STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

DAVID MCCOY
SECRETARY

December 8, 1999

Mr. Mike Bell
U.S. Army Corps of Engineers
Washington Regulatory Field Office
Post Office Box 1000
Washington, NC 27889

Dear Mr. Bell:

SUBJECT: Croatan Wetland Mitigation Bank Prospectus, Craven County
Action ID No. 199811922 / Croatan Wetlands Mitigation Bank

The North Carolina Department of Transportation is respectfully submitting the attached document as a Mitigation Bank Prospectus per Federal Guidance on the Establishment, Use and Operation of Mitigation Banks [Federal Register: November 28, 1995 (Volume 60, Number 228)] [Notices] [Page 58605-58614]. The proposed Croatan Wetland Mitigation Bank (CWMB) is located south of Catfish Lake Road (S.R. 1100) and north of Long Lake, northwest of Havelock, in Craven County.

The Department requests the formal establishment of the Mitigation Bank Review Team (MBRT) for this project in order to initiate the planning and review process by the appropriate agencies. If you have any questions, please contact Mr. Tanner Holland at (919) 733-1200.

Sincerely,

for William D. Gilmore, P.E.
Branch Manager
Project Development & Environmental Analysis

Attachment

cc: David Robinson, Ph.D., P.E.
Charles Bruton, Ph.D.
Fred Lamar

CROATAN WETLAND MITIGATION BANK PROSPECTUS

Neuse River Basin
Craven County

Prepared for:

U.S. Army Corps of Engineers

and

Mitigation Banking Review Team

Prepared by:

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

November 19, 1999

WETLAND MITIGATION BANK PROSPECTUS

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PROSPECTUS

Croatan Wetland Mitigation Bank
Craven County, North Carolina

The size and configuration of the Croatan Wetland Mitigation Bank (CWMB) present the opportunity for large-scale wetland mitigation across a range of landscape positions. Control of a substantial portion of the East Prong Brice Creek watershed between Long Lake and Catfish Lake Road further contributes to the opportunity for wetland ecosystem restoration. Restoration of historic hydrologic connectivity of the extensive headwater wetland storage areas is expected to benefit estuarine systems downstream from Brice Creek; increasing precipitation retention time on the 4040-acre CWMB should reduce the size of freshwater pulses into the coastal wetlands. The extensive size of the CWMB, along with the contiguity to adjoining portions of the Croatan National Forest, particularly the proximity to Sheep Ridge Wilderness, will also benefit wildlife populations, particularly species such as black bear and area-sensitive neotropical migrant birds which require extensive tracts of undisturbed habitat.

A. Administrative Provisions

A-1. Bank Sponsor Identification

The North Carolina Department of Transportation (NCDOT) recognizes in fulfilling its public service mission of roadway and other transportation constructions its important responsibility to protect the State's environment, and to protect the State's wetlands resources in a prudent manner in compliance with applicable State and Federal law.

A-2. Type of Bank

The Croatan Wetland Mitigation Bank (CWMB) is proposed for use in providing in-kind compensatory mitigation for unavoidable wetland impacts on NCDOT projects for which no on-site, in-kind mitigation is available.

A-3. Bank Clientele

Single Client / State Agency

A-4. Real Estate Interests

NCDOT has fee simple ownership of the 4040 acre Croatan Wetland Mitigation Bank (CWMB) located in Craven County.

A-5. Cost Assurances

NCDOT wetland mitigation process is funded as part of each construction project. This may be done with either State or Federal funds.

NCDOT is financially supported through state and federal actions as authorized by legislation. This authorization includes a portion of the taxes collected from the sale of gasoline.

NCDOT anticipates no difficulty in meeting its obligations for funding of wetland mitigation banks as specified by law, rule or regulation.

B. Technical Provisions

B-1. Location and Size of Bank

The Croatan Wetland Mitigation Bank (CWMB) is located in the lower portion of the Neuse River Drainage Basin within the Atlantic Coastal Plain Physiographic Province of North Carolina. The CWMB is included in USGS hydrologic cataloging unit 03020204 which includes watersheds of the Neuse and associated tributaries, including the Trent River, from the Pamlico Sound upstream to New Bern.

The CWMB constitutes a contiguous parcel of approximately 4040 acres, or 6.3 square miles, located approximately 3.6 miles northwest of Havelock in Craven County (Figure 1). Specifically, the CWMB is located between the northeastern shore of Long Lake and East Prong Brice Creek at Catfish Lake Road (SR 1100).

The northeastern shore of Long Lake forms the southern boundary of the CWMB. U.S. Department of Agriculture (USDA) Forest Service lands border the entire western and northern boundaries of the CWMB and much of the eastern boundary. A single private holding abuts the CWMB along the southeastern boundary. The only other non-Forest Service tract adjoining the CWMB is a tract purchased by NCDOT located along the central portion of the eastern boundary. A CP&L power transmission line, with 170 feet of associated cleared easement, crosses the northern portion of the CWMB.

B-2. Location, Type, Acreage, and Condition of Existing Bank Wetlands

Approximately 95 acres of the CWMB consist of riverine wetlands associated with channels of East Prong Brice Creek along the northeastern boundary and an associated tributary (hereafter referred to as the CWMB Branch) located within the northwestern portion of the CWMB. Approximately 85 acres of additional historic riverine wetlands may extend beyond the upper extent of the present channel on the CWMB Branch. Field efforts are underway to delineate and characterize the stream channels and associated riverine wetlands.

A large proportion of the interstream area between Long Lake and the headwaters of East Prong Brice Creek is dominated by the remains of Gum Swamp, which historically appeared to be a large, nonriverine wetland forest system. Preliminary evaluations show that wetlands may remain on an estimated 2500 acres of the approximately 3800 acres of non-riverine hydric soils presumed to have been present historically. Field efforts are underway to delineate the extent of jurisdictional wetlands on the CWMB.

Approximately 17 miles of large roadside ditches and more than 9 miles of other ditches have been identified on the CWMB. A review of historic aerial photography shows that the ditching was initiated between 1949 and 1964. Most of the existing road and ditch network had been completed by 1974. Under historic conditions, the majority of the interior wetlands associated with Gum Swamp likely served as an above-headwater storage area for East Prong Brice Creek. The southern portion of the CWMB also likely received hydrologic input from groundwater flow from Long Lake. Preliminary field evaluations, ditch drainage modeling, surficial monitoring well data, and jurisdictional delineations conducted to date show that the ditches have depressed adjacent water tables throughout much of the site. Extensive artificial drainage features throughout the CWMB have resulted in subsidence of organic layers within the organic soils.

Figure 2 presents the mapped soils for CWMB (USDA 1989). Non-hydric soil mapping units account for less than 100 acres of the 4040-acre CWMB. The dominant hydric soils on the CWMB include Croatan muck, an organic soil, Bayboro mucky loam, and Pantego fine sandy loam. Other organic soils present include the Dare series along Long Lake and the Dorovan series along the upper floodplain of the headwaters

of the CWMB Branch. Masontown mucky fine sandy loam, found along the floodplain of the CWMB Branch, and Murville mucky loamy sand, found along the interstream divide, all have relatively higher organic content compared to other mapped mineral soils. Muckalee sandy loam is also found along the CWMB Branch floodplain and would have been frequently flooded under undisturbed conditions. The remaining hydric soils (Leaf silt loam, Leon sand, Rains fine sandy loam, and Torhunta fine sandy loam) are found in broad flats and depressions. Detailed soil investigations, including confirmation of mapped series and evaluation of organic soil degradation, are being conducted.

