FINAL

ANNUAL REPORT FOR 2006

Croatan Wetland Mitigation Bank
Craven County, North Carolina

Prepared for:

The Ecosystem Enhancement Program
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SUMMARY

The following report summarizes the monitoring and construction activities that have occurred prior to and during 2006 at the 4035-acre Croatan Wetland Mitigation Bank (CWMB). The CWMB site is expected to provide compensatory wetland mitigation for several NCDOT projects in the Neuse River Basin (Hydrologic Unit 03020204). This site was designed and implemented in two phases, Phase I (1469.3 acres) and Phase II (2565.3 acres). Phase I construction was completed in the winter of 2001 and Phase II construction was completed in the spring of 2002. Each phase has been divided into Management Units (MU) to aid in the report presentation. In 2006, hydrologic and vegetative monitoring in Phase II (MU 1-11) continued into the fourth year and monitoring in Phase I (MU 12A-18) 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.

Prior to the beginning of the 2006 growing season, 286 ground water monitoring gauges were installed throughout Phase I and II for monitoring success. A total of 33 reference gauges were installed either onsite or offsite in areas of minimal disturbance to provide a range of reference conditions for the ten hydric soil mapping units present on the CWMB. Rain Gauge 2 was used for hydrologic analysis. Rain Gauges 3 and 4 malfunctioned, therefore these gauges were not used for data analyses.

Entire Growing Season (March-November)
Hydrologic monitoring in 2006 showed 229 of 286 (80.1%) monitoring gauges in the CWMB 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] (Figures 3a and 3b). Of the 57 gauges that did not meet both respective success criteria, 37 made jurisdictional hydrology for $\geq$ 12.5% of the growing season, 13 made jurisdictional hydrology between 5 and 12.5% of the growing season, and seven (Gauges 75, 76, 102, 137, 149, 286, and 287) did not make jurisdictional hydrology for at least 5% of the growing season.

Of the 204 monitoring gauges in non-riverine mineral soils, 150 met both hydrologic success criteria and 19 did not meet either hydrologic success criterion; the remaining 35 gauges met Success Criterion 1 only. Of the 62 monitoring gauges in non-riverine organic soils, 61 met both hydrologic success criteria, and one gauge (Gauge 133) met hydrologic Success Criterion 2 only. Of the 12 monitoring gauges in riverine organic soils, 12 met both hydrologic success criteria. Of the eight monitoring gauges in riverine mineral soils six met both hydrologic success criteria, and the remaining two gauges (Gauges 102 and 243) did not meet either hydrologic success criterion.

Hydrologic monitoring in 2006 showed 78 of 102 (76.4%) monitoring gauges in Phase I met both respective hydrologic success criteria. Of the 71 monitoring gauges in non-riverine mineral soils, 48 met both hydrologic success criteria, nine did not meet either hydrologic success criterion and the remaining 14 gauges met Success Criterion 1 only. Of the 31 monitoring gauges in Phase I in non-riverine organic soils, 30 met both hydrologic success criteria, and the remaining gauge (Gauge 133) met hydrologic Success Criterion 2 only.

Hydrologic monitoring in 2006 showed 151 of 184 (82.1%) monitoring gauges in Phase II met both respective hydrologic success criteria. Of the 133 monitoring gauges in non-riverine mineral soils, 102 met both hydrologic success criteria and 10 did not meet either hydrologic success criterion; the remaining 21 gauges met Success Criterion 1 only. All 31 of the monitoring gauges in non-riverine organic soils met both hydrologic success criteria. Of the 12 monitoring gauges in riverine organic soils, 12 met both hydrologic success criteria. Of the eight monitoring gauges in riverine mineral soils, six met both hydrologic success criteria, one gauge (Gauge 102) did not meet either hydrologic success criterion, and the remaining gauge (Gauge 243) met Success Criterion 1.

In years with normal rainfall there may be small areas in Phase II that may not be returned to jurisdictional hydrology. The non-jurisdictional areas around these monitoring gauges may need to be delineated and removed from mitigation credits if they are not returned to jurisdictional hydrology in Year 5.

Rainfall

Overall, the rainfall for the 2006 growing season was normal ($\geq$44.7 inches onsite compared to normal 26.7 to 46.1 inches March through October). Rainfall in January and February 2006 was on the low side of normal (5.8 inches on-site compared to normal 6.1 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. Ecosystem Enhancement Program (EEP) has agreed to continue monitoring this site for the remainder of the five years or until success criteria are met. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (*i.e.,* for an expected 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.

Of the 4,035-acre CWMB, approximately 224.5 acres were involved in tree planting for Phase I and 466.0 acres were involved in tree planting for Phase II. There were 25 vegetation monitoring plots established throughout the Phase I planting areas, and 23 vegetation monitoring plots established throughout the Phase II planting areas. The 2006 vegetation monitoring of the Phase I portion of the site revealed an average tree density of 352 trees/acre, which exceeds the minimum success criteria of 260 trees/acre for Year 5. The vegetation monitoring of the Phase II portion of the site revealed an average tree density of 330 trees/acre, which exceeds the minimum success criteria of 288 trees/acre for Year 4.

Areas of Concern

Phase I - Overall 2002-2006

Overall, mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of Phase I. 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 the normal rainfall conditions.

Gauges 2, 4, 18, 26, 135, 136, 141, 171, 172, 175, 178, 180, 181, 192, 193, 194, and 195 met jurisdictional hydrology. These gauges met Success Criterion 1, but did not meet Success Criterion 2. Mitigative measures 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. Gauge 133 met Success Criterion 2, but did not consistently achieve jurisdictional hydrology for the minimum hydroperiod of 25% of the growing season established for organic soils.

The areas of concern in Phase I are the areas represented by Gauges 3, 11, 24, 137, 182, 183, and 191. The gauges are not meeting minimum jurisdictional hydrology for 12.5% of the growing season.

Gauges 3, 182, 183, and 191 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, although all exhibited hydroperiods between 5 and 12.5% of the growing season. 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.

Gauges 11, 24, and 137 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 11 and 24 exhibited hydroperiods between 5 and 12.5% of the growing season.

Phase II - 2006

For 2006, mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of Phase II. Hydrologic monitoring in 2006 showed 151 of 184 (82.1%) monitoring gauges in Phase II met both respective hydrologic success criteria. However, there are some areas of concern, especially in MU 2A, 2B, 3, 4A, and 5. Jurisdictional hydrology has been restored in areas that are located adjacent to point plugged ditches that maintain the access roads. However, mitigative measures have not been successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions.

Gauges 94, 95, 261, 260, 258, and 259 occur adjacent to ditches that remain partially open where point-plugs were used to fill the ditch. These gauges were placed in non-jurisdictional areas within the zone of influence of the ditch. These gauges met jurisdictional hydrology ($\geq$ 12.5% of the growing season), but may not meet Success Criterion 2 (% of Reference Range) within the zone of influence off the former ditch under normal rainfall conditions.

Gauges 92, 93, 286 and 287 occur adjacent to ditches that remain partially open where point-plugs were used to fill the ditch. These gauges were placed in non-jurisdictional areas within the zone of influence of the ditch. These gauges sites did not achieve jurisdictional hydrology greater than 12.5% of the growing season within the zone of influence off the former ditch under normal rainfall conditions, although Gauges 92 and 93 exhibited hydroperiods between 5 and 12.5% of the growing season. 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. The non-jurisdictional areas around these monitoring gauges may need to be delineated and removed from mitigation credits if they are not returned to jurisdictional hydrology in Year 5.

Gauges 85, 102, 149, 150, 75, and 76 appear to be located on topographic highs compared to the surrounding landscape. In years with normal rainfall these areas may not achieve hydroperiods greater than 12.5% of the growing season, although Gauges 85 and 150 exhibited hydroperiods between 5 and 12.55 of the growing season. The non-jurisdictional areas around these monitoring gauges may need to be delineated and removed from mitigation credits if they are not returned to jurisdictional hydrology in Year 5.

Jurisdictional hydrology has been restored to the remaining 20 gauges, but mitigative measures have not been successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions.

Of the 20 monitoring gauges in riverine areas, six (Gauges 102, 227, 236, 243, 246, and 256) did not show evidence of surface water throughout much of the growing season. Some of these gauge sites may be too high in the landscape to function as riverine influenced wetlands. However, additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 242, and 251) showed prolonged surface flooding and flowing water throughout much of the growing season. These areas are headwater wetlands that have a surface connection to the unnamed tributary to East Prong Brice Creek and should be re-evaluated for riverine function and credit.

The areas of concern in Phase II are the areas represented by Gauges 75, 76, 85, 92, 93, 102, 149, 150, 286, and 287. The gauges are not meeting minimum jurisdictional hydrology for 12.5% of the growing season.

Recommendations

Phase I

It is recommended that monitoring of Phase I be closed out due to the high rate of hydrologic success under normal rainfall conditions and the completion of five years of monitoring. Gauges 3, 11, 24, 137, 182, 183, and 191 are not 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 I should be removed and credits released based on the contingency plan for the areas that have not been returned to jurisdictional status.

Phase II

It is recommended that monitoring of Phase II hydrology and vegetation will continue in 2007 (Year 5). However, due to the high rate of hydrologic success in Phase II, under normal rainfall conditions, ESI would recommend that selected interior gauges that are meeting success criteria consistently through Year 4 be removed from monitoring. Thirty-three interior gauges in Phase II should be considered for removal from hydrologic monitoring. Each of the gauges

considered for early removal has met or exceeded both expected hydrologic success criteria in each year of monitoring. The majority of these gauges have met jurisdictional hydrology for 100% of the growing season in years with normal rainfall. Mitigative measures have successfully enhanced and/or restored jurisdictional hydrology to the areas represented by these gauge sites. The areas represented by these gauges sites should be considered to have successfully met all success criteria through Year 5 established by the MBRT.

Gauge sites adjacent to roads or point-plugged ditches, areas where riverine credit may be gained, areas that are not meeting the success criteria established for years four and five, and representative areas across Phase II of the CWMB should continue to be monitored through Year 5.

ESI also recommends that additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 242, and 251) be re-evaluated for riverine function. These areas showed prolonged surface flooding and flowing water throughout much of the growing season and may be considered riverine mitigation due to the surface connection with the unnamed tributary to East Prong Brice Creek.

It is recommended that Rain Gauges 3 and 4 be replaced due to repeated malfunction and unreliable data collected during 2006.

1.0 INTRODUCTION

1.1 Project Description

The Croatan Wetland Mitigation Bank (CWMB) is located in Craven County, North Carolina approximately 3.6 miles northwest of Havelock. The site is situated west of US 70 and south of Catfish Lake Road (SR 1100) (**Figure 1**). The CWMB was created to provide compensatory mitigation for several projects in the Neuse River Basin (Hydrologic Unit 03020204). The site encompasses approximately 4,035 acres and was designed and implemented in two phases (Phase I and Phase II). Each phase was divided into Management Units (MU) to aid in planning, and this is continued for presentation of monitoring results. Phase I is approximately 1469.3 acres and contains approximately 1446.5 acres targeted for a combination of non-riverine wetland restoration (311.6 acres), enhancement (1026.9 acres), and preservation (108.0 acres). The remaining 22.8 acres of Phase I consists of non-hydric soils (3.9 acres) and areas considered non-restorable (18.9 acres). Phase II is approximately 2565.3 acres and contains approximately 2333.5 acres targeted for a combination of non-riverine wetland restoration (1123.6 acres), enhancement (956.9 acres), and preservation (253.0 acres). Approximately 179 acres are targeted for a combination of riverine restoration (49.6 acres), enhancement (91.6 acres), and preservation (37.8 acres). The remaining 52.8 acres of Phase II consists of non-hydric soils (25.7 acres) and areas considered non-restorable (27.1 acres). In 2005, hydrologic and vegetative monitoring continued for a fourth year in Phase II and continued for a fifth year in Phase I.

1.2 Purpose

In order to demonstrate successful mitigation, vegetative and hydrologic monitoring will be conducted for a minimum of five years. Success criteria were established by the Mitigation Bank Review Team (MBRT). The following report describes the results of the hydrologic and vegetation monitoring for Phase I and II during the 2006 growing season at the CWMB. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season and site photographs.

1.3 Project History

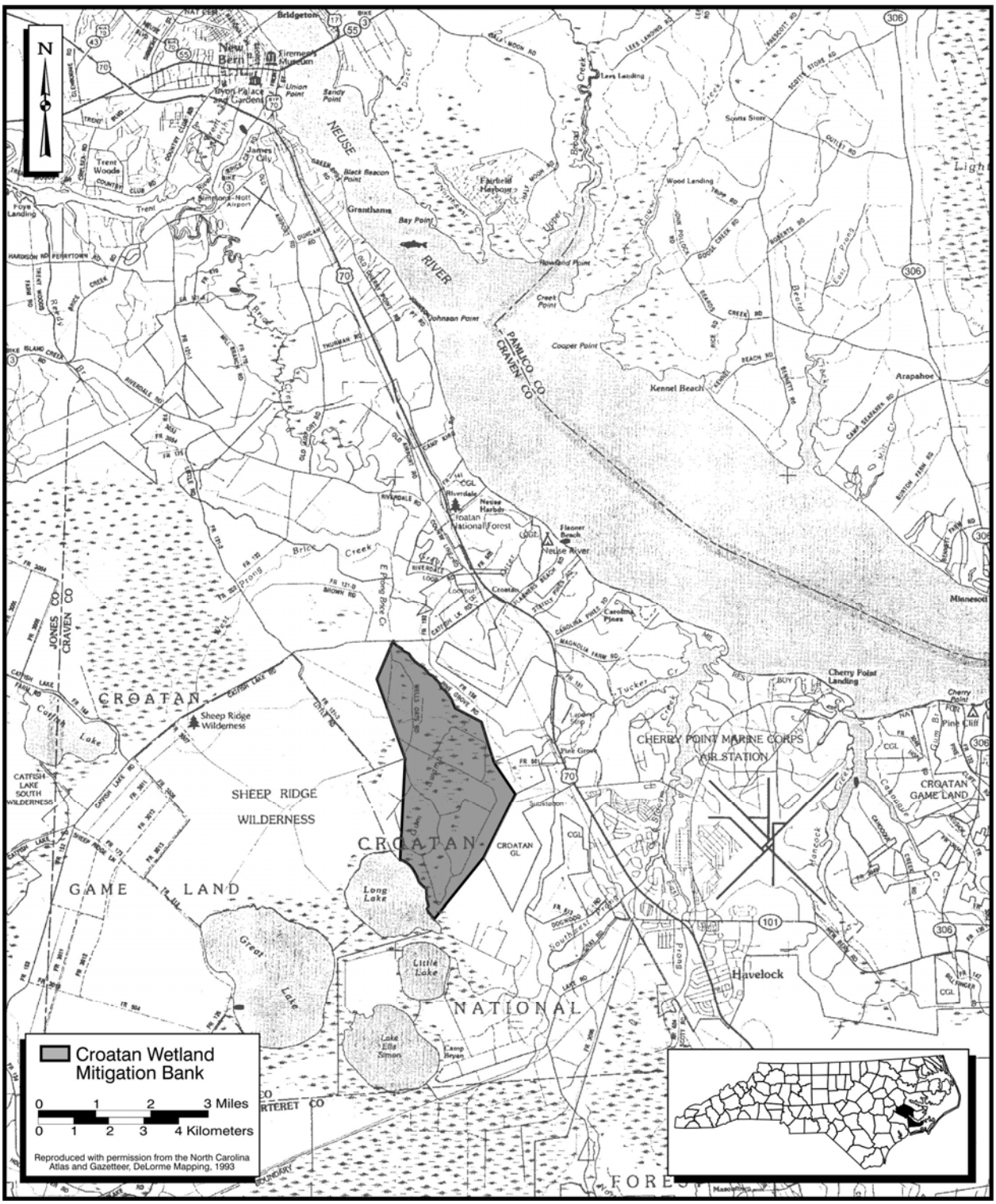
Phase I

1998-2000	Gauges Installed to Aid Delineation
November 2000	Drum-chopping of Phase I Planting Areas
December 2000	Herbicide of Phase I Planting Areas
February 2001	Planting of Phase I
September 2001 – February 2002	Construction of Phase I
February 2002	Additional Monitoring Gauges Installed
March – November 2002	Hydrologic Monitoring (1 yr.)
July 2002	Vegetation Monitoring (1 yr.)
March – November 2003	Hydrologic Monitoring (2 yr.)
August 2003	Vegetation Monitoring (2 yr.)
March – November 2004	Hydrologic Monitoring (3 yr.)
August 2004	Vegetation Monitoring (3 yr.)
March – November 2005	Hydrologic Monitoring (4 yr.)
August 2005	Vegetation Monitoring (4 yr.)
March – November 2006	Hydrologic Monitoring (5 yr.)
August 2006	Vegetation 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.)

Figure 1. Site Location Map



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 less than 5% are always classified as non-wetlands. Areas inundated between 5% and 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of hydrophytic vegetation and hydric soils.

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

Hydrologic success criteria will include both of the following:

1) inundation or saturation within 12 inches of the surface for at least 12.5% of the growing season for mineral soils and 25% of the growing season for organic soils and riverine restoration/enhancement areas (**Success Criterion 1**); and

2) the hydroperiod for restoration/enhancement areas shall be within 50% of reference saturation or inundation depth, duration and frequency for the first three years and shall be within 20% for years four and five (**Success Criterion 2**).

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

The growing season in Craven County begins March 18 and ends November 14. These dates correspond to a 50% probability that air temperatures will drop to 28° F or lower after March 18 and before November 14. Thus, the growing season is 242 days. A jurisdictional hydroperiod of 12.5% of the growing season is approximately 30 days. A jurisdictional hydroperiod of 25% of the growing season is approximately 60 days. However, the site must also experience average climatic conditions for the data to be valid. Use of reference gauge data collected concurrently with site data for evaluating success is expected to provide more meaningful means for evaluating success following initial site re-hydration regardless of rainfall conditions. Table 1 provides a summary of hydrologic success criteria.

