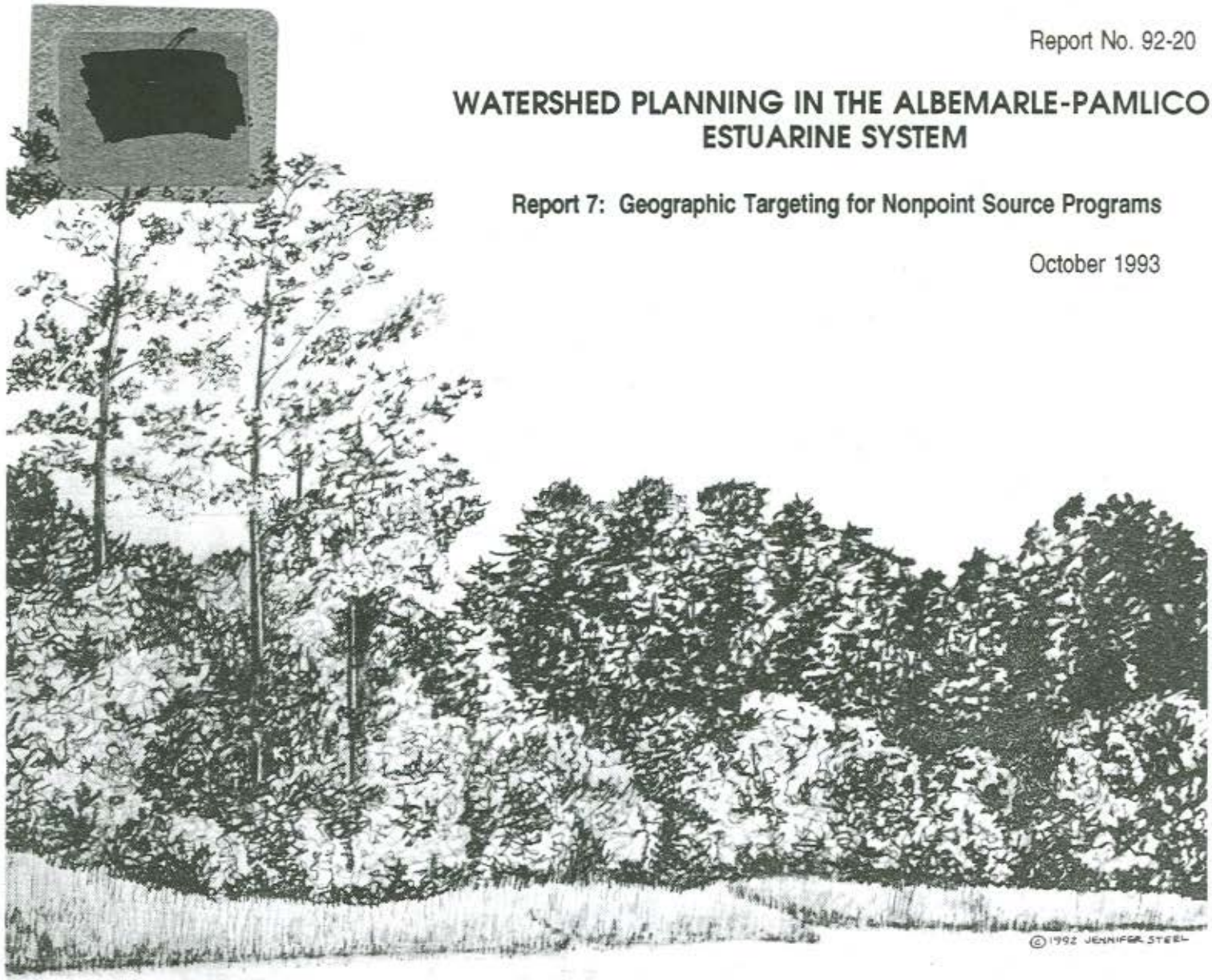

Report No. 92-20

WATERSHED PLANNING IN THE ALBEMARLE-PAMLICO ESTUARINE SYSTEM

Report 7: Geographic Targeting for Nonpoint Source Programs

October 1993

ALBEMARLE-PAMLICO ESTUARINE STUDY

NC Department of Environment, Health, and Natural Resources

ALBEMARLE-PAMLICO

Environmental Protection Agency National Estuary Program

Watershed Planning in the Albemarle-Pamlico Estuarine System

Report 7 — Geographic Targeting for Nonpoint Source Programs

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October 1993

PREFACE

This report is the seventh in a series of eight reports by Research Triangle Institute (RTI) that support watershed planning and the Comprehensive Conservation and Management Plan for the Albemarle-Pamlico (A/P) Estuary Study Area. This work is being done under Cooperative Agreement No. C-14010 between RTI and the U.S. Environmental Protection Agency, with funding also provided by the State of North Carolina.

The series includes the following reports:

- Annual Average Nutrient Budgets
- Ground-water Discharge and a Review of Ground-water Quality Data
- Toxics Analysis
- A Subbasin PC Database
- Fishing Practices Mapping
- Use of Information Systems for Developing Subbasin Profiles
- Geographic Targeting for Nonpoint Source Programs
- Riparian Buffers for Water Quality Enhancement.

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SUMMARY AND RECOMMENDATIONS

The Albemarle-Pamlico (A/P) estuarine system is one of 21 estuaries identified nationwide under the U.S. Environmental Protection Agency's (EPA's) National Estuary Program. This report presents the results of a project to study the ability of current programs to establish appropriate geographic priorities for nonpoint source management and is one of several efforts by Research Triangle Institute (RTI) to support watershed planning in the A/P Study Area. The work was performed under contract to the North Carolina Department of Environment, Health, and Natural Resources and the EPA, Region 4.

The process of geographic targeting involves marshalling resources and expertise on a geographic basis to provide the most efficient and cost-effective solutions for water quality problems. This concept is currently advocated by EPA. Specifically, geographic targeting, as defined herein, involves identifying and prioritizing watersheds for concerted remedial or preventive actions to reduce nonpoint source loadings. Because of the largely rural nature of the study area, eutrophication issues in the estuaries, and evidence that most of the nutrients reaching the estuarine system originate from agricultural land, nutrients from agricultural land are emphasized.

Although components of EPA's targeting approach have been pursued to varying degrees by various agencies in the A/P Study Area, targeting as a unifying or widely accepted concept has not been embraced. North Carolina and Virginia have taken different approaches to prioritizing areas for nonpoint source control and management. Virginia has used GIS technology and an algorithm based on animal, agricultural, and urban loading factors and ambient phosphorus and 305(b) assessment data to rank and prioritize ***watersheds*** for control efforts for all nonpoint programs. North Carolina's Agriculture Cost Share Program and U.S. Department of Agriculture programs recognize ***counties*** as fundamental accounting units. Geographic data (beyond county statistics) have not been available in a central database in North Carolina. In fact, a major distinction between the two States' programs has been degree of database development.

To address these issues, the following recommendations are made:

1. Better ways to share information are needed. An effort to integrate various nonpoint source agency databases in North Carolina should be initiated. For example, good means for sharing data from the databases of the N.C. Division of Environmental Management (NCDEM), the N.C. Division of Soil and Water Conservation (NCDSWC), and the U.S. Soil Conservation Service (SCS) and

Agricultural Stabilization and Conservation Service have not been developed. The delineation of watersheds by SCS and adoption of these units as a basis for accounting within a hierarchical watershed classification scheme would be a major step. The information management plan that has been recommended by the N.C. Center for Geographic Information and Analysis should also help. Additional software development (such as a PC database with watershed ranking functions developed by RTI) and adoption of tools such as EPA's Waterbody System are also needed to facilitate and integrate data management efforts.

2. A prioritization analysis similar, in concept at least, to the one completed in Virginia should be pursued for the entire study area. The Virginia analysis was based on pollution potential and water quality and focused on targeting watersheds. This effort needs to draw on several agencies' expertise and databases and will require considerable technical resources, commitment, and coordination.

3. Although the North Carolina Agriculture Cost Share Program has been very successful and the process for allocating funds from the State to the NCDSWC Districts accounts for many complex issues, specific modifications to the process are recommended. First, weights should be assigned to the different allocation parameters used by the NCDSWC to emphasize the individual importance of each parameter in the overall program objectives. In addition, the data source for the allocation parameter for surface water quality condition should be updated, in coordination with NCDEM, to include more recent assessment information. Finally, nutrient reductions achieved by the program should be estimated.

4. The targeting process should take into consideration the need to prioritize nutrient management best management practices (BMP) implementation (see Section 2). This effort should include identifying watersheds with nutrient management needs based on runoff and leaching potential resulting from both animal waste and commercial fertilizer sources. A critical aspect of improving the ability to target nutrient management BMPs will be improving institutional arrangements for data sharing.

5. An increasing amount of research, both in the A/P Study Area and in other locales, suggests that riparian system protection and restoration should be recognized as an integral component of watershed management efforts. A plan for implementing the riparian buffer requirement recommended in the Comprehensive Conservation Management Plan should be developed. This plan should include recommendations on how to identify stream reaches and watersheds in greatest need of streamside management initiatives.

6. The results of screening studies to identify areas containing potentially toxic residues of pesticides by the National Oceanic and Atmospheric Administration may be useful for targeting areas for implementing pesticide management practices.

It is important to realize that, in the absence of coordinated, formal, and more rigorous analyses, targeting/prioritization efforts will, out of necessity, continue to be made based on less comprehensive, more informal, and more subjective criteria.

ACKNOWLEDGMENTS

The authors would especially like to thank Beth McGee and David Harding of the Water Quality Section of the North Carolina Division of Environmental Management, Jim Cummings and Pat Hooper of the North Carolina Division of Soil and Water Conservation, Mike Flagg of the Virginia Division of Soil and Water Conservation, and Joe Zublena and Jim Barker of the North Carolina Cooperative Extension Service for their guidance and willingness to share information. Thanks are also due to the many people at RTI who assisted with the tasks necessary to produce this report.

SECTION 1

INTRODUCTION

1.1 Background

The Albemarle-Pamlico (A/P) drainage encompasses 30,880 square miles and a vast array of ecological characteristics, human activities, and Federal, State, and local agencies and programs. This diversity, while providing a desirable richness, also presents challenges to the wise stewardship of the system's aquatic resources. One of these challenges is to identify areas most needing management attention. This process is termed "geographic targeting" and is the subject of this report. Geographic targeting identifies *where* emphasis should be placed to protect and enhance water quality. This report addresses nonpoint source programs primarily because of the greater impact of nonpoint sources and the greater need to address geographic aspects of nonpoint source pollution—the spatial/locational characteristics of point sources, as direct discharges to surface waters, are generally much more tangible and tractable.

The remainder of this introduction further defines targeting and discusses its importance; much of the material was originally prepared by Research Triangle Institute (RTI) for the U.S. Environmental Protection Agency's (EPA's) Office of Water for use in *Geographic Targeting: Selected State Examples* (USEPA, 1993a). Section 2 summarizes previous targeting efforts and programmatic considerations.

1.1.1 What is Geographic Targeting?

Geographic targeting, as defined by EPA (USEPA, 1993a), refers to the selection of a geographic area or areas for focused remedial or preventive attention and involves marshalling resources and expertise to provide the most efficient and cost-effective solutions for water quality problems. Geographic targeting is typically guided by factors such as

- Data availability
- Severity of risk
- Impairment to the waterbody (documented or potential)
- Resource value of the waterbody to the public

- Resolvability of the problems (adequacy of available technology)
- Availability of staff and resources to correct the problems expeditiously
- Overall planning goals (e.g., statewide or basinwide goals)
- Willingness to proceed on the part of the agencies and the public.

Geographic targeting addresses activities at the watershed or waterbody level and considers impacts resulting from traditional chemical pollutants as well as nontraditional stressors such as habitat destruction or physical alteration.