The CWMB has undergone heavy degradation of its wetland natural communities over the last several decades. This site was actively managed for forest production for nearly 50 years prior to purchase by NCDOT. During this period (and prior to this period), most of the desirable hardwood species have been removed. Successional, opportunistic hardwoods such as sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and swamp red bay (*Persea palustris*) have achieved dominance in stands that under natural conditions should be dominated by baldcypress (*Taxodium distichum*), swamp tupelo (*Nyssa biflora*), Atlantic white cedar (*Chamaecyparis thyoides*), and a mixture of hydrophytic oaks (*Quercus* spp.). The CWMB presently contains a mix of forested stands of varying degrees of disturbance, regenerating cut-overs, and recent clear cuts. Figure 3 presents a recent (March 1997) aerial photo of the CWMB. Field efforts are underway to map and characterize remaining forested stands and vegetative units on the CWMB.

Figure 4 presents a schematic depicting existing site conditions for the CWMB. This schematic is based on preliminary data; on-going field efforts will result in more detailed jurisdictional delineations and stand characterizations.

B-3. Location, Type, Acreage, and Condition of Proposed Debiting Wetlands

The CWMB is proposed for use in providing in-kind compensatory mitigation for unavoidable wetland impacts occurring on NCDOT projects for which no practicable on-site, in-kind mitigation is available. Proposed debiting wetlands will be within the proposed service area and will consist of the same types proposed for restoration, enhancement, and preservation at the CWMB. Among the NCDOT projects for consideration of utilizing the CWMB are:

- T.I.P. No. R-1015 US 70, Havelock Bypass, North of Pine Grove to North of Carteret County Line, Craven County.
- T.I.P. No. R-2001 NC 11, NC 241 in Pink Hill to Jacksons Store, Lenoir County.
- T.I.P. No. R-2105 NC 24, Swansboro to US 70 at Morehead City, Carteret-Onslow Counties.
- T.I.P. No. R-2235 US 258, NC 24 Near Richlands to US 70 at Kinston, Onslow-Jones-Lenoir Counties.
- T.I.P. No. R-2250 NC 11-903, Greenville Southwest Bypass, NC 11 to Greenville Bypass, Pitt County.
- T.I.P. No. R-2301A US 17, New Bern Bypass, US 17 South of New Bern to US 70, Craven County.
- T.I.P. No. R-2513 US 17, SR 1438 to Washington Bypass, Craven-Beaufort Counties.
- T.I.P. No. R-2514 US 17, Multi-lanes North of Jacksonville to Multi-lanes South of New Bern, Onslow-Jones Counties.
- T.I.P. No. R-2539 NC 55, US 17 at Bridgeton to NC 304 in Bayboro, Craven-Pamlico Counties.
- T.I.P. No. R-2553 US 70, Kinston Bypass, Lenoir County.
- T.I.P. No. R-2719 New Route, Crescent Road in Kinston, US 70 to NC 58, Lenoir County.
- T.I.P. No. R-3403 US 17, Mills Street in Bridgeton to SR 1438, Craven County.

This list is included for preliminary consideration and is not a complete or final accounting of all eligible projects. Service area, availability of credits, debiting wetland type, and approval from the MBRT will determine which projects will be eligible to utilize the CWMB.

B-4. Proposed Credit Production Methods

Credit production on the CWMB will be achieved through restoration, enhancement, and preservation of wetland functions through mitigative measures.

Nonriverine Wetland Credit Production

Restoration credit for nonriverine areas will be produced by restoring jurisdictional hydrology to hydric soils that currently lack jurisdictional hydroperiods; suitable vegetative cover will also be restored in appropriate areas. Nonriverine enhancement credit will be produced by increasing hydroperiods in existing degraded wetlands to levels approaching historic conditions; criteria for determining hydrologic enhancement are being developed based on on-site hydrology monitoring, reference site monitoring, and published data. Enhancement credit will also be generated by selective plantings of suitable species in existing wetlands containing disturbed vegetative cover. Existing jurisdictional nonriverine wetlands will generate preservation credits unless hydrologic enhancement or vegetative enhancement is demonstrated.

Riverine Wetland Credit Production

Riverine restoration credits will be generated by restoring hydrologic connectivity between East Prong Brice Creek and the CWMB Branch and the respective headwater storage areas which have been effectively isolated by existing road and ditch network.

Non-hydric soil, roads, and hydric soil areas where jurisdictional hydrology is not achieved will not generate credits.

A detailed site investigation is underway to collect baseline data for use in developing the mitigation plan. Baseline credit potential will be identified through a combination of field investigations and data modeling. Field investigations include delineation of hydric soils, delineation of jurisdictional wetlands, vegetation characterization, monitoring of groundwater and surface water fluctuations, and geotechnical evaluations.

As part of the hydrology monitoring, three rain gauge stations, 17 surface water gauges, and 100 shallow groundwater monitoring well stations have been established on the CWMB. Surface water gauges consist of Remote Data Systems (RDS) WL-80 (80-inch) series monitoring wells installed within the ditch network of CWMB, Long Lake, East Prong Brice Creek, and CWMB Branch. Shallow groundwater monitoring well stations consist of RDS WL-20 (20-inch) and WL-40 (40-inch) series monitoring wells installed individually or clustered. Reference wetland hydrology data are being collected using shallow groundwater monitoring wells installed at five on-site locations and five off-site reference wetland locations. On-site reference wetland monitoring sites are located along the periphery of the CWMB in areas with little hydrologic disturbance. Off-site reference wetland monitoring sites are located in close proximity to the CWMB on USDA Forest Service lands. Hydrology monitoring data are being used to aid in validating jurisdictional delineations, to establish baseline groundwater hydrology data (pre-implementation conditions), and to validate modeling efforts. Hydrology monitoring following implementation will be used to document mitigation success.

Subsurface investigations and hydrogeological assessments are being undertaken to determine the presence and extent of any shallow or deep confining layers within the CWMB that may have been affected by historic ditching or that may be affected by mitigation efforts. Shallow (5 to 8 feet) and deep (30 to 40 feet) piezometers were installed throughout the CWMB and are being monitored to establish site horizontal and vertical groundwater gradients. As part of the hydrogeologic assessment, hydraulic conductivity data are

being collected from surficial soil strata to facilitate the modeling effort for predicting hydrologic restoration and enhancement. DRAINMOD will be used to simulate existing conditions and conditions under a variety of restoration scenarios to determine the preferred alternative from both a hydrologic restoration perspective as well as a cost perspective. DRAINMOD will also be instrumental in modeling and forecasting the extent of hydrologic enhancement potential available for existing degraded jurisdictional wetlands on the CWMB.

Hydrologic and hydraulic (H&H) analyses are being conducted to model surface water runoff potential and estimate flows for watersheds and flow networks on the CWMB. The ability to predict surface water runoff potential is necessary for future design of water control and other features at this site in addition to understanding site hydrology. Hydrologic and hydraulic analyses will be conducted using the U.S. Army Corps of Engineers Flood Hydrograph Package (HEC-1), River Analysis System (HEC-RAS), and Flood Frequency Analysis (HEC-FFA) computer programs and in-house spreadsheet programs. The H&H analyses will also be used to develop a water balance for the CWMB.

