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Albemarle-Pamlico National Estuary Program

North Carolina Department of Environment and Natural Resources

US Environmental Protection Agency

Report on Regional Councils Workshops

Using GIS to Support Environmental Management in the Albemarle-Pamlico Sounds Region

October 1999

Albemarle-Pamlico National Estuary Program
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Albemarle-Pamlico National Estuary Program

Report on Regional Councils Workshops

Using GIS to Support Environmental Management in the Albemarle-Pamlico Sounds Region

October 1999

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Funding to conduct these workshops was provided by the US Environmental Protection Agency.

Albemarle-Pamlico National Estuary Program

Report on Regional Councils Workshops

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October 1999

TABLE OF CONTENTS

Albemarle-Pamlico National Estuary Program

Report on Regional Councils Workshops
October 1999

Introduction

The Albemarle-Pamlico National Estuary Program (APNEP) held a series of five Geographic Information Systems (GIS) workshops for members of the River Basin Regional Councils and their guests. Each workshop followed basically the same agenda with variations pertaining to local issues and resources.

The purpose of the workshops was to inform the River Basin Regional Councils and their guests about the applicability of GIS to water quality issues. Regional Councils have an advisory role in implementing the Comprehensive Conservation Management Plan at the local level. The Councils support and inform environmental management in the region. Through an overview of GIS technology and data available today in North Carolina, presentations by local users of this technology, and an example of a planning application, workshop participants received a solid briefing on GIS as a tool. In the afternoon of each workshop, participants were given a live demonstration of GIS tailored to each Council's Program of Work. Each workshop ended with a discussion of what the group learned and how the council could use GIS in its efforts. The workshops were successful in giving the Regional Councils a solid base of information, an understanding of water quality issues, and a focal point for their own demonstration projects, using GIS.

The APNEP staff and three senior staff from the NC Center for Geographic Information and Analysis (CGIA, in the Office of State Planning) conducted the workshops. CGIA is the lead organization in the state for GIS. As part of its services program, CGIA assists public and private organizations with development and use of geographic information systems and data. Since 1988, CGIA has supported the APNEP program with GIS analyses, public outreach, and numerous GIS related services. CGIA's work has involved the development, coordination and management of a large body of digital geographic data for the region. Although APNEP's financial support for this data management activity ended in 1995, most of the data continue to be maintained as a dynamic component of the state's Corporate Geographic Database.

As part of its commitment to APNEP and as part of a management action contained in the Comprehensive Conservation Management Plan, CGIA continues to work on ways to provide more affordable geographic data and tools to local government for use in planning and public education. One feature that CGIA brought to the workshop series this year is a GIS tool containing 100 layers of geospatial data packaged on a PC laptop. The tool was originally developed through a grant from the North Carolina Clean Water Management Trust Fund. Based partly on responses from the APNEP workshops, CGIA plans to further develop and distribute this tool on CD-ROM later this year.

This report is presented in sections relating to each river basin Regional Council. For each council, documentation includes the workshop agenda, attendance list, discussion summary, and recommendations for employing GIS in the council's Program of Work.

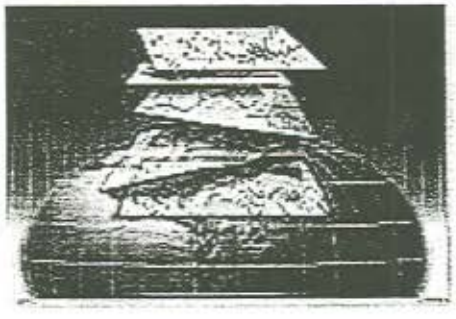
REGIONAL COUNCIL GIS WORKSHOPS

Presented by CGIA and the Albemarle-Pamlico National Estuary Program

The Albemarle-Pamlico National Estuary Program (APNEP) and NC Center for Geographic Information and Analysis (CGIA) invite you to attend a special workshop designed to help Regional Council members and local officials learn more about Geographic Information Systems (GIS) and its role as a planning and resource management tool. Each workshop will provide an opportunity for participants to evaluate the utility of GIS in local decision making, to learn what GIS data is available from the state's Corporate Database and to discover how GIS can help Regional Councils meet the goals and objectives outlined in their respective Programs of Work.

Workshops will begin at 9:30 AM and end at 4:00 PM and a Dutch lunch will be available. You are encouraged to bring local representatives and officials who you feel might benefit from this workshop.

Regional Council	Date	Location
Pasquotank	May 12	College of the Albemarle - Small Business Center Hwy. 17N., Elizabeth City, NC
Chowan	May 13	Roanoke-Chowan Community College - Small Business Center Community College Road, Ahoskie, NC
Neuse	May 19	Lenior County Cooperative Extension Service 1791 Hwy. 11/55, Kinston, NC
Roanoke	May 20	Bertie County Cooperative Extension Service 102 Dundee Street, Windsor, NC
Tar-Pamlico	May 21	Edgecombe County Cooperative Extension Service 201 St. Andrew Street, Tarboro, NC



For More Information Contact:

Joan Giordano (APNEP Public Involvement Coordinator) at 252-946-6481 or joan_giordano@waro.enr.state.nc.us

or

Guy Stefanski (APNEP Program Coordinator) at 919-733-5083 ext. 585 or guy_stefanski@h2o.enr.state.nc.us

I. Pasquotank River Basin Regional Council

May 12, 1999, College of the Albemarle-Small Business Center, Elizabeth City

A. Introductory Notes

The Pasquotank River Basin is located in the northeastern corner of North Carolina and southeastern Virginia, and includes parts or all of Camden, Chowan, Currituck, Dare, Gates, Hyde, Pasquotank, Perquimans, Tyrrell, and Washington counties. The Pasquotank River, Albemarle Sound, Currituck Sound, Alligator River and the Pamlico Sound are the major water bodies. Elizabeth City, Hertford, and Edenton are the major settlements in this predominantly rural river basin. Total population was 97,215 in 1990, with a density of 27 persons per square mile. There are 479 freshwater stream miles in the basin.

The Pasquotank Regional Council developed a two-year Program of Work in April 1998. In brief, taking into account the most likely opportunities to generate public interest and partnerships, the Council agreed on a work program that includes:

1. A high profile basin-wide clean-up event

2. Selected pilot projects in basin sub-areas:
   - Septic
   - Salinity
   - Shellfish
   - WQ issues

3. Broad policy issues to pursue in partnership with others:
   - Oregon Inlet
   - Wetlands
   - Acid Rain
   - Funding
   - Public Education

4. Organizational issues

B. Workshop Notes

The meeting began with a welcome by Jimmy Dixon, Chair of the Pasquotank County Board of Commissioners. See the meeting agenda and attendance list on the following pages.

The room set-up included a high-resolution projector linked to a laptop computer and a projection screen. This enabled slide presentations and live, interactive GIS sessions.

Pasquotank River Basin Workshop Attendees

NAME	TITLE	ORGANIZATION
Alan Burne	GIS Coordinator	Dare County, Tax Office
Cheryl Byrd		Dare County Board of Commissioners
Sam Chambers		Elizabeth City State University, Dept. of Geosciences
Kevin Curling	Environmental Engineer	Virginia Dept. Evnironmental Quality, Planning and Permit Support
Jimmy Dixon	Chairman	Pasquotank County Commission
Eric Haste		Perquimans County
Sarah Kozal	GIS Coordinator	Pasquotank County, Assessor's Office
Harry P. Lee	Planner I	Currituck County, Planning and Inspections
Ginger Midgett	Computer Support Technician	Pasquotank-Perquimans-Camden-Chowan (PPCC), District Health Department
Timothy S. Peoples	Environmental Health Specialist	PPCC, District Health Department
Walker Rayburn		PPCC, District Health Department
Richard Reid		Town of Kitty Hawk
Nelson Smith		Tyrrell County Schools
Kim White		PPCC District Health Dept.
Jeffrey Brown	Project Manager	NC Center for Geographic Info. & Analysis
Joan Giordano	Public Involvement Coordinator	NC DENR-APNEP
Zsolt Nagy	Coordination Program Manager	NC Center for Geographic Info. & Analysis
Elizabeth Pearce	Water Quality Specialist	NC Center for Geographic Info. & Analysis
Guy Stefanski	APNEP Coordinator	NC DENR-APNEP

Albemarle-Pamlico National Estuary Program

PASQUOTANK RIVER BASIN REGIONAL COUNCIL

Geographic Information System (GIS) Workshop

May 12, 1999
College of the Albemarle - Small Business Center
Elizabeth City, NC

Workshop Agenda

9:00	**Registration and coffee**
10:00	**Welcome** Jimmy Dixon, Chair, Pasquotank County Board of Commissioners Eric Haste, Jr., Pasquotank River Basin Regional Council Chair
10:15	**Purpose/Intent of Workshop** Joan Giordano – Albemarle-Pamlico National Estuary Program
10:20	**GIS Today in North Carolina** Zsolt Nagy, Center for Geographic Information and Analysis (CGIA)
10:50	**Pasquotank County GIS Overview** Sarah Kozal, Pasquotank County
11:10	**PPCC District Health Department GIS Overview** Ginger Midgett, PPCC
11:20	**Virginia GIS Update** Kevin Curling, Virginia Department of Environmental Quality
11:40	**Using GIS for Planning** Jeff Brown, Center for Geographic Information and Analysis
11:45	**LUNCH** (dutch – delivered)
12:45	**Applying GIS to the Pasquotank Regional Council Program of Work** Betsy Pearce, Center for Geographic Information and Analysis *(CGIA will present GIS views and maps corresponding to the Pasquotank Regional Council's interests and issues identified in the Program of Work.)*
2:45	**BREAK**
3:00	**Group Discussion: What Did We Learn & Where Do We Go From Here?** Jeff Brown, Center for Geographic Information and Analysis
3:30	**Adjourn**

GIS Today in North Carolina

Zsolt Nagy presented an overview of the state of GIS in North Carolina, with emphasis on the array of geographic data available. In particular, the NC Corporate Geographic Database features over 100 layers of information including roads, soils, political boundaries, land cover, rivers and streams, water quality conditions, potential sources of pollution, water supply watersheds, natural heritage areas, wetlands, and many others relating to the environment. In addition, the state is distributing digital orthophoto quarter quads, 1993 black and white, and is working on a program to develop 1998 color infrared imagery in the coming months.