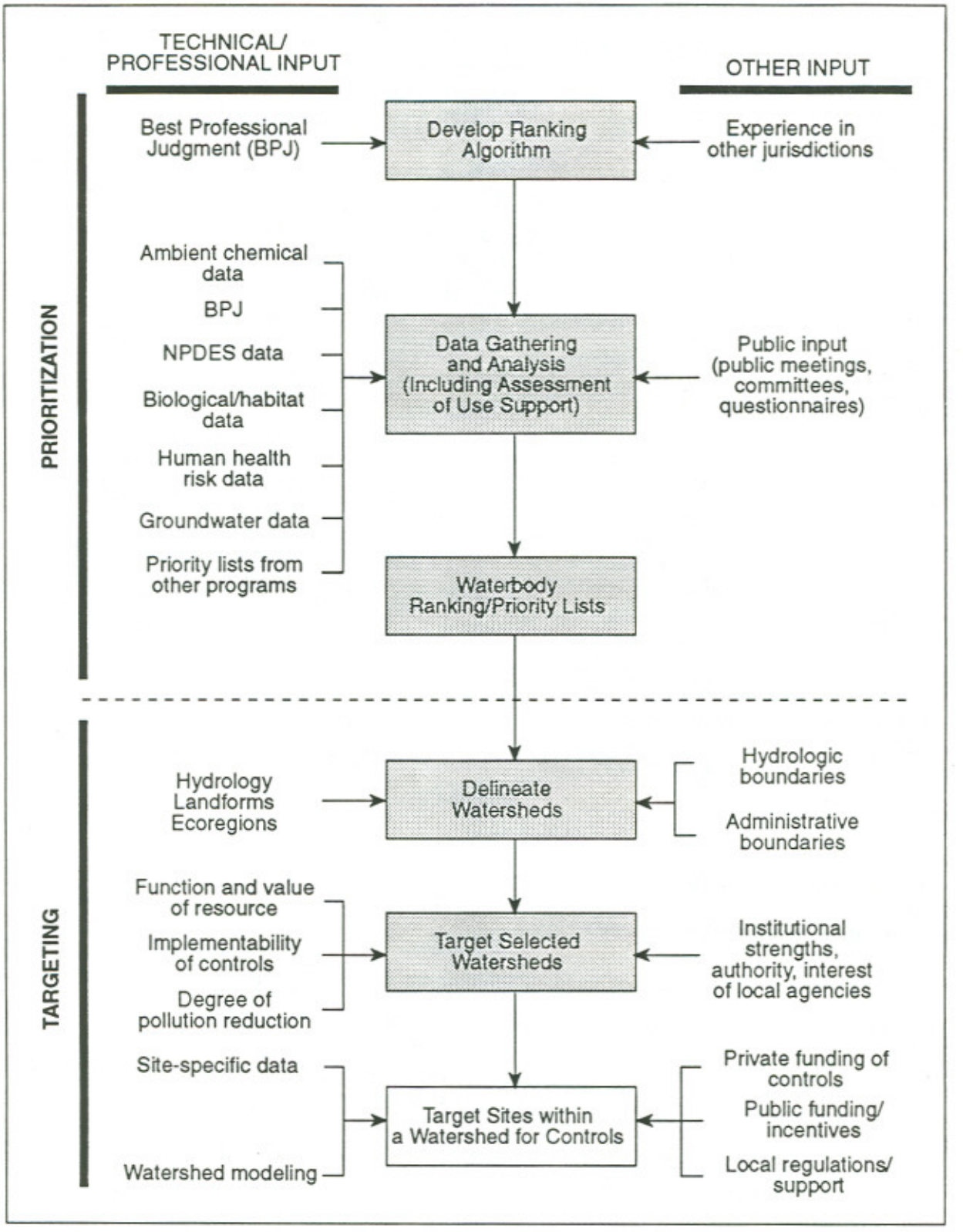
Figure 1-1 shows a generic approach to targeting watersheds. Steps above the dashed line in Figure 1-1 refer to prioritizing or ranking of individual waterbodies. This ranking step is emphasized in Clean Water Act (CWA) Sections 303(d), 304(l), 314, and 319. Selected high-priority waterbodies or watersheds are then targeted for immediate management attention and implementation of controls.

The last two boxes in Figure 1-1 are further explored in Table 1-1. This table illustrates that geographic targeting can be done on several spatial scales. Basins are often several thousand square miles in size, while watersheds may range in size from less than one hundred to several hundred square miles (especially those that are larger than demonstration watersheds).

Table 1-1 also shows two types of geographic targeting that typically occur—targeting during initial selection of watersheds for management attention and targeting specific sources and controls for implementation *within* targeted watersheds. This report is concerned mainly with the shaded portion of Table 1-1, that is, targeting (identifying) watersheds for management action.

Within-watershed targeting (see the far right column in Table 1-1) is highly site-specific and is discussed in technical manuals of the Soil Conservation Service (SCS), the Forest Service, and numerous other Federal and State agencies. Some concepts of within-watershed targeting are also presented in a draft report prepared by RTI, *Watershed Protection Approach: A Project Focus* (USEPA, 1993b).

Although many of the activities identified in Figure 1-1 and Table 1-1 have been pursued by different agencies in the North Carolina portion of the region and have resulted in informal targeting, coordinated efforts to formally target watersheds have not been pursued.



Source: USEPA, 1993a.

Figure 1-1. A generic approach to targeting waterbodies and watersheds.

Table 1-1. Types of Targeting Activities by Spatial Scale and Purpose

	Type or Purpose of Targeting Activity	
Spatial Scale	Targeting Watersheds for Management Action	Targeting Specific Areas for Controls *Within* a Watershed
River basin	Selection of a basin for integrated PS/NPS controls under a basinwide planning process.	Selection of watersheds for additional study and controls.
Large or medium-sized watershed	Selection of a watershed for integrated PS/NPS controls based on a prioritization system, local interest, and other factors.	Selection of individual PSs and NPSs and specific control measures, e.g., targeting high erosion-potential farms and uncontrolled animal operations for BMPs.
Small, use-oriented watershed or individual waterbody	Selection of a small water supply watershed for protection from development pressure; selection of a stretch of river for a TMDL.	Selection of individual sources and specific control measures.

BMPs = Best management practices.
PS/NPS = Point source/nonpoint source.
TMDL = Total maximum daily load.

Nonpoint source agencies in Virginia have completed a watershed ranking and prioritization process, which is discussed in Section 2.

1.1.2 Why Target Watersheds?

Targeting specific watersheds for management attention makes sense for technical, financial, and institutional reasons that include the following:

- Targeting selected watersheds for cleanup can integrate the technical skills and pool the financial resources of multiple agencies.
- Targeting aids in planning long-range activities and provides a basis for setting management priorities.
- A watershed approach encourages the involvement of local government and nongovernment organizations.

- Targeting helps focus the attention of the public on the water resource being restored or maintained, increasing public interest and support.

1.2 Purpose

The purposes of this report are to

- Review and summarize past and current targeting efforts in the A/P Study Area,
- Identify important targeting considerations, and
- Provide practical targeting recommendations.

Because of the largely rural nature of the study area, this report emphasizes nonpoint sources and, in particular, agricultural activities. Nutrients are covered to a greater extent than other pollutants because of the recognized impact of elevated nutrient concentrations. Targeting watersheds is emphasized rather than within-watershed targeting. The focus on this aspect of targeting is a function of the areawide scope of work and data availability. Targeting at a local level is extremely important to the success of nonpoint source programs. In fact, the Chesapeake Bay Commission (1990), in studying the success of the longest and most extensive estuarine management program, recommended that "Targeting strategies need to focus on smaller land areas, rather than whole counties or watersheds."

SECTION 2

PAST AND CURRENT TARGETING EFFORTS

Various agencies and programs have pursued activities relevant to watershed or waterbody targeting efforts to varying degrees. These efforts have ranged from an explicit watershed prioritization project to ongoing programs with implicit targeting components.

2.1 Virginia's Watershed Prioritization

The most formal effort has been completed by the Virginia Division of Soil and Water Conservation (Hession et al., 1992). This analysis resulted in identification of nonpoint source pollution priorities for each hydrologic unit (watershed) in the State. In the A/P area, the watersheds in the eastern part of the drainage were identified as high priority (draining to Currituck Sound and Albemarle Sound), much of the Blackwater and Nottoway drainage was identified as medium priority, and watersheds in the Meherrin drainage were identified as medium or low priority (Figure 2-1). The ratings were calculated using the process shown in Figure 2-2. First, pollution potential ranks were calculated:

$$TAGR_i = AGLLI_i + ALI_i + AGERI_i$$

where

$TAGR_i$ = Total agricultural rank for hydrologic unit i
$AGLLI_i$ = Agricultural nutrient land load index for hydrologic unit i (0-1)
ALI_i = Animal nutrient load index for hydrologic unit i (0-1)
$AGERI_i$ = Agricultural erosion load index for hydrologic unit i (0-1)

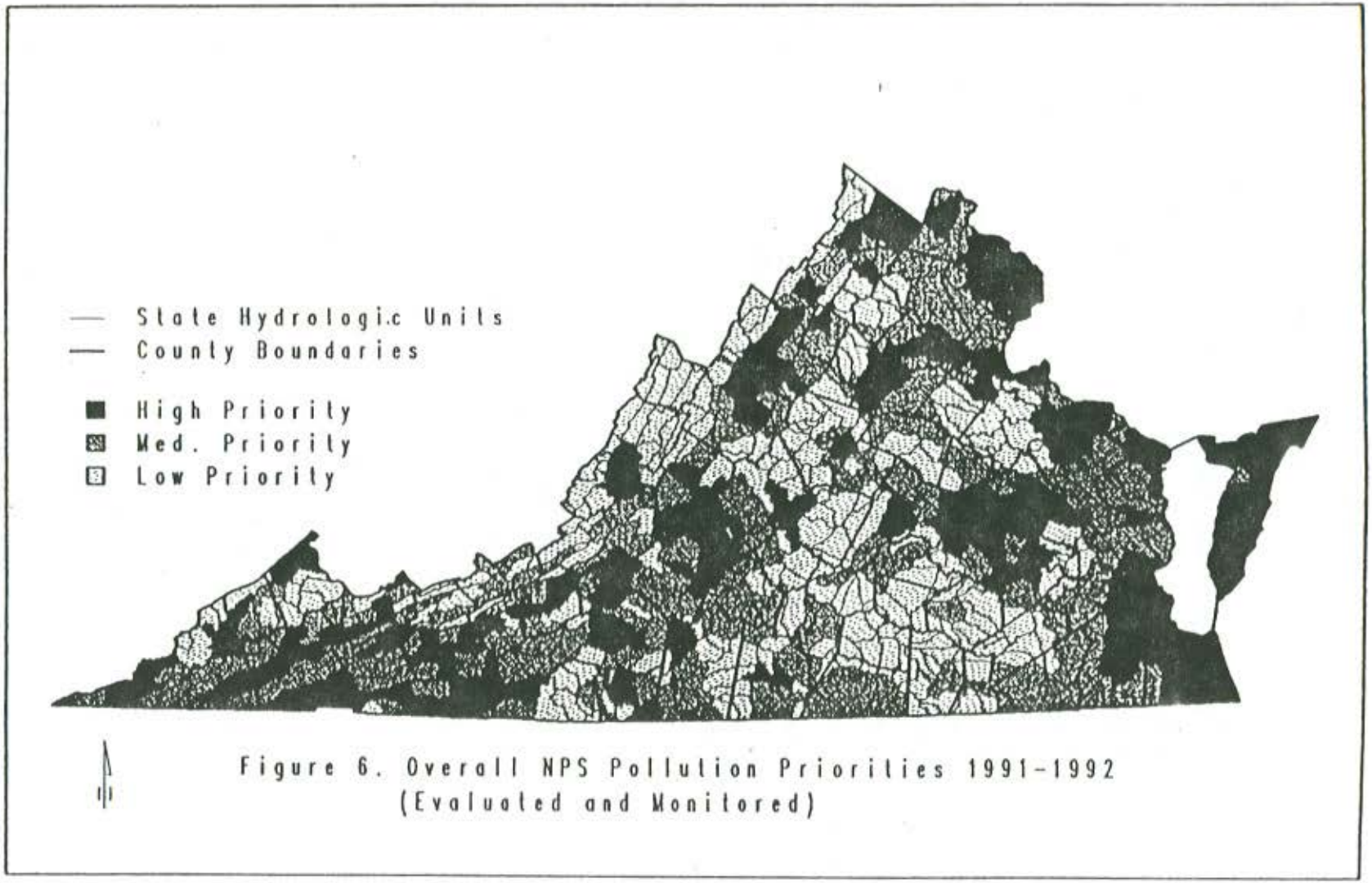
and

$$TURR_i = URLLI_i + URERI_i$$

where

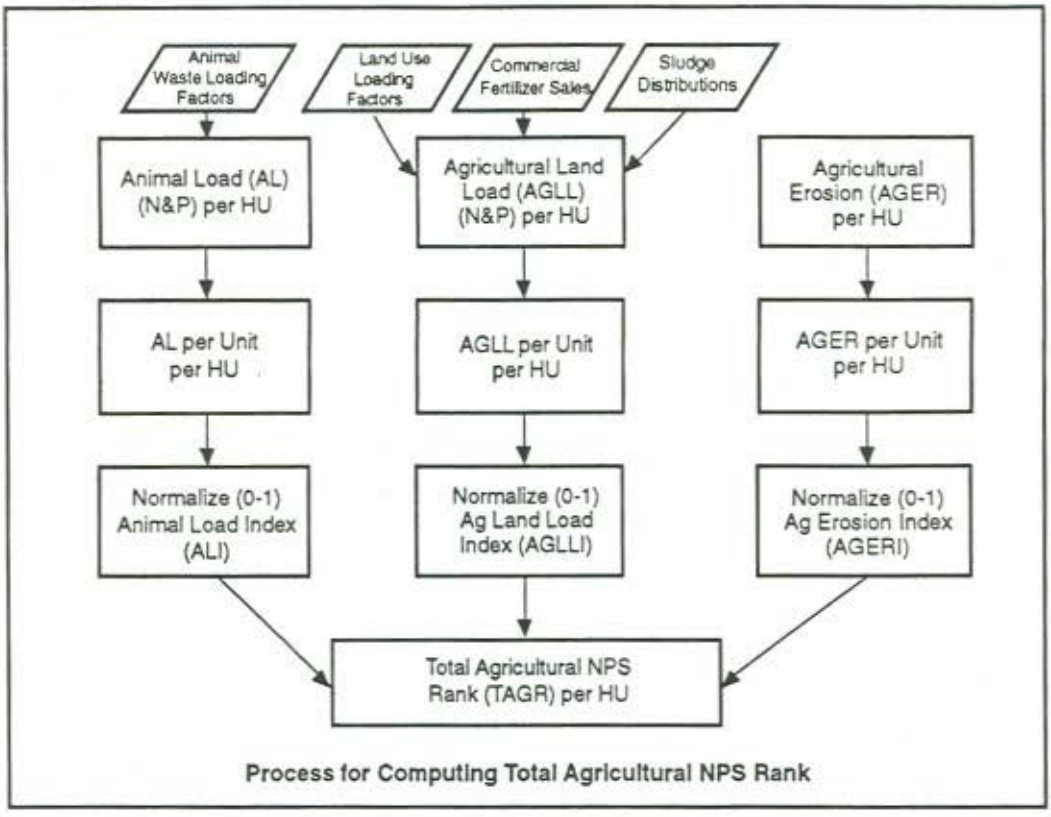
$TURR_i$ = Total urban rank for hydrologic unit i
$URLLI_i$ = Urban nutrient land load index hydrologic unit i (0-1)
$URERI_i$ = Urban erosion load index for hydrologic unit i (0-1).

