Best Management Practices for Georgia Agriculture

Conservation Practices to Protect Surface Water Quality

Georgia Soil & Water Conservation Commission
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Second Edition

Developed by:

The Georgia Soil & Water Conservation Commission

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ACRONYMS

AFO
Animal Feeding Operation

BMP
Best Management Practice

CAFO
Concentrated Animal Feeding Operation

CNMP
Comprehensive Nutrient Management Plan

EPA
Environmental Protection Agency

EQIP
Environmental Quality Incentives Program

GAEPD
Georgia Environmental Protection Division

GFC
Georgia Forestry Commission

GDA
Georgia Department of Agriculture

IPM
Integrated Pest Management

NMP
Nutrient Management Plan

NPS
Nonpoint Source (Pollution)

SWCD
Soil & Water Conservation District

UGA CES
University of Georgia Cooperative Extension Service

USDA FSA
Farm Service Agency

USDA NRCS
Natural Resources Conservation Service

Chapter 1:

INTRODUCTION

Purpose of the Manual

This manual is designed to provide the agriculture community with knowledge of the best management practices (BMPs) that work to protect surface water quality as well as to help agency personnel educate farmers about BMPs and their usefulness. *Best Management Practices for Georgia Agriculture* is a compilation of conservation practices that address surface water quality and includes an estimate of the effectiveness and relative cost of each BMP. This second edition of the manual also includes an expanded section on nutrient management planning.

The Federal Water Pollution Control Act, otherwise known as the Clean Water Act, is considered the cornerstone for U.S. water quality policy. This legislation established current policy and created new programs to protect water resources. The term "best management practice" was introduced in the Clean Water Act and relates to methods of reducing the amount of pollutants entering water bodies (rivers, marine waters, streams or lakes). A BMP is defined as a practice or combination of practices determined to be the most effective practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. For water bodies that are already polluted, the federal government requires the development of total maximum daily loads (TMDLs). BMPs are used as a tool in TMDL Implementation Plans to reduce and prevent pollutants from entering water sources and to lower the number of water bodies failing to meet federal and state water quality standards.

Nonpoint source (NPS) pollution is a broad-based term used in environmental regulations and policy. The agriculture industry has been identified by the U.S. Environmental Protection Agency (US EPA) as significant sources of NPS pollution in the United States. Much of the difficulty with NPS pollution is in defining the source of this type of pollution. NPS pollution can be a slow, gradual process or a sudden, unpredictable process in which there is a release of pollutants into water bodies. Typically, NPS pollution is unintentional. Small, often unobservable releases of pollutants in runoff from fields, animal manure land applications, and animal access to water sources add up over time as a source of water quality degradation. Common agriculture related pollutants in Georgia are pathogens, sediment (organic and inorganic) and nutrients (nitrogen and phosphorus), which result in water failing to meet designated use standards.

Agricultural producers should be very concerned about potential contaminants and should take advantage of available opportunities to reduce negative environmental impacts from their operations. BMPs are versatile and allow producers to select practices that best fit their type of production and operation. While no single practice is the answer for pollution problems, the combination and implementation of BMPs, even on a small scale, can reduce overall water quality degradation. Selecting and implementing practices that work together to reduce pollutant transport, along with sound management decisions, will provide a larger reduction in pollutants than using a single practice.

Numerous other conservation practices exist but are not included in this manual. More detailed information can be found in the references provided at the end of the manual. Actual costs are not provided in this manual

as they will vary by producer and region, but ranges are provided. Any conservation agency representative can provide you with more information on these practices and how to properly implement them on your operation. NRCS specifications for all conservation practices can be obtained online from the NRCS website. In this manual, you will find a number next to the practice name at beginning of each practice description. This number is a reference for the NRCS Conservation Practice Standard number. You will also find the same information at the bottom of the page in the Additional Resources section. Other practices that are discussed will also be listed as well as sources of more information or guidance. In addition, state and federal contact information, Georgia agricultural organizations contact information and other resources have been provided in Chapter 3 of this manual.

This manual is laid out in seven planning sections. First is Planning for Your Farm followed by Nutrient Management Planning for Your Farm, General Farm Management Planning, Animal Waste Management Planning, Irrigation Water Management Planning, Row Crop Management Planning and lastly, Wetlands & Stream Protection and Management Planning. At the beginning of each section, you will find a flow chart that will help guide you to the practices that address specific pollutant issues on your farm. You will notice that some of the practices listed on the flow chart will not be found in that particular section. Since some practices fall into more than one planning section, they have been located in the most relevant section. Practices in other planning sections that are not listed on the flow charts may also be applicable to your farm operation. Be sure to review each section in order to identify the BMPs that best fit your farming operation.

BEST MANAGEMENT PRACTICES INDEX

Below is a list of the conservation practices included in this manual by their corresponding NRCS Conservation Practice Number.

511	Forage Harvest Management
512	Forage & Biomass Planting
430	Pipeline-Irrigation
516	Pipeline-Livestock
528	Prescribed Grazing
557	Row Arrangement
558	Roof Runoff Structure
560	Access Road
561	Heavy Use Area Protection
574	Spring Development
575	Animal Trails & Walkways
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580	Streambank & Shoreline Protection
584	Channel Bed Stabilization
585	Contour Stripcropping
586	Field Stripcropping
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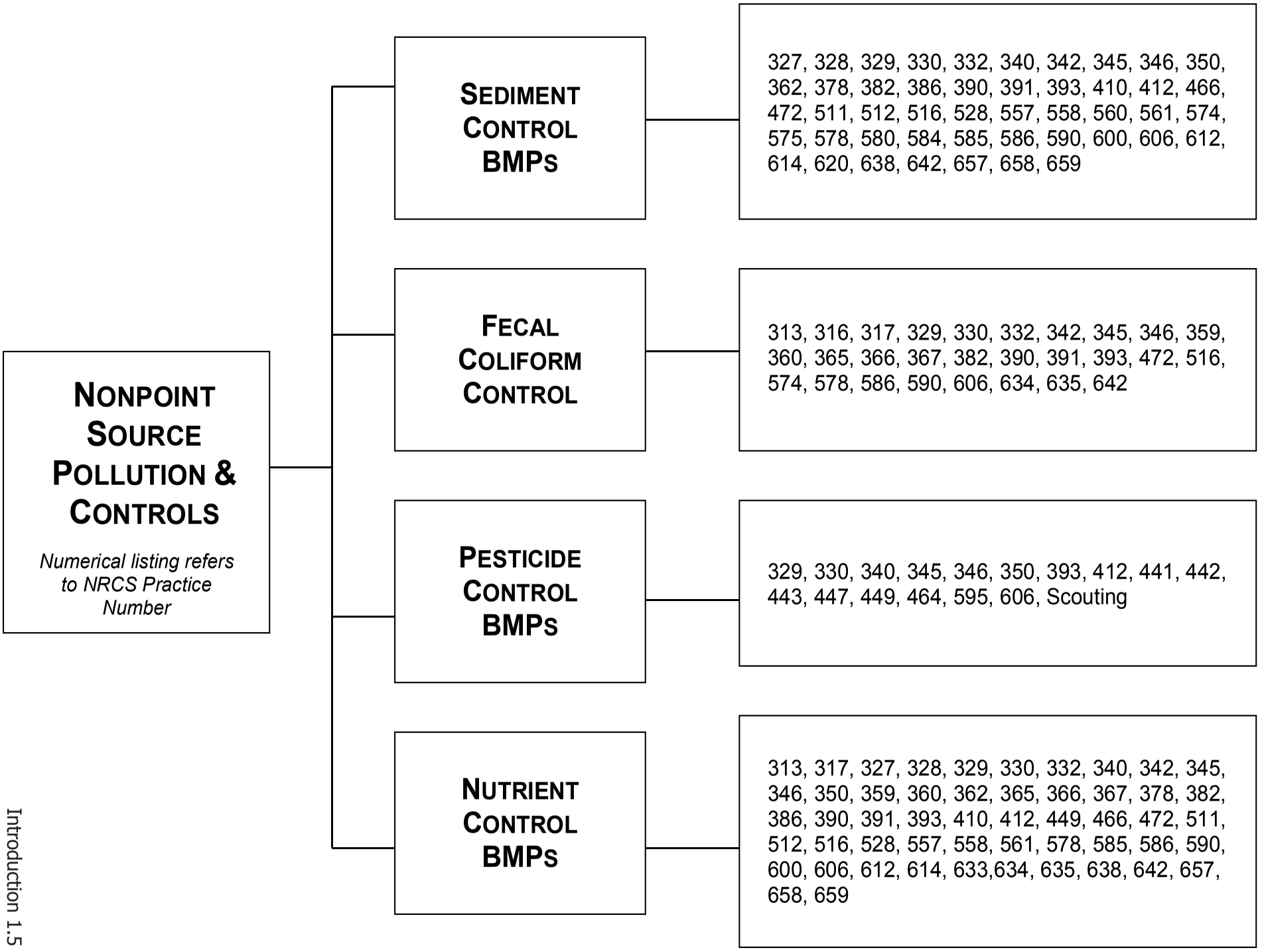
595	Integrated Pest Management
600	Terrace
606	Subsurface Drain
612	Tree & Shrub Establishment
614	Watering Facility
620	Underground Outlet
634	Waste Transfer
635	Vegetated Treatment Area
638	Water & Sediment Control Basin
642	Water Well
657	Wetland Restoration
658	Wetland Creation
659	Wetland Enhancement
	Scouting


