacent to existing roads and point-plugged ditches or on topographic highs.

Gauges 75, 76, 102, 149, and 150 appear to be located on topographic highs. The areas represented by these gauges should be reviewed to determine the extent of the non-jurisdictional areas and a contingency plan developed for the areas that have not been returned to jurisdictional status.

Gauges 92, 93, 239, 286, and 287 are located adjacent to point plugged ditches. These partially open ditches may still have a zone of influence extending a greater distance off the ditch than can be measured with existing gauges or these gauges may be installed in residual spoil material. The areas represented by these gauges should be reviewed to determine the zone of influence and a contingency plan developed for the areas that have not been returned to jurisdictional status.

Recommendations

Phase II
It is recommended that monitoring of Phase II be closed out due to the high rate of hydrologic success under normal rainfall conditions and the completion of five years of monitoring. Gauges 75, 76, 102, and 149 are not meeting minimum jurisdictional hydrology for 12.5% of the growing season. Gauges 92, 93, 150, 239, 286, and 287 are not consistently meeting minimum jurisdictional hydrology for 12.5% of the growing season. The areas represented by these gauges should be reviewed to determine the extent of the non-jurisdictional areas around these gauge sites and develop a contingency plan for the areas that have not been returned to jurisdictional status. All of the gauges in Phase II should be removed and credits released based on the contingency plan for the areas that have not been returned to jurisdictional status.

Riverine Wetland Credit
Additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 242, and 251) have shown prolonged surface flooding and flowing water throughout much of the growing season in years with normal rainfall. 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 wetland function and credit.

Stream Credit
The U.S. Army Corps of Engineers (COE) and N.C. Division of Water Quality (DWQ) have recently revised their interpretation for stream restoration in the outer coastal plain of North Carolina. The preferred method is now what was done at CWMB, taking headwater surface flow intercepted by ditches and restoring the flow to natural drainage features. Stream credits available in Phase II of the CWMB should be documented prior to closing out the mitigation site monitoring.

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). In 2006, Phase I completed its fifth and final year of monitoring.

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 179.0 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 2007, hydrologic and vegetative monitoring continued for a fifth year in Phase II.

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 vegetative monitoring for Phase II during the 2007 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

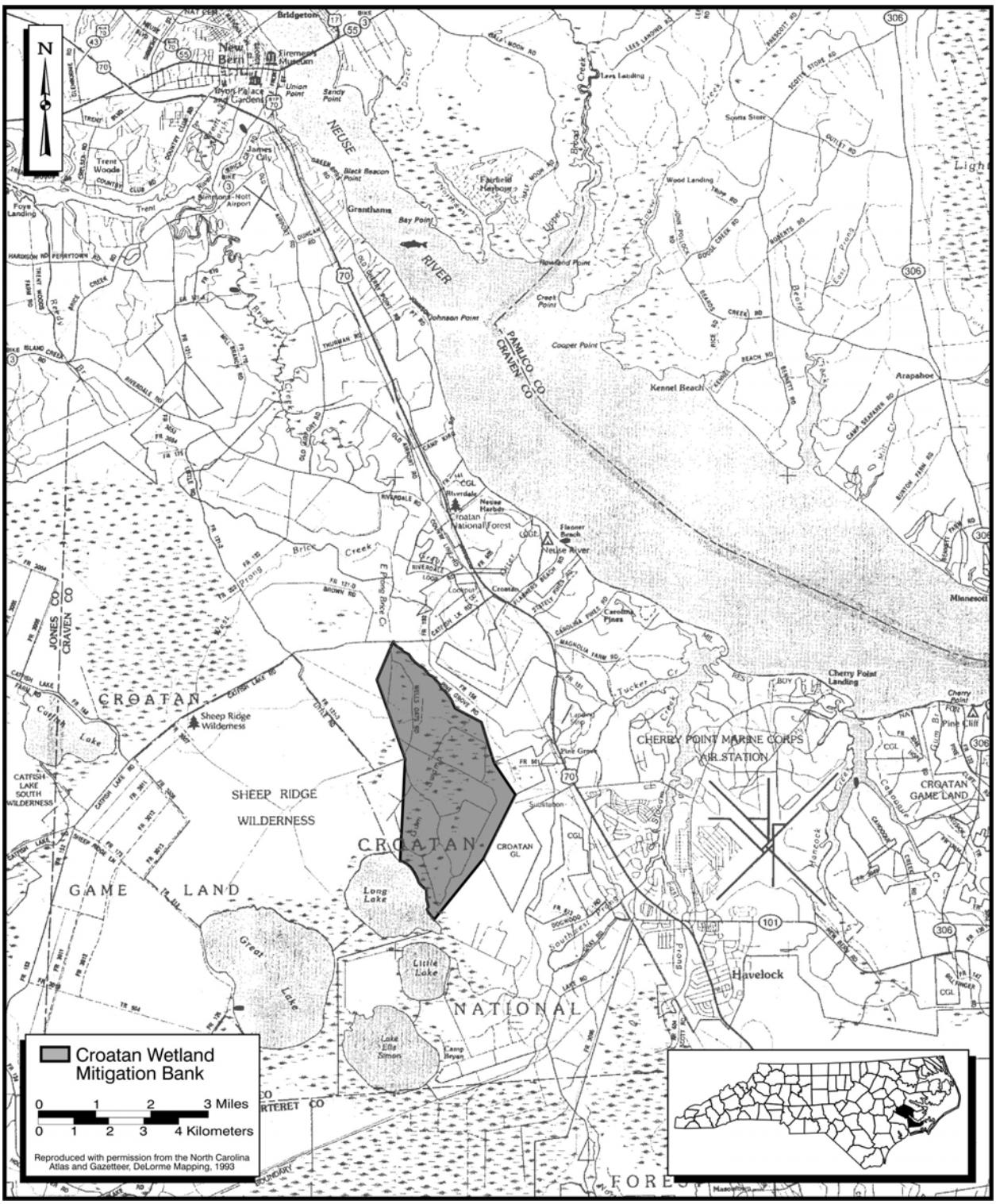
Phase I

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	Vegetative Monitoring (1 yr.)
March – November 2003	Hydrologic Monitoring (2 yr.)
August 2003	Vegetative Monitoring (2 yr.)
March – November 2004	Hydrologic Monitoring (3 yr.)
August 2004	Vegetative Monitoring (3 yr.)
March – November 2005	Hydrologic Monitoring (4 yr.)
August 2005	Vegetative Monitoring (4 yr.)
March – November 2006	Hydrologic Monitoring (5 yr.)
August 2006	Vegetative Monitoring (5 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.)
March - November 2004	Hydrologic Monitoring (2 yr.)
August 2004	Vegetative Monitoring (2 yr.)
March - November 2005	Hydrologic Monitoring (3 yr.)
August 2005	Vegetative Monitoring (3 yr.)
March - November 2006	Hydrologic Monitoring (4 yr.)
August 2006	Vegetative Monitoring (4 yr.)
March - November 2007	Hydrologic Monitoring (5 yr.)
August 2007	Vegetative Monitoring (5 yr.)

Figure 1. Site Location



2.0 HYDROLOGY

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, success criteria for hydrology state 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 or saturated less than 5% are always classified as non-wetlands. Areas inundated or saturated 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 1 provides a summary of hydrologic success criteria.

Table 1. Expected Wetland Conditions 2007

Wetland Type	Soil Mapping Unit	Success Criterion 1	Success Criterion 2 20% of Reference Range	MUs with Representative Gauges
Non-riverine, Mineral	Bayboro (Ba)	≥ 12.5 %	25.2-84.3%	1, 2A, 2B, 3, 4A, 4B, 5, 6, 7, 8, 9, 10A, 10B, 11
	Leaf (La)	≥ 12.5 %	24.0-53.7%	1, 2A, 2B, 3, 5, 6
	Pantego (Pa)	≥ 12.5 %	23.1-79.3%	1, 2B, 4B, 5, 6, 7, 8, 10B, 10C, 11
	Rains (Ra)	≥ 12.5 %	9.1-53.7%	5, 6, 10B, 10C
Non-riverine, Organic	Croatan (CT)	≥ 25.0 %	33.9-100%	4B, 6, 8, 9, 10A, 10B, 10C, 11
Riverine	Dorovan (DO)	≥ 25.0 %	80.2-100%	6
	Masontown/Muckalee (MM)	≥ 25.0 %	80.2-100%	5, 6
	Bayboro (Ba)	≥ 25.0 %	25.2-84.3%	2A,2B,3,6
	Leaf (La)	≥ 25.0 %	24.0-53.7%	2B

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 and completed in 2006. Phase II construction was completed in the spring of 2002 and hydrologic monitoring began in the spring of 2003. Hydrologic monitoring was conducted in 2007 by Environmental Services, Inc., (ESI). In 2007, 184 monitoring gauges in Phase II were monitored (**Figure 2a**). Phase II gauges consist of a combination of Remote Data Systems (RDS) WL-20, WL-40, and Ecotone monitoring gauges. In addition, three to four monitoring gauges were monitored per soil mapping unit in areas of minimal disturbance to provide reference conditions for the CWMB (a total of 33 reference monitoring gauges located onsite and offsite) (**Figures 2a and 2b)**; reference gauges are also RDS WL-20, WL-40, or Ecotone monitoring 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. Three Infinity rain gauges are spaced across the site to capture onsite rainfall events.

The CWMB is being tracked by riverine and non-riverine wetland restoration (R), enhancement (E), and preservation (P) areas (**Figure 2a**). 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. Additional gauges were installed in Phase I in 2002 and Phase II in 2003 after mitigation construction activities were completed and used to supplement the previous gauges for monitoring success.

Gauges established in Phase I in 2002 and 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.

In 2004, one additional gauge (Gauge 321) was installed to document hydrology between Gauges 84 and 85, and Gauge 196 was removed due to safety concerns (alligator).

Table 2 provides general gauge locations within each MU and the number of gauges within each mitigation type.