To attain site hydrology goals, roadway cuts and culverts will be located and sized to restore presumed historic groundwater and surface water flow conditions. Existing water control structures (*i.e.* culverts, ditches, and spillways) may be used or modified. At this time it is not clear what water control structures will be needed to provide the desired wetland hydrology. Possible alternatives under consideration range from filling ditches adjacent to roadway sections slated to be abandoned to constructing low weirs in drainageways. The structures selected will depend on the water detention needs of the site. Simply filling in all ditches may not be adequate for restoring wetland hydrology because significant soil oxidation has occurred. Water control structures in and around existing channels will meet durability standards for engineered construction. Structures will typically be designed to safely pass 100-year expected discharges (either through, over, or in some combination) with no erosion in the 10-year expected discharge.

A detailed evaluation of existing CWMB vegetative community composition and structure is being conducted to develop a planting plan that incorporates existing vegetation wherever possible. Detailed site mapping and stand evaluations will identify components and maturity of existing vegetative community units on the CWMB. Reference wetland data will be used in conjunction with these data to aid in preparation of stand prescriptions and planting plan.

After implementation of hydrologic modifications and vegetation planting, the CWMB will be monitored as required to document successful attainment of mitigation goals. Final credit production will be contingent on the amount and degree of successful wetland restoration and enhancement.

B-5. Target Crediting Types

Figure 5 presents a schematic of potential site conditions following implementation of the CWMB. Target crediting types will include riverine wetlands associated with East Prong Brice Creek and tributaries, and nonriverine wetlands throughout the remainder of the site. Specific wetland community types targeted for restoration and/or enhancement on the CWMB follow Schafale and Weakley (1990):

- Coastal Plain Small Stream Swamp (Blackwater Subtype);
- Nonriverine Swamp Forest;
- Nonriverine Wet Hardwood Forest;
- Bay Forest;
- Peatland Atlantic White Cedar;
- Pond Pine Woodland;
- High Pocosin;

- Pine Savanna; and
- Wet Pine Flatwoods.

As part of the ecosystem restoration approach, other community types will be evaluated for enhancement. These areas are minor in coverage but with minimal effort may further enhance the ecological value of the CWMB. The Natural Lake Shoreline community type present along Long Lake will be investigated for potential enhancement opportunities. Small ponds, probably associated with excavation during minor sand-mining activities, will be evaluated for potential enhancement as Small Depression Pond or Vernal Pool community types depending on hydrologic conditions. The minor amount of non-hydric soil pockets scattered on the CWMB will be evaluated for reforestation efforts targeting the nonjurisdictional Mesic Pine Flatwoods community type.

B-6. Without Bank Conditions

Figure 6 presents a schematic depicting presumed future site conditions without implementation of the CWMB. Without mitigation implementation, the site would be expected to be used primarily for timber production with the areas containing drained hydric soils considered to be candidate areas for intensive silvicultural plantation operations. No net loss or gain in wetland acreage is expected; however, some loss in wetland function is expected. Within existing organic soil wetlands, degradation of soils is expected to continue in the absence of hydrologic restoration. With continuing oxidation of organic soils, loss of mature trees in these areas is expected to continue. Some loss in wetland function is expected to accompany the reduction in water storage and retention capacity.

B-7. Crediting and Debiting Methodology

Crediting - Credits will be generated through successful implementation of the CWMB. The total available credits at the CWMB will be determined by the acreage of successful wetlands restoration. Each mitigation credit will consist of one (1.0) acre of restoration, with the balance composed of some combination of enhancement and/or preservation, the amount of which will be determined following detailed site investigations and site planning. Monitoring results and subsequent reports will be the vehicle by which successful achievement of mitigation goals will be demonstrated. The Bank Sponsor, in consultation with the MBRT, will determine when performance standards have been met. If performance standards are not met, then the Bank Sponsor will perform any and all remedial activities to the satisfaction of the MBRT. Credits will be released according to a schedule approved by the MBRT.

Debiting - The compensation ratio for debiting from the CWMB will be determined following completion of on-going site investigations to determine the amount of restoration, enhancement, and preservation expected to be available on the site. The Bank Sponsor will submit a written notification to the MBRT at the time of each transaction within the Bank. In addition, an accounting schedule (ledger) will be submitted to the MBRT on an annual basis. This accounting schedule will be certified by the Bank Sponsor prior to submission to the MBRT.

B-8. Preliminary Credit Calculations

On-going field investigations and hydrologic modeling will better define the actual amount of land available for restoration, enhancement, and preservation on the CWMB. Preliminary credit calculations presented in the following table are modified from EPA guidelines (Page and Wilcher 1990). Final credit calculations will satisfy state requirements for a minimum 1:1 replacement ratio through restoration as described in North Carolina Administrative Code Section 15A NCAC 2H .0506(h)(6), which pertains to mitigation requirements under the state's Section 401 water quality certification program. Unless otherwise determined by the

Mitigation Banking Review Team, total credits will not exceed the number of acres successfully restored to jurisdictional status and each credit will consist of one (1.0) acre of restoration as well as a representative proportion of the available enhancement and preservation acreage. Credits will be tracked by either riverine or nonriverine status.

Preliminary Credit Calculation:

Mitigation Type		**Area (acres)**	**Potential Mitigation Credit**	**Potential Replacement Credit (acre credits)**	
Nonriverine Wetlands	Restoration	1150	2:1	575	Total: 1150* (*maximum limited to restoration acreage total)
	Enhancement	2100	4:1	525	
	Preservation	400	5:1	80	
Riverine Wetlands	Restoration / Enhancement	180	3:1 (2:1 / 4:1)	60	
Nonjurisdictional	Buffers/Roads	210	0:1	0	
	TOTAL	4040	3.3:1	1210	

Based on preliminary field efforts and calculations, the CWMB is expected to generate approximately 1150 nonriverine credits and 60 riverine credits. Actual credits will be determined by the MBRT following completion of mitigation plan.

B-9. Proposed Schedule for Bank Completion and Credit Release

Due to the size of the CWMB, site preparation and planting are projecting to occur in two phases over a two-year period. Based on current projections, the following is the proposed schedule for CWMB completion:

- January 2000: Preliminary evaluations and modeling complete
- March 2000: Draft Conceptual Mitigation Plan submitted to NCDOT
- April 2000: Conceptual Mitigation Plan submitted to MBRT
- June 2000: Conceptual Mitigation Plan finalized
- July-December 2000: Final Design
- January 2001: Mitigation Banking Instrument signed
- January 2001-March 2001: Design Services
- March 2001-December 2001: Site construction for Phase I
- December 2001-March 2002: Planting for Phase I
- March 2002-December 2006: Five-year monitoring period for Phase I
- March 2002-December 2002: Site construction for Phase II
- December 2002-March 2003: Planting for Phase II
- March 2003-December 2007: Five-year monitoring period for Phase II

The actual dates for credit release may vary and will depend on when specific milestones are reached.