GIS users are numerous and well connected in North Carolina. A recent survey of state and local government users elicited a high response rate and indicated that over 60 of 100 counties use GIS. Local governments are moving beyond tax mapping into other applications of the data and technology that support planning functions. Local governments are creating more geographic data than ever, some of which have multiple uses for local and state analysis.

GIS in Pasquotank County

Sarah Kozal, GIS Coordinator for Pasquotank County, described the hardware, software, and data including tax parcel boundaries and related information that are used in the county. She demonstrated her use of GIS, including location of zoning districts, fire districts, road centerlines, water and sewer systems, subdivisions, election precincts, flood zones and hurricane evacuation routes. Address matching capability (locating a street address on a map) has been useful as well. Late in 1999, the county will acquire new software for the tax assessor, allowing the GIS to link directly to tax data. In the future, Sarah expects more public access to the county's GIS data.

GIS in Pasquotank-Perquimans-Camden-Chowan (PPCC) District Health Department

Ginger Midgett related her agency's use of GIS, particularly in health and environmental health. PPCC covers multiple counties in the Pasquotank and Chowan river basins and provides a range of regional services. The agency has much interest in projects that would support a sustainable environment. In particular, the agency would like to achieve improvements in septic systems in the region.

GIS and Water Quality in Virginia

Kevin Curling, a water quality specialist with the Virginia Department of Environmental Quality, Tidewater Region, presented information on water quality across the state border. Curling showed data in a live *ArcView*® (Environmental Systems Research Institute) session relating to water quality monitoring stations, discharges, and impaired stream segments. He is able to link monitoring data from numerous monitoring stations to respective stream segments. Data from the monitoring stations upstream from the North Carolina portion of the Pasquotank River Basin were of particular interest.

Using GIS for Planning
Jeff Brown (CGIA) demonstrated examples of using GIS to support planning decisions. Given sufficient data, a GIS can answer questions about distance, proximity, intersection and other spatial relationships between map features (such as streams and forested land). Planners can use GIS for a variety of applications. For example, GIS is an effective tool for applying criteria to a region to target areas for open space preservation, for identifying the areas most vulnerable to natural hazards, and for highlighting the areas most suitable for economic development. Graphic displays and maps generated by a GIS can effectively communicate information in executive sessions and public meetings.

Applying GIS to the Pasquotank River Basin Regional Council Program of Work
Betsy Pearce showed workshop participants a GIS project that she had customized for the Pasquotank River Basin. Working with a set of geographic data layers and customized viewing tools in a desktop GIS (an extension of *ArcView*®), Betsy highlighted water quality conditions in the basin. Views included potential sources of pollution, protected lands, environmentally sensitive areas, demographics, political boundaries, river basin boundaries and hydrologic units, public water and sewer systems, and others. She included geographic data on southeastern Virginia, supplied by Kevin Curling.

Betsy's presentation highlighted the relationships between layers of information such as impaired waters and land cover adjacent to streams. The views revealed that water quality problems and opportunities appear to vary across the river basin, and that efforts to improve water quality could use a GIS to target stream segments. Betsy produced a map of the river basin with water quality themes and supplied a copy for each workshop participant.

Discussion: What Did We Learn and Where Do We Go From Here?

This discussion addressed the specific issues identified in the Pasquotank Regional Council's Program of Work.

Basinwide Clean-Up
A "big sweep" for cleaning rivers would benefit from a GIS analysis that targets stream segments based on population density, impaired waters, high quality and outstanding resource waters, shellfish areas, fish nursery areas, non-swimmable areas, and areas that attract visitors.

Demonstration Projects
Septic tanks were a point of much discussion. Data collection and analysis relating to septic tanks could be complaint-driven (failures) or application-driven (new installations). CGIA is working on a project to identify septic tank locations with the NC Division of Water Quality and may have some useful methods and information in a few months. An attendee noted that discharges from straight pipes could be as harmful or more damaging to water quality than septic tank failures.

Participants expressed a need to know the location of septic tanks, the condition (is a tank failing?), the year installed, and inspections. PPCC is inspecting all new septic tanks in 9

counties with 4 inspectors. PPCC has been installing alternative systems for at least 10 years. One participant suggested a cooperative septic tank program between state and local governments that would conduct inspections at least every four years.

Jeff Brown pointed out that defining the scope of the septic system problem could lead to action. Until the Rural Economic Development Center carried out an inventory of public water and sewer systems, the state did not know the extent of problems and needs. Following the inventory, North Carolina citizens supported a huge bond issue to correct the most pressing problems.

Participants agreed that GIS is a useful tool for analysis and decision support. Other data that would be useful additions to the system demonstrated by Betsy include highly erodable soils and sea grasses. Analysis of land cover received attention, as well.

David Parrot, Director of the Albemarle Commission, suggested that there are funding options for further work in support of the river basin, including the state's 205j program relating to water quality. Betsy Pearce pointed out that the Clean Water Management Trust Fund is using a similar GIS tool developed by CGIA for evaluating grant proposals. The Trust Fund awards grants for projects that improve water quality and would like grant applicants to have ready access to the information that Betsy showed.

Policy Issues

A participant noted that stabilizing Oregon Inlet would mean an environmental impact to beaches to the south. Stabilizing the inlet would also reduce the estuary's flushing capacity, a key factor in water quality. This merits attention from the council.

Resources

The participants agreed that GIS is an excellent tool for water quality analysis. Some observations included:

- GIS is a visual tool that highlights the location of sensitive waters.
- GIS can help determine priority areas in the basin.
- Coordination is critical among agencies.
- A forum is critical to maintain exchange of data and ideas between county, state and federal agencies.

GIS is common to state environmental agencies in North Carolina and Virginia, and North Carolina has many layers of data for applications in the river basin. Pasquotank, Dare and Washington counties use GIS extensively, and GIS is becoming a more widespread resource within the Pasquotank River Basin as Currituck and Perquimans counties get started with GIS. Some counties, such as Camden, have no GIS capability yet.

For some GIS analyses, local tax parcel data are necessary. For example, for the Council to identify opportunities for reducing potential pollution from septic tanks, addresses of likely septic tank locations would be useful.

Cooperation and data sharing have much potential in the basin. The NC Corporate Geographic Database, a collection of strategic statewide data, has much to offer. CGIA, through the state's coordination structure, has a stake in cooperation within the basin and statewide. As a result of this workshop, CGIA and Virginia DEQ now have a working relationship. As noted in the workshop, Elizabeth City State University (ECSU) and Pasquotank County have no electronic link, but they do talk and are working on a data sharing arrangement. Another idea was to take advantage of ECSU's minor program in GIS through internships with the Council or constituent counties.

Additional Ideas and Thoughts

The discussion generated additional ideas and thoughts that are important to the Pasquotank Regional Council's Program of Work.

- Participants recognized the importance of good quality data. GIS is powerful, but data must be reliable and accurate to make it a dependable decision support tool.
- Signs along the shore that prohibit swimming and shellfish harvesting are powerful public relations tools. The tourist industry is apt to suffer when such signs are posted. This creates an incentive for a local commitment to protecting and improving water quality.
- In economic development in the region, Council members' proactive participation in development planning would be valuable. Economic development need not be a competing issue, and environmental problems can be avoided with well-informed planning.
- Some counties and organizations in the region need affordable and economical ways to acquire and use GIS.
- Mr. Haste, Chair of the Council, encouraged anticipating future problems and planning for years ahead, but he also urged the workshop to focus on solutions to existing problems. Probably as many as 90 percent of septic tanks have problems with overuse or unsuitable soils. He wants to take a serious look at gathering the essential data and find technical and administrative solutions. PPCC has much interest in solving this problem, as well.

C. Recommendations

CGIA recommends that APNEP do the following:

Direct CGIA, under the current contractual agreement, to develop and carry out a work plan to create a septic tank database for priority areas in the river basin. This plan will involve representatives from the Council supplemented by technical specialists from local government, regional organizations and Elizabeth City State University.

Direct CGIA, under the current contractual agreement, to link a database in the NC Department of Environment and Natural Resources that contains monitoring results to the monitoring point locations in the GIS.

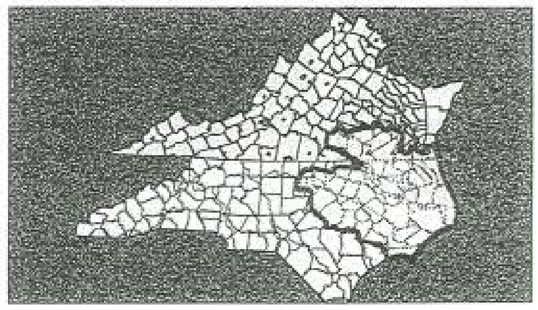
Request that CGIA make copies of a GIS project, like the one demonstrated at the workshop with modifications based on feedback from the APNEP workshops, available to APNEP for distribution to the Pasquotank Regional Council. Charges to the project under the current Memorandum of Agreement should be based on a large quantity distribution of a standard product ("*BasinPro*") to keep the product affordable for APNEP and for other parties that may want to order copies from CGIA.

Consult with the Pasquotank Council to select an organization to be responsible for using *BasinPro* in support of the Council.

Direct CGIA to update the Closed Shellfish Area data and make it available in or as a supplement to *BasinPro*.

Organize a session in which CGIA uses the GIS to assist the Council in identifying a demonstration project that could be submitted as a grant proposal to the North Carolina Department of Environment and Natural Resources (DENR), US EPA, or the Clean Water Management Trust Fund.

