APPENDIX VI

LISTS OF BEST MANAGEMENT PRACTICES (BMPs) FOR:

- Agriculture
- Urban Runoff
- Sedimentation and Erosion Control
- Onsite Wastewater Disposal
- Forestry
- Mining

Note: The BMPs lists included in this appendix were excerpted from a document entitled North Carolina Nonpoint Source Management Program (Report 89-02). The document was prepared by the North Carolina Department of Environment, Health, and Natural Resources, Division of Environmental Managment, Water Quality Section.

Agricultural Best Management Practices

Table 4. BMPs for Agriculture

I. Crop and Pasture Lands

A. <u>BMPs for sediment control</u>

Conservation Tillage System
Critical Area Planting
Cropland Conversion
Diversion
Field Border
Filter Strip
Grade Stabilization Structure
Grassed Waterway
Rock-lined Waterways or Outlets
Sediment Control Structure
Sod-based Rotation
Stripcropping
Terrace
Water Control Structure
Pastureland Conversion

B. <u>BMPs for nutrient control</u>

Legumes in Rotation
Soil Testing
Liming
Setting Realistic Crop Yield Goals (determines fertilization rates)
Fertilizer Waste Application (method, rate, and timing)
Sediment Control BMP's

C. <u>BMPs for pesticide control</u>

Alternative Pesticides
Optimize Pesticide Formulation, Amount, Placement Timing, Frequency
Crop Rotation
Resistant Crop Varieties
Other Cultural or Biological Controls
Optimize Crop Planting Time
Plant Pest Quarantines
Proper Disposal of Obsolete Pesticides and Containers
Certification of Applicators
Sediment Control BMP's

Table 4 Cont.

II. Animal Production (esp. Confined Animal Operations)

BMPs for bacteria and nutrient control

Grade Stabilization Structures
Heavy Use Area Protection
Livestock Exclusion
Spring Development
Stock Trails and Walkways
Trough or Tank
Waste Management System
Waste Storage Pond
Waste Storage Structure
Waste Treatment Lagoon
Land Application of Waste
Water Control Structure

Table 5
BEST MANAGEMENT PRACTICES ELIGIBLE FOR COST SHARING
UNDER THE AGRICULTURE COST SHARE PROGRAM

Practice	Minimum Life Expectancy (years)
Conservation Tillage System	1
Critical Area Planting	10
Cropland Conversion (Trees, Grasses, or Permanent Wildlife Plantings)	10
Diversion	10
Field Border	10
Filter Strip	10
Grassed Waterway	10
Heavy Use Area Protection	10
Livestock Exclusion	10
Pastureland Conversion	10
Rock-lined Waterway or Outlet	10
Sediment Control Structure	10
Sod-based Rotation	4 or 5
Spring Development	10
Stock Trails and Walkways	10
Stripcropping	5
Terrace	10
Trough or Tank	10
Waste Management System	10
Waste Storage Pond	10
Waste Storage Structure	10
Waste Treatment Lagoon	10
Land Application of Waste	1
Grade Stabilization Structure	10
Water Control Structure	10

The minimum life expectancy of the BMPs is also listed in Table 5. Practices designated by a District shall meet the life expectancy requirement established by the Division for that District BMP.

Conservation tillage systems, sod-based rotation, stripcropping, and land application of animal wastes shall be funded under a cost-share incentive payment. Payments for conservation tillage systems and land application of animal wastes are limited to a maximum of three years per farm. Farmers are expected to incorporate BMPs on their own initiative after this time.

The ACSP has a detailed implementation plan that is to be used in conjunction with the rules and regulations for the Program. The following is a list of definition of practices in the plan:

(1) Conservation Tillage System means a form of non-inversion tillage that retains protective amounts of residue mulch on the surface throughout the year. These include no tillage, strip tillage, stubble mulching and other types of non-inversion tillage which maintain a minimum of 50 percent ground cover at planting or a minimum surface residue of 2,000, 1,500, and 1,000 pounds per acre for corn, soybeans, and small grain, respectively.

