



Cost and Benefits of Best Management Practices to Control Nitrogen in the Piedmont

Introduction

State regulations require the agricultural community to reduce nitrogen loading into the Neuse River by 30 percent by the year 2003. Several tools or best management practices (BMPs) to keep nitrogen out of groundwater and surface waters are available to producers in the three regions of the Neuse River Basin. These include riparian buffers (both herbaceous and woody), nutrient management, controlled drainage, and a conservation tillage system that uses a cereal cover crop managed to reduce nitrogen loading of shallow groundwater. To accomplish the 30 percent reduction in nitrogen loading, producers must either participate in a collective local strategy or implement individually the BMPs that have been



Figure 1. Counties in the Neuse River Basin

specified for each region of the Neuse River Basin (Table 1). As the table indicates, some BMPs work better in some areas than in others.

In the piedmont (parts of Wake, Durham, Orange, Person, Granville, and Franklin counties—the darkest area in Figure 1), the two practices that are most effective in reducing nitrogen losses into streams and

Table 1. BMPs by region in the Neuse River Basin and their effectiveness in nitrogen reduction

Design	Region			N-reduction ^d
	Piedmont	Upper and middle coastal plain	Lower coastal plain	
Trees 30 ft + Grass 20 ft ^a	X	X		85%
Tree buffer ≥ 20 ft	X	X		75%
Shrub buffers ≥ 20 ft	X	X		75%
Grass buffers ≥ 30 ft	X	X		65%
Filter strips ≥ 20 ft ^b	X	X		40%
Nutrient management	X	X	X	Variable
Cover crop	X	X	X	5-15%
No-till or strip-till (corn only)	X			15%
Controlled drainage ^c		X	X	40%

^a The forested area is next to the stream, and the grass area is away from the stream.

^b Only effective if the drainage area above the filter strip has greater than 1% but less than 10% slopes. Filter strips must be planted with permanent vegetation (grass, legumes, and/or other forbs).

^c Only effective if the slope in the channel is less than 1% and the water table can be kept within 36" of surface soil for 50% of field area.

^d Reduction rates are based on research and approval of the Neuse Basin Oversight Committee.

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Source: Based on decisions by the Neuse River Basin Oversight Committee.



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Table 2. Costs of a buffer (dollars per acre)

<i>Buffer type</i>	<i>Annual cost of land¹</i>	<i>Establishment cost²</i>	<i>Annual maintenance cost</i>
Forested	\$53	\$70	\$2
Fescue + bahia ³	\$53	\$207	\$50
Switchgrass	\$53	\$154	\$58

¹ Based on a 2-year rotation of wheat conventional-till and tobacco NOT grown close to streams. This rotation is common in the piedmont.

² For the forested buffer, the establishment costs are those of planting or seeding loblolly pine. For the grass buffers the establishment costs are those for hay and pasture but with a higher seeding rate. For details, see <http://www2.ncsu.edu/unity/lockers/users/g/gawossin/Papers/bmpecon.pdf>.

³ The N.C. Conservation Reserve Enhancement Program requires 50% warm-season grass.

ditches are riparian buffers and nutrient management (Table 1). Nonfertilized cereal cover crops and no-till production are less effective in this region than the other BMPs but still can be used. The “controlled drainage” BMP is not suitable for the piedmont.

Costs

Because producers must either install BMPs or join a collective local strategy with similar BMPs, it is essential to compare the costs of the BMPs with the payments offered by cost-share programs. Here is an outline of the costs for buffers, nutrient management, and conservation tillage—the best options for piedmont producers.

Riparian buffers. The costs of riparian buffers include installation, maintenance, and cost of land. Installation expenses, such as seed and fertilizer, occur only in the first year. The other costs, such as land, labor, and some types of equipment, may occur yearly. Land costs recognize the loss of revenues from crop production when the land is switched into buffers. Equipment and labor costs occur during installation and when maintenance is performed. For example, to achieve maximum efficiency with a grass or shrub buffer, the vegetation should be managed so that a moderate vegetation height is maintained. A summary of the costs

for buffers and when these occur is given in Table 2.

