

## CHAPTER 6 - AGRICULTURE AND WATER QUALITY IMPACTS

Confined animal operations, grazing, plowing, stream access, pesticide spraying, fertilizing, planting and harvesting are all agricultural activities that may impact water quality. The major agricultural nonpoint source pollutants that result from these activities are sediment, nutrients, pathogens (i.e., bacteria), pesticide and salts. Agricultural activities can also damage habitat and stream channels.

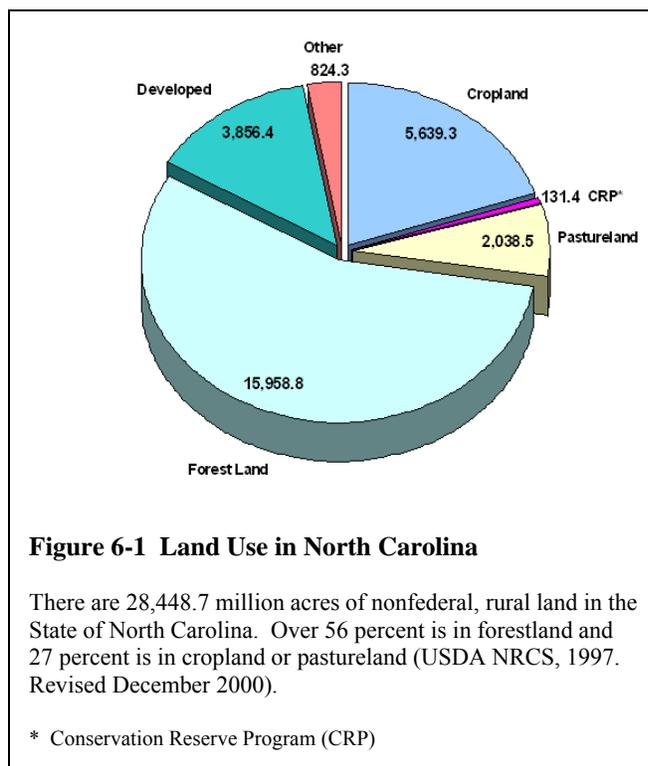
This chapter includes an overview of how agricultural activities can impact water quality, a summary of key legislative rules that effect animal operations throughout the state of North Carolina, how several federal and state agencies play an active role in protecting water quality, and how conservation and best management practices (BMPs) can protect water quality.

### 6.1 AGRICULTURAL LAND USE ACROSS THE NATION

Land use is dynamic, with annual shifts in and out of different uses. Examining net change in land use reveals general trends, but masks the real extent of land use change over time. In agriculture there are frequent shifts in the use of land among cropland, pastureland, rangeland and forestland. Each time land use changes, it may affect erosion potential, contiguity of habitat, or hydrologic features of the landscape.

Cropland, pastureland, rangeland and forestland comprise the majority of the nation's land resources. Consequently, the condition of these lands directly and indirectly influences the environment (NRCS, May 2006).

The National Resources Inventory (NRI) is a statistical survey of natural resource conditions and trends on nonfederal land in the United States -- nonfederal land includes privately owned lands, tribal and trust lands, and lands controlled by State and local governments. The NRI provides nationally consistent statistical data on how these lands are used and on changes in land use patterns for the period 1982 - 2003. To assess conservation issues on nonfederal rural lands, this land use information must be analyzed in conjunction with other NRI data elements. Land uses of particular interest are those involving the production of agricultural and timber products that are the foundation of our Nation's agricultural economy.



Nationwide, the key findings from the NRI include:

- ❑ The contiguous 48 states cover 1.9 billion acres. About 71 percent of this area is in nonfederal, rural land use – nearly 1.4 billion acres.
- ❑ Non-Federal rural lands are predominantly forestland (406 million acres), rangeland (405 million acres) and cropland (368 million acres).
- ❑ The Nation's cropland acreage declined from 420 million acres in 1982 to 368 million acres in 2003, a decrease of 12 percent (approximately 2 million acres lost per year). The net decline between 1997 and 2003 was 8 million acres, or about two percent (approximately 1 million acres lost per year).
- ❑ Between 1982 and 2003, nonfederal acreage devoted to grazing uses – rangeland, pastureland and grazed forestland – declined from 611 million acres to 576 million acres, a decrease of 5 percent (approximately 1.5 million acres per year) (NRCS, May 2006).

In North Carolina, there are 28,448.7 million acres in nonfederal, rural land use – 56 percent forestland, 20 percent cropland, 14 percent developed and 7 percent pasture (Figure 6-1). More information about the NRI can be found on the NRCS Web site ([www.nrcs.usda.gov/technical/NRI/](http://www.nrcs.usda.gov/technical/NRI/)).

## **6.2 IMPACTS TO WATER QUALITY**

### **6.2.1 HABITAT DEGRADATION**

Instream habitat degradation is identified as a notable reduction in habitat diversity or a negative change in habitat. Habitat degradation includes sedimentation, streambank erosion, channelization, lack of riparian vegetation, loss of pools and/or riffles, loss of organic (woody and leaf) habitat, and streambed scour. These stressors to aquatic insect and fish communities can be caused by many different land use activities and less often by discharges of treated wastewater. Refer to Chapter 3 for more information.

Good instream habitat is necessary for aquatic life to survive and reproduce. Streams that typically show signs of habitat degradation are in watersheds that have a large amount of land-disturbing activities (i.e., construction, mining, timber harvest, agricultural activities) or a large percentage of impervious surfaces. A watershed in which most of the riparian vegetation has been removed from streams or channelization (straightening) has occurred also exhibits instream habitat degradation.

### **6.2.2 STREAMBANK EROSION AND SEDIMENTATION**

Livestock grazing with unlimited access to the stream channel and banks can also cause severe streambank erosion resulting in sedimentation and degraded water quality. Although they often make up a small percentage of grazing areas by surface area, riparian zones (vegetated stream corridors) are particularly attractive to cattle that prefer the cooler environment and lush vegetation found beside rivers and streams. This concentration of livestock can result in increased sedimentation of streams due to "hoof shear", trampling of bank vegetation, and

entrenchment by the destabilized stream. Despite livestock's preference for frequent water access, farm veterinarians have reported that cows are healthier when stream access is limited (EPA, 1999).