Figure 2a. Hydrologic Monitoring Gauge Location, Phase II

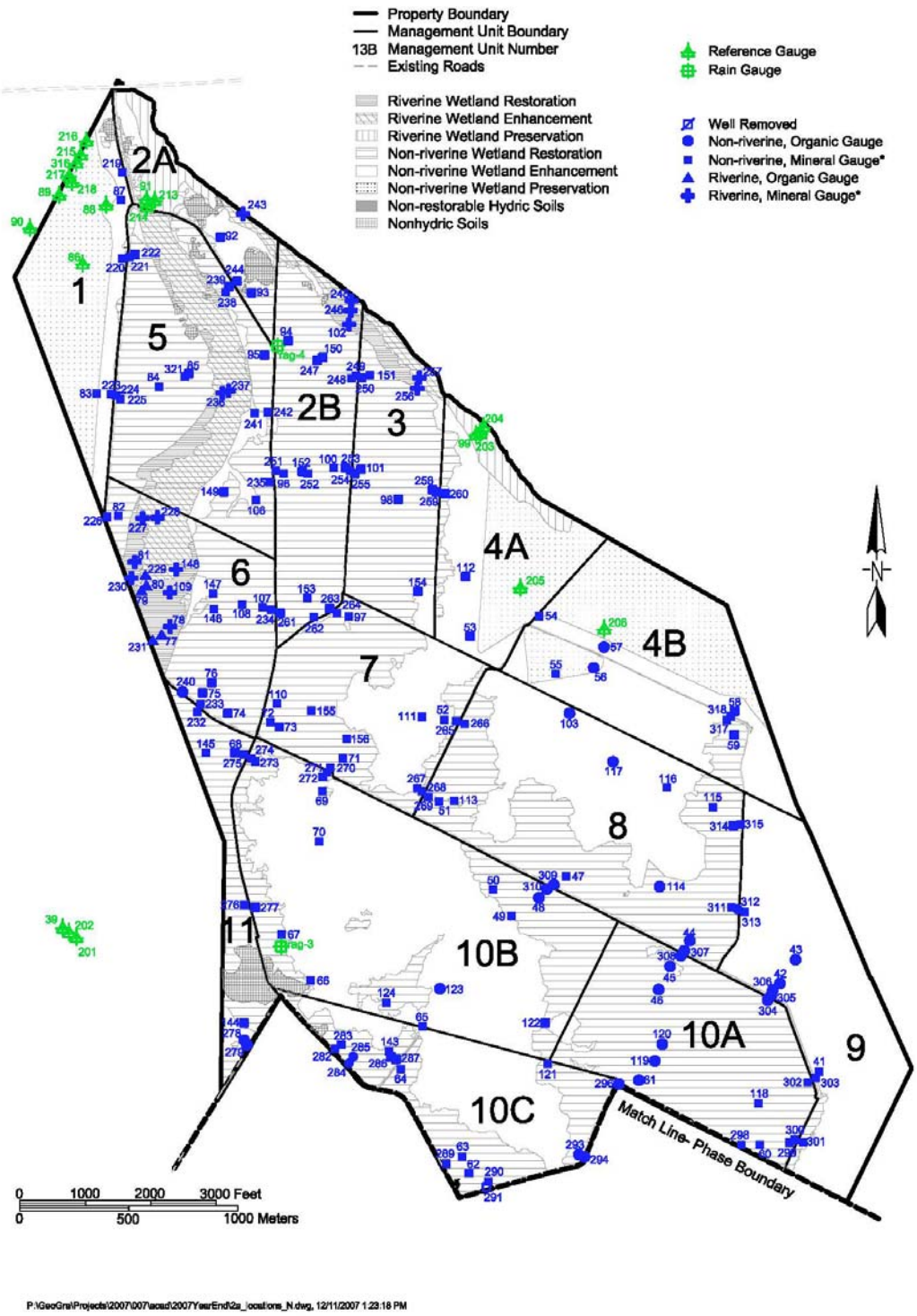


Figure 2b. Hydrologic Monitoring Gauge Location, Phase I

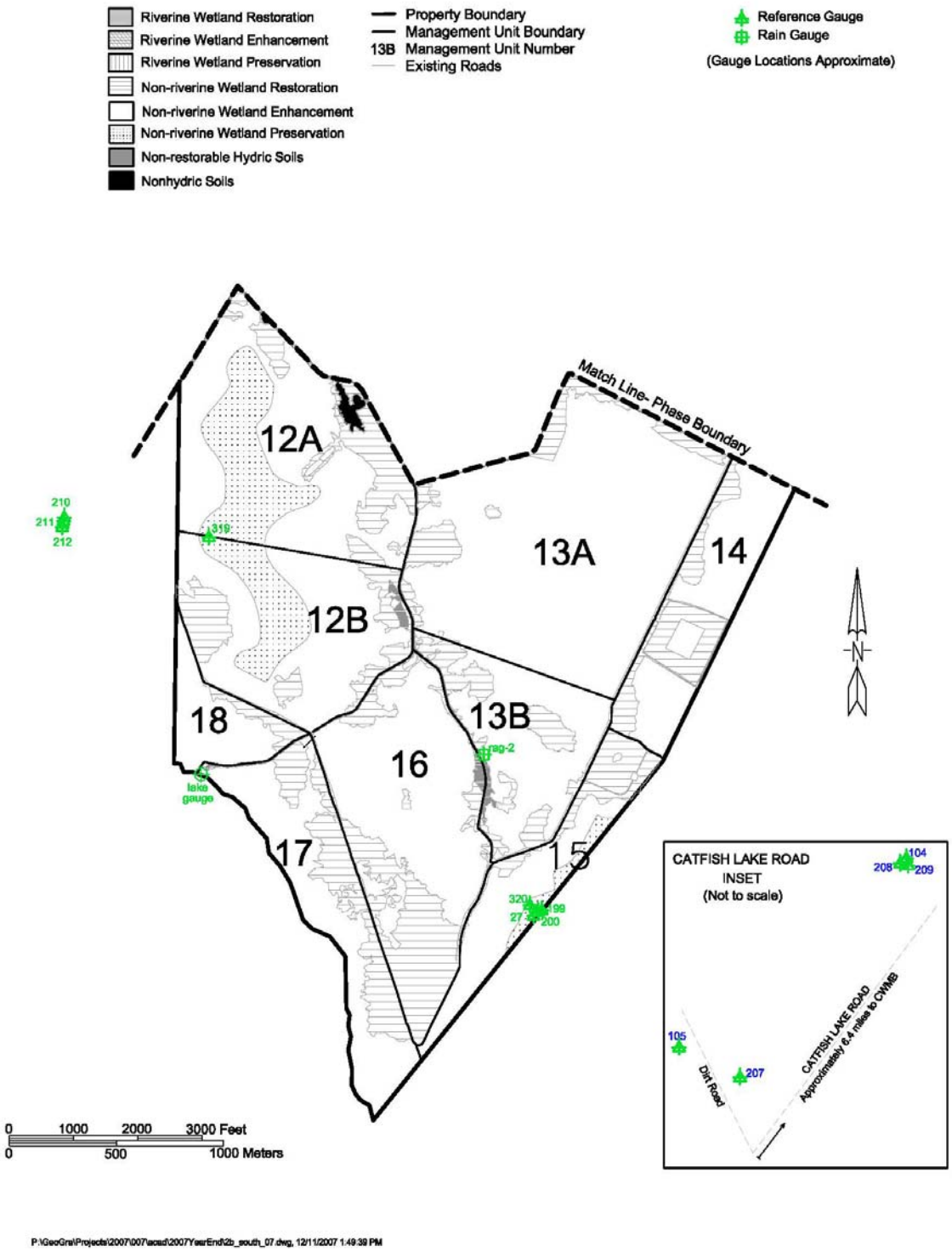


Table 2. Phase II (MU: 1-11) and Reference Gauge Locations

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	17	NR-13[b], 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 2 Continues.

Table 2 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	1 Reference	NP-1*
15	Southeastern portion of Phase I south of 14	4 Reference	NP-4*
Off-site	Catfish Lake Road	5 Reference	N/A
Off-site	Forest Service Land adjacent to the Croatan WMB western boundary	7 Reference	N/A

[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)

[b] Gauge 321 in MU 5 was installed in 2004.

* Onsite Reference gauges

Appendix A contains a numerical list of all monitoring and reference gauges monitored in 2007. 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 2007 came from the three onsite rain gauges.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

As described previously, 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 1, monitoring gauges in mineral soils must have jurisdictional hydrology for 12.5% of the growing season and monitoring gauges in riverine or organic soils must have jurisdictional hydrology for 25% of the growing season. In order to achieve Success Criterion 2, each monitoring gauge must be within 20% of the Reference Range for its respective soil series for year five.

Reference Gauges

All of the reference gauges, except Leon and Rains soils, met or exceeded the number of days and time of year for the seasonal high water table values published for each soil type in the Craven County soil survey. The reference gauge data for the Leon and Rains soil series were below the number of days and time of year for the seasonal high water table values published in the Craven County soil survey. The reference gauges in the soil series did not meet published values probably due to the lower rainfall conditions.

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 A1 provides the 50% and 20% 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 20% of the Reference Range for year five (Appendix D).

For example, in 2007 all monitoring gauges within the Bayboro (mineral) soil series in non-riverine areas must have jurisdictional hydrology for 12.5% of the growing season in order to achieve Success Criterion 1; in riverine areas of Bayboro soils, jurisdicitional hydrology must be 25% of the growing season. A gauge must also have jurisdictional hydrology between 61 and 204 days (25.2% to 84.3%) 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 the expected percentage of the Reference Range (Criterion 2).

Monitoring Gauges

Phase II is separated into 15 MUs, identified as MU 1 through 11. Tables 3 through 17 and **Figure 3a** provide an overview 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.

Several of the monitoring gauges have missing data due to malfunctioning gauges. Where reasonable, ESI interpolated the missing data for each gauge by using reference gauges, nearby gauges in the same soil type, rainfall events, and adjacent data points. ESI analyzed the hydrographic response to rainfall events prior to and subsequent to the missing data gap and then interpolated the missing data based on comparison to data from a comparable gauge

that exhibited similar groundwater levels and hydrographic responses to precipitation events. Data are discussed in the report relative to the largest number of consecutive days, including reasonably interpolated data, $\geq$ 12.5% of the growing season.

Non-riverine minerals soils, such as Bayboro, Pantego, Leaf, and Rains, occupy a large portion of the CWMB. These soil types typically have a seasonal high water table that is within 12 inches of the ground surface during the winter and early spring. The water table tends to drop below 12 inches of the ground surface in late spring or early summer. Therefore these soil types should meet the jurisdictional hydrology requirement in the spring and early summer (the critical defining hydroperiod for many wetlands in eastern North Carolina).

Figure 3. Hydrologic Monitoring Results 2007, Phase II

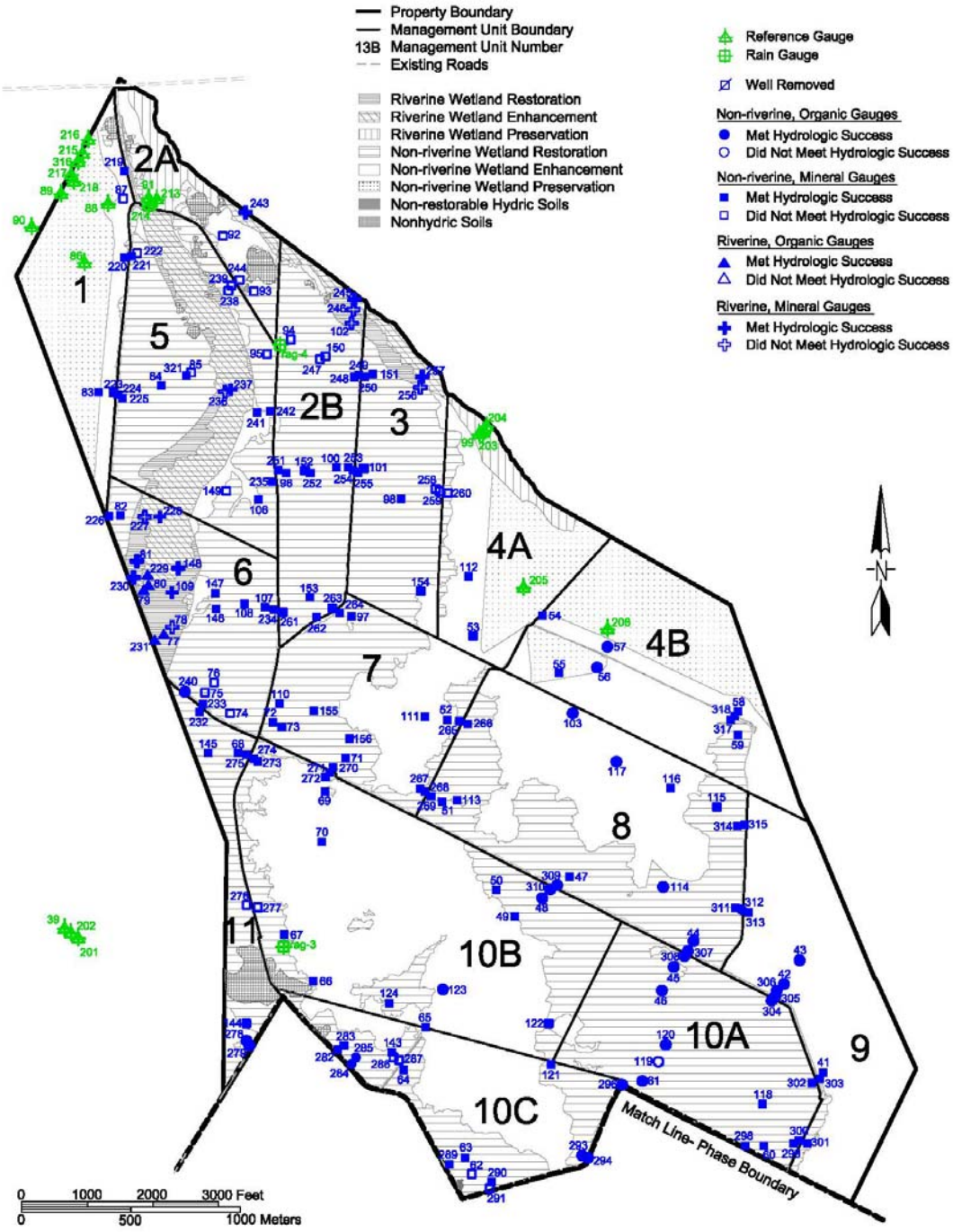


Table 3. Hydrologic Monitoring Results – MU 1

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; ≤ 20% of Reference Range)					
83	Pa/NP	72.3	√	√	√
87	La/NE	18.6	√	–	–
219	Ra/NE	67.8	√	√	√
220	La/NE	44.6	√	√	√
223	Pa/NE	71.9	√	√	√

[a] Soils: Pa – Pantego, La – Leaf, and Ra – Rains.
Mitigation Types: Non-riverine Enhancement – NE, and Non-riverine Preservation – NP.