Table 1. Expected Wetland Conditions 2006

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 %	80.2-100%	1, 2A, 2B, 3, 4A, 4B, 5, 6, 7, 8, 9, 10A, 10B, 11, 12A, 13A, 13B, 14, 15, 17
	Leaf (La)	≥ 12.5 %	28.9-75.2%	1, 2A, 2B, 3, 5, 6
	Leon (Ln)	≥ 12.5 %	8.3-20.7%	13B, 16, 18
	Murville (Mu)	≥ 12.5 %	80.2-100%	12A, 12B, 13A, 13B, 15, 16
	Pantego (Pa)	≥ 12.5 %	28.9-100%	1, 2B, 4B, 5, 6, 7, 8, 10B, 10C, 11, 12A, 12B, 13A, 13B, 14, 15, 16, 17, 18
	Rains (Ra)	≥ 12.5 %	12.8-100%	5, 6, 10B, 10C, 12A
Non-riverine, Organic	Croatan (CT)	≥ 25.0 %	12.4-100%	4B, 6, 8, 9, 10A, 10B, 10C, 11, 12B, 13A, 15, 16, 17, 18
	Dare (DA)	≥ 25.0 %	80.2-100%	16, 17
Riverine	Dorovan (DO)	≥ 25.0 %	80.2-100%	6
	Masontown/Muckalee (MM)	≥ 25.0 %	28.9-100%	5, 6

2.2 Hydrologic Description

Phase I construction was completed prior to the onset of the 2002 growing season. Phase I began monitoring for hydrologic success in 2002 and continued into 2005. Phase II construction was completed in the spring of 2002 and hydrologic monitoring began in the spring of 2003. Hydrologic monitoring was conducted in 2006 by Environmental Services, Inc. (ESI). In 2006, 286 monitoring gauges were monitored (**Figures 2a and 2b**). Gauges consist of a combination of Remote Data Systems (RDS) WL-20, WL-40, and Ecotone monitoring gauges. In addition, three 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); 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; however, Rain Gauges 3 and 4 malfunctioned in 2006, therefore the data for these two gauges could not be used. Data for Rain Gauge 2 were used for the entire site.

The CWMB is being tracked by riverine and non-riverine wetland restoration (R), enhancement (E), and preservation (P) areas (**Figures 2a and 2b**). The monitoring gauges installed throughout the CWMB between 1998 and 2000 were used to collect data in support of jurisdictional determinations and to assist in mitigation planning. 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 Map, Phase II

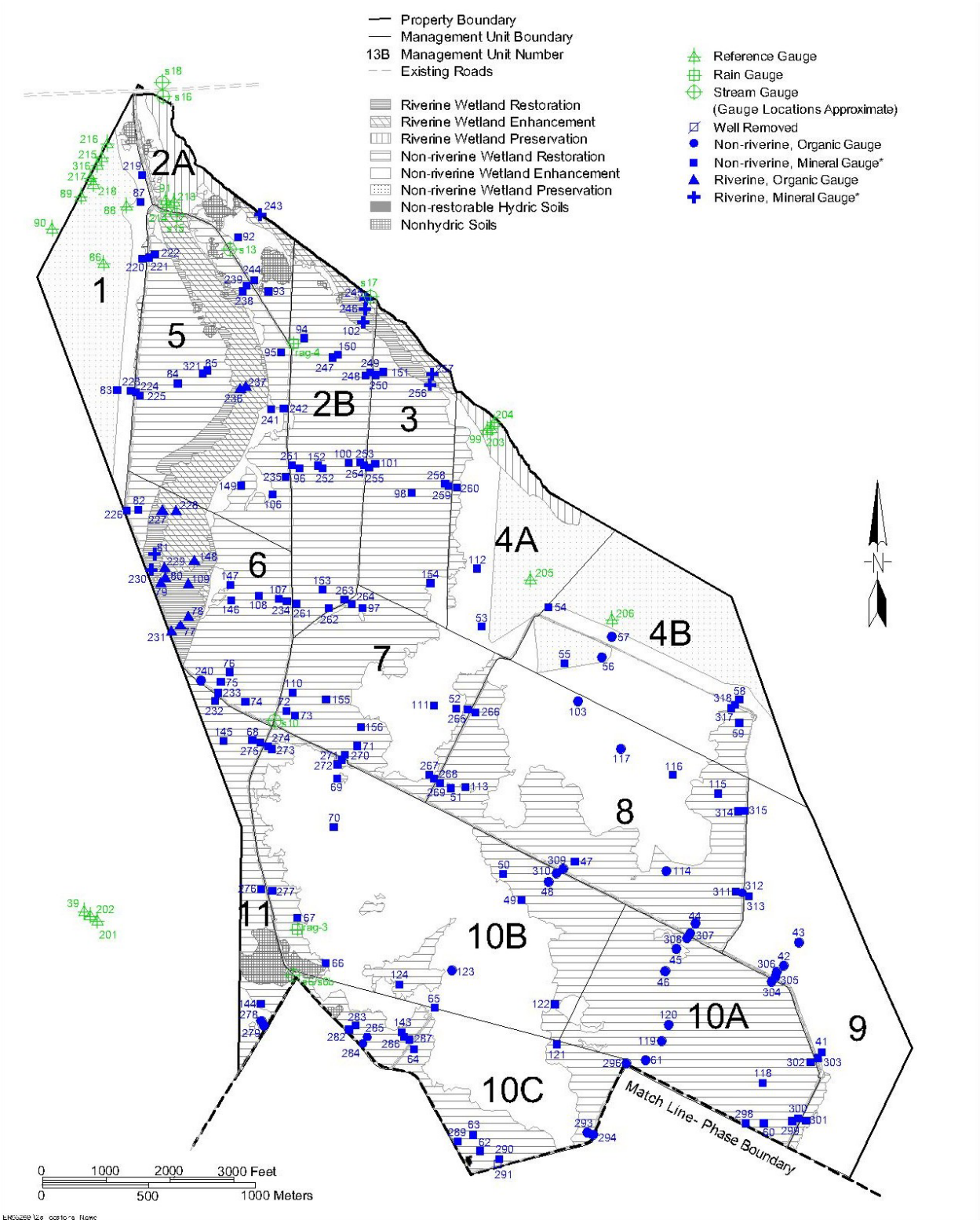


Figure 2b. Hydrologic Monitoring Gauge Location Map, Phase I

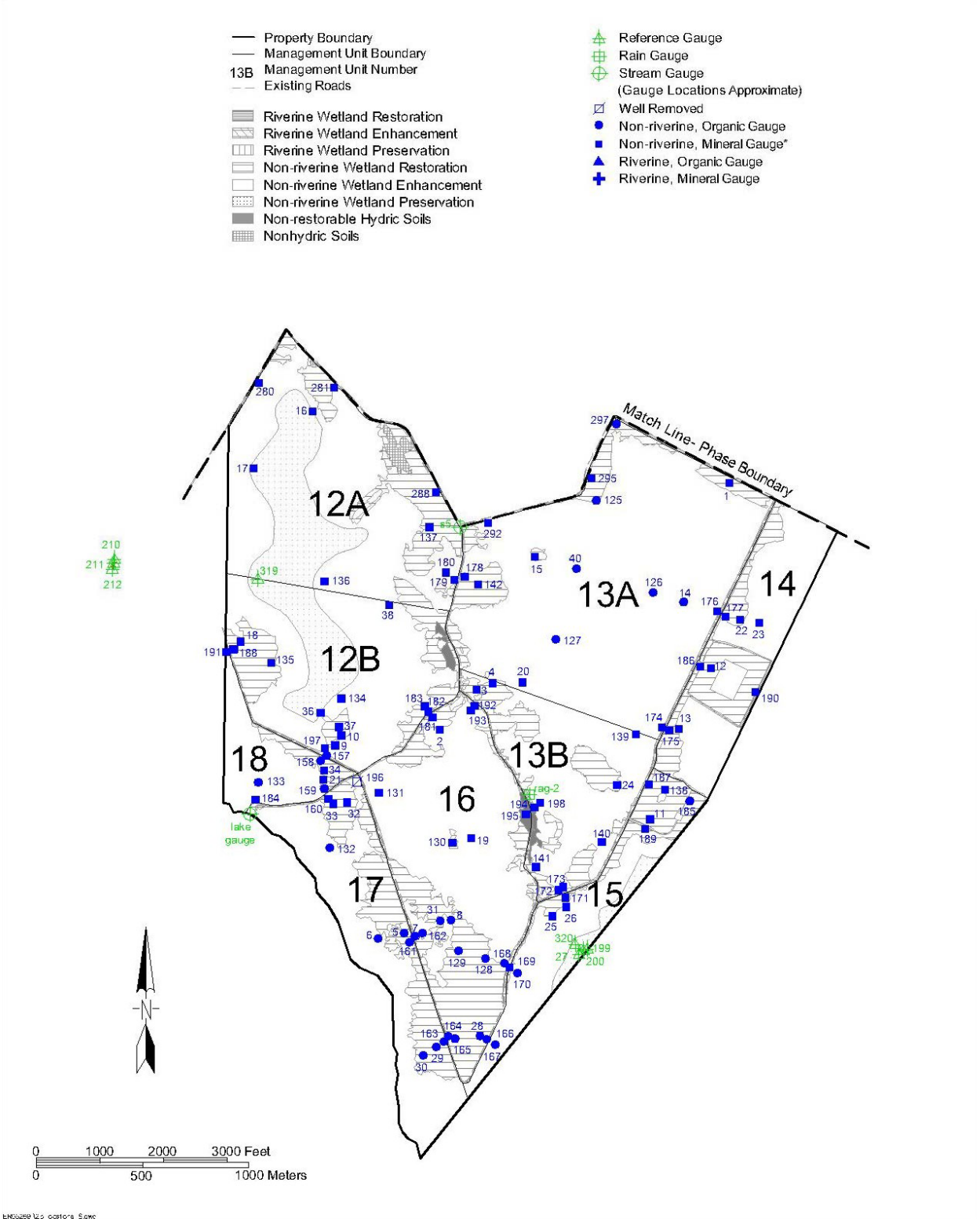


Table 2. Phase II (MU: 1-11) and I (MU: 12A-18) Gauge Locations

Phase II			
MU	**Location**	**Total # of Gauges**	**# of Gauges per Mitigation Type (NR, NE, NP,RR, RE, RP)[a]**
1	Northwestern portion of Phase II along western boundary	5 (+ 8 Reference)	NE–4, NP-1 + 8*
2A	Northern portion of Phase II adjacent to Catfish Lake Rd. and East Prong Brice Creek	4 (+3 Reference)	NR-1, NE-2, RE-1, and RP-3*
2B	North-central portion of Phase II east of 2A and west of 3	19	NR-17, RE-2
3	North-central portion of Phase II east of 2B and west of 4A	10	NR-7, NE-1, RE-1, RR-1
4A	North-central portion of Phase II east of 3 and west of 4B	3 (+4 Reference)	NR-1, NE-2, NP-1*, and RP-3*
4B	Northeastern portion of Phase II along the boundary north of transmission line	8 (+ 1 Reference)	NR-3, NE-3, and NP-2 + 1*
5	Northwestern portion of Phase II east of 1 and north of transmission line	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	9 (+1 Reference)	NR-4, NE-5, NP-1*
12B	Western portion of Phase I south of 12A	13	NR-9, NE-4
13A	Center of Phase I adjacent to the northern Phase I Boundary	15	NR-9, NE-6
13B	Center of Phase I south of 13A	10	NR-4, NE-6
14	Northeastern portion of Phase I along eastern boundary	8	NR-7, NE-1
15	Southeastern portion of Phase I south of 14	10 (+ 4 Reference)	NR-8, NE-2, and NP-4*
16	Center of Phase I south of 13B	20	NR-17, NE-3
17	Southeastern portion of Phase I adjacent to Long Lake	9 [c]	NR-8, NE-1
18	Southwestern portion of Phase I adjacent to Long Lake	7	NR-3, NE-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.
[c] Gauge 196 in MU 17 was removed due to safety concerns (alligator).
* Onsite Reference gauges

Appendix A contains a numerical list of all monitoring and reference gauges monitored in 2006. 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 2006 came from one onsite rain gauge (Rain Gauge 2).

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 years four and five.

Reference Gauges

Overall, the reference gauges met or exceeded the number of days and time of year for the high water table values published for each soil type in the Craven County soil survey.

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 years four and five (Appendix D).

For example, in 2006 all monitoring gauges within the Bayboro (mineral) soil series must have jurisdictional hydrology for 12.5% of the growing season in order to achieve Success Criterion 1. A gauge must also have jurisdictional hydrology between 194 and 242 days (80.2% to 100%) of the growing season to achieve Success Criterion 2. Thus, a gauge could achieve success for overall percentage of the growing season (Criterion 1), but not achieve the expected percentage of the Reference Range (Criterion 2).

Monitoring Gauges

Phase II is separated into 15 MUs, identified as MU 1 through 11 and Phase I is separated into nine MUs, identified as MU 12A through MU 18. Tables 3 through 26 and **Figures 3a and 3b** provide overviews of which monitoring gauges achieved hydrologic success. Each table lists gauges within each MU, the soil series in which the gauge is installed, mitigation type, expected jurisdictional hydroperiod, actual jurisdictional hydroperiod, and whether the gauge met both respective hydrologic success criteria.

Several of the monitoring gauges have missing data due to malfunctioning gauges. Where reasonable, ESI extrapolated 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 extrapolated the missing data based on comparison to data from a comparable gauge that exhibited similar groundwater levels and hydrographic responses to precipitation events. Missing data is discussed in the report relative to the largest number of consecutive days $\geq$ 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 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 3a. Hydrologic Monitoring Results 2006, Phase II

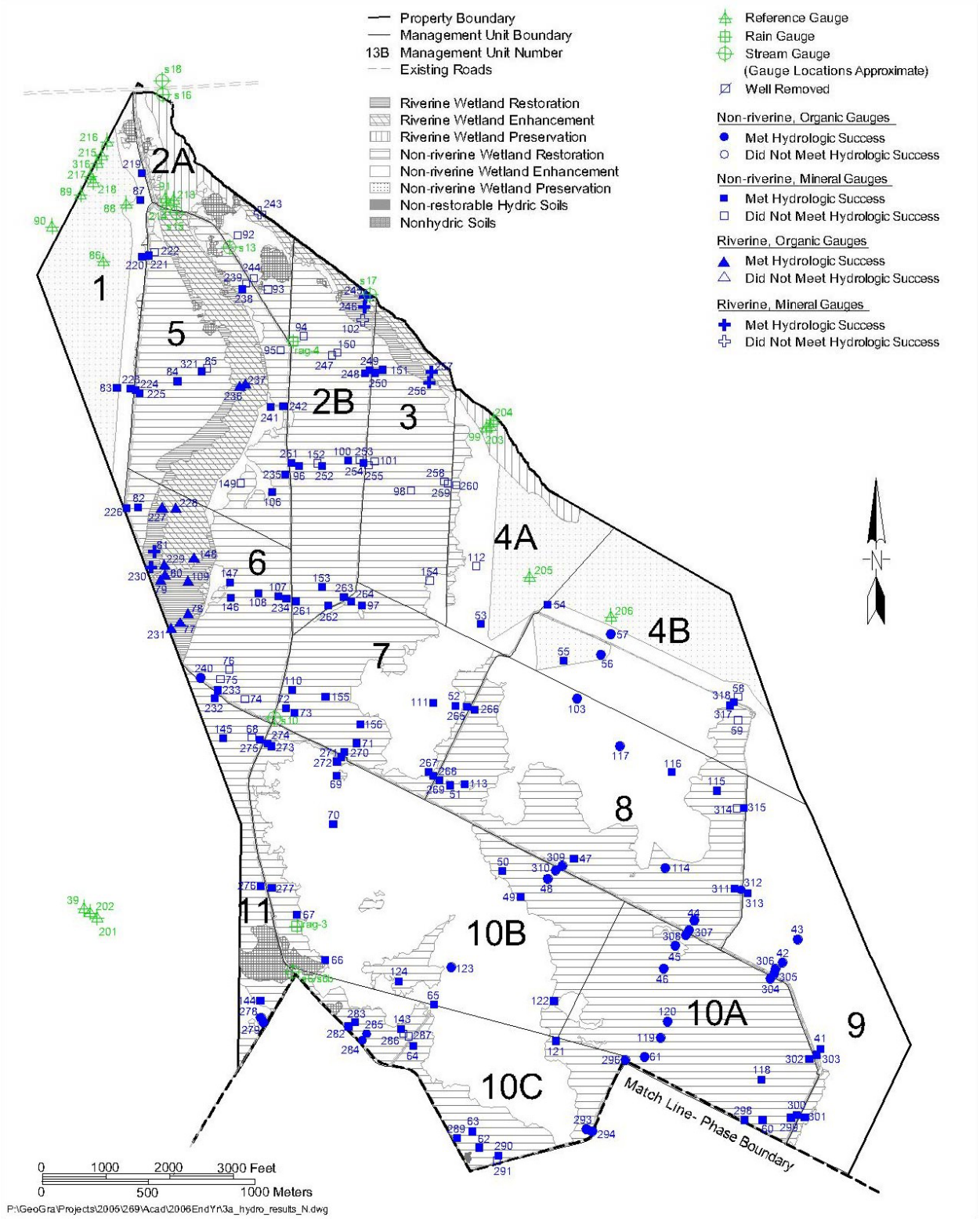


Figure 3b. Hydrologic Monitoring Results 2006, Phase I

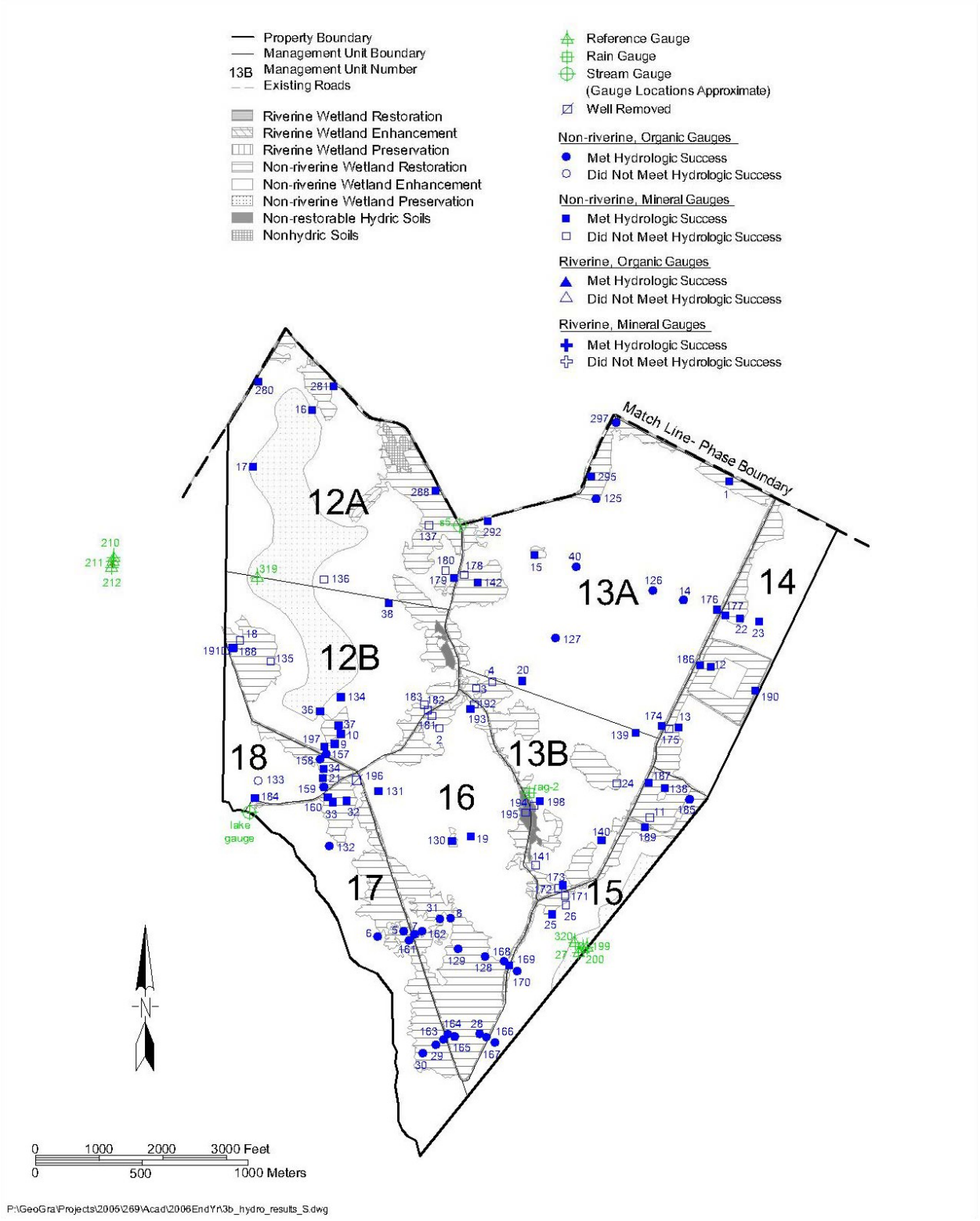


Table 3. Hydrologic Monitoring Results – MU 1

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	100	√	√	√
87	La/NE	36.4[b]	√	√	√
219	Ra/NE	63.2[b]	√	√	√
220	La/NE	62.0	√	√	√
223	Pa/NE	100	√	√	√