### 6.2.3 LOSS OF RIPARIAN VEGETATION

Removing trees, shrubs and other vegetation to plant grass or place rock (also known as riprap) along the bank of a river or stream degrades water quality. Removing riparian vegetation eliminates habitat for aquatic macroinvertebrates that are food for trout and other fish. Rocks lining a streambank absorb the sun's heat and warm the water. Some fish require cooler water temperatures as well as the higher levels of dissolved oxygen cooler water provides. Trees, shrubs and other native vegetation cool the water by shading it. Straightening a stream, clearing streambank vegetation, and lining the streambanks with grass or rock severely impact the habitat that aquatic insects and fish need to survive.

Establishing, conserving and managing streamside vegetation (riparian buffer) is one of the most economical and efficient BMPs. Forested buffers in particular provide a variety of benefits including filtering runoff and taking up nutrients, moderating water temperature, preventing erosion and loss of land, providing flood control and helping to moderate streamflow, and providing food and habitat for both aquatic and terrestrial wildlife (NCDENR-DWQ, 2004).

### 6.2.4 CHANNELIZATION OR CHANNEL MODIFICATIONS

In the middle and lower coastal plains and tidewater regions of eastern North Carolina, channelization began as early as the 1700s in order to improve overland water drainage and provide more land for agricultural production. Channelization refers to the physical alteration of naturally occurring streams and riverbeds in the name of flood control, reduced erosion, increased usable land area, greater navigability and more efficient drainage. However, increased flooding, streambank erosion and channel instability often occur in downstream areas after channelization has occurred. Direct or immediate biological effects of channelization include injury and mortality of aquatic insects, fish, shellfish/mussels and other wildlife populations, as well as habitat loss. Indirect biological effects include changes in the aquatic insect, fish and wildlife community structures, favoring species that are more tolerant of or better adapted to the altered habitat (McGarvey, 1996).

#### *Typical Channel Modifications*

- ❑ Remove any obstructions, natural or artificial, that inhibit a stream's capacity to convey water (also referred to as clearing and snagging).
- ❑ Widening, deepening or straightening the channel to maximize water movement away from the land surface.
- ❑ Lining the stream channel or streambanks with rock or other resistant material.

### 6.2.5 NUTRIENTS

Nutrients refer to the elements phosphorus and nitrogen, both of which are common components of fertilizers, animal and human wastes, vegetation, aquaculture and some industrial processes. Both point and nonpoint sources contribute to the phosphorus and nitrogen levels in surface water. Sources include agricultural and urban runoff, wastewater treatment plants, forestry

activities and atmospheric deposition. Nutrients in nonpoint source runoff come mostly from fertilizer and animal wastes. Nutrients in point source discharges typically come from human waste, food residues, cleaning agents and industrial processes.

Nutrients are beneficial to aquatic life in small amounts, but excessive nutrient concentrations can stimulate algal blooms and plant growth in ponds, lakes, reservoirs and estuaries. Through respiration and decomposition, algal blooms can deplete the water column of dissolved oxygen and contribute to serious water quality problems. In addition, algal blooms are aesthetically undesirable, cause an unbalanced food web, impair recreational uses of surface waters, impede commercial fishing and pose problems for water treatment systems.

Nutrient sensitive water (NSW) is a supplemental water classification applied to waters that are experiencing, or are subject to, excessive growths of microscopic or macroscopic vegetation. The NC Environmental Management Commission (EMC) defines excessive vegetation growth as growth, which can substantially impair the use of a waterbody as determined by the classification applied to that waterbody.

NSW may include any or all waters within a river basin that the EMC deems necessary to effectively control excessive growths of aquatic vegetation. For the purposes of this classification, "nutrients" refers to phosphorus and nitrogen, although other nutrients or chemicals may be specified if it is determined that they are essential to the growth of aquatic vegetation.

No increase in nutrients over background levels is allowed within NSW waters unless it can be shown that: (1) the increase is the result of natural variations; (2) the increase will not endanger human health, safety or welfare; and (3) preventing the increase would cause a serious economic hardship without equal or greater public benefits. In North Carolina, Nutrient Management Strategies have been implemented in the Tar-Pamlico and Neuse River basins. The Chowan River basin, the New River watershed in the White Oak River basin and the Jordan Lake watershed in the Cape Fear River basin are also designated NSW. BMPs must be implemented to prevent nutrient impacts to surface water quality.

### **6.2.6 BACTERIA**

Fecal coliform bacteria live in the digestive tract of warm-blooded animals. They are excreted in the solid waste of humans and other mammals. In themselves, fecal coliform do not pose a danger to people or animals. Where fecal coliform are present, however, disease-causing bacteria may also be present and water that is polluted by animal and/or human waste can harbor other pathogens that may threaten human health.

Under favorable conditions, fecal coliform bacteria can survive in bottom sediments for an extended period of time (Howell *et al.*, 1996; Sherer *et al.*, 1992; Schillinger and Gannon, 1985). Therefore, bacterial levels measured in the water column can reflect both recent inputs as well as the resuspension of older inputs.

Improperly designed or managed animal waste operations are a potential source of fecal coliform bacteria in many sections of the state. Livestock in streams and stormwater runoff from pasturelands are also potential sources for fecal coliform bacteria. Limiting direct, easy access to streams can dramatically reduce impacts from bacteria, and there are several rules and regulations that facilities must follow when dealing with animal waste issues.

## **6.3 RULES AND REGULATIONS**

There are approximately 18,800 concentrated animal feeding operations (CAFOs) in the United States. They can contribute up to 60 percent of all manure generated by operations that confine animals. Poorly managed CAFOs may threaten water quality and public health by releasing pollutants into the environment through spills, overflows and runoff (EPA, June 2006). Several federal and state rules and regulations are in place to prevent CAFOs from impacting water quality.

### **6.3.1 FEDERAL REGULATIONS**

The federal Clean Water Act created the National Pollution Discharge Elimination System (NPDES) Program "to protect and improve water quality by regulating point source dischargers." The Act defines a CAFO as a point source; therefore, general and/or individual permits are required under the NPDES Program. National Effluent Limitation Guidelines were also established. In February 2003, EPA issued a revised rule that included requirements to address the land application of manure from CAFOs. It required all large and medium CAFOs that discharge manure, litter or process wastewater to the nation's waters apply for an NPDES permit. The rules became effective in April 2003. Authorized NPDES states were required to modify their programs by February 2005 and develop state technical standards. The final 2003 rule can be found on the EPA Web site ([http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm?program\\_id=7](http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm?program_id=7)).