Table 3 MU 1 Discussion
March-November
Four of the five monitoring gauges in MU 1 met both expected hydrologic success criteria for Year 5.

Gauge 87 made jurisdictional hydrology for 18.6% of the growing season, and therefore met Success Criterion 1. However, Gauge 87 did not meet Success Criterion 2 (20% of Reference Range) for the Leaf soil series (24.0 – 53.7% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 87, but were not successful at returning the gauge site to within 20% of reference conditions under the lower rainfall conditions.

Overall 2003-2007
Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range.

In 2007 Gauge 87 met jurisdictional hydrology, but failed to meet Success Criterion 2. This gauge met Hydrologic Success from 2003 through 2006 (years 1-4). This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. Gauge 87 should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 1 should be considered for removal.

Table 4. 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; ≤ 20% of Reference Range)					
92	La/NE	5.0	–	–	–
93	La/NR	4.6	–	–	–
244	La/NE	12.8	√	–	–
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
243	Ba/RE	58.3 [b]	√	√	√

[a] Soils: Ba – Bayboro and La – Leaf.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, and Riverine Enhancement – RE.
[b] Actual %: Missing data interpolated from comparable gauges.

Table 4 MU 2A Discussion
March-November
One of the four monitoring gauges in MU 2A met both expected hydrologic success criteria for Year 5.

Gauges 92 and 93 did not meet either of their expected hydrologic success criteria. Even in years with normal rainfall, the areas represented by Gauges 92 and 93 have not made jurisdictional hydrology. These gauges are located adjacent to ditches that maintain the access roads. Point-plugs instead of reach-plugs were used to fill these ditches.

Gauge 243 has recorded data for a minimum 93 consecutive days (38.4%) and one data gap. Using the rainfall data and adjacent data points to interpolate the missing data, it can be assumed that Gauge 243 would have met jurisidictional hydrology for 58.3% of the growing season.

Gauge 244 met jurisdictional hydrology for 12.8% of the growing season and therefore met Success Criterion 1. However, Gauge 244 did not meet Success Criterion 2 (20% of Reference Range) for the Leaf soil series (24.0 – 53.7% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to this gauge, but were not successful at returning this gauge site to within 20% of reference conditions under the lower rainfall conditions.

Overall 2003-2007
Mitigative measures have been successful at restoring and enhancing jurisdictional hydrology to portions of MU 2A. The areas of concern in MU 2A include 92, 93, 243, and 244.

Gauge 243 met Hydrologic Success in 2007 (year 5). This gauge failed to meet Hydrologic Success in 2005 and 2006 (years 3 and 4), but has met jurisdictional hydrology in each year of monitoring. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 243, but were not successful at consistently returning this gauge site to within 20% of reference conditions. This gauge should be considered for success.

Gauge 244 failed to meet Hydrologic Success in 2006 and 2007 (years 4 and 5), but has met jurisdictional hydrology in each year of monitoring. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 243, but were not successful at consistently returning this gauge site to within 20% of reference conditions. This gauge should be considered for success.

Gauges 92 and 93 failed to meet Hydrologic Success in 2004-2007 (years 2-5). These gauges should be reviewed to determine the extent of the non-jurisdictional area surrounding these gauge sites and the contingency plan for the areas that have not been returned to jurisdictional status.

Due to the completion of five years of monitoring, the gauges in MU 2A should be considered for removal following resolution of how to address the unsuccessfully restored areas.

Table 5. 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; ≤ 20% of Reference Range)					
94	Pa/NR	17.4	√	–	–
96	La/NR	42.6	√	√	√
100	La/NR	31.4 [b]	√	√	√
150	La/NR	5.8	–	–	–
152	Ba/NR	38.8	√	√	√
153	Ba/NR	63.6	√	√	√
247	La/NR	6.6	–	–	–
248	La/NR	31.4	√	√	√
249	La/NR	42.6 [b]	√	√	√
251	Ba/NR	62.8	√	√	√
252	Ba/NR	44.2	√	√	√
253	Ba/NR	42.6	√	√	√
254	Ba/NR	42.6 [b]	√	√	√
261	Ba/NR	62.8	√	√	√
262	Ba/NR	69.8	√	√	√
263	Ba/NR	42.6	√	√	√
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
102	Ba/RR	2.9	–	–	–
245	Ba/RE	71.9	√	√	√
246	La/RE	24.4	–	√	–

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

Table 5 MU 2B Discussion

March-November

Fourteen of the nineteen monitoring gauges in MU 2B met both expected hydrologic success criteria for Year 5. Gauges 100, 249, and 254 have missing data due to gauge malfunction.

Gauge 94 made jurisdictional hydrology for 17.4% of the growing season, and therefore met Success Criterion 1. However, Gauge 94 did not meet Success Criterion 2 (20% of Reference Range) for the Pantego soil series (23.1 – 79.3% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 94, but were not successful at returning the gauge site to within 20% of reference conditions under the lower rainfall conditions.

Gauge 246 made jurisdictional hydrology for 24.4% of the growing season and therefore did not meet Success Criterion 1 for Riverine soils ($\geq$ 25% of growing season). Gauge 246 met jurisdictional hydrology and Success Criterion 2 (20% of Reference Range) for the Leaf soil series (24.0 to 53.7% of the growing season).

Gauges 102, 150, and 247 did not meet either expected hydrologic success criteria. In a year with lower rainfall conditions, the areas represented by Gauges 102, 150, and 247 did not make jurisdictional hydrology. These gauges may be located on topographic highs. Additional measures may need to be addressed for the areas around these gauges.

Gauge 100 has recorded data for 46 consecutive days (19.0%) and two data gaps. Using nearby Gauge 253 and adjacent data points to interpolate missing data, it can be assumed that Gauge 100 would have made jurisdictional hydrology for approximately 31.4% of the growing season.

Gauge 249 has recorded data for 54 consecutive days (22.3%) and one data gap. Using nearby Gauges 248 and 250 and adjacent data points to interpolate missing data, it can be assumed that Gauge 249 would have made jurisdictional hydrology for approximately 42.6% of the growing season.

Gauge 254 has recorded data for 73 consecutive days (30.2%) and one data gap. Using nearby Gauge 253 and adjacent data points to interpolate missing data, it can be assumed that Gauge 254 would have made jurisdictional hydrology for approximately 42.6% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 2B.

In 2007 Gauge 246 met jurisdictional hydrology, and met 20% of the reference range, but failed to meet expected 25% of the growing season for riverine areas by one day. This gauge met Hydrologic Success from 2003 through 2006 (years 1-4). This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. Gauge 246 should be considered for success.

The areas of concern in MU2B include 94, 102, 150, 247. These gauges appear to be on topographic highs.

Gauge 94 failed to meet Hydrologic Success in 2006 and 2007 (years 4 and 5), but has met jurisdictional hydrology in each year of monitoring. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 94, but were not successful at consistently returning this gauge site to within 20% of reference conditions. This gauge should be considered for success.

Gauge 247 failed to meet Hydrologic Success in 2004 through 2007 (years 2-5). In years with normal rainfall conditions, Gauge 247 met jurisdictional hydrology for > 12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 247, but were not successful at consistently returning this gauge site to within 20% of reference conditions. This gauge should be considered for success.

Gauge 102 failed to meet Hydrologic Success and jurisdictional hydrology in all five years of monitoring.

Gauge 150 failed to meet Hydrologic Success in 2005 through 2007 (year 3 through 5). Gauge 150 failed to consistently meet jurisdictional hydrology $\geq$ 12.5% of the growing season.

Gauges 102 and 150 should be reviewed to determine the extent of the non-jurisdictional area surrounding these gauges and the contingency plan for the areas that have not been returned to jurisdictional status.

Due to the completion of five years of monitoring, the gauges in MU 2B should be considered for removal following resolution of how to address the unsuccessfully restored areas.

Table 6. 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; ≤ 20% of Reference Range)					
98	Ba/NR	31.0	√	√	√
101	Ba/NR	31.0[b]	√	√	√
151	La/NR	31.4	√	√	√
154	Ba/NE	31.4	√	√	√
250	La/NR	38.0	√	√	√
255	Ba/NR	41.7	√	√	√
258	Ba/NR	9.1	–	–	–
259	Ba/NR	17.4	√	–	–
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
256	Ba/RR	10.7	–	–	–
257	Ba/RE	45.0	√	√	√

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

Table 6 MU 3 Discussion

March-November

Seven of the ten monitoring gauges in MU 3 met both expected hydrologic success criteria for Year 5.

Gauge 259 met jurisdictional hydrology for 17.4% of the growing season and therefore met Success Criterion 1. However, Gauge 259 did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (25.2 – 84.3% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 259, but were not successful at returning this gauge site to within 20% of reference conditions under the lower rainfall conditions.

Gauges 256 and 258 did not meet either expected hydrologic success criteria. In a year with lower rainfall conditions, the areas represented by Gauges 256 and 258 did not make jurisdictional hydrology.

Gauge 101 has recorded data for 23 consecutive days (9.5%) and four data gaps. Using nearby Gauge 255 and adjacent data points to interpolate missing data, it can be assumed that Gauge 101 would have made jurisdictional hydrology for approximately 31.0% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 3. The areas of concern in MU 3 include 154, 256, 258, and 259. These gauges are located adjacent to point-plugged ditches.

Gauge 154 failed to meet Hydrologic Success in 2005 and 2006 (years 3 and 4). This gauge met jurisdictional hydrology in years with normal to above normal rainfall. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 154, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 154 should be considered for success.

Gauge 256 failed to meet Hydrologic Success in 2003, 2005, and 2007 (years 1, 3, and 5). This gauge met jurisdictional hydrology in years with normal to above normal rainfall. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 256, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 256 should be considered for success.

Gauges 258 and 259 failed to meet Hydrologic Success in 2003, 2005-2007 (years 1, 3 through 5). In years with normal to above normal rainfall, these gauges met jurisdictional hydrology for ≥12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 258 and 259, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauges 258 and 259 should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 3 should be considered for removal.

Table 7. 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; ≤ 20% of Reference Range)					
53	Ba/NE	38.4	√	√	√
112	Ba/NE	30.2	√	√	√
260	Ba/NR	9.1	–	–	–

[a] Soils: Ba – Bayboro.
Mitigation Types: Non-riverine Restoration – NR, and Non-riverine Enhancement – NE.

Table 7 MU 4A Discussion
March-November
Two of the three monitoring gauges (Gauges 53 and 112) in MU 4A met both expected hydrologic success criteria for Year 5.

Gauge 260 did not meet either expected hydrologic success criteria. In a year with lower rainfall, conditions the areas represented by Gauge 260 did not make jurisdictional hydrology.

Overall 2003-2007
Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 4A. The areas of concern in MU 4A include areas represented by Gauge 260. This gauge is located adjacent to point-plugged ditches.