NONPOINT SOURCE POLLUTION & CONTROLS
Numerical listing refers to NRCS Practice Number
SEDIMENT CONTROL BMPS
327, 328, 329, 330, 332, 340, 342, 345, 346, 350, 362, 378, 382, 386, 390, 391, 393, 410, 412, 466, 472, 511, 512, 516, 528, 557, 558, 560, 561, 574, 575, 578, 580, 584, 585, 586, 590, 600, 606, 612, 614, 620, 638, 642, 657, 658, 659
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PESTICIDE CONTROL BMPS
329, 330, 340, 345, 346, 350, 393, 412, 441, 442, 443, 447, 449, 464, 595, 606, Scouting
NUTRIENT CONTROL BMPS
313, 317, 327, 328, 329, 330, 332, 340, 342, 345, 346, 350, 359, 360, 362, 365, 366, 367, 378, 382, 386, 390, 391, 393, 410, 412, 449, 466, 472, 511, 512, 516, 528, 557, 558, 561, 578, 585, 586, 590, 600, 606, 612, 614, 633,634, 635, 638, 642, 657, 658, 659

PRACTICE DEFINITIONS & OTHER IMPORTANT TERMINOLOGY

Practice Definition *Page Number*

Access Control (472): the restriction of animals, people or vehicles from areas to improve and protect natural resources in the area

2.24

Access Road (560): a permanent or temporary structure that reduces erosion by providing a fixed entry point into fields and pastures for year-round access

2.7

AFO: see *Animal Feeding Operation*

Alternative Water Source: an alternative watering source to limit animal access in areas of environmental concern or where water supply is unable to meet demand; examples may include watering ramps, spring development, troughs, tanks and wells

2.40

Anaerobic Digester--Ambient Temperature (365): an unheated waste treatment impoundment that biologically treats waste as part of a waste management system

2.17

Anaerobic Digester--Controlled Temperature (366): a managed temperature waste treatment impoundment that biologically treats waste as part of a waste management system

2.17

Animal Feeding Operation (AFO): a lot or facility where animals have been, are or will be stabled, confined and fed or maintained for at least 45 days within a 12-month period and where vegetation, crops, and forage growth is not sustained over any part of the lot or facility in a normal growing season

2.13

Animal Mortality Facility (316): a permanent structure used to dispose of carcasses used as part of a waste management plan

2.18

Animal Trails and Walkways (575): the construction and maintenance of paths specifically for animal movement, especially in heavy traffic areas

2.20

Best Management Practice: a practice or combination of practices determined to be the most effective practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals

1.1

CAFO: see *Concentrated Animal Feeding Operation*

Channel Bed Stabilization (584): method used to alter bed depth and sediment transport in order to stabilize or strengthen the bed or bottom of a channel 2.80

CNMP: see *Nutrient Management Plan*

Composting Facility (317): a facility used to dispose of carcasses and waste in a sanitary method that results in a usable soil additive by-product

2.21

Concentrated Animal Feeding Operation (CAFO): an animal feeding operation that has been identified by the federal government as a possible point source of pollution. CAFO identification is based on the type of animal production, the size of the individual operation or the amount of waste that is discharged from the site. CAFOs are subject to NPDES permitting under current regulations

2.13

Conservation Cover (327): the establishment and maintenance of permanent vegetative cover on retired agricultural land or highly erodible land

2.55

Conservation Tillage: a tillage planting system that maintains at least 30% residue cover on the soil surface after planting; three predominant types of conservation tillage include mulch tillage, no-tillage, and ridge tillage

2.56

Contour Buffer Strip (332): strips of permanent vegetation established on a field's contour to reduce erosion, slow sediment transport and reduce runoff

2.59

Contour Farming (330): a planting system of tilling, planting and performing farming operations on or near the contour of a field to reduce erosion and runoff

2.58

Contour Stripcropping (585): a planting system in which crops are grown in an alternating pattern with fallow strips of equal width to reduce soil erosion and water degradation

2.59

Cover Crop (340): the establishment of close-growing grasses, legumes and forages as a temporary cover to reduce soil erosion, capture and use excess nutrients, and improve soil quality

2.60

Critical Area Planting (342): the establishment of permanent vegetation or cover on highly erodible land in order to reduce soil erosion

2.23

Crop Rotation (328): a planting system in which crops are planted in recurring sequence to reduce soil erosion and runoff

2.61

Diversion (362): the establishment of permanently vegetated strips across a slope to slow water flow and redirect water to areas of need

2.62

Fence (382): barriers installed to limit animal, human and wildlife entry into specified areas and water sources

2.24

Field Border (386): permanently vegetated borders established around fields and pastures to reduce soil erosion

2.63

Field Stripcropping (586): a planting system in which crops are grown in alternating strips with grasses to reduce soil erosion and runoff

2.64

Filter Strip (393): strips of vegetation located between cropland, grazing land or disturbed areas and water sources to protect water quality

2.65

Forage & Biomass Planting (512): a management strategy that reduces soil erosion and improves water quality by establishing native or introduced forages for pasture, hay or biomass production

2.8

Forage Harvest Management (511): a management system designed to maximize yield and forage quality and to reduce erosion and water quality degradation by maintaining forage stand

2.9

Grade Stabilization Structure (410): structures that allow water to move from a higher elevation to a lower elevation while minimizing soil erosion

2.67

Grassed Waterway (412): natural or constructed grass channels established within a field to slow the flow of water, re-direct excess water from fields and to prevent soil erosion

2.68

Heavy Use Area Protection (561): the establishment of vegetation and/or the installation of erosion prevention materials to protect heavy traffic areas

2.25

Integrated Pest Management (595): a management plan that uses environmentally sensitive practices to control weeds, insects and disease on fields and pastures and reduce negative effects on humans, and soil and water quality

2.69

IPM: see *Integrated Pest Management*

Intermittent Stream: a stream, or portion of a stream, that flows only in direct response to precipitation. It receives little or no water from springs or groundwater and no long-continued supply from melting snow or other sources. It is dry for a large part of the year, ordinarily more than three months

2.17

Irrigation Land Leveling (464): the reshaping and grading of land to be irrigated to improve water usage

2.27

Irrigation Tailwater Recovery System (447): a water recovery system designed to collect, store and transport tailwater for reuse in an irrigation system

2.44

Irrigation Water Management (449): a management plan designed to efficiently use irrigation water by determining and controlling the rate, amount and timing of irrigation water

2.45

Land Application System (LAS): any waste utilization system in which animal manure is applied to land for beneficial use

2.13

Land Smoothing (466): the removal of irregularities on land surfaces to improve surface drainage

2.27

Microirrigation (441): a type of irrigation used to efficiently apply water to the root zone of plants using low-pressure emitters

2.46

Mulch Tillage (345): a conservation tillage system in which residue is maintained on fields year-round and the entire field is tilled prior to planting

2.56

NMP: See *Nutrient Management*

No Tillage (329): a conservation tillage system in which crops are grown on areas that have previously not been tilled

2.56

Nutrient Management (590): a management plan that assists producers in improving management and nutrient use by matching needs more efficiently and reducing nutrients in runoff

2.28

Perennial Stream: a watercourse that flows throughout a majority of the year in a well-defined channel

2.17

Pipeline (516/430): a component of an alternative water system used to transport water for livestock or irrigation purposes

2.40/2.47

Pond (378): an impoundment constructed to provide water for livestock, fish, wildlife, recreation, fire control and other uses

2.10

Prescribed Grazing (528): a grazing system that promotes vegetative quality and quantity by managing grazing animals to promote stand longevity

2.30

Prime Farmland: land that has soil with the best combination of physical and chemical characteristics for producing food and fiber on a sustained basis with proper management; soil is classified into capability classes based on limitations related to soil type and the need for conservation practices to reduce erosion potential

2.51

Ridge Tillage (346): a conservation tillage system in which residue is maintained on fields year-round and crops are grown on pre-formed ridges that are alternated with furrows with residue

2.56

Riparian Forest Buffer (391): the establishment of primarily trees and/or shrubs adjacent to water bodies to protect water quality, provide wildlife habitats and to stabilize stream banks and channels

2.81

Riparian Herbaceous Cover (390): the establishment of grasses, grass-like plants and forbs adjacent to water bodies to protect water quality, provide wildlife habitats and to stabilize stream banks and channels

2.83

Roof Runoff Structure (558): structures used to capture and transport water from roofs and to limit soil erosion resulting from roof runoff

2.12

Row Arrangement (557): a system of planting crops on grades and lengths to slow water running from fields into surface ditches

2.58

Scouting: the utilization of available research and thorough field investigation to determine when pests reach a sufficient threshold to require pesticide treatment

2.71

Sediment Basin (350): an impoundment constructed to capture and store debris or sediment running off of fields or pastures

2.73

Sprinkler (442): a method of water application that uses pressurized nozzles to apply water to irrigated acres

2.48

Spring Development (574): the development of a spring or seep to improve the quality, quantity and distribution of water

2.40

Streambank and Shoreline Protection (580): the stabilization and protection of streams, constructed channels and shorelines in order to reduce erosion and water degradation

2.84

Stream Crossing (578): a structure that is designed to protect quality and reduce erosion by designating stable access points and crossings for livestock