EPA recently proposed to revise the NPDES permitting requirements and effluent limitations for CAFOs. The proposal would revise several aspects of the current regulations governing CAFOs.

- ❑ EPA proposes to require only the owners and operators of those CAFOs that discharge or propose to discharge to apply for a NPDES permit. Those CAFOs that land apply manure, litter or processed wastewater would not be required to obtain an NPDES permit if the only discharge from those facilities is agricultural stormwater.
- ❑ EPA proposes to require greater public participation in the issuance of an NPDES permit by requiring CAFOs seeking coverage under a permit to submit a facility-specific nutrient management plan (NMP) with their permit application or notice of intent. Permitting authorities are also required to incorporate terms of the NMP into the permits as enforceable elements.
- ❑ EPA proposes to authorize permit writers, upon request by a CAFO, to establish best management, zero discharge effluent limitations when the facility demonstrates that it has designed an open containment system that will comply with the no discharge requirements.

The proposed rule modification was the result of decisions by the Second Circuit Court of Appeals decision in *Waterkeeper Alliance et al. v. EPA*. The changes further the statutory goal of restoring and maintaining the nation's water quality and effectively ensuring that CAFOs properly manage on-site waste and manure (<http://cfpub.epa.gov/npdes/afo/aforule.cfm>).

### **6.3.2 NORTH CAROLINA WATER QUALITY REGULATIONS**

Over the years, key legislative bills were introduced and approved to regulate CAFOs in the State of North Carolina. Original rules for animal waste management systems were set forth under 15A NCAC 02H .0200 (<http://h2o.enr.state.nc.us/admin/rules/2H.0200.pdf>) – Waste Not Discharged to Surface Waters. These rules identified the requirements and procedures for the application and issuance of permits for animal waste management systems. Subchapter 02H .0200 also sets forth requirements and procedures for other non-discharge systems including wastewater collection systems, wastewater residuals and other non-discharge systems including wastewater irrigation, reclaimed water utilization, groundwater remediation and soil remediation projects.

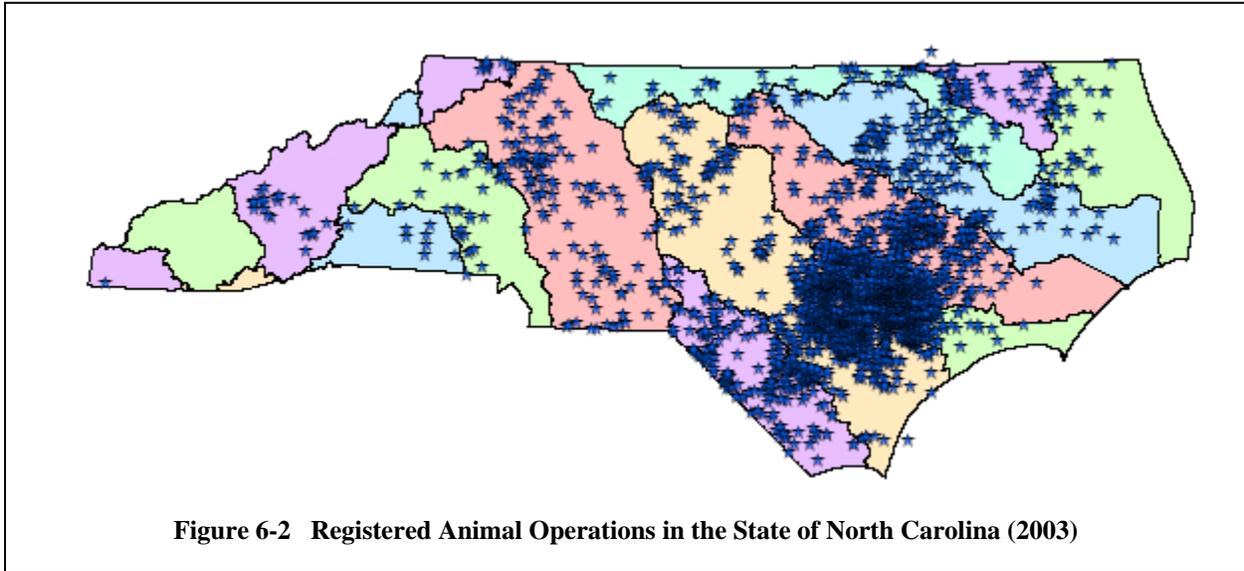
In May 2006, the Environmental Management Commission (EMC) adopted Title 15A Subchapter 02T ([http://h2o.enr.state.nc.us/admin/rules/documents/2Tbook\\_000.pdf](http://h2o.enr.state.nc.us/admin/rules/documents/2Tbook_000.pdf)). The subchapter replaced 15A NCAC 02H .0200 and Rules 15A NCAC 02H .0122 – Concentrated Animal Feeding Operations – and 15A NCAC 02H .0123 – Requirements: Evaluating Feedlot Permit Applications. The rules reflect current policy and provide routine consideration of an applicant's compliance status. Section .1300 of Subchapter 02T applies to all persons proposing to construct, modify, expand or operate an animal waste management system. Animal waste is defined as livestock or poultry excreta or mixture of excreta with feed, litter, bedding or other material generated at a feedlot. Animal waste management systems are defined as a combination of structural and nonstructural practices that collect, treat, store or apply animal waste to the land. An animal waste management plan is defined as a plan to properly collect, store, treat or apply animal waste to the land in an environmentally safe manner developed in accordance with the General Statute §143-215.10C ([www.ncleg.net/EnactedLegislation/Statutes/HTML/BySection/Chapter\\_143/GS\\_143-215.10C.html](http://www.ncleg.net/EnactedLegislation/Statutes/HTML/BySection/Chapter_143/GS_143-215.10C.html)).

### **6.3.3 PERMITS ISSUED BY DWQ**

In 2003, there were 2,461 registered animal operations required to obtain a permit from DWQ (Figure 6-2). DWQ has issued state non-discharge permits for swine, cattle, dairy and poultry operations since 1997. Non-discharge permits are issued to those animal operations that land-apply treated effluent. Instead of discharging treated wastewater to the nearest waterbody, it is discharged to a spray irrigation system, rapid infiltration basin or trickling system. Rapid infiltration systems are designed to have a much more intense and higher rate of land application compared to spray irrigation. Most rapid infiltration systems are located in the sandy regions of the state where soils can handle an increased application volume.

