A message from the Neuse Education Team

Back in 1997, the Neuse Education Team realized that in order to meet the 5-year, 30% nitrogen reduction goal for agriculture – as mandated by North Carolina’s General Assembly – the Team needed significant resources to lead an effective, basin-wide education program that would lead to water quality improvements.

In the fall of 1998, as a concrete way to meet this challenge, the Center for Agricultural Partnerships, with support from the Pew Charitable Trusts and the Environmental Protection Agency, initiated the Neuse Crop Management Project. The Neuse Education Team led this educational outreach endeavor. The goal of the Neuse Crop Management Project – to significantly increase the use of production practices in the Neuse River Basin to improve farmer profits while improving Neuse River water quality – was achieved. The Neuse Team used four specific management strategies: BMP demonstration and implementation, partnerships and communication, nutrient management training and continual project evaluation to meet this goal.

This NeuseLetter special edition highlights each of these strategies and shows the impact each strategy had that allowed the Neuse Crop Management project to succeed. Also, it should be noted that in addition to the organizations mentioned above, the North Carolina Clean Water Management Trust Fund, the UNC Water Resources Institute and the North Carolina Cooperative Extension Service at North Carolina State University each provided important funding that allowed the project to come to fruition.

We are grateful for the foresight of all of these funders and their commitment to water quality. We are especially appreciative of the Center for Agricultural Partnerships, whose participation laid the groundwork for important partners to come together and for science-based water quality education to thrive.

—The Neuse Education Team

Neuse Crop Management Project yields results, exceeds objectives

Balance is a driving factor behind all of the Neuse Education Team’s (NET) science and educational outreach efforts, particularly the balance between water quality and a viable livelihood, which is the heart of the team’s agricultural program. That also was Neuse Crop Management Project’s (NCMP) goal: to enable farmers to adopt best management practices (BMPs) so they could continue to earn a living while helping the Neuse.

NCMP achieved this goal by meeting three important objectives: implementing nutrient and weed integrated pest management practices on 100,000 cropland acres; helping farmers decrease soil-applied herbicides by 40%; and assisting involved farmers to collectively reduce overall nitrogen (N) fertilizer application rates by more than 23%.

Controlled Drainage is a dual purpose BMP — reducing nutrient losses and providing sub-irrigation to farmers’ fields.
NCMP used four demonstration farms, representing the Neuse River Basin’s different agricultural and geographic regions — in Franklin/Wake, Wayne, Lenoir and Craven counties — to showcase how farmers could use nutrient management, controlled drainage and riparian buffers to reduce N while increasing profits.

The team identified specific BMPs that addressed producer needs and developed targeted programs to encourage producer adoption. Working with county-level soil and water districts, NCMP personnel installed grassed waterways, field borders, critical area plantings, sod-based rotations, wildlife areas, water diversions, grass and shrub buffers and controlled drainage structures in the four demonstration areas.

• The Piedmont Demonstration Farm in Franklin and Wake counties focused on intensive wheat N management in the Rocky Branch Watershed. The core demonstration area included six cooperators. Detailed nutrient management plans developed for each field accounted for soil type variability. This location was also used to explore soil sampling strategies that best results. Also, sediment-reducing BMPS were installed due to water quality problems from sediment losses from the region’s highly erodible soils.

• The Upper Coastal Plain Demonstration Farms in Wayne County focused on nutrient management and controlled drainage for corn, soybeans, cotton, wheat and tobacco. More than 2,000 acres of cropland on five farms were intensively soil-sampled, with detailed nutrient management plans implemented for each. Cotton petiole nitrate monitoring was used on scores of fields during the project, assuring farmers that their lowered N fertilizer rates were sufficient.

Four water-control structures were installed to maintain higher water tables and promote denitrification on 400 cropland acres. A warm-season grass buffer was planted on 7,000 feet of ditch bank. Also, more than five miles of ditch banks were maintained with the weed sweep to control large woody vegetation.