2.31

Subsurface Drain (606): an underground drain used to collect and remove excess water

2.49

Surface and Subsurface Irrigation (443): a method of irrigation that is constructed to promote efficient irrigation water distribution

2.50

Terrace (600): embankment or ridges constructed across field slopes to capture runoff water and convey it to stable outlets 2.75

Total Maximum Daily Load (TMDL): a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources

1.1

Tree/Shrub Establishment (612): the establishment of trees and shrubs to slow runoff, provide additional time for nutrient absorption, and to provide long-term erosion control

2.86

Underground Outlet (620): a component of a drainage system used to collect surface water and convey it to safe outlets

2.77

Vegetated Treatment Area (635): a strip of herbaceous cover used to reduce sediment and nutrient loadings as part of an agricultural waste management system

2.33

Waste Facility Closure (360): the closure of lagoons and waste storage ponds that are no longer used for their original purpose

2.34

Waste Facility Cover (367): a component of an animal waste management system used to maintain the capacity of and limit rainfall entering storage facilities to improve water and air quality

2.35

Waste Storage Facility (313): a storage facility constructed to temporarily store waste, wastewater and contaminated runoff as part of an agricultural waste management system

2.36

Waste Transfer (634): a manure transport system that utilizes a conveyance system to transport manure to storage facilities, loading areas or agricultural land

2.38

Waste Treatment Lagoon (359): a treatment facility constructed to biologically treat waste, wastewater and contaminated runoff as part of an agricultural waste management system

2.39

Watering Facility (614): an alternative watering source used to provide livestock and wildlife with a water supply where needed

2.40

Water and Sediment Control Basin (638): an impoundment constructed to temporarily capture runoff, trap sediment, reduce soil erosion and improve water quality

2.76

Water Well (642): a component of an alternative water supply used to provide water for irrigation, livestock, wildlife or recreation purposes

2.40

Wetland Creation (658): the establishment of a wetland on a site that has not historically been a wetland

2.87

Wetland Enhancement (659): the modification or rehabilitation of an existing wetland to improve the function and capacity of the wetland

2.87

Wetland Restoration (657): the restoration of a wetland that previously existed to restore the natural condition as much as possible

2.87

Chapter 2:

BEST MANAGEMENT PRACTICE PLANNING

SECTION ONE

Plan to Manage and Manage to Plan

The most important step you can take as a farmer or producer is to plan. Planning is your way of preparing for the unexpected and reducing the risks associated with your operation. Ultimately, planning for the future will also improve your bottom line and improve your operation's efficiency.

In the same sense, it is essential that each operation have a farm plan that includes conservation elements. These conservation elements are your recorded strategies for protecting the natural resources that are on your farm. Through your conservation plan, you will incorporate management decisions that may include water quality BMPs into your farming operation. BMPs work best as a group rather than as individual practices. These practices work together to protect natural resources and reduce environmental impacts. For instance, by planning to incorporate BMPs into your cropping system, you will save irreplaceable soil that your crops thrive in. This soil can be lost in runoff from any number of farming activities or simply from natural occurrences such as excessive rainfall. You will also protect the quality of water that runs through your operation by reducing sediment and other contaminants entering water sources.

Many of the BMPs discussed in this manual are simply management decisions. Each agricultural operation is different, not only in the type of operation but also in farming practices, soils, water and organizational structure. Your conservation plan should be designed to meet the needs of your operation and should be specific to the concerns and impacts of your operation.

Planning takes time, but the time spent is well worth the cost of that time. When your plan is put into practice, it becomes a living plan that will need to be re-evaluated and adjusted regularly. A stagnant, unchanging plan will ultimately fail. Planning should begin with identifying priority issues. These priority issues should be areas where environmental impacts are significant. There will most likely be a number of issues on any farm that will need to be prioritized into a list of importance. This will help you focus your attention on correcting the more serious problems and then working on other areas with fewer impacts. By applying BMPs to these areas, you will be able to reduce environmental impacts and improve your overall operation.

Implementing a farm plan will take time. It cannot be completed overnight. In fact, the ideal conservation plan will never be completed because it will constantly be re-evaluated and improved. Priorities will change and operations will change. Your conservation elements should be adaptable to address new issues and to monitor those issues you've already addressed.

By keeping records, producers can identify weaknesses in their operation and work to strengthen those areas and improve efficiency. By becoming more efficient, profits can be increased and wasteful practices eliminated. Record keeping helps producers to plan and then implement any conservation, nutrient management or farm plan. This could potentially lower costs and save producers money in the long run.

On-farm records may include:

- Soil, manure and plant tissue testing results
- Seeding rates, depths, tillage style, weed problems, herbicide applications (frequency and amount), crop yields, etc.
- Livestock type and herd size
- Vaccine and veterinary records
- Equipment costs and maintenance
- Time frames for implementing BMPs
- Any water monitoring results

Record keeping can and should be tied into nutrient management planning as well. Any conservation agency can provide you with more information on nutrient management plans (NMPs) and requirements on record keeping for NMPs. Records can be handwritten or maintained on a computer. With lower costs, computers and computer software are an excellent means of accurately storing records and, depending on software programs, can make comparisons much easier. Initially, the time needed to learn computer software programs may be substantial, but it is worth the time cost in the long run. More information on nutrient management planning can be found in Section 2 of this chapter.

Maintaining good farm records demonstrates a producer's commitment to his or her business and livelihood. Through records, the effectiveness of best management practices can be analyzed, and the efficiencies of your conservation efforts can be better understood.

Being a better manager of your natural resources makes you a better environmental steward. Protecting the natural resources in our state is essential to the sustainability of the agriculture industry in Georgia. This manual will provide you with general descriptions of numerous BMPs that impact water quality, and will hopefully serve as a source of information when you need assistance in developing or implementing your conservation plan.

SECTION 2

Nutrient Management Planning for Your Farm

Nutrient management planning is the concept of planning your nutrient inputs to meet the nutrient needs of the crops you have on your field/pasture in an economically and environmentally beneficial way. What is the purpose of nutrient management planning? The goal of a nutrient management plan (NMP) is to apply crop nutrients in a way that will achieve agronomic yield while at the same time, protect the environment.

What do nutrient management plans consist of? The answer is “it depends.” Every NMP is farm and field specific. The nutrient application rate will vary from field to field, even on the same farm. How do you determine the rate of nutrient application to your fields and why is it important to apply nutrients at the correct rate needed by the crop? First, it makes economic sense to only apply the needed nutrients because of the high cost of fertilizers. Secondly it’s environmentally responsible to balance inputs and outputs on your fields and pastures. If nutrients are over applied, there is an increased risk of nutrient loss into surface water bodies which leads to water quality problems. And let’s face it, if your fertilizer is washed off into the creek, that’s money down the drain. The tool to assist you in making sound economic and environmental decisions is your nutrient management plan.

Nutrient management plans are required on larger animal feeding operations but are useful on all farming operations, regardless of size. Perhaps the simplest form of a NMP is a soil test report which will give you a snapshot of what nutrients are currently available in your soil for crop uptake and what nutrient deficiencies you may need to supplement for with chemical or organic fertilizers. Chemical fertilizers can be purchased and blended to meet the nutrient needs of the crop very closely. The likelihood of over application of nutrients when using chemical fertilizers is less than with organic fertilizer as it is not economically feasible to over apply purchased nutrients.

In addition to applying nutrients at rates recommended by your soil test, proper timing of application is also critical. Nutrients should be applied when the nutrients are needed by the crop and when weather conditions are favorable. Again, it boils down to economics: the more time there is between when nutrients are applied and crop demand, the higher the risk of losing some of those nutrients from the system which may significantly impact yield. Also, if the ground is frozen, covered in ice or snow, hydraulically saturated, or if a rainfall event is forecasted within 24-48 hours, the risk of losing those nutrients, along with your money, is higher.

When using organic fertilizers such as animal manure or compost, nutrient management plans become more complex. Since livestock does not provide us with a perfectly blended manure fertilizer, it becomes a balancing act to try to achieve the needed amount of nutrients such as nitrogen (N) without over applying other nutrients such as phosphorus (P). In nutrient management plans where organic fertilizers are used, additional steps are taken to put management decisions in place to keep applied nutrients on the land and out of the water.

There are several parameters that must be known and management decisions to be made for each individual field before a nutrient management plan can be developed including: what crop(s) will be grown in that field for a full year; what plant available nutrients are already in the soil (soil test); what additional nutrients need to be applied to achieve desired yields (soil test report recommendations); what is the nutrient content of the fertilizer source (manure tests); and where are environmentally sensitive areas located (wells, creeks, lakes, drainage ditches, sink holes, etc.).

Once these decisions are made, this information is used to determine the risk of P loss from each field. This is done using a tool call the Georgia Phosphorus Index. This tool has 3 main inputs: Phosphorus source (P source), Phosphorus transport (P transport), and best management practices (BMPs). P source is where the phosphorus is coming from, which includes phosphorus already in the soil and in all fertilizer sources (both organic and chemical). P source also takes into consideration how fertilizer nutrients are managed and applied. P transport factors include things that affect the movement of phosphorus across the landscape such as soil characteristics, topography, ground cover, depth to water table, etc. Last, but not least, are BMPs. BMPs are practices put in place to reduce the transport of nutrients to surface water such as filter strips, riparian buffers, fencing surface water, etc.