Trickling systems, which are typically used for lower effluent volumes are located statewide. Animal waste management plans must meet standards adopted by the USDA NRCS or the Soil

and Water Conservation Commission (SWCC) and adhere to all applicable state statutes and rules at the time of development and design. The practices must provide water quality protection and should not be applied above agronomic rates (15A NCAC 02T .1304).



Facilities with more than 2,500 swine, 1,000 slaughter and feeder cattle, 700 mature dairy cows or 30,000 laying hens or broilers which discharge or propose to discharge waste to surface waters are required to obtain an NPDES general or individual permit. Facilities with fewer numbers of animals that discharge or propose to discharge waste to surface waters are also required to obtain an NPDES permit under new guidance by the EMC. The permit must comply with both state and federal requirements and reflect effluent limitations based on technological capability, water quality standards and more stringent state requirements.

General permits are issued to facilities that involve the same or substantially similar operations, have similar discharge characteristics, require the same effluent limitations or operating conditions, and require the same or similar monitoring. The basis for the animal waste NPDES general permits can be found in the North Carolina General Statutes 143-215.1 ([http://www.ncleg.net/EnactedLegislation/Statutes/HTML/BySection/Chapter\\_143/GS\\_143-215.1.html](http://www.ncleg.net/EnactedLegislation/Statutes/HTML/BySection/Chapter_143/GS_143-215.1.html)) and 143-215.10C ([http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter\\_143/GS\\_143-215.10C.html](http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_143/GS_143-215.10C.html)). Under new guidance by the EMC, the general permits now incorporate federal requirements and includes additional operational, monitoring and reporting requirements.

Individual permits may be required if the facility is a significant contributor of pollutants to waters of the state; conditions of the permitted facility have changed, altering the constituents or characteristics of the wastewater; noncompliance with the general permit or with DWQ rules; and/or technology or practices to control or abate applicable pollutants changed. Individual permits may also be issued if it has been determined that there is the potential for direct discharge of wastewater, sludge or residuals to waters of the state. Factors considered when making this determination include: chronic flooding (100-year floodplain); staging areas located in or near a wetland; and land application adjacent to water of the state, with special emphasis on

Outstanding Resource Waters, shellfish waters, critical habitats, water supply watersheds, wild and scenic rivers and waters listed as impaired for nutrients or other pollutants found in animal wastes. Both permits become effective on July 1, 2007 and will be applicable for five years. Each facility will be covered under an animal waste permit by issuance of a certificate of coverage (COC). More information on NPDES permits can be found on the DWQ Aquifer Protection Section, Animal Feeding Operations Unit (AFOU) Web site ([http://h2o.enr.state.nc.us/aps/afou/afou\\_home.htm](http://h2o.enr.state.nc.us/aps/afou/afou_home.htm)).

#### **6.3.4 OPERATOR TRAINING AND CERTIFICATION**

The Technical Assistance and Certification Unit (<http://h2o.enr.state.nc.us/tacu/index.html>) of the DWQ Office of Personnel, Training and Information Management (PTIM) Section (<http://h2o.enr.state.nc.us/PTIMHome.htm>) is responsible for administering the training and certification program for operators of animal waste management systems. The purpose of the program is to reduce nonpoint source pollution associated with the operation of animal waste management systems. Senate Bill 974 §143-215.74C-E (<http://www.ncga.state.nc.us/Sessions/1995/Bills/Senate/HTML/S974v7.html>) specifically notes that animal operations with 250 or more swine are required to designate an Operator or Charge who is responsible for the operation of the animal waste management system. Rule 15A NCAC 08F .0203 identifies additional animal operations required to obtain permits and/or designate operator responsibilities.

Working with representatives from the animal agriculture industry, environmental groups, North Carolina Department of Agriculture & Consumer Service (NCDA&CS), NRCS, NC Division of Soil and Water Conservation (DSWC), NC Cooperative Extension Service and DWQ, an instruction manual and exam questions were developed for the training and certification program. Individuals who wish to become certified animal waste management system operators must attend a minimum of ten training hours and demonstrate competence in the operation of animal waste management systems by passing an examination. More information about training and certification can be found on the PTIM Web site (<http://h2o.enr.state.nc.us/tacu/aniwaste.html>). To date, approximately 2,500 animal operations statewide are required to designate a Certified Operator.

#### **6.3.5 NORTH CAROLINA PESTICIDE LAW OF 1971**

The North Carolina Pesticide Law of 1971, G.S. 143-434, Article 52 ([http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/ByArticle/Chapter\\_143/Article\\_52.html](http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/ByArticle/Chapter_143/Article_52.html)) (§143-434 through §143-470.1), establishes programs of pesticide management and control under the authority of the North Carolina Pesticide Board. The purpose of the Law is to protect the health, safety and welfare of the people of this State, and to promote a more secure, healthy and safe environment for all people of the state. This is accomplished by regulation in the public interest of the use, application, sale, disposal and registration of pesticides. The law also requires the registration of pesticide products in the state, the licensing and certification of commercial and private applicators and pest control consultants, the proper handling, transportation, storage and disposal of pesticides, and the licensing of dealers selling restricted use pesticides.

Under the NC Department of Agriculture & Consumer Services (NCDA&CS) Division of Structural Pest Control and Pesticides, the Pesticide Section is responsible for enforcement on the 1971 Pesticide Law through inspections and investigations. All commercial storage facilities and pesticide applicators that store restricted-use pesticides must have an approved pre-fire plan and an annual inspection by a local fire department and/or emergency services office. In addition, each commercial storage facility and pesticide applicator storing at least 10,000 pounds of restricted-use pesticides at any one time must have a board-approved contingency plan that describes the actions facility personnel will take in the event of fires, explosions, spills or any other sudden release of pesticides or pesticide contaminated materials to air, soil or surface water.

The NCDA&CS Pesticide Section has also been involved in a groundwater-monitoring program to determine the impact of pesticides on this valuable resource. The section has been conducting private domestic drinking water well surveys in order to protect human health and to find additional locations to study by installing new monitoring wells. Data will be used in the development of Pesticide Management Plans for the protection of groundwater resources as required by the USEPA. More information can be found on the NCDA&CS Pesticide Section Web site (<http://www.ncagr.com/str-pest/pesticides/>).