The Albemarle-Pamlico National Estuary Program



PASQUOTANK RIVER BASIN

- County boundary
- Closed Shellfish Areas
- Waterbodies
- Municipal boundary

e Support
- Not Evaluated
- Non-Supporting
- Partially Supporting
- Fully Supporting
- Support Threatened

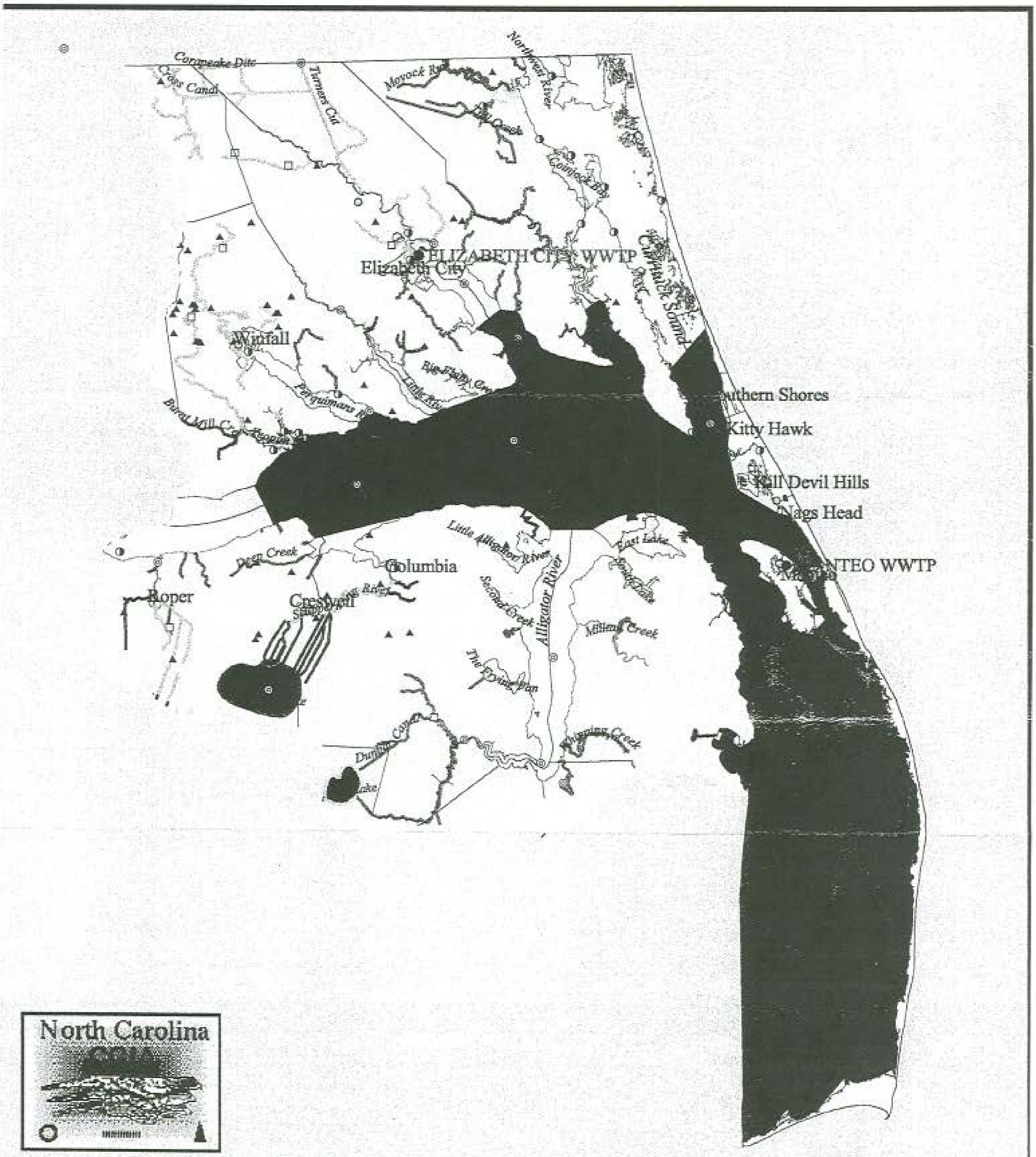
Major NPDES discharges
- municipal
- nonmunicipal

- USGS WQ sites
- Citizens Water Quality Monitoring Sites
- NC Ambient WQ Monitoring Sites
- Municipal STP

Registered livestock operation
- Cattle
- Cattle/Horse
- Horses
- Poultry
- Swine

N W E S

10 0 10 20 Miles



Map prepared by NC CGIA, May 1999

II. Chowan River Basin Regional Council

May 13, 1999, Chowan Community College-Small Business Center, Ahoskie

A. Introductory Notes

The Chowan River Basin is located in northeastern North Carolina and southeastern Virginia, and includes parts or all of Bertie, Chowan, Gates, Hertford, and Northampton counties. The Chowan River and Meherrin River are the major water bodies. Ahoskie is the major settlement in this predominantly rural river basin. Total population was 62,474 in 1990, with 45 persons per square mile. The basin has 788 freshwater stream miles.

The Chowan Regional Council developed a two-year Program of Work in April 1998. In brief, the Council agreed on a work program that includes:

1. A citizen monitoring initiative
2. Local partnerships to protect and restore water quality
3. Pollution from non-agricultural chemical use
4. Selected policy issues

B. Workshop Notes

The meeting began with a welcome by Don Craft, Manager of Hertford County. See the meeting agenda and attendance list on the following pages.

The room set-up included a high-resolution projector linked to a laptop computer and a projection screen. This enabled slide presentations and live, interactive GIS sessions.

Chowan River Basin — Workshop Attendees

NAME	TITLE	ORGANIZATION
William P. Boone		Natural Resources Conservation Service
Brewster Brown		Roanoke-Chowan Community College-Business Center
Randy Collins		NC Cooperative Extension - Gates County
Donald C. Craft	County Manager	Hertford County
Kevin Curling	Environmental Engineer	Virginia Dept. Evnironmental Quality, Planning and Permit Support
William S. Early	Executive Director	Hertford County, Economic Development Commission
Greg Hughes		Hertford Soil and Water Conservation
Nan Laughton		Chowan Conservation Committee
Daniel Parker	Student	Roanoke-Chowan CC, Environmental Science
G.D. Perry	Council Member	Roanoke-Chowan COG
Eric Storie		Roanoke-Chowan CC, Environmental Science
Gay Sumner	Land Records Supervisor	Hertford County, Land Records
Jeffrey Brown	Project Manager	NC Center for Geographic Info. & Analysis
Joan Giordano	Public Involvement Coordinator	NC DENR-APNEP
Zsolt Nagy	Coordination Program Manager	NC Center for Geographic Info. & Analysis
Elizabeth Pearce	Water Quality Specialist	NC Center for Geographic Info. & Analysis
Guy Stefanski	APNEP Coordinator	NC DENR-APNEP

Albemarle-Pamlico National Estuary Program

CHOWAN RIVER BASIN REGIONAL COUNCIL
Geographic Information System (GIS) Workshop

May 13, 1999
Roanoke – Chowan Community College - Small Business Center
Ahoskie, NC

Workshop Agenda

9:00	**Registration and coffee**
10:00	**Welcome** Don Craft, County Manager, Hertford County Brewster Brown, Chowan River Basin Regional Council Vice-Chair
10:15	**Purpose/Intent of Workshop** Joan Giordano – Albemarle-Pamlico National Estuary Program
10:20	**GIS Today in North Carolina** Zsolt Nagy, Center for Geographic Information and Analysis (CGIA)
11:00	**Virginia GIS Update** Kevin Curling, Virginia Department of Environmental Quality
11:30	**Using GIS for Planning** Jeff Brown, Center for Geographic Information and Analysis
11:45	**LUNCH** (dutch – delivered)
12:45	**Applying GIS to the Chowan Regional Council Program of Work** Betsy Pearce, Center for Geographic Information and Analysis *(CGIA will present GIS views and maps corresponding to the Chowan Regional Council's interests and issues identified in the Program of Work.)*
2:45	**BREAK**
3:00	**Group Discussion: What Did We Learn & Where Do We Go From Here?** Jeff Brown, Center for Geographic Information and Analysis
3:30	**Adjourn**

GIS Today in North Carolina
Zsolt Nagy presented an overview of the state of GIS in North Carolina, with emphasis on the array of geographic data available. In particular, the NC Corporate Geographic Database features over 100 layers of information including roads, soils, political boundaries, land cover, rivers and streams, water quality conditions, potential sources of pollution, water supply watersheds, natural heritage areas, wetlands, and many others relating to the environment. In addition, the state is distributing digital orthophoto quarter quads, 1993 black and white, and is working on a program to develop 1998 color infrared imagery in the coming months.

GIS users are numerous and well connected in North Carolina. A recent survey of state and local government users elicited a high response rate and indicated that over 60 of 100 counties use GIS. Local governments are moving beyond tax mapping into other applications of the data and technology that support planning functions. Local governments are creating more geographic data than ever, some of which have multiple uses for local and state analysis.

GIS and Water Quality in Virginia
Kevin Curling, a water quality specialist with the Virginia Department of Environmental Quality, Tidewater Region, presented information on water quality across the state border. Curling showed data in a live *ArcView®* (Environmental Systems Research Institute) session relating to water quality monitoring stations, discharges, and impaired stream segments. He is able to link monitoring data from numerous monitoring stations to respective stream segments. Data from the monitoring stations upstream from the North Carolina portion of the Chowan River Basin were of particular interest. The Suffolk office of the Virginia Department of Conservation and Recreation is a contact for the agricultural aspect of nutrient management plans.

Using GIS for Planning
Jeff Brown (CGIA) demonstrated examples of using GIS to support planning decisions. Given sufficient data, a GIS can answer questions about distance, proximity, intersection and other spatial relationships between map features (such as streams and forested land). Planners can use GIS for a variety of applications. For example, GIS is an effective tool for applying criteria to a region to target areas for open space preservation, for identifying the areas most vulnerable to natural hazards, and for highlighting the areas most suitable for economic development. Graphic displays and maps generated by a GIS can effectively communicate information in executive sessions and public meetings.

Applying GIS to the Chowan River Basin Regional Council Program of Work
Betsy Pearce showed workshop participants a GIS project that she had customized for the Chowan River Basin. Working with a set of geographic data layers and customized viewing tools in a desktop GIS (an extension of *ArcView®*), Betsy highlighted water quality conditions in the basin. Views included potential sources of pollution, protected lands, environmentally sensitive areas, demographics, political boundaries, river basin

boundaries and hydrologic units, public water and sewer systems, and others. She included geographic data on southeastern Virginia, supplied by Kevin Curling.