So how do you get a nutrient management plan for your farm? NMPs are not that complex and on unregulated operations, you can do them yourself. There are numerous entities that can help you complete a NMP for your farming operation including the Georgia Soil & Water Conservation Commission, the Natural Resources Conservation Service, the UGA Cooperative Extension Service and private consultants who have been certified as nutrient management planners. However, the key to successful nutrient management planning is for you, as the farmer/operator, to play a very active role as the plan is being developed. It is also important to remember that these are not static documents. NMPs are very useful in helping you determine what is and isn't working on your farm. So keep records and modify your plan and farm management as needed to achieve both economic and environmental improvement over time.

This section was developed in cooperation with the UGA Cooperative Extension Service.

SECTION THREE
General Farm Management Planning

Every Georgia farmer has the opportunity to protect water quality on and around his or her operation. Protecting water quality and overall farm sustainability should be the ultimate goal of every farmer. Georgia's rural landscape is slowly diminishing because of industrial and urban growth. Agricultural producers are facing more regulations and more environmental issues than ever. In a changing society, farmers need to take every opportunity to demonstrate environmental stewardship.

Practices listed in this section are applicable to every Georgia farm, regardless of size, commodity or location. These practices can help you make improvements that will enhance your operation, improve your efficiency and protect the natural resources on your farm. The practices listed in this section are only a small collection of conservation practices. There will be practices listed in other sections that can also be applied on your farm. Be sure to take the time to look through all of the practices. If you have more questions about any of the practices described in this book, you can find contact information in Chapter 3 of this manual.

Conservation practices included in the General Farm Management Planning section include:

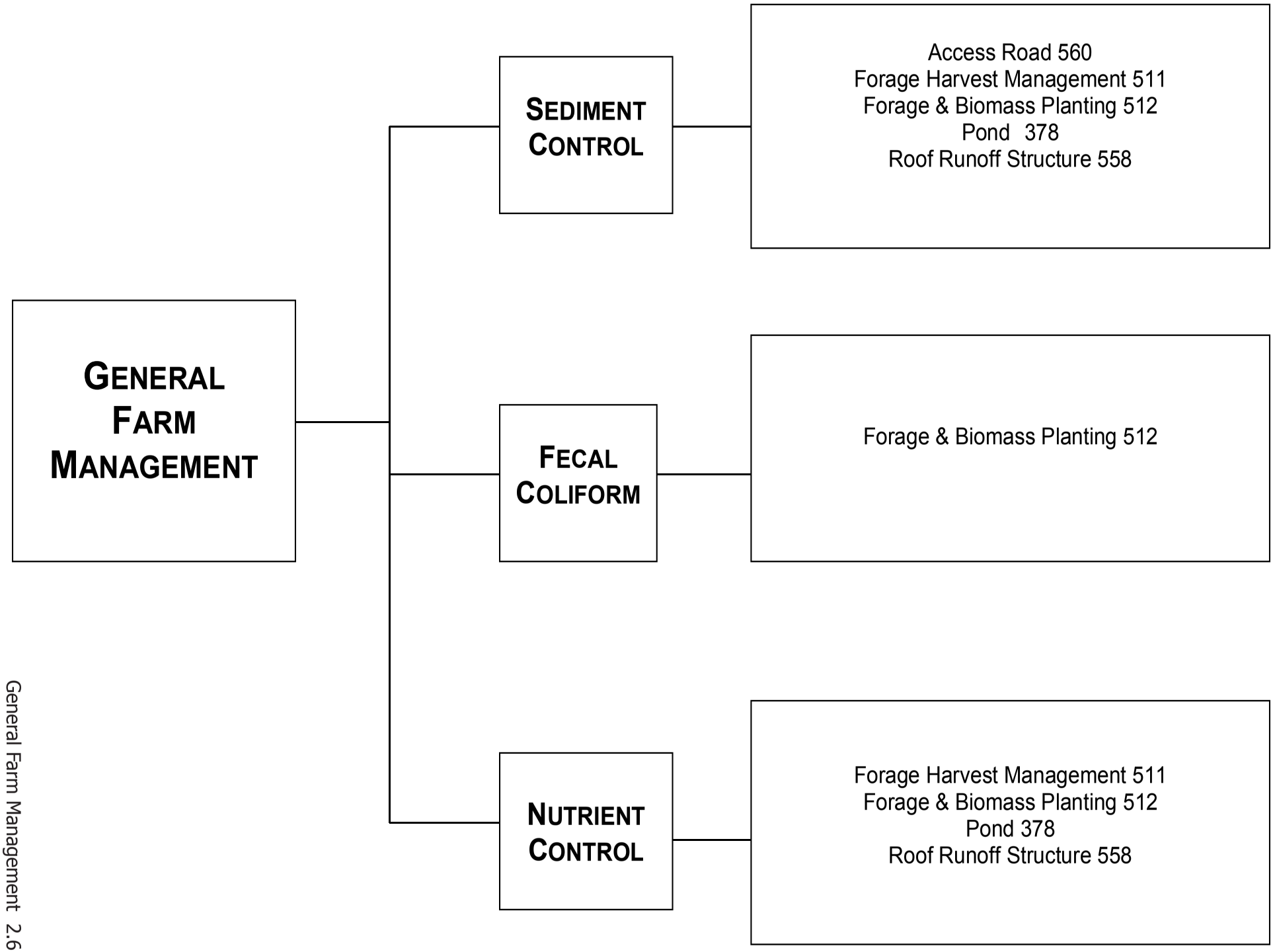
Access Road 560

Forage & Biomass Planting 512

Forage Harvest Management 511

Pond 378

Roof Runoff Structure 558


GENERAL FARM MANAGEMENT
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Roof Runoff Structure 558

ACCESS ROADS (560) reduce erosion by providing a fixed entry point into fields and pastures for year-round access.

By establishing access roads you reduce soil erosion and sediment transport into nearby water bodies

Water Quality Benefits

- Reduces soil erosion
- Reduces sediment and runoff entering fields
- Protects downstream water quality

When to Use

Access roads are ideal as permanent or temporary structures in heavy traffic areas. Access roads should be avoided in wetlands and riparian areas.

How to Establish

Plan roads to follow natural contours and slopes. The minimum width for one-way traffic is 14 feet and 20 feet for two-way traffic with an additional 2 feet for shoulder construction. Ditches may be needed to divert water.

Once construction is complete, re-vegetate as soon as possible. Vegetation will slow water traveling on surfaces and reduce soil erosion. Filter strips and buffers can protect nearby water sources.

For more information, see *Additional Resources.*

Costs and Considerations

Before installing an access road, consider potential negative impacts. Improperly managed access roads can negatively impact downstream flows, increase sedimentation in water, and impair water quality.

Access road maintenance can be substantial if soil erosion is a problem or if roads are poorly planned and constructed. Costs associated with this practice may include filter strip and buffer planting, surface cover costs, silt fences and general maintenance. It may also be necessary to periodically re-cover surfaces to maintain road integrity.

Access roads are moderate to high in cost depending on materials, size and construction.

Effectiveness

Forest access road reconstruction can potentially reduce sediment yield by 70% using slope reduction, vegetated and brush barriers, broad-based-dips, hay bales and silt fences.

Additional Resources

NRCS Conservation Practice Standard 560
Best Management Practices for Forestry Manual

There are 15 mandated baseline provisions for road construction and maintenance in and across the waters of the U.S in order to qualify for exemption. More information can be found in the GFC Best Management Practices for Forestry Manual, Section 3.3.1 or in Chapter 3 of this handbook.

FORAGE & BIOMASS PLANTING (512) prevents soil erosion and improves water quality by establishing native or introduced forages in fields or pastures.

Water Quality Benefits

- Reduces soil erosion
- Reduces sediment transport
- Increases infiltration
- Reduces surface water leaving a field

Water Quality Benefits

Forage and biomass planting can be used wherever forage production and/or conservation is needed.

How to Establish

Select plant species that are native or adaptable to the region. Choose species based on climate and soil conditions, resistance to regional diseases and insects, intended use, realistic expected yield, maturity stage and compatibility with other plant species and crops.

Proper planting practices and appropriate seeding rates and planting depths should be met. Use conservation and no-till planting methods in areas at risk for erosion.

Fertilizer and soil amendments may be needed. Nutrient applications should be planned according to a nutrient management plan and based on soil and manure test results. Overseeding can improve forage availability. For recommended planting mixtures, see GA NRCS recommendations.

For more information, see *Additional Resources*.

Considerations and Costs

To reduce erosion, adequate ground cover is necessary.

In areas with large animal populations, select plant species that are tolerant of close grazing and heavy traffic.

Costs associated with this practice include site preparation, seed/plant materials, fertilizer and soil amendments, and insect and weed control.

Forage and biomass planting is low in cost.

Effectiveness

Forage and biomass planting can potentially reduce erosion by up to an estimated 85% on protected areas.

Additional Resources

NRCS Conservation Practice Standard 512

FORAGE HARVEST MANAGEMENT (511) is a management system designed to maximize yield and forage quality and to reduce erosion and water quality degradation by maintaining forage stand.

A forage harvesting schedule can improve productivity and increase yield

Water Quality Benefits

- Maximizes available nutrient usage
- Reduces excess nutrients leaving fields and pastures in runoff
- Slows runoff from fields and pastures and protects water quality

When to Use

Forage harvest management can be used on all land where forages are machine harvested. Forage harvest management is a component of nutrient utilization and management and is used to stabilize soil.