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

Table 3 MU 1 Discussion
March-November

All five monitoring gauges in MU 1 met both expected hydrologic success criteria for Year 4. Gauges 87 and 219 have missing data due to gauge malfunction.

Gauge 87 has recorded data for 66 consecutive days (27.3% of the growing season) and one data gap. Using adjacent data points and rainfall events to extrapolate missing data, it can be assumed that Gauge 87 would have made jurisdictional hydrology for approximately 36.4% of the growing season.

Gauge 219 has recorded data for 88 consecutive days (36.4%) and one data gap. Using adjacent data points and rainfall events to extrapolate missing data, it can be assumed that Gauge 219 would have made jurisdictional hydrology for approximately 63.2% of the growing season.

Due to the high rate of hydrologic success, ESI recommends that a portion of the gauges in MU 1 be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 83 and 223 should be considered for removal from hydrologic monitoring. The remaining gauges in MU 1 are located adjacent to existing roads or along transects where roads have been removed and these areas should be monitored through Year 5.

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	11.2	–	–	–
93	La/NR	7.9	–	–	–
244	La/NE	25.2	√	–	–
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
243	Ba/RE	62.4	√	–	–

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

Table 4 MU 2A Discussion
March-November
None of the four monitoring gauges in MU 2A met both expected hydrologic success criteria for Year 4.

Gauges 92 and 93 did not meet either of their expected hydrologic success criteria. In a year with normal rainfall the areas represented by Gauges 92 and 93 did not make 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. Additional mitigative measures may need to be addressed if jurisdictional hydrology is not restored in Year 5.

Gauge 243 met jurisdictional hydrology for a maximum continuous hydroperiod of 62.4% of the growing season and therefore met Success Criterion 1 for riverine mineral soils. However, Gauge 243 did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (80.2 - 100% 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 244 met jurisdictional hydrology for 25.2% 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 (28.9 - 100% 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.

Due to the low rate of hydrologic success, ESI recommends that all of the gauges in MU 2A be monitored through Year 5.

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	26.9	√	–	–
96	La/NR	100	√	√	√
100	La/NR	36.4	√	√	√
150	La/NR	11.2	–	–	–
152	Ba/NR	36.4	√	–	–
153	Ba/NR	100	√	√	√
247	La/NR	16.1	√	–	–
248	La/NR	36.4	√	√	√
249	La/NR	61.6	√	√	√
251	Ba/NR	100	√	√	√
252	Ba/NR	100[b]	√	√	√
253	Ba/NR	36.4	√	–	–
254	Ba/NR	100	√	√	√
261	Ba/NR	100	√	√	√
262	Ba/NR	100	√	√	√
263	Ba/NR	100	√	√	√
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
102	Ba/RR	4.6	–	–	–
245	Ba/RE	100	√	√	√
246	La/RE	36.4	√	√	√

[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 extrapolated from comparable gauges.

Table 5 MU 2B Discussion

March-November

Thirteen of the nineteen monitoring gauges in MU 2B met both expected hydrologic success criteria for Year 4. Gauge 252 has missing data due to gauge malfunction.

Gauge 94 made jurisdictional hydrology for 26.9% 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 (28.9 - 100% 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 normal rainfall conditions.

Gauges 152 and 253 each made jurisdictional hydrology for a maximum continuous hydroperiod of 36.4% of the growing season, and therefore met Success Criterion 1. However, these gauges did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (80.2 - 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 152 and 253, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauge 247 made jurisdictional hydrology for 16.1% of the growing season, and therefore met Success Criterion 1. However, Gauge 247 did not meet Success Criterion 2 (20% of Reference Range) for the Leaf soil series (28.9 - 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauge 247, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauges 102 and 150 did not meet either expected hydrologic success criteria. In a year with normal rainfall the areas represented by Gauges 102 and 150 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 252 has recorded data for 173 consecutive days (71.5%) and one data gap. Using nearby Gauge 254 and adjacent data points to extrapolate missing data, it can be assumed that Gauge 252 would have made jurisdictional hydrology for approximately 100% of the growing season.

The overall hydrologic success rate of MU 2B is not as high as other portions of Phase II. Therefore, ESI would recommend that all of the gauges in MU 2B be monitored through years four and five.

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	36.4	√	–	–
101	Ba/NR	36.4	√	–	–
151	La/NR	36.4	√	√	√
154	Ba/NE	58.7	√	–	–
250	La/NR	36.4	√	√	√
255	Ba/NR	36.4	√	–	–
258	Ba/NR	19.8	√	–	–
259	Ba/NR	19.8	√	–	–
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
256	Ba/RR	100	√	√	√
257	Ba/RE	100	√	√	√

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

Table 6 MU 3 Discussion

March-November

Four of the ten monitoring gauges in MU 3 met both expected hydrologic success criteria for Year 4.

Gauges 98, 101, 154, 255, 258, and 259 met jurisdictional hydrology for at least 12.5% of the growing season and therefore met Success Criterion 1. However, these gauges did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (80.2 - 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to these gauges, but were not successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions.

Due to the low rate of hydrologic success, ESI would recommend that all of the gauges in MU 3 be monitored through Year 5.

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	100	√	√	√
112	Ba/NE	36.4[b]	√	–	–
260	Ba/NR	19.4	√	–	–

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

Table 7 MU 4A Discussion
March-November

Only one of the three monitoring gauges (Gauge 53) in MU 4A met both expected hydrologic success criteria for Year 4. Gauge 112 has missing data due to gauge malfunction.

Gauge 112 has recorded data for 66 consecutive days (27.3 % of the growing season) and one data gap. Using nearby Gauge 112 and adjacent data points to extrapolate missing data, it can be assumed that Gauge 112 would have made jurisdictional hydrology for approximately 36.4% of the growing season.

Gauges 112 and 260 met jurisdictional hydrology for 36.4 and 19.4% of the growing season and therefore met Success Criterion 1. However, these gauges did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (80.2 - 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 112 and 260, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions.

Due to the low rate of hydrologic success, ESI recommends that all of the gauges in MU 4A continue to be monitored in Year 5.

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	100[b]	√	√	√
55	Ba/NE	100	√	√	√
58	Ba/NE	31.8	√	–	–
59	Ba/NR	62.0	√	–	–
317	Ba/NR	100	√	√	√
318	Ba/NR	100[b]	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
56	CT/NP	100	√	√	√
57	CT/NE	100[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 extrapolated from comparable gauges.

Table 8 MU 4B Discussion

March-November

Six of the eight monitoring gauges in MU 4B met both expected hydrologic success criteria for Year 4. Gauges 54, 57, and 318 have missing data due to gauge malfunction.

Gauges 58 and 59 met jurisdictional hydrology for 31.8 and 62.0% of the growing season and therefore met Success Criterion 1. However, these gauges did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (80.2 - 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 58 and 59, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauge 54 has recorded data for 118 consecutive days (48.8% of the growing season) and one data gap. Using Reference Gauge 206 to extrapolate missing data, it can be assumed that Gauge 54 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 57 has recorded data for 197 consecutive days (81.4%) and one data gap. Using nearby Reference Gauge 206 to extrapolate missing data, it can be assumed that Gauge 57 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 318 has recorded data for 140 consecutive days (57.9%) and one data gap. Using nearby Reference Gauge 206 to extrapolate missing data, it can be assumed that Gauge 318 would have made jurisdictional hydrology for approximately 100% of the growing season.

Due to the high rate of hydrologic success, ESI would recommend that a portion of the gauges in MU 4B be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 54, 55, and 56 should be considered for removal from hydrologic monitoring.

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	36.4	√	√	√
85	Pa/NR	11.2	–	–	–
95	La/NR	16.2	√	–	–
106	Ba/NE	100	√	√	√
149	Pa/NR	3.7	–	–	–
221	La/NR	100	√	√	√
222	La/NR	18.6	√	–	–
224	Pa/NR	100[b]	√	√	√
225	Pa/NR	100[b]	√	√	√
235	Ba/NR	100	√	√	√
238	Ra/NR	14.1	√	√	√
239	Ra/NR	11.2	–	–	–
241	Ra/NE	100	√	√	√
242	La/NR	100	√	√	√
321	Pa/NR	100[b]	√	√	√
Riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
236	MM/RR	33.5	√	√	√
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.

[b] Actual %: Missing data extrapolated from comparable gauges.

Table 9 MU 5 Discussion

March-November

Twelve of the seventeen monitoring gauges in MU 5 met both expected hydrologic success criteria for Year 4. Gauges 224, 225, and 321 have missing data due to gauge malfunction.

Gauges 95 and 222 made jurisdictional hydrology for 16.2 and 18.6% of the growing season, and therefore met Success Criterion 1. However, these gauges did not meet Success Criterion 2 (20% of Reference Range) for the Leaf soil series (28.9 – 75.2% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 95 and 222, but were not successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions.

Gauges 85, 149, and 239 did not meet either of expected hydrologic success criteria. In a year with normal rainfall, Gauges 85, 149, and 239 did not make jurisdictional hydrology. These gauges may be located on topographic highs. Additional measures may need to be addressed if jurisdictional hydrology is not restored in Year 5.

Gauge 224 has recorded data for 203 consecutive days (83.9% of the growing season) and one gap. Using nearby Gauge 225 to extrapolate missing data, it can be assumed that Gauge 224 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 225 has recorded data for 231 consecutive days (95.5% of the growing season) and one data gap. Using nearby Gauge 224 to extrapolate missing data, it can be assumed that Gauge 225 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 321 has recorded data for 180 consecutive days (74.4% of the growing season) and one data gap. Using rainfall data and adjacent data points to extrapolate missing data, it can be assumed that Gauge 321 would have made jurisdictional hydrology for approximately 100% of the growing season.

Due to the high rate of hydrologic success, ESI recommends that a portion of the gauges in MU 5 be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 224 and 225 should be considered for removal from hydrologic monitoring. The remaining gauges in MU 5 are located adjacent to existing roads or along transects where roads have been removed and these areas should be monitored through Year 5.

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	25.2[b]	√	–	–
75	Ba/NR	2.9	–	–	–
76	Ba/NR	3.7	–	–	–
82	Pa/NR	100	√	√	√
107	Ba/NR	100	√	√	√
108	Ba/NR	100	√	√	√
146	La/NR	36.4	√	√	√
147	Ba/NE	100[c]	√	√	√
226	Pa/NR	100	√	√	√
233	Ra/NR	36.4[c]	√	√	√
234	Ba/NR	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
240	CT/NR	100	√	√	√
Riverine, Mineral (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
81	Ba/RR	100[c]	√	√	√
230	Ba/RR	100	√	√	√

Table 10 Continues

Table 10 Concluded.

Riverine, Organic, 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**
77	CT/RE	100	√	√	√
78	MM/RR	100[c]	√	√	√
79	DO/RR	100[c]	√	√	√
80	DO/RR	100[c]	√	√	√
109	MM/RR	100[c]	√	√	√
148	MM/RE	100[c]	√	√	√
227	MM/RR	36.4	√	√	√
228	MM/RE	100	√	√	√
229	CT/RE	100	√	√	√
231	CT/RR	100	√	√	√

[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] Missing data could not be extrapolated with any degree of certainty.
[c] Actual %: Missing data extrapolated from comparable gauges.

Table 10 MU 6 Discussion

March-November

Twenty-one of the twenty-four monitoring gauges in MU 6 met both expected hydrologic success criteria for Year 4. Gauges 74, 78, 79, 80, 81, 109, 147, 148, and 233 have missing data due to gauge malfunction.

Gauge 74 has missing data during critical draw-down periods and the hydrograph for this gauge is too flashy to extrapolate missing data with any certainty. As a result, the hydroperiod reported is the longest for which data are available. Gauge 74 made jurisdictional hydrology for at least 25.2% 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 (80.2 - 100% 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. Additional measures may need to be addressed.

Gauge 78 has recorded data for 126 consecutive days (52.5% of the growing season) and two data gaps. Using nearby Gauges 80, 81, 229, and 230 to extrapolate missing data, it can be assumed that Gauge 78 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 79 has recorded data for 231 consecutive days (95.4% of the growing season) and two data gaps. Using nearby Gauges 81, 229, and 230 to extrapolate missing data, it can be assumed that Gauge 79 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 80 has recorded data for 238 consecutive days (98.4% of the growing season) and one data gap. Using nearby Gauges 79, 81, 229, and 230 to extrapolate missing data, it can be assumed that Gauge 80 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 81 has recorded data for 164 consecutive days (67.8% of the growing season) and one data gap. Using nearby Gauges 79, 80, 229, and 230 to extrapolate missing data, it can be assumed that Gauge 81 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 109 has recorded data for 101 consecutive days (41.7% of the growing season) and one data gap. Using Reference Gauges 99, 203, and 204 and rainfall events to extrapolate missing data, it can be assumed that Gauge 109 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 147 has recorded data for 139 consecutive days (57.4% of the growing season) and two data gaps. Using adjacent data points and rainfall events to extrapolate missing data, it can be assumed that Gauge 147 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 148 has recorded data for 198 consecutive days (81.8% of the growing season) and one data gap. Using nearby Gauge 109 and adjacent data points to extrapolate missing data, it can be assumed that Gauge 148 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 233 has recorded data for 66 consecutive days (27.3% of the growing season) and one data gap. Using nearby rainfall data and adjacent data points to extrapolate missing data, it can be assumed that Gauge 233 would have made jurisdictional hydrology for approximately 36.4% of the growing season.

Due to the high rate of hydrologic success, a portion of the gauges in MU 6 could be removed from hydrologic monitoring. However, the majority of the gauges in MU 6 are located in riverine wetland restoration areas or adjacent to existing roads. Therefore, all of the gauges in MU 6 should be monitored through Year 5.

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	100	√	√	√
71	Ba/NR	100	√	√	√
72	Ba/NR	100	√	√	√
73	Pa/NR	100	√	√	√
97	Ba/NR	100	√	√	√
110	Pa/NR	100[b]	√	√	√
111	Ba/NE	100[b]	√	√	√
155	Ba/NR	100	√	√	√
156	Ba/NR	100	√	√	√
264	Ba/NR	100	√	√	√
265	Ba/NR	100	√	√	√
267	Ba/NE	100[b]	√	√	√
268	Ba/NR	100[b]	√	√	√
270	Ba/NR	100	√	√	√

[a] Soils: Pa – Pantego and Ba – Bayboro.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Actual %: Missing data extrapolated 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 4. Gauges 110, 111, 267, and 268 have missing data due to gauge malfunction.

Gauge 110 has recorded data for 124 consecutive days (51.2% of the growing season) and one data gap. Using nearby Gauge 73 to extrapolate missing data, it can be assumed that Gauge 110 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 111 has recorded data for 103 consecutive days (42.6% of the growing season) and one data gap. Using rainfall data and adjacent data points to extrapolate missing data, it can be assumed that Gauge 111 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 267 has recorded data for 174 consecutive days (71.9% of the growing season) and one data gap. Using nearby Gauge 265 to extrapolate missing data, it can be assumed that Gauge 267 would have made jurisdictional hydrology for approximately 100% of the growing season.

Gauge 268 has recorded data for 230 consecutive days (95.0% of the growing season) and one data gap. Using nearby Gauge 270 to extrapolate missing data, it can be assumed that Gauge 268 would have made jurisdictional hydrology for approximately 100% of the growing season.

Due to the high rate of hydrologic success, ESI would recommend that a portion of the gauges in MU 7 be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 52, 111, 156, and 265 should be considered for removal from hydrologic monitoring.