• On the Middle Coastal Plain Demonstration Farm in Lenoir County,

<table>
<thead>
<tr>
<th>Acres of Best Management Practices Installed by NCMP by County</th>
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<tbody>
<tr>
<td><strong>Best Management Practices</strong></td>
</tr>
<tr>
<td>Grassed waterways</td>
</tr>
<tr>
<td>Field border</td>
</tr>
<tr>
<td>Diversion</td>
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<tr>
<td>Critical area</td>
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<tr>
<td>Sod-based rotations</td>
</tr>
<tr>
<td>Wildlife</td>
</tr>
<tr>
<td>Controlled drainage</td>
</tr>
</tbody>
</table>

**Demonstration:** Planting cover crops is one technique to reduce N losses from fallow fields.

N application rates were determined using digitized soil maps and their related Realistic Yield Expectations (RYE). The participating farmer said of the soil maps used, “The mapping system in the nutrient management planning is great for me to identify fields and nitrogen rates.” Measured yields demonstrated that the new nutrient management plans did not affect yields.

• To enhance shrub buffers in place on part of the farm, weed wiping was used to control trees. On-site graduate student research projects focused on buffer ecology and width influences on denitrification in shallow groundwater. This research demonstrated a 65-95% reduction in nitrate moving into streams through the shallow ground water that
Implementation: Variable rate nitrogen application trial on tobacco in Wilson County. Cooperating farmer David Hinnant said “last year we used substantially less nitrogen per acre and had better yields and quality.”

Farmers said, “Yes, the project decreased my nitrogen rates,” “I’m using 15-20% less on cotton as a result of the project,” and “Overall, I’ve decreased nitrogen on tobacco due to the [project’s] trials.”

“The hands-on, one-on-one work with the growers was good,” said one grower. “Good information,” particularly information on soil sampling, also was widely appreciated, with one person citing it as a project strength:

Nutrient Management Plans

- Nutrient management planning was a major thrust of the project. Staff worked directly with cooperating producers from 1999 to 2002 to write and implement nutrient management plans on more than 105,000 cropland acres, exceeding the original goal of 100,000 acres. In Wayne County alone, more than 69,000 acres received nutrient management plans. To meet the challenge of developing thousands of acres of nutrient management plans, project personnel developed two innovative approaches:

1) A simplified computerized N fertilizer spreadsheet for commercial fertilizer plans, and

2) Group nutrient management planning sessions that allowed greater outreach to more farmers. Groups of approximately 10 farmers with their farm records and maps met with project technicians who helped them determine the appropriate nutrient management strategy and write the plan.

Farmers embraced nutrient management planning as a useful tool. Said one project farmer, “[Nutrient management plans are] good for the river and for my pocketbook. I have a real concern for the effects on the environment and people living below me on the river. Just to survive you have to save a dime and this helps control costs somewhat.”

<table>
<thead>
<tr>
<th>County</th>
<th>Acres</th>
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<tbody>
<tr>
<td>Carteret</td>
<td>0</td>
<td>Nash</td>
<td>6,000</td>
</tr>
<tr>
<td>Craven*</td>
<td>19,502</td>
<td>Orange</td>
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<tr>
<td>Durham</td>
<td>0</td>
<td>Pamlico</td>
<td>0</td>
</tr>
<tr>
<td>Franklin</td>
<td>250</td>
<td>Person</td>
<td>0</td>
</tr>
<tr>
<td>Granville</td>
<td>0</td>
<td>Pitt</td>
<td>0</td>
</tr>
<tr>
<td>Greene</td>
<td>106.1</td>
<td>Wake</td>
<td>2,295</td>
</tr>
<tr>
<td>Johnston</td>
<td>1,038.2</td>
<td>Wayne</td>
<td>72,900.2</td>
</tr>
<tr>
<td>Jones</td>
<td>0</td>
<td>Wilson</td>
<td>0</td>
</tr>
<tr>
<td>Lenoir</td>
<td>3007.1</td>
<td>Total</td>
<td>105,098.6</td>
</tr>
</tbody>
</table>

Croppland Acres with Implemented Nutrient Management Plans (through the Neuse Crop Management Project) by County in 2002

passes through shrub buffers.