(2) Critical Area Planting means planting trees, shrubs, grasses, or legumes on critically eroding agricultural areas in order to reduce erosion, sediment delivery and nonpoint source pollution to receiving waters.

(3) Critical Erosion as applied to critical areas means erosion so severe that special agricultural BMPs must be used to stabilize the area of concern.

(4) Cropland Conversion means the establishment of perennial grasses, trees, or permanent wildlife plantings on excessively eroding cropland. Cost share will be based on 75 percent of the average cost of establishing fescue.

(5) Diversion means a channel with a supporting ridge on the lower side constructed across the slope to divert excess water from cropland areas.

(6) Excessive Erosion means sheet, rill and/or concentrated erosion on agricultural lands occurring at an annual rate greater than the soil loss tolerance (T).

(7) Field Border means a strip of perennial vegetation

established at the edge of the field to control erosion.

(8) Filter Strip means a strip or area of perennial vegetation for removing sediment, organic matter, and other pollutants from cropland or as part of waste management systems for treating runoff from concentrated animal areas.

(9) Grade Stabilization Structure means a structure to stabilize the grade of agricultural cropland or pasture land where concentrated and high velocity runoff results in head cutting and gully formation.

(10) Grassed Waterway means a natural waterway or outlet, shaped or graded, established in suitable vegetation and used to route excess water from cropland, reduce gully erosion and reduce nonpoint source pollutant delivery to receiving waters. As a condition for cost sharing, the field or treatment unit draining into the waterway must have installed, or the farmer must agree to install as part of the agreement, erosion control measures necessary to prevent damage from washout or excessive sedimentation in the waterway.

(11) Heavy Use Area Protection means stabilizing high concentration areas for livestock to reduce stream loading of sediment and/or animal waste.

(12) Livestock Exclusion means permanent fencing used to exclude livestock from an area and is to be used in conjunction with livestock waste treatment systems, stream crossings, streambank protection or other areas as needed to protect surface water quality.

(13) Pastureland Conversion means establishing trees or perennial wildlife plantings on excessively eroding pasture that is too steep to mow or maintain with conventional equipment. (Class VII Land)

(14) Rock-lined Waterway or Outlet means a waterway or outlet having an erosion-resistant lining of permanent material which provides safe disposal of runoff where unlined or grassed waterways would be inadequate.

(15) Sediment Control Structure means a temporary or permanent basin constructed to collect and store sediment and other agricultural nonpoint source pollution.

(16) Sod-based Rotation means establishing perennial grasses and/or legumes or a mixture of them on excessively eroding cropland and maintaining at least a four-year rotation. A one-time incentive payment per field will be made for establishment.

(17) Spring Development means improving springs and seeps by excavating, cleaning, capping or providing collection and storage facilities. Springs are to be developed as a source for livestock watering in conjunction with livestock exclusion from streams. The SWCD's have been made aware of the potential conflict of spring development with habitat preservation for wetland flora and fauna. Conflicts are reviewed on a case-by-case basis.

(18) Stock Trails and Walkways means a system used to control erosion where livestock cross ditches, streams, or other areas where surface water quality needs to be protected. Trails and walkways must be used in conjunction with livestock exclusion.

(19) Stripcropping means growing crops in a systematic arrangement of strips or bands across the general slope. The crops are arranged so that a strip of grass or close-growing crop is alternated with a clean-tilled crop or a crop under a conservation tillage system. Cost sharing will be based on a one-time payment of 75 percent of the average cost of establishing fescue multiplied by the acres in sod plus an incentive payment for the establishment of the strips.

(20) Terrace means an earth embankment, a channel, or a combination ridge and channel constructed across the slope.

(21) Trough or Tank means constructing a device for livestock watering in conjunction with livestock exclusion from streams.

