MAPPING POCOSINS AND ASSOCIATED WETLANDS IN NORTH CAROLINA

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Abstract: The National Wetlands Inventory of the U.S. Fish and Wildlife Service, in cooperation with the North Carolina Department of Environmental, Health and Natural Resources, is preparing large (1:24,000) scale wetland maps for North Carolina. To date, the mapping effort has been concentrated in the area from the Outer Banks westward into Durham County. Of the 470 maps covering the area, 415 are currently available. The basic data from which the maps have been prepared is high altitude 1:58,000 scale infrared photography taken during the winters of 1981, 1982, and 1983. Field checking has been conducted to confirm interpretable photographic signatures and to determine the accuracy of the maps. Wetlands have been classified in accordance with Wetlands and Deepwater Habitats of the United States by Cowardin et. al. Pocosins are classified

into several wetland categories depending on the life form of the dominant vegetation. The maps have been widely distributed and used for a variety of purposes, including site specific evaluations, university research projects, land use studies, etc. Wetland maps can be ordered by calling 1-800-USA-MAPS, by contacting the Soil and Water Conservation Division of the Department of Environment, Health and Natural Resources in Raleigh, North Carolina, or by contacting the Regional Office of the U.S. Fish and Wildlife Service in Atlanta, Georgia.

Key Words: Maps; North Carolina; pocosins; wetlands

INTRODUCTION

The National Wetlands Inventory (NWI) Project of the U.S. Fish and Wildlife Service (Service) has been actively preparing wetland maps and developing related products since 1979. The NWI is the fourth in a series of wetland inventories conducted by the Federal Government. Two previous inventories, in 1906 and 1922, by the Department of Agricultural were designed to identify lands that could be drained for crop production. The Service conducted an inventory in 1955 to locate wetlands important to wildlife, especially waterfowl (Shaw and Fredine, 1956). Wilson (1962) published the information gathered by the Service for North Carolina, including county maps on which the wetlands were delineated.

The NWI began production of modern wetland maps for North Carolina in 1983. After a slow start, compounded by extensive revisions to the initial maps, over 400 maps are now available for eastern North Carolina. Another 60 maps will be ready in the summer of 1990.

MAPPING PROCEDURES

Mapping of wetlands and deepwater habitats by the NWI is a well established seven step process. These steps are listed below.

1. Preliminary field investigations
2. Photo-interpretation of high-altitude photography
3. Review of existing wetlands information
4. Quality control of interpreted photographs
5. Draft map production
6. Interagency review of draft maps
7. Final map production

Preliminary field investigations enable photo-interpreters/biologists to obtain first hand knowledge about the wetland types that they will delineate. Aerial photographic signatures are compared directly to the ground cover. Once familiarity with the signatures has been established, photo-interpretation begins.

Photographs used for the inventory in North Carolina are 1:58,000 scale color infrared taken in 1981, 1982, and 1983. The photographs are viewed stereoscopically under four power magnification and the wetlands are delineated on clear mylar overlays attached directly to the photographic transparencies. The interpreters review and utilize a variety of published materials to assist them in making accurate delineations. At a minimum, County Soil Surveys and topographic maps are consulted. If available, reports such as those by Otte and Ingram (1980) or Sharitz and Gibbons (1982) are also studied.

Completed interpretations are then reviewed for accuracy and regional consistency at the Regional Office of the Service in Atlanta and then for national consistency at the NWI Project Office in St. Petersburg, Florida. If satisfactory, the line work and classification codes are transferred to 1:24,000 scale U.S. Geological Survey topographic base maps forming the draft wetland map. The process from field investigation to draft maps normally takes a full year.

The draft composite maps are distributed to any agency which has indicated a desire to review them. The Division of Soil and Water Conservation (Division) distributes map copies throughout the North Carolina Department of Environment, Health, and Natural Resources. Simultaneously, the Service sends maps to the Army Corps of Engineers, the Soil Conservation Service, the Environmental Protection Agency, and others. We have found this

interagency review to be the single most important step in assuring that the maps are accurate and usable. For the initial maps in North Carolina, multi-agency review parties spent one full day checking each 1:24,000 scale wetland map. Currently, over a half day is invested in checking each map. After field checking, editorial comments are compiled, maps are corrected, and final maps are prepared and distributed.

Success in preparing accurate maps can be attributed in part to the support and cooperation afforded to the NWI by the Division. The Division provides logistical support and wetland expertise during preliminary field investigations, coordinates and conducts field reviews of draft maps, and edits the draft maps. In addition, the Division serves as the coordination point for all NWI activities within the State.

MAP DISTRIBUTION

Over the years, the NWI has distributed nearly one million map copies. Twenty-one State-run distribution centers have also been established to make maps readily accessible to local users. The Division, which already provides maps to sister agencies, is considering becoming such a center. In the mean time, information on map availability and ordering can be obtained by calling toll free 1-800-USA-MAPS, which connects to the central user assistance facility of the United States Geological Survey.