Two controlled drainage structures affecting 351 acres were installed and nine more structures, draining 1500 acres, were installed on Lenoir County farms.

A kiosk with detailed information constructed at this demonstration farm has been used extensively as a teaching lab. Seven field days were held here for farmers, agribusiness, state and federal agencies, county- and city-level elected officials and NC State University students.

- Craven County’s Mosley Creek Watershed was selected for its Lower Coastal Plain location and because it represents a natural subwatershed boundary. Eight farmers whose fields are extensively ditched farm in this subwatershed and all participated. Nine controlled drainage structures were installed throughout the watershed. One farmer said, “Water control structures would be very beneficial to any farmer in a dry year — plus they’re good for the river.” Sixteen miles of ditch bank in Core Creek Watershed were weed wiped to establish filter strips.

Field boundaries were georeferenced so digital soil maps could determine RYEcs. Nutrient management plans were written for all farms in this watershed and other fields in nearby watersheds. Twelve cotton and corn nutrient management trials were implemented in the county.
The Neuse Crop Management Team recognized the importance of collaboration and communication in achieving its goal. Partnerships were essential to plugging the right people into the work of the project.

The following organizations joined with the N.C. State University Cooperative Extension Service in implementing programs to meet farmer needs:

- Corn Growers Association of North Carolina
- Cotton Incorporated
- Dixie-Harvey Fertilizer and Gas
- National Cotton Council
- North Carolina Cooperative Extension Service
- North Carolina Department of Agriculture and Consumer Services
- North Carolina Department of Environment and Natural Resources
- North Carolina Farm Bureau Federation
- North Carolina Plant Food Association
- North Carolina Small Grain Growers Association
- North Carolina Soybean Growers Association
- Royster-Clark Inc.
- Southern States Cooperative

As an advisory board member pointed out, the board assured “collaboration among agencies and with growers,” and that “staff and growers worked together.” Another person pointed out that the project’s contact with these diverse players “increased their knowledge and professional abilities.” Others said, “It brought a lot of different groups of people together to address an issue in a pro-active way,” and “It was a cooperative effort among a lot of different actors, more collaborative and with less [turf] battles than usual.”

Project staff used extensive outreach efforts to promote BMPs that reduce N and pesticide losses. Media interest in the project increased as the demonstration sites developed. Project awareness was promoted through the NeuseLetter (NET’s quarterly newsletter), local newspapers, radio, television and project literature, including fact sheets. The extensive media campaign provided a multiplier effect for increasing project contacts.

**Communication:**
NET member Mitch Woodward, center, communicates wetlands project details to a TV cameraman.
One of the requirements of the Neuse Rules was for the N.C. Cooperative Extension Service to develop and provide nutrient management training for anyone who fertilized 50 acres or more in the Neuse River Basin. To accomplish this, two NET members prepared training notebooks that included curriculum, slide sets, CDs with PowerPoint presentations and paper copies of presentation materials. The notebooks were distributed to 35 trainers working for N.C. Cooperative Extension Service and partnering agencies throughout the river basin.

- Training was piloted in five counties in 2000. In 2001 and 2002, nutrient management training was offered throughout the Neuse River Basin to 1,240 producers.
- Nutrient management training focused on helping producers and agribusiness better understand nutrient management, off-site N movement and BMP impacts.
- Additional training in writing certifiable nutrient management plans was held for project and Neuse technicians, NRCS staff and other agency personnel.

One farmer who attended the training said, “I liked it, it was very educational. I got an idea about how easy nitrogen runoff can get into the river. It made me more aware of the need to watch what we are doing, not to over-fertilize due to the environment and economics, especially as I have land near the river.”