Betsy's presentation highlighted the relationships between layers of information such as impaired waters and land cover adjacent to streams. The views revealed that water quality problems and opportunities appear to vary across the river basin, and that efforts to improve water quality could use a GIS to target stream segments. Betsy produced a map of the river basin with water quality themes and supplied a copy for each workshop participant.

Discussion: What Did We Learn and Where Do We Go From Here?

This discussion addressed the specific issues identified in the Chowan Regional Council's Program of Work. The group discussed water quality monitoring extensively. Between North Carolina, Virginia and the US Geological Survey, there are many monitoring points in the basin. In addition, citizen monitoring through the APNEP Citizens' Water Quality Monitoring Program (CWQMP), for example the Arrowhead Beach Association, could be a valuable source of information. Access to the citizen-collected data is a problem. East Carolina University has managed the data in the past, and recently hired a new CWQMP coordinator.

Brewster Brown observed that a lot has changed in recent years and that there is more monitoring occurring than he realized. He suggested that the Council focus on better coordination of monitoring in the near term and evaluate the extent of monitoring after doing analysis of the data that are currently being collected. Having the information accessible via the Internet would be useful.

Mr. Brown also identified a need for analysis of monitoring results. The *Chowan River Basinwide Water Quality Management Plan* (DENR) may be a vehicle for analysis and reporting. Council members do not have the capacity to synthesize the monitoring data. Assessment reports need to be summarized in laymen's terms. The APNEP newsletter may be a forum for "capsule" water quality reports.

A demonstration project in partnership with the US Geological Survey, Water Resources Division, may be possible if a practical application related to water quality monitoring were proposed. Because so much of the water in the Chowan River comes from Virginia, involvement of our neighboring state seems essential.

Another issue that needs attention is air quality monitoring and deposition of pollutants from animal operation emissions.

The group was interested in digital soil surveys as part of a GIS. In addition, there was interest in data on septic tanks in the basin. CGIA and DENR will be working on a project in 1999 that will produce new data that may be useful to the Council.

The group referred to Billy Griffin's proposal at the last Council meeting, relating to aeration of sub-soil for land application sites, as a possible demonstration project.

The issue of economic development in this relatively distressed region arose several times in discussions. There is concern about nitrogen loading in Virginia that reduces water quality and development potential in North Carolina. The Nucor steel recycling plant, under construction, has raised environmental concerns while bringing significant investment to the region.

Participants suggested that the state's Conservation Resource Enhancement Program (CREP) could benefit water quality in the basin, but the best results require local Cooperative Extension Service and Soil and Water Conservation Districts to be involved in decision making.

Looking ahead, the group expressed interest in GIS training and suggested that a core GIS person and/or place would be valuable to the Council. Chowan-Roanoke Community College will be teaching GIS, and will have *ArcView* 3.1, the software used for CGIA's presentation. Brewster Brown would like to see training sessions for the Council and for county agents in the region. The Roanoke-Chowan Community College (Ahoskie) and the College of the Albemarle (Elizabeth City) volunteered sites for training.

C. Recommendations

CGIA recommends that APNEP do the following:

Direct CGIA to obtain the latest "305b" report from Kevin Curling to supplement North Carolina data.

Identify a core GIS person or team that can support the Council.

Request that CGIA make copies of a GIS project, like the one demonstrated at the workshop with modifications based on feedback from the APNEP workshops, available to APNEP for distribution to the Chowan Regional Council. Charges to the project under the current contractual agreement should be based on a large quantity distribution of a standard product ("*BasinPro*") to keep the product affordable for APNEP and for other parties that may want to order copies from CGIA.

Direct CGIA to provide GIS training at sites in the region to include and go beyond the *BasinPro* package.

Hold a session in which CGIA will translate the Assessment Reports from the Division of Water Quality and monitoring results from USGS and Virginia into trends and implications and show the information to the extent possible in the GIS.

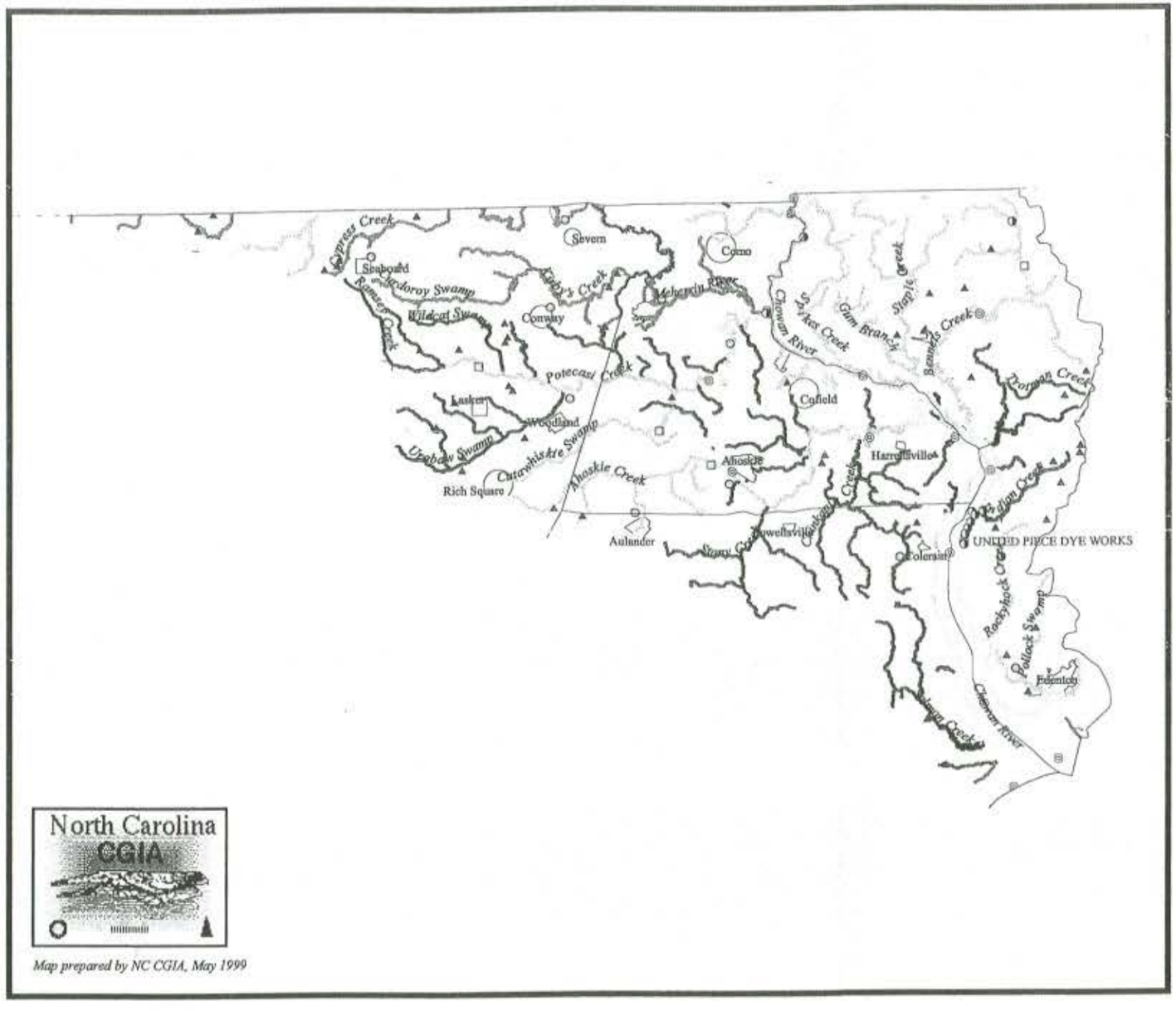
Identify a web site for Citizen Monitoring Sites, perhaps on or through the APNEP home page, and request data from East Carolina University.

Direct CGIA, under the current contractual agreement, to link a database in the NC Department of Environment and Natural Resources that contains monitoring results to the monitoring point locations in the GIS.

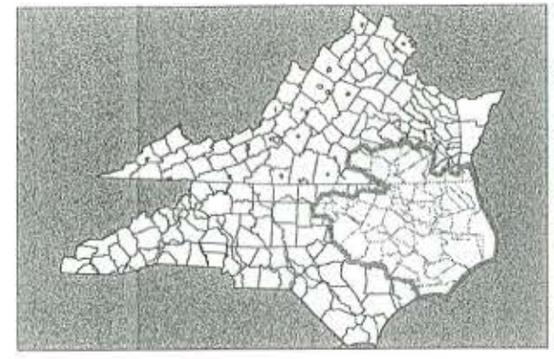
Organize a session in which CGIA uses the GIS to assist the Council in identifying a demonstration project that could be submitted as a grant proposal to DENR, the Clean Water Management Trust Fund, or other sources of funds.

The Albemarle-Pamlico
National Estuary Program

CHOWAN RIVER BASIN



Map prepared by NC CGIA, May 1999



- USGS WQ sites
- Citizens Water Quality Monitoring Sites
- NC Ambient WQ Monitoring Sites

Major NPDES discharges
- municipal
- nonmunicipal
- Municipal STP

Registered livestock operation
- Cattle
- Cattle/Horse
- Horses
- Poultry
- Swine

Use Support
- Not Evaluated
- Non-Supporting
- Partially Supporting
- Fully Supporting
- Support Threatened

- County boundary
- Closed Shellfish Areas
- Waterbodies
- Municipal boundary

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III. Neuse River Basin Regional Council

May 19, 1999, Lenoir County Cooperative Extension Service, Kinston

A. Introductory Notes

The Neuse River Basin is located entirely in the central and eastern North Carolina and includes parts or all of Carteret, Craven, Durham, Franklin, Granville, Greene, Johnston, Jones, Lenoir, Nash, Orange, Pamlico, Person, Pitt, Wake, Wayne and Wilson counties. The Neuse River, Trent River, and Falls Lake Reservoir are the major water bodies. New Bern, Kinston, Goldsboro, Smithfield, Cary, Garner, Raleigh and Durham are the major municipalities in this river basin. Total population was 1,015,511 in 1990 and density was 163 persons per square mile. The basin has 3,443 freshwater stream miles.