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	100[b]	√	√	√
51	Ba/NE	100[b]	√	√	√
113	Ba/NE	100[b]	√	√	√
115	Pa/NR	100[b]	√	√	√
116	Pa/NE	100[b]	√	√	√
266	Ba/NR	100	√	√	√
269	Ba/NE	100	√	√	√
311	Ba/NR	100	√	√	√
314	Ba/NR	67.8	√	–	–
315	Ba/NR	100[b]	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
44	CT/NR	100	√	√	√
103	CT/NE	100	√	√	√
114	CT/NR	100	√	√	√
117	CT/NE	100	√	√	√
307	CT/NR	100	√	√	√
309	CT/NR	100	√	√	√
312	CT/NR	100[b]	√	√	√

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

Table 12 MU 8 Discussion

March-November

Sixteen of the seventeen monitoring gauges in MU 8 met both expected hydrologic success criteria for Year 4. Gauges 47, 51, 113, 115, 116, 312, and 315 have missing data due to gauge malfunction.

Gauge 314 made jurisdictional hydrology for a maximum continuous hydroperiod of 67.8% of the growing season, and therefore met Success Criterion 1. However, Gauge 314 did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (80.2 - 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology and enhancing the hydrology to Gauge 314, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauge 47 has recorded data for a minimum of 225 consecutive days (93.0%) and one data gap. Using rainfall data and adjacent data points to extrapolate the missing data, it can be assumed that Gauge 47 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 51 has recorded data for a minimum of 174 consecutive days (36.8%) and one data gap. Using nearby Gauge 269 to extrapolate the missing data, it can be assumed that Gauge 51 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 113 has recorded data for a minimum of 210 consecutive days (86.8%) and one data gap. Using nearby Gauge 266 to extrapolate the missing data, it can be assumed that Gauge 113 would have made jurisdictional hydrology 100% of the growing season.

Gauge 115 has recorded data for a minimum of 129 consecutive days (53.3%) and one data gap. Using nearby Gauge 116 to extrapolate the missing data, it can be assumed that Gauge 115 would have made jurisdictional hydrology for 100% of the growing season.

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

Gauge 312 has recorded data for a minimum of 174 consecutive days (71.9%) and one data gap. Using nearby Gauges 311 and 313 to extrapolate the missing data, it can be assumed that Gauge 312 would have made jurisdictional hydrology 100% of the growing season.

Gauge 315 has recorded data for a minimum of 207 consecutive days (85.5%) and one data gap. Using nearby Gauge 314 to extrapolate the missing data, it can be assumed that Gauge 315 would have made jurisdictional hydrology 100% of the growing season.

Due to the high rate of hydrologic success, ESI would recommend that a portion of the gauges in MU 8 be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 47, 103, 113, 114, 117, 266, and 309 should be considered for removal from hydrologic monitoring.

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	100	√	√	√
301	Ba/NR	100	√	√	√
303	Ba/NR	100	√	√	√
313	Ba/NE	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
42	CT/NE	67.8	√	√	√
43	CT/NE	67.4	√	√	√
305	CT/NR	100	√	√	√
306	CT/NE	100[b]	√	√	√

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

Table 13 MU 9 Discussion

March-November

All eight monitoring gauges in MU 9 met both expected hydrologic success criteria for Year 4. Gauge 306 has missing data due to gauge malfunction.

Gauge 306 has recorded data for a minimum of 206 consecutive days (85.1%) and two data gaps. Using nearby Gauge 305 to extrapolate the missing data, it can be assumed that Gauge 306 would have made jurisdictional hydrology for 100% of the growing season.

Due to the high rate of hydrologic success, ESI recommends that a portion of the gauges in MU 9 be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 41, 301, and 303 should be considered for removal from hydrologic monitoring.

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	100	√	√	√
118	Ba/NR	100	√	√	√
298	Ba/NR	100	√	√	√
299	Ba/NR	100	√	√	√
300	Ba/NR	100	√	√	√
302	Ba/NR	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
45	CT/NR	100[b]	√	√	√
46	CT/NR	100	√	√	√
61	CT/NR	100	√	√	√
119	CT/NR	71.1	√	√	√
120	CT/NR	100	√	√	√
296	CT/NR	100	√	√	√
304	CT/NR	100[b]	√	√	√
308	CT/NR	100	√	√	√

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

Table 14 MU 10A Discussion

March-November

All fourteen monitoring gauges in MU 10A met both expected hydrologic success criteria for Year 4. Gauges 45 and 304 have missing data due to gauge malfunction.

Gauge 45 has recorded data for a minimum of 197 consecutive days (81.4%) and two data gaps. Using nearby Gauge 61 to extrapolate the missing data, it can be assumed that Gauge 45 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 304 has recorded data for a minimum of 190 consecutive days (78.5%) and one data gap. Using nearby Gauge 305 to extrapolate the missing data, it can be assumed that Gauge 304 would have made jurisdictional hydrology for 100% of the growing season.

Due to the high rate of hydrologic success, ESI recommends that a portion of the gauges in MU 10A be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 120, 299, 300, and 302 should be considered for removal from hydrologic monitoring.

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	100	√	√	√
50	Ba/NR	100	√	√	√
65	Pa/NE	100	√	√	√
66	Ra/NE	100[b]	√	√	√
67	Pa/NR	100[b]	√	√	√
69	Ba/NR	100[b]	√	√	√
70	Ba/NE	100[b]	√	√	√
122	Pa/NR	100	√	√	√
124	Pa/NR	36.8	√	√	√
271	Ba/NR	100	√	√	√
272	Ba/NR	100	√	√	√
273	Ba/NR	100	√	√	√
274	Ba/NR	100	√	√	√
277	Ra/NR	17.8	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
48	CT/NR	100	√	√	√
123	CT/NE	100	√	√	√
310	CT/NR	100	√	√	√

[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 extrapolated from comparable gauges.

Table15 MU 10B Discussion

March-November

All seventeen monitoring gauges in MU 10B met both expected hydrologic success criteria for Year 4. Gauges 66, 67, 69, and 70 have missing data due to gauge malfunction.

Gauge 66 has recorded data for a minimum of 107 consecutive days (44.2%) and two data gaps. Using adjacent data points and rainfall events to extrapolate the missing data, it can be assumed that Gauge 66 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 67 has recorded data for a minimum of 88 consecutive days (36.4%) and one data gap. Using nearby Gauge 65 to extrapolate the missing data, it can be assumed that Gauge 67 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 69 has recorded data for a minimum of 208 consecutive days (86.0%) and one data gap. Using nearby Gauge 70 to extrapolate the missing data, it can be assumed that Gauge 69 would have made jurisdictional hydrology for 38.0% of the growing season.

Gauge 70 has recorded data for a minimum of 174 consecutive days (71.9%) and one data gap. Using nearby Gauge 69 to extrapolate the missing data, it can be assumed that Gauge 70 would have made jurisdictional hydrology for 100% of the growing season.

Due to the high rate of hydrologic success, ESI recommends that a portion of the gauges in MU 10B be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 48, 49, 50, 122, and 310 should be considered for removal from hydrologic monitoring.

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	16.1	√	√	√
63	Pa/NR	100	√	√	√
64	Ra/NR	36.8	√	√	√
121	Pa/NR	100	√	√	√
143	Pa/NR	100	√	√	√
282	Pa/NR	100	√	√	√
283	Pa/NR	100	√	√	√
286	Ra/NR	3.3	–	–	–
287	Ra/NR	3.3	–	–	–
289	Pa/NR	36.4	√	√	√
290	Pa/NR	100	√	√	√
291	Pa/NR	19.4	√	–	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
284	CT/NR	100[b]	√	√	√
285	CT/NR	100	√	√	√
293	CT/NR	100	√	√	√
294	CT/NR	100	√	√	√

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

Table 16 MU 10C Discussion

March-November

Thirteen of the sixteen monitoring gauges in MU 10C met both expected hydrologic success criteria for Year 4. Gauge 284 has missing data due to gauge malfunction.

Gauge 284 has recorded data for a minimum of 160 consecutive days (66.1%) and two data gaps. Using nearby Gauge 285 to extrapolate the missing data, it can be assumed that Gauge 284 would have made jurisdictional hydrology for 100% of the growing season.

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 (28.9 - 100% 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.

Due to the high rate of hydrologic success, ESI recommends that a portion of the gauges in MU 10C be removed and leave gauges in representative areas to be monitored through Year 5. Gauges 121, 293 and 294 should be considered for removal from hydrologic monitoring. The majority of the remaining gauges in MU 10C are adjacent to existing roads or in transects along removed roads. These areas should be monitored through Year 5.

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	36.4	√	–	–
144	Pa/NR	36.4	√	√	√
145	Ba/NR	100	√	√	√
232	Ra/NR	36.4	√	√	√
275	Ba/NR	100	√	√	√
276	Ra/NR	19.8	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
278	CT/NE	100	√	√	√
279	CT/NR	100[b]	√	√	√

[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 extrapolated 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 4. Gauge 279 has missing data due to gauge malfunction.

Gauge 68 made jurisdictional hydrology for 36.4% of the growing season, and therefore met Success Criterion 1. However, Gauge 68 did not meet Success Criterion 2 (20% of Reference Range) for the Bayboro soil series (80.2 - 100% of the growing season). Mitigative measures appear to be successful at returning jurisdictional hydrology and enhancing the hydrology to Gauge 68, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauge 279 has recorded data for a minimum of 193 consecutive days (79.8%) and one data gap. Using nearby Gauges 278 to extrapolate the missing data, it can be assumed that Gauge 279 would have made jurisdictional hydrology for 100% of the growing season.

Due to the high rate of hydrologic success, a portion of the gauges in MU 11 could be considered for removal. However, the majority of the gauges in MU 11 are adjacent to existing roads and these areas should be monitored through Year 5.

Table 18. Hydrologic Monitoring Results – MU 12A

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥12.5% of Growing Season; ≤ 20% of Reference Range)					
16	Pa/NE	100	√	√	√
17	Pa/NP	100[b]	√	√	√
136	Mu/NE	67.8	√	–	–
137	Mu/NR	3.7	–	–	–
179	Pa/NR	100	√	√	√
180	Ba/NE	36.8	√	–	–
280	Pa/NE	100	√	√	√
281	Ra/NE	71.1[c]	√	√	√
288	Ra/NR	36.4	√	√	√

[a] Soils: Pa – Pantego, Mu – Murville, Ba – Bayboro, and Ra - Rains.
Mitigation Types: Non-riverine Restoration – NR, Non-riverine Enhancement – NE, and Non-riverine Preservation – NP.
[b] Actual %: Missing data extrapolated from comparable gauges.
[c] Missing data could not be extrapolated with any degree of certainty.

Table 18 MU 12A Discussion

March-November

Six of the nine monitoring gauges in MU 12A met both expected hydrologic success criteria for Year 5. Gauges 17 and 281 have missing data due to gauge malfunction.

Gauge 17 has recorded data for a minimum of 234 consecutive days (96.7%) and one data gap. Using Gauge 16 to extrapolate the missing data, it can be assumed that Gauge 17 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 136 made jurisdictional hydrology for a maximum continuous hydroperiod of 67.8% 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 Murville soil series (80.2 - 100% of the growing season) due to two minor, brief drops below 12 inches. Gauge 136 still achieved jurisdictional hydrology for more than 98% of the growing season cumulatively. Mitigative measures appear to be successful at returning jurisdictional hydrology and enhancing the hydrology to Gauge 136, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions, based on single hydroperiod.

Gauge 137 did not meet either of its expected hydrologic success criteria established for the Murville soil series for Year 5. In a year with normal rainfall the area around this gauge did not make jurisdictional hydrology. Gauge 137 may be located on a topographic high. Additional measures may need to be addressed for the areas around this gauge.

Gauge 180 made jurisdictional hydrology for a maximum continuous hydroperiod of 36.8% 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 (80.2 - 100% of the growing season). Mitigative measures appear to be successful at enhancing the hydrology to Gauge 180, but were not successful at returning the gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauge 281 has missing data during critical draw-down periods and the hydrograph for this gauge is too flashy to extrapolate missing data with any certainty. As a result, the hydroperiod reported is the longest for which data are available, but this was sufficient to document success.

Overall 2002-2006

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 12A. The only area of concern in MU 12A is the area represented by Gauge 137. Gauge 137 has failed to meet hydrologic success during any of the five years of monitoring. This gauge site should be reviewed to determine the extent of the non-jurisdictional area surrounding Gauge 137 and a contingency plan developed for the areas that have not been returned to jurisdictional status.

Gauge 136 met both success criteria in 2003 and 2004 (years 2 and 3), and was close to achieving success in 2006 (jurisdictional hydrology cumulatively greater than 98% of the growing season, interrupted by two minor, brief falls below 12 inches). Gauge 180 met both success criteria in 2003 through 2005 (years 2 through 4). Both gauges are in enhancement areas and should be compared against baseline data, which documents increased hydroperiods.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 12A should be considered for removal.

Table 19. Hydrologic Monitoring Results – MU 12B

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 20% of Reference Range)					
9	Pa/NR	67.8	√	√	√
10	Pa/NR	71.1	√	√	√
18	Pa/NR	19.8	√	–	–
36	Pa/NE	100	√	√	√
37	Pa/NR	67.8	√	√	√
38	Mu/NE	100	√	√	√
134	Pa/NE	100	√	√	√
135	Pa/NR	18.6	√	–	–
182	Mu/NR	5.4	–	–	–
183	Mu/NR	5.8	–	–	–
188	Pa/NR	36.6	√	√	√
197	Pa/NE	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
157	CT/NR	100[b]	√	√	√

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

Table 19 MU 12B Discussion

March-November

Nine of the thirteen monitoring gauges in MU 12B met both expected hydrologic success criteria for Year 5. Gauge 157 has missing data due to gauge malfunction.

Gauges 18 and 135 made jurisdictional hydrology for 19.8 and 18.6% of the growing season, and therefore met Success Criterion 1. Neither of the gauges met Success Criterion 2 (20% of Reference Range) for the Pantego soil series (28.9 - 100% of the growing season).

Gauge 157 has recorded data for a minimum of 172 consecutive days (71.1%) and one data gap. Using rainfall data and adjacent data points to extrapolate the missing data, it can be assumed that Gauge 157 would have made jurisdictional hydrology for 100% of the growing season.

Gauges 182 and 183 did not meet either of their expected hydrologic success criteria, but did achieve hydroperiods between 5 and 12.5% of the growing season. These gauges are located adjacent to the north-south ditch that maintains the main access road. Point-plugs instead of reach-plugs were used to fill this ditch. The point-plugs may be successful at returning jurisdictional hydrology to some areas within the zone of influence of the ditch and not in others. The ditch adjacent to 182 and 183 may still have a zone of influence extending a greater distance off the ditch than can be measured with existing gauges.

Overall 2002-2006

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 12B. The areas of concern in MU 12B are the areas where gauges (Gauges 18, 135, 182, and 183) are located adjacent to ditches that maintain the access roads. Point-plugs instead of reach-plugs were used to fill these ditches.

Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 18 and 135, which are in restoration areas, but were not successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions. Credit should be evaluated for restoring jurisdictional status to the previously non-jurisdictional area around Gauges 18 and 135. Gauges 182 and 183 have failed to meet jurisdictional hydrology. These areas should be reviewed to determine the extent of the non-jurisdictional area surrounding these gauge sites and a contingency plan developed 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 12B should be considered for removal.

Table 20. Hydrologic Monitoring Results – MU 13A

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 20% of Reference Range)					
1	Ba/NR	100	√	√	√
15	Pa/NR	100	√	√	√
20	Pa/NE	100	√	√	√
142	Pa/NR	36.8[b]	√	√	√
174	Ba/NR	100[c]	√	√	√
176	Ba/NR	100	√	√	√
178	Mu/NR	71.1[b]	√	–	–
292	Pa/NE	71.1	√	√	√
295	Pa/NR	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
14	CT/NE	100[c]	√	√	√
40	CT/NE	100	√	√	√
125	CT/NR	100[c]	√	√	√
126	CT/NE	100	√	√	√
127	CT/NE	100	√	√	√
297	CT/NR	100	√	√	√

[a] Soils: Ba – Bayboro, Pa – Pantego, Mu – Murville, and CT – Croatan.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Missing data could not be extrapolated with any degree of certainty.
[c] Actual %: Missing data extrapolated from comparable gauges.

Table 20 MU 13A Discussion

March-November

Fourteen of the fifteen monitoring gauges in MU 13A met both expected hydrologic success criteria for Year 5. Gauges 14, 125, 142, 174, and 178 have missing data due to gauge malfunction.

Gauges 142 and 178 have missing data during critical draw-down periods and the hydrographs for these gauges are too flashy to extrapolate missing data with any certainty. As a result, the hydroperiod reported is the longest for which data are available.

Gauge 14 has recorded data for a minimum of 138 consecutive days (57.0%) and two data gaps. Using Gauge 126 to extrapolate the missing data, it can be assumed that Gauge 14 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 125 has recorded data for a minimum of 102 consecutive days (42.2%) and one data gap. Using Gauge 126 to extrapolate the missing data, it can be assumed that Gauge 125 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 174 has recorded data for a minimum of 139 consecutive days (57.4%) and one data gap. Using rainfall data and adjacent data points to extrapolate the missing data, it can be assumed that Gauge 174 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 178 made jurisdictional hydrology for an estimated 71.7% of the growing season, and therefore met Success Criterion 1. However, due to extensive gaps, critical data could not be extrapolated with any certainty. This gauge responded in a similar fashion to Gauge 292, though in a less flashy way. Based on this comparison, a single brief drop below 12 inches may have occurred in late May. This gauge did not appear to meet Success Criterion 2 (20% of Reference Range) for the Murville soil series (80.2 - 100% of the growing season). Gauge 178 met both Succes Criteria in 2002 through 2005 (years 1 through 4), and should be successfully restored.

Overall 2002-2006

Mitigative measures in MU 13A have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 13A should be considered for removal.

Table 21. Hydrologic Monitoring Results – MU 13B

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 20% of Reference Range)					
3	Mu/NR	6.2[b]	–	–	–
4	Mu/NR	16.1	√	–	–
24	Mu/NR	7.0	–	–	–
139	Ba/NE	100[c]	√	√	√
140	Pa/NE	70.1	√	√	√
141	Pa/NE	17.8	√	–	–
172	Ba/NR	36.8	√	–	–
173	Ba/NE	100	√	√	√
194	Mu/NE	20.7	√	–	–
198	Ln/NE	28.1	√	√	√[d]

[a] Soils: Ba – Bayboro, Pa – Pantego, Mu – Murville, and Ln - Leon.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Missing data could not be extrapolated with any degree of certainty.
[c] Actual %: Missing data extrapolated from comparable gauges.
[d] Gauge exceeds 20% of reference range.