Each index was normalized so that each contributed equally to the overall rank. The TAGR and TURR were summed for each unit. Then 1990 305(b) results and water quality monitoring data for phosphorus were used to adjust the rank resulting from TAGR and TURR.

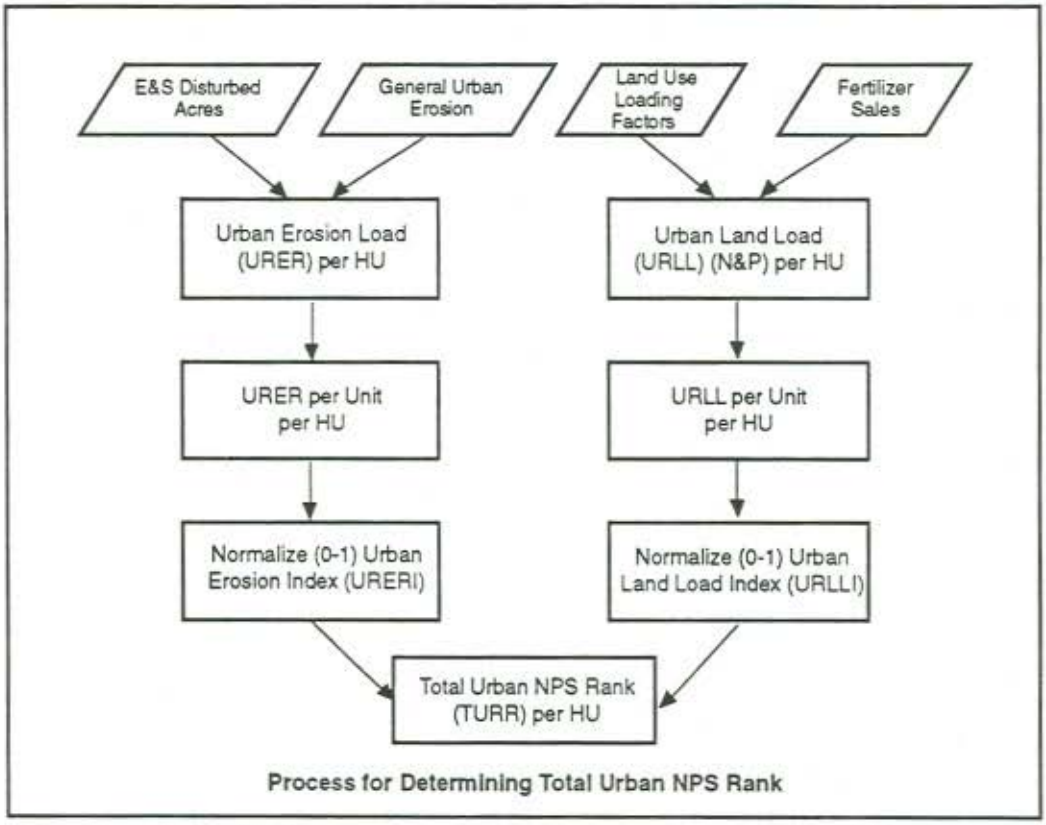


Source: Hession et al., 1992.

Figure 2-1. Overall NPS pollution priorities 1991-1992 (evaluated and monitored).



Process for Computing Total Agricultural NPS Rank



Process for Determining Total Urban NPS Rank

Source: Hession et al., 1992. HU = Hydrologic Unit

Figure 2-2. Virginia's targeting methodology.

The final priorities will be used to select Section 319 projects and to set priorities for other NPS activities.

A parallel watershed prioritization effort has not been completed in North Carolina. (The Soil Conservation Service is currently conducting a watershed prioritization study in eastern North Carolina, with results expected in Spring, 1994.) However, "targeting" has been addressed as a result of administrative, regulatory, and programmatic decisions.

2.2 North Carolina's Nonpoint Source Programs

North Carolina has many different agencies and programs with nonpoint source responsibilities. Compilations of these can be found in the 319 report (NCDEM, 1989) and the draft Comprehensive Conservation Management Plan (APES, 1992). It was beyond the scope of this report to review targeting considerations for each of these programs. A brief discussion of targeting efforts by the lead nonpoint source agency in North Carolina (the NC Division of Environmental Management [NCDEM]) follows. Subsequent sections provide more detailed discussion of issues and programs related to agricultural sources.

A great deal of "targeting" occurs in North Carolina as a result of implementation of regulations and management initiatives by the many agencies with nonpoint source responsibilities. In this context, targeting involves identification of surface waters, watersheds, or jurisdictions that receive priority for some programmatic function. For example, Coastal Areas of Environmental Concern, adoption of coastal stormwater regulations, identification of PL-566 watersheds, Water Supply Watersheds, High Quality Waters, Outstanding Resource Waters, Primary Nursery Areas, Nutrient Sensitive Waters, funding of demonstration projects, and certainly many other initiatives all have targeting implications.

The North Carolina Division of Environmental Management developed criteria based on some of these factors for targeting on a statewide basis in its description of North Carolina's Nonpoint Source Program (under Section 319 of the Clean Water Act) (NCDEM, 1989). Targeted waterbodies for both existing and proposed management programs were identified based on surface water classifications and use support status.

This list of targeted waterbodies has been made available to other State and local nonpoint source agencies. The North Carolina Land Quality Section in the Division of Land Resources and the North Carolina Division of Forest Resources use this list in their programs. The degree of utilization of the list for targeting purposes is not known for other programs.

2.3 North Carolina Agriculture Cost Share Program (NCACSP)

The NCACSP was initiated in 1984 as a water quality control program. The program has been successful from several standpoints. Farmer interest and participation has been high; from 1984-1991, more than twice as much assistance was requested as was available (Table 2-1) in the APES area. In addition, 500,000 acres of land were treated, about 1.4 million tons of soil erosion was averted, and 366 waste management systems were installed. Estimates of the nutrient reductions achieved in the APES area are not currently available, although statewide estimates are available for implementation of best management practices (BMPs) applicable to nutrient control (Table 2-2). Table 2-3 lists the BMPs that are eligible through the NCACSP. (Additional information concerning the program is provided in Appendix A.)

The administering agency, the N.C. Division of Soil and Water Conservation (NCDSWC), has inventoried projected BMP implementation in the Neuse River basin. These data are available by county from the NCDSWC or by hydrologic unit from a FOXPRO PC database (Tippett and Dodd, 1993).

The NCACSP allocates funding at two levels: from the State to the Soil and Water Conservation Districts, and from each District to landowners. Allocation parameters used for State funding for FY93 are summarized in Figure 2-3. These parameters have remained fairly stable since the program's inception. Points are assigned to each parameter based on readily available data. The parameters are then summed (with equal weighting) to determine a total score.

The following description of prioritization at the District level is excerpted from the NCACSP Program Manual.

> "Districts will be allocated monies based on the identified level of agricultural related nonpoint source pollution problems and the respective Districts' Best Management Practice (BMP) installation goals and available technical services . . ." (NCAC Title 15, Chap 6 Section 6E, .0003). "Technical and financial assistance will be targeted to facilitate BMP implementation on the identified critical areas" (NCAC 15, (6) 6E: .0008).
>
> Districts prioritize funds based on water quality needs and also on limiting factors such as:
>
> 1. availability of contractors, engineering assistance, and/or materials,
> 2. landowner's agreement to complete work,
> 3. length of growing season, and
> 4. degree of water quality impact from BMP installation.

Table 2-1. APES Counties (by County Boundary) - Summary of NCACSP Participation PY 1985 - 12/06/91

ACSP prog year entry	County	Total BMP $ allocated	Total TA $ allocated	Total BMP $ requested	Total # of contracts	Total acres affected[a]	Total tons soil saved	Total # waste management systems	Total acres erosion control[b]
87	Beaufort	542,132	0.00	1,222,543	111	29,275	3	20	1
85	Bertie	658,934	95,940.60	1,508,849	244	21,725	42,472	19	4,986
87	Camden	321,304	21,522.00	582,824	121	34,133	86,471	3	22,818
87	Carteret	151,623	53,431.46	285,713	42	9,496	12,511	4	7,074
85	Chowan	401,116	32,735.68	580,784	126	30,150	8,290	18	5,132
87	Craven	393,935	32,735.68	761,800	97	14,622	19,177	15	1,807
87	Currituck	255,690	66,179.67	540,150	90	17,577	35,852	2	15,096
87	Dare	169,606	0.00	331,380	19	15,131	21,902	0	6,179
85	Durham	193,579	32,720.00	434,288	89	1,969	31,274	0	36,701
90	Edgecombe	221,882	50,683.76	1,294,837	113	5,927	18,372	3	93,049
85	Franklin	464,272	12,958.00	979,943	193	8,164	70,225	0	8,525
85	Gates	230,527	5,024.91	541,289	186	9,826	10,796	16	3,740
85	Granville	461,478	90,692.53	1,004,850		5,900	79,286	1	12,538
88	Greene	502,472	46,147.29	958,472	265	10,032	52,279	22	80,484
90	Halifax	207,451	50,204.00	1,312,994	90	3,415	54,270	3	219,613
85	Hertford	641,359	80,278.25	1,370,060	331	26,485	91,541	8	12,572
87	Hyde	405,922	10,466.78	741,984	118	20,509	2,505	14	2,514
88	Johnston	685,727	55,799.50	1,052,350	444	8,659	117,676	21	104,173
87	Jones	332,659	62,645.77	447,037	117	7,560	8,529	17	6,218
88	Lenoir	411,861	62,075.37	479,568	187	7,351	10,904	22	27,150
90	Martin	200,505	0.00	412,094	85	4,890	746	8	25
88	Nash	526,502	56,519.95	1,135,748	220	12,718	28,590	5	119,729
85	Northampton	1,063,526	91,154.78	3,382,001	640	32,760	54,341	7	231,010
85	Orange	953,898	151,649.38	1,555,168	477	13,057	66,319	20	22,994
87	Pamlico	525,400	62,787.15	1,499,622	81	17,497	3,866	0	1,881
87	Pasquotank	241,645	18,509.91	509,550	133	26,905	25,463	2	12,867

(continued)

Table 2-1 (continued)

ACSP prog year entry	County	Total BMP $ allocated	Total TA $ allocated	Total BMP $ requested	Total # of contracts	Total acres affected[a]	Total tons soil saved	Total # waste management systems	Total acres erosion control[b]
87	Perquimans	411,456	25,517.01	548,076	164	28,419	13,134	19	7,711
85	Person	1,191,081	88,748.87	2,009,956	662	14,485	137,511	5	188,668
88	Pitt	590,780	0.00	921,173	155	9,957	21,612	15	3,531
87	Tyrell	252,855	4375.00	622,130	62	25,541	23,485	7	5,335
90	Vance	113,640	0.00	459,073	56	983	7,282	0	80,779
85	Wake	479,915	0.00	1,184,491	231	8,700	74,446	6	20,972
90	Warren	183,502	39,795.14	387,925	133	4,080	17,005	0	102,991
87	Washington	514,216	17,607.00	902,447	172	41,946	15,953	6	13,922
88	Wayne	608,498	55,635.86	920,820	300	13,702	23,379	49	18,070
88	Wilson	407,185	59,851.26	677,432	271	19,017	112,411	9	32,141
	Grand Totals	15,918,433	1,548,491.71	33,599,421	7,195	562,565	1,399,878	366	1,533,000

BMP = Best management practices.
TA = Technical assistance.