Training producers: Outlining the concepts behind nutrient management deepened farmers’ understanding of the role they play in the nutrient cycle and water quality protection.

Project Advisory Team

A 35-person advisory team set objectives and provided input on the work plan for the Neuse Crop Management Project. This team consisted of representatives from commodity organizations, agribusiness, state and federal agencies, Farm Bureau, consultants and producers. The team, updated and consulted yearly, also provided a mid-term review to ensure that the project was meeting its objectives. Project Advisory Team members included:

- Charles Alexander, NC Small Grain Growers Association
- Steve Bevington, CWMTF
- Anne Coan, NC Farm Bureau
- Jacob Crandall, USDA-NRCS
- Roger Crickenberger, NCSU
- Paul Dugger, National Cotton Council
- Larry Elworth, Center for Agricultural Partnerships
- David Hardy, Craven CES
- Jim Haskins, AgriBusiness Communications Group
- Steve Hodges, NCSU
- Billy Hodges, producer
- Rick Holder, Dixie - Harvey Fertilizer and Gas
- Carlton Ipock, Royster Clark
- Greg Jennings, NCSU
- Gene Kamprath, NCSU
- Mike Linker, NCSU
- Bill Lord, Franklin CES
- Susan Mackey, Center for Agricultural Partnerships
- Andy Moye, producer
- Becky McClanahan, National Cotton Council
- Billy McLawhorn, McLawhorn Services
- Clayton Mitchell
- Deanna Osmond, NCSU
- Jim Parrott, Parrott Farms
- Ron Perry, Southern States Cooperative Inc.
- Bob Pleasants, Wayne CES
- Al Privette, producer
- Mike Regans, Greene CES
- Richard Reich, NC Department of Agriculture and Consumer Services
- Doug Roberts, Southern States
- Howard Singletary, NC Plant/ Food Association
- Tommy Valco, Cotton Inc.
- Jim Wilder, NC Soybean Association
- David Williams, NC Soil and Water Division, DENR
- Mitch Woodward, Wake CES
- Joyce Woodhouse, NC Corn Growers Association
- Lin Xu, NC DWQ-DENR
NCMP evaluations established baselines, collected basic data, ensured that the project was focused on-target and assessed project results.

Few projects have ever provided cost-benefit analyses of agricultural best management practices. Two cost-benefit analyses were conducted during this project. A nutrient management cost-benefit analysis was produced using cooperators’ information. The cost-benefit ratio for nutrient management was highly variable, depending on soil test levels and farmers’ practices, but in general, many farmers apparently can save $20-40 per acre through nutrient management. The cost-benefit analysis for the project’s other BMPs was unique. The BMP’s benefit depended highly on the specific BMP and geographic region. For instance, wooded riparian buffers were more cost-effective in the Piedmont than in other regions, but controlled drainage was only cost-effective in the Lower Coastal Plain. Fact sheets on these cost-benefit analyses are at http://www.neuse.ncsu.edu/aginfo.html.

Project evaluations were conducted at the project’s midterm and end to identify successes and weaknesses. The final evaluation showed that both growers and nongrower assessments of the NCMP and its impact were positive. The project’s success, as determined by the final evaluation, was based on a unique set of circumstances: the work of NET and many other agencies and organizations in the Neuse River Basin; the extensive consultation and feasibility study at the beginning of the project, which led to the creation of strong working relationships that made the project successful on a very significant scale; the ability to obtain funding from multiple sources; a highly competent staff; the project’s multidisciplinary, multiagency and multipartner structure; farmers’ willingness to be part of the solution; and regulatory pressures for N reduction.

The project met critically important needs not sufficiently funded through the state budget:

- Training materials for the mandated nutrient management education program
- Computerization of BMP accounting and a tracking tool – NLEW
- Computerization of the new tool – PLAT – needed to meet new USDA-Natural Resources Conservation Service nutrient management standards
- Development of the commercial fertilizer computerized spreadsheet used in developing N fertilizer plans

Most significantly, many project producers used their nutrient management plans and other BMPs. The final evaluation indicated that two-thirds of the growers reported they decreased N application rates as a result of project recommendations.