Table 21 MU 13B Discussion

March-November

Four of the ten monitoring gauges in MU 13B met both expected hydrologic success criteria for Year 5. Gauges 3 and 24 did not meet either expected hydrologic success criteria for Year 5, but did achieve hydroperiods between 5 and 12.5% of the growing season. Gauges 3 and 139 have missing data due to gauge malfunction.

Gauge 3 has missing data during critical draw-down periods and the hydrograph for this gauge is too flashy to extrapolate missing data with any certainty. As a result, the hydroperiod reported is the longest for which data are available.

Gauges 3 and 24 did not meet either of their expected hydrologic success criteria. In a year with normal rainfall Gauges 3 and 24 did not make jurisdictional hydrology. These gauges are located on topographic highs. Additional measures may need to be addressed.

Gauges 4 and 194 made jurisdictional hydrology for 16.1 and 20.7% of the growing season, and therefore met Success Criterion 1. Neither of the gauges met Success Criterion 2 (20% of reference) for the Murville soil series (80.2 to 100% of the growing season).

Gauge 141 made jurisdictional hydrology for 17.8% of the growing season, and therefore met Success Criterion 1. However, Gauge 141 did not meet Success Criterion 2 (20% of reference) for the Pantego soil series (28.9 to 100% of the growing season).

Gauge 172 made jurisdictional hydrology for a maximum continuous hydroperiod of 36.8% of the growing season, and therefore met Success Criterion 1. However, Gauge 172 did not meet Success Criterion 2 (20% of reference) for the Bayboro soil series (80.2 to 100% of the growing season). Gauge 172 dropped below 12 inches briefly on two occasions and cumulatively met jurisdictional hydrology for more than 99% of the growing season.

Gauge 194 made jurisdictional hydrology for 20.7% of the growing season, and therefore met Success Criterion 1. However, Gauge 194 did not meet Success Criterion 2 (20% of reference) for the Murville soil series (80.2 to 100% of the growing season).

Gauge 139 has recorded data for a minimum of 139 consecutive days (57.4%) and one data gap. Using Gauge 173 to extrapolate the missing data, it can be assumed that Gauge 139 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 198 made jurisdictional hydrology for 28.1% of the growing season, and therefore met both expected hydrology success criterion. However, Gauge 198 exceeded Success Criterion 2 (20% of Reference Range).

Overall 2002-2006

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for portions of MU 13B, which is a complex of sandy areas interspersed with sloughs. The areas of concern in MU 13B are the areas where gauges are located adjacent to ditches that maintain the access roads. Point-plugs instead of reach-plugs were used to fill these ditches. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 4, 141, 172, and 194 but have not been successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions. Gauges 3 and 24 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.

Gauge 172 met both success criteria from 2002 through 2004 (years 1 through 3) and was close to achieving success in 2006 (jurisdictional hydrology cumulatively greater than 99% of the growing season, interrupted by two minor, brief falls to or below 12 inches). Gauge 172 should be considered for success.

Due to the completion of five years of monitoring, the gauges in MU 13B should be considered for removal following resolution of how to address the unsuccessfully restored areas. The lower end of the road spur remaining along the southwestern boundary of MU 13B may be evaluated for remedial actions to determine whether removal of roadbed or addition of drains may facilitate transport of surface or groundwater into the southern and eastern portions of MU 13B.

Table 22. Hydrologic Monitoring Results – MU 14

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 20% of Reference Range)					
12	Pa/NR	100	√	√	√
13	Ba/NR	100	√	√	√
22	Pa/NR	100	√	√	√
23	Pa/NE	100[b]	√	√	√
175	Ba/NR	7.0[c]	–	–	–
177	Pa/NR	100	√	√	√
186	Pa/NR	100	√	√	√
190	Pa/NR	100	√	√	√

[a] Soils: Ba – Bayboro and Pa – Pantego.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.
[b] Actual %: Missing data extrapolated from comparable gauges.
[c] Missing data could not be extrapolated with any degree of certainty.

Table 22 MU 14 Discussion
March-November
Seven of the eight monitoring gauges in MU 14 met both expected hydrologic success criteria for Year 5. Gauges 23 and 175 have missing data due to gauge malfunction.

Gauge 23 has recorded data for a minimum of 138 consecutive days (57.0%) and one data gap. Using nearby Gauge 22 to extrapolate the missing data, it can be assumed that Gauge 23 would have made jurisdictional hydrology for 100% of the growing season.

Gauge 175 has missing data during critical draw-down periods and the hydrograph for this gauge is too flashy to extrapolate missing data with any certainty and appears to be corrupted. As a result, the hydroperiod reported is the longest for which data are available.

Gauge 175 did not meet either expected hydrologic success criteria. In a year with normal rainfall Gauge 175 did not make jurisdictional hydrology. The gauge is located adjacent to reach-filled ditches where the road has been removed. The jurisdictional hydrology for this gauge site may differ from surrounding gauges due to a small zone of influence in the removed roadbed and ditch or they may be on a topographic high.

Overall 2002-2006
Mitigative measures in MU 14 have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range.

Gauge 175 appears to have corrupted data for 2006. This gauge met both success criteria from 2002 through 2005 (years 1 through 4) and should be closely evaluated to determine why success criteria were not met in 2006.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 14 should be considered for removal.

Table 23. Hydrologic Monitoring Results – MU 15

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 20% of Reference Range)					
11	Pa/NR	7.4	–	–	–
25	Pa/NR	36.8	√	√	√
26	Mu/NR	36.4	√	–	–
138	Pa/NR	100	√	√	√
171	Ba/NR	36.4	√	–	–
187	Ba/NR	100	√	√	√
189	Pa/NR	36.4	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
167	CT/NE	100	√	√	√
170	CT/NE	100	√	√	√
185	CT/NR	100	√	√	√

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

Table 23 MU 15 Discussion

March-November

Seven of the ten monitoring gauges in MU 15 met both expected hydrologic success criteria for Year 5.

Gauge 11 did not meet either of its expected hydrologic success criteria. In a year with normal rainfall Gauge 11 did not make jurisdictional hydrology.

Gauge 26 made jurisdictional hydrology for at least 12.5% of the growing season, and therefore met Success Criterion 1. However, Gauge 26 did not meet Success Criterion 2 (20% of reference) for the Murville soil series (80.2 to 100% of the growing season) due to two slight, brief drops below 12 inches. Gauge 26 cumulatively met jurisdictional hydrology for more than 98% of the growing season.

Gauge 171 made jurisdictional hydrology for at least 12.5% of the growing season, and therefore met Success Criterion 1. However, Gauge 171 did not meet Success Criterion 2 (20% of reference) for the Bayboro soil series (80.2 to 100% of the growing season) due to two slight, brief drops below 12 inches. Gauge 171 cumulatively met jurisdictional hydrology for more than 98% of the growing season.

Overall 2002-2006

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 15. Areas of concern in MU 15 are the areas represented by Gauges 11, 26, and 171. These gauges are located adjacent to ditches that maintain the access roads. Point-plugs instead of reach-plugs were used to fill these ditches. Mitigative measures appear to be successful at returning jurisdictional hydrology to these gauge sites, but were not successful at returning this gauge site to within 20% of reference conditions under the normal rainfall conditions.

Gauges 26 and 171 met both success criteria from 2002 through 2004 (years 1 through 3) and were close to achieving success in 2006 (jurisdictional hydrology cumulatively greater than 98% of the growing season, both interrupted by two slight, brief drops below 12 inches). Gauges 26 and 171 should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 15 should be considered for removal.

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Table 24. Hydrologic Monitoring Results – MU 16

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 20% of Reference Range)					
2	Mu/NE	28.1	√	–	–
19	Pa/NE	100	√	√	√
130	Pa/NR	100	√	√	√
131	Mu/NE	100	√	√	√
169	Pa/NR	100	√	√	√
181	Mu/NR	17.8	√	–	–
192	Mu/NR	36.8	√	–	–
193	Mu/NR	100	√	√	√
195	Ln/NR	7.8	–	–	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
7	CT/NR	100	√	√	√
8	CT/NR	100	√	√	√
28	DA/NR	100	√	√	√
31	CT/NR	100	√	√	√
128	CT/NR	100	√	√	√
129	CT/NR	100	√	√	√
162	CT/NR	100	√	√	√
164	CT/NR	100	√	√	√
165	CT/NR	100	√	√	√
166	DA/NR	100	√	√	√
168	CT/NR	100	√	√	√

[a] Soils: DA – Dare, CT – Croatan, Ln – Leon, Mu – Murville, and Pa – Pantego.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.

Table 24 MU 16 Discussion

March-November

Sixteen of the twenty monitoring gauges in MU 16 met both expected hydrologic success criteria for Year 5.

Gauges 2, 181, and 192 made jurisdictional hydrology for at least 12.5% of the growing season, and therefore met Success Criterion 1. None of these gauges met Success Criterion 2 (20% of reference) for the Murville soil series (80.2 to 100% of the growing season).

Gauges 2, 181, and 192 are located in non-riverine restoration mitigation areas. Mitigative measures have been successful at increasing the jurisdictional hydrology in these areas from <5% of the growing season to >12.5% of the growing season. These gauges are located adjacent to existing roads and point-plugged ditches. Mitigative measures appear to be successful at restoring the hydrology to the areas around Gauges 2, 181, and 192, but were not successful at returning the gauge sites to within 20% of reference conditions under the normal rainfall conditions based on a single hydroperiod. However, Gauge 192 still achieved jurisdictional hydrology for more than 98% of the growing season cumulatively, interrupted by two slight, brief drops below 12 inches. Likewise, Gauge 2 achieved jurisdictional hydrology for more than 97% of the growing season, cumulatively, interrupted by four slight, brief drops below 12 inches. Gauge 181 exhibited a flashier response to precipitation and drawdown, but still achieved jurisdictional hydrology for more than 90% of the growing season cumulatively, interrupted by a series of brief drops below 12 inches.

Gauge 195 made jurisdictional hydrology for 7.8% of the growing season; therefore it did not meet Success Criterion 1. Gauge 195 also failed to meet met Success Criterion 2 (20% of reference) for Leon soil series (8.3 to 20.7% of the growing season) for 2006.

Overall 2002-2006

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 16. The areas of concern in MU 16 are the areas where gauges are located adjacent to ditches that maintain the access roads. Point-plugs instead of reach-plugs were used to fill these ditches. Mitigative measures appear to be successful at returning jurisdictional hydrology to Gauges 2, 181, 192, and 195 but were not successful at consistently returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions.

Gauges 2 and 192 met both success criteria from 2002 through 2004 (years 1 through 3) and were close to achieving success in 2006 (jurisdictional hydrology cumulatively greater than 97% and 98%; respectively, interrupted by few minor, brief falls below 12 inches). Gauges 181 and 195 met both success criteria from 2003 through 2005 (years 2 through 4) and were close to achieving success in 2006. These gauges should be considered for success.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 16 should be considered for removal.

Table 25. Hydrologic Monitoring Results – MU 17

Gauge	Soil Series and Mitigation Type[a]	Actual %	Criterion 1 Met (% of Growing Season)	Criterion 2 Met (% of Reference Range)	Hydrologic Success Met
Non-riverine, Mineral (Success = Saturation/inundation ≥ 12.5% of Growing Season; ≤ 20% of Reference Range)					
32	Ba/NR	100	√	√	√
33	Ba/NR	100	√	√	√
160	Ba/NR	100	√	√	√
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
5	DA/NR	100[b]	√	√	√
6	DA/NE	100	√	√	√
29	CT/NR	100	√	√	√
30	DA/NR	100	√	√	√
132	CT/NE	70.1	√	√	√
161	CT/NR	100	√	√	√
163	CT/NR	100	√	√	√

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

Table 25 MU 17 Discussion

March-November

All ten monitoring gauges in MU 17 met both expected hydrologic success criteria for Year 5. Gauge 196 was removed from monitoring due to safety concerns (alligator). Gauge 196 was in a semi-permanently ponded area. Gauge 5 has missing data due to gauge malfunctions.

Gauge 5 has recorded data for a minimum of 149 consecutive days (61.6%) and one data gap. Using nearby Gauge 6 to extrapolate the missing data, it can be assumed that Gauge 5 would have made jurisdictional hydrology for 100% of the growing season.

Overall 2002-2006

Mitigative measures in MU 17 have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 17 should be considered for removal.

Table 26. Hydrologic Monitoring Results – MU 18

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)					
21	Pa/NE	100	√	√	√
34	Pa/NR	100	√	√	√
184	Ln/NE	17.4	√	√	√
191	Pa/NE	12.0	–	√	–
Non-riverine, Organic (Success = Saturation/inundation ≥ 25% of Growing Season; ≤ 20% of Reference Range)					
133	CT/NE	19.8	–	√	–
158	CT/NR	100	√	√	√
159	CT/NR	100	√	√	√

[a] Soils: CT – Croatan, Ln – Leon, and Pa – Pantego.
Mitigation Types: Non-riverine Restoration – NR and Non-riverine Enhancement – NE.

Table 26 MU 18 Discussion

March-November

Five of the seven monitoring gauges in MU 18 met both expected hydrologic success criteria for Year 5. Gauge 191 did not meet either expected hydrologic success criteria for Year 5 and Gauge 133 only met Success Criterion 2 (20% of reference range).

Gauges 133 and 191 did not meet both expected hydrologic success criteria. Point-plugs were used to fill the adjacent ditch and the ditch is open on the adjacent U.S. Forest Service property. The point plugs appear to be successful at enhancing hydrology over baseline conditions, but may not be enough to consistently meet target hydroperiods.

Overall 2002-2006

Mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of MU 18. The area of concern in MU 18 is the area represented by Gauges 191 and 133, both located in enhancement areas. Gauge 191 is located near the final point plug on the property in a ditch that remains open on the adjacent Forest Service property. Point-plugs instead of reach-plugs were used to fill this ditch. Gauges 133 and 191 represent enhancement areas. When compared to baseline conditions, mitigative measures do not appear to be successful at enhancing the jurisdictional hydrology to the areas represented by Gauges 133 and 191. However, Gauge 133 met both success criteria in 2004 and 2005 (years 3 and 4) and Gauge 191 met both success criteria in year 2004 (year 3). The areas around Gauges 133 and 191 should be reviewed and a contingency plan developed for the areas that have not been successfully enhanced.

Due to the high rate of hydrologic success and completion of five years of monitoring, the gauges in MU 18 should be considered for removal.

2.3.2 Climatic Data

Figure 5 is a comparison of 2005 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 2006 growing season. The historical data was collected from the North Carolina State Climate Office rain gauge in Craven County, North Carolina. An onsite rain gauge (Rain Gauge 2) provided 2006 rainfall data.

Rain Gauges 3 and 4 malfunctioned and were not used to determine normal rainfall, due to the malfunctions and unreliable data.

Overall, the rainfall for the 2006 growing season was normal (≥44.7 inches onsite compared to normal 26.7 to 46.1 inches March through October). Rainfall in January and February 2006 was on the low side of normal (5.8 inches on-site compared to normal 6.1 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.

Entire Growing Season (March-November)

Hydrologic monitoring in 2006 showed 229 of 286 (80.1%) monitoring gauges in the CWMB 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] (**Figures 3a and 3b**). Of the 57 gauges that did not meet both respective success criteria, 37 made jurisdictional hydrology for ≥ 12.5% of the growing season, 13 made jurisdictional hydrology between 5 and 12.5% of the growing season, and seven (Gauges 75, 76, 102, 137, 149, 286, and 287) did not make jurisdictional hydrology for at least 5% of the growing season.

Of the 204 monitoring gauges in non-riverine mineral soils, 150 met both hydrologic success criteria and 19 did not meet either hydrologic success criterion; the remaining 35 gauges met Success Criterion 1 only. Of the 62 monitoring gauges in non-riverine organic soils, 61 met both hydrologic success criteria, and one gauge (Gauge 133) met Success Criterion 2 only. Of the 12 monitoring gauges in riverine organic soils, 12 met both hydrologic success criteria. Of the eight monitoring gauges in riverine mineral soils six met both hydrologic success criteria, and the remaining two gauges (Gauges 102 and 243) did not meet either hydrologic success criterion.

Hydrologic monitoring in 2006 showed 78 of 102 (76.4%) monitoring gauges in Phase I met both respective hydrologic success criteria. Of the 71 monitoring gauges in non-riverine mineral soils, 48 met both hydrologic success criteria, nine did not meet either hydrologic success criterion; and the remaining 14 gauges met Success Criterion 1 only. Of the 31 monitoring

gauges in Phase I in non-riverine organic soils, 29 met both hydrologic success criteria, and the remaining gauge (Gauge 133) met Success Criterion 2 only.

Hydrologic monitoring in 2006 showed 151 of 184 (82.1%) monitoring gauges in Phase II met both respective hydrologic success criteria. Of the 133 monitoring gauges in non-riverine mineral soils, 102 met both hydrologic success criteria and 10 did not meet either hydrologic success criterion; the remaining 21 gauges met Success Criterion 1 only. All 31 of the monitoring gauges in non-riverine organic soils met both hydrologic success criteria. Of the 12 monitoring gauges in riverine organic soils, 12 met both hydrologic success criteria. Of the eight monitoring gauges in riverine mineral soils, six met both hydrologic success criteria, one gauge (Gauge 102) did not meet either hydrologic success criterion, and the remaining gauge (Gauge 243) met Success Criterion 1.

In years with normal rainfall there may be small areas in Phase II that may not be returned to jurisdictional hydrology. The non-jurisdictional areas around these monitoring gauges may need to be delineated and removed from mitigation credits if they are not returned to jurisdictional hydrology in Year 5.

Areas of Concern

Phase I - Overall 2002-2006

Overall, mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of Phase I. Jurisdictional hydrology has generally 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 the normal rainfall conditions.

Gauges 2, 4, 18, 26, 135, 136, 141, 171, 172, 175, 178, 180, 181, 192, 193, 194, and 195 met jurisdictional hydrology. These gauges met Success Criterion 1, but did not meet Success Criterion 2. Mitigative measures 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. Gauge 133 met Success Criterion 2, but did not consistently achieve jurisdictional hydrology for the minimum hydroperiod of 25% of the growing season established for organic soils.

The areas of concern in Phase I are represented by Gauges 3, 11, 24, 137, 182, 183, and 191 (**Figure 5b**). These gauges are not meeting minimum jurisdictional hydrology for 12.5% of the growing season.

Gauges 3, 182, 183, and 191 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. The areas represented by these gauges should be reviewed to determine the zone of influence and the contingency plan for the areas that have not been returned to jurisdictional status.