(22) Waste Management System means a planned system for managing liquid, solid waste, and runoff from concentrated animal areas. System components may include:

(A) Waste Storage Pond means an impoundment made by excavation or earthfill for temporary storage of animal or other agricultural waste.

(B) Waste Storage Structure means a fabricated structure for temporary storage of animal or agricultural waste.

(C) Waste Treatment Lagoon means an impoundment made by excavation or earthfill for biological treatment of animal or other agricultural waste.

(D) Land application of Wastes means the application of agricultural wastes on land in an environmentally acceptable manner.

(23) Water Control Structure means a man-made structure installed in on-farm water management systems to reduce the delivery of nonpoint source pollutants into main water courses.

Best Management Practices

Structural best management practices for urban runoff control typically are designed to reduce sediment, its attached pollutants, and nutrients. In addition, other BMPs provide shade to waterbodies and reduce the likelihood of excessive water temperatures. Nonstructural BMPs, such as a design manual or a public education program, encourage the comprehensive and effective implementation of structural BMPs. Table 6 contains a list of both structural and nonstructural BMPs. This list will become more complete when the design manual for urban BMPs (currently being written by the Water Quality Section of DEM) is available.

Table 6. BMPS for Urban Runoff Control

STRUCTURAL
- Wet Detention Basin
- Infiltration Basin
- Vegetative Practices
  - Filter Strips
  - Swales with Check Dams
- Oil and Grease Separator
- Rollover-Type Curbing

NONSTRUCTURAL
- Design Manual for Urban BMPs
- Public Education
- Identification and Enforcement of Illegal Discharges
- Land-Use Control

Structural BMPs may affect groundwater quality in certain situations. Devices that recharge groundwater pose the risk of passing soluble pollutants, collected from stormwater runoff, into groundwater systems. At present it is not known whether pollutant concentrations in recharged groundwater areas pose a significant environmental or health risk. USGS is presently conducting a study of the groundwater quality effects of urban BMPs. In addition, if funds are made available, DEM could conduct a similar study in North Carolina. It is hoped that monitoring projects, like the USGS project, will clarify the groundwater quality impacts of urban BMPs.

Best Management Practices

The typical or suggested BMPs of the North Carolina Sedimentation Pollution Control Act of 1973 are selected on the basis of performance in providing protection from the maximum peak rate of runoff from a 10-year storm. This allows the developer/designer of the control measures, structures, or devices to determine and submit for approval the most economical and effective means of controlling erosion and preventing sedimentation damage. Practices are therefore reviewed for acceptability based upon the characteristics of each individual site and its erosion potential. Ideally, the erosion control plan will employ both practices and construction management techniques which will provide the most effective and reasonable means of controlling erosion while considering the uniqueness of each site. Table 7 provides a list of practices commonly used in sedimentation and erosion control plans across North Carolina.

Table 7. BMPs for Sedimentation Control

Land Grading
Surface Roughening
Topsoiling
Tree Preservation & Protection
Temporary Gravel Construction Entrance/Exit
Temporary Seeding
Permanent Seeding
Sodding
Trees, Shrubs, Vines & Ground Covers
Mulching
Riprap
Vegetative Dune Stabilization
Temporary Diversions
Permanent Diversions
Perimeter Dike
Right-Of-Way Diversions
Grass-lined Channels
Grass Channels with Liner
Riprap-lined Channels
Paved Channels
Temporary Slope Drains
Paved Flume (Chutes)
Level Spreader
Outlet Stabilization Structure
Temporary Excavated Drop Inlet Protection
Fabric Drop Inlet Protection
Temporary Block & Gravel Inlet Protection
Sod Drop Inlet Protection
Temporary Sediment Trap
Sediment Basin
Sediment Fence
Rock Dam
Temporary Stream Crossing
Permanent Stream Crossing
Vegetative Streambank Stabilization
Structural Streambank Stabilization
Construction Road Stabilization
Subsurface Drain
Grade Stabilization Structure
Check Dam
Dust Control
Sand Fence (Wind Fence)