The following is the proposed schedule for release of credits:

	Date (approx.)	Milestone Reached	Release	Cumulative
•	January 2001	MBI signed	10%	10%
•	January 2002	As-built Report for Phase I	10%	20%
•	January 2003	First-year Monitoring Report (10%), As-built Report for Phase II (10%)	20%	40%
•	January 2004	Second-year Monitoring Report	10%	50%
•	January 2005	Third-year Monitoring Report	10%	60%
•	January 2006	Fourth-year Monitoring Report	10%	70%
•	January 2007	Fifth-year Monitoring Report*	15%	85%
•	January 2008	Sixth-year Monitoring Report*	15%	100%

* Final release of the remaining credits will be contingent on demonstration of successful attainment of hydrology and vegetation goals. Actual credits available will be determined by the amount of successful restoration and enhancement achieved. Sixth-year monitoring report corresponds to fifth year for Phase II.

C. Operations Provisions

C-1. Proposed Service Area

The proposed service area (Figure 7) for the CWMB is requested to include the lower portion of the Neuse River Drainage Basin including Hydrologic Cataloging Unit 03020204 (corresponding to DWQ sub-basins 03-04-10, 03-04-11, and 03-04-14) and Hydrologic Cataloging Unit 03020202 (corresponding to DWQ sub-basins 03-04-09, 03-04-08, and 03-04-05). The Bay River drainage area of USGS Hydrologic Cataloging Unit 03020105 in Pamlico County is also proposed for inclusion in the service area; this area is included in the Neuse Drainage by DWQ (DWQ sub-basin 03-04-13). Hydrologic Cataloging Unit 03020106 within the White Oak River Drainage Basin (corresponding to DWQ sub-basins 03-05-01, 03-05-03, 03-04-03, and 03-04-05) is also proposed for inclusion within the service area. Inclusion of this adjacent portion of the White Oak drainage basin is based on the tenuous hydrologic boundary between the Neuse and White Oak drainage basins in the extensive pocosins in the vicinity of the Croatan Lakes region.

C-2. Wetland Type and Function Acceptable for Debiting

The 4040-acre CWMB will contain a variety of wetland types spanning a spectrum of hydrologic conditions from frequently flooded riverine wetlands to seasonally saturated nonriverine wetlands. Wetland types acceptable for debiting at the CWMB will include most non-tidal, freshwater wetland types commonly encountered within the lower Coastal Plain of North Carolina. Mitigation credits will be used for unavoidable in-kind riverine or nonriverine wetland losses associated with projects in the CWMB service area.

C-3. Monitoring and Contingency Plans

The monitoring plan for the CWMB will consist of a direct comparison between relatively undisturbed reference wetlands and wetland/enhancement areas of the CWMB. The wetland restoration and enhancement success criteria will be based upon a comparative analysis between designated reference wetlands and the wetland mitigation site. Monitoring of wetland restoration and enhancement efforts will be performed until success criteria are fulfilled.

Hydrology

Monitoring - Surficial groundwater monitoring wells have been placed on the CWMB and within ten reference wetland sites along the CWMB periphery and nearby Forest Service property during 1998 and 1999. These wells are currently being monitored as part of the preliminary data collection effort. Following site implementation these groundwater monitoring wells will continue to be monitored throughout subsequent growing seasons at intervals necessary to satisfy the hydrology success criteria within each of the restoration and enhancement areas. Additional groundwater monitoring wells will be placed on the CWMB following implementation to provide adequate coverage for documenting hydrologic restoration and enhancement. Specific locations for additional groundwater monitoring wells will be determined in the detailed mitigation plan; consideration will be given to soil type, existing and predicted hydrologic conditions, and overall areal coverage.

Success Criteria - Target hydrological characteristics for restoration areas include inundation or saturation within 12 inches of the surface for 12.5 percent of the growing season during average climatic conditions for most soil types present. Hydrology success for enhancement areas include increasing existing jurisdictional hydroperiods to soil type-specific hydroperiods approaching those of reference wetlands. Based on preliminary modeling, hydrologic success in enhancement areas is expected to be achieved on an incremental basis over several years. Specific annual target hydroperiods relative to reference will be established during development of the detailed mitigation plan; an acceptable range of variance will be based on specific soil conditions, published values, and modeled variability.

Vegetation

Monitoring - After planting has been completed in winter or early spring, an initial evaluation will be performed to verify planting methods and to verify initial composition and density. Supplemental planting and additional site modifications will be implemented, if necessary.

During the first year, vegetation will receive cursory, visual evaluation on a periodic basis to ascertain the degree of overtopping of planted elements by nuisance species. Subsequently, quantitative sampling of vegetation will be performed between August 1 and November 30 each growing season until the vegetation success criterion is achieved.

Vegetation sampling plots will be placed within each restored community type. Sample plot distributions will be correlated with hydrological monitoring locations to provide point-related data on hydrological and vegetation parameters.

Performance criteria will be met if sample plots demonstrate annual survival goals. At the end of each of the first three complete years of monitoring, 320 target-species plants per acre must have survived such that at the end of three years, 320 three-year old target-species plants per acre have survived. In years four and five, 288 and 260 target-species plants per acre, respectively, have survived on the site, such that at the end of year five, 260 five-year old target-species plants per acre have survived on the site.

Target tree species are those found within the reference ecosystems as well as acceptable species naturally recruited and considered natural components of the target community types as described in Schafale and Weakley (1990). Naturally recruited non-target trees can not comprise more than 10 percent of the surviving stems/acre requirement in restoration areas targeted for reforestation. In

existing forested areas (proposed for restoration and enhancement) identified for supplemental plantings, specific success criteria for tree plantings will be established on a stand-by-stand basis.

Specific stand planting diversity and species representation (relative proportion) will be determined by target community type. Within targeted Pond Pine Woodland stands for example, pond pine and loblolly bay may constitute the majority of stems planted and lesser amounts of sweetbay, red bay, and Atlantic white cedar may be planted. Natural recruitment of red maple and loblolly pine is anticipated and should be acceptable since these species are natural constituents of Pond Pine Woodland as described in Schafale and Weakley (1990).

No quantitative sampling requirements are proposed for herb and shrub assemblages as part of the vegetative success criteria.

Soils - Since the majority of the CWMB has been documented as containing soils formed under hydric conditions, successful restoration or enhancement of hydrology to these applicable areas shall be considered successful attainment of the hydric soil criteria. No specific soil monitoring is proposed.