WETLAND CLASSIFICATION

The NWI maps describe wetlands and other aquatic features in accordance with Classification of Wetlands and Deepwater Habitats (Cowardin et al., 1979). Although this classification defines wetlands differently from the Federal regulatory agencies, commonalities in the definitions exist. Both definitions identify wetlands in terms of hydric soils, hydrophytic vegetation, and periodic saturation or flooding during the growing season. The descriptive portion of the classification is hierarchical and can be complex, necessitating some training or experience in its application before the maps are easily understood.

Pocosins are not readily differentiated from associated wetlands on the NWI maps for several reasons. First, wetland scientists and land managers are not in general agreement on which landscape features (soils, vegetative communities, or geomorphologies) constitute pocosins. Second, pocosins may be classified the same as similarly vegetated wetlands, such as Carolina bays or interdunal swales. Third, individual pocosins may be divided into a variety of classification types, depending on the life form (trees, shrubs, emergents) of the dominant vegetation. Table 1 lists the most common alphanumeric codes for pocosin habitats. The Division has developed "User Notes" describing wetland habitats and their classifications to assist in comprehending the maps.

MAP USES

Although NWI maps do not delineate jurisdictional limits of wetlands, they have been used for a variety of other purposes. Maps are first and foremost a planning tool providing land managers and wetland scientists a starting point. In general terms they describe what and where the wetlands are. The maps cannot, however, supersede detailed site specific studies such as those necessary to delineate Federal jurisdiction (Federal Interagency Committee for Wetland Delineation, 1989). NWI maps have been used for comprehensive land use planning, oil spill contingency planning, environmental impact assessments, permit reviews, facility and corridor siting, analysis of wildlife habitat, land acquisition, trend studies, and historic documentation.

NATIONAL WETLANDS INVENTORY DIGITAL DATABASE

Recognizing that large volumes of complex cartographic information can more readily be utilized through automated analyses, the NWI is constructing a georeferenced digital database to be used with geographic information systems (GIS). Nationally, the NWI has digitized over 4,000 maps covering about 7 percent of the continental United States. The NWI is beginning to digitize wetland maps for

North Carolina, starting at Albemarle-Pamlico Peninsula area and expanding as funding permits. Digital files can be purchased through the St. Petersburg Office of the NWI. These data will be available on magnetic tape in MOSS export, DLG3 optional, ELAS, or EGE formats. Custom map products and data analyses can also be purchased.

Digital files can be manipulated to determine relationships between mapped information such as soils, vegetation, topography, and land use. The limitation is the availability of digital data, i.e., county soil surveys or NWI maps. We have begun to utilize a GIS approach to investigate these relationships at a landscape level. The following project was developed to determine relationships between wetlands and hydric soils in coastal North Carolina. Pocosin specific information can be derived from the data, however, the data would have been entered in a different format if the study had been pocosin specific.

WETLANDS AND HYDRIC SOILS STUDY

Study Area: Washington and Tyrrell Counties are located on the Albemarle-Pamlico Peninsula in the lower Coastal Plain of North Carolina. The peninsula is a low-lying, tidewater region

characterized by poorly drained mineral soils of the Pamlico Plain with large areas of organic soils which occur on interstream divides or broad flats (Daniels et al. 1984). Washington and Tyrrell Counties are adjacent counties in the northern portion of the peninsula. The Suffolk Scarp occurs in the western part of Washington County.

Methods: County soil surveys and NWI maps were used to create digital files. The soils were digitized according to the great group classification in soil taxonomy (Soil Conservation Service, 1975) but were consolidated into soil orders for this report (Table 2). The NWI wetlands were consolidated into broad vegetation cover types (Table 3). The data were entered into a GIS by digitizing the maps on a GTCO Digipad (Model 3648A, GTCO Corporation, Columbia, MD). The GIS data layers were created, manipulated, and analyzed using ERDAS software (Version 7.3, ERDAS Inc., Atlanta, GA) on a Compaq Deskpro 386 microcomputer (Compaq Computer Corporation, Houston, TX). Wetland vegetation communities occurring on different soil types were identified by matrixing the wetlands and soils data. The resulting data set has unique values corresponding to the co-occurrence of the two original data sets. Visually the result is a map overlay with new values that can be numerically quantified.

Results and Discussion: Washington and Tyrrell Counties have extensive areas of hydric soils (Table 2). Organic soils (Histosols) accounted for approximately 42 percent of the total land area of the two counties. Histosols were located in the interstream divides but were also found in the floodplains of blackwater rivers. Hydric Inceptisols and Ultisols fringed the Histosols in the interstream divides. The hydric soils of these three soil orders represented 87 percent of the total land area and 96 percent of the total hydric soil acreage. The zonation from organic soils to mineral soils followed no obvious pattern at this level of classification.