Best Management Practices

In order to protect public health and water quality, best management practices (BMPs) need to be implemented throughout the life cycle of an on-site wastewater disposal system. Life-cycle management problems can be addressed in three phases (Steinbeck, 1984). The first phase includes system siting, design, and installation. The second phase involves the operation of the system and phase three involves maintenance and repair when the system malfunctions or fails. As BMPs are applied in each life-cycle phase, the primary factor influencing the success of the system is the participation of the local health department and the cooperation of the developer, owner, design engineer, system operator, and the state. The following is a summary of the current life-cycle management practices and penalties utilized in North Carolina to implement the on-site sewage systems program (Steinbeck, 1984).

Table 8. BMPs for On-Site Wastewater Disposal

1. Application -- The developer or property owner meets with the staff of the local health department to review the project proposal and submits an application to the local health department that contains information regarding ownership, plat of property, site plan, type of facility, estimated sewage flow, and proposed method of sewage collection, treatment, and disposal.

2. Site Evaluation -- The local health department, with technical assistance from the state, evaluates the proposed sewage effluent disposal site for several factors, including slope, landscape position, soil morphology, soil drainage, soil depth, and space requirements. Next, the local health department will assign a site suitability classification, establish the design sewage flow, and the design loading rate for the soil disposal system.

3. Design Review --The applicant is required to submit plans and specifications for the sewage collection, treatment, and disposal system prepared by a professional engineer, for complex systems, or for systems exceeding 3,000

gal/day. Reviews are made by both state and local health departments. The designer must also include in the plans and specifications, installation procedures, phasing schedules, operation and maintenance procedures, monitoring requirements, and designate the responsible agents for operation and maintenance.

4. Legal Document Review -- For systems with multiple ownership or off-site disposal, the applicant must prepare and submit to state and local health departments for their legal review documents applicable to the project.

5. Improvement Permit -- Issued only after a successful review of the proposed project, including each of the items discussed above and allows construction to begin for the on-site sewage system. The improvement permit must be issued prior to other construction permits and allows only temporary electrical power to the site. This permit contains the necessary conditions for construction of the projects with the plans, specifications, and legal documentation appended to it.

6. Operation Permit -- Issued to the owner of the on-site sewage system by the local health department when it determines that all the requirements in the rules, plans and specifications are met; all conditions on the improvement permit are met; and the design engineer for the sewage collection, treatment, and disposal system certifies in writing to the local health department that the on-site system has been installed in accordance with the approved plans and specifications. The operation permit is also conditioned to establish performance requirements and may be issued for a specific period of time. It allows the on-site sewage system to be placed into use, prevents permanent electrical service to the project and prevents occupancy of the facilities until issued. The operation permit applies to systems larger than 480 gallons per day. A certificate of completion is required for conventional septic tank systems when the design sewage flow is less than 480 gal/day.

7. Surveillance -- Once an on-site sewage system is placed into operation the local health department must make routine inspections at least annually for large systems to determine that the system is performing satisfactorily and not creating a public health nuisance or hazard. Additionally, required monitoring reports are routinely submitted to the local health department as required in the permits. The state provides technical assistance to the local health department and the system operator in assuring adequate performance. While annual inspections are required, frequent performance checks must be made by the local health department.

8. Remedies -- When voluntary compliance with the performance requirements for the on-site system is unsuccessful, the General Statutes (1983) provide for the following remedies:

   a. Right of Entry -- Allows the state or local health department to enter the premises to determine compliance with the laws and rules and provides for an administrative search and inspection warrant when entry is denied.

   b. Injunction -- The state or local health department may institute an action for injunctive relief against the owner to bring the on-site sewage system into compliance.

   c. Order of Abatement -- The state or local health department is empowered to issue an order of abatement directing the owner to take any necessary action to bring the system into compliance. However, if the on-site system is determined to be creating an imminent health hazard, the state or local health department may, after previous unsuccessful attempts at correction, take the necessary action to correct the problem and recover any costs for abatement from the owner. This is the least frequently applied remedy.