The Regional Council developed a two-year Program of Work in May 1998. In brief, the Council agreed on a work program that includes:

1. Nonpoint source demonstration projects
2. A greenway/buffer initiative
3. Briefings for local governments and other organizations
4. Policy issues
5. Organizational issues

B. Workshop Notes

The meeting began with a welcome by Bill Ritchie, Chair of the Neuse River Basin Regional Council and Mayor of River Bend. See the meeting agenda and attendance list on the following pages.

The room set-up included a high-resolution projector linked to a laptop computer and a projection screen. This enabled slide presentations and live, interactive GIS sessions.

Neuse River Basin — Workshop Attendees

NAME	TITLE	ORGANIZATION
Janice Allan		NC Coastal Land Trust
Marshall Beach	Tax Administrator	Pamlico County
Kathryn Blalock		River Bend Water Resources Dept., Craven and Jones Counties
Anita L. Hoffman	Planner	Pamlico County Planning Dept.
Margaret Holton		
Sam Holton		
Wayland Humphrey		
Andy McLawhorn		Pitt County
Sondia Ipoc Riggs	Commissioner	Jones County
William H. Ritchie, Jr.	Mayor	Town of River Bend
Marguerite Whitfield		Lenoir County
Jeffrey Brown	Project Manager	NC Center for Geographic Info. & Analysis
Joan Giordano	Public Involvement Coordinator	NC DENR--APNEP
Zsolt Nagy	Coordination Program Manager	NC Center for Geographic Info. & Analysis
Elizabeth Pearce	Water Quality Specialist	NC Center for Geographic Info. & Analysis
Guy Stefanski	APNEP Coordinator	NC DENR--APNEP

NEUSE RIVER BASIN REGIONAL COUNCIL
Geographic Information System (GIS) Workshop

May 19, 1999
Lenoir County Cooperative Extension Service
1701 Hwy. 11/55
Kinston, NC

Workshop Agenda

9:00	**Registration and coffee**
10:00	**Welcome** John Bauer, County Manager, Lenoir County Bill Ritchie, Neuse River Basin Regional Council Chair
10:15	**Purpose/Intent of Workshop** Joan Giordano – Albemarle-Pamlico National Estuary Program
10:20	**GIS Today in North Carolina** Zsolt Nagy, Center for Geographic Information and Analysis (CGIA)
11:00	**Lenoir County GIS Overview** Joey Taylor, Resource Development Director, Lenoir County
11:30	**Using GIS for Planning** Jeff Brown, Center for Geographic Information and Analysis
11:45	**LUNCH** (dutch – delivered)
12:45	**Applying GIS to the Neuse Regional Council Program of Work** Betsy Pearce, Center for Geographic Information and Analysis *(CGIA will present GIS views and maps corresponding to the Neuse Regional Council's interests and issues identified in the Program of Work.)*
2:45	**BREAK**
3:00	**Group Discussion: What Did We Learn & Where Do We Go From Here?** Jeff Brown, Center for Geographic Information and Analysis
3:30	**Adjourn**

GIS Today in North Carolina
Zsolt Nagy presented an overview of the state of GIS in North Carolina, with emphasis on the array of geographic data available. In particular, the NC Corporate Geographic Database features over 100 layers of information including roads, soils, political boundaries, land cover, rivers and streams, water quality conditions, potential sources of pollution, water supply watersheds, natural heritage areas, wetlands, and many others relating to the environment. In addition, the state is distributing digital orthophoto quarter quads, 1993 black and white, and is working on a program to develop 1998 color infrared imagery in the coming months.

GIS users are numerous and well connected in North Carolina. A recent survey of state and local government users elicited a high response rate and indicated that over 60 of 100 counties use GIS. Local governments are moving beyond tax mapping into other applications of the data and technology that support planning functions. Local governments are creating more geographic data than ever, some of which have multiple uses for local and state analysis.

Lenoir County GIS Overview
Joey Taylor, Resource Development Director in Lenoir County, is using GIS extensively in his daily work. For example, digital orthophotos provide a visual context for streets and address ranges. Digital soil surveys are useful for fertilizer management by the conservation officer and for tax assessment purposes. Flood zones defined by the Federal Emergency Management Agency (FEMA) are useful in hazard mitigation efforts, including public acquisition of flood damaged properties. Lenoir County is developing an Internet map serving capability that may be a useful resource for the Council.

Using GIS for Planning
Jeff Brown (CGIA) demonstrated examples of using GIS to support planning decisions. Given sufficient data, a GIS can answer questions about distance, proximity, intersection and other spatial relationships between map features (such as streams and forested land). Planners can use GIS for a variety of applications. For example, GIS is an effective tool for applying criteria to a region to target areas for open space preservation, for identifying the areas most vulnerable to natural hazards, and for highlighting the areas most suitable for economic development. Graphic displays and maps generated by a GIS can effectively communicate information in executive sessions and public meetings.

Applying GIS to the Neuse River Basin Regional Council Program of Work
Betsy Pearce showed workshop participants a GIS project that she had customized for the Neuse River Basin. Working with a set of geographic data layers and customized viewing tools in a desktop GIS (an extension of *ArcView*®), Betsy highlighted water quality conditions in the basin. Views included potential sources of pollution, protected lands, environmentally sensitive areas, demographics, political boundaries, river basin boundaries and hydrologic units, public water and sewer systems, and others.

Betsy's presentation highlighted the relationships between layers of information such as impaired waters and land cover adjacent to streams. The views revealed that water quality problems and opportunities appear to vary across the river basin, and that efforts to improve water quality could use a GIS to target stream segments. Betsy produced a map of the river basin with water quality themes and supplied a copy for each workshop participant.

Discussion: What Did We Learn and Where Do We Go From Here?

Joey Taylor and Guy Stefanski both noted the potential for multiple benefits—hazard mitigation, water quality, wetland restoration, open space creation—available from acquisition of flood damaged properties. A demonstration project for the Neuse Regional Council could tie into the hazard mitigation program in Kinston.

The group showed particular interest in water quality monitoring, population change statistics, water and sewer systems, community confidence reports related to drinking water, best management practices (BMP), fish kill data, stream gauges, and animal operations. Water quality assessments were discussed in the context of Swift Creek where its intended use is not supported. Based on monitored data, the suspected source of the problem is non-point source pollution.

Participants noted that *BasinPro* would be a useful tool in the creation of a Neuse River Atlas that the Neuse River Foundation is undertaking.

In terms of water quality monitoring, the Council is considering a project at the confluence of the Trent and Neuse rivers near New Bern. *BasinPro* revealed that the area is closed to shellfishing, and waters are impaired.

The group suggested that the Neuse River Basin needs restoration of wetlands and an incentive program to preserve farmland. In addition, septic tanks need to be mapped. There is potential for a project to determine locations of septic tanks jointly with local governments.

Participants saw value in color infrared imagery for water quality assessment and for hazard mitigation. Elevation data would be invaluable for modeling floods and run-off as well.

Bill Ritchie wants to focus on six sites for monitoring. GIS would be useful in targeting, identifying, and characterizing project locations. Areas that are impaired and not currently monitored would be candidates. A project that targets areas would need follow-up with landowners to explore possible options that would improve water quality.

A project related to hazard mitigation could create open space, greenways, riparian buffers, or recreational areas and could take advantage of extensive mitigation work in Kinston.

Another project idea is to team with the Neuse River Foundation and others to compile an inventory of buffers, greenways, and other open space on the Neuse to help target new efforts.

Another concern was drinking water supply. Is water and sewer provision coordinated in the basin and if not, what is happening to water levels in aquifers? An alliance with the Global TransPark Regional Partnership might be appropriate on this issue.

One organizational consideration was the need to inform the general public about Neuse issues and projects.

C. Recommendations

CGIA recommends that APNEP do the following:

Request that CGIA make copies of a GIS project, like the one demonstrated at the workshop with modifications based on feedback from the APNEP workshops, available to APNEP for distribution to the Neuse Regional Council. Charges to the project under the current contractual agreement should be based on a large quantity distribution of a standard product ("*BasinPro*") to keep the product affordable for APNEP and for other parties that may want to order copies from CGIA.

Direct CGIA, under the current contractual agreement, to develop and carry out a work plan to create a septic tank database for priority areas in the river basin. This plan will involve representatives from the Council supplemented by technical specialists from local government, regional organizations and universities.

Direct CGIA to provide GIS training to include and go beyond the *BasinPro* package.