[a]Includes total acres affected by *all* BMPs.
[b]Does not include sediment and nutrient reduction BMPs such as grassed waterways, filter strips, field borders, water control structures, stream crossings, and livestock exclusion.

Table 2-2. N.C. Agriculture Cost Share Program—BMP Log Summary Report, August 1984 through June 30, 1992 (Statewide)

Number of agreements		14,630
Acres		895,850
Acres erosion control		328,636
Tons saved		3,158,420
Erosion/Nutrient Control BMPs		
Sod-based rotation (acres)		31,576
Cropland conversion (acres)		47,629
Conservation tillage (acres)		210,468
Critical area planting (acres)		1,598
Stripcropping (acres)		17,407
Terraces (acres @ 150 ft = 1 acre)	<1,335,737 ft>	8,905
Diversions (acres @ 100 ft = 1 acre)	<1,105,495 ft>	11,055
Confined Animal Operation BMPs		
Structures (No.)		908
Storage capacity (gallons)		532,824,825
Storage capacity (tons)		33,155
Nitrogen storage capacity (pounds)		29,326,799
Phosphorus storage capacity (pounds)		17,274,687
Liquid waste application (gallons)		812,458,692
Poultry litter applied (tons)		776,755
Acres applied		183,536
Nitrogen applied (pounds)		37,927,300
Phosphorus applied (pounds)		38,174,197
Stream protection systems (No.)		2,730
Livestock exclusion (ft)		1,484,675
Sediment/Nutrient Control BMPs		
Grassed waterways (No.)		3,994
Field borders/filter structures (No.)		4,168
Water control structures (No.)		2,586
Grade stabilization structures (No.)		359

Source: James R. Cummings, N.C. Division of Soil and Water Conservation, personal communication, August 8, 1992.

Table 2-3. List of Eligible Best Management Practices for Cost Sharing under the N.C. Agriculture Cost Share Program

Erosion/Nutrient Control
- Conservation tillage
- Terraces
- Diversions
- Critical area planting
- Sod-based rotation
- Stripcropping
- Cropland conversion to grass
- Cropland conversion to trees
- Cropland conversion to wildlife plantings
- Cropland conversion to Christmas trees
- Grade stabilization structures

Sediment/Nutrient Control
- Filter strips
- Field borders
- Grassed waterways
- Water control structures

Confined Animal Operations Control
- Lagoons
- Ponds
- Dry stacks
- Pads
- Litter storage
- Composters
- Heavy use area protection
- Spring development
- Stock trails
- Stream crossings
- Livestock water facilities (tank/trough)
- Nutrient reduction management
- Wells
- Pesticide load areas
- Portable watering facilities (livestock)
- Land application of animal waste
- Solid set waste management system for land application
- Wetlands development for land application
- Dry hydrant waste management system for land application

Source: Jim Cummings, N.C. Division of Soil and Water Conservation, personal communication, 1992.

I. Number of acres of agricultural land[a] in the county

II. Acres of "e" (highly erodible) cropland in the county

III. Animal Waste Management Systems—Total Needs

IV. Animal Waste Management Systems—Annual Priorities[b]

V. Pasture/Stream Protection Systems

VI. Acres needing water management

VII. Percent of county with surface water quality in a fair to poor condition (according to DEM Assessment Document, 5/85)

VIII. Percent of county draining to PNA, ORW, HQW, NSW, Trout, Shellfishing, Critical Water Supply Watersheds

IX. Technical Assistance: measure of how much technical assistance is available to plan and install BMPs (based on historical averages and district projection)

X. Previous Program Year Funds Paid Out: measure of success of individual Soil and Water Conservation District Program

XI. Previous Program Year Funds Outstanding: measure of technical assistance needs to complete already planned measures (negative factor)

Basis of Parameters:

I - V: Level of Agricultural Activity and District Priorities

VI - VIII: Recognition of Areas of State/Federal Concern

IX - XI: Planning and Application of Program

[a]Cropland, Hayland, Pasture Land
[b]Systems can install in PY93 based on planning, design, or installation limitations.

Source: NCDSWC, 1992.

Figure 2-3. N.C. Agriculture Cost Share Program allocation parameters for FY93.

Alternative plans must also be developed for less-predictable factors as listed below.

1. weather (drought or wetness can negate plans for vegetative practices)
2. crop prices (change in prices can change regional farming practices of landowners)
3. governmental actions
   a. tobacco allotments—increases or decreases cause changes in land use
   b. dairy buy-out program
   c. 1985 Farm Bill
   d. local zoning or land-use restrictions
4. corporate decisions—an increase or decrease in animal production in specific region of state shifts priorities of farmers

Agriculture in North Carolina is a multi-billion dollar industry but it is not static. Farming priorities fluctuate and Districts must be flexible in their responses to pressures put on water quality by these changes.

Districts vary in their methods of prioritization but these usually consist basically of:

1. Identify water quality problem: type (ie, dairy waste) or area (ie, water supply watershed),
2. Identify BMP's needed to solve problem,
3. Establish list of BMPs in order of preference,
4. Advertise sign up period and receive applications from landowners,
5. Prioritize applications based on water quality problem or seek specific known problem farm,
6. Initiate planning, design and installation based on technical assistance and engineering assistance, and
7. Adjust priorities in deference to any of the many possible limiting factors.

Example:

I. District lists priorities as:

   A. Town water supply watershed
   B. BMP Priority:
      1. animal waste management systems,
      2. sediment control structures, and
      3. stripcropping with sod strips.

II. 15 landowners request assistance with swine but engineering assistance is only available to design and install 3 lagoons in 1989.

III. District moves to 2nd priority (sediment structure) to meet annual goal of accelerating water quality protection in water supply watershed. Contractors only available to build 3 of the 9 requested structures so District moves to next priority, stripcropping (3).

IV. Technician assists 7 landowners in planning sod base rotation stripcropping system on 200 acres that will prevent 10,000 tons of sediment from entering the water supply reservoir over the next 10 years.

(NCDSWC, 1990)

The Raleigh office of the NCDSWC independently determines the availability of NCACSP funds to each District for each year. Each District determines their annual funding requirements. Some Districts request fewer funds than have been made available; thus they receive 100 percent of their request. The excess funds (difference between available and requested) are reallocated to those requesting more than was originally determined to be available.

The allocation process involves ranking each county for each parameter and adding the ranks for each parameter to obtain an overall score. As the process currently exists, the percent of the county with poor to fair water quality therefore receives about 9 percent of the overall weight, as does the percent of the county draining to special waters with supplemental classifications reflecting high resource value. These parameters therefore collectively receive much less weight than parameters reflecting agricultural activity and needs and programmatic capabilities. It is recommended that these water quality based parameters, or acceptable alternatives, be given more weight in the allocation process.

An additional recommendation is to consider updating the basis for water quality conditions from the 1985 Assessment Document to NCDEM's 1992 305(b) database. The 305(b) database incorporates more recent monitored and evaluated information for the water quality assessments. The adoption of EPA's Waterbody System would facilitate data sharing between NCDEM and the NCACSP (and other agencies) and integration of waterbody and watershed data and is recommended as well.

2.4 Voluntary Programs Administered by the Agricultural Stabilization and Conservation Service and the Soil Conservation Service

The U.S. Department of Agriculture (USDA) administers several programs initially legislated under the 1985 Food Security Act, but which nevertheless include nonpoint source control components and implications. Financial assistance is provided by the Agricultural Stabilization and Conservation Service (ASCS), and technical assistance is provided by the Soil Conservation Service. These programs are discussed in Appendix B.

Formal methods for geographically prioritizing watersheds to control nonpoint source pollution have not been developed in the North Carolina ASCS or SCS offices. SCS is in the process of delineating watershed boundaries that will be used to create a geographic information system (GIS) data layer in North Carolina. This step is an important one in creating the capability to geographically target watersheds. SCS has also initiated an Eastern North Carolina River Basin Study, which will include prioritization efforts (S. Biggerstaff, SCS, personal communication, 1992).

Information concerning the implementation of USDA programs is currently housed in several databases, with limited design and query capabilities to allow for information sharing (e.g., concerning implementation of management practices and technical assistance). Because these databases are not integrated with the NCACSP database, it is difficult to obtain data on, for example, percentage of agricultural acreage receiving State or Federal cost sharing assistance. One source of information concerning cultivation practices and key provisions of the 1985 Food Security Act is the Conservation Technology Information Center at Purdue University (see Tippett and Dodd, 1993, and Dodd et al., 1993a, for more information).

Data concerning the implementation of the Conservation Reserve Program (CRP; see Appendix B for a description) were obtained from ASCS and are presented in Table 2-4. There has not been a substantial amount of land retired as a result of this program in the APES area. Several counties located primarily in the upper Tar-Pamlico basin, the area with much of the region's most highly erodible soils, have been the most active participants. The Food, Agriculture, Conservation, and Trade Act of 1990 allows for designation of priority areas for CRP and specifically requests that State water quality agencies identify "high priority watersheds within designated 319 areas."

Table 2-4. USDA Conservation Reserve Program Progress Through June 1991

County	Cropland (acres)	CRP (acres)	CRP (%of total)	CRP (% of eligible)
Beaufort	117,413	291	0.25%	0.99%
Bertie	97,559	68	0.07%	0.28%
Camden	42,817	0	0.00%	0.00%
Carteret	17,500	29	0.17%	0.66%
Chowan	39,246	25	0.06%	0.25%
Craven	57,522	69	0.12%	0.48%
Currituck	41,452	0	0.00%	0.00%
Dare	142	1	0.35%	1.41%
Durham	14,847	625	4.21%	16.84%
Edgecombe	132,489	1,327	1.00%	4.01%
Franklin	69,040	7,337	10.63%	42.51%
Gates	42,246	148	0.35%	1.40%
Granville	66,416	3,174	4.78%	19.12%
Greene	78,405	700	0.89%	3.57%
Halifax	131,918	3,805	2.88%	11.54%
Hertford	55,039	174	0.32%	1.26%
Hyde	86,034	1,088	1.26%	5.06%
Johnston	163,727	5,778	3.53%	14.12%
Jones	46,997	132	0.28%	1.12%
Lenoir	102,133	790	0.77%	3.09%
Martin	91,137	678	0.74%	2.98%
Nash	116,831	2,359	2.02%	8.08%
Northampton	102,712	373	0.36%	1.45%
Orange	47,225	321	0.68%	2.72%
Pamlico	32,445	0	0.00%	0.00%
Pasquotank	64,303	23	0.04%	0.14%
Perquimans	70,885	0	0.00%	0.00%
Person	54,096	808	1.49%	5.97%
Pitt	165,720	120	0.07%	0.29%
Tyrrell	55,064	95	0.17%	0.69%
Vance	31,768	2,756	8.68%	34.70%
Wake	86,922	547	0.63%	2.52%
Warren	41,673	5,879	14.11%	56.43%
Washington	103,201	159	0.15%	0.62%
Wayne	144,780	314	0.22%	0.87%
Wilson	98,084	857	0.87%	3.49%
Total	2,709,788	40,850	1.51%	6.03%

Source: ASCS, Raleigh, NC.

2.5 Nutrient Budget Calculations by Hydrologic Unit

Table 2-5 presents total nonpoint source (excluding atmospheric inputs) annual average nitrogen and phosphorus loading for North Carolina subbasins. Because the same export coefficients were used for land use/land cover categories for different locations in the study area, these estimates strictly reflect watershed size and LANDSAT land use/land cover data distribution in different watersheds. Other factors potentially impacting the relative inputs from different subbasins (transport of nutrients to the estuary, relative degree of implementation of BMPs, differences in soil characteristics, etc.) therefore are not reflected. Details of the analysis as well as basin summaries of nonpoint source loading per unit area are presented in Dodd et al. (1992). Subbasin nonpoint source loading by land use and land use data are available in a PC database (Tippett and Dodd, 1993).

2.6 Other Targeting Considerations

2.6.1 Animal Waste and Fertilizer Management

Zublena and Barker (1991) completed a project that may be useful for targeting counties with critical nutrient management needs. The objectives of the project were to: (1) determine the amount of nutrients that could be recovered from manure and made available to agronomic crops and the amount of commercial fertilizer purchased; (2) determine the amount of nutrients required by crops; (3) calculate the ability of manure and commercial fertilizer to satisfy (or exceed) crop requirements.

Results of the analysis are provided in Tables 2-6 and 2-7. One interpretation of the analysis is that the ranking of counties may reflect the relative potential for nutrients to leach or run off into surface or groundwaters or at least reflect the needs of counties to implement nutrient management programs.

The N.C. Department of Agriculture's (NCDA's) Division of Veterinary Medicine maintains an electronic database of information on each hog-producing operation in the State. The database includes owner's name, location, type of operation, and capacity (in number of animals). RTI requested information on number, location, and size of operations (without owner names) by subbasin. NCDA has not provided this information pending a confidentiality determination.