Gauge 260 failed to meet Hyrdologic Success in 2003, and 2005 through 2007 (years 1, 3 through 5). In years with normal to above normal rainfall conditions, Gauge 260 met jurisdictional hydrology for >12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 260, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 260 should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 4A should be considered for removal.

Table 8. 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; ≤ 20% of Reference Range)					
54	Pa/NP	38.8	√	√	√
55	Ba/NE	70.7	√	√	√
58	Ba/NE	29.8	√	√	√
59	Ba/NR	66.5	√	√	√
317	Ba/NR	42.1	√	√	√
318	Ba/NR	38.0	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
56	CT/NP	71.9	√	√	√
57	CT/NE	66.5[b]	√	√	√

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

Table 8 MU 4B Discussion

March-November

All eight monitoring gauges in MU 4B met both expected hydrologic success criteria for Year 5. Gauge 57 has missing data due to gauge malfunction.

Gauge 57 has recorded data for 82 consecutive days (33.9%) and one data gap. Using nearby Reference Gauge 56 to interpolate missing data, it can be assumed that Gauge 57 would have made jurisdictional hydrology for approximately 66.5% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 4B.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 4B should be considered for removal.

Table 9. 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; ≤ 20% of Reference Range)					
84	Ra/NR	30.6	√	√	√
85	Pa/NR	6.2	–	–	–
95	La/NR	9.5	–	–	–
106	Ba/NE	62.8	√	√	√
149	Pa/NR	2.9	–	–	–
221	La/NR	70.3	√	√	√
222	La/NR	8.7	–	–	–
224	Pa/NR	68.6	√	√	√
225	Pa/NR	63.6	√	√	√
235	Ba/NR	45.0	√	√	√
238	Ra/NR	7.4	–	–	–
239	Ra/NR	5.8	–	–	–
241	Ra/NE	71.1	√	√	√
242	La/NR	69.8	√	√	√
321	Pa/NR	69.4	√	√	√
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
236	MM/RR	30.6	√	–	–
237	MM/RE	100	√	√	√

[a] Soils: Ra – Rains, Pa – Pantego, Ba – Bayboro, La –Leaf, and MM –Masontown/Muckalee.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Riverine Restoration – RR, and Riverine Enhancement – RE.

Table 9 MU 5 Discussion

March-November

Ten of the seventeen monitoring gauges in MU 5 met both expected hydrologic success criteria for Year 5.

Gauge 236 made jurisdictional hydrology for 30.6% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (20% of Reference Range) for the Masontown/Muckalee soil series (80.2-100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 236, but were not successful at returning this gauge site to within 20% of reference conditions under the below normal rainfall conditions.

Gauges 85, 95, 149, 222, 238, and 239 did not meet either of expected hydrologic success criteria. In a year with lower rainfall conditions, Gauges 85, 95, 149, 222, 238, and 239 did not make jurisdictional hydrology.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 5.

In 2007, Gauge 222 failed to meet either expected Hydrologic Success criterion. This gauge met Hydrologic Success from 2003 through 2005 (years 1-3) and met jurisdictional hydrology for 2006 (year 4). This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. Gauge 222 should be considered for success.

In 2007, Gauge 236 met jurisdictional hydrology, but failed to meet Success Criterion 2. This gauge met Hydrologic Success from 2003, 2005 through 2006 (years 1, 4, and 5). This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. Gauge 236 should be considered for success.

In 2007, Gauge 238 failed to meet either expected Hydrologic Success criterion. This gauge met Hydrologic Success from 2003 through 2006 (years 1-4). This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. Gauge 238 should be considered for success.

The areas of concern in MU 5 (Gauges 85, 95, 149, 222, 236, and 239) are the areas where gauges are located adjacent to ditch that maintain the access road and areas that appear to be on topographic highs.

Gauge 85 failed to meet Hydrologic Success in 2003, 2006, and 2007 (years 1, 4, and 5). In years with normal to above normal rainfall conditions, Gauge 85 met jurisdictional hydrology for $\geq$12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 85, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 85 should be considered for success.

Gauge 95 failed to meet Hydrologic Success in 2003 and 2004 (years 1 and 2). In years with normal to above normal rainfall conditions, Gauge 95 met jurisdictional hydrology for $\geq$12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 95, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 95 should be considered for success.

Gauge 222 failed to meet Hydrologic Success in 2006 and 2007 (years 4 and 5). In years with normal to above normal rainfall conditions, Gauge 222 met jurisdictional hydrology for ≥12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 222, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 222 should be considered for success.

Gauge 236 failed to meet Hydrologic Success in 2004 and 2007 (years 2 and 5). In years with normal to above normal rainfall conditions, Gauge 236 met jurisdictional hydrology for ≥12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 236, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 236 should be considered for success.

Gauge 149 failed to meet Hydrologic Success and jurisdictional hydrology in all five years of monitoring.

Gauge 239 failed to meet Hydrologic Success and jurisdictional hydrology in 2004, 2006, and 2007 (years 2, 4 and 5).

Gauges 149 and 239 should be reviewed to determine the extent of the non-jurisdictional area surrounding these gauge sites and the contingency plan for the areas that have not been returned to jurisdictional status.

Due to the completion of five years of monitoring, the gauges in MU 5 should be considered for removal following resolution of how to address the unsuccessfully restored areas.

Table 10. 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; ≤ 20% of Reference Range)					
74	Ba/NR	17.4	√	–	–
75	Ba/NR	1.7	–	–	–
76	Ba/NR	2.5	–	–	–
82	Pa/NR	63.2	√	√	√
107	Ba/NR	64.5	√	√	√
108	Ba/NR	63.6	√	√	√
146	La/NR	30.6	√	√	√
147	Ba/NE	71.9	√	√	√
226	Pa/NR	70.7	√	√	√
233	Ra/NR	30.6[b]	√	√	√
234	Ba/NR	70.7	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
240	CT/NR	100	√	√	√

Table 10 Continues

Table 10 Concluded.

Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% 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**
78	MM/RR	71.9	√	–	–
80	DO/RR	100	√	√	√
81	Ba/RR	100	√	√	√
109	MM/RR	100	√	√	√
148	MM/RE	100	√	√	√
227	MM/RR	42.1	√	–	–
228	MM/RE	100	√	√	√
230	Ba/RR	100	√	√	√
Riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
77	CT/RE	100	√	√	√
79	DO/RR	100	√	√	√
229	CT/RE	100	√	√	√
231	CT/RR	100[b]	√	√	√

[a] Soils: Ra – Rains, Pa – Pantego, Ba – Bayboro, La –Leaf, MM –Masontown/Muckalee, CT – Croatan, and DO - Dorovan.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, Riverine Restoration – RR, and Riverine Enhancement – RE.
[b] Actual %: Missing data interpolated from comparable gauges.

Table 10 MU 6 Discussion

March-November

Nineteen of the twenty-four monitoring gauges in MU 6 met both expected hydrologic success criteria for Year 5. Gauges 231 and 233 have missing data due to gauge malfunction.

Gauge 74 made jurisdictional hydrology for 17.4% of the growing season, and therefore met Success Criterion 1. However, this gauge did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (25.2-84.3% of the growing season).

Gauges 75 and 76 did not meet either of their expected hydrologic success criteria. In a year with normal rainfall, Gauges 75 and 76 did not make jurisdictional hydrology. These gauges are located on the upper edge of the floodplain and may be on a topographic high.

Gauge 227 made jurisdictional hydrology for 42.1% of the growing season, and therefore met Success Criterion 1. However, due to the below normal rainfall, this gauge did not meet Success Criterion 2 (20% of Reference Range) for the Masontown/Muckalee soil series (80.2-100% of the growing season).

Gauge 78 made jurisdictional hydrology for 71.9% of the growing season, and therefore met Success Criterion 1. However, due to the below normal rainfall, Gauge 78 did not meet Success Criterion 2 (20% of Reference Range) for the Masontown/Muckalee soil series (80.2-100% of the growing season), by dropping below the 12-inch threshold by less than 1 inch for less than one day.

Gauge 231 has recorded data for 211 consecutive days (87.2% of the growing season) and one data gap. Using nearby Gauges 77 and 78 to interpolate missing data, it can be assumed that Gauge 231 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 233 has recorded data for 53 consecutive days (21.9% of the growing season) and one data gap. Using nearby rainfall data and adjacent data points to interpolate missing data, it can be assumed that Gauge 233 would have made jurisdictional hydrology for approximately 30.6% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 6.

In 2007 Gauge 78 met jurisdictional hydrology, but failed to meet Success Criterion 2. This gauge met Hydrologic Success from 2003 through 2006 (years 1-4). This failure to meet jurisdictional hydrology may be due to the low rainfall conditions since the gauge dropped below 12 inches by less than 1 inch for one day before returning to within 12 inches of the surface for the remainder of the growing season. Gauge 78 should be considered for success.

The areas of concern in MU 6 (Gauge 74, 75, 76, and 227) are the areas that appear to be on topographic highs.

Gauge 74 failed to meet Hydrologic Success in 2005 through 2007 (years 3 through 5). In years with normal to above normal rainfall, this gauge met jurisdictional hydrology for $\geq$ 12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 74, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 74 should be considered for success.

Gauge 227 failed to meet Hydrologic Success in 2004, 2005, and 2007 (years 2, 3, and 4). In years with normal to above normal rainfall, this gauge met jurisdictional hydrology for $\geq$ 12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 227, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 227 should be considered for success.

Gauges 75 and 76 failed to meet Hydrologic Success and jurisdictional hydrology in all five years of monitoring, and four of five years, respectively. Gauges 75 and 76 should be reviewed to determine the extent of the non-jurisdictional area surrounding these gauge sites and the contingency plan for the areas that have not been returned to jurisdictional status.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 5 should be considered for removal following resolution of how to address the unsuccessfully restored areas.

Table 11. 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; ≤ 20% of Reference Range)					
52	Ba/NE	59.5	√	√	√
71	Ba/NR	44.6	√	√	√
72	Ba/NR	59.9	√	√	√
73	Pa/NR	42.6	√	√	√
97	Ba/NR	63.2	√	√	√
110	Pa/NR	44.6	√	√	√
111	Ba/NE	63.6	√	√	√
155	Ba/NR	62.8	√	√	√
156	Ba/NR	59.5	√	√	√
264	Ba/NR	64.1	√	√	√
265	Ba/NR	64.5[b]	√	√	√
267	Ba/NE	45.5	√	√	√
268	Ba/NR	63.6	√	√	√
270	Ba/NR	69.0	√	√	√

[a] Soils: Pa – Pantego and Ba – Bayboro.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Actual %: Missing data interpolated from comparable gauges.

Table 11 MU 7 Discussion

March-November

All fourteen of the monitoring gauges in MU 7 met both expected hydrologic success criteria for Year 5. Gauge 265 has missing data due to gauge malfunction.

Gauge 265 has recorded data for 125 consecutive days (51.7% of the growing season) and one data gap. Using nearby Gauge 266 to interpolate missing data, it can be assumed that Gauge 265 would have made jurisdictional hydrology for approximately 64.5% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for all of the monitoring gauges of MU 7.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 7 should be considered for removal.

Table 12. 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; ≤ 20% of Reference Range)					
47	Ba/NR	81.0[b]	√	√	√
51	Ba/NE	69.0	√	√	√
113	Ba/NE	69.0[b]	√	√	√
115	Pa/NR	42.2[b]	√	√	√
116	Pa/NE	68.2	√	√	√
266	Ba/NR	69.8	√	√	√
269	Ba/NE	69.8	√	√	√
311	Ba/NR	44.6	√	√	√
314	Ba/NR	38.8	√	√	√
315	Ba/NR	42.6	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
44	CT/NR	44.2	√	√	√
103	CT/NE	70.7	√	√	√
114	CT/NR	44.2	√	√	√
117	CT/NE	71.9	√	√	√
307	CT/NR	45.9[b]	√	√	√
309	CT/NR	68.6	√	√	√
312	CT/NR	45.0	√	√	√

[a] Soils: Pa – Pantego, Ba – Bayboro, and CT - Croatan.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Actual %: Missing data interpolated from comparable gauges.