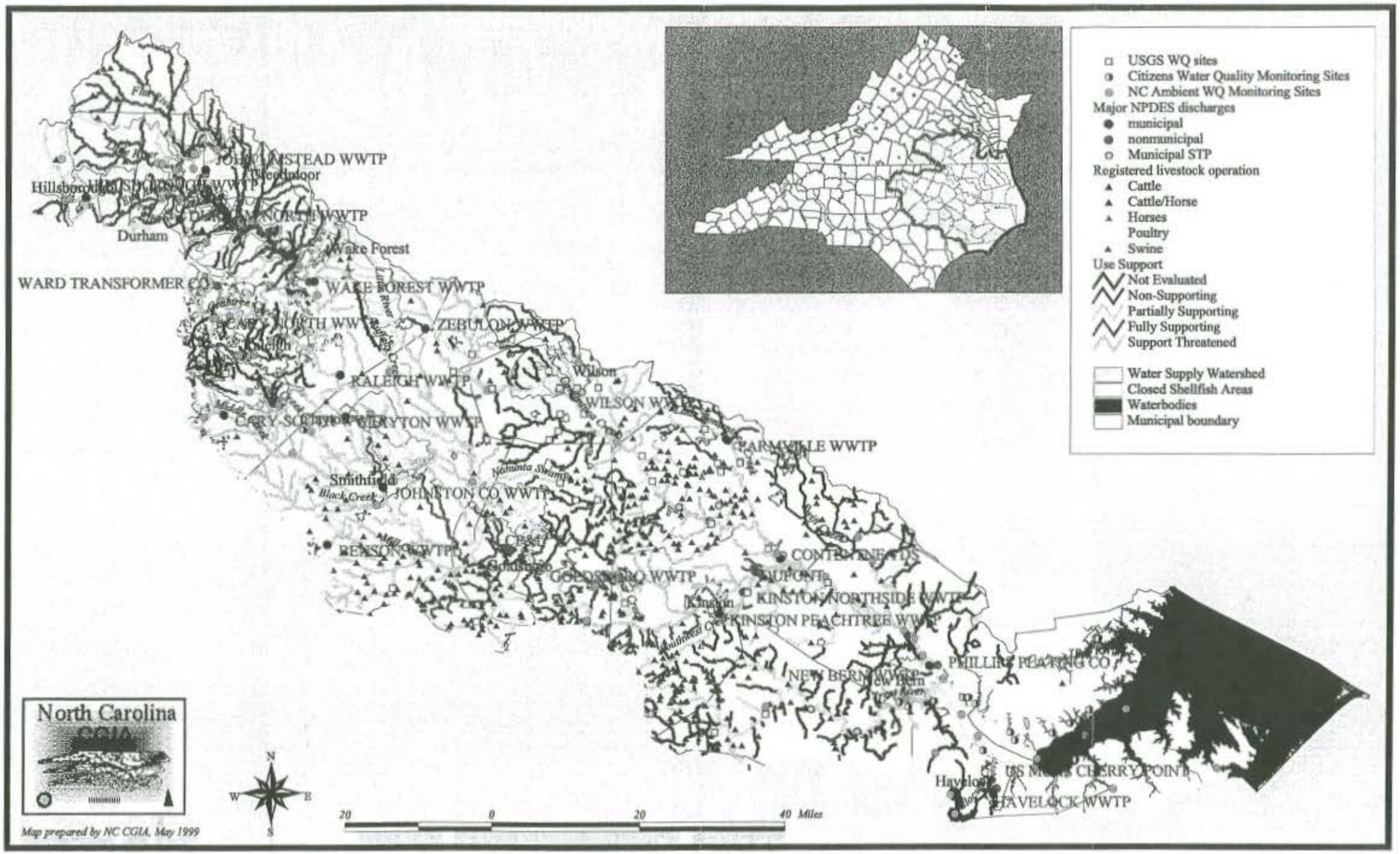
Consult with the Neuse Regional Council to select an organization to be responsible for using *BasinPro* in support of the Council.

Encourage the Council to consider a demonstration project that can tie into the extensive hazard mitigation efforts in Kinston.

Organize a session in which CGIA uses the GIS to assist the Council in identifying a demonstration project that could be submitted as a grant proposal to NC DENR, the Clean Water Management Trust Fund, the Hazard Mitigation Grant Program, or other source of grant funds. As part of the process, CGIA could assist the Council in targeting areas for monitoring or other activities.

The Albemarle-Pamlico
National Estuary Program

NEUSE RIVER BASIN



IV. Roanoke River Basin Regional Council

May 20, 1999, Bertie County Cooperative Extension Service, Windsor

A. Introductory Notes

The Roanoke River Basin Regional Council consists of representatives from counties located in the lower Roanoke River Basin. The lower portion of the Roanoke River Basin begins below the Lake Gaston Dam. It is located in northern North Carolina and includes parts or all of Bertie, Halifax, Martin, Northampton, and Washington counties. The Roanoke River, portions of Lake Gaston, and Roanoke Rapids Lake are the major water bodies. Roanoke Rapids, Weldon, Williamston and Plymouth are the major municipalities in this predominantly rural river basin. Total population for the entire basin in 1990 was 263,661, with 75 person per square mile. The entire basin has 2,390 freshwater stream miles.

The Regional Council developed a two-year Program of Work in April 1998. In brief, the Council agreed on a work program that includes:

1. A flow management initiative
2. Agriculture/forestry Best Management Practices demonstration project
3. Water quality conditions in specific stream segments
4. Policy issues

B. Workshop Notes

The meeting began with a welcome by Jack Williford, Manager of Bertie County. See the meeting agenda and attendance list on the following pages.

The room set-up included a high-resolution projector linked to a laptop computer and a projection screen. This enabled slide presentations and live, interactive GIS sessions.

Roanoke River Basin — Workshop Attendees

NAME	TITLE	ORGANIZATION
J. Phillip Hoggard	Chief Mapper	Bertie County
Jeff Horton		The Nature Conservancy
Tim Ivey		
Mary P. Lilley		Greenfield Associates, Inc.
Jean Richter		US Fish and Wildlife Service
Roger Spivey		
John Stallings		
Michael Taylor		
Kay Winn		
Jeffrey Brown	Project Manager	NC Center for Geographic Info. & Analysis
Joan Giordano	Public Involvement Coordinator	NC DENR--APNEP
Zsolt Nagy	Coordination Program Manager	NC Center for Geographic Info. & Analysis
Elizabeth Pearce	Water Quality Specialist	NC Center for Geographic Info. & Analysis
Guy Stefanski	APNEP Coordintor	NC DENR--APNEP

Albemarle-Pamlico National Estuary Program

ROANOKE RIVER BASIN REGIONAL COUNCIL

Geographic Information System (GIS) Workshop

May 20, 1999
Bertie County Cooperative Extension Service
102 Dundee Street
Windsor, NC

Workshop Agenda

9:00	**Registration and coffee**
10:00	**Welcome** Jack Williford, County Manager, Bertie County Jerry Holloman, Roanoke River Basin Regional Council Chair
10:15	**Purpose/Intent of Workshop** Joan Giordano – Albemarle-Pamlico National Estuary Program
10:20	**GIS Today in North Carolina** Zsolt Nagy, Center for Geographic Information and Analysis (CGIA)
11:00	**The Nature Conservancy's Roanoke River Database & Land Use Applications** Jeff Horton, The Nature Conservancy
11:30	**Using GIS for Planning** Jeff Brown, Center for Geographic Information and Analysis
11:45	**LUNCH** (dutch – delivered)
12:45	**Applying GIS to the Roanoke Regional Council Program of Work** Betsy Pearce, Center for Geographic Information and Analysis *(CGIA will present GIS views and maps corresponding to the Roanoke Regional Council's interests and issues identified in the Program of Work.)*
2:45	**BREAK**
3:00	**Group Discussion: What Did We Learn & Where Do We Go From Here?** Jeff Brown, Center for Geographic Information and Analysis
3:30	**Adjourn**

GIS Today in North Carolina
Zsolt Nagy presented an overview of the state of GIS in North Carolina, with emphasis on the array of geographic data available. In particular, the NC Corporate Geographic Database features over 100 layers of information including roads, soils, political boundaries, land cover, rivers and streams, water quality conditions, potential sources of pollution, water supply watersheds, natural heritage areas, wetlands, and many others relating to the environment. In addition, the state is distributing digital orthophoto quarter quads, 1993 black and white, and is working on a program to develop 1998 color infrared imagery in the coming months.

GIS users are numerous and well connected in North Carolina. A recent survey of state and local government users elicited a high response rate and indicated that over 60 of 100 counties use GIS. Local governments are moving beyond tax mapping into other applications of the data and technology that support planning functions. Local governments are creating more geographic data than ever, some of which have multiple uses for local and state analysis.

The Nature Conservancy's Roanoke River Database & Land Use Applications
Jeff Horton of the Nature Conservancy demonstrated an array of GIS data that highlight changes in land cover and stream flows in the basin. He explained the relationship between river flow, flooding and water quality using Mush Island as an example. This is a regional GIS resource that will be relevant and useful to the Council's Program of Work.

Using GIS for Planning
Jeff Brown (CGIA) demonstrated examples of using GIS to support planning decisions. Given sufficient data, a GIS can answer questions about distance, proximity, intersection and other spatial relationships between map features (such as streams and forested land). Planners can use GIS for a variety of applications. For example, GIS is an effective tool for applying criteria to a region to target areas for open space preservation, for identifying the areas most vulnerable to natural hazards, and for highlighting the areas most suitable for economic development. Graphic displays and maps generated by a GIS can effectively communicate information in executive sessions and public meetings.

Applying GIS to the Roanoke River Basin Regional Council Program of Work
Betsy Pearce showed workshop participants a GIS project that she had customized for the Roanoke River Basin. Working with a set of geographic data layers and customized viewing tools in a desktop GIS (an extension of *ArcView*®), Betsy highlighted water quality conditions in the basin. Views included potential sources of pollution, protected lands, environmentally sensitive areas, demographics, political boundaries, river basin boundaries and hydrologic units, public water and sewer systems, and others.

Betsy's presentation highlighted the relationships between layers of information such as impaired waters and land cover adjacent to streams. The views revealed that water quality problems and opportunities appear to vary across the river basin, and that efforts

to improve water quality could use a GIS to target stream segments. She included GIS data obtained from the Virginia Department of Environmental Protection. Betsy produced a map of the river basin with water quality themes and supplied a copy for each workshop participant.

Discussion: What Did We Learn and Where Do We Go From Here?

Discussion centered around seven issues.

1. Protected land and land use patterns. GIS provides a picture of land cover and the location of protected lands. These pictures are useful in targeting efforts and understanding current pressure on traditional land uses including agriculture and on wildlife habitat.
2. River flow. A minimum flow is important to water quality and wildlife habitat. Flood control has its impacts and is of particular importance on the Roanoke River.
3. Privacy. While public access to data is expected and accepted, there are instances of misuse of public data, putting property owners in vulnerable positions. For example, personal information about farm owners has been placed on the Internet, opening a door for harassing phone calls to farmers.
4. Preservation of agricultural land. Conversion of agricultural land to residential and commercial developments is a water quality issue as well as a rural quality of life issue.
5. Zoning. Local zoning ordinances and the lack thereof add a lot of uncertainty to future land use and water quality.
6. Water quality information. There are no citizen water quality monitoring sites in the Roanoke River Basin. Catherine Creek has not been evaluated for use-support. The basin is economically distressed and has relatively good water quality, making it a target for new industry. Modeling could be useful as a baseline to use in future assessments.
7. GIS capacity. The group expressed interest in having access to water quality and other information in GIS format. Accuracy and currency of the data are concerns as well as access. More data relating to topography and soils would be useful in soil and water conservation efforts.