How to Establish

Harvest forages at the stage of maturity that maximizes quality and quantity. Moisture content significantly impacts forage quality. Depending on what the forage will be used for (hay, green chop or silage), forages should be harvested at recommended moisture content levels. When applying nutrients to forages, a soil test is necessary to best meet the needs of the forage. Excess nutrients can be devastating to crops and to animals being grazed on pastures.

For more information, see *Additional Resources.*

Considerations and Costs

Costs associated with this practice include seed, chemical and equipment costs as well as maintenance costs. Keep fields clear of debris in order to prevent equipment damage.

Forage harvest management is low in cost.

Effectiveness

Sediment runoff models indicate that, in conjunction with prescribed grazing, forage harvest management can be 75% effective in reducing soil loss.

Additional Resources

NRCS Conservation Practice Standard 511

Hay is prepared for baling as part of a forage harvesting system

PONDS (378) are built to provide water for livestock, fish and wildlife, recreation, fire control and other uses.

A farm pond in southwest Georgia

Water Quality Benefits

- Potentially protects and further enhances water quality
- Provides/enhances aesthetic value
- Captures sediment and reduces transport downstream

When to Use

Ponds may be constructed for various reasons.

When ponds are being constructed for irrigation purposes, additional requirements and permitting may be required. Please contact your local conservation agent and see NRCS Conservation Practice Standard 436 for information about Irrigation Storage Reservoirs.

How To Establish

The Georgia Department of Natural Resources must be notified prior to any pond construction with an embankment of 25 feet or more or when the pond will have an impoundment capacity at a maximum water storage elevation of 100 AC-FT.

Prior to any pond restoration project, contact the U.S. Army Corps of Engineers and GA EPD for additional requirements.

GAEPD and the Army Corps of Engineers require documentation of agricultural use for exemption from erosion and sedimentation control permitting programs and NPDES permitting programs.

Ponds, in conjunction with vegetative buffers, can act as secondary traps for pollutants passing through primary practices.

NRCS typically accounts for sedimentation during the design of ponds. Your local NRCS representative can provide you with more information regarding appropriate pond sizing for your operation.

Owners are responsible for obtaining all permits. These include Georgia 401 Clean Water certification, Section 404 of the Clean Water Act permits and authorization from the Department of Natural Resources, Fish and Wildlife Division in addition to any local permits that may be necessary.

For more information regarding pond construction and requirements, see *Additional Resources*.

Considerations and Costs

Locate ponds in an area that will provide the most benefit. Consider visual impacts and wildlife habitat impacts. During construction, consider and plan for impacts on downstream watercourses, off-stream locations and environmental impacts on wetlands, aquifers and downstream users.

Costs associated with pond construction may include permitting, construction and maintenance. If stocking fish, additional costs are associated with purchasing stock and supplemental feeding. Maintenance may include removing debris and sediment. Also, when constructing a pond, establish vegetative cover on all sides of the pond.

Contact your local conservation agent prior to beginning a pond construction project in order to fully

understand maintenance requirements.

Ponds are moderate to high in cost and depend on the size of the pond.

Effectiveness

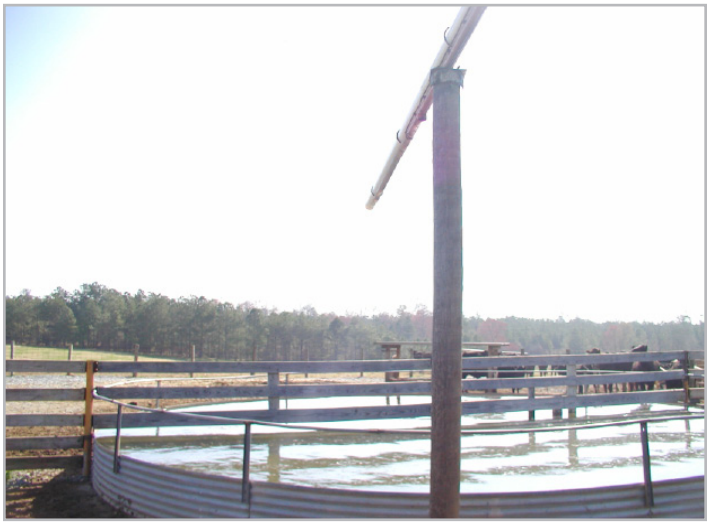
Ponds can potentially trap up to 80% of sediment depending pond design.

Additional Resources

NRCS Conservation Practice Standard 378
U.S. Army Corps of Engineers
Georgia EPD

Contact the GA EPD and local issuing authorities prior to constructing any pond for additional guidelines. Local authorities may require an erosion and sediment control plan. If working within a wetland, contact the Army Corps of Engineers.

ROOF RUNOFF STRUCTURES (558) are used to capture and transport water from roofs and to limit soil erosion from roof runoff.



A runoff collection system in Middle Georgia collects rainwater for livestock watering

Water Quality Benefits

- Reduces soil erosion
- Diverts water to more beneficial outlets

When to Use

Install roof runoff structures where there is potential for increased soil erosion and runoff as a result of flow from roofs.

Roof runoff structures can be used as a component of an alternative water system and/or an animal waste management system.

How to Establish

Numerous materials are available for use as roof runoff structures. Choose durable materials with a minimum life expectancy of 10 years.

Rock used for channels, trenches and pads should be poorly graded and free of sand and soil particles.

Runoff should be diverted to grass, vegetative or mass planting areas to increase infiltration rates.

Select downspouts of proper size to ensure the proper flow rate and system capacity.

For more information, see *Additional Resources*.

Considerations and Costs

Dissimilar metals should not be in contact of each other.

Keep roof runoff structures clear of debris. Periodically inspect for damages and make repairs in a timely manner. Regular inspections and maintenance will lower replacement costs.

Contact your local conservation agent prior to beginning a roof runoff structure project in order to fully understand maintenance requirements.

Discharge outlets should not be near wells or into structures that discharge directly into surface water.

Roof runoff structures are moderate in cost, depending on complexity.

Effectiveness

These facilities protect water quality by offering an alternative water supply which, with exclusion fencing, reduces animal access and waste entering nearby water bodies.

Additional Resources

NRCS Conservation Practice Standard 558

SECTION FOUR

Animal Waste Management Planning

Planning for animal manure management and animal waste systems can be quite complex. There are a variety of approaches to animal waste management and nutrient utilization planning. Numerous land application (LAS) systems are used through the agriculture industry for manure utilization.

All farms that maintain livestock are considered to be animal feeding operations (AFOs). Nutrient management plans (NMPs), also known as comprehensive nutrient management plans (CNMPs), are required for any AFO that receives a permit from the Georgia Environmental Protection Division (GA EPD). Large animal feeding operations that are regulated by the GA EPD are referred to as concentrated animal feeding operations (CAFOs). The definition of an AFO and a CAFO, as defined by the US EPA, can be found in the Practice Definitions section of this manual. NMPs are plans that address environmentally friendly nutrient utilization, animal mortality and record keeping on the farm. These plans result in a plan for a balance between nutrient inflows and nutrient outflows. Nutrients can be brought onto the farm in a variety of ways including feeds, fertilizers, animal by-products and other off-farm inputs. A nutrient balance can be achieved through the application of a combination of your NMP and BMPs.

The University of Georgia Nutrient Management Taskforce breaks NMPs into six categories: evaluation of nutrient needs, inventory of nutrient supply, determination of nutrient balance, mortality management, preventative maintenance and inspection, and emergency response planning. As a whole, these six components will help you address virtually all of your on and off farm nutrient inputs and outputs and are compatible with the federal requirements for NMPs.

Production by-products such as poultry litter and sludge from lagoons are often used on farmland and pasture land as an inexpensive fertilizer. In order to apply the proper amounts of these organic and inorganic fertilizers, a soil test is necessary. A soil test will provide you with recommended application rates of nitrogen, phosphorus and potassium. Your soil test will also help in determining if your litter should be applied according to a nitrogen-based plan or a phosphorus-based plan.

In addition, it is a good idea to have a litter test performed on your litter or any litter that is brought onto your farm. Animal by-products such as poultry litter can vary in nutrient content from load to load, house to house and can also depend on handling. A litter test will provide you with an accurate measurement of the amount of nutrients in the litter you will be applying. This will help you apply litter at the appropriate rates and reduce the potential for over applying nutrients, which can be detrimental to soil and water quality.

Animal waste systems require careful planning to properly utilize manure and other animal production by-products in an environmentally friendly way. Careful consideration should be given to locate waste system components in safe locations that also maximize the use of the system.