## **6.4 REDUCING AGRICULTURAL IMPACTS TO WATER QUALITY – BEST MANAGEMENT PRACTICES AND FUNDING OPPORTUNITIES**

To address agricultural impacts to water quality, the State of North Carolina encourages voluntary participation in the protection of land and water resources through the installation and implementation of best management practices (BMPs) and conserving working lands. This approach is supported by financial incentives, technical and educational assistance, research and regulatory programs at the federal and state level.

### **6.4.1 USDA NRCS ENVIRONMENTAL QUALITY IMPROVEMENT PROGRAM (EQIP)**

The Environmental Quality Incentives Program (EQIP) is a voluntary program that provides assistance to farmers and ranchers who face threats to soil, water, air and other related natural resources on their land. Through EQIP, NRCS provides assistance to agricultural producers in a manner that will promote agricultural production and environmental quality as compatible goals, optimize environmental benefits and help farmers and ranchers meet federal, state, tribal and local environmental requirements. The 2002 Farm Bill reauthorized national EQIP funding at \$6.16 billion over the six-year period of FY 2002 through FY 2007. Program priorities are as follows:

- ❑ Reduction of nonpoint source pollution including nutrients, sediment, pesticides and excess salinity in impaired watersheds consistent with total maximum daily loads (TMDLs) where available; reduction of groundwater contamination; and reduction of point source pollution including contamination from CAFOs.

#### ***North Carolina EQIP Funding 2000-2005***

<b>2000:</b>	\$1.1 Million
<b>2001:</b>	\$3.5 Million
<b>2002:</b>	\$7.1 Million
<b>2003:</b>	\$10.0 Million
<b>2004:</b>	\$13.2 Million
<b>2005:</b>	\$14.3 Million

- ❑ Conservation of ground and surface water resources.
- ❑ Reduction of emissions including particulate matter, nitrogen oxides (NO<sub>x</sub>), volatile organic compounds and ozone precursors and depleters that contribute to air quality impairment violations of National Ambient Air Quality Standards.
- ❑ Reduction in soil erosion and sedimentation.
- ❑ Promotion of at-risk species habitat conservation.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practice and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed \$450,000 for all EQIP contracts entered during the term of the Farm Bill. More information about EQIP can be found on the NRCS Web site ([www.nc.nrcs.usda.gov/programs/EQIP/index.html](http://www.nc.nrcs.usda.gov/programs/EQIP/index.html)).

#### **6.4.2 CONSERVATION RESERVE PROGRAM (CRP)**

The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. Through CRP, a farmer can receive annual rental payments and cost-share assistance to establish long-term, resource-conserving covers on eligible farmland. The Commodity Credit Corporation (CCC) makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years.

CRP protects millions of acres of American topsoil from erosion and is designed to safeguard the Nation's natural resources. By reducing water runoff and sedimentation, CRP protects groundwater and helps improve the condition of lakes, rivers, ponds and streams. Acreage enrolled in the CRP is planted to resource-conserving vegetative covers, making the program a major contributor to increased wildlife populations in many parts of the country.

The USDA Farm Service Agency (FSA) administers CRP. Technical support functions are provided by NRCS, USDA's Cooperative State Research, Education and Extension Services, state forestry agencies, local SWCDs and private sector providers of technical assistance.

Monthly reports by the USDA show that as of September 2006, there are 137,600 acres of farmland and 5,824 farms in North Carolina enrolled in CRP. More information on CRP can be found on the USDA FSA Web site

([www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp](http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp)) or on the NRCS Programs Web site ([www.nrcs.usda.gov/programs/crp/](http://www.nrcs.usda.gov/programs/crp/)).

### **6.4.3 CONSERVATION RESERVE ENHANCEMENT PROGRAM (CREP)**

The Conservation Reserve Enhancement Program (CREP) is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat and safeguard ground and surface water. The program is a partnership among producers including tribal, state and federal governments and in some cases, private groups. CREP is an offshoot of the country's largest private-lands environmental improvement program - the Conservation Reserve Program (CRP). Like CRP, USDA's Farm Service Agency (FSA) administers CREP. By combining CRP resources with state, tribal, and private programs, CREP provides farmers and ranchers with a sound financial package for conserving and enhancing the natural resources of farms.

Enrollment in a state is limited to specific geographic areas and practices. A specific CREP project begins when a state, Indian tribe, local government or local nongovernmental entity identifies an agriculture-related environmental issue of state or national significance. The involved parties and FSA then develop a project proposal to address particular environmental issues and goals. CREP is a cost-effective way to address rural environmental problems and meet regulatory requirements. It also provides a viable option to supplement farm income. Other benefits include:

- ❑ CREP is convenient for producers because it is based on the familiar, highly successful CRP model. Land must be owned or leased for at least one year prior to enrollment to be eligible, and must be physically and legally capable of being cropped in a normal manner.
- ❑ Land must also meet cropping history and other eligibility requirements. Enrollment can be on a continuous basis, permitting farmers and ranchers to join the program at any time rather than waiting for specific sign-up periods. CREP supports increased conservation practices such as filter strips and forested buffers. These conservation practices help protect streams, lakes, and rivers from sedimentation and agricultural runoff.
- ❑ CREP also helps landowners develop and restore wetlands through the planting of appropriate groundcover. Restoring water regimes helps protect national treasures like the Chesapeake Bay, Mammoth Cave, and the Florida Everglades. By maintaining clear goals and requiring annual monitoring, CREP helps participants measure progress and ensure success.
- ❑ CREP addresses high-priority conservation issues of both local and national significance, such as impacts to water supplies, loss of critical habitat for threatened and endangered wildlife species, soil erosion, and reduced habitat for fish populations such as salmon. CREP is a community-based, results-oriented effort centered around local participation and leadership.