Gauges 11, 24, and 137 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 around these gauges and the contingency plan for the areas that have not been returned to jurisdictional status.

Phase II - 2006

For 2006, mitigative measures have been successful at restoring jurisdictional hydrology to within 20% of the Reference Range for the majority of Phase II. Hydrologic monitoring in 2006 showed 151 of 184 (82.1%) monitoring gauges in Phase II met both respective hydrologic success criteria. However, there are some areas of concern, especially in MU 2A, 2B, 3, 4A, and 5. Jurisdictional hydrology has been restored in areas that are located adjacent to point plugged ditches that maintain the access roads. However, mitigative measures have not been successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions.

Gauges 94, 95, 261, 260, 258, and 259 occur adjacent to ditches that remain partially open where point-plugs were used to fill the ditch. These gauges were placed in non-jurisdictional areas within the zone of influence of the ditch. These gauges met jurisdictional hydrology ($\geq$ 12.5% of the growing season), but may not meet Success Criterion 2 (% of Reference Range) within the zone of influence off the former ditch under normal rainfall conditions.

Gauges 92, 93, 286 and 287 occur adjacent to ditches that remain partially open where point-plugs were used to fill the ditch. These gauges were placed in non-jurisdictional areas within the zone of influence of the ditch. These gauge sites did not achieve jurisdictional hydrology greater than 12.5% of the growing season within the zone of influence off the former ditch under normal rainfall conditions, although Gauges 92 and 93 exhibited hydroperiods between 5 and 12.5% of the growing season. 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. The non-jurisdictional areas around these monitoring gauges may need to be delineated and removed from mitigation credits if they are not returned to jurisdictional hydrology in Year 5.

Gauges 85, 102, 149, 150, 75, and 76 appear to be located on topographic highs compared to the surrounding landscape. In years with normal rainfall these areas may not achieve hydroperiods greater than 12.5% of the growing season, although Gauges 85 and 150 exhibited hydroperiods between 5 and 12.5% of the growing season. The non-jurisdictional areas around these monitoring gauges may need to be delineated and removed from mitigation credits if they are not returned to jurisdictional hydrology in Year 5.

Jurisdictional hydrology has been restored to the remaining 20 gauges, but mitigative measures have not been successful at returning these gauge sites to within 20% of reference conditions under the normal rainfall conditions.

Of the 20 monitoring gauges in riverine areas, six (Gauges 102, 227, 236, 243, 246, and 256) did not show evidence of surface water throughout much of the growing season. Some of these gauge sites may be too high in the landscape to function as riverine influenced wetlands. However, additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 242, and 251) showed prolonged surface flooding and flowing water throughout much of the growing season. These areas are headwater wetlands that have a surface connection to the unnamed tributary to East Prong Brice Creek and should be re-evaluated for riverine function and credit.

The areas of concern in Phase II are the areas represented by Gauges 75, 76, 85, 92, 93, 102, 149, 150, 286, and 287 (**Figure 5a**). The gauges are not meeting minimum jurisdictional hydrology for 12.5% of the growing season.

Rainfall
Overall, the rainfall for the 2006 growing season was normal (≥44.7 inches onsite compared to normal 26.7 to 46.1 inches March through October). Rainfall in January and February 2006 was on the low side of normal (5.8 inches on-site compared to normal 6.1 to 10.1 inches).

Recommendations

Phase I
It is recommended that monitoring of Phase I be closed out due to the high rate of hydrologic success under normal rainfall conditions and completion of five years of monitoring. Gauges 3, 11, 24, 137, 182, 183, and 191 are not 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 I should be removed and credits released based on the contingency plan for the areas that have not been returned to jurisdictional status.

Phase II
It is recommended that monitoring of Phase II continue into 2007 (Year 5). However, due to the high rate of hydrologic success in Phase II, under normal rainfall conditions, ESI would recommend that selected interior gauges that are meeting success criteria consistently through Year 4 be removed from monitoring. Thirty-three interior gauges in Phase II should be considered for removal from hydrologic monitoring. **Figures 11a and 11b** (in Appendix E) designate the gauges that should be considered for early removal from hydrologic monitoring. **Figures 11a and 11b** (in Appendix E) depict how the remaining gauges will provide representative coverage In Phase II. Each of the gauges considered for early removal has met or exceeded both expected hydrologic success criteria in each year of monitoring. The majority of these gauges have met jurisdictional hydrology for 100% of the growing season in years with normal rainfall. Mitigative measures have successfully enhanced and/or restored jurisdictional hydrology to the areas represented by these gauge sites. The areas represented by these gauges sites should be considered to have successfully met all success criteria through Year 5 established by the MBRT.

Gauge sites adjacent to roads or point-plugged ditches, areas where riverine credit may be gained, areas that are not meeting the success criteria established for years four and five, and representative areas across Phase II of the CWMB should continue to be monitored through Year 5.

ESI also recommends that additional areas in MU 6, 5, and 2B (for example Gauges 241, 240, 242, and 251) be re-evaluated for riverine function. These areas showed prolonged surface flooding and flowing water throughout much of the growing season and may be considered riverine mitigation due to the surface connection with the unnamed tributary to East Prong Brice Creek.

It is recommended that Rain Gauges 3 and 4 be replaced due to repeated malfunction and unreliable data collected during 2006.

Figure 4a. Hydrologic Areas of Concern 2006, Phase II

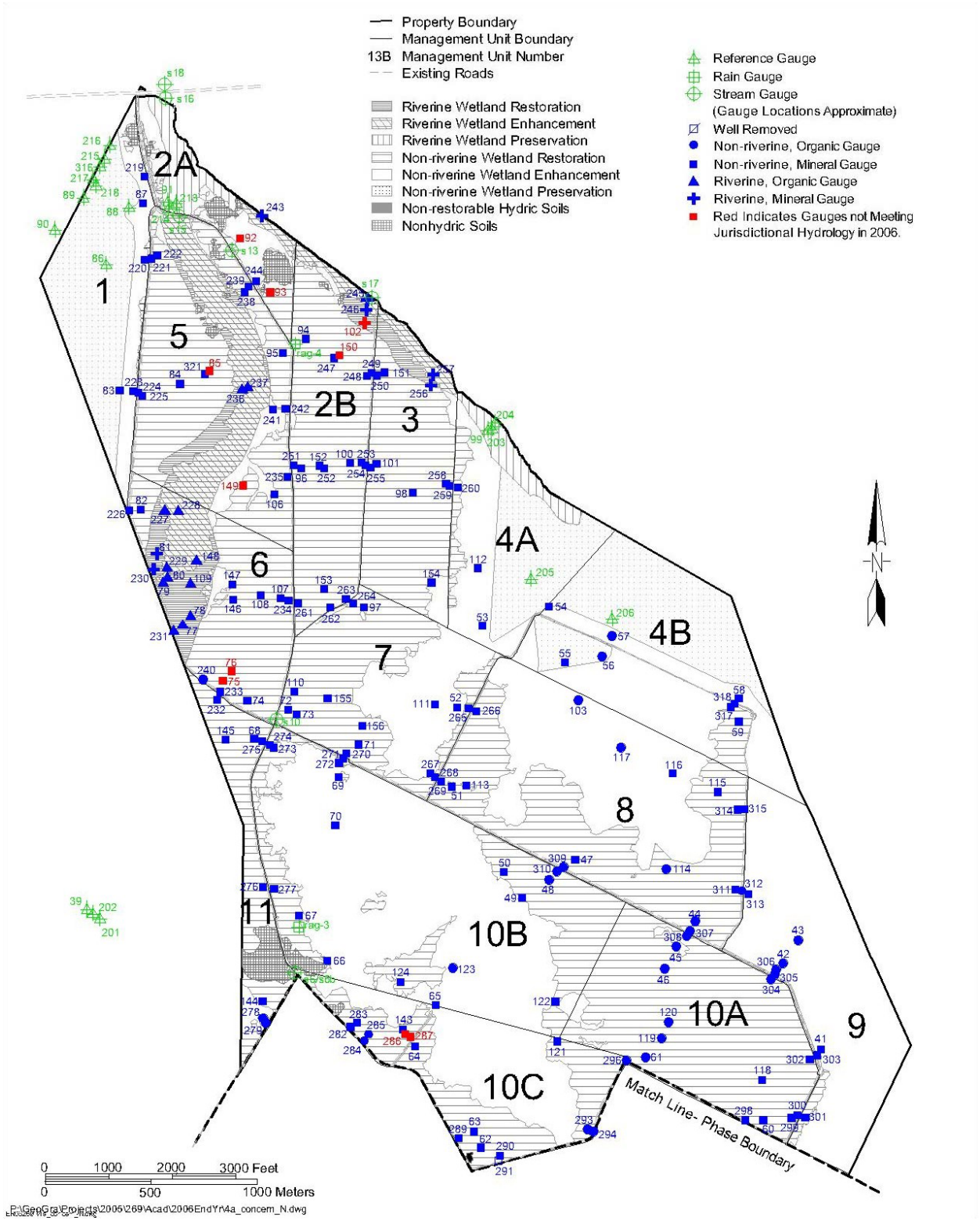


Figure 4b. Hydrologic Areas of Concern 2002-2006, Phase I

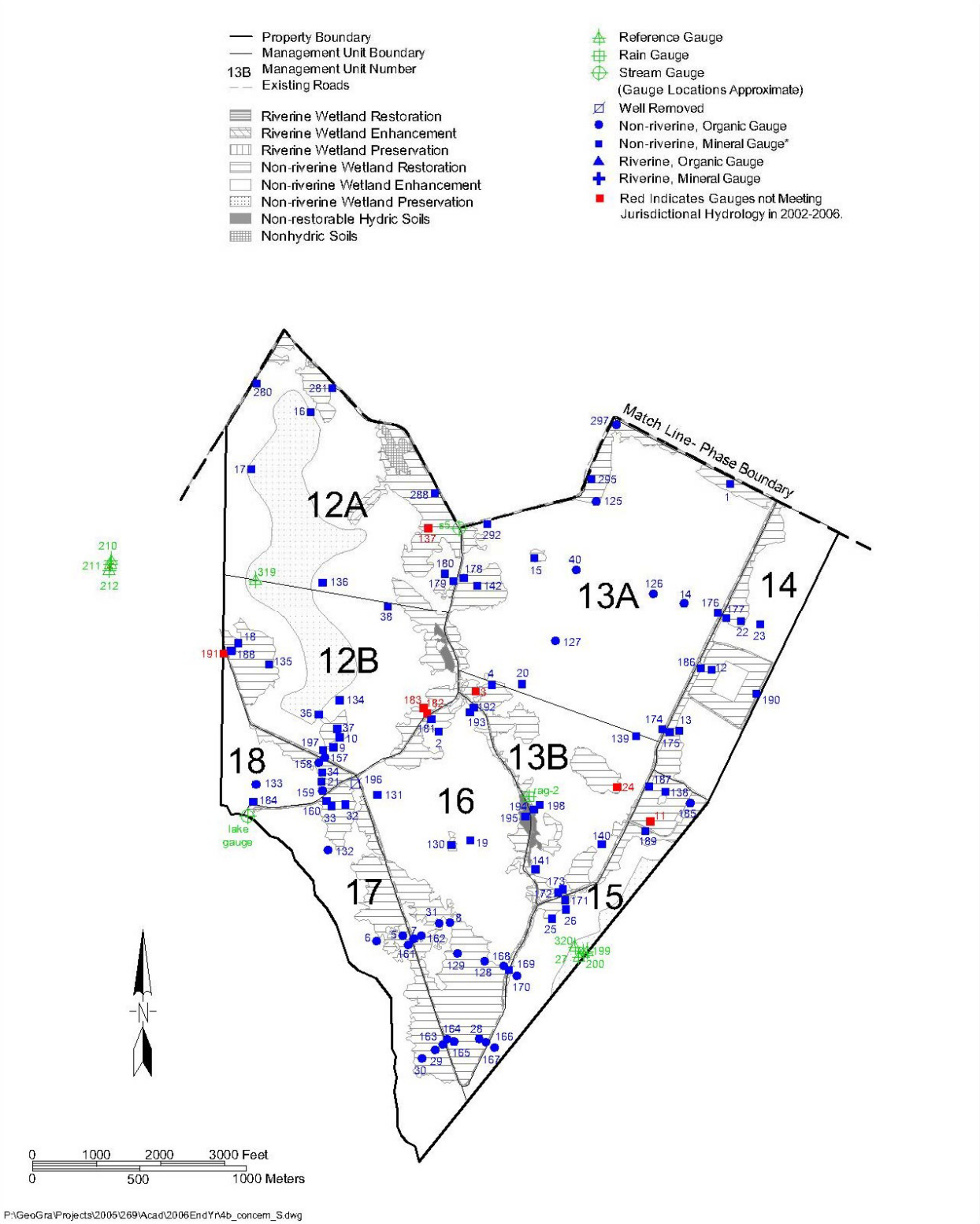
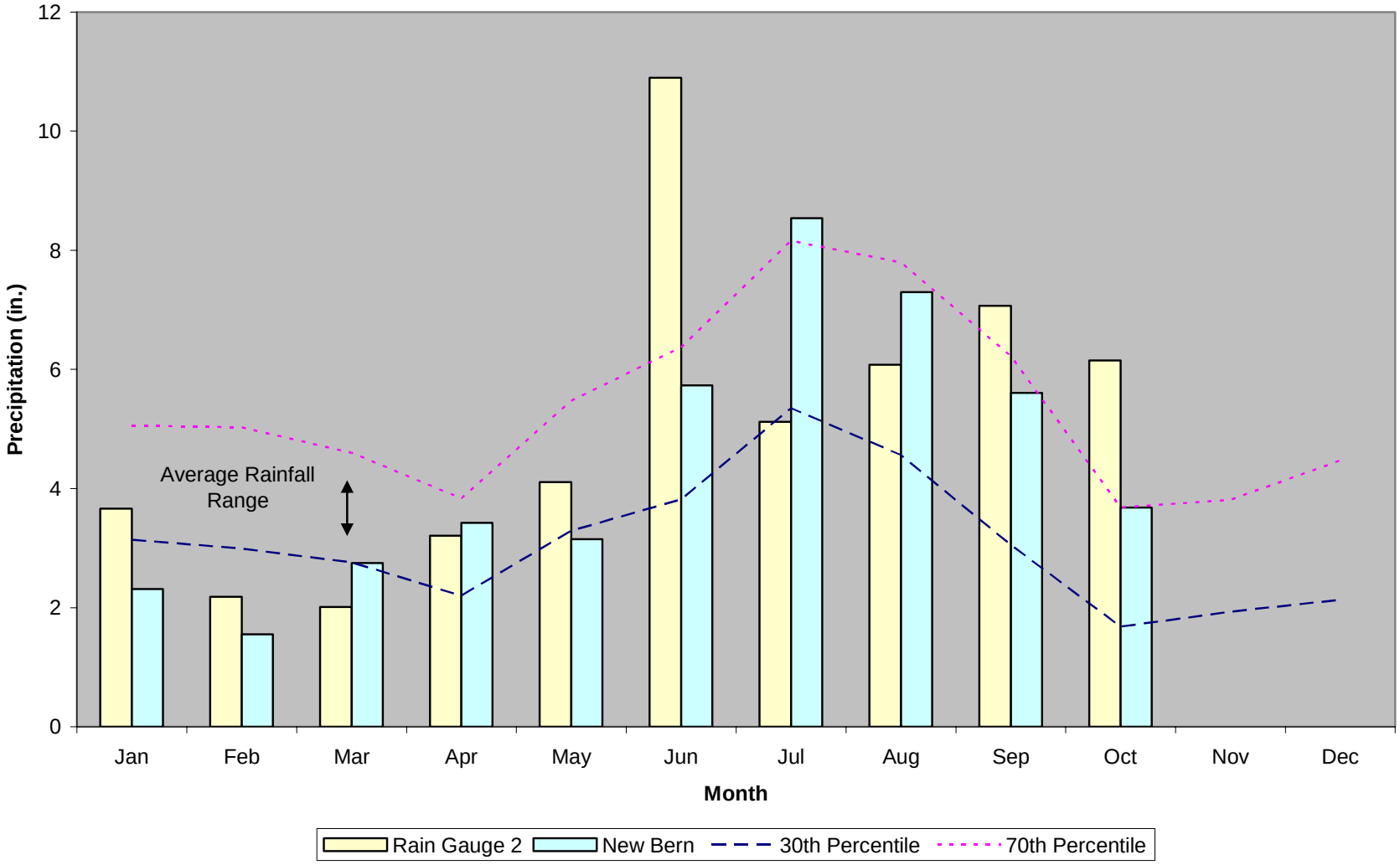


Figure 5. Croatan WMB 30-70 Percentile Graph



3.0 VEGETATION

3.1 Success Criteria

Success criteria states that there must be a minimum of 320 trees per acre surviving for three consecutive years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 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 each mitigation area. Specific information regarding tree counts in each plot is provided in Tables 27a and 27b associated with Section 3.3. Summaries for 2006 stem counts, plot density, and success criteria for each plot, target community (also known as planting zones) and phase is provided in Tables 28a and 28b associated with Section 3.3. Other observations concerning each Target Community are presented in Section 3.4. **Figures 6a and 6b** depict the vegetation plot locations, Target Communities, and photo locations.

Phase I

Target Community: Wet Pine Flat (63.2 acres)

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

Target Community: Pond Pine Woodland (89.3 acres)

Pinus taeda, loblolly pine
Pinus serotina, pond pine

Target Community: Non-Riverine Wet Hardwood Forest (Type A) (60.6 acres)

Quercus falcata var. *pagodifolia*, cherrybark oak
Quercus laurifolia, laurel oak
Quercus lyrata, overcup oak
Nyssa aquatica, water tupelo
Quercus michauxii, swamp chestnut oak
Quercus nigra, water oak
Quercus phellos, willow oak

Target Community: Non-Riverine Swamp Forest (11.4 acres)

Taxodium distichum, bald cypress
Fraxinus pennsylvanica, green ash
Nyssa aquatica, water tupelo
Pinus serotina, pond pine
Chamaecyparis thyoides, Atlantic white cedar

Phase II

Target Community: Wet Pine Flat
Pinus taeda, loblolly pine
Pinus palustris, longleaf pine
Pinus serotina, pond pine

Target Community: Mesic Pine Flat
Pinus palustris, longleaf 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 2006 by Environmental Services, Inc. and by David Dummond, a botanist utilized as a sub-consultant to conduct more qualitative assessments of herbaceous vegetation in the monitoring plots. Prior to 2005, vegetation monitoring was conducted for NCDOT by another consultant. **Figures 7a and 7b** depict the monitoring results for the vegetation plot and overall Target Communities by Phase. These results are shown in Appendix B along with photo pages that depict the changing vegetation patterns from years 2003 to 2006.