Table 12 MU 8 Discussion

March-November

All seventeen monitoring gauges in MU 8 met both expected hydrologic success criteria for Year 5. Gauges 47, 113, 115, and 307 have missing data due to gauge malfunction.

Gauge 47 has recorded data for a minimum of 154 consecutive days (62.6%) and one data gap. Using nearby Gauge 51 and adjacent data points to interpolate the missing data, it can be assumed that Gauge 47 would have made jurisdictional hydrology for 81.0% of the growing season.

Gauge 113 has recorded data for a minimum of 96 consecutive days (39.7%) and one data gap. Using nearby Gauge 266 to interpolate the missing data, it can be assumed that Gauge 113 would have made jurisdictional hydrology 69.0% of the growing season.

Gauge 115 has recorded data for a minimum of 38 consecutive days (15.7%) and one data gap. Using nearby Gauge 116 to interpolate the missing data, it can be assumed that Gauge 115 would have made jurisdictional hydrology for 42.2% of the growing season.

Gauge 307 has recorded data for a minimum of 94 consecutive days (38.8%) and one data gap. Using nearby Gauge 44 and adjacent data points to interpolate the missing data, it can be assumed that Gauge 307 would have made jurisdictional hydrology 45.9% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for all of the monitoring gauges of MU 8.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 8 should be considered for removal.

Table 13. 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; ≤ 20% of Reference Range)					
41	Ba/NE	44.2	√	√	√
301	Ba/NR	69.0	√	√	√
303	Ba/NR	69.0	√	√	√
313	Ba/NE	44.2	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
42	CT/NE	41.7	√	√	√
43	CT/NE	38.4	√	√	√
305	CT/NR	42.6	√	√	√
306	CT/NE	42.1	√	√	√

[a] Soils: Ba – Bayboro and CT - Croatan.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.

Table 13 MU 9 Discussion

March-November

All eight monitoring gauges in MU 9 met both expected hydrologic success criteria for Year 5.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for all of the monitoring gauges of MU 9.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 9 should be considered for removal.

Table 14. 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; ≤ 20% of Reference Range)					
60	Ba/NR	71.9	√	√	√
118	Ba/NR	66.5[b]	√	√	√
298	Ba/NR	100[b]	√	√	√
299	Ba/NR	71.5	√	√	√
300	Ba/NR	70.7[b]	√	√	√
302	Ba/NR	71.1	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
45	CT/NR	100	√	√	√
46	CT/NR	41.7	√	√	√
61	CT/NR	42.2	√	√	√
119	CT/NR	31.4	√	–	–
120	CT/NR	38.8	√	√	√
296	CT/NR	44.6	√	√	√
304	CT/NR	44.2	√	√	√
308	CT/NR	100	√	√	√

[a] Soils:, Ba – Bayboro and CT – Croatan.
Mitigation Types: Non-riverine Restoration – NR.
[b] Actual %: Missing data interpolated from comparable gauges.

Table 14 MU 10A Discussion

March-November

Thirteen of the fourteen monitoring gauges in MU 10A met both expected hydrologic success criteria for Year 5. Gauges 118, 298, and 300 have missing data due to gauge malfunction.

Gauge 119 met jurisdictional hydrology for 31.4% of the growing season and therefore met Success Criterion 1. However, Gauge 119 did not meet Success Criterion 2 (20% of Reference Range) for the Croatan soil series (33.9 – 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 119, but were not

successful at returning this gauge site to within 20% of reference conditions under the lower rainfall conditions.

Gauge 118 has recorded data for a minimum of 82 consecutive days (33.9%) and one data gap. Using nearby Gauges 298 and 302 to interpolate the missing data, it can be assumed that Gauge 118 would have made jurisdictional hydrology for 66.5% of the growing season.

Gauge 298 has recorded data for a minimum of 148 consecutive days (61.2%) and one data gap. Using nearby Gauge 60 to interpolate the missing data, it can be assumed that Gauge 298 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 300 has recorded data for a minimum of 68 consecutive days (28.1%) and one data gap. Using nearby Gauge 299 to interpolate the missing data, it can be assumed that Gauge 300 would have made jurisdictional hydrology for 70.7% of the growing season.

Overall 2003-2007
Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 10A.

Gauge 119 failed to meet Hydrologic Success in 2007 (year 5), but met jurisdictional hydrology. This gauge met Hydrologic Success in 2003-2006 (years 1 through 4) and should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 10A should be considered for removal.

Table 15. 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; ≤ 20% of Reference Range)					
49	Ba/NR	47.1	√	√	√
50	Ba/NR	66.1	√	√	√
65	Pa/NE	38.4	√	√	√
66	Ra/NE	38.4	√	√	√
67	Pa/NR	30.2	√	√	√
69	Ba/NR	42.6	√	√	√
70	Ba/NE	38.8	√	√	√
122	Pa/NR	37.6	√	√	√
124	Pa/NR	41.3	√	√	√
271	Ba/NR	69.0[b]	√	√	√
272	Ba/NR	68.6	√	√	√
273	Ba/NR	38.8	√	√	√
274	Ba/NR	44.6	√	√	√
277	Ra/NR	5.4	–	–	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
48	CT/NR	69.8	√	√	√
123	CT/NE	42.1	√	√	√
310	CT/NR	70.3	√	√	√

[a] Soils:, Ba – Bayboro, CT – Croatan, Ra – Rains, and Pa - Pantego.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Actual %: Missing data interpolated from comparable gauges.

Table15 MU 10B Discussion

March-November

Sixteen of the seventeen monitoring gauges in MU 10B met both expected hydrologic success criteria for Year 5. Gauge 271 has missing data due to gauge malfunction.

Gauge 277 did not meet either expected hydrologic success criteria. In a year with lower rainfall conditions the areas represented by Gauge 277 did not make jurisdictional hydrology.

Gauge 271 has recorded data for a minimum of 166 consecutive days (68.6%) and one data gap. Using nearby Gauges 69 and 272 and adjacent data points to interpolate the missing data, it can be assumed that Gauge 271 would have made jurisdictional hydrology for 69.0% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 10B.

Gauge 277 met Hydrologic Success in 2003 through 2006 (years 1 through 4), but failed to meet jurisdictional hydrology in 2007. This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. This gauge should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 10B should be considered for removal.

Table 16. 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; ≤ 20% of Reference Range)					
62	Ra/NR	7.4	–	–	–
63	Pa/NR	38.4	√	√	√
64	Ra/NR	30.2	√	√	√
121	Pa/NR	45.5[b]	√	√	√
143	Pa/NR	38.0	√	√	√
282	Pa/NR	45.5	√	√	√
283	Pa/NR	45.0	√	√	√
286	Ra/NR	2.9	–	–	–
287	Ra/NR	2.5	–	–	–
289	Pa/NR	28.5	√	√	√
290	Pa/NR	38.4	√	√	√
291	Pa/NR	19.4	√	–	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
284	CT/NR	45.5	√	√	√
285	CT/NR	69.0	√	√	√
293	CT/NR	70.3	√	√	√
294	CT/NR	100[b]	√	√	√

[a] Soils:, Pa - Pantego, CT – Croatan, and Ra – Rains.
Mitigation Types: Non-riverine Restoration – NR.
[b] Actual %: Missing data interpolated from comparable gauges.

Table 16 MU 10C Discussion

March-November

Twelve of the sixteen monitoring gauges in MU 10C met both expected hydrologic success criteria for Year 5. Gauges 121 and 294 have missing data due to gauge malfunction.

Gauge 62 did not meet either expected success criteria. In a year with lower rainfall conditions the areas represented by Gauge 62 did not make jurisdictional hydrology.

Gauges 286 and 287 did not meet either 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.

Gauge 291 met jurisdictional hydrology for 19.4% of the growing season and therefore met Success Criterion 1. However, Gauge 291 did not meet Success Criterion 2 (20% of Reference Range) for the Pantego soil series (23.1-79.3% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to this gauge, but were not successful at returning this gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauge 121 has recorded data for a minimum of 94 consecutive days (38.8%) and one data gap. Using nearby Gauge 122 and adjacent data points to interpolate the missing data, it can be assumed that Gauge 121 would have made jurisdictional hydrology for 45.5% of the growing season.

Gauge 294 has recorded data for a minimum of 185 consecutive days (76.5%) and one data gap. Using nearby Gauge 293 to interpolate the missing data, it can be assumed that Gauge 294 would have made jurisdictional hydrology for 100% of the growing season.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 10C.

Gauge 62 met Hydrologic Success in 2003 through 2006 (years 1 through 4), but failed to meet jurisdictional hydrology in 2007. This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. This gauge should be considered for success.

The areas of concern in MU10C include 286, 287, and 291. Gauges 286 and 287 are located adjacent to a point-plugged ditch and the old roadbed.

Gauge 291 failed to meet in 2003, 2006, and 2007 (years 2, 4, and 5). In years with normal to above normal rainfall, this gauge met jurisdictional hydrology for $\geq$ 12.5% of the growing season. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 291, but were not successful at consistently returning this gauge site to within 20% of reference conditions. Gauge 291 should be considered for success.

Gauges 286 and 287 failed to meet Hydrologic Success and jurisdictional hydrology in all five years of monitoring. Gauges 286 and 287 should be reviewed to determine the extent of the

non-jurisdictional area surrounding these gauges and the contingency plan for the areas that have not been returned to jurisdictional status.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 10C should be considered for removal following resolution of how to address the unsuccessfully restored areas.

Table 17. 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; ≤ 20% of Reference Range)					
68	Ba/NR	30.6	√	√	√
144	Pa/NR	30.6	√	√	√
145	Ba/NR	42.6	√	√	√
232	Ra/NR	31.4	√	√	√
275	Ba/NR	44.6	√	√	√
276	Ra/NR	7.9	–	–	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
278	CT/NE	71.5	√	√	√
279	CT/NR	71.5	√	√	√

[a] Soils: Pa – Pantego, Ba – Bayboro, Ra – Rains, and CT - Croatan.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Actual %: Missing data interpolated from comparable gauges.

Table 17 MU 11 Discussion

March-November

Seven of the eight monitoring gauges in MU 11 met both expected hydrologic success criteria for Year 5.

Gauge 276 did not meet either expected hydrologic success criteria. The gauge is located adjacent to the main access road. Point-plugs instead of reach plugs were used to fill this ditch. In a year with lower rainfall conditions, mitigation measures were not successful at returning jurisdictional hydrology to Gauge 276.

Overall 2003-2007

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 11.

Gauge 276 met Hydrologic Success in 2003 through 2006 (years 1 through 4), but failed to meet jurisdictional hydrology in 2007. This failure to meet jurisdictional hydrology may be due to the low rainfall conditions. This gauge should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 11 should be considered for removal.

2.3.2 Climatic Data

Figure 5 is a comparison of 2007 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 2007 growing season. The historical data was collected from the North Carolina State Climate Office rain gauge in Craven County, North Carolina. Three onsite rain gauges provided 2007 rainfall data.

Overall, the rainfall for the 2007 growing season trended towards below normal to the low end of the normal range (24.0 to 30.8 inches onsite compared to normal 26.7 to 46.1 inches for March through October). Rainfall between November and December 2006 trended towards normal to above normal (4.6 to 10.6 inches on-site compared to normal 4.1 to 8.3 inches). The rainfall between January and February 2007 was well below normal (.64 to 4.7 inches onsite compared to normal 6.13 to 10.1 inches).

2.4 Conclusions

The majority of the monitoring gauges showed that groundwater levels began to drop in late spring and early summer, but then rose due to large rainfall events throughout the growing season. Therefore, the longest number of consecutive days reported for success criteria occurred during the critical defining hydroperiod for many of the non-riverine minerals soils that occupy a large portion of the CWMB.