In North Carolina, CREP is a joint effort of the DSWC (<http://www.enr.state.nc.us/DSWC/index.html>), the NC Clean Water Management Trust Fund (<http://www.cwmtf.net/>) (CWMTF), the Ecosystem Enhancement Program (EEP) (<http://www.nceep.net/>), and USDA FSA (<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=landing&topic=landing>). Like the NC Agricultural Cost Share Program (NCACSP) (Section 6.4.4), it is a voluntary program that seeks to protect lands along waterbodies that are currently in agricultural production. Objectives for CREP in North Carolina include: installing 100,000 acres of forested riparian buffers (<http://www.soil.ncsu.edu/publications/BMPs/buffers.html>), grassed filter strips and wetlands; reducing the impacts of sediment and nutrients within the targeted areas; and providing substantial ecological benefits for many wildlife species that are declining in part as a result of habitat loss. Program funding will combine the CRP funding with State funding from the CWMTF, NCACSP (<http://www.enr.state.nc.us/DSWC/pages/agcostshareprogram.html>) and the NC EEP.

Under CREP, landowners can voluntarily enroll eligible land in 10-year, 15-year, 30-year or permanent contracts. The state will pay additional bonuses to landowners that enroll land in 30-year or permanent agreements. Cost sharing will be available for installation of forested riparian buffers, grassed filter strips, wetlands restoration practices, water control structures, livestock exclusion, and remote livestock watering in order to increase the efficiency of enrolled practices. Interested landowners should contact their local DSWC or USDA Farm Service Agency Office (<http://www.fsa.usda.gov/edso>). More information about CREP can be found on the DSWC Web site (<http://www.enr.state.nc.us/DSWC/pages/crep.html>) and on the USDA FSA Web site (<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=cep>).

#### **6.4.4 NC AGRICULTURAL COST SHARE PROGRAM (NCACSP)**

The NC Agricultural Cost Share Program (NCACSP) was established in 1983 to help reduce agricultural nonpoint runoff into the state's waters. The program helps owners and renters of established agricultural operations improve their on-farm management by using BMPs and include vegetative, structural or management systems that can improve the efficiency of farming operations while reducing the potential for surface and groundwater pollution. The Division of Soil and Water Conservation (DSWC) implements the NCACSP. The BMPs are divided into five main purposes or categories:

- ❑ *Erosion Reduction/Nutrient Loss Reduction in Fields*  
Erosion/nutrient management measures include planned systems for reducing soil erosion and nutrient runoff from cropland into streams. Practices include: critical area planting, cropland conversion, water diversion, long-term no-till, pastureland conversion, sod-based rotation, stripcropping, terraces and Christmas tree conservation cover.
- ❑ *Sediment/Nutrient Delivery Reduction from Fields*  
Sediment/nutrient management measures include planned systems that prevent sediment and nutrient runoff from fields into streams. Practices include: field borders, filter strips, grassed waterways, nutrient management strategies, riparian buffers, water control structures, streambank stabilization and road repair/stabilization.

- ❑ *Stream Protection from Animals*  
Stream protection management measures are planned systems for protecting streams and streambanks. Such measures eliminate livestock access to streams by providing an alternate watering source away from the stream itself. Other benefits include: reduced soil erosion, sedimentation, pathogen contamination and pollution from dissolved, particulate and sediment-attached substances. Practices include: heavy use area protection, livestock exclusion (i.e., fencing), spring development, stream crossings, trough or watering tanks, wells and livestock feeding areas.
- ❑ *Animal Waste Management*  
A waste management system is a planned system in which all necessary components are installed for managed liquid and solid waste to prevent or minimize degradation of soil and water resources. Practices include: animal waste lagoon closures, constructed wetlands, controlled livestock lounging area, dry manure stacks, heavy use area protection, insect and odor control, stormwater management, waste storage ponds/lagoons, compost and waste application system.
- ❑ *Agricultural Chemical (Agrichemical) Pollution Prevention*  
Agrichemical pollution prevention measures involve a planned system to prevent chemical runoff to streams. Practices include: agrichemical handling facilities and fertigation/ chemigation back flow prevention systems.

The NCACSP is a voluntary program that reimburses farmers up to 75 percent of the cost of installing an approved BMP. The remaining 25 percent is paid by the landowner or through in-kind contributions. The cost share funds are paid to the farmer once the planned BMP is completed, inspected and certified. The BMP must be installed according to NCACSP standards.

Cost Share allocation and funding decisions by District Boards are based on their written strategy plans. After receiving their allocation, District Boards review applications from landowners for Cost Share funding and decide who will be funded for BMP installation. The written strategy plans are used to prioritize the BMPs in terms of effectiveness for water quality protection. District Boards are encouraged to place the highest priority on the most cost effective water quality protection measures.

Since the first cost share contracts were issued in 1984, there have been approximately 45,241 contracts approved for installing BMPs through the end of the 2005 program year. It has been estimated that an average of 7.2 million tons of soil have been saved annually during the life of the program. Additional accomplishments include (1984-2005):

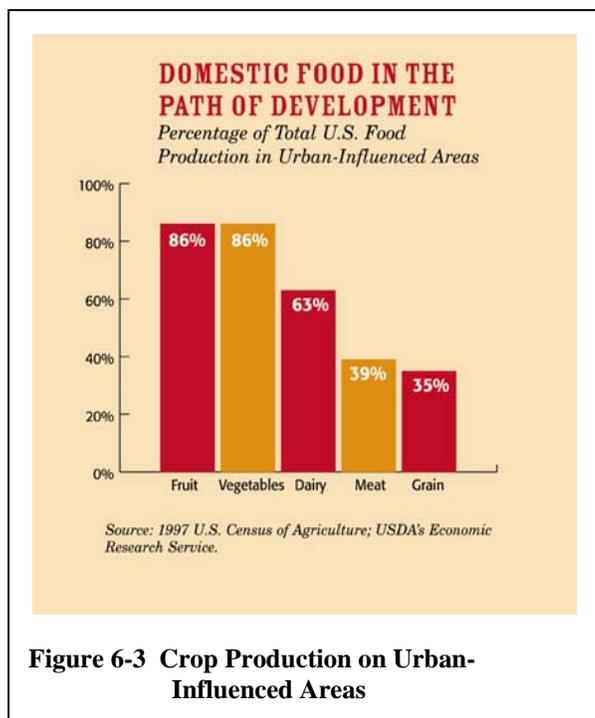
- ❑ Converted 117,143 acres of cropland to trees or grass.
- ❑ Installed 4,829,540 feet of fence to exclude livestock from streams.
- ❑ Constructed 3,870 waste management structures to properly store and dispose of animal waste.
- ❑ Installed 15,426 acres of grassed waterways and field borders to prevent sediment and nutrient delivery to streams, lakes and estuaries.