Conservation practices included in the Animal Waste Management Planning section include:

Anaerobic Digester
Ambient Temperature 365
Controlled Temperature 366

Animal Mortality Facility 316

Animal Trail and Walkway 575

Composting Facility 317

Critical Area Planting 342

Fence 382
Access Control 472

Heavy Use Area Protection 501

Land Leveling 464
Land Smoothing 466

Nutrient Management 590

Prescribed Grazing 528

Stream Crossing 578

Vegetated Treatment Area 635

Waste Facility Closure 360

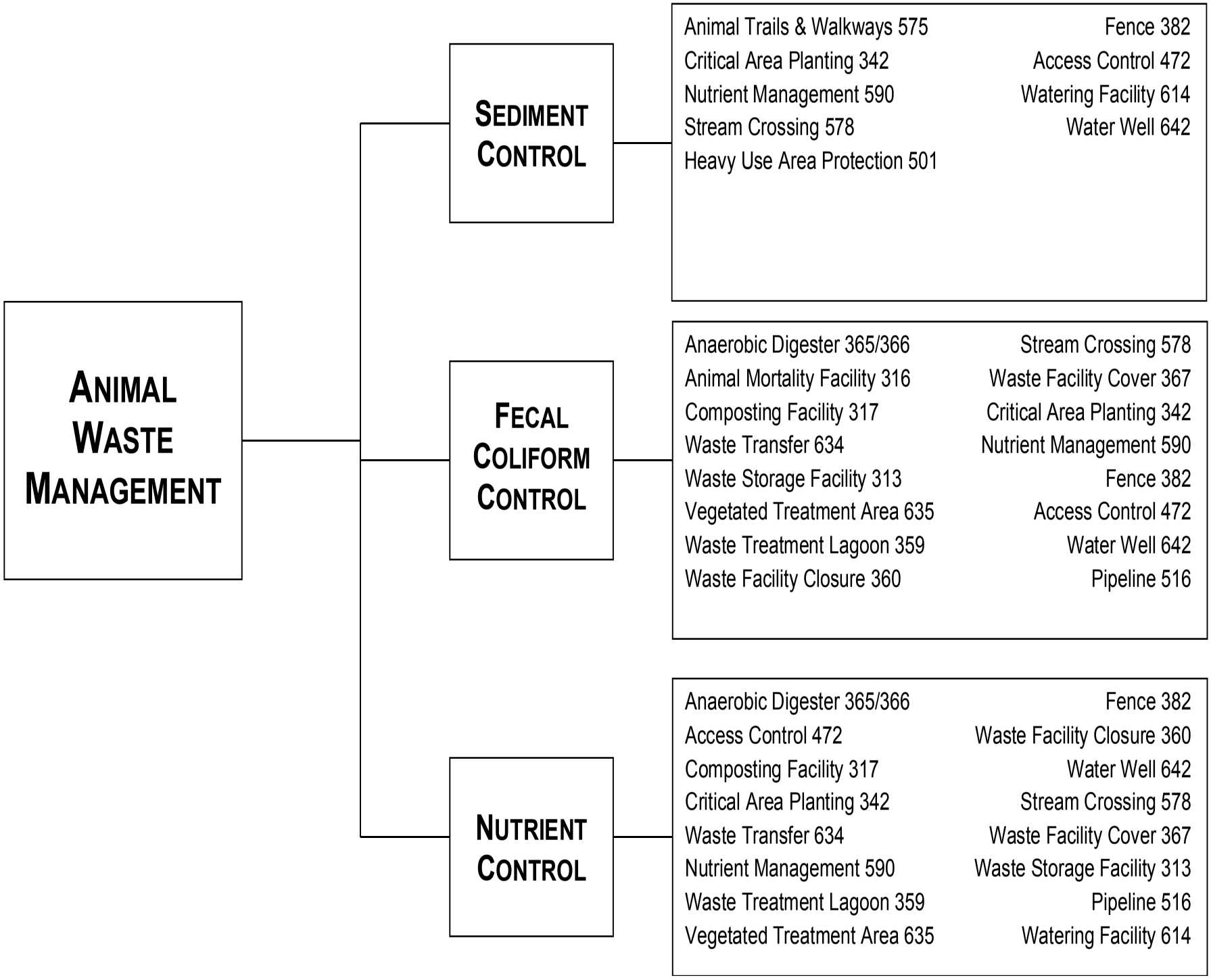
Waste Facility Cover 367

Waste Storage Facility 313

Waste Transfer 634

Waste Treatment Lagoon 359

Watering Facility (614)
Pipeline 516
Spring Development 574
Water Well 642


ANIMAL WASTE MANAGEMENT
SEDIMENT CONTROL
Animal Trails & Walkways 575
Critical Area Planting 342
Nutrient Management 590
Stream Crossing 578
Heavy Use Area Protection 501
Fence 382
Access Control 472
Watering Facility 614
Water Well 642
FECAL COLIFORM CONTROL
Anaerobic Digester 365/366
Animal Mortality Facility 316
Composting Facility 317
Waste Transfer 634
Waste Storage Facility 313
Vegetated Treatment Area 635
Waste Treatment Lagoon 359
Waste Facility Closure 360
Stream Crossing 578
Waste Facility Cover 367
Critical Area Planting 342
Nutrient Management 590
Fence 382
Access Control 472
Water Well 642
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NUTRIENT CONTROL
Anaerobic Digester 365/366
Access Control 472
Composting Facility 317
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Waste Treatment Lagoon 359
Vegetated Treatment Area 635
Fence 382
Waste Facility Closure 360
Water Well 642
Stream Crossing 578
Waste Facility Cover 367
Waste Storage Facility 313
Pipeline 516
Watering Facility 614

MINIMUM REQUIREMENTS FOR CONCENTRATED ANIMAL FEEDING OPERATIONS

ADDRESS PROPER OPERATION AND MAINTENANCE

Ensure adequate storage or manure, litter and process wastewater, including procedures to ensure proper operation and maintenance of the storage facilities

ADDRESS ANIMAL MORTALITY

Ensure proper management of animal mortalities (i.e. dead animals) to ensure that they are not disposed of in any liquid manure, storm water, or process wastewater storage or treatment system that is not specifically designed to treat animal mortalities

DIVERT CLEAN WATER

Ensure that clean water is diverted, as appropriate, from the production area

PREVENT DIRECT CONTACT OF CONFINED ANIMALS WITH U.S. WATERS

ADDRESS CHEMICAL DISPOSAL

Ensure that chemicals and other contaminants handled on-site are not disposed of in any manure, litter, or process wastewater, or stormwater storage or treatment system, unless specifically designed to treat such chemicals and other contaminants

PROVIDE AND MAINTAIN BUFFERS OR EQUIVALENT PRACTICES

Identify appropriate site specific conservation practices to be implemented, including, as appropriate, buffers or equivalent practices to control runoff of pollutants to waters of the United States

MAINTAIN PROPER STORAGE CAPACITY

Identify protocols for appropriate testing of manure, litter, process wastewater, and soil

ADDRESS RATES AND TIMING OF LAND APPLICATION OF MANURE AND WASTEWATER

Establish protocols to land apply manure, litter, or process wastewater in accordance with site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure, litter or process wastewater

ADDRESS RECORD KEEPING AND TESTING

Identify specific records that will be maintained to document the implementation and management of the minimum elements listed

(USEPA Minimum Requirements for CAFOs)

ANAEROBIC DIGESTERS (365 & 366) biologically treat animal manure using either an unheated or a managed temperature waste treatment facility.

An operational anaerobic digester

Water Quality Benefits

- Reduces nutrient transport downstream

When to Use

Digesters are used as part of a new or existing waste management system where fresh manure can be collected for use. There are two types of digesters: ambient temperature (unheated) and anaerobic (managed temperature).

How to Establish

All federal, state and local regulations should be followed.

Locate digesters as close as possible to sources of manure, and at least 300 feet from neighboring dwellings and public areas or within 25 feet of an intermittent or perennial streams, unless there are no other feasible locations in order to maintain water quality benefits. Divert rainwater away from these facilities to reduce discharges and maintain capacity.

Treat manure from ruminants by solid separation prior to entering an anaerobic digester. Nutrients processed in a digester are immediately available to plants upon application. Nitrogen is converted to an ionic form that plants can utilize more rapidly.

For more information, see *Additional Resources*.

Considerations and Costs

Consider installing a vegetated screen to reduce negative visual impacts, especially for more visible systems. Improperly installed and maintained digesters increase odors.

Additional potential benefits of controlled temperature digesters may include reduced herbicide usage and lower weed seed germination.

Contact your local conservation agent prior to beginning a digester construction project in order to fully understand maintenance requirements. Anaerobic digesters are moderate to high in cost depending on materials, construction, and size.

Effectiveness

Digesters at mesophilic temperature (35ºC) reduced E.coli by 90% in less than one day during batch digestion compared to bacterial survival in manure slurry of up to 77 days in studies. Controlled temperature digesters reduced pathogenic fecal coliform organisms by 99.9% and M. avium paratuberculosis by 99% in studies.

Additional Resources

NRCS Conservation Practice Standard 365
NRCS Conservation Practice Standard 366

ANIMAL MORTALITY FACILITIES (316) are permanent structures used to dispose of carcasses and include burial pits, mortality composting facilities, incinerators and freezers.

Mortality composting bins

Water Quality Benefits

- Provides an alternative disposal of dead animals and can reduce soil and water contamination resulting from inclement weather

When to Use

Animal mortality facilities are typically part of a waste management plan. All federal, state and local regulations should be followed. Commonly used animal mortality facilities include burial pits, freezers, mortality composters and incinerators.

Poultry operations must obtain written approval or certification from the Georgia Department of Agriculture to dispose of poultry carcasses.

How to Establish

Prior to constructing a pit, the Georgia Department of Agriculture (GDA) must complete a site assessment and approve the site. Locate pits at least 100 feet from any existing or proposed wells and water supply lines, 15 feet from the edge of any embankment, and 100 feet from the normal water level of any body of water.