Table 2-5. Annual Average Nutrient Loading from Nonpoint Sources Ranked By Subbasin

Hydrologic Unit	Major Drainage	Minor Drainage	N Loading (kg/yr)	P Loading (kg/yr)	Loading Rank*	N Loading (kg/ha/yr)	P Loading (kg/ha/yr)	Loading Rank*
3-02-01-04-02	PAMLICO RIVER ESTUARY	UNNAMED	1,284,608	117,907	1	4.21	0.39	43
3-02-02-03-02	NEUSE RIVER	CONTENTNEA CREEK	872,268	82,995	2	6.74	0.64	8
3-01-02-05-04	ALBEMARLE SOUND	UNNAMED	643,505	61,383	4	4.60	0.44	37
3-02-02-01-05	NEUSE RIVER	UNNAMED	643,436	67,037	4	5.68	0.59	20
3-01-01-07-01	ROANOKE RIVER	UNNAMED	596,502	53,732	6	5.29	0.48	31
3-02-01-01-01	TAR-PAMLICO RIVER	UNNAMED	596,091	57,575	6	5.31	0.51	28
3-01-01-07-02	ROANOKE RIVER	UNNAMED	567,186	50,095	8	4.03	0.36	46
3-02-01-02-03	TAR-PAMLICO RIVER	FISHING CREEK	559,222	51,557	8	5.90	0.54	20
3-02-01-03-03	TAR-PAMLICO RIVER	UNNAMED	553,163	52,172	8	6.48	0.61	13
3-02-02-01-09	NEUSE RIVER	UNNAMED	493,880	48,823	10	6.87	0.68	4
3-02-02-03-04	NEUSE RIVER	LITTLE CONTENTNEA CREEK	454,439	42,945	12	6.48	0.61	12
3-01-02-05-05	ALBEMARLE SOUND	SCUPPERNONG RIVER	452,490	42,107	13	3.79	0.35	48
3-01-02-03-02	CHOWAN RIVER	UNNAMED	471,838	41,212	14	4.13	0.36	45
3-01-02-05-03	ALBEMARLE SOUND	ALLIGATOR RIVER	486,158	38,482	14	1.88	0.15	57
3-02-01-03-04	TAR-PAMLICO RIVER	UNNAMED	448,591	41,979	14	5.85	0.55	20
3-01-02-05-02	ALBEMARLE SOUND	PASQUOTANK RIVER	443,910	41,926	15	4.54	0.43	39
3-02-02-02-01	NEUSE RIVER	UNNAMED	421,972	40,103	17	6.63	0.63	9
3-02-02-02-04	NEUSE RIVER	SWIFT CREEK	421,239	37,302	18	4.89	0.43	36
3-02-01-05-03	PAMLICO SOUND	UNNAMED	395,962	35,453	20	1.25	0.11	60
3-02-02-01-11	NEUSE RIVER	LITTLE RIVER	378,976	36,446	21	6.31	0.61	14
3-02-01-02-02	TAR-PAMLICO RIVER	FISHING CREEK	391,344	33,467	21	4.30	0.37	43
3-02-01-03-05	TAR-PAMLICO RIVER	UNNAMED	376,978	35,334	22	5.97	0.56	19
3-02-02-04-03	NEUSE RIVER ESTUARY	UNNAMED	388,432	31,884	22	5.41	0.44	31
3-02-01-01-06	TAR-PAMLICO RIVER	UNNAMED	324,855	30,259	24	6.11	0.57	15
3-02-01-01-02	TAR-PAMLICO RIVER	UNNAMED	321,001	29,989	26	5.36	0.50	29
3-01-01-07-03	ROANOKE RIVER	CASHIE RIVER	323,218	27,284	27	4.06	0.34	47
3-01-02-05-06	CURRITUCK SOUND	UNNAMED	318,479	29,237	27	2.82	0.26	52
3-01-02-04-02	CHOWAN RIVER	POTECASI CREEK	316,312	28,627	28	5.44	0.49	28
3-02-02-02-03	NEUSE RIVER	UNNAMED	282,774	25,992	30	5.62	0.52	25
3-02-02-02-05	NEUSE RIVER	UNNAMED	280,810	25,042	31	4.69	0.42	38
3-02-02-04-02	NEUSE RIVER	TRENT RIVER	288,263	24,930	31	4.02	0.35	48
3-02-02-01-06	NEUSE RIVER	SWIFT CREEK	244,110	24,946	32	6.07	0.62	14
3-02-02-01-13	NEUSE RIVER	UNNAMED	236,805	22,166	33	4.99	0.47	33

Table 2-5. (con)

Hydrologic Unit	Major Drainage	Minor Drainage	N Loading (kg/yr)	P Loading (kg/yr)	Loading Rank*	N Loading (kg/ha/yr)	P Loading (kg/ha/yr)	Loading Rank*
3-02-02-03-01	NEUSE RIVER	CONTENTNEA CREEK	231,913	21,253	34	5.68	0.52	24
3-01-02-04-01	CHOWAN RIVER	MEHERRIN RIVER	226,527	20,695	36	5.48	0.50	27
3-02-01-01-03	TAR-PAMLICO RIVER	SWIFT CREEK	225,865	20,963	36	5.28	0.49	31
3-02-01-01-05	TAR-PAMLICO RIVER	UNNAMED	219,324	20,157	37	5.76	0.53	23
3-02-02-01-10	NEUSE RIVER	UNNAMED	199,954	18,359	39	5.80	0.53	22
3-02-01-06-02	WHITE OAK RIVER	UNNAMED	202,950	15,940	39	2.48	0.19	54
3-02-01-01-04	TAR-PAMLICO RIVER	UNNAMED	188,528	17,561	40	6.03	0.56	18
3-01-02-03-03	CHOWAN RIVER	UNNAMED	154,042	14,627	42	4.82	0.46	35
3-02-02-01-12	NEUSE RIVER	UNNAMED	151,934	14,497	43	6.91	0.66	6
3-02-01-02-01	TAR-PAMLICO RIVER	LITTLE FISHING CREEK	163,589	12,770	44	3.55	0.28	51
3-02-02-04-01	NEUSE RIVER	TRENT RIVER	155,300	13,648	44	3.61	0.32	50
3-02-02-01-07	NEUSE RIVER	MIDDLE CREEK	141,114	14,459	45	6.53	0.67	8
3-02-02-03-03	NEUSE RIVER	NAHUNTA SWAMP	145,165	13,920	45	7.03	0.67	4
3-02-01-03-02	TAR-PAMLICO RIVER	CONETOE CREEK	112,156	10,430	48	6.09	0.57	16
3-02-02-02-02	NEUSE RIVER	UNNAMED	112,129	10,851	48	7.37	0.71	1
3-01-02-03-04	CHOWAN RIVER	UNNAMED	110,549	10,150	49	4.48	0.41	41
3-02-01-06-03	CORE SOUND	UNNAMED	106,954	9,667	51	2.42	0.22	54
3-02-01-06-05	BOGUE SOUND	UNNAMED	110,089	9,105	51	2.18	0.18	56
3-02-01-05-04	PAMLICO SOUND	UNNAMED	104,017	9,605	52	1.45	0.13	59
3-01-02-05-01	ALBEMARLE SOUND	UNNAMED	89,804	8,548	53	3.92	0.37	46
3-02-02-01-08	NEUSE RIVER	MIDDLE CREEK	84,198	8,378	54	6.77	0.67	6
3-01-02-03-01	CHOWAN RIVER	AHOSKIE CREEK	78,225	6,899	55	4.97	0.44	35
3-02-01-03-01	TAR-PAMLICO RIVER	UNNAMED	43,600	4,190	56	7.11	0.68	2
3-01-02-05-07	ALBEMARLE SOUND	ROANOKE SOUND	42,088	4,027	58	1.47	0.14	58
3-02-01-06-06	WHITE OAK RIVER	UNNAMED	42,525	3,591	58	2.41	0.20	55
3-02-01-05-02	PAMLICO SOUND	UNNAMED	30,090	2,800	60	0.23	0.02	64
3-02-01-06-01	CORE SOUND	UNNAMED	30,648	2,585	60	0.35	0.03	63
3-02-01-04-01	TAR-PAMLICO RIVER	VAN SWAMP	21,152	2,026	61	6.50	0.62	10
3-02-01-05-01	PAMLICO SOUND	UNNAMED	18,894	1,127	62	1.17	0.07	61
3-01-01-06-01	ROANOKE RIVER	UNNAMED	11,094	996	63	4.50	0.40	41
3-02-01-06-04	CORE SOUND	UNNAMED	7,721	731	64	0.58	0.05	62
* = (N Loading Rank + P Loading Rank)/2								

Source: Dodd et al., 1992.

Table 2-6. Amount of Phosphorus Required by Crops Supplied by Manure and Fertilizer by County (tons/year)

	P required by crops	Manure P applied	Fertilizer P applied	Total P applied	Crop P required - P applied	% Crop P required met by fertilizer and manure
Beaufort	2048	288	843	1131	917	55
Lenoir	1312	841	104	945	367	72
Wayne	1697	1714	252	1966	-269	116
Nash	1029	729	54	783	246	76
Washington	1038	470	621	1091	-53	105
Craven	739	225	322	547	192	74
Martin	1032	192	121	313	719	30
Carteret	378	47	102	149	229	39
Pasquotank	895	51	130	181	714	20
Edgecombe	1403	321	123	444	959	32
Wilson	1180	220	239	459	721	39
Johnston	1614	499	111	610	1004	38
Wake	892	185	929	1114	-222	125
Currituck	409	99	19	118	291	29
Pitt	1897	711	272	983	914	52
Pamlico	423	48	169	217	206	51
Dare	24	23	0	23	1	96
Onslow	508	309	53	362	146	71
Greene	1090	747	11	758	332	70
Durham	243	37	12	49	194	20
Vance	338	47	18	65	273	19
Chowan	431	116	161	277	154	64
Camden	552	37	7	44	508	8
Hertford	504	144	122	266	238	53
Perquimans	741	174	357	531	210	72
Gates	524	155	74	229	295	44
Tyrrell	840	169	326	495	345	59
Jones	594	62	129	191	403	32
Northampton	937	315	78	393	544	42
Warren	528	202	14	216	312	41
Hyde	1231	85	725	810	421	66
Person	804	139	51	190	614	24
Halifax	1468	477	453	930	538	63
Orange	652	286	6	292	360	45
Franklin	969	368	49	417	552	43
Bertie	1089	387	79	466	623	43
Granville	1015	212	6	218	797	21

Source: Zublena and Barker, 1991.

Table 2-7. Amount of Nitrogen Required by Crops Supplied by Manure and Fertilizer by County (tons/year)

	N required by crops	Manure N applied	Fertilizer N applied	Total N applied	Crop N required - N applied	% Crop N required met by fertilizer and manure
Beaufort	5004	192	6777	6969	-1965	139
Lenoir	3205	514	4641	5155	-1950	161
Wayne	4063	1159	4810	5969	-1906	147
Nash	2235	473	2880	3353	-1118	150
Washington	2624	326	3378	3704	-1080	141
Craven	1821	152	2321	2473	-652	136
Martin	2537	138	3030	3168	-631	125
Carteret	975	35	1549	1584	-609	162
Pasquotank	2149	36	2680	2716	-567	126
Edgecombe	3226	226	3531	3757	-531	116
Wilson	2642	147	3000	3147	-505	119
Johnston	3685	341	3631	3972	-287	108
Wake	1664	149	1615	1764	-100	106
Currituck	1031	68	1063	1131	-100	110
Pitt	4363	460	3941	4401	-38	101
Pamlico	1015	35	1005	1040	-25	102
Dare	65	18	9	27	38	42
Onslow	1280	198	1000	1198	82	94
Greene	2649	490	1946	2436	213	92
Durham	605	29	319	348	257	58
Vance	722	37	385	422	300	58
Chowan	985	81	591	672	313	68
Camden	1380	26	1017	1043	337	76
Hertford	1256	110	771	881	375	70
Perquimans	1863	126	1344	1470	393	79
Gates	1359	111	641	752	607	55
Tyrrell	2132	111	1381	1492	640	70
Jones	1497	42	813	855	642	57
Northampton	2128	230	1176	1406	722	66
Warren	1339	153	343	496	843	37
Hyde	3225	59	2303	2362	863	73
Person	1990	107	958	1065	925	54
Halifax	3375	344	2009	2353	1022	70
Orange	1762	251	450	701	1061	40
Franklin	2365	268	941	1209	1156	51
Bertie	2870	288	1194	1482	1388	52
Granville	2574	172	336	508	2066	20

Source: Zublena and Barker, 1991.