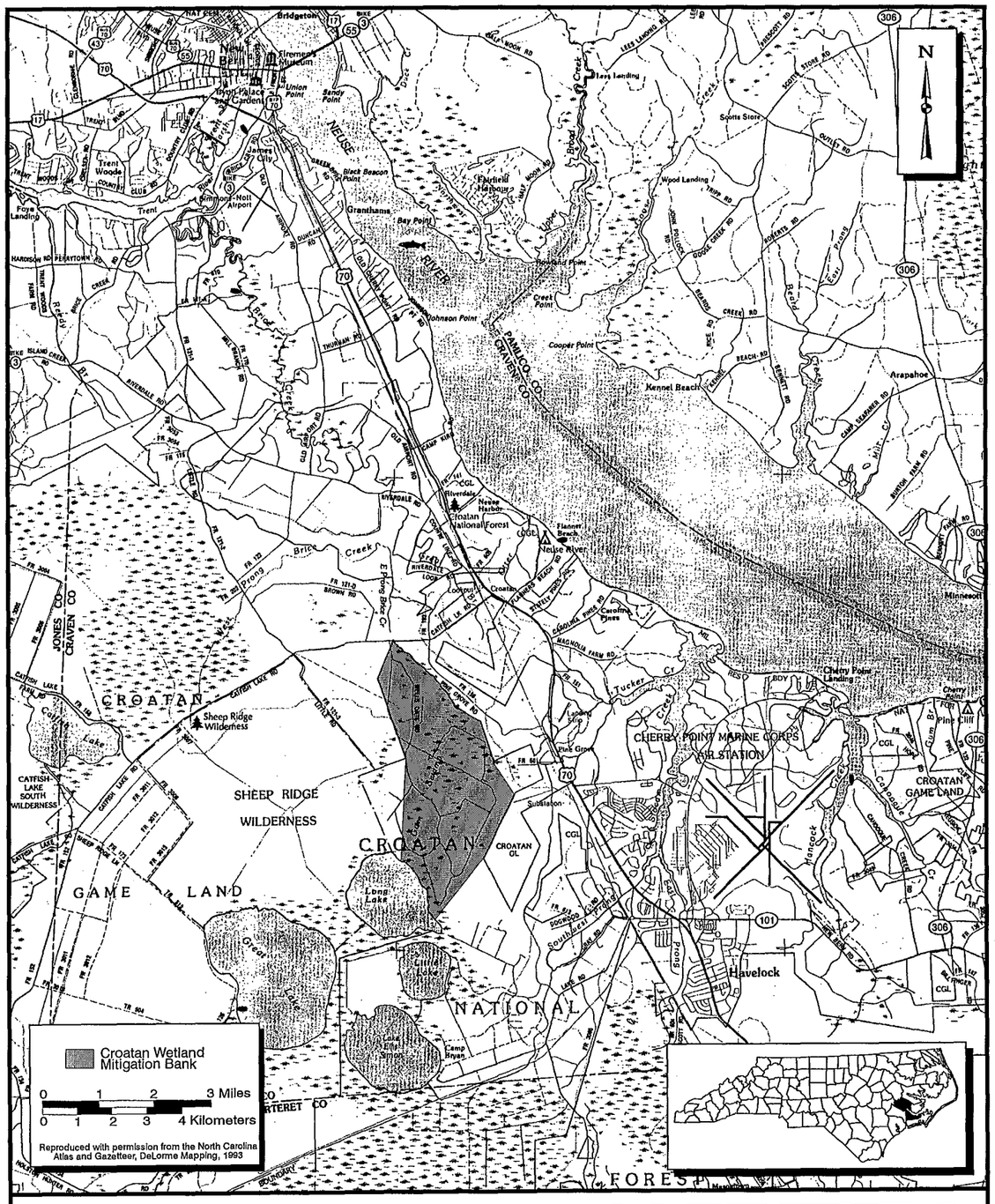
Report Submittal - An "as-built" report of the CWMB, including plan drawings, initial species compositions by community type, and monitoring/sample plot locations will be provided within 90 days of completion of site implementation. A discussion of the planting design, including densities and numbers of each species planted, will also be included.

Subsequently, reports will be submitted yearly to the MBRT following each assessment. Submitted reports will document the sample transect locations, along with photographs which illustrate site conditions in reference and mitigation wetlands. Surficial well data will be summarized in tabular format. The duration of wetland hydroperiods during the growing season will also be calculated within each community restoration type and reference area. The survival and density of planted tree stock will be reported. A visual estimate and photographic evidence of the relative cover of shrub and herb species will be generated.

Contingency - In the event that vegetation or hydrology success criteria are not fulfilled, a mechanism for contingency will be implemented. For vegetation contingency, replanting and extending the monitoring period will be implemented if community restoration does not fulfill minimum species density and distribution requirements. Hydrologic contingency will require consultation with hydrologists and MBRT in the event that predicted wetland hydrology restoration or enhancement is not achieved during the monitoring period. Recommendations for contingency to establish wetland hydrology will be implemented and monitored until the hydrology success criteria are achieved.

D. Attachments

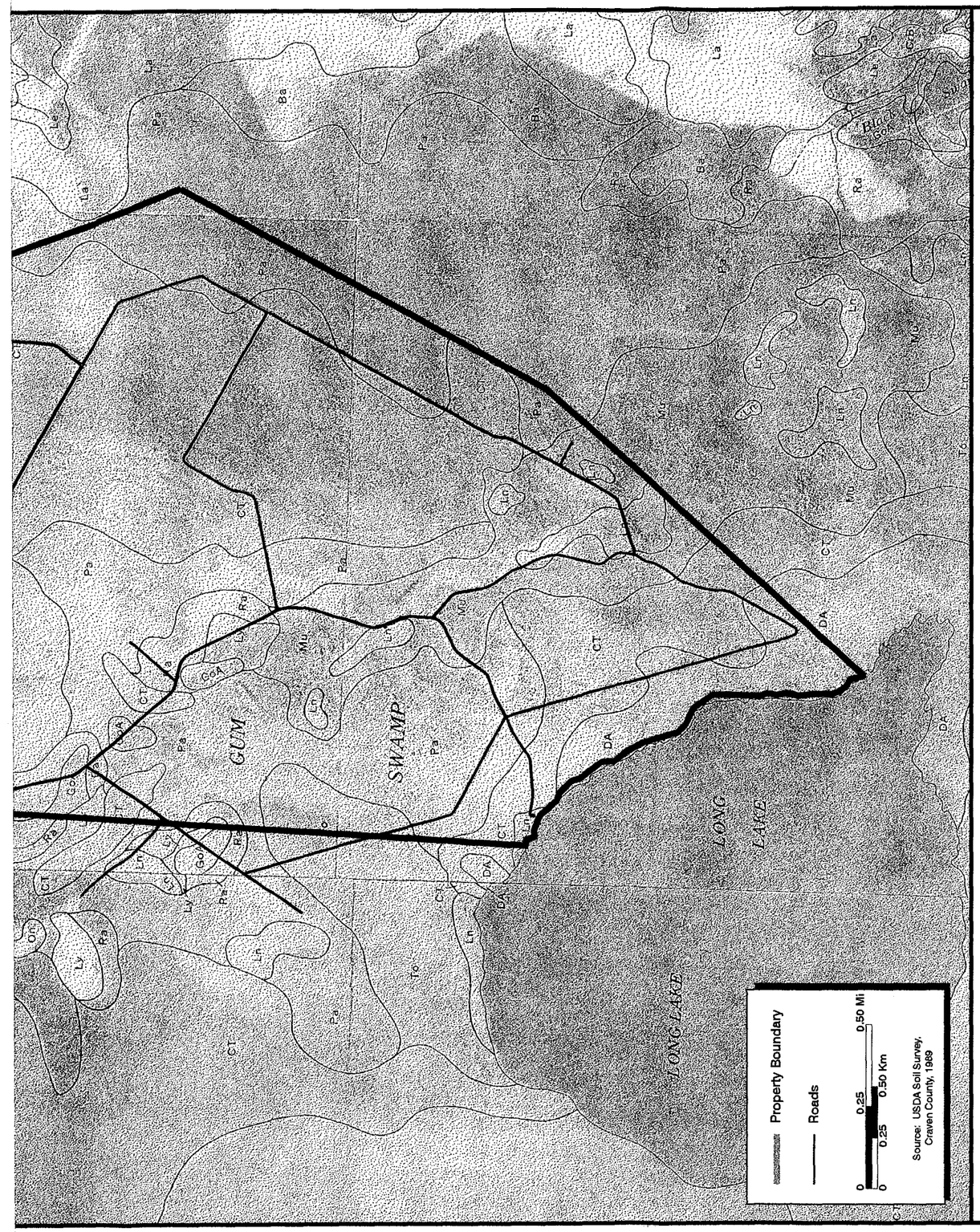
- Figure 1. Location Map
- Figure 2. Soil Map
- Figure 3. Current Aerial Photo
- Figure 4. Site Schematic: Current Condition
- Figure 5. Site Schematic: With Bank Condition
- Figure 6. Site Schematic: Without Bank Condition
- Figure 7. Proposed Service Area