Phase II - Entire Growing Season (March-November)

Hydrologic monitoring in 2007 showed 152 of 184 (82.6%) monitoring gauges in Phase II met both respective hydrologic success criteria [≥ 12.5 % (mineral soils) or ≥ 25 % (organic/riverine soils) of the growing season and within 20% of Reference Range] (Figure 3). Of the 32 gauges that did not meet both respective success criteria, 11 made jurisdictional hydrology for ≥ 12.5% of the growing season, 14 made jurisdictional hydrology between 5 and 12.5% of the growing season, and only seven (Gauges 75, 76, 93, 102, 149, 286, and 287) did not make jurisdictional hydrology for at least 5% of the growing season.

Of the 133 monitoring gauges in non-riverine mineral soils, 108 met both hydrologic success criteria and 19 did not meet either hydrologic success criterion; the remaining six gauges met Success Criterion 1 only. Of the 31 monitoring gauges in non-riverine organic soils, 30 met both hydrologic success criteria, and the remaining gauge (Gauge 119) met Success Criterion 1 only. All five monitoring gauges in riverine organic soils, met both hydrologic success criteria. Of the 15 monitoring gauges in riverine mineral soils, nine met both hydrologic success criteria, two gauges (Gauges 102 and 256) did not meet either hydrologic success criterion, and the remaining four gauges met either Criterion 1 or Criterion 2 only.

Even in years with lower rainfall conditions, the CWMB has a high rate of success. However, in years with normal rainfall there may be small areas in Phase II that may not be returned to jurisdictional hydrology. The areas represented by these gauges should be reviewed to determine the extent of the non-jurisdictional areas around these gauge sites and develop a contingency plan for the areas that have not been returned to jurisdictional status.

Areas of Concern

Phase II - Overall 2003-2007
Overall, mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of Phase II. Jurisdictional hydrology has been restored in areas that are located adjacent to point plugged ditches that maintain the access roads. However, these measures have not been successful at returning these gauge sites to within 20% of reference conditions under normal rainfall conditions.

The areas of concern in Phase II are the areas represented by the following:

- Gauges 74, 85, 94, 95, 154, 222, 227, 236, 243, 244, 247, 256, 258, 259, 260, and 291 have consistently met jurisdictional hydrology, but have not consistently met Success Criterion 2 (20% of Reference Range).
- Gauges 75, 76, 102, and 149 which have not met jurisdictional hydrology ($\geq$12.5% of the growing season).
- Gauges 92, 93, 150, 239, 286, 287 which have not consistently met jurisdictional hydrology ($\geq$12.5% of the growing season).

The mitigative measures for areas represented by Gauges 74, 85, 94, 95, 154, 222, 227, 236, 243, 244, 247, 256, 258, 259, 260, and 291 have been successful at returning jurisdictional hydrology to these areas, but these gauges may never meet Success Criterion 2 (20% of reference) for their respective soil series because of their location adjacent to existing roads and point-plugged ditches or on topographic highs.

Gauges 75, 76, 102, 149, and 150 appear to be located on topographic highs. The areas represented by these gauges should be reviewed to determine the extent of the non-jurisdictional areas and a contingency plan developed for the areas that have not been returned to jurisdictional status.

Gauges 92, 93, 239, 286, and 287 are located adjacent to point plugged ditches. These partially open ditches may still have a zone of influence extending a greater distance off the ditch than can be measured with existing gauges or these gauges may be installed in residual spoil material. The areas represented by these gauges should be reviewed to determine the zone of influence and a contingency plan developed for the areas that have not been returned to jurisdictional status.

Rainfall
Overall, the rainfall for the 2007 growing season trended towards below normal to the low end of the normal range (24.0 to 30.8 inches onsite compared to normal 26.7 to 46.1 inches for March through October). Rainfall between November and December 2006 trended towards normal to above normal (4.6 to 10.6 inches on-site compared to normal 4.1 to 8.3 inches). The rainfall

between January and February 2007 was well below normal (.64 to 4.7 inches onsite compared to normal 6.13 to 10.1 inches).

Recommendations

Phase II

It is recommended that monitoring of Phase II be closed out due to the high rate of hydrologic success under normal rainfall conditions and the completion of five years of monitoring. Gauges 75, 76, 102, and 149 are not meeting minimum jurisdictional hydrology for 12.5% of the growing season. Gauges 92, 93, 150, 239, 286, and 287 are not consistently meeting minimum jurisdictional hydrology for 12.5% of the growing season. The areas represented by these gauges should be reviewed to determine the extent of the non-jurisdictional areas around these gauge sites and develop a contingency plan for the areas that have not been returned to jurisdictional status. All of the gauges in Phase II should be removed and credits released based on the contingency plan for the areas that have not been returned to jurisdictional status.

Riverine Wetland Credit

Additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 242, and 251) have shown prolonged surface flooding and flowing water throughout much of the growing season in years with normal rainfall. 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 wetland function and credit.

Stream Credit

The U.S. Army Corps of Engineers and N.C. Division of Water Quality have recently revised their interpretation for stream restoration in the outer coastal plain of North Carolina. The preferred method is now what was done at CWMB, taking headwater surface flow intercepted by ditches and restoring the flow to natural drainage features. Stream credits available in Phase II of the CWMB should be documented prior to closing out the mitigation site monitoring.

Figure 4. Hydrologic Areas of Concern 2003-2007, Phase II

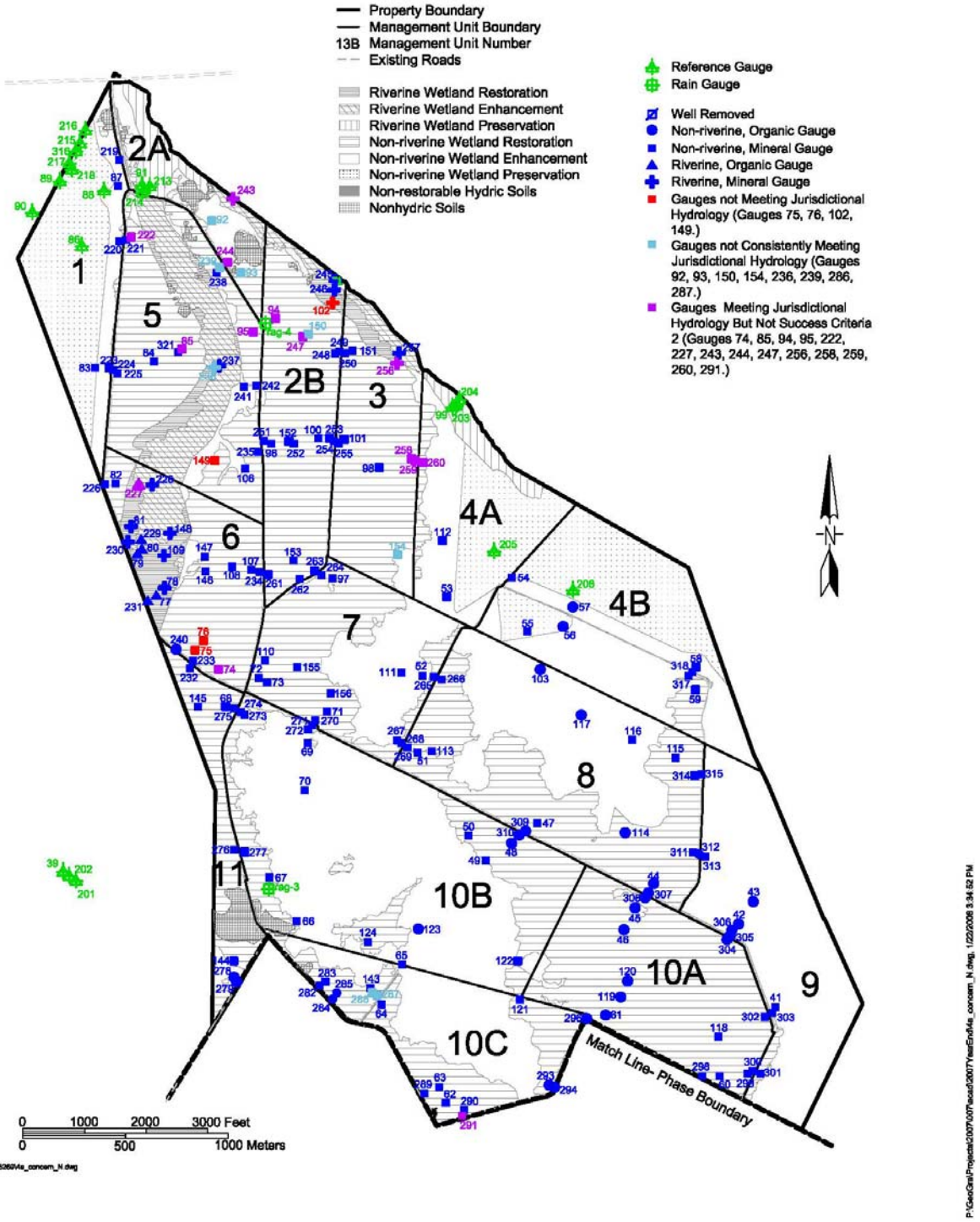
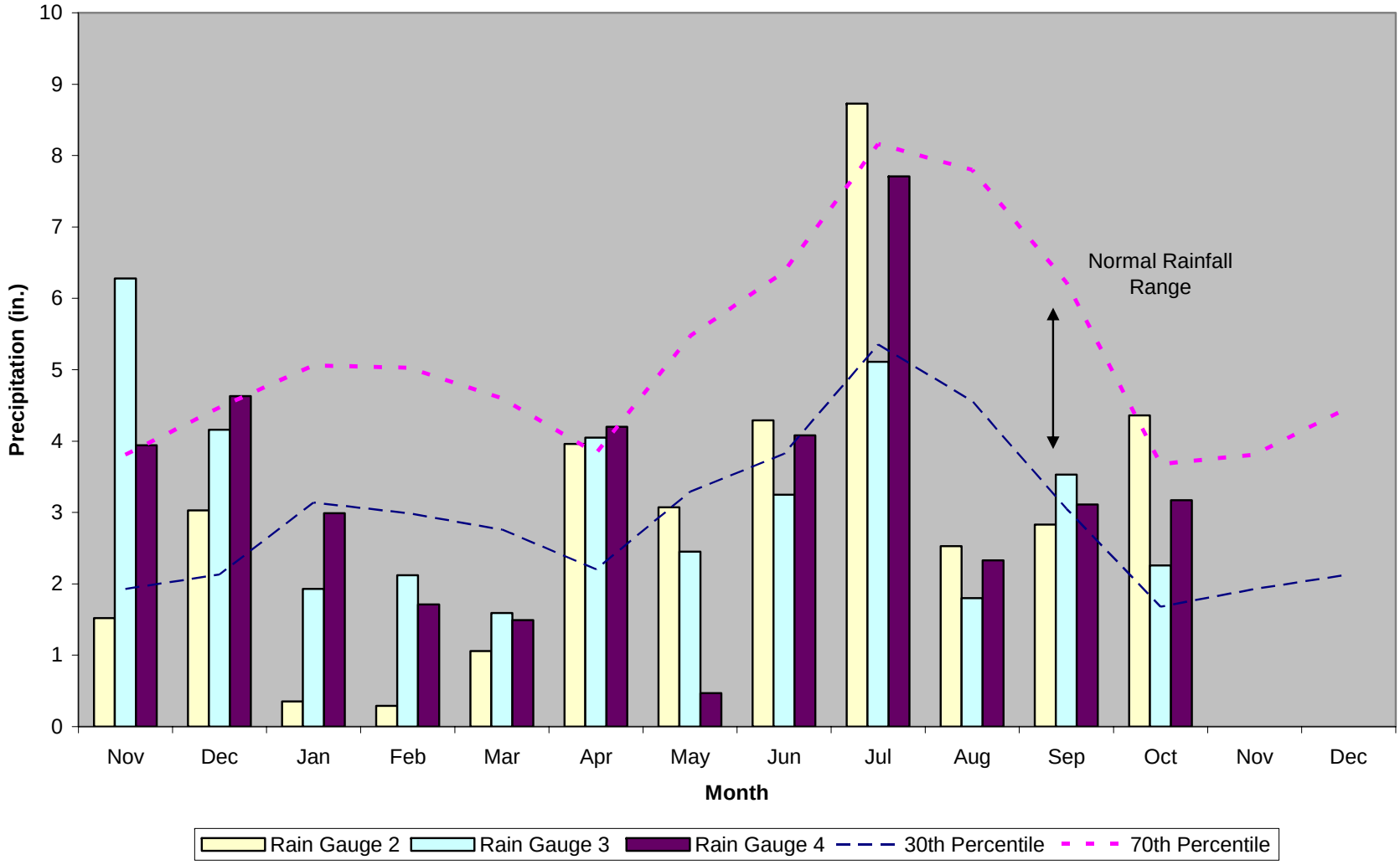


Figure 5. Croatan WMB 30-70 Percentile Graph



3.0 VEGETATION

3.1 Success Criteria

Success criterion 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 288 trees/acre for Year 4, and 260 trees/ acre for Year 5), such that at the end of Year 5, there are at least 260 5-year old trees per acre.