Burial pits must be at least 4 feet wide and long enough to maintain carcasses. Pits can be a minimum of 3 feet deep and can be no more than 8 feet deep. Pits must be 1 foot above the water table. Carcasses must be covered with 3 feet of soil. Restrict vehicular traffic within 4 feet of pits. If multiple pits are used, separate pits at least 3 feet. Store stockpiled soil that will be used in a burial pit at least 20 feet from the pit.

Freezers are used to store carcasses for off-farm removal or incineration. Chest-type freezers work best and should be located on a suitable base (concrete) near the entrance to the farm in an easily accessible area for emptying equipment.

Incinerators are used to burn carcasses. Permits, approval and registration are the responsibility of the owner. Maintain a minimum distance of 20 feet between incinerators and any other structure, at least 100 feet from any surface watercourse, well or water source, and 900 feet from neighboring residences. It is also recommended that these facilities be kept out of sight of the general public. Runoff should be diverted away from animal mortality facilities.

For more information, see *Additional Resources.*

Considerations and Costs

Costs vary depending on the type of facility selected for an operation. Consider equipment availability, and construction and maintenance costs prior to installation. Producers should choose a facility that meets their needs as economically as possible.

Animal mortality facilities are moderate to high in cost, depending on materials, construction and size.

Effectiveness

Products from composting facilities can be incorporated into the soil and improve agronomic conditions and can also be used a part of a nutrient management plan.

Additional Resources

NRCS Conservation Practice Standard 316

A drum composting system on a poultry farm in southwest Georgia

ANIMAL TRAILS AND WALKWAYS (575) are established and maintained specifically for animal movement, especially in heavy traffic areas.

Dairy cattle travel an established path to barns

Water Quality Benefits

- Reduces erosion
- Reduces sediment entering water sources
- Protects downstream water quality and habitats

When to Use

Establish trails on areas of frequent use where the potential for soil erosion is high.

How to Establish

Consider ecological and environmental impacts when designing trails or walkways. Trail and walkway width should accommodate animal travel at a reasonable pace.

To establish, grade pathways level and cover with surface material. For long and short-term control of erosion, vegetative cover can be established.

For more information, see *Additional Resources*.

Considerations and Costs

In addition to site preparation, producers may opt to seed for vegetative cover. After seeding, provide adequate time for plant establishment.

Fences may be used with this practice to confine animals to trails and walkways.

Maintenance costs associated with this practice include periodic grading, re-shaping, re-surfacing, re-seeding and fence mending.

In areas with heavy animal traffic, a better option is Heavy Use Area Protection (561). See page 2.25 for more information on Heavy Use Area Protection.

Animal trails and walkways are moderate to high in cost, depending on materials, construction and size.

Effectiveness

By providing a stable and protected travel path, animal trails and walkways can significantly reduce the amount of sediment and nutrients entering water.

Additional Resources

NRCS Conservation Practice Standard 575

COMPOSTING FACILITIES (317) utilize animal manure or other waste products (not including animal carcasses) in a sanitary method that results in a product that can be used on farms to improve soil organic matter.

Composted materials can be used to improve soil and increase water-holding capacity

Water Quality Benefits

Composting provides a soil amendment that:

- Physically protects soil from rain and wind and reduces sediment transport in runoff
- Increases plant growth and soil cover
- Improves soil structure, organic content, water infiltration and water holding capacity
- Provides an alternative use for poultry litter and other animal by-products as part of a nutrient management plan

When to Use

Composting facilities provide an alternative use for manure and other waste products from agricultural operations and can improve air quality and odors.

In order to maintain water quality benefits, composting facilities should not be located within 25 feet of an intermittent or perennial stream, unless there are no other feasible locations.

These facilities can be designed to handle animal mortality. Please see Animal Mortality Facilities on page 2.18 for more information.

How to Establish

When possible, composting facilities should be located outside of floodplains and above seasonal high water tables. Permeable soil is ideal to reduce surface water contamination. Be sure to divert runoff away from composting facilities.

Facilities need to be large enough to handle the type and amount of composting materials being used.

pH levels should be neutral or slightly lower to reduce nitrogen losses. Once established, moisture content should remain between 40-60%. The minimum composting period for stability is 21-28 days; for higher quality compost, piles may need up to 60 days.

The GA Department of Agriculture now approves large animal composting on a case-by-case basis. The State Veterinarian must provide final approval for these facilities.

For more information, see *Additional Resources*.

Considerations and Costs

Inspect composting facilities frequently to ensure proper function. This includes temperature, odor, moisture and oxygen. Initially, use a composting mix of 30:1 to reduce odors. Chemical agents and carbonaceous materials may be needed to maintain proper function.

To obtain maximum solar warming, piles should be aligned north to south with moderate side slopes.

Composting facilities can be high in cost depending on materials, size and construction.

Effectiveness

Composting by-products reduced erosion by 86% in studies. On slopes up to 15%, composted materials reduced runoff by 70% in studies.

By using composting by-products sediment transport was reduced up to 99% compared to silt fences and 38% compared to hydroseeding in studies.

Additional Resources

NRCS Conservation Practice Standard 317

A composting system using large equipment to turn materials

Contact the Georgia Department of Agriculture or any conservation agency for more information about installation and use requirements.

CRITICAL AREA PLANTING (342) is establishing permanent vegetation in highly erodible areas to prevent soil erosion and sediment transport in water.

Establishing vegetation in critical areas stabilizes soil and can reduce erosion and protect water quality

Water Quality Benefits

- Reduces erosion
- Reduces sediment transport into water sources
- Filters sediment from runoff
- Protects downstream water quality
- Increases infiltration and water-holding capacity

When to Use

Critical area planting should be used where vegetation cannot be established by ordinary conservation practices.

How to Establish

Site preparation may be necessary to prepare the area for conventional seeding or planting. Areas should be seeded or planted to meet minimum canopy requirements. Native or adapted plant species are ideal for critical areas.

Grading is not necessary when hydroseeding is used.

When planting individual plants, follow proper horticultural practices. Mulching may also be necessary, depending on the site.

For more information, see *Additional Resources*.

Considerations and Costs

Other costs may include fertilizer, compost, mulch, pH adjusting agents, and maintenance.

Diversions may be necessary to divert concentrations of water to safe outlets and reduce erosion.

Depending on the site, liming may be necessary. A soil test will determine if additional fertilizer is needed. Contact your local extension agent for soil testing instructions.

Consider installing irrigation to ensure plant establishment in critical areas.

Critical area planting is high in cost depending on materials, size and construction.

Effectiveness

Sediment runoff models indicate that critical area planting can be 75% effective in reducing soil loss.

Additional Resources

NRCS Conservation Practice Standard 342

FENCING AND ACCESS CONTROL (382 & 472) provide barriers that limit animal, human and wildlife entry into specific areas to protect natural resources.

Fencing animals out of ponds protects water

Water Quality Benefits

- Reduces sediment entering water sources
- Reduces nutrients entering water sources
- Reduces erosion
- Improves water quality
- Protects aquatic habitats

When to Use

Fences should be used to keep animals out of water sources as much as possible. Access control can be used whenever necessary.

How to Establish

Fences need to be of the proper height and material to maintain livestock species being kept on pasture. Be sure that adequate water and shade are available for livestock.

Fences can be constructed of barbed wire, field fence or electric fencing materials. Select materials that will prevent animals from escaping.

For access control, barriers can be constructed from natural or artificial materials. When access control is used to limit access to critical areas, a two-year exclusion period is needed or until vegetation is well established.

For more information, see *Additional Resources*.

Considerations and Costs

Consider impacts on water quality during and after construction. Alternative watering practices are available and should be used whenever possible. When installing fences or access control barriers, reduce impacts on wildlife, animals and surrounding habitats as much as possible.

Costs associated with fencing include site preparation, materials, labor and maintenance costs. Fences need to be periodically inspected to maintain the integrity of the fence.

Fences are moderate in cost depending on material costs and the amount of fencing installed. Access control is low to moderate in cost depending on material costs.

Effectiveness

Fences have been found to reduce nitrogen by 60%, sediment by 75% and suspended solids by 50-90% in studies. Fencing animals out of small, second order streams has reduced fecal coliform colony forming units by 99% in studies.

Additional Resources

NRCS Conservation Practice Standard 382
NRCS Conservation Practice Standard 472

HEAVY USE AREA PROTECTION (561) involves the establishment of vegetation and/or the installation of erosion prevention materials that protect areas where heavy traffic is expected.

Heavy Use Area Protection around a watering trough

Water Quality Benefits

- Reduces soil erosion by limiting animal traffic
- Reduces nutrient and sediment transport in water
- Protects water quality

When to Use

This practice applies to frequently or intensively used areas but does not apply to stream crossings.

How to Establish

Structures should be constructed in accordance with all federal, state and local regulations.

Design heavy use areas to withstand the type and amount of anticipated traffic. A base of coarse gravel, crushed stone, or other suitable material should be provided for load bearing strength, depending on the type and amount of traffic in the area.

Heavy use areas that will be used for livestock need to be clear of any loose, wet, organic or other undesirable materials.

Watering ramps should not extend more than 5 feet into a stream with a slope of 5 to 1 or flatter toward the water source. Install ramps perpendicular to stream flow. Diversions or other means to reduce surface water flow into streams may be needed.