There appear to be common needs in the Roanoke River Basin among farmers, resource managers, the Nature Conservancy, and local governments. Traditional uses of natural resources appear to be particularly important in this basin. There may be opportunities for local governments and resource managers to cooperatively build and use GIS capacity in order that both public and private land use decisions are based on the best available information.

In the short term, GIS could be useful in targeting an area for a demonstration project related to flow management, water quality monitoring, or agricultural best management practices.

C. Recommendations

CGIA recommends that APNEP do the following:

Request that CGIA make copies of a GIS project, like the one demonstrated at the workshop with modifications based on feedback from the APNEP workshops, available to APNEP for distribution to the Roanoke Regional Council and the Nature Conservancy. The latter's work is a valuable resource, and this would enable CGIA to get more state data integrated with regional data. Charges to the project under the current contractual agreement should be based on a large quantity distribution of a standard product ("*BasinPro*") to keep the product affordable for APNEP and for other parties that may want to order copies from CGIA.

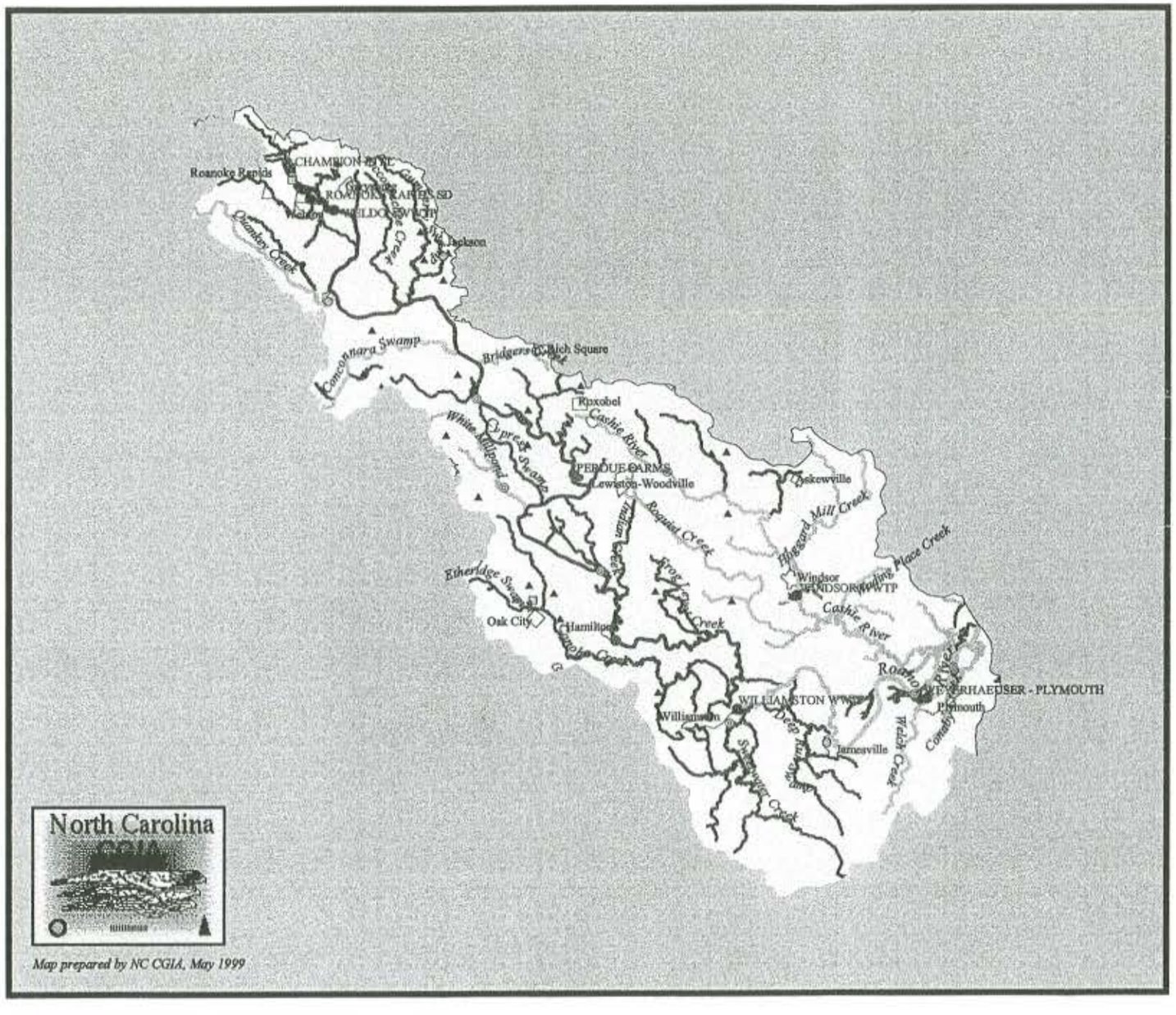
Identify five or six potential information centers in the basin that can take advantage of *BasinPro* to support decision making related to land use and water quality, and explore funding options for local government GIS capability. The state's coordination structure may be useful in identifying opportunities for cooperation.

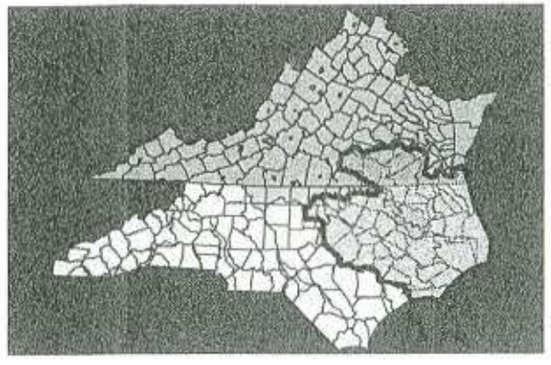
Organize a session in which CGIA uses the GIS to assist the Council in identifying a demonstration project that could be submitted as a grant proposal to NC DENR, US EPA, the Clean Water Management Trust Fund or other sources of funds.

Explore, through DENR, the Governor's Office and the Farm Land Preservation Trust, opportunities for linking water quality issues to farm land preservation issues in the basin.

The Albemarle-Pamlico
National Estuary Program

ROANOKE RIVER BASIN





- USGS WQ sites
- Citizens Water Quality Monitoring Sites
- NC Ambient WQ Monitoring Sites

Major NPDES discharges
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- nonmunicipal
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Registered livestock operation
- Cattle
- Cattle/Horse
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Use Support
- Not Evaluated
- Non-Supporting
- Partially Supporting
- Fully Supporting
- Support Threatened

- County boundary
- Closed Shellfish Areas
- Waterbodies
- Municipal boundary

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V. Tar-Pamlico River Basin Regional Council

May 21, 1999, Edgecombe County Cooperative Extension Service, Tarboro

A. Introductory Notes

The Tar-Pamlico River Basin is located in northeastern North Carolina and includes parts or all of Beaufort, Dare, Edgecombe, Franklin, Granville, Halifax, Hyde, Martin, Nash, Pamlico, Person, Pitt, Vance, Warren, Washington, and Wilson counties. The Tar River and Pamlico Sound are the major water bodies. Greenville, Tarboro, Rocky Mount, Washington and Wilson are the major municipalities in this river basin. Total population was 364,862 in 1990, with 65 persons per square mile. The basin has 2,355 freshwater stream miles.

The Regional Council developed a two-year Program of Work in May 1998. In brief, the Council agreed on a work program that includes:

1. Cooperative Extension Service environmental education team initiative
2. River's edge initiative
3. Groundwater contamination and availability exploration
4. Policy and organizational issues

B. Workshop Notes

The meeting began with a welcome by Joe Durham, Manager of Edgecombe County. See the meeting agenda and attendance list on the following pages.

The room set-up included a high-resolution projector linked to a laptop computer and a projection screen. This enabled slide presentations and live, interactive GIS sessions.

Tar-Pamlico River Basin — Workshop Attendees

NAME	TITLE	ORGANIZATION
Joanne Ball		Franklin County
Stuart Bass		Edgecombe County Planning Dept
Earl Bell	Sales Rep. Swine Products	Elanco Animal Health
John Faulkner		Franklin County Solid Waste
Jeffrey C. Furness	Sr. Environmental Scientist	PCS Phosphate Aurora
Mary Jane Jennings		
Tony King		Town of Louisburg
Larry S. Odom		Nash County
Joe Shearon		Town of Louisburg, Town Council
Jim Stephenson		Pamlico-Tar River Foundation
C. Alexander Turner III	GIS Analyst	City of Greenville, MIS Dept.
Jeffrey Brown	Project Manager	NC Center for Geographic Info. & Analysis
Joan Giordano	Public Involvement Coordinator	NC DENR--APNEP
Zsolt Nagy	Coordination Program Manager	NC Center for Geographic Info. & Analysis
Elizabeth Pearce	Water Quality Specialist	NC Center for Geographic Info. & Analysis
Guy Stefanski	APNEP Coordinator	NC DENR--APNEP

TAR-PAMLICO RIVER BASIN REGIONAL COUNCIL

Geographic Information System (GIS) Workshop

May 21, 1999
Edgecombe County Cooperative Extension Service
210 St. Andrew Street
Tarboro, NC

Workshop Agenda

9:00	**Registration and coffee**
10:00	**Welcome** Joe Durham, County Manager, Edgecombe County Earl Bell, Tar-Pamlico River Basin Regional Council Chair
10:15	**Purpose/Intent of Workshop** Joan Giordano – Albemarle-Pamlico National Estuary Program
10:20	**GIS Today in North Carolina** Zsolt Nagy, Center for Geographic Information and Analysis (CGIA)
11:00	**City of Greenville GIS Overview** Lex Turner, MIS Department – City of Greenville
11:30	**Using GIS for Planning** Jeff Brown, Center for Geographic Information and Analysis
11:45	**LUNCH** (dutch – delivered)
12:45	**Applying GIS to the Tar-Pamlico Regional Council Program of Work** Betsy Pearce, CGIA *(CGIA will present GIS views and maps corresponding to the Tar-Pamlico Regional Council's interests and issues identified in the Program of Work.)*
2:45	**BREAK**
3:00	**Group Discussion: What Did We Learn & Where Do We Go From Here?** Jeff Brown, Center for Geographic Information and Analysis
3:30	**Adjourn**

GIS Today in North Carolina
Zsolt Nagy presented an overview of the state of GIS in North Carolina, with emphasis on the array of geographic data available. In particular, the NC Corporate Geographic Database features over 100 layers of information including roads, soils, political boundaries, land cover, rivers and streams, water quality conditions, potential sources of pollution, water supply watersheds, natural heritage areas, wetlands, and many others relating to the environment. In addition, the state is distributing digital orthophoto quarter quads, 1993 black and white, and is working on a program to develop 1998 color infrared imagery in the coming months.