Location Map
Croatan Wetland Mitigation Bank
Craven County, North Carolina

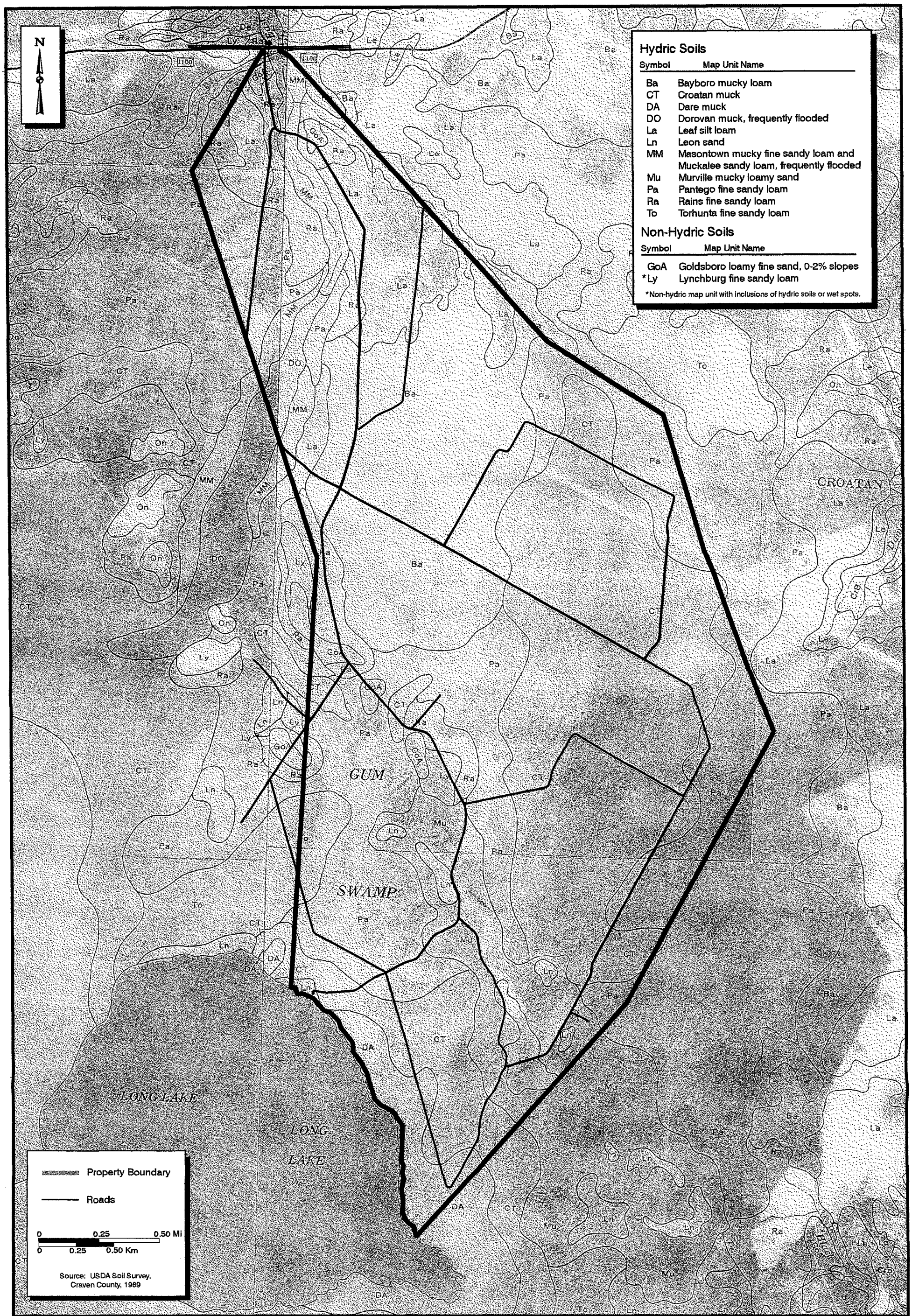
Figure:	1
Project:	R-1015WM
Date:	Nov 1999

ER98006.07/locat.cdr



Soil Map
Croatan Wetland Mitigation Bank
Craven County, North Carolina

Figure:	2
Project:	R-1015WM



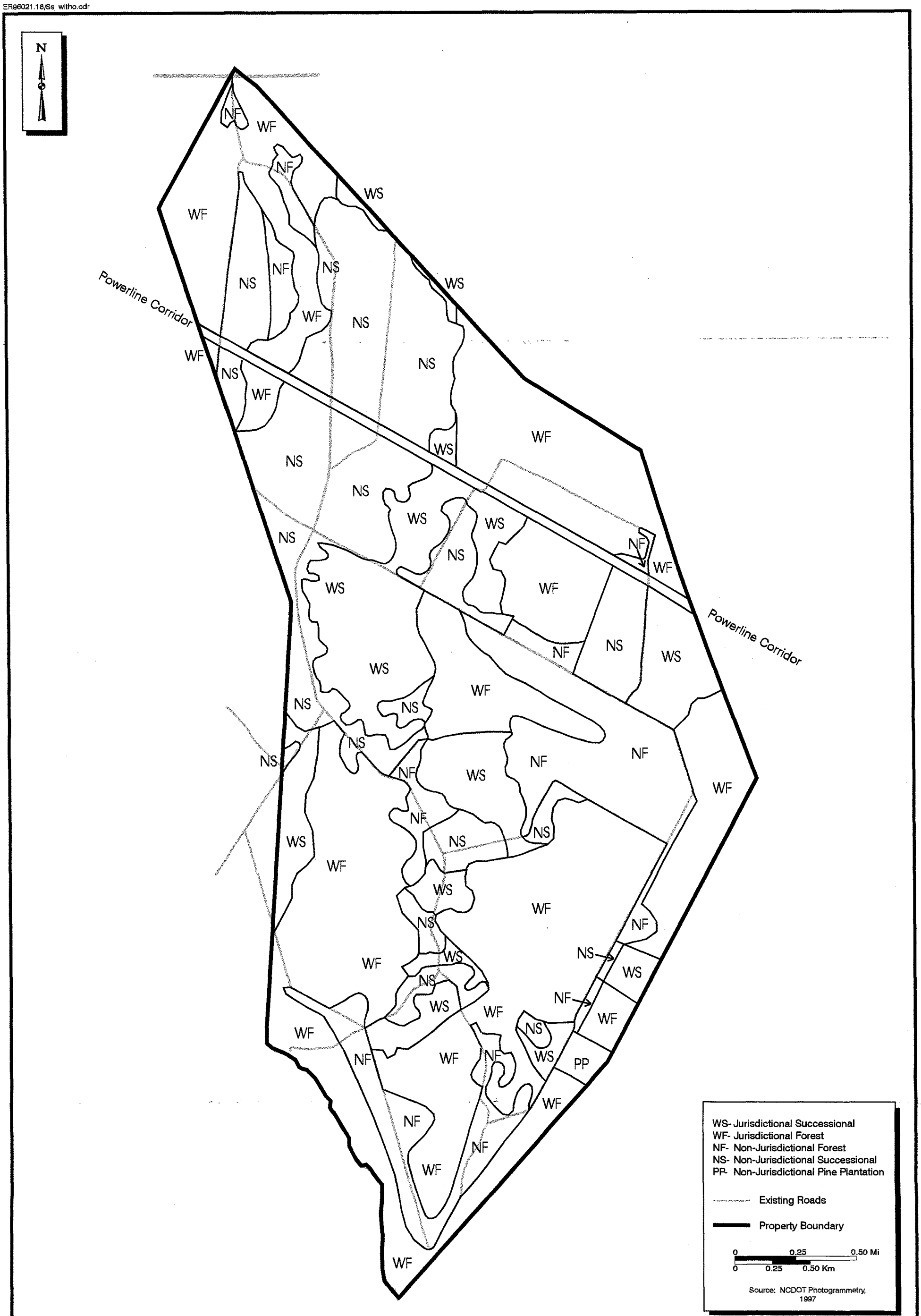
Soil Map
Croatan Wetland Mitigation Bank
Craven County, North Carolina