Evergreen scrub-shrub wetlands accounted for approximately 4 percent of the total wetlands in both counties (Table 2). This was surprising since pocosins are frequently thought of as evergreen shrub bogs, and this area of North Carolina is noted for pocosins. Likewise, given the extensive area of organic soils, we anticipated larger areas of evergreen or mixed scrub-shrub wetlands.

Over 90 percent of the wetlands in both counties were delineated as forested wetlands. Approximately 30 percent of the wetlands in Tyrrell County were evergreen forested wetlands compared to 5 percent in Washington County. A large proportion of wetlands on

mineral hydric soils in Washington County had previously been drained and cleared. Recent conversions of wetlands on organic soils have resulted primarily in losses of evergreen forested and scrub-shrub wetlands.

The pocosin types described by Otte (1987) were communities dominated by needle- and broad-leaved evergreen trees and shrubs. The correlations between evergreen forested or scrub-shrub wetlands and organic soils (Table 4) were the highest observed for all combinations of hydric soils and vegetation cover types in this study. Emergent marsh wetlands located on organic soils were found primarily in the blackwater river floodplains of the Alligator River in Tyrrell County.

Establishing the relationships between hydric soils and wetland vegetation has been the focus of several field research efforts supported by the U.S. Fish and Wildlife Service (Christensen et al. 1988; Erickson and Leslie, 1988). The results of those studies were more quantitative, based on individual plant species and soils. We evaluated the relationships at a landscape level using mapped hydric soils and wetlands information. Our approach is highly dependent on the accuracy of mapped information and the format of entry. The data could have been digitized at the soil series level of soil classification and vegetation by each

community type (see Table 1 for examples). Regardless of format, the GIS approach is an excellent compliment to field studies and can be used to examine soil/plant relationships at a much broader scale.

CONCLUSION

Wetland mapping will continue in North Carolina with the completion of the entire state by 1998 as directed by the Emergency Wetland Resources Act of 1986. Cooperative funding from other governmental sources will be used to accelerate mapping progress. At present, wetland maps are available in the areas of greatest wetland densities and of critical concern in North Carolina. Maps, however, are only a tool whose utility is determined by the creativity of those interested in using them. Ongoing studies by Mark Brinson and his associates at East Carolina University exemplify innovative map uses. Now is the time to analyze the mapped data. At a minimum, measurements should be taken to determine the acreages of various wetland types and their locations by watersheds and counties. Without this information, scientists and administrators will be unable to determine the impacts of proposed wetland management programs. Uncertainty of this type ultimately leads to failure of any proposal which must be sanctioned by legislative process.

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Table 1. Commonly used pocosin classifications.

Alphanumeric Code	Classification
PEM1B	Palustrine, emergent, persistent, saturated
PSS7B	Palustrine, scrub-shrub, evergreen, saturated
PSS3B	Palustrine, scrub-shrub, broad-leaved evergreen, saturated
PSS6/7B	Palustrine, scrub-shrub, deciduous and evergreen, saturated
PSS4B	Palustrine, scrub-shrub, needle-leaved evergreen, saturated
PFO4B	Palustrine, forested, needle-leaved evergreen, saturated
PFO4Bg	Palustrine, forested, needle-leaved evergreen, saturated, acid (unique to *Chamaecyparis thyoides*)
PFO7B	Palustrine, forested, evergreen, saturated

Table 2. Hydric soils in Washington and Tyrrell Counties by soil order.

Soil Order	Washington	Tyrrell
	-----ha (% of land area)-----	
Alfisols	3,158 (3.5)	1,515 (1.5)
Entisols	1,140 (1.3)	811 (0.8)
Histosols	26,412 (29.5)	53,644 (53.0)
Inceptisols	14,704 (16.4)	12,728 (12.6)
Ultisols	30,340 (33.8)	28,148 (27.8)
Non-hydric	13,883 (15.5)	4,428 (4.4)

Table 3. Wetlands of Washington and Tyrrell Counties by vegetation cover types.

Vegetation Cover Type	Washington	Tyrrell
	----ha (% of wetlands)----	
Forested		
Evergreen	830 (4.7)	16,297 (30.0)
Deciduous	13,481 (76.3)	17,288 (31.3)
Mixed	2,332 (13.2)	17,786 (32.2)
Scrub-shrub		
Evergreen	742 (4.2)	1,933 (3.5)
Deciduous	88 (0.5)	608 (1.1)
Mixed	124 (0.7)	622 (1.1)
Emergent Marsh	71 (0.4)	442 (0.8)

Table 4. Relationship between Histosols and pocosin vegetation cover types (pvct).

Vegetation Cover Type	Washington	Tyrrell
	----% of pvct in histosols----	
Forested		
Evergreen	91	94
Scrub-shrub		
Evergreen	99	98
Mixed	40	96
Emergent Marsh	63	75