3.2 Description of Species

The listing below details the tree species that were planted in the Phase II mitigation area. Specific information regarding tree counts for each plot in Phase II is provided in Table 18, associated with Section 3.3. Summaries for 2007 stem counts, plot density, success criterion for each plot, and target community (also known as planting zones) are provided in Table 19, associated with Section 3.3. Other observations concerning each Target Community are presented in Section 3.4. Figure 6 depicts the vegetation plot locations, Target Communities, and photo locations.

Phase II

Target Community: Wet Pine Flat

Pinus taeda, loblolly pine
Pinus palustris, longleaf pine
Pinus serotina, pond pine

Target Community: 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

Target Community: 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

Target Community: 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

Vegetation monitoring was conducted in 2007 by Environmental Services, Inc. Prior to 2005, vegetation monitoring was conducted for NCDOT by another consultant. Figure 7 depicts the monitoring results for the vegetation plots and overall Target Communities for Phase II. These results are shown in Appendix B along with photo pages that depict the changing vegetation patterns from years 2003 to 2007. Vegetation monitoring for Phase I was completed in 2006. All figures, tables, and data from the Phase I vegetation plots can be found in the 2006 monitoring report.

Figure 6. Target Communities and Vegetative Plot Location, Phase II

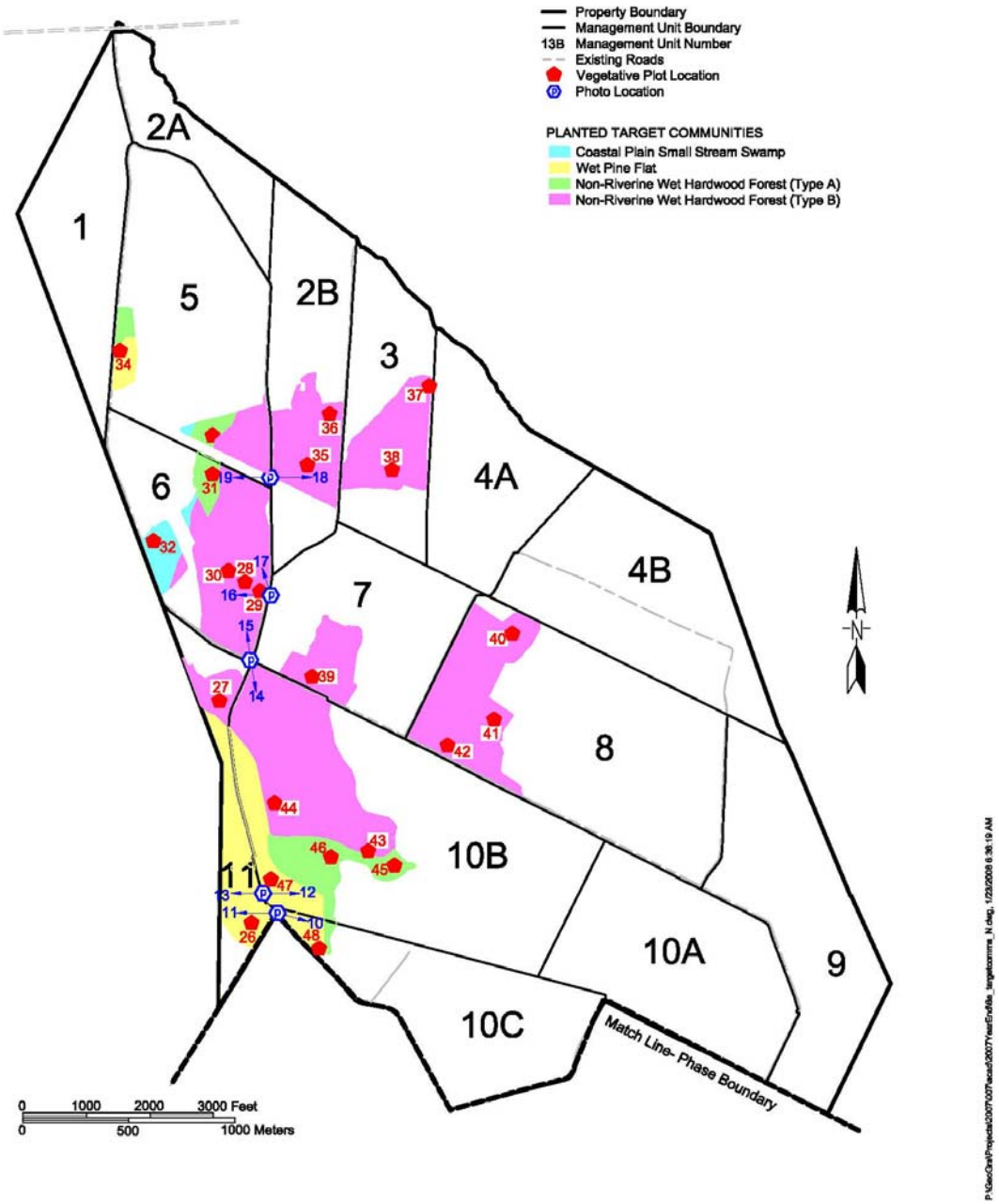


Table 18. Phase II Vegetation Monitoring Statistics 2007

Target Community[a]	Plot Number	Cherrybark Oak	Laurel Oak	Overcup Oak	Swamp Blackgum	Swamp Chestnut Oak	Water Oak	Willow Oak	Longleaf Pine	Bald cypress	Green Ash	Pond/Loblolly Pine	Atlantic White Cedar	Total 2007 (Year 5)	Total (at planting)
WPF	**26**											31(2)		**33**	39
	34									1(2)		2(2)		**7**	39
	47								5			48		**53**	39
	48	1					27		17(5)			12		**62**	39
NRWH (A)	**31**	3		1	13		1			1		2(1)		**22**	39
	33				1		2							**3**	39
	45			1	6(4)		1					2		**14**	39
	46			4(1)	12(1)									**18**	39

Table 18. Continues

Table 18. Continued

Target Community[a]	Plot Number	Cherrybark Oak	Laurel Oak	Overcup Oak	Swamp Blackgum	Swamp Chestnut Oak	Water Oak	Willow Oak	Longleaf Pine	Bald cypress	Green Ash	Pond/Loblolly Pine	Atlantic White Cedar	Total 2007 (Year 5)	Total (at planting)
NRWH (B)	**27**			0(1)			3(1)	0(1)			10	2(1)		**19**	39
	28	4		6				1			3(1)	8		**23**	39
	29	2	0(1)	1	2		1			3(3)	3			**16**	39
	30	2		5			1(1)	3(2)				13		**27**	39
	35	1										3		**4**	39
	36	2(2)	1	2	6						2	14		**29**	39
	37		1				1	1						**3**	39
	38		2	0(1)	4(3)						4	5		**19**	39
	39			1	2			0(1)		1	1	1		**7**	39
	40				13(6)									**19**	39
	41				1(4)									**5**	39
	42											1		**1**	39
	43				9						2			**11**	39
	44		2		4		1					5		**12**	39
CPSSS	**32**				6					20		14		**40**	39

a- Target Community: WPF – Wet Pine Flat, NRWH (A) – Non-Riverine Wet Hardwood Forest (Type A), NRWH (B) – Non-Riverine Wet Hardwood (Type B), CPSSS – Coastal Plain Small Stream Swamp.

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 the Wet Pine Flat and Coastal Plain Small Stream Swamp Target Communities. Specific information regarding each Target Community 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 was assumed that 39 total stems were planted in each plot. All stem count numbers in parenthesis represent unflagged and untagged tree species that appear to be planted, but appear to have been overlooked in the 2006 vegetation monitoring period. These untagged trees are believed to be planted individuals due to their appearance in rows with planted trees, similar sizes/ages as planted trees, and/or lack of naturally occurring species of the same type within the immediate vicinity.

Table 19. Phase II 2007 Summaries

Target Community[a]	Plot Number	Total (at planting)	Total 2007 (Year 5)	Plot Density 2007 (Trees/Acre)	Meets Success Criteria (Y/N)
WPF	26	39	33	575	Y
	34	39	7	122	N
	47[b]	39	53	923	Y
	48[b]	39	62	1080	Y
Wet Pine Flat Average				**675**	**Y**
NRWH (A)	31	39	22	383	Y
	33	39	3	52	N
	45	39	14	244	N
	46	39	18	314	Y
Non-Riverine Wet Hardwood (Type A) Average				**248**	**N**
NRWH (B)	27	39	19	331	Y
	28	39	23	401	Y
	29	39	16	279	Y
	30	39	27	470	Y
	35	39	4	70	N
	36	39	29	505	Y
	37	39	3	52	N
	38	39	19	331	Y
	39	39	7	122	N
	40	39	19	331	Y
	41	39	5	87	N
	42	39	1	17	N
	43	39	11	192	N
	44	39	12	209	N
Non-Riverine Wet Hardwood (Type B) Average				**243**	**N**
CPSSS	32[b]	39	40	697	Y
Coastal Plain Small Stream Swamp Average				**697**	**Y**
Phase II Average				**466**	**Y**

a- Target Community: WPF – Wet Pine Flat, NRWH (A) – Non-Riverine Wet Hardwood Forest (Type A), NRWH (B) – Non-Riverine Wet Hardwood Forest (Type B), CPSSS – Coastal Plain Small Stream Swamp.
b- Total flagged and/or tagged trees found exceeded the original amount planted.

Notes: Density calculations were completed by taking the number of trees counted in 2007 and dividing by the plot size in acres (0.0573921ac). Specific information regarding each Target Community 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 was assumed that 39 total stems were planted in each plot. Environmental Services, Inc. began Croatan vegetation monitoring in 2005, therefore all data and calculations prior to 2005 were obtained from previous consultants.

