

US EPA

REGION 4

# Nonpoint Source Program Success Story

## North Carolina

### ***Agricultural Engineering Improves Water Quality in Western North Carolina***

**Waterbodies Improved** Animal feeding operations have led to water quality problems in western North Carolina; these include increased sediment and nutrient loads. Technical assistance provided to farmers in the area helped to significantly increase the number of best management practices (BMPs) installed and improve water quality in river basins of sixteen Western North Carolina counties.

#### **OVERVIEW**

In the mountain counties of western North Carolina, intense rainfall and steep valleys are common. Thus, many streams in the watersheds are highly unstable, losing tons of sediment and degrading water quality with each storm. Also, streambank instability leads to soil erosion for many landowners. Unlike upland, pasture, or crop field soil loss, all sediment lost from streambank erosion enters the watercourses. Water quality problems related to concentrated animal feeding operations have also been well documented in this area.

To address these issues, the Agricultural Engineering project was designed to provide technical support to accelerate implementation of agricultural BMPs. The Agricultural Engineer, supported by this project, provided technical assistance in the design and application of BMPs to improve the quality of surface waters and waterways in the area. This included sixteen western NC counties and the following river basins:

- Upper French Broad
- Pigeon
- Tuckasegee
- Upper Little Tennessee
- Lower Little Tennessee
- Hiwassee
- Upper Catawba (Non-TVA Watershed)
- Upper Broad (Non-TVA Watershed)

The Agricultural Engineer position was established as a cooperative effort of the Tennessee Valley Authority Land & Water 201 and the U.S. Environmental Protection Agency 319 programs. The position was developed to provide technical assistance to federal, state, and local agencies in order to improve the quality of water within the Tennessee Valley watershed in North Carolina.

North Carolina administers an Agriculture Cost Share Program that provides financial assistance to farmers to implement BMPs for water quality protection. While the program has been very popular among farmers, it has been limited by the availability of engineering assistance needed to properly design waste management systems for animal feeding operations, as well as design stream restoration and/or stabilization projects. This project provided the technical support needed to help farmers implement BMPs for stream restoration and thus comply with the non-discharge rule for animal waste management.



Raccoon Creek in Waynesville NC after tree plantings

### **HIGHLIGHTS**

The goals of the project were to: 1) complete the design and installation of BMPs for 40 projects with technical assistance from the Agricultural Engineer; 2) report on the types and numbers of BMPs designed and/or installed, including estimated load reductions; and 3) provide latitude and longitude coordinates of all BMPs designed and/or installed. BMPs designed and installed included: critical area planting, heavy use protection area, riparian herbaceous cover, roof runoff management, water tanks, dam repair, agricultural road repair/stabilization and streambank stabilization.

For streambank stabilization, the methodology used was the "Natural Stream Channel Design" as described by David Rosgen. In this method, data were collected from a stable channel and the dimension, pattern and profile of the stable channel were reproduced in the channel being restored or stabilized. The process uses the ratio of the design parameters to the bankfull width of the channel so that the data could be applied to channels within a range of watershed sizes.

An alternative BMP for cattle farmers is the Beef Feed Waste Storage Structure; this is an open sided, roofed structure over a concrete slab with a feeding and watering area at one end and a waste storage area at the other end. This BMP is an alternative for cattle farmers who are managing and feeding their cattle adjacent to waterways during the winter months. A requirement of this BMP is that operators also fence their cattle out of creeks, thereby greatly reducing streambank degradation and sediment loads from individual farms. Beef Feed Waste Storage Structures are designed to: (1) remove the cattle feeding area from near a stream and place it at a more suitable upland site and (2) provide a means of collecting and temporarily storing cattle manure until it can be applied to crops at agronomic rates, rather than carried by runoff into a stream.



Feed/Waste Structure in Western NC

## RESULTS

During the two years of the project, more than 146 BMPs were designed to reduce sediment and nutrient loads into watercourses and thirty-four of those BMPs were installed during that time period. A landowner had three years to complete a BMP once a contract was initiated; therefore, several of the BMPs designed during the project were completed later. Thirty-three landowners participated in the project and received agricultural engineering technical assistance.

The Tables below summarize BMPs designed and installed during FYs 2006 and 2007:

<b>Summary of BMPs Designed and/or Installed During FY2006</b>		
<b>BMP</b>	<b>Number of</b>	<b>Estimated</b>
Access Road	3	1,600 LF
Agricultural Road Repair/Stabilization	1	1,700 LF
Critical Area Planting	19	9.5 acres
Dry Stack, Feed/Waste Storage Structure	4	4 each
Heavy Use Protection Area	1	5,000 SF
Riparian Herbaceous Cover	14	4 acres
Roof Runoff Management	4	7,168 SF
Streambank Stabilization	14	7,300 LF
Stream Channel Stabilization	13	7,000 LF
Stream Crossing	1	1 each
Water Tank	4	8 each

<b>Summary of BMPs Designed and/or Installed During FY2007</b>		
<b>BMP</b>	<b>Number of Projects</b>	<b>Estimated Quantity</b>
Access Road	4	750 LF
Critical Area Planting	17	4 acres
Dry Stack, Feed/Waste Storage Structure	4	4 each
Dam Repair	1	1 each
Riparian Herbaceous Cover	13	3.2 acres
Roof Runoff Management	4	7,168 SF
Streambank Stabilization	13	4,000 LF
Stream Channel Stabilization	7	2,500 LF
Stream Crossing	1	1 each
Water Tank	4	8 each

Installed BMPs resulted in sediment load reductions of several hundred tons per year to nearby watercourses. In addition, Beef Feed Waste Storage Structures significantly reduce the amount of nutrients entering the watercourses. The Table below summarizes estimated sediment and nutrient load reductions as a result of the project.

<b>Western NC Region: Load Reduction Impact for Twelve Counties</b>		
<b>Pollutant Type</b>	<b>Load Reduction Estimate</b>	<b>Units</b>
Biochemical Oxygen Demand (BOD)	8176.2	LBS/YR
Nitrogen	30313.8	LBS/YR
Phosphorus	4167	LBS/YR
Sedimentation-Siltation	1272.5	TONS/YR

The agricultural engineer position funded by this project provided technical assistance to install BMPs that might not have otherwise been implemented; therefore, most of the pollutant reductions are likely a direct result of the project. Thus, the position achieved the project's goals of numbers of BMPs designed and installed in order to accelerate water quality improvements. While water quality concerns have been met, additional benefits include enhancement of wildlife habitat and landscape naturalization/beautification.

## ***PARTNERS AND FUNDING***

The project was funded by \$59,352 in US Environmental Protection Agency Section 319 funding. State match was provided by the Department of Environment and Natural Resources in the form of salaries and fringe benefits or other direct costs associated with implementing the NC Agriculture Cost Share Program for a total of \$47,465. Additional support was received from the sixteen Soil and Water Conservation Districts of Area 1 for a total of \$38,400, and the Natural Resources Conservation Service (NRCS). Sixteen counties make up the Area 1 Association of Soil and Water Conservation Districts in Western NC, and 12 of those counties implemented BMPs during this grant period.

The project was administered by North Carolina Division of Water Quality. Project Partners included: Soil and Water Conservation Districts in Western North Carolina; North Carolina Department of Environment & Natural Resources (DENR); USDA Natural Resources Conservation Service (NRCS); and Cooperating Landowners/Project Participants in the following Counties: Buncombe, Cherokee, Clay, Graham, Haywood, Jackson, Macon, Madison, McDowell, Rutherford, Swain, and Transylvania.

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