Some examples of such estimated reductions include: 15-20% on cotton; 14-28% on corn; 15-24% on tobacco; and 4-20% on wheat. Here’s a participant’s illustrative statement about these changes: “The project helped us think through what we were doing and not just apply fertilizer according to tradition, which is how a lot of us farmers work.”
Neuse Education Team welcomes new member

Charlie Humphrey, Craven County area-specialized North Carolina Cooperative Extension agent in environmental education, recently assumed his new duties with the Neuse Education Team.

Born in Alabama, Humphrey grew up in North Carolina, where he earned a B.S. in natural resources from N.C. State in 1996, also specializing in ecosystem assessment. He earned a M.S. in soil science in 2002 from N.C. State as well.

As a forestry intern in Kinston’s Planning Department in 1996, he conducted an urban forest inventory of that city.

He worked as an environmental health specialist in Union County’s Health Department from 1997 to 1999, performing soil evaluations for septic system suitability. He also designed septic systems and inspected system installations.

From 2001 until he assumed his present duties, he performed soil and site evaluations for septic system suitability, designed septic systems and inspected septic system installations for Wake County Environmental Services.

“I have always had an interest in natural resources and conservation,” Humphrey says. “I consider myself a ‘science person’ and have really enjoyed being a part of the N.C. Cooperative Extension Service, and being affiliated with NCSU again.”

“The Neuse Education Team is excited to have Charlie join us to coordinate efforts in the lower part of the river basin,” says Team Coordinator Dr. Greg Jennings. “Charlie’s expertise and enthusiasm make him well qualified to carry on the local environmental education programs in that critical area.”

Team Effort

Today’s Neuse Education Team includes: Front row, from left, Mitch Woodward, Extension area specialized agent; Mike Regans, Extension area specialized agent in environmental education. Back row, from left: Bill Hunt, Extension biological and agricultural engineering specialist in urban stormwater; Deanna Osmond, Soil Science Department Extension leader; Bill Lord, Extension area specialized agent in environmental education and NeuseLetter managing editor; Greg Jennings, team coordinator and professor of Biological and Agricultural Engineering; and Ada Wossink, Agricultural and Resource Economics Department. Not pictured: Art Latham, NET editor; Charlie Humphrey (see story above).

Neuse Conference set for November in New Bern

PLAN NOW TO ATTEND THE NEUSE CONFERENCE, set for Nov. 19 and 20, 2003 at the New Bern Riverfront Convention Center.

On Nov. 19, water quality experts who work in the Neuse River Basin will offer presentations and case studies highlighting progress in meeting basin-wide nitrogen reduction goals over the past five years in agriculture, point sources and urban stormwater.

Nov. 20’s activities will include a half-day of local water-quality tours.

Call for posters: We are soliciting poster presentations on topics related to Neuse River water quality.

The conference is still in the planning stages, says Bill Lord, conference coordinator.

For information, call him at 919.496.3344, or e-mail him at william_lord@ncsu.edu
## Results: Practices
- Water Control Structures = 21 structures (~3,000 acres)
- Grassed Waterways = 7.84 ac
- Field Borders = 15.01 ac
- Diversion = 0.77 ac
- Critical Area = 0.24 ac
- SBR = 267.71 ac
- Wildlife Planting = 2.61 ac
- Weed Wiping = 20+ sites

## Results: Training
- Nutrient Management Training (Farmers, Turf, Industry and Agencies) > 1,200
- Training on Certified Nutrient Management Training = ~200
- Neuse Rules (Producers and Agencies) = 500
- Weed ID and Herbicide (Industry) = 100
- Field Days = 300
- Nutrient Management Demonstration/Research Sites (corn, cotton, tobacco, wheat) = 23

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For information: Deanna Osmond (deanna_osmond@ncsu.edu)