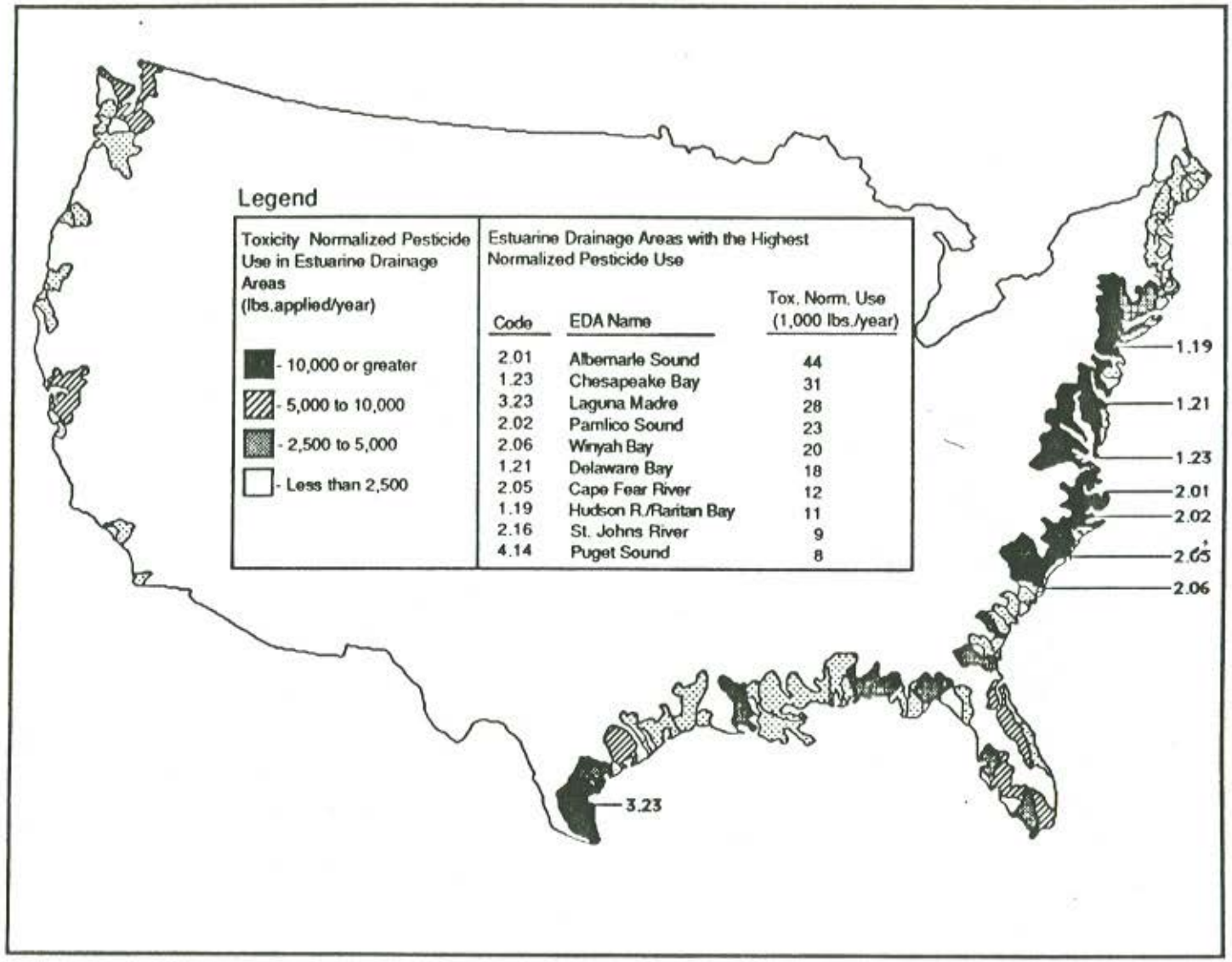
A project has been started, with funding from several environmental organizations, to locate and map swine operations. Data from this project were made available (D. Van Dyken, personal communication, August 1992) for Wilson, Greene, and Northampton counties. In Greene County, 110 swine operations were identified; in Wilson County, 15 operations were identified; and in Northampton County, 6 operations were identified.

The current coverage of this project prohibits areawide or basinwide analysis; nevertheless, an important areawide concern that operations can be clustered is raised. In adjacent counties (Wilson and Greene), a considerable disparity in the number of operations is evident. Depending on how animal waste is handled and distributed within and across counties, it is likely that this disparity suggests differing attention to nutrient and animal waste management needs to be given to these two counties and their watersheds. It is interesting to note that much of Greene County includes the Contentnea Creek watershed, which was identified in the Neuse River Basin Management plan (NCDEM, 1993) as a tributary of special concern.

2.6.2 Identification of Pesticide Hotspots

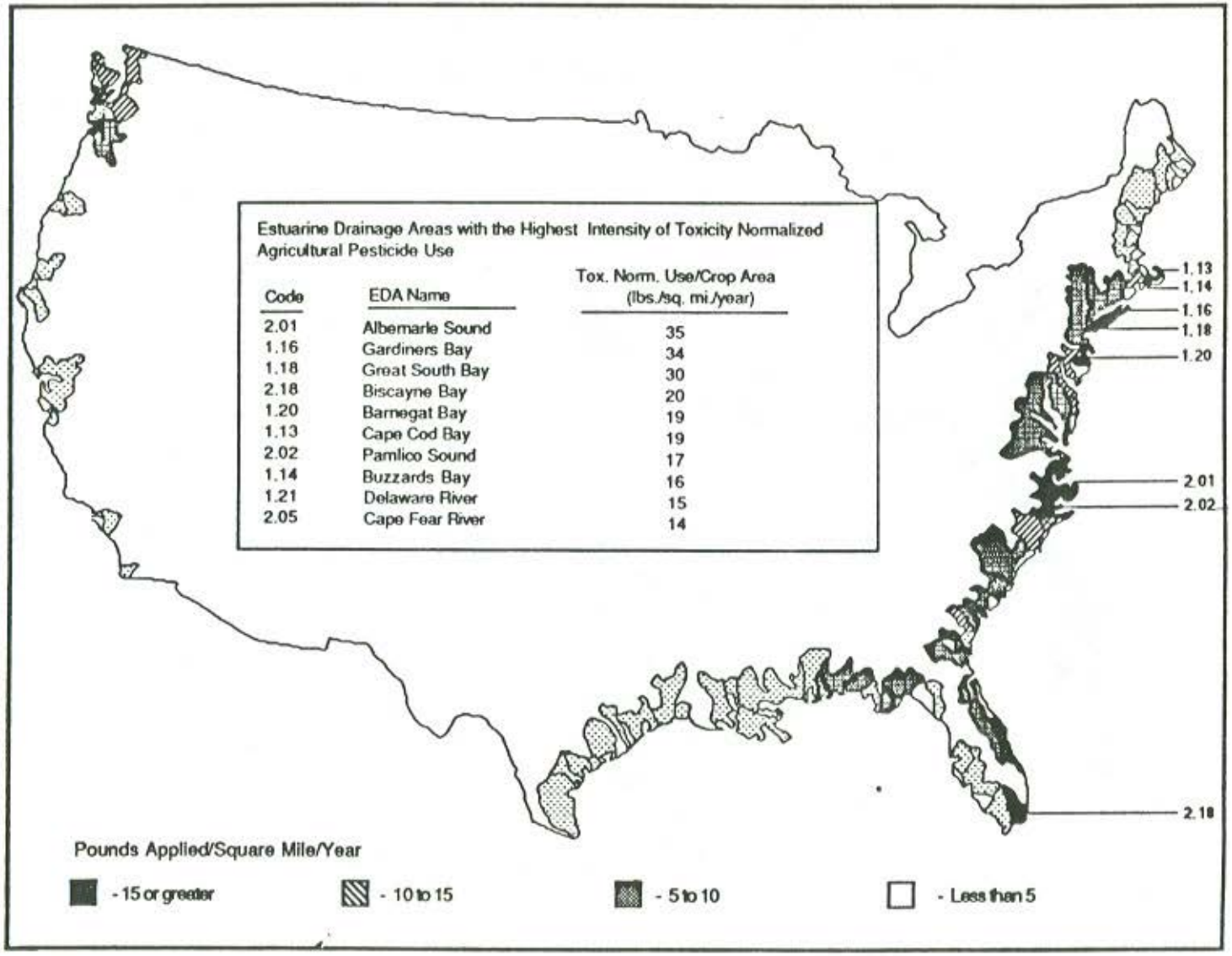
Although the focus of this report is on nutrient issues, results of studies conducted by the National Oceanic and Atmospheric Administration (NOAA) indicate the need to consider targeting for pesticides as well. Of 78 estuarine drainage areas in the United States, Pait et al. (1989) identified the Albemarle and Pamlico drainage areas as third and fourth highest in pesticide use (pounds/year) (Figures 2-4 and 2-5).

NOAA completed a screening study to identify "whole counties or portions of counties . . . containing potentially toxic levels of agricultural pesticide residues" for the Pamlico Sound drainage (Farrow et al., 1989). Examples of the results of the analysis are presented in Figure 2-6. A toxicity normalizing coefficient was calculated because different pesticides have varying degrees of toxicity. The insecticide phorate is the most toxic of the 28 pesticides in NOAA's database for the sheepshead minnow, an anadramous fish used extensively as a test organism for toxicity testing, and was therefore used as a basis for calculating a toxic unit loading. This value was divided by the area of cropland to determine a measure of the intensity of the toxicity potential of the pesticides applied.



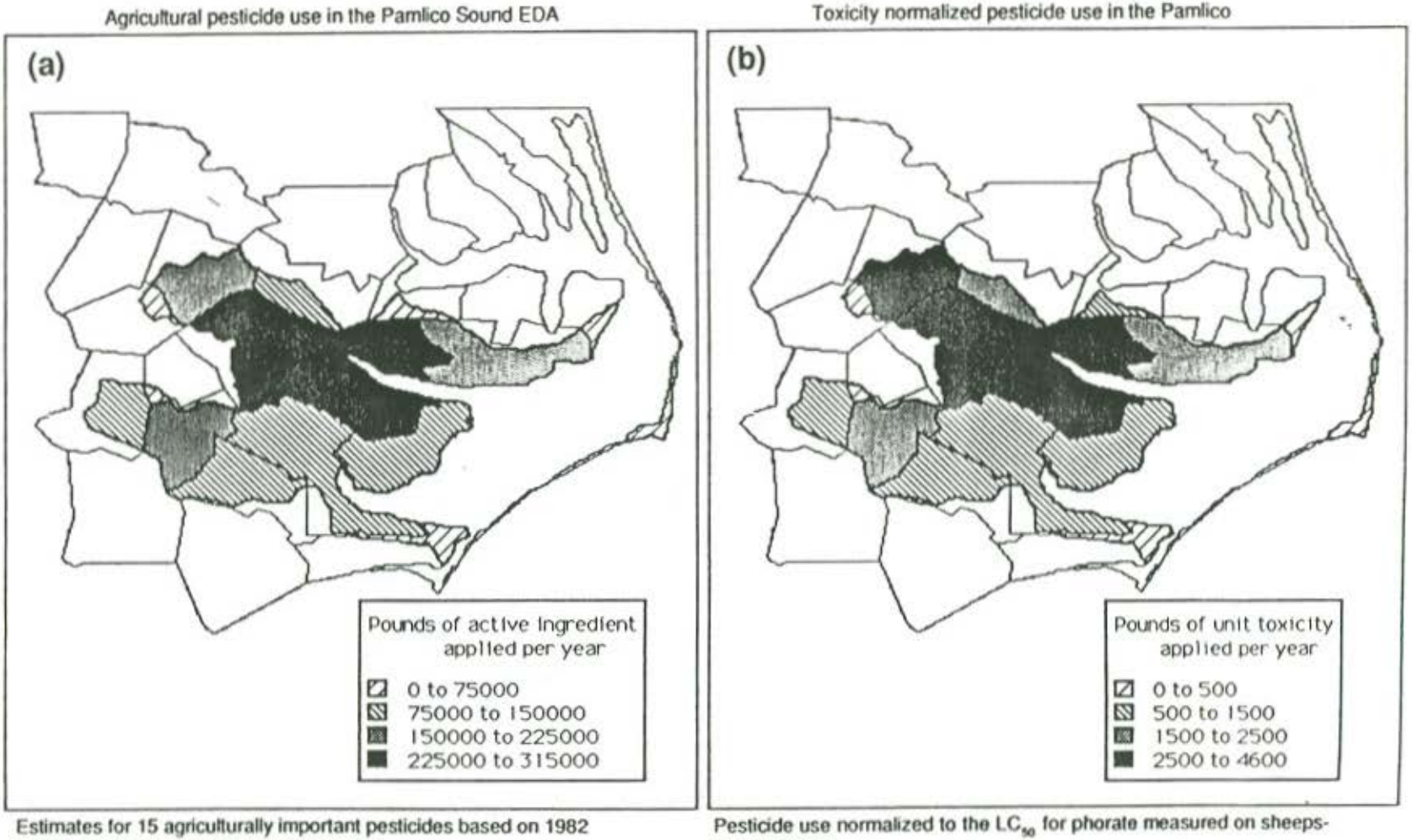
Source: Pait et al., 1989.

