



Cost and Benefits of Best Management Practices to Control Nitrogen in the Lower Coastal Plain

Introduction

State regulations require the agricultural community to reduce nitrogen loading into the Neuse River by 30 percent by 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 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 lower coastal plain (Beaufort, Carteret, Craven, Jones, and Pamlico counties; Figure 1),

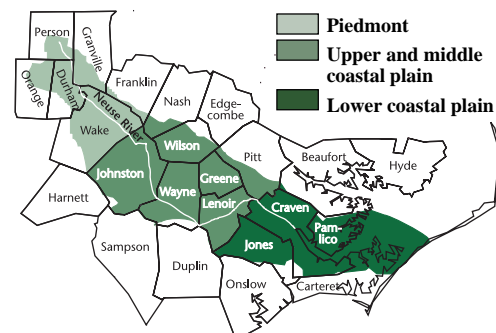


Figure 1. Counties in the Neuse River Basin

controlled drainage is the most effective BMP for reducing nitrogen losses into streams and ditches (Table 1). Nonfertilized cereal cover crops are less effective than controlled drainage, but can be used; nutrient management's effectiveness is highly variable.

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 \geq 20 ft	X	X		75%
Shrub buffers \geq 20 ft	X	X		75%
Grass buffers \geq 30 ft	X	X		65%
Filter strips \geq 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%

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^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% slope. 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.

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



College of Agriculture and Life Sciences, NC State University
School of Agriculture and Environmental and Allied Sciences,
NCA&T State University

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Costs

Because producers must either install BMPs or join a collective local strategy with similar BMPs, it is essential to compare the costs of these practices with the payments offered by cost-share programs. Here is a look at the costs of controlled drainage, the top option for the lower coastal plain.

Controlled drainage. Controlled drainage consists of a surface drainage system of 3- to 5-foot-deep open ditches, a flashboard riser installed in the collector canal, a corrugated metal pipe culvert for an outlet, and concrete to stabilize the riser. For the ditches, no installation and maintenance costs were included, as it is assumed that these are part of the pre-existing condition. Where the land slope is 0.5 to 2 feet per mile, one structure is installed in the canal every mile or so on a 2- to 2.5-foot contour interval. Using this typical layout, a control structure in the main canal serves 320 acres. With controlled drainage, yield levels can be from 2 percent higher (soybeans and cotton) to 5 percent higher (corn) in the long run if the system is carefully monitored and controlled. For wheat and tobacco, no yield increases are expected (Table 2).

Nutrient management. Expenditures for nutrient management are assumed to be negligible. The North Carolina Department

Table 2. Costs of controlled drainage (dollars per acre per year)

Installation ^a	\$19
Annual maintenance ^b	\$1.25
Benefits from yield increases	\$2-\$11 ^c

^a Control structure consists of a riser, 72 in. @ \$1,670; 30 ft of pipe @ \$135.20/ft; and 4 cu yd of concrete @ \$108/cu yd. This structure serves 320 acres.

^b Maintenance of the control structure is calculated as 1% of installation costs plus 0.125 hr of labor @ \$8.50 per acre per year for inspection.

^c The benefits vary depending on the rotation. We assumed a tobacco-wheat-soybean rotation (\$2 per acre) and a rotation of Roundup Ready cotton and corn (\$11 per acre).

Table 3. Net annual profit (dollars per acre) for the next 15 years^a of controlled drainage in the lower coastal area of the Neuse River Basin

	Benefits from yield increases (per acre per year) ^b	
	\$2	\$11
Investment per acre	\$19	\$19
Cost-share payment per acre	\$15	\$15
Annual maintenance costs per acre	\$1.25	\$1.25
Annual profit per acre	\$0	\$9

^a Based on a 15-year CREP contract.

^b The benefits vary depending on the rotation (Table 2).

of Agriculture and Consumer Services will provide a free soil test, which is used to calculate nitrogen requirements. 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. The 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 meets NRCS and state standards. Nutrient management requires more time but likely will reduce fertilizer cost.

Financial incentives for controlled drainage

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.

For controlled drainage, CREP offers a cost-share of 80 percent, depending on approval by the Soil and Water Conservation District Board of Directors and the length of

the contract (typically 15 years).

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 2004. Evaluation of applications is noncompetitive.

Long-term income

Controlled drainage can provide income for many years. By accounting for the value of future expenditures and receipts, we can calculate the annual profit of this BMP (Table 3).

Conclusion

Cost-shared controlled drainage is a financially practical BMP for the lower coastal plain.

List of Contacts

For more information about the N.C. 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, e-mail: david.b.williams@ncmail.net or phone 919-715-6103.

Prepared by
Ada Wossink, Extension Specialist, Department of Agricultural and Resource Economics, and
Deanna Osmond, Extension Specialist, Soil Science Department

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