In 2004-2005 fiscal year, NCACSP received \$7.3 million in state appropriations. The \$7.3 million include \$2.1 million for technical assistance funding. The program cost shared 123 full and part-time technical positions to plan, design and install agricultural BMPs to improve water quality. NCASCP is currently budgeted for \$7.3 million in non-reverting, recurring funds. More information about the NCACSP and BMPs eligible for cost sharing can be found on the DSWC Web site (<http://www.enr.state.nc.us/DSWC/pages/agcostshareprogram.html>).

#### 6.4.5 WORKING LANDS AND CONSERVATION BENEFITS

Working Lands are used for agriculture, forestry or other natural resource industries. Well-managed working lands provide important non-market goods and services. For example, farms, ranches and forestlands provide food and cover for wildlife, help control flooding, protect wetlands and watersheds and maintain air quality. They can absorb and filter wastewater, runoff and provide groundwater recharge.

Rapid urbanization is forcing the conversion of working lands to developed land at an astonishing rate in North Carolina. From 1992 to 1997, over 170,000 acres of agricultural land was converted to developed land. That was the 12<sup>th</sup> highest rate in the nation. The figures for Prime Farmland, the best land for growing crops, are even more disturbing. North Carolina is losing prime farmland at the fourth fastest rate in the nation (USDA, 2001). The 1997 U.S. Census of Agriculture shows that a large percentage of cropland is in urban-influenced areas, making them prime targets for development (Figure 6-3). It is well established that developed land negatively impacts water quality; therefore, preserving North Carolina's working lands should be a priority (Figure 6-4).



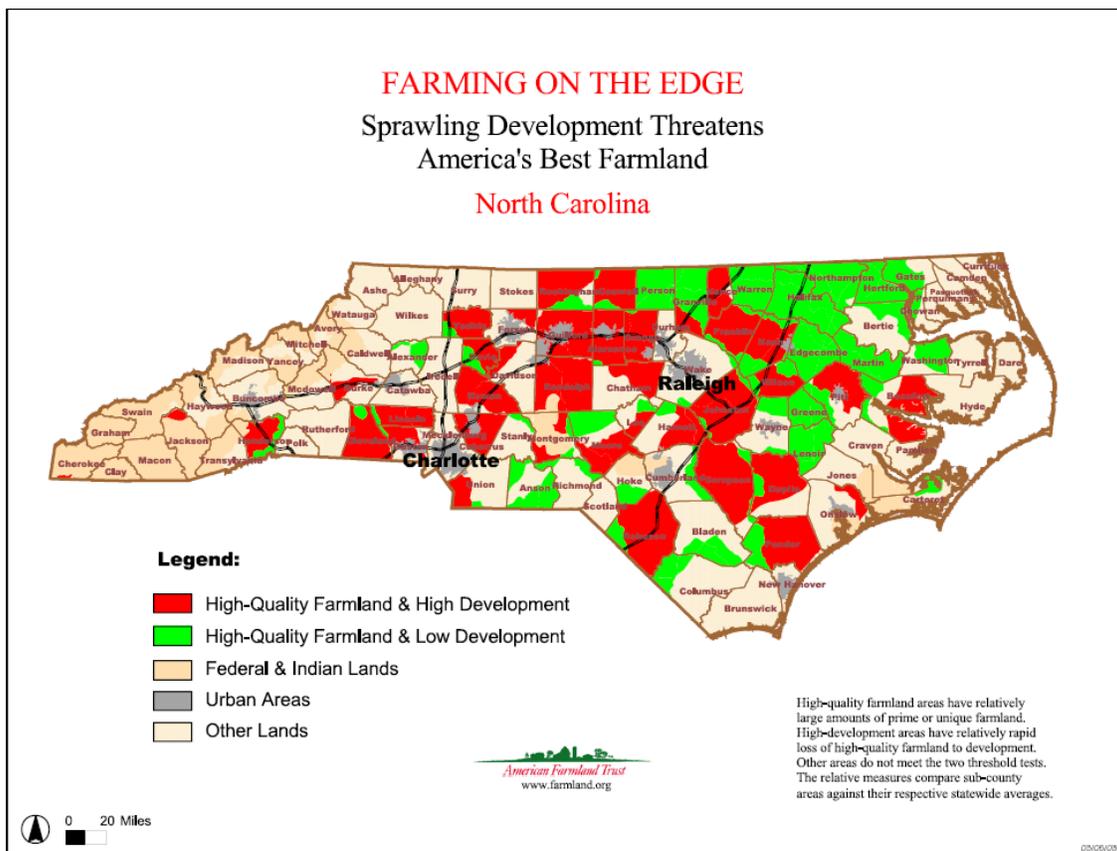
**Figure 6-3 Crop Production on Urban-Influenced Areas**

The value of specific working lands can be calculated for any watershed by performing a Cost of Community Services (COCS) study. COCS studies are a case study approach used to determine a community's public service costs versus revenues based on current land use. Their particular niche is to evaluate the overall contribution of agricultural and other open lands on equal ground with residential, commercial and industrial development.

As of January 2002, 83 COCS studies conducted in 19 states found that tax and other revenues collected from farm, ranch and forest landowners more than covered the public service costs these lands incur. COCS studies show that on average, residential development generates significant tax revenue but requires costly public services that typically are subsidized by revenues from commercial and industrial land uses. The special contribution of COCS studies is that they show that farm, ranch, and forestlands are important commercial land uses that help balance community budgets. Working lands are not just vacant land waiting to be developed (Freedgood et al., 2002).

A recent analysis of the fiscal impact of different land uses in Macon County, North Carolina demonstrates the cost-saving benefits to the county of maintaining farmland and open space. Using county budget data and tax data from fiscal year 2000, the study indicates that typical residential and commercial properties cost the county budget by demanding more in tax-supported services than they contribute in property tax revenues. Such services include schools, roads, water and sewer lines, fire and police protection and social and administrative services. On the other hand, the typical farmland/open-space parcel contributed more property tax to the county budget than it demanded in expenditures for county services. Analyzing a scenario of a 30-acre parcel of farmland/open-space, the study estimated that the county budget would gain \$290 if the land remained as farmland, but would lose a net \$532 if converted to ten 3-acre lots with houses on them (Jones and Kask, 2001).