Figure:	2
Project:	R-1015WM
Date:	Nov 1999

Current Aerial Photo
Croatan Wetland Mitigation Bank
Craven County, North Carolina

Figure:	3
Project:	R-1015WM
Date:	Nov 1999

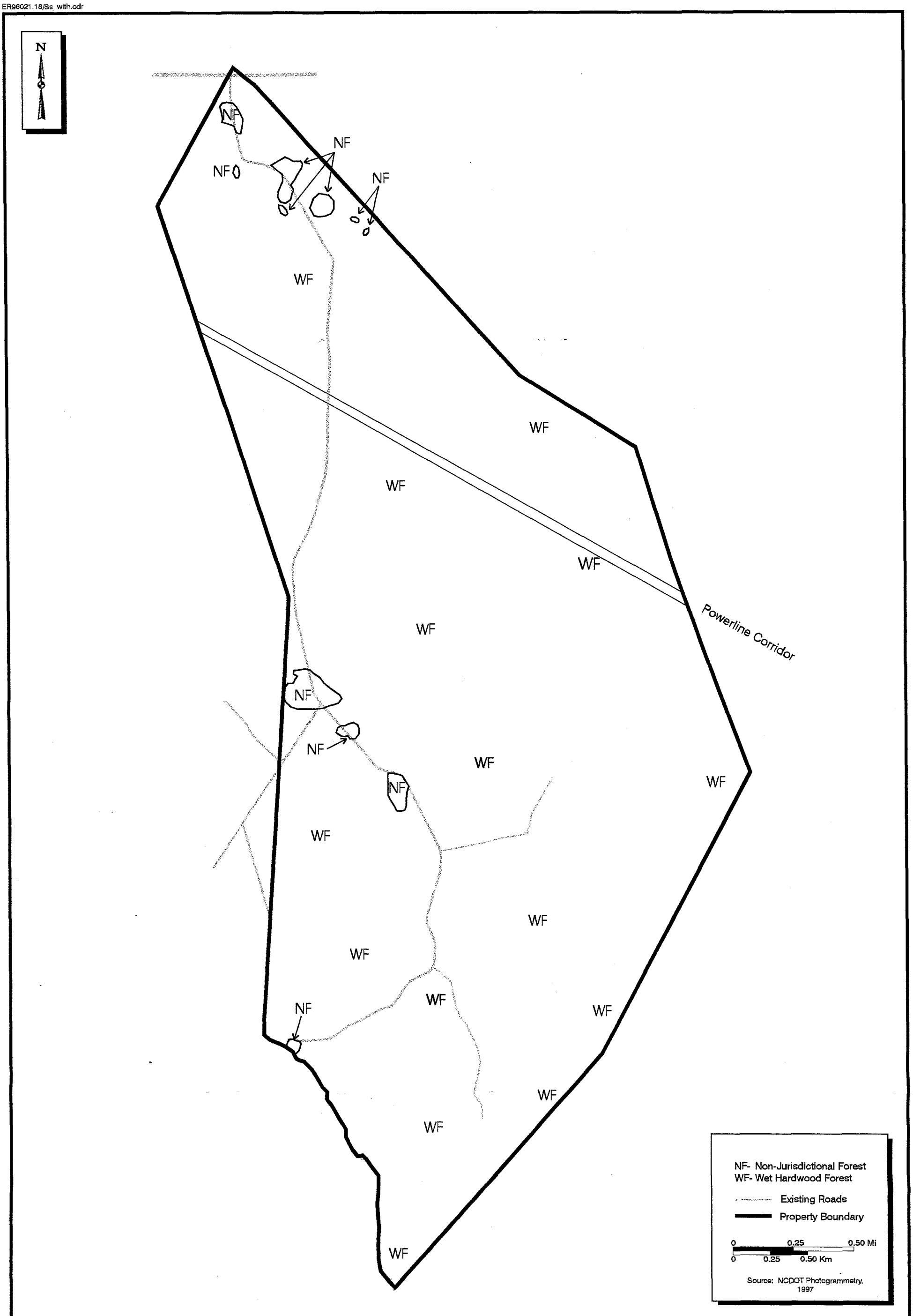
ER96021.18/Ss_witho.cdr



Site Schematic: Current Condition
Croatan Wetland Mitigation Bank
Craven County, North Carolina