Nutrient management. Expenditures for nutrient management are assumed to be negligible. The North Carolina Department of Agriculture and Consumer Services will provide a free soil test. A nitrogen management plan in the Neuse River Basin should be based on Realistic Yield Expectations (RYEs). Calculating nitrogen needs from RYE depends on both the nitrogen requirements of the crop and the soil type. N.C. Cooperative Extension or the federal Natural Resources Conservation Service (NRCS) will verify your nutrient management plan at no charge to make sure that it is consistent with NRCS and state standards. Nutrient management requires more time but likely will reduce fertilizer cost.

Conservation tillage. In the piedmont, conservation tillage is encouraged to reduce erosion and increase yield. Both the cover crop and, in the case of corn, the type of tillage will be credited as a nitrogen-

reducing BMP. Conservation tillage increases net revenue in soybeans but reduces net revenue in corn (Table 3).

Financial incentives for riparian buffers

Cost-share programs have been established in North Carolina to offset some of the expenses of buffers. The N.C. Conservation Reserve Enhancement Program (CREP) appears to be the most economically viable program to help farmers use buffers to protect the Neuse River Basin. Eligible landowners may enroll in CREP contracts of 10, 15, or 30 years or of permanent duration. The payments include a 75 to 100 percent share of the installation costs, annual incentive payments of 70 to 100 percent of the annual rental rate for up to 15 years, a state bonus for a 30-year or permanent contract, and an additional bonus if trees are planted.

Agricultural land near rivers, streams, drainage ditches, and wetlands is eligible for CREP. The land 1) must have been owned or farmed by the applicant for the previous 12 months, 2) must have been planted or considered planted to an agricultural commodity in 2 of the last 5 years, and 3) must be physically and legally capable of being planted in a normal manner. Landowners may enroll at any time through the year 2004. Evaluation of applications is noncompetitive. During the contract period, the cropland that has been retired may

Table 3. Costs of conservation tillage (dollars per acre per year)

	<i>Cover crop (wheat)</i>	<i>Soybeans no-till</i>	<i>Soybeans conv. tillage</i>	<i>Corn no-till</i>	<i>Corn conv. tillage</i>
Costs	\$76	\$148.50	\$150.75	\$271.46	\$248.52
Receipts	\$0	\$212.04	\$200.88	\$256.26*	\$246.40
Net revenue	-\$76	\$63.55	\$50.13	-\$15.21	-\$2.12

*Assuming 4% yield increase.

Table 4. Farm economic profitability of buffers in the piedmont area of the Neuse River Basin

<i>Buffer Type</i>	<i>Net Annual Profit* (dollars per acre) for the next 15 years</i>		
	<i>Permanent CREP contract</i>	<i>30-year CREP contract</i>	<i>15-year CREP contract</i>
Forested buffer	\$80	\$57	\$40
Fescue-bahia-grass buffer	\$15	-\$6	-\$22
Switchgrass buffer	\$12	-\$9	-\$25

* Compared with a 2-year rotation of wheat conventional-till and tobacco NOT grown close to streams.

not be grazed, harvested, or used in any commercial manner other than for hunting leases. Public access to the buffer land is not required.

Long-term income

Buffers can provide income for many years. When comparing CREP opportunities with current crop options and other land uses, consider long-term income from the buffer option in CREP when deciding whether to install a buffer. By accounting for the value of future

expenditures and receipts, we can calculate the net annual profit of a buffer (Table 4).

Which BMPs pay off in the piedmont?

This comparison of possible BMPs shows that a forested buffer with cost-sharing payments is the best option for controlling nitrogen in the piedmont because it offers greater net profit. The outlook for the other BMPs is this:

- A permanent CREP contract for a grass buffer is profitable, but a 15-year or 30-year contract is not, assuming that the alternative use of the land is a rotation of wheat conventional-till and tobacco not grown close to streams.
- Conservation tillage increases net revenue in soybeans, but reduces net revenue in corn.
- The financial result for a cover crop is negative.

List of contacts

For more information about the Conservation Reserve Enhancement Program (CREP) or other state or federal cost-share programs, contact your local Soil and Water Conservation District; Farm Service Agency Office; or the N.C. Department of Environment and Natural Resources' Division of Soil and Water Conservation, David Williams, 1614 Mail Service Center, Raleigh, N.C. 27699-1614, phone 919-715-6103; e-mail: david.b.williams@ncmail.net.

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