Figure 2-4. Toxicity normalized use of selected agricultural pesticides in estuarine drainage areas, circa 1982.



Source: Pait et al., 1989.

Figure 2-5. Intensity of toxicity normalized use for 28 pesticides in estuarine drainage areas, circa 1982.



Estimates for 15 agriculturally important pesticides based on 1982 Census of Agriculture land use estimates.

Pesticide use normalized to the LC_{50} for phorate measured on sheepshead minnow

Source: Farrow et al., 1989.

Figure 2-6. Distribution of pesticides use and toxicity potential in the Pamlico Sound drainage.

Pesticide toxicity potential for the Pamlico Sound EDA.

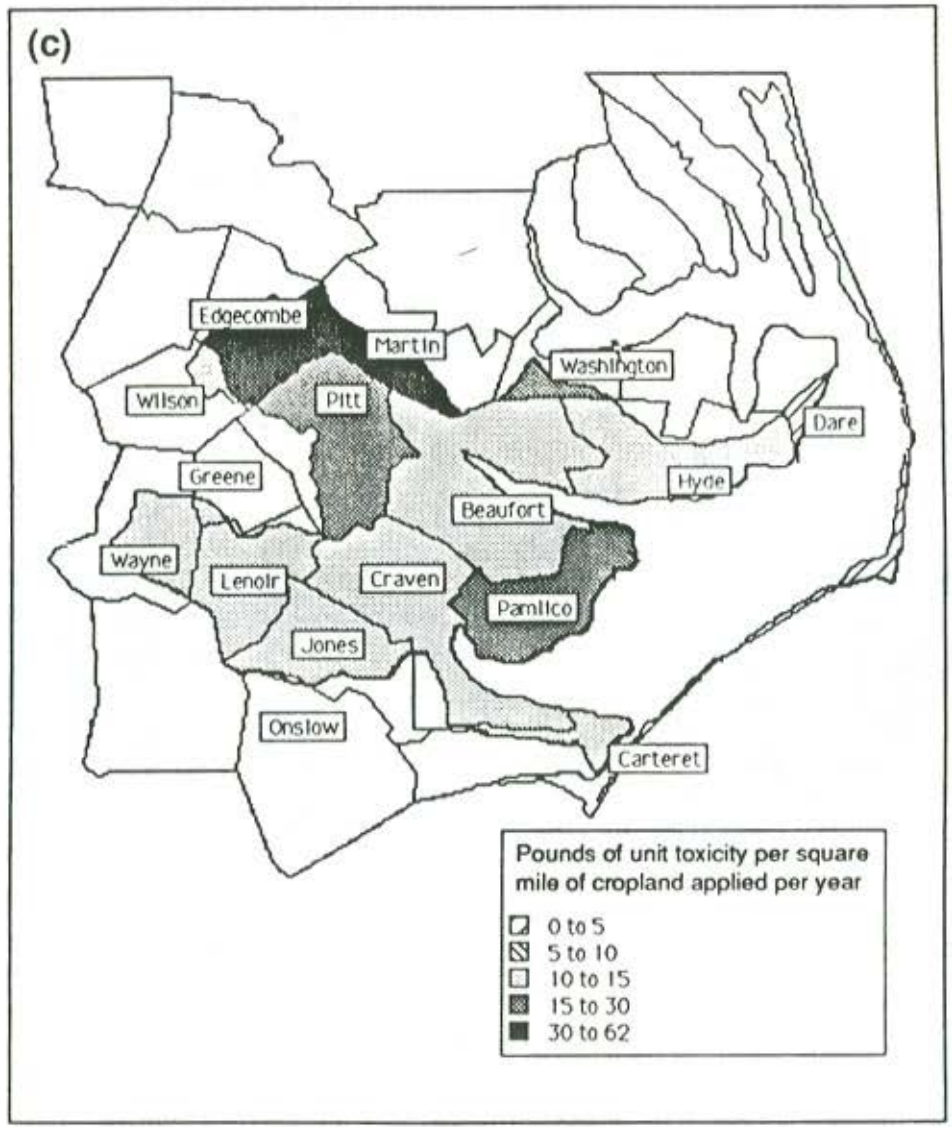


Figure 2-6. (continued)

2.6.3 Groundwater Considerations

Groundwater considerations are important both because of the close link between surface and groundwater in the A/P region and because of the predominant use of groundwater as a drinking water source. Liddle (1993) provides an overview of groundwater/surface water interactions and groundwater quality in the region. Several observations from this report bear mention when considering geographic targeting of nonpoint source programs. On a regional level, groundwater and, more specifically, the surficial (shallow) aquifer appear to be responsible for a large portion of streamflow; the surficial aquifer is hydraulically connected to both surface waters and, in places where confining units are thin or absent, underlying aquifers. This suggests that groundwater management has a regional dimension. A study by Showers et al. (1990) in the Neuse River basin suggests this as well because tracing of nitrates associated with the large drainage of the mainstem of the Neuse demonstrated that nitrates in storm discharge were largely derived from groundwater sources, mostly associated with agriculture.

Also of concern are more local issues related to field level nutrient management and local nutrient sources, such as animal waste sites and septic tanks. One important concern is the increasing use of conservation tillage practices, which may increase the potential for groundwater contamination because of higher infiltration rates. Heatwole et al. (1991) note that conservation tillage effectiveness depends on complementary implementation of nutrient management practices.

2.6.4 Riparian[1] Area Considerations

A critical factor in the impact that a land-disturbing activity has on water quality is the proximity of the activity to the water body. All other factors being equal, a disturbance can be assumed to influence surface waters more severely if it occurs closer to a water body rather than farther away. Other factors, such as type of vegetative cover, soil type, erodibility, slope, and type of disturbance obviously influence the degree of impact as well. Recent research has focused on the role of riparian areas in maintaining water quality and, in particular, on the need to recognize and protect ecological functions of riparian systems.

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[1]Riparian refers to the land area immediately adjacent to a watercourse. Riparian ecosystems in their natural state are typically dominated by wetlands characteristics.

Kovacic et al. (1990) documented nitrogen and phosphorus movement from cropland through riparian forested and grassed systems in surface flow, seepage, and tile drainage. Dramatic nitrogen removal was documented. The authors concluded that riparian systems in an intermediate location in a landscape relative to croplands and streams "must be recognized by resource managers and planners and become part of watershed scale management efforts to improve water quality." Kuenzler (1991) concluded that riparian swamp systems can remove close to 100 percent of nitrogen loading from uplands.

Streamside ecosystems provide habitat in addition to mitigating or controlling nonpoint source pollution. In addition to being extremely effective in removing nutrients and sediment from surface runoff and shallow groundwater, these systems can provide the necessary canopy to produce optimal light and temperature conditions and the carbon processing needed to maintain high biological productivity. These systems function as filters of sediment and associated pollutants, transformers of pollutants, e.g., from inorganic to organic forms, sinks (e.g., long-term storers), and sources of energy in the form of carbon.

Dodd et al. (1993b) present results of an analysis of land use/cover in riparian corridors and provide recommendations for how nonpoint source programs can more effectively incorporate riparian corridor protection and restoration elements into nonpoint source pollution control plans. The GIS approach discussed in this report could provide input into efforts both to target watersheds for management actions and to target areas within a watershed.

SECTION 3

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APPENDIX A

Summary of the North Carolina Agriculture Cost Share Program

Source: Albemarle-Pamlico Estuarine Study. 1992. *The First Public Draft of the Comprehensive Conservation Management Plan of the Albemarle-Pamlico Estuarine Study*. NC Department of Environmental Health, and Natural Resources, Raleigh, NC.

Division of Soil and Water Conservation
Agricultural Cost Share Program

Program Objectives

The Agricultural Cost Share Program for Nonpoint Source Pollution Control, was officially initiated in 1984, under Gubernatorial mandate, to accelerate the implementation of water quality protection best management practices (BMPs) on agricultural operations "to reduce the input of agricultural nonpoint source pollution into the waters of the State." The Program focuses its efforts on the control of nutrients, sediments, pesticides, and, adjacent to Primary Nursery Areas, freshwater.

Program Description

The Agricultural Cost Share Program for Nonpoint Source Pollution Control is a decentralized, voluntary program which reimburses farmers up to 75% of the cost of installing any of the 28 accepted Best Management Practices (BMP costs are standardized annually), up to $15,000. Farmers apply in the summertime for technical assistance and BMP cost-share money through the 100 local five-member Soil and Water Conservation District Board offices. The local boards then determine, based on budget and pollution control priorities, which applications should be funded. 100% of the appropriated implementation funds (currently, roughly $8 million annually) go to implementation of BMPs.

The Soil and Water Conservation Districts receive state appropriations for the implementation of the program directly from the Soil and Water Conservation Commission. The Division of Soil and Water Conservation staff members serve as technical support by: reviewing and approving management plans (roughly 5,000 per year), supplying field staff, offering educational outreach, and training technicians. General farm management and conservation efforts are shared with Agricultural Extension agents and with Soil Conservation Service (SCS) district representatives.

Once proposed management projects have been approved by the Board, individual plans are developed with Division of Soil and Water Conservation, Soil and Water Conservation District, or SCS staff assistance, and contracts between the landowner and the Soil and Water Conservation District are signed. Each contract stipulates the requirements of a 10-year implementation agreement and describes the details of the cost-sharing. All plan details are entered into a computerized (Paradox) database maintained by the Division of Soil and Water Conservation in Raleigh.

Cost-share money is paid to each farmer as each planned control measure is certified as complete and meeting all technical specifications by the job coordinator.

Five percent of the funded projects may be spot-checked annually by SCS staff and 5% are spot-checked annually by Soil and Water Conservation District staff. All waste management systems are reviewed annually for the first five years of operation.

If a violation of a contract agreement is discovered, through voluntary disclosure or site inspection, and recalcitrance regarding remediation is encountered, the return of all cost-share monies can be demanded.

Participation rates are high and the demands for additional technical and BMP assistance continue to exceed program availability. From 1984 through 1991, almost $34 million of BMP assistance funds in the North Carolina portion of A/P region were requested by Soil and Water Conservation Districts, but less than $16 million has been available through the Agricultural Cost Share Program. To date, roughly 35% of all land in need of treatment has been covered by the Agricultural Cost Share Program for Water Quality Control.

Staffing and Funding

The 94 Soil and Water Conservation District Boards are made up of 495 elected (2/3) and appointed (1/3) citizens who donate their time to administer the many programs under District operations. The Division of Soil Water Conservation, Nonpoint Source Section supports a staff of 6 people and two additional "project monitors" are provided through local and federal funds. Three more regional coordinators should be hired so that all regions of the state will be adequately covered. Three more staff should be hired for the Raleigh office: (1) one mid-level staff with technical expertise to assist with plan creation, field support, monitoring, and general education, (2) one grants coordinator, and (3) one clerical staff to increase the efficiency of operations.

The Soil and Water Conservation Commission provides $1.3 million to the Districts to support some staff and over 100 technical assistants. Local governments provide $5.4 million for additional administrative and technical support. The funds for technical assistance and BMP cost share should be increased by 25% and 50% respectively to further accelerate the efforts of Districts in the A/P region. The increasingly intense agricultural production (confined animal production and truck crops) calls for immediate action to retrofit old operations and or design new BMPs that will protect water quality.

Opportunities for Public Involvement

Public involvement is an important component of District activities in all their programs, including the Agricultural Cost Share Program for Nonpoint Source Pollution Control. The Districts usually hold monthly, open meetings, often with media coverage. Most District field offices also have programs in which they produce articles for local field days for schools; teacher re-certification workshops; speech, essay, and poster contests for local, state, and national competitions; and many other public information activities. The Districts and the USDA Soil Conservation Service in many counties utilize local volunteers for a vast array of activities from general office work to public information activities. The Division of Soil and Water Conservation provides regional coordinators to, in part, provide assistance to Districts in establishing and maintaining public involvement and education programs.

APPENDIX B

Summary of U.S. Department of Agriculture Programs

Source: Albemarle-Pamlico Estuarine Study. 1992. *The First Public Draft of the Comprehensive Conservation Management Plan of the Albemarle-Pamlico Estuarine Study*. NC Department of Environmental Health, and Natural Resources, Raleigh, NC.

UNITED STATES DEPARTMENT OF AGRICULTURE

Agricultural Stabilization and Conservation Service
North Carolina State Office

Program Objective

The Agricultural Stabilization and Conservation Service (ASCS) was developed to promote the wise use of agricultural land and water resources in partnership with farmers and ranchers. ASCS works in cooperation with other federal and state agencies and organizations to implement its conservation programs. ASCS programs are voluntary and are administered at the local ASCS offices. A locally-elected Agriculture and Stabilization Conservation Committee works with the community to assess conservation problems and determine which measures should be offered to landowners within their jurisdiction to solve these problems. The Agricultural Conservation Program (ACP) is the principal conservation and environmental protection program. Other program which emphasize specific conservation aspects include the Conservation Reserve Program, the Forestry Incentives Program, and the Wetlands Reserve Program. In addition, the Conservation Compliance, Swampbuster, and Sodbuster programs of the 1985 Farm Bill are administered by ASCS.