For walkways, an additional 8 to 15 foot treatment area extension is needed. Treatment areas for watering ramps need a bottom width of 10 to 20 feet.

For loafing areas, the maximum recommended treatment area per animal is 200 ft^2 for dairy cattle, 150 ft^2 for beef cattle, 150 ft^2 for horses and 10 ft^2 for sheep and goats according to USDA NRCS standards and specifications.

For more information, see *Additional Resources*.

Considerations and Costs

Locate heavy use areas an appropriate distance from facilities where animals typically congregate (i.e. hay rings, water troughs and mineral blocks) and may cause resource concerns.

To protect water quality, heavy use areas should be located as far as possible from water sources. Watering ramps should be used when no other option is feasible for an operation. Keep heavy use areas as small as possible.

Initial costs may include site preparation, installation, and materials costs.

Maintenance costs may include regenerating vegetative cover and replenishing other heavy use area cover.

Heavy use areas are moderate to high in cost depending on materials, size and construction.

Effectiveness

Heavy Use Area Protection has the potential to reduce erosion from protected areas up to 80%.

Additional Resources

NRCS Conservation Practice Standard 561

A livestock watering area in need of Heavy Use Area Protection and an improved watering facility

Heavy Use Area improvements include a new watering tank and gravel to protect the area

LAND LEVELING AND LAND SMOOTHING (464 & 466) is the reshaping and grading of land to remove soil surface irregularities in order to improve water usage efficiency for irrigation and surface drainage purposes.

Water Quality Benefits

- Protects water quality by decreasing runoff potential
- Reduces sediment in runoff
- Improves water distribution
- Improves surface drainage

When to Use

Land leveling should be used on land that has a detailed engineering survey, design and layout.

Land smoothing is used in areas where irregularities such as depressions, mounds, old terraces, etc. interfere with the implementation of conservation and management practices.

Land leveling and land smoothing are components of other conservation practices and should not be utilized as individual conservation practices.

How to Establish

All federal, state and local regulations should be met.

After leveling, soil should be deep enough to support the root zone. In situations where more than one crop is grown on a field, land should be leveled to meet the requirements of the most restrictive crop.

For more information, see *Additional Resources*.

Considerations and Costs

It may be necessary to border fields with erosion resistant grasses or legumes until good crop stands are established.

In areas where irrigation water will contain more sediment, it may be necessary to raise the height at the point of delivery. Also consider impacts on water flows and aquifers, other users and adjacent wetlands and habitats.

Costs associated with this practice include site preparation, materials and maintenance costs.

Land smoothing may impact the movement of sediment and sediment-attached substances in runoff. Also consider potential impacts on wetland and wildlife habitats.

These practices are low to moderate in cost, depending on the situation.

Effectiveness

Land leveling and smoothing reduces the likelihood of sediment and runoff entering water and promotes proper drainage.

Additional Resources

NRCS Conservation Practice Standard 464
NRCS Conservation Practice Standard 466

NUTRIENT MANAGEMENT (590) involves the development of a plan that will assist producers in improving management and nutrient use by matching needs more efficiently and reducing excess nutrients in runoff.

A litter spreader applies waste to a field as fertilizer

Water Quality Benefits

- Reduces nutrient loadings into surface and groundwater
- Properly utilizes manure
- Improves and/or maintains soil condition

When to Use

A nutrient management plan (NMP) is required for all animal feeding operations receiving permits through GAEPD cost share programs and for any agricultural operation that is receiving federal funding.

How to Establish

All federal, state and local regulations should be followed.

There are 6 parts of a NMP: evaluation of nutrient needs, inventory of nutrient supply, determination of nutrient balance, mortality management, preventative maintenance and inspection, and an emergency response plan.

A detailed farm map will be needed as a basis for a NMP and should include farm property lines, clearly identified fields, roads, off-site dwellings and public gathering areas, the location of all surface waters with direction of flow included, and a soils map if available. Identify critical areas around water sources where nutrient use should be reduced or eliminated.

A soil test is required to identify which nutrient additions are needed. County extension agents can provide you with instructions for soil sampling and can submit soil samples to the UGA Soils Laboratory. Testing costs are minimal. Test results provide producers with an analysis of the soil nutrient content that can be used to determine application rates. Ultimately, nutrient inputs from all sources and outputs should be balanced.

A defined mortality management plan is needed to identify how livestock and poultry mortalities will be managed. This should include normal mortality estimates, methods of disposal or utilization, and plans for dealing with catastrophic mortality events.

Detailed, clear records are part of preventative maintenance and can be used as part of the inspection process. All results from soil, plant and manure tests should be maintained for at least 5 years. Records should include cropping and application schedules, and calibration, maintenance and inspection records.

Emergency response plans include instructions for actions to take in emergency situations, emergency contact information, and any authorizations necessary to obtain essential equipment or neighboring property access.

NMPs can be nitrogen-based or phosphorus-

based, depending on soil test results. Your local conservation agent can help you complete your NMP.

For more information, see *Additional Resources*.

Considerations and Costs

Whenever possible, split nitrogen applications to promote plant uptake and utilization.

Avoid winter applications of nitrogen whenever possible; they are the least efficient.

Always apply nutrients uniformly or according to precision agriculture techniques. Annual reviews are needed to determine if there are any changes to the nutrient balance that need to be addressed in the following year's plan.

NMPs are low to moderate in cost per acre and can often be completed using cost-share money.

Effectiveness

Nutrient management plans result in an average reduction of 35% in total phosphorus loads and 15% reduction in total nitrogen loads.

Additional Resources

NRCS Conservation Practice Standard 590
Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6

Nutrient management plans are required for all LAS permitted AFO and NPDES permitted CAFOS, and are recommended for all liquid manure systems. NMPs are also required for any operation receiving cost share funding through Clean Water Act Section 319(h) funding. Contact any conservation agency for more information or the Georgia Department of Agriculture.

PRESCRIBED GRAZING (528) systems maintain vegetative quality and quantity by managing grazing animals to promote stand longevity.

By planning a grazing system, productivity and yield can be improved

Water Quality Benefits

- Slows runoff and allows time for nutrient absorption
- Promotes thick, well anchored vegetation

When to Use

Prescribed grazing can be used on any land where grazing animals are managed. Prescribed grazing is the intensive management of grazing animals to promote vegetative quality and reduce damage to pastures from over grazing.

How to Establish

Plan prescribed grazing programs based on the type and number of animals, length of grazing periods and growing seasons. Animals should be managed to leave adequate cover and to encourage plant health and vigor. Schedule grazing during the growing season to manage growth.

Adequate ground cover and plant density are necessary for improved filtering capacity, infiltration and soil condition.

For more information, see *Additional Resources*.

Considerations and Costs

In order to maintain minimum adequate cover, it may be necessary to limit animal access for periods of time to allow for plant re-vegetation.

Locate feeding, handling and watering facilities to minimize impacts on vegetation. Other conservation practices that work well with prescribed grazing include fences, pest management, and heavy use areas.

Consider supplying alternative feeds to meet forage intake requirements during low growth winter months and during extreme conditions.

Prescribed grazing is low in cost.

Effectiveness

Sediment runoff models indicate that prescribed grazing can be 75% effective in reducing soil loss.

Additional Resources

NRCS Conservation Practice Standard 528

STREAM CROSSINGS (578) are designed to protect water quality and reduce erosion by designating stable access points and crossings.

A distant view of a stream crossing

Water Quality Benefits

- Reduces nutrient, organic and inorganic loadings in water
- Reduces sedimentation in water
- Reduces erosion by limiting access

When to Use

Stream crossings can be used on any land where there is a need to cross water bodies.

How to Establish

The type of stream crossing installed depends on the amount of traffic through an area. Stream crossing sites should have a stable streambed. Stream crossings should be designed to handle peak runoff and floodwaters.

Multi-use stream crossings should be at least 10 feet wide; livestock crossings should be at least 6 feet wide. Stabilize side slopes. Blend approaches with existing surroundings and have a gradual descent/ascent with a suitable material beneath gravel to reduce erosion. Divert runoff around approaches and away from crossing surfaces.

To limit access, adjacent areas should be permanently fenced. Cross-stream fencing can be used at fords to limit access.

There are several types of stream crossings.

FORDS or drive-throughs are used for low levels of traffic through streams. Design fords to have a minimal impact on streams. Rocks or gravel can be placed within streambeds to provide necessary support.

Concrete fords should only be used where the streambed foundation has adequate strength to support the weight of the concrete.

CULVERTS typically consist of a pipe installed slightly below grade inside a streambed to allow water to pass through, and is covered with backfill to allow for movement across the stream. Culvert length is dependent on the desired width of the road top.

BRIDGES are permanent stream crossings installed over large streams. Bridges are constructed out of concrete, steel or wood. Abutments and wingwalls are recommended to protect stream flows and water quality.

For more information, see *Additional Resources.*

Considerations and Costs

Whenever possible, redirect traffic around water bodies instead of installing stream crossings. If traffic is infrequent, fords have the least impact on overall water quality.

Consider long and short-term impacts on upstream and downstream flows and habitats. Stream crossings can result in increased sedimentation, erosion and flooding, and should be carefully monitored and maintained. All stream crossings should

be evaluated for safety.

Stream crossings are moderate to high in cost depending on materials