GIS users are numerous and well connected in North Carolina. A recent survey of state and local government users elicited a high response rate and indicated that over 60 of 100 counties use GIS. Local governments are moving beyond tax mapping into other applications of the data and technology that support planning functions. Local governments are creating more geographic data than ever, some of which have multiple uses for local and state analysis.

GIS in Greenville, NC
Lex Turner, Management Information Systems Department of the City of Greenville, described recent GIS developments in the city. GIS is being extended to 50 users in the city, including police, planning, public works and others. The intent is to make land use data available to the public over the Internet.

Using GIS for Planning
Jeff Brown (CGIA) demonstrated examples of using GIS to support planning decisions. Given sufficient data, a GIS can answer questions about distance, proximity, intersection and other spatial relationships between map features (such as streams and forested land). Planners can use GIS for a variety of applications. For example, GIS is an effective tool for applying criteria to a region to target areas for open space preservation, for identifying the areas most vulnerable to natural hazards, and for highlighting the areas most suitable for economic development. Graphic displays and maps generated by a GIS can effectively communicate information in executive sessions and public meetings.

Applying GIS to the Tar-Pamlico River Basin Regional Council Program of Work
Betsy Pearce showed workshop participants a GIS project that she had customized for the Tar-Pamlico River Basin. Working with a set of geographic data layers and customized viewing tools in a desktop GIS (an extension of *ArcView*®), Betsy highlighted water quality conditions in the basin. Views included potential sources of pollution, protected lands, environmentally sensitive areas, demographics, political boundaries, river basin boundaries and hydrologic units, public water and sewer systems, and others.

Betsy's presentation highlighted the relationships between layers of information such as impaired waters and land cover adjacent to streams. The views revealed that water quality problems and opportunities appear to vary across the river basin, and that efforts to improve water quality could use a GIS to target stream segments. Betsy produced a

map of the river basin with water quality themes and supplied a copy for each workshop participant.

Discussion: What Did We Learn and Where Do We Go From Here?

Environmental Education Team Initiative
In discussing water quality data, the Council expressed a need for "Stream Watch" data and other monitoring data that are not included in the DENR sites. The Council would like to have old data for use-support (1994) for a comparison to current data. The group identified needs for digital soils mapping for the basin, a wetlands map for the basin, and a hydrogeology map (Rolesville rock is a factor in Franklin County). Also, the locations of wells and septic tanks would be valuable.

The Cooperative Extension Service has an environmental education team working specifically in the Neuse River Basin. A similar education team established in the Tar-Pamlico River Basin would be useful in support of this part of the Council's Program of Work.

The group expressed a desire to use GIS to target areas for demonstration projects, and to build GIS databases in counties that lack GIS currently.

River's Edge Initiative
Aerial photos would be very helpful in this effort. Creating buffers on either side of rivers taking into account contours would be useful. Other geographic information that will be most useful are parks and recreational areas, boat access sites (some are municipal), natural heritage areas, anadromous fish spawning areas, and crop types on farm land.

Groundwater Contamination
An issue of concern is fertilization (especially nitrates) from golf courses and private lawns. Also, monitoring needs to be improved. Some sampling is done every five years. Steadier monitoring is needed, especially for fish tissue samples.

Demonstration Projects
The Council is considering two demonstration projects that would advance their goals.

1. Alternative septic tank systems.
2. Precision Farming System. The Council has identified 10,000 acres in Warren County. GIS could be used to identify pastureland in proximity to rivers and streams, and then overlay soils and other data to help target areas for precision farming.

C. Recommendations

CGIA recommends that APNEP do the following:

Direct CGIA, under the current contractual agreement, to develop and carry out a work plan to create a septic tank database for priority areas in the river basin. This plan will involve representatives from the Council supplemented by technical specialists from local governments and regional state resource agents.

Direct CGIA, under the current contractual agreement, to link a database in the NC Department of Environment and Natural Resources that contains monitoring results to the monitoring point locations in the GIS.

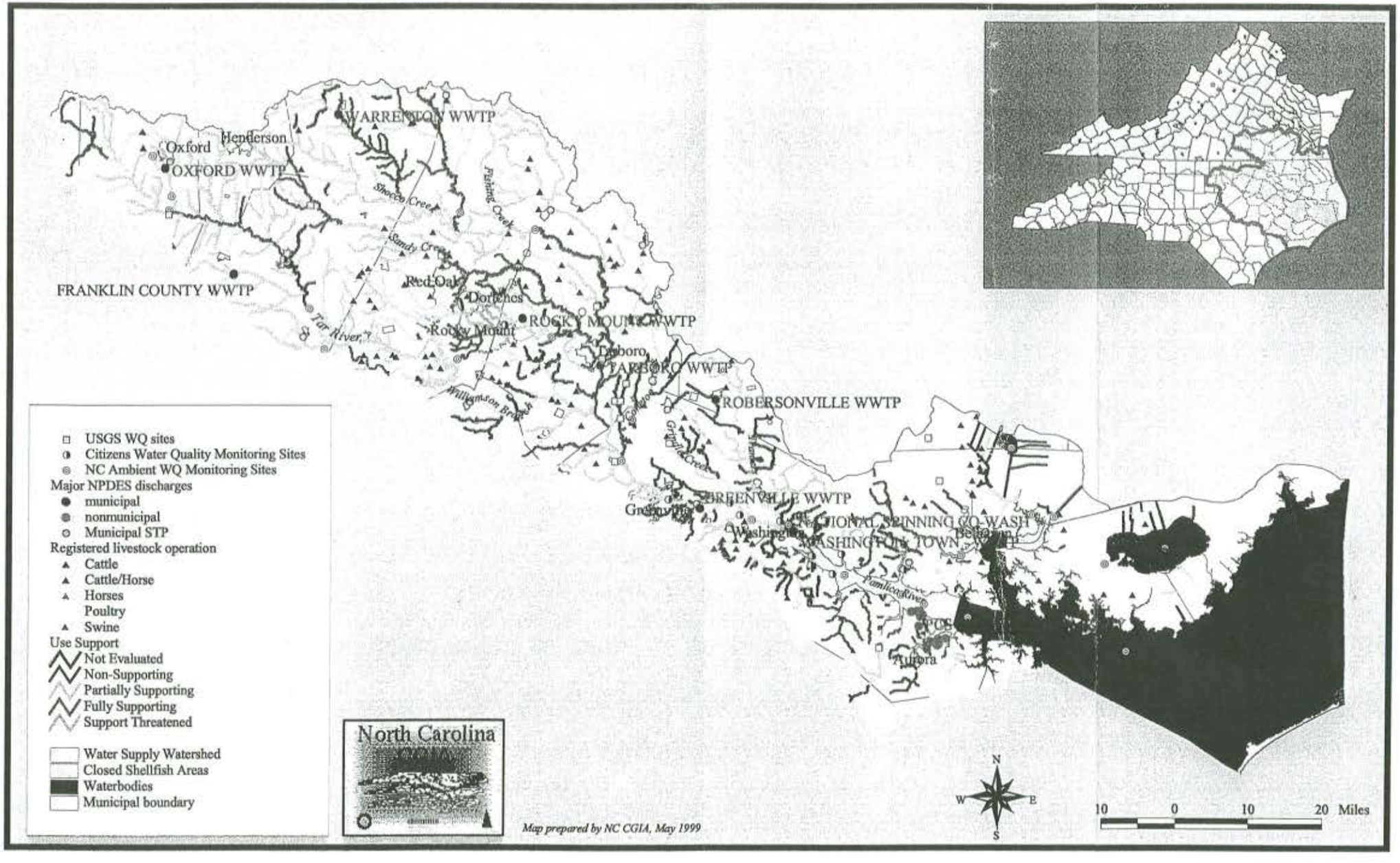
Request that CGIA make copies of a GIS project, like the one demonstrated at the workshop with modifications based on feedback from the APNEP workshops, available to APNEP for distribution to the Tar-Pamlico Regional Council. Charges to the project under the current Memorandum of Agreement should be based on a large quantity distribution of a standard product ("*BasinPro*") to keep the product affordable for APNEP and for other parties that may want to order copies from CGIA.

Consult with the Tar-Pamlico Regional Council to select an organization to be responsible for using *BasinPro* in support of the Council.

Organize a session in which CGIA uses the GIS to assist the Council in identifying a demonstration project that could be submitted as a grant proposal to NC DENR, US EPA, the Clean Water Management Trust Fund or other sources of funds.

The Albemarle-Pamlico
National Estuary Program

TAR PAMLICO RIVER BASIN



VI. Final Thoughts on the Workshops

The workshops went well. Presentations by local GIS practitioners were strong, the GIS demonstrations by CGIA were conducted without any show-stopping technical problems, APNEP staff provided timely guidance, and participants were interested and engaged.

Overall, CGIA recommends the following:

> APNEP and the River Basin Councils would benefit from another set of workshops in 2001 to communicate the progress of council demonstration projects in the context of advances in state and local GIS data and capabilities.
>
> APNEP should engage CGIA as the coordinator of the growing network of GIS expertise and resources in each of the five river basins. This would help the Councils and APNEP tap the available resources effectively and efficiently.
>
> Use CGIA as a means of tightening the relationship between water quality experts in North Carolina and Virginia on behalf of the Pasquotank, Chowan, and Roanoke River Basins.
>
> Make the new *BasinPro* GIS extension available to the network of GIS experts in the river basins to give them desktop capability to view and analyze basinwide data in support of the River Basin Councils.