Program Description

The Agricultural Conservation Program (ACP) was established by the Soil Conservation and Domestic Allotment Act of 1936. ACP is the principal ASCS conservation program and is designed to solve soil, water, and related resource problems through cost-sharing. Technical and financial assistance is available from ACP for farmers to install a variety of soil-saving practices including vegetative cover, composting, sod waterways, and other measures to control erosion. These practices also help reduce the amount of sediment, chemicals, and animal waste in streams and lakes. Cost-share to the farmer for implementing these practices ranges from 25% to 75% of the cost of the practice. Practice costs are established by ASCS based on the average cost of implementation in the region. Local ASC committees determine which practices are acceptable within their jurisdiction.

The most popular practice utilized by farmers in the ACP is cover crop which probably offers the least water quality and soil erosion protection. ASCS personnel are working to reeducate both field personnel and farmers to employ practices which offer greater protection.

The Conservation Reserve Program (CRP) was authorized by the Food Security Act of 1985 to retire 45 million acres of highly erodible cropland from production by 1995. A farmer who stops growing crops on land designated by soil conservationists to be highly erodible and plants trees or grass receives an annual rental payment for the converted acreage for the term of the 10-year contract. In addition, cost share funds up to 50% are available from ASCS to the farmer to employ practices including vegetative cover, windbreaks, and vegetative filter strips. A landowner is eligible for the CRP if the landowner has cropped the land to be retired for at least two years between 1981 and 1985, acquired the land before January 1, 1985 or owned the land for at least three years before entering it in the program. Land which is considered highly erodible and meets these cropping requirements is eligible for the CRP. By March 15, 1991, 6,059 farms totalling 140,144 acres were accepted into the CRP in North Carolina.

CRP bids are accepted by ASCS during sign ups scheduled once or twice each year from landowners and are weighted by ASCS personnel to decide which land will be accepted into the program. Heavier weights were applied to highly erodible soils for the first several sign ups, however, the more recent signups have apparently changed emphasis. Those bids including land which is highly productive may have been given higher weight than highly erodible land. To better promote environmental protection through the CRP, preference must be given to poor soil lands, not highly productive lands.

The CRP will likely meet the original goal of retiring 45 million acres of highly erodible cropland from production. However, this program is scheduled for termination in 1995 unless the 1995 Farm Bill extends the goal of the existing program or establishes a new program. Such an extension would be desirable from an environmental protection and conservation perspective if emphasis was returned to retiring highly erodible land as opposed to highly productive land.

The Forestry Incentives Program (FIP) was authorized by Congress in 1973 to encourage private nonindustrial landowners to develop and properly manage their woodlands for timber production. Federal and state agencies share the costs of tree planting and timber stand improvement with private forest landowners. Funds are offered to eligible landowners for planting, site preparation, and planning. A landowner is eligible for cost-share assistance under FIP if the landowner (1) owns no more than 1,000 acres (exceptions may be granted up to 5,000 acres), (2) is a private forest landowner, (3) has land suitable for forestation, reforestation, or improved forest management, and (4) has productive timber lands of at least 10 acres. ASCS develops state FIP plans and conducts annual reviews of the program. The North Carolina Division of Forest Resources offers technical assistance for the program. The maximum cost share payment that a person can earn annually for forestry practices under FIP is 10,000 dollars.

The Wetlands Reserve Program (WRP) was established with the federal Food, Agriculture, Conservation, and Trade Act of 1990 to restore 1 million acres nationally of former wetlands by 1995. The federal government will compensate owners of the previously converted cropland, rangeland, and pastureland who voluntarily transfer their property rights as permanent conservation easements to the reserve. The conditions of the conservation easements should prohibit the landowner from further development or alteration of the land. Much of the cost of improvements to these lands to enhance their wetland functions will be paid by the federal government. Fifty thousand acres will be accepted into the program by the end of 1992 in 9 pilot states chosen to participate in the program. North Carolina is one of the nine.

The Conservation Compliance, Swampbuster, and Sodbuster provisions of the Food Security Act of 1985 are administered by the ASCS. Technical services and field inspections are conducted primarily by the USDA Soil Conservation Service (see USDA/SCS program description for further information). ASCS makes final decisions on whether to withdraw USDA benefits from noncompliant farmers based on recommendations from SCS.

Staffing and Funding

ASCS employs approximately 2 staff members in each field office and a small administrative staff in the Raleigh headquarters. Generally, there is a field office in each county of the state. North Carolina received, through Congressional appropriations just under 5 million dollars for the ACP in FY 1991-1992 and 627,000 dollars for the FIP.

Generally, ASCS field staff receive training when a new program is implemented. These field staff members are the primary contact for farmers and foresters and therefore offer the best

opportunity for education of landowners on conservation practices. It may be beneficial to thoroughly and regularly educate field staff on the importance and degree of environmental protection offered by various practices. In turn, these well-trained staff members can educate landowners and promote the use of practices not only beneficial to production but also most beneficial to environmental protection.

Opportunities for Public Involvement

ASCS programs are administered at the local ASCS offices. A locally-elected Agriculture and Stabilization Conservation Committee works with the community to assess conservation problems and determine which measures should be offered to landowners within their jurisdiction to solve these problems. Cost-share levels and allowable practices in an area are determined by these local committees.

Soil Conservation Service

Program Objective

The mission of the Soil Conservation Service (SCS) is to provide national leadership in the conservation and wise use of soil, water, and related resources through a balanced cooperative program that protects, restores, and improves those resources. SCS was developed with the Soil Conservation Act of 1935. Within the SCS are several programs with importance in the Albemarle-Pamlico region including Conservation Operations, Resource Conservation and Development Program, Small Watersheds Program, River Basin Investigations and Surveys, Emergency Watershed Protection, and the Soil Survey Program.

Program Description

Conservation Operations Technical Assistance (CTA) (P.L.14-46) activities incorporate the implementation of the 1985 Food Security Act and the Food, Agriculture, Conservation and Trade Act of 1990, including the Conservation Compliance, Sodbuster and Swampbuster provisions. The Conservation Compliance component requires any farmer with highly erodible soils in crop production prior to passage of the 1985 Farm Bill to operate under an approved conservation plan or lose eligibility for USDA benefits. The purpose of the Sodbuster provision is to discourage the conversion of highly erodible land to cropland use. The Swampbuster provision is aimed at discouraging the conversion of wetlands for agricultural purposes. The conversion of wetlands or highly erodible soils to croplands after passage of the 1985 Farm Bill may result in the farmer's loss of eligibility for certain USDA program benefits. Farmers were required to file Food Security Plans including implementation dates with the SCS by January 1, 1990. These plans may be amended if crops are changed. SCS field staffs inspect 5% of the farms with Food Security Act Plans annually to determine if the approved conservation measures are in place. If the requirements of the plan have not been met, SCS staff alert USDA Agriculture Stabilization and Conservation Service (ASCS) staff who in turn may deny the farmer certain USDA benefits. Otherwise, CTA is provided in all counties to assist landusers with problems of erosion, sedimentation, total water management, water quality and related issues.

Generally, farmers who rely heavily upon price supports and other USDA benefits are more likely to participate in the voluntary Farm Bill programs. Farmers who do not rely on benefits may choose to not participate in programs which promote environmental protection.

The Resource Conservation and Development (RC&D) Program was initiated in 1962 (P.L. 97-98, Sec.1528) and provides technical and financial assistance to locally sponsored areas designated by the Secretary of Agriculture. The purpose is to accelerate conservation , development, and utilization of natural resources to improve the general level of economic activity, and to enhance the environment and standard of living in authorized areas. There are seven RC&D areas in North Carolina, two of which are in the Albemarle-Pamlico region. These include the Mid-East RC&D (Beaufort, Bertie, Hertford, Martin, and Pitt counties) and the Albemarle RC&D (Camden, Chowan, Currituck, Dare, Gates, Hyde, Pasquotank, Perquimans, Tyrrell, and Washington counties). Each RC&D area is managed by a volunteer council of local citizens, with coordinator assistance from the SCS. These councils develop and implement a plan for social, economic, and environmental improvement of their communities. Examples of RC&D programs in the Albemarle and Mid-East areas include an integrated aqua-vegeculture system, irrigation water management, dead hog disposal, and boat and piling removal.

The Small Watersheds Program in North Carolina was enacted with the Watershed Protection and Flood Prevention Act of 1954 (P.L. 83-566). The program is a cooperative effort among federal, state, and local governments to plan and implement water resource projects in watersheds of less

than 250,000 acres. These projects are initiated in local communities through soil and water conservation districts and are approved by the N.C. Soil and Water Conservation Commission before any federal action is taken. Once project proposals are endorsed locally and by the state, SCS and other federal, state, and local agencies provide technical and financial assistance to develop and implement the watershed plan. Most projects are funded by local governments/sponsors and the federal government. All projects must meet requirements of the National and State Environmental Policy Acts (NEPA,SEPA) and other environmental laws and regulations. Examples of project activities include the installation of over 85 flood prevention and multipurpose dams, the installation of over 1,100 miles of channel improvements, and the installation of over 27 miles of dikes.

The River Basin Investigations and Surveys Program was authorized by the Watershed Protection and Flood Prevention Act of 1954, as amended (P.L. 83-566). The program in North Carolina is a cooperative effort among various federal, state, and local governments to identify water and related resource problems, evaluate alternatives, and provide local communities with technically sound water resource data for use in their local plans. Eight river basin studies and 29 flood plain management studies have been completed in the state to date including a study of the soil erosion and sediment delivery in a limited watershed in Guilford County.

The Emergency Watershed Protection program is an immediate response program designed to relieve imminent hazards to life and property caused by floods and products of erosion that have been created by natural disasters. The program facilitates the deployment of SCS technical and financial assistance to local communities to restore blocked stream channels and remove other hazards which threaten life and property.

The Soil Survey Program in North Carolina is a cooperative effort between federal, state, and local governments to obtain through soil surveys, an inventory of the state's soil resources, record the location of soils, predict soil performance under defined use and management, facilitate the transfer of soil information from one location of the state to another, and contribute to the knowledge, understanding, and proper use of our land resources. Local governments use soil surveys in many ways including environmental impact assessments and tax valuation. The Soil Survey Program hopes to have a soil survey for every N.C. county completed by the year 2000, however, budget constraints may postpone this in some counties.

SCS activities overlap significantly with the N.C. Agricultural Cost-Share Program (ACSP). ACSP assists farmers in nutrient sensitive watersheds to install best management practices (BMPs) and protect water quality. The N.C. Division of Soil and Water Conservation provides funding, local Soil Conservation Districts administer cost-sharing, and SCS provides training, technical assistance, and vehicles. In addition, the ACSP has adopted SCS BMP standards and procedures.

Staffing and Funding

The Conservation Operations Program has a FY92 budget of 8,020,000 dollars and a staff of 167 persons including one to three persons in each of the county offices and the headquarters staff in Raleigh.

The Resource Conservation and Development Program in North Carolina received 720,000 dollars in FY92. RC&D projects are financed through cooperative agreements, grants, and cost-sharing assistance from federal, state and local funding. The Albemarle and Mid-East RC&D each have one and one-half SCS employees.

There are 34 staff members for the Small Watersheds Program and River Basin Studies Program including an environmental specialist, economist, hydrologist, planning engineer, GIS technician, as well as field and administrative personnel. These programs typically receive approximately 3 million dollars per year.

The total budget for the Soil Survey Program for FY92 is approximately 1,900,000 dollars. SCS and the N.C. Division of Soil and Water Conservation will contribute 1,378,000 and 300,000 dollars respectively, for in-kind services. Local governments will contribute approximately 160,000 dollars and the U.S. Forest Service will pay 36,000 to 37,000 dollars for contract work to SCS. SCS employs 30 staff member statewide including 23 soil scientists in the field conducting soils mapping and support services and 7 soil scientists and support personnel in the central state office for quality control and manuscript and material development.

Opportunities for Public Involvement

As of the 1990 Farm Bill, local district boards, speaking for local residents, work with SCS to determine if suggested practices are feasible and realistic for the area farmers. Three members of the local boards are elected into office by local residents during regular election cycles. Two board members are appointed by the N.C. Soil and Water Conservation Commission. SCS employees serve as staff to the local board.

Resource Conservation and Development Councils are made up of local citizens who volunteer their time to improve their communities.

Public involvement with the Small Watersheds Program and River Basin Investigations and Surveys Program include work sessions with the local governments/sponsors and steering committees, informational public meetings to educate the local citizens on the details of the project or study, and public hearings as required by the NEPA and SEPA processes.

Before the 1985 and 1990 Farm Bills were enacted, the SCS had a more well-rounded program including considerable public education activities. Implementation of the Farm Bills has limited the number of staff free to participate in such programs.