The opportunities for private landowners to protect working lands are growing. North Carolina cities and counties have now begun to use the new set of farmland protection tools authorized by the General Assembly in 2005 through Session Law 2005-390. Along with an expanded definition of agriculture and a revamped Agricultural Development and Farmland Preservation Trust Fund, this legislation authorized a new category for localities to promote the stability of their agricultural sectors. Counties and municipalities now have the authority to create an Enhanced Voluntary Agricultural District (EVAD) option, which offers an increased set of incentives for landowners to restrict development over a ten-year period. Polk County in the



**Figure 6-4 North Carolina's High Quality Farmland and High Development Areas**

mountains and Wentworth in the Piedmont are amongst the first jurisdictions in the state to utilize this new tool, with the recent adoption of local EVAD ordinances. Landowners interested in working land protection should contact their local land trust, NRCS field representative or SWCD. The Farmland Information Center is also an excellent online resource ([www.farmlandinfo.org/](http://www.farmlandinfo.org/)). Local government officials interested in the value of working land conservation should visit the Land Trust Alliance’s Economic Benefits of Open Space Protection Web site ([www.lta.org/resources/economic\\_benefits.htm](http://www.lta.org/resources/economic_benefits.htm)).

#### 6.4.6 NRCS WETLANDS RESERVE PROGRAM (WRP)

The Wetlands Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect, restore and enhance wetlands on their property. It was established by the 1990 Farm Bill with the goal to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. The USDA NRCS provides technical and financial support to help landowners with their wetland restoration efforts and offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

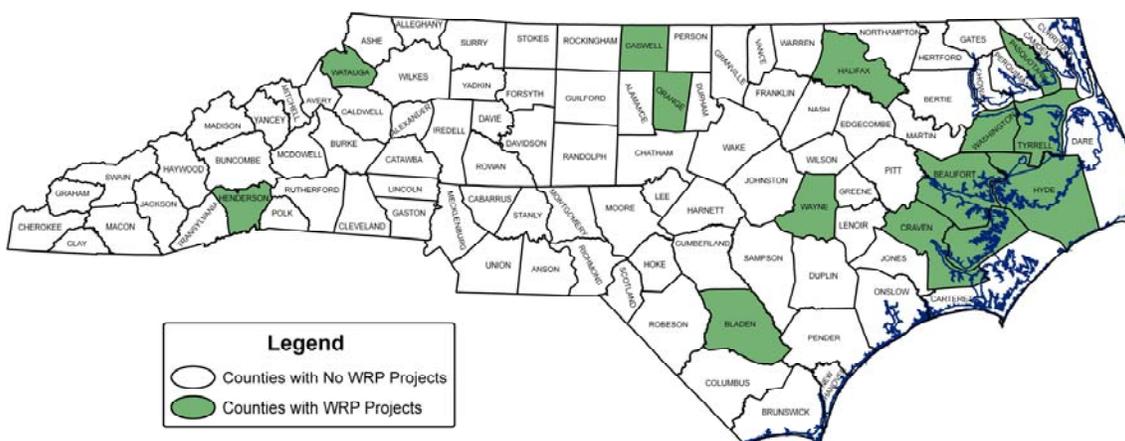


Figure 6-5 Wetland Reserve Programs in North Carolina

The program has become a popular, cost-effective and ecologically successful voluntary, incentive-based wetlands restoration and conservation program. WRP provides incentives to farmers and ranchers to stop cultivating areas that were once wetlands and make them wetlands again. WRP met the acreage limit established prior to the 2002 Farm Bill. Consequently, Congress raised the program’s total acreage enrollment limit to 2,275,000 acres. This action enables WRP to continue to be a viable option for the nation’s private landowners who want to restore wetlands through 2007. As of fiscal year 2004, 8,396 projects have been enrolled on 1,633,398 acres. Landowner interest in the program remains strong. NRCS anticipates enrolling 154,500 acres in fiscal year 2005.

Landowners have three program participation options: (1) short-term 10-year restoration cost-share agreements, (2) mid-term 30-year conservation easements or (3) permanent easements. NRCS provides financial assistance in the form of easement payments, restoration cost-share assistance and technical assistance for restoration and wetland management.

Enrolled lands are mostly marginal, high-risk, flood prone restorable agricultural wetlands. All states and Puerto Rico have active WRP projects. The top 10 states in terms of enrollment are Louisiana, Arkansas, Mississippi, California, Florida, Missouri, Iowa, Texas, Minnesota and Oklahoma. Nationally, the full average project cost per acre is approximately \$1,470. In FY 2004 the average project size was approximately 188 acres.

Landowners participating in WRP continue to control access, have use of non-developed recreational activities, such as hunting and fishing, and maintain the right to lease the recreational uses of their land for financial gain. At any time during the contract period, landowners may request NRCS approval of other uses that are compatible with wetland and wildlife conservation objectives of the program. WRP funds and subsequent lease revenue provide financial relief to landowners and reduce future disaster assistance needs.

As of FY 2003, 28,773 acres have been enrolled in the WRP in North Carolina (Figure 6-5). More information on WRP can be found on the NRCS Programs Web site ([www.nrcs.usda.gov/programs/wrp/](http://www.nrcs.usda.gov/programs/wrp/)).

#### **6.4.7 SOIL TESTING AND WASTE ANALYSIS**

The Agronomic Division, Plant/Waste/Solution Section of the NCDA&SC provides analytical and advisory services to protect soil and water resources and improve agricultural productivity and efficiency. Soil testing and waste analyses are the basic tools needed to responsibly apply waste and other nutrient-bearing materials on agricultural land while protecting the State's natural resources.

Soil testing determines fertility status and nutrient requirements. A waste analysis indicates usability of by-products as nutrient sources and predicts nutrient availability. Plant analysis determines nutritional status of growing crops and the effectiveness of fertilizer programs in meeting crop requirements. Solution analysis indicates quality of surface and groundwater supplies and usability in agricultural production.

Agronomic Division services can be effective in solving crop production problems and ensuring optimum yield, quality and efficiency. They are also critical in monitoring soil and water resources and environmental stewardship. Division field advisory services provide a staff of agronomists for site-specific implementation of recommendations and assistance in crop production and waste utilization. More information on soil, waste and solution analysis can be found on the Agronomic Division Web site (<http://www.ncagr.com/agronomi/pwshome.htm>).

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