   d. Administrative Penalties -- The state may impose administrative penalties up to $300 per day for violation of the laws, rules, or any permit condition for on-site sewage systems serving multi-family residences with a flow greater than 480 gal/day. A penalty of up to $50 per day can be assessed for malfunctioning systems where the flow is less than or equal to 480 gal/day.

   e. Suspension and Revocation of Permits -- The state may suspend or revoke a permit for violations of the laws, rules, or permit conditions upon a finding that a violation has occurred.

   f. Misdemeanor -- The owner who violates the sewage laws or rules shall be guilty of a misdemeanor and punishable by a fine or imprisonment as determined by the courts. This is the most frequently used remedy.

Best Management Practices for Forestry

The North Carolina Forestry Council has prepared a reference document for silvicultural BMPs entitled "Forest Practices Guidelines Related to Water Quality." Table 10 summarizes these BMPs:

Table 10. BMPs for North Carolina Forests

1. Properly design and place access roads, skid trails, and loading areas on forestland.

   a. Avoid streambanks and channels except when crossing streams.
   b. Install water management structures and techniques.
   c. Stabilize bare soil areas.
   d. Prevent steep slopes on roads and trails.

2. Designate streamside management zones (SMZ) which are undisturbed strips of vegetation parallel and adjacent to the stream channels.

3. Avoid placing debris in stream channels (Stream Obstruction Law).

4. Use practices which minimize soil exposure when reforesting.

5. Use environmentally safe procedures when applying chemicals in forested areas.

6. Train forestry related personnel in nonpoint source pollution control methods.

Best Management Practices

Significant environmental damage can and often times does occur during land-disturbing activities of mining operations, especially during the initial stages. The potential for such damage can be substantially reduced with the installation of BMPs. Once the mining has terminated, BMPs are used to reclaim or reasonably rehabilitate the site (for mined lands after June 11, 1971). The basic objective of the reclamation is to establish on a continuing basis the vegetative covers, soil stability, and water and safety conditions appropriate to the area. The BMPs are basically performance oriented allowing the applicant for a mining permit to design and submit for approval the most economical and effective means of a) controlling erosion and preventing off-site sedimentation damage; b) preventing contamination of surface waters and groundwater; and, c) preventing any condition that will have unduly adverse effects on wildlife or freshwater, estuarine, or marine fisheries. BMP selection is site specific and controlled in part by the pre- and post-mining land use(s). The acceptability, therefore, of a BMP is based upon the characteristics of the individual site and its potential for off-site damage.

Table 12 provides a list of BMPs which is virtually the same as apply in the Sedimentation and Erosion Control Program since the problems are similar.

Table 12. BMPs for Mining

Land Grading
Surface Roughening
Topsoiling
Tree Preservation and Protection
Temporary Gravel Construction Entrance/Exit
Temporary Seeding
Permanent Seeding
Sodding
Trees, Shrubs, Vines & Ground Covers
Mulching
Riprap
Vegetative Dune Stabilization
Temporary Diversions
Permanent Diversions
Perimeter Dike
Right-of-Way Diversions
Grass-lined Channel
Grass Channels with Liner

Table 12 (Cont.)

Riprap-lined Channels
Temporary Slope Drains
Paved Flume (Chutes)
Level Spreader
Outlet Stabilization Structure
Temporary Excavated Drop Inlet Protection
Temporary Fabric Drop Inlet Protection
Temporary Block and Gravel Inlet Protection
Sod Drop Inlet Protection
Temporary Sediment Trap
Sediment Basin
Sediment Fence
Rock Dam
Temporary Stream Crossing
Permanent Stream Crossing
Vegetative Streambank Stabilization
Structural Streambank Stabilization
Construction Road Stabilization
Subsurface Drain
Grade Stabilization Structure
Check Dam
Dust Control
Sand Fence (Wind Fence)
Groundwater Monitoring Wells
Mining Newsletter