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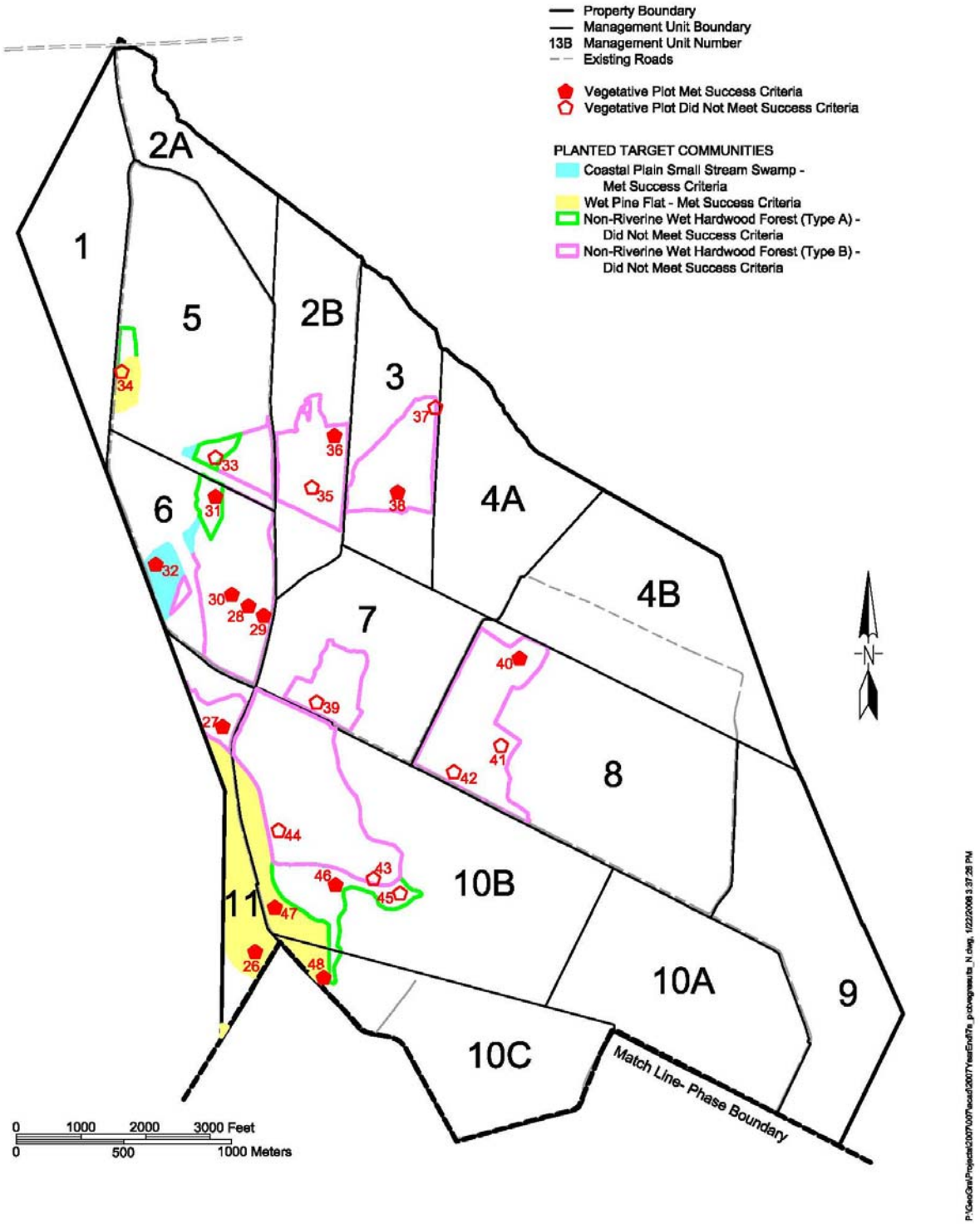
Figure 7. Target Communities and Vegetative Plot Monitoring Results, Phase II



3.4 Plot Descriptions

As requested by EEP, qualitative assessments for vegetative species composition in each plot were not conducted in 2007. In 2006, sub-consultant Dave Dummond gave each species identified a subjective, non-quantitative designation of relative abundance of either dominant or co-dominant (D), common (C), uncommon (U). These results, obtained in 2006, can be found in Appendix B, *Relative Abundance of Vascular Plant Species Recorded within 50' x 50' Plots at the North Carolina Department of Transportation's Croatan Mitigation Area* of the 2006 Monitoring Report. The qualitative assessment was requested by the EEP to provide better documentation as to the vegetative species re-colonizing the planting areas.

The Phase II assessment included fifth year vegetation surveys associated with 23 established plots covering four planted Target Communities. In addition to the planted species, commonly observed species in the Wet Pine Flat Target Community included Maryland meadow-beauty (*Rhexia mariana*) and swamp titi (*Cyrilla racemiflora*). Overall, the Wet Pine Flat Target Community meets the average success criterion of 260 trees/acre for Year 5. The average density for the Wet Pine Flat Target Community is 675 trees/acre. Plot 34 does not meet the Year 5 success criterion.

Commonly observed species in the Non-Riverine Wet Hardwood Forest (Type A) Target Community, in addition to the planted species, include giant plume grass (*Saccharum giganteum)*, red maple (*Acer rubrum*), pine-barren goldenrod (*Solidago fistulosa*), slender goldentop (*Euthamia caroliniana*), southern waxy sedge (*Carex glaucescens*), swamp bay (*Persea palustris*), and Virginia chain fern (*Woodwardia virginica*). The Non-Riverine Wet Hardwood Forest (Type A) Target Community does not meet the success criterion of 260 trees/acre for Year 5. The Non-Riverine Wet Hardwood Forest (Type A) Target Community has an average density of 248 trees/acre. Plots 33 and 45 do not meet the Year 5 meet success criterion. Additional investigation may be needed to determine why this Target Community is not meeting minimum success criterion and if further action is needed.

Commonly observed species in the Non-Riverine Wet Hardwood Forest (Type B) Target Community, in addition to the planted species, included giant plume grass, Maryland meadow-beauty, red maple, and cottongrass bulrush (*Scirpus cyperinus*). The Non-Riverine Wet Hardwood Forest (Type B) Target Community does not meet the success criterion of 260 trees/acre for Year 5. The average density for the Non-Riverine Wet Hardwood Forest (Type B) Target Community is 243 trees/acre. Plots 35, 37, 39, 41, 42, 43, and 44 all fail to meet the Year 5 success criterion. The Non-Riverine Wet Hardwood Forest (Type B) Target Community, with 14 plots, is the largest Target Community in Phase II. Further investigation is needed to determine why the seven plots failed to meet the Year 5 success criterion.

Commonly observed species in the Coastal Plain Small Stream Swamp Target Community, in addition to the planted species, included purple bluestem (*Andropogon glaucopsis),* red maple, pine barren goldenrod, slender goldentop (*Euthamia caroliniana*), small dog-fennel (*Eupatorium capillifolium*), and swamp bay. Overall, the Coastal Plain Small Stream Swamp Target Community meets the success criterion of 260 trees/acre for Year 5, with an average density of 697 trees/acre.

3.5 Conclusions

Approximately 466.0 acres were involved in tree planting for Phase II. There were 23 vegetation monitoring plots established throughout the Phase II planting areas. The 2007 vegetation monitoring of the Phase II portion of the site revealed an average tree density of 466 trees/acre, which exceeds the minimum success criterion of 260 trees/acre for Year 5. Individual plots within Target Communities and overall Target Communities may not meet minimum success criteria. The overall average for the Wet Pine Flat and Coastal Plain Small Stream Swamp Target Communities exceed the 260 stems/acre requirement for Year 5. Both Type A and Type B of the Non-Riverine Wet Hardwood Forest Target Community, have an average of 248 and 243 trees/acre and do not meet minimum success criteria.

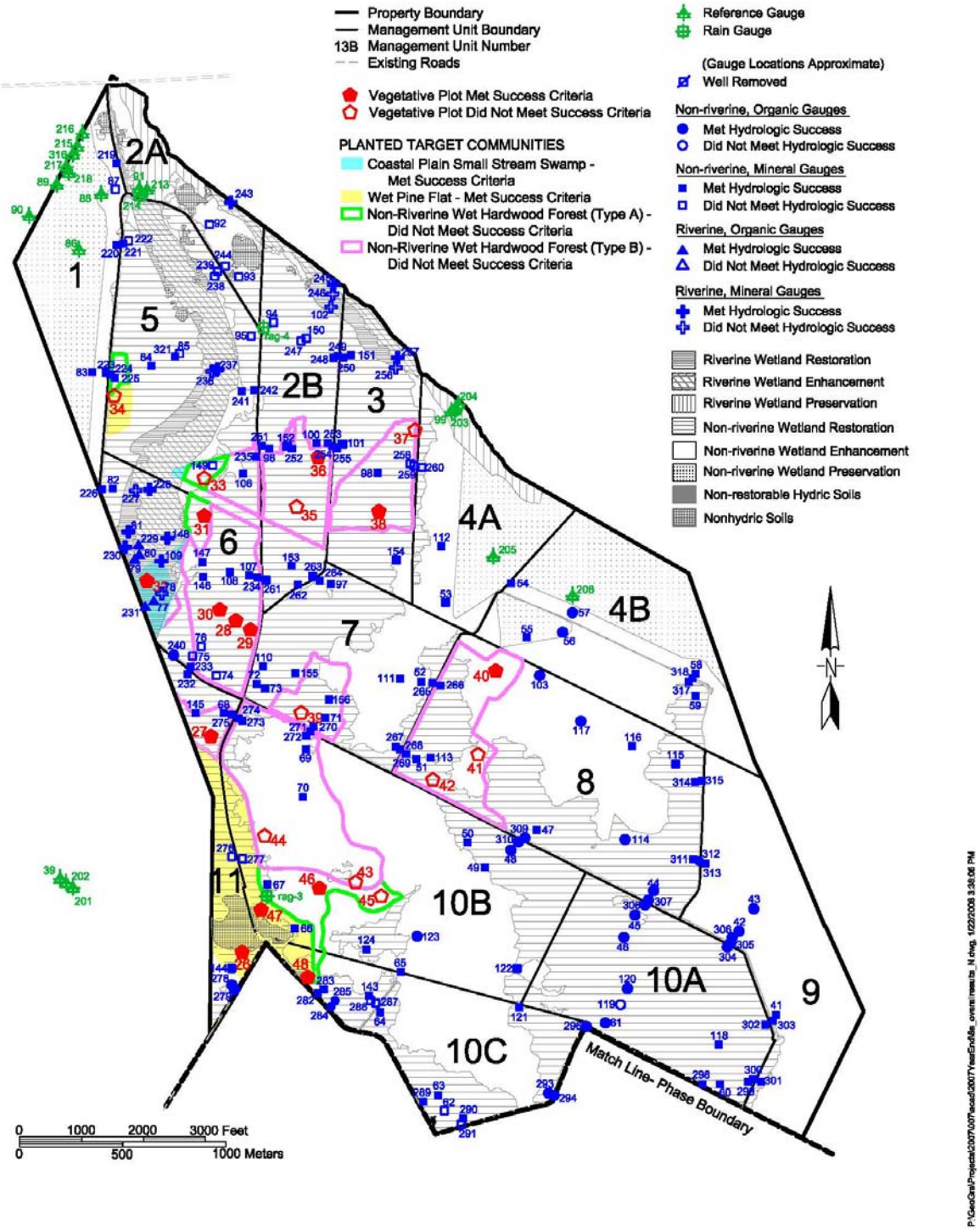
4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

All of the gauges in Phase II should be removed and credits released based on the contingency plan for the areas that have not been returned to jurisdictional status. **Figure 8** depicts the monitoring results for the monitoring gauges, vegetation plots, and overall Target Communities by Phase.

Additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 242, and 251) have shown prolonged surface flooding and flowing water throughout much of the growing season in years with normal rainfall. These areas are headwater wetlands that have a surface connection to the unnamed tributary to East Prong Brice Creek. It is recommended that these areas be re-evaluated for riverine wetland function and credit. In addition, stream credits should be evaluated for the CWMB in light of the recent interpretation of stream mitigation in the North Carolina outer coastal plain by the COE and DWQ.

Of the vegetation surveys performed in the CWMB, 10 plots in Phase II do not meet the Year 5 success criterion. The overall average tree density for Phase II planting areas exceeds the minimum Year 5 success criterion of 260 trees/acre, with a density of 466 trees/acre. The Non-Riverine Wet Hardwood Forest Types A and B Target Communities in Phase II do not meet the success criterion of 260 trees/acre for Year 5. Further investigation may be needed in these Target Communities to determine why the success criterion is not being met and what further actions should be taken.

Figure 8. Overall Monitoring Results 2007, Phase II



Click on the Desired Link Below

Appendix A

Appendix B

Appendix C

Appendix D