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

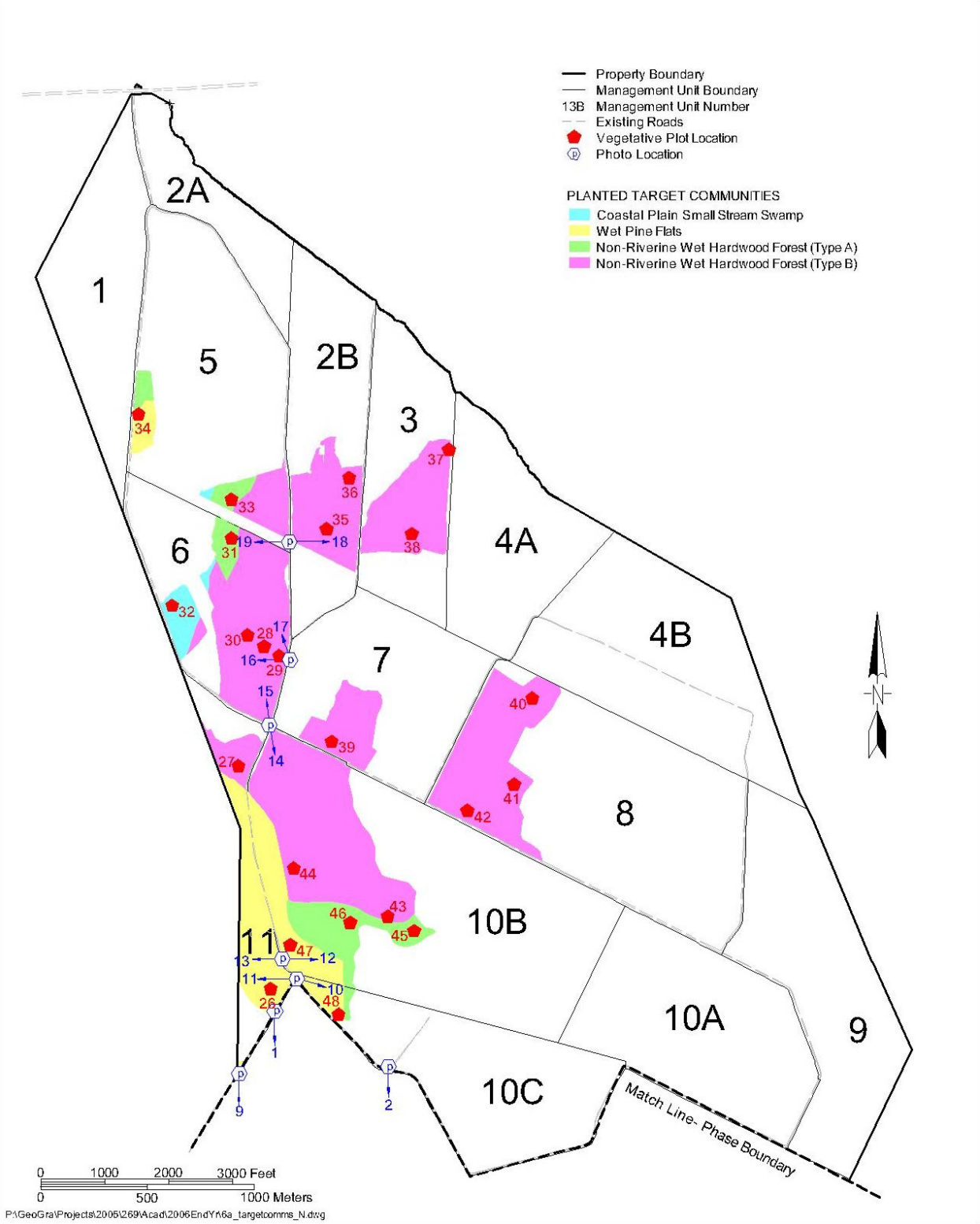


Figure 6b. Target Communities and Vegetative Plot Location Map, Phase I

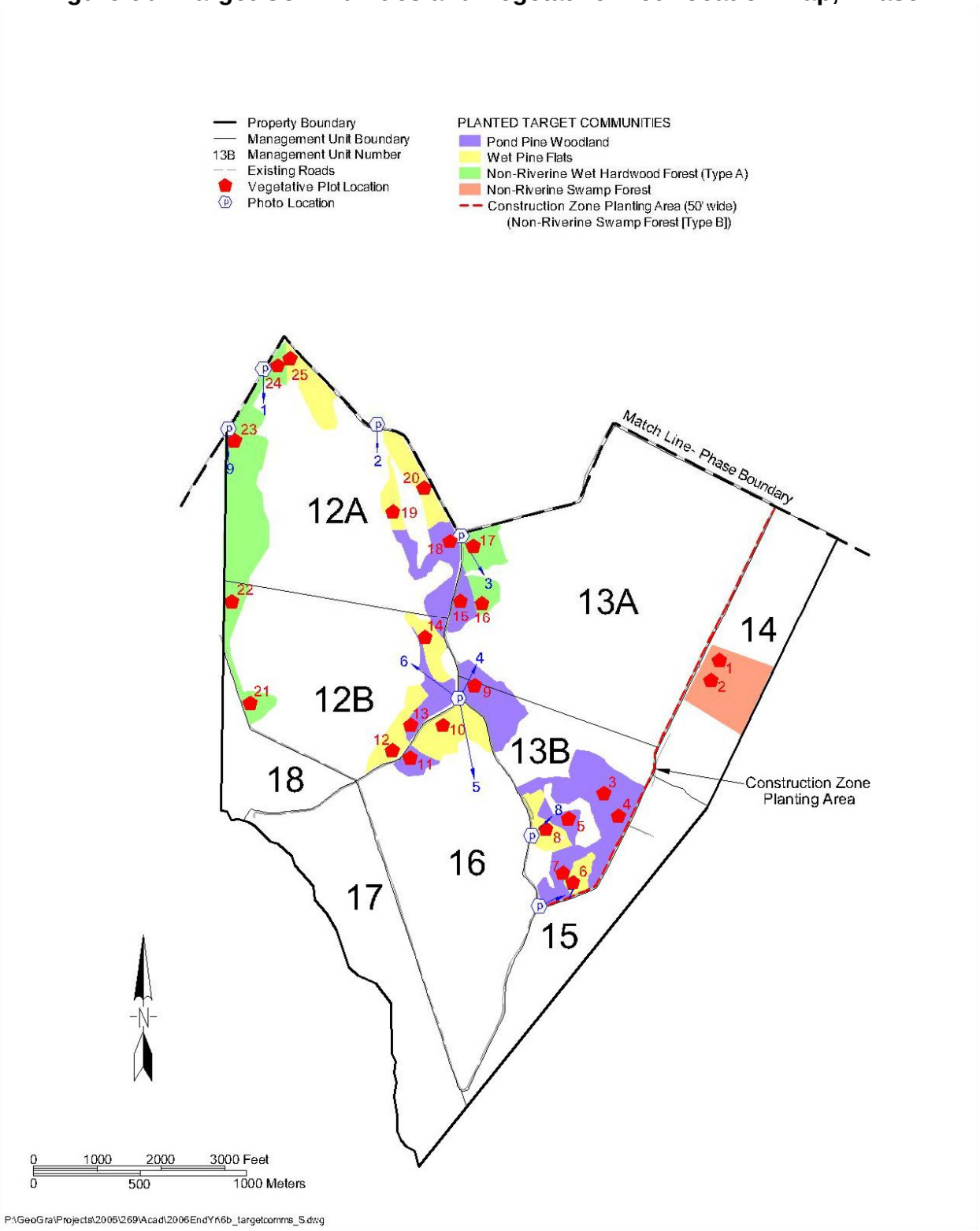


Table 27a. Phase I Vegetation Monitoring Statistics 2006

Target Community[a]	Plot Number	Cherrybark Oak	Laurel Oak	Overcup Oak	Water Tupelo	Swamp Chestnut Oak	Water Oak	Willow Oak	Oak sp. (no leaves)	Pond Pine	Longleaf Pine	Bald cypress	Green Ash	Pond/Loblolly Pine	Atlantic White Cedar	Total 2006 (Year 5)	Total (at planting)
WPF	6													27		27	36
	8										7			33		40	42
	10													27		27	30
	12													26		26	31
	14													15		15	28
	19[b]													36		36	35
	20													23		23	33
	25													19		19	44
PPW	3													19		19	24
	4													10		10	22
	5													6		6	12
	7													12(2)		14	21
	9													22		22	36
	11													14		14	30
	13													28		28	40
	15[b]													26		26	23
	18													28		28	32
NRWH (A)	16	1	4	2		1	9	5								22	30
	17[c]	3				4	7									14	16
	21			5(1)		8										14	27
	22[d]			6			7	5	2							20	30
	23	4		13(2)		16	1	4								40	76
	24					2		1						1		6	40
NRSF	1											2				2	40
	2									2		4	1			7	37

a- Target Community: WPF – Wet Pine Flat, PPW – Pond Pine Woodland, NRWH (A) – Non-Riverine Wet Hardwood Forest (Type A), NRSF – Non-Riverine Swamp Forest.

b- Total flagged and/or tagged trees found exceeded the amount originally identified as planted.

c- One water oak was previously labeled as cherrybark oak, two water oaks were previously labeled as overcup oaks.

d- *Two oak sp. were flagged and/or tagged but too small to differentiate between species .*

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 Target Community. Specific information regarding each Target Community is presented after the tables. 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 initial vegetation monitoring period. These untagged trees are believed to represent planted individuals due to their appearance in rows with planted trees, similar size/ages with planted trees, and/or lack of naturally occurring species of the same type within the immediate vicinity.

Table 27b. Phase II Vegetation Monitoring Statistics 2006

Target Community[a]	Plot Number	Cherrybark Oak	Laurel Oak	Overcup Oak	Water Tupelo	Swamp Chestnut Oak	Water Oak	Willow Oak	Oak sp. (no leaves)	Pond Pine	Longleaf Pine	Bald cypress	Green Ash	Pond/Loblolly Pine	Atlantic White Cedar	Total 2006 (Year 4)	Total (at planting)
WPF	26													31		31	39
	34											1		3		4	39
	47										3(1)			50		54	39
	48[d]	1					27			12	17					57	39
NRWH (A)	31	4		1	13			1				(1)		2		22	39
	33[b]		1				2									3	39
	45[c]			(1)	5(1)		1							2		10	39
	46			4(1)	7(5)											17	39
NRWH (B)	27[d]						3			3			7(4)			17	39
	28[c]	6(1)		16			1	2		9			2(1)			38	39
	29	2		1	2		1					3	4			13	39
	30	1(1)		6	1		1	2(1)		13			1			27	39
	35	1								4						5	39
	36	1	1	3	6					16			2			29	39
	37	1	1	1			1	1								5	39
	38		2		4					5			5			16	39
	39			2						(1)		1	3			7	39
	40				6(7)											13	39
	41				(1)			1								2	39
	42													1		1	39
	43				4(5)								2			11	39
	44		2		4		1			6						13	39
CPSSS	32				6					14		21				41	39

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

b- One water oak was previously labeled as overcup oak, one laurel oak was previously labeled as overcup oak.

c- One water oak was previously labeled as overcup oak.

d- Three water oaks were previously labeled as overcup oaks, the tag of one titi previously labeled as a laurel oak was removed.

e- *Twenty-six of the water oaks were previously labeled as overcup oaks.*

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 intial 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 28a. Phase I 2006 Summaries

Target Community[a]	Plot Number	Total (at planting)	Total 2006 (Year 5)	Plot Density 2006 (Trees/Acre)	Meets Success Criteria (Y/N)
WPF	6	36	27	470	Y
	8	42	40	697	Y
	10	30	27	470	Y
	12	31	26	453	Y
	14	28	15	261	Y
	19[b]	35	36	627	Y
	20	33	23	401	Y
	25	44	19	331	Y
Wet Pine Flat Average				**463**	**Y**
PPW	3	24	19	331	Y
	4	22	10	174	N
	5[c]	12	6	105	N
	7	21	14	244	N
	9	36	22	383	Y
	11	30	14	244	N
	13	40	28	488	Y
	15[b]	23	26	453	Y
	18	32	28	488	Y
Pond Pine Woodland Average				**323**	**Y**
NRWH (A)	16	30	22	383	Y
	17	16	14	244	N
	21	27	14	244	N
	22	30	20	348	Y
	23	76	40	697	Y
	24	40	6	105	N
Non-Riverine Wet Hardwood (Type A) Average				**337**	**Y**
NRSF	1	40	2	35	N
	2	37	7	122	N
Non-Riverine Swamp Forest Average				**79**	**N**
Phase I Average				**352**	**Y**

a- *Target Community: WPF – Wet Pine Flat, PPW – Pond Pine Woodland, NRWH (A) – Non-Riverine Wet Hardwood Forest (Type A), NRSF – Non-Riverine Swamp Forest.*

b- *Total flagged and/or tagged trees found exceeded the amount originally identified as planted.*

c- *Total trees at planting do not meet plot density (trees/acre) success criteria for Year 5 of 260 trees/acre.*

Notes: Density calculations were completed by taking the number of trees counted in 2006 and dividing by the plot size in acres (0.0573921ac). Specific information regarding each Target Community is presented after the tables. Environmental Services, Inc. began Croatan vegetation monitoring in 2005, therefore all data and calculations prior to 2005 were obtained from previous consultants.

Table 28b. Phase II 2006 Summaries

Target Community[a]	Plot Number	Total (at planting)	Total 2006 (Year 4)	Plot Density 2006 (Trees/Acre)	Meets Success Criteria (Y/N)
WPF	26	39	31	540	Y
	34	39	4	70	N
	47[b]	39	54	941	Y
	48[b]	39	57	993	Y
Wet Pine Flat Average				**636**	**Y**
NRWH (A)	31	39	22	383	Y
	33	39	3	52	N
	45	39	10	174	N
	46	39	17	296	Y
Non-Riverine Wet Hardwood (Type A) Average				**226**	**N**
NRWH (B)	27	39	17	296	Y
	28	39	38	662	Y
	29	39	13	227	N
	30	39	27	470	Y
	35	39	5	87	N
	36	39	29	505	Y
	37	39	5	87	N
	38	39	16	279	N
	39	39	7	122	N
	40	39	13	227	N
	41	39	2	35	N
	42	39	1	17	N
	43	39	11	192	N
	44	39	13	227	N
Non-Riverine Wet Hardwood (Type B) Average				**245**	**N**
CPSSS	32[b]	39	41	714	Y
Coastal Plain Small Stream Swamp Average				**714**	**Y**
Phase II Average				**330**	**Y**

a- Target Community: WPF – Wet Pine Flat, PPW – Pond Pine Woodland, 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 2006 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.