Figure:	4
Project:	R-1015WM
Date:	Nov 1999

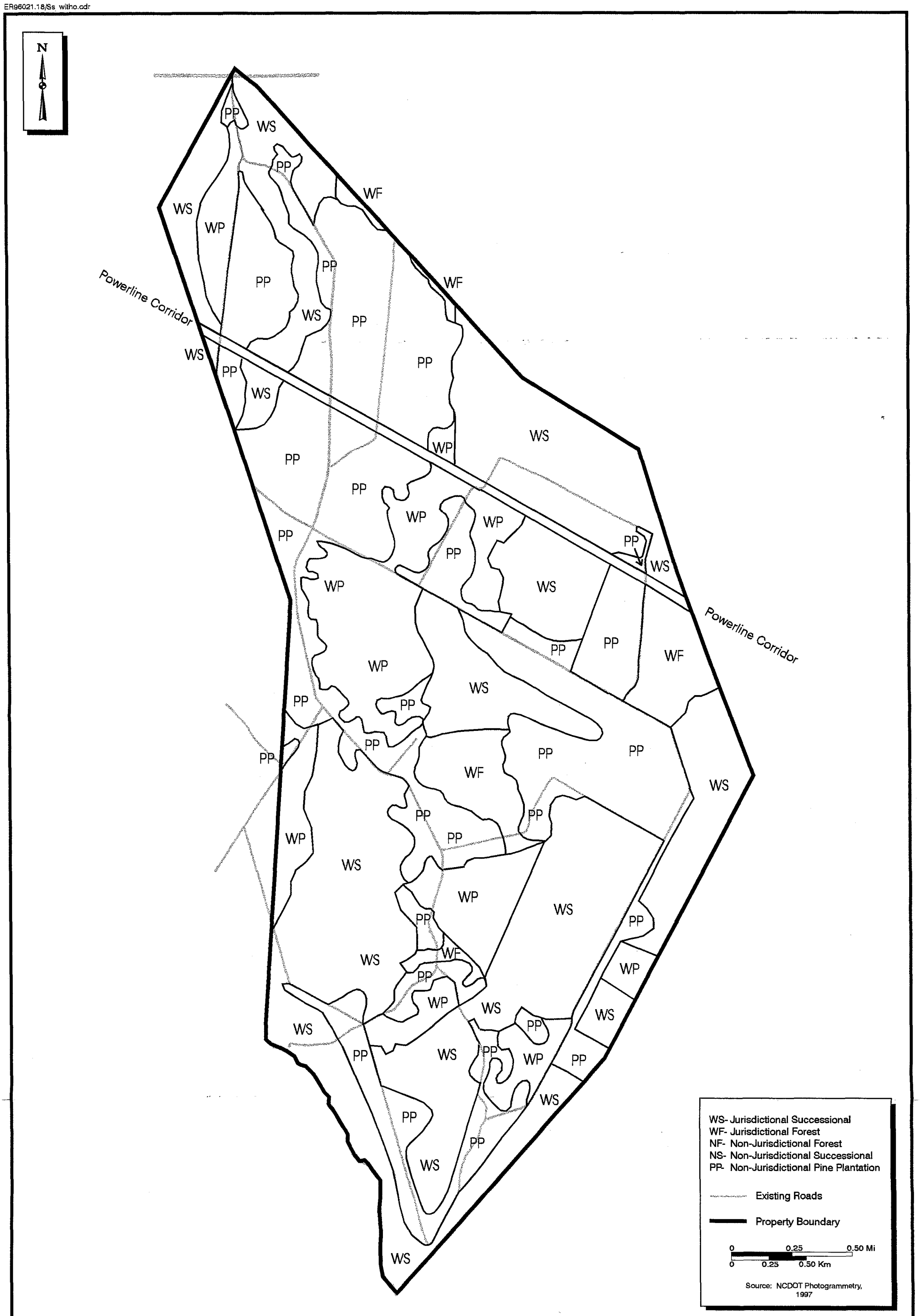
ER96021.18/Ss_with.cdr



Site Schematic: With Bank Condition
Croatan Wetland Mitigation Bank
Craven County, North Carolina

Figure:	5
Project:	R-1015WM
Date:	Nov 1999

ER96021.18/Ss_witho.cdr



Site Schematic: Without Bank Condition
Croatan Wetland Mitigation Bank
Craven County, North Carolina

Figure:	6
Project:	R-1015WM
Date:	Nov 1999

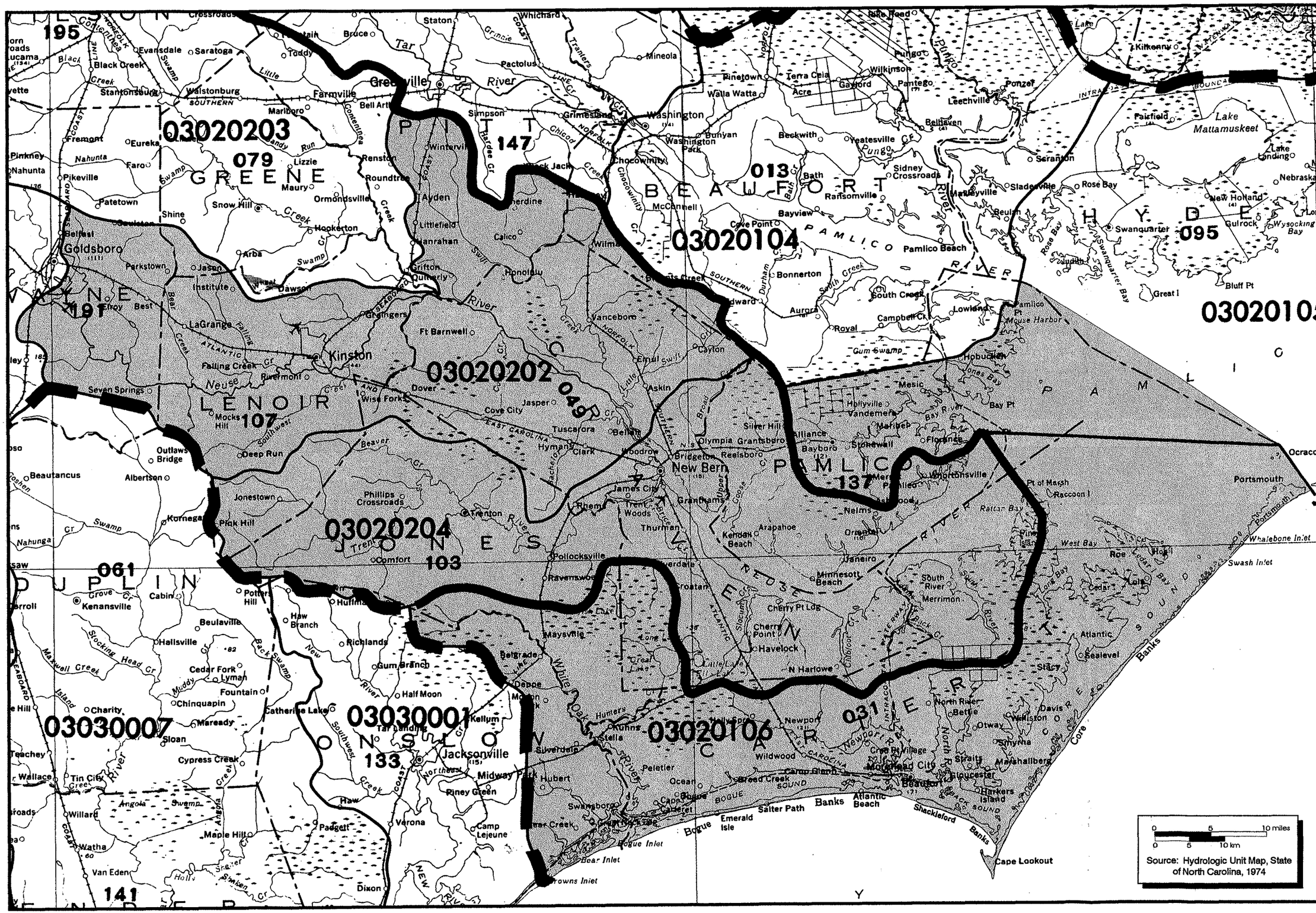


Figure:	7
Project:	R-1015WM
Date:	Nov 1999

Proposed Service Area
Croatan Wetland Mitigation Bank
Craven County, North Carolina