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

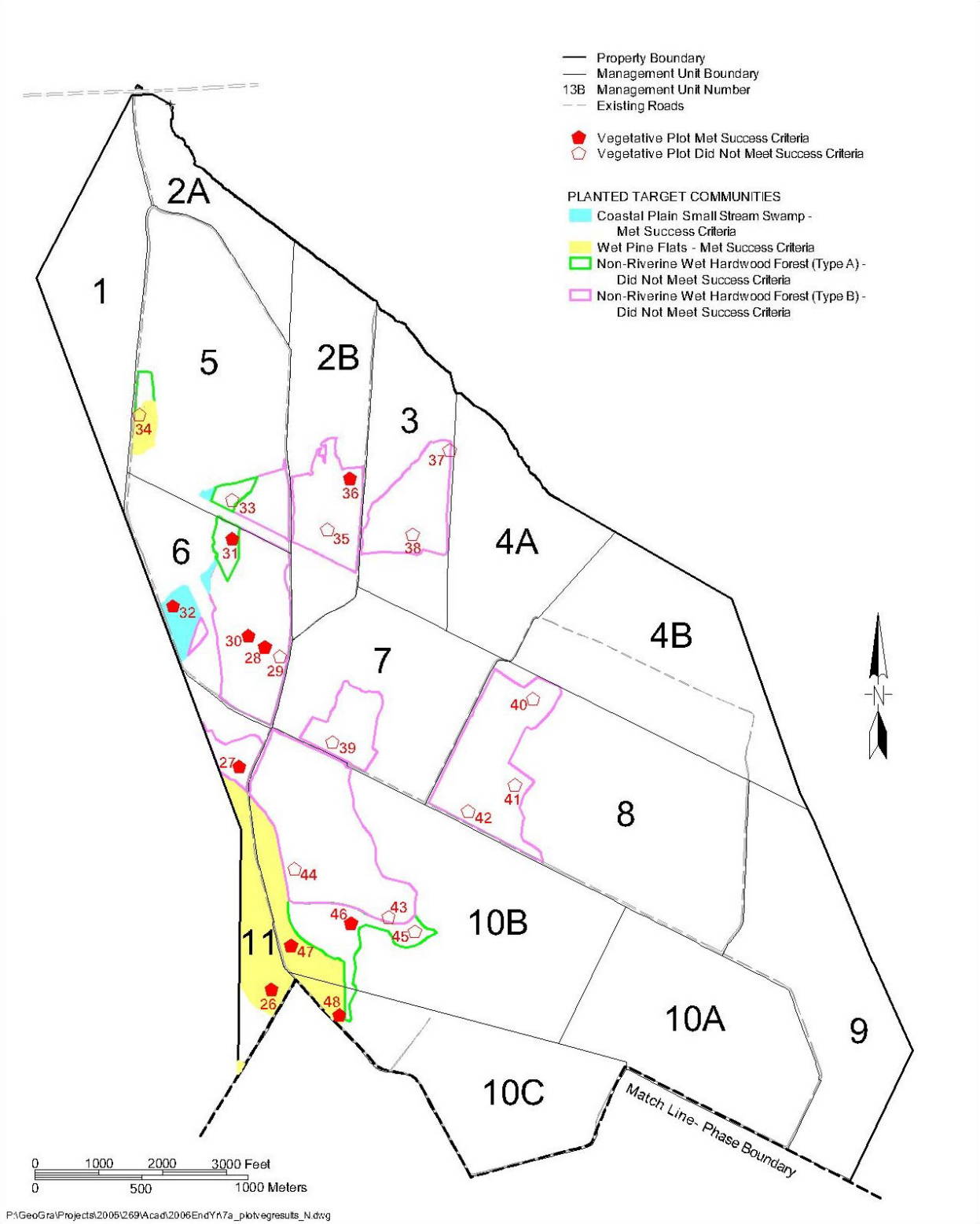
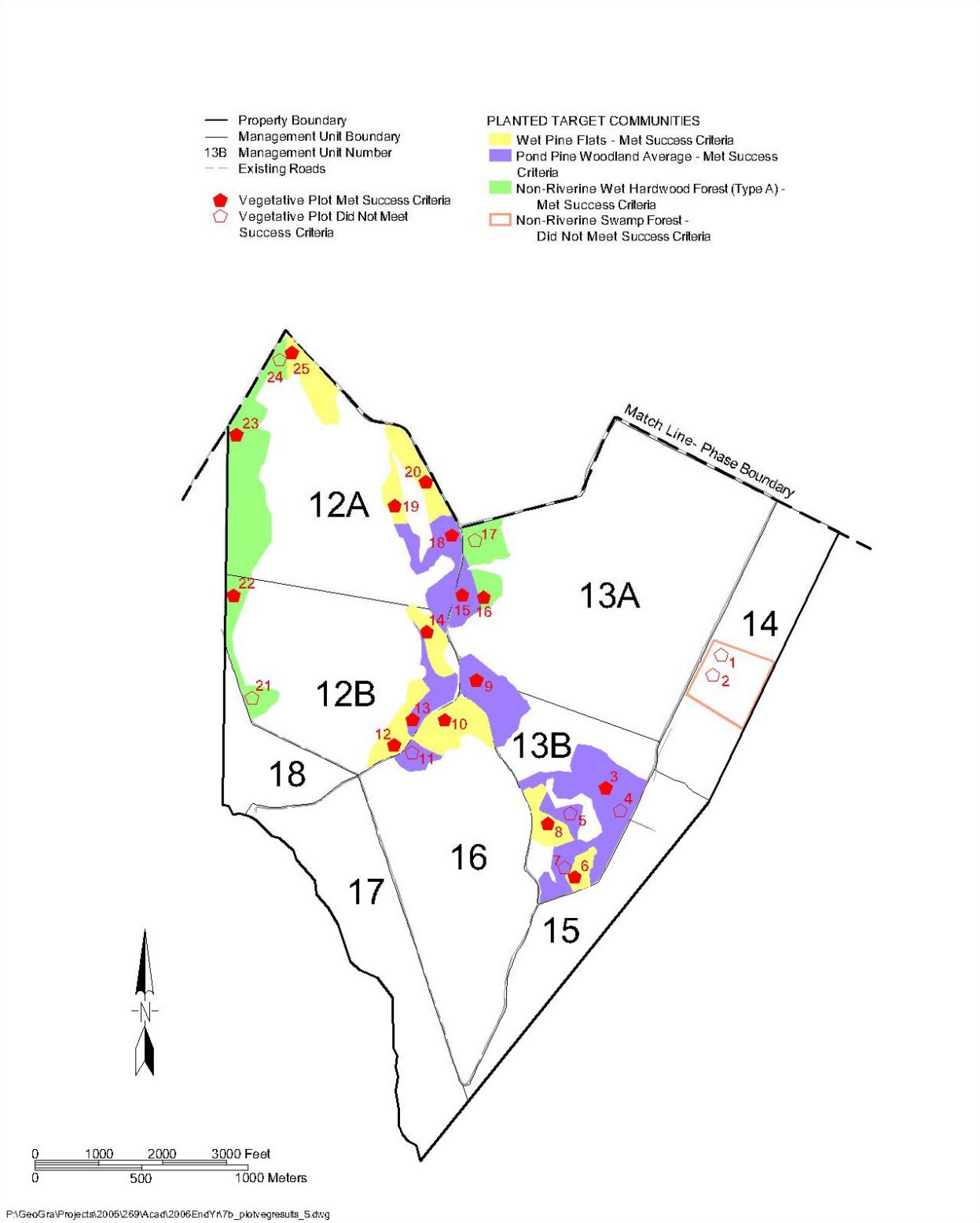


Figure 7b. Target Communities and Vegetative Plot Monitoring Results Map, Phase I



3.4 Plot Descriptions

Qualitative assessments for vegetative species composition in each plot were conducted by sub-consultant Dave Dummond. Mr. 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 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.* The qualitative assessment was requested by the EEP to provide better documentation as to the vegetative species re-colonizing the planting areas.

The Phase I assessment included fifth year vegetation surveys associated with the existing 25 total plots. Commonly observed species in the Wet Pine Flat Target Community, in addition to the planted species, included grey inkberry (*Ilex glabra*). Overall the Wet Pine Flat Target Community meets the average success criteria for Year 5 with an average density of 463 trees/acre, all plots met success criteria. Commonly observed species in Pond Pine Woodland Target Community, in addition to the planted species, included coastal bluestem (*Andropogon glaucopsis*), grey inkberry, shinyleaf (*Lyonia lucida*), and swamp bay (*Persea palustris*). Overall the Pond Pine Woodland Target Community meets the average success criteria for Year 5 with an average density of 323 trees/acre, plots 4, 5, 7, and 11 do not meet success criteria. Of those four plots not meeting success criteria, plot 5 was not originally planted dense enough to meet the success criteria. Commonly observed species in the Non-Riverine Wet Hardwood (Type A) Target Community, in addition to the planted species, included sweet-gum (*Liquidambar styraciflua*). Overall the Non-Riverine Wet Hardwood (Type A) Target Community meets the average success criteria for Year 5 with an average density of 337 trees/acre, plots 17, 21, and 24 do not meeting success criteria. Commonly observed species in the Non-Riverine Swamp Forest Target Community, in addition to the planted species, included Canadian rush (*Juncus canadensis*), giant plume grass (*Saccharum giganteum*), lamp rush (*Juncus effusus*), cottongrass bulrush (*Scirpus cyperinus*), red maple (*Acer rubrum*), Virginia chain fern (*Woodwardia virginica*), Virginia Marsh-St. John's-Wort (*Triadenum virginicum*). The Non-Riverine Swamp Forest Target Community with an average density of 79 trees/acre falls well below the success criteria of 260 trees/acre for Year 5, with neither plot 1 or 2 meeting success criteria. Plots 1 and 2 are located in an area that remains inundated year round and contains dense emergent vegetation. These two factors may be preventing the success of planted species.

The Phase II assessment included fourth year vegetation surveys associated with 23 established plots covering four of five planted Target Communities. Commonly observed species in the Wet Pine Flat Target Community, in addition to the planted species, included Maryland meadow-beauty (*Rhexia mariana*) and swamp titi (*Cyrilla racemiflora*). Overall the Wet Pine Flat Target Community meets the average success criteria of 288 trees/acre for Year 4. With an average density of 636 trees/acre, only plot 34 does not meet success criteria. Commonly observed species in the Non-Riverine Wet Hardwood Forest (Type A) Target Community, in addition to the planted species, included giant plume grass, red maple, pine-barren goldenrod (*Solidago fistulosa*), slender goldentop (*Euthamia caroliniana*), southern waxy sedge (*Carex glaucescens*), swamp bay, and Virginia chain fern. The Non-Riverine Wet Hardwood Forest (Type A) Target Community does not meet success criteria of 288 trees/acre for Year 4. Non-Riverine Wet Hardwood Forest (Type A) Target Community has an average density of 226 trees/acre; both plots 33 and 45 do not meet success criteria. Additional investigation may be needed to determine why this Target Community is not meeting minimum

success criteria 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. The Non-Riverine Wet Hardwood Forest (Type B) Target Community does not meet the success criteria of 288 trees/acre for Year 4. With an average density of 245 trees/acre, plots 29, 35, 37, 38, 39, 40, 41, 42, 43, and 44 all fail to meet the success criteria. The Non-Riverine Wet Hardwood Forest (Type B) Target Community with 14 plots is the largest Target Community in Phase II, with ten plots failing to meet success criteria; further investigation may be needed to determine why success criteria are not being met. Commonly observed species in the Coastal Plain Small Stream Swamp Target Community, in addition to the planted species, included coastal bluestem, red maple, shinyleaf, slender goldentop, small dog-fennel (*Eupatorium capillifolium*), and swamp bay. Overall the Coastal Plain Small Stream Swamp Target Community meets the average success criteria of 288 trees/acre for Year 4 with an average density of 714 trees/acre.

3.5 Conclusions

Of the 4,035-acre CWMB, approximately 224.5 acres were involved in tree planting for Phase I and 466.0 acres were involved in tree planting for Phase II. There were 25 vegetation monitoring plots established throughout the Phase I planting areas, and 23 vegetation monitoring plots established throughout the Phase II planting areas. The 2006 vegetation monitoring of the Phase I portion of the site revealed an average tree density of 352 trees/acre, which exceeds the minimum success criteria of 260 trees/acre for Year 5. The vegetation monitoring of the Phase II portion of the site revealed an average tree density of 330 trees/acre, which exceeds the minimum success criteria of 288 trees/acre for Year 4.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

All of the gauges in Phase I should be removed and credits released based on the contingency plan for the areas that have not been returned to jurisdictional status. Monitoring of Phase II hydrology and vegetation will continue in 2007 (Year 5). Monitoring is required to continue for a minimum of 5 years in each phase. However, due to the high rate of hydrologic success under normal rainfall conditions, it is recommended to the MBRT that selected interior gauge sites of Phase II have consistently met success criteria for the first four years be removed from monitoring. Gauge sites adjacent to roads, point-plugged ditches, areas where riverine credit may be gained, areas that are not meeting the success criteria established for years four and five, and representative areas across Phase II of the CWMB should continue to be monitored through Year 5. **Figures 8a and 8b** depict the monitoring results for the monitoring gauges, vegetation plots, and overall Target Communities by Phase.

It is recommended that Rain Gauges 3 and 4 be replaced due to repeated malfunction and unreliable data collected during 2006.

Of the vegetation surveys performed in the CWMB, 9 plots in Phase I and 13 plots in Phase II do not meet the established success criteria. The overall average tree density for Phase I planting areas exceeds the minimum success criteria of 260 trees/acre for Year 5. The Non-Riverine Swamp Forest Target Community is the only target community in Phase I that does not meet the success criteria of 260 trees/acre for Year 5. The Non-Riverine Wet Hardwood Forest Types A and B Target Communities in Phase II do not meet the success criteria of 288

trees/acre for Year 4, although the overall average tree density for all plating areas exceeds the minimum success criteria of 288 trees/acre for Year 4. Further investigation may be needed in these Target Communities to determine why success criteria are not being met. Phase II Vegetation surveys should continue to be conducted in 2007.

Figure 8a. Overall Monitoring Results Map 2006, Phase II

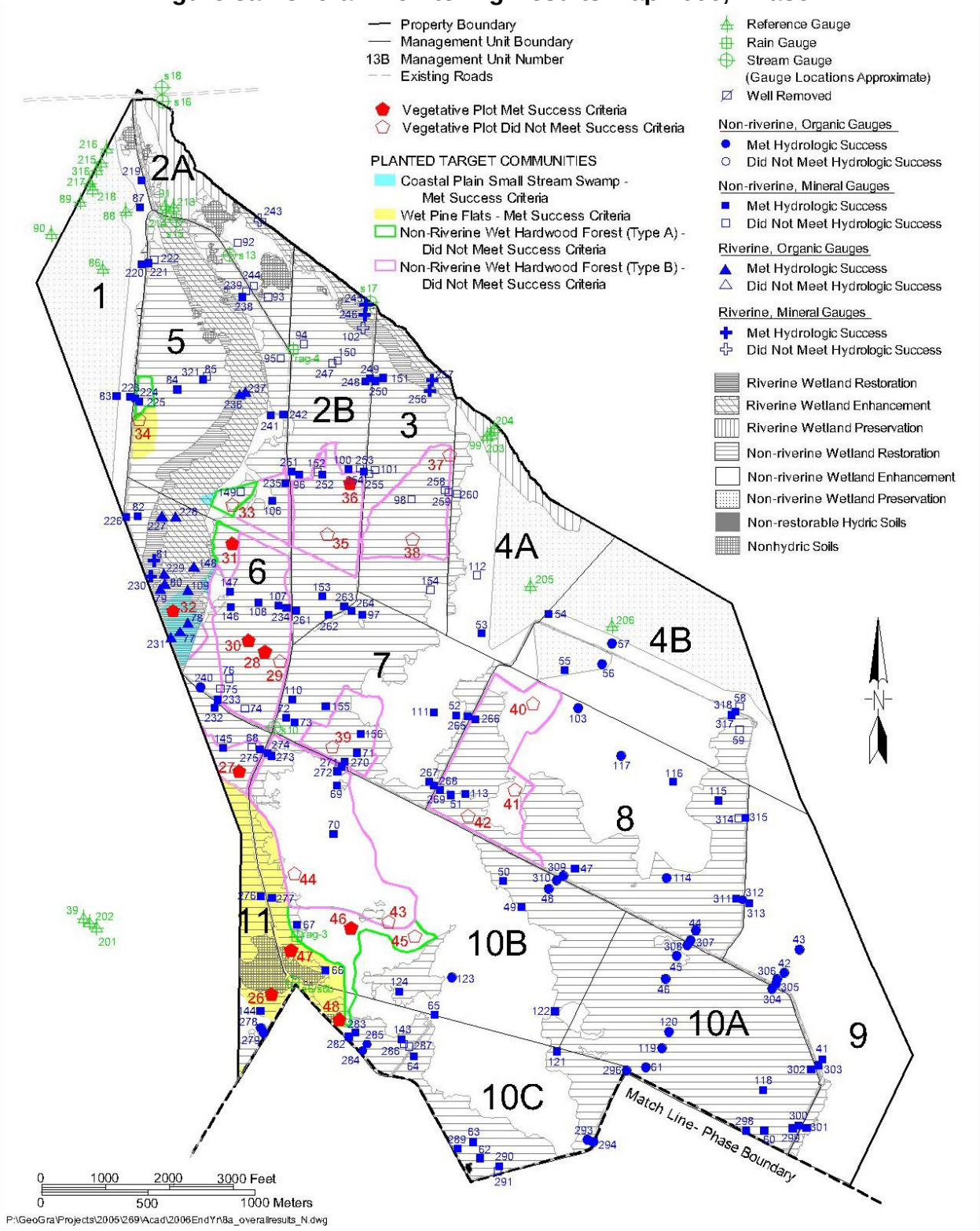
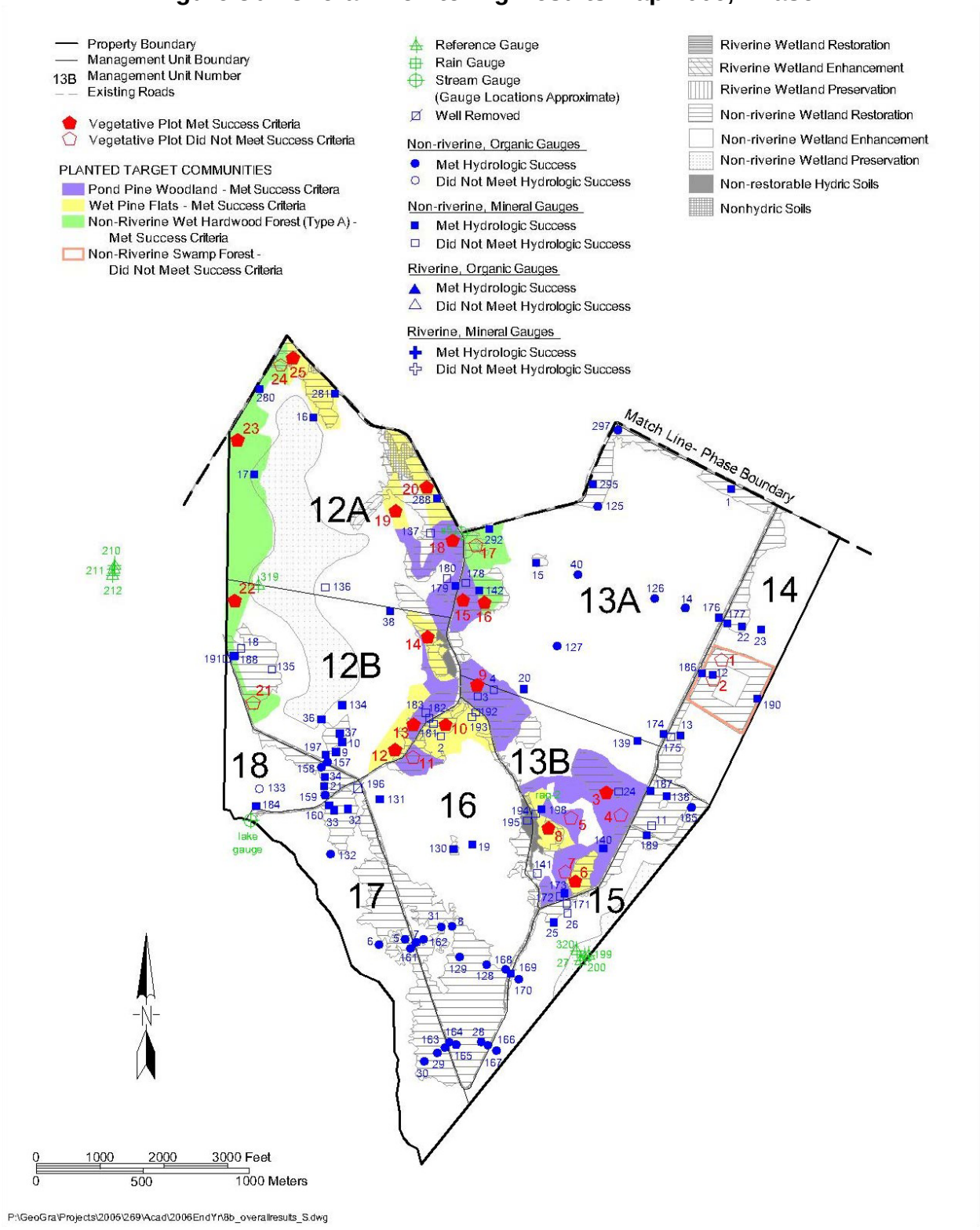


Figure 8b. Overall Monitoring Results Map 2006, Phase I



Click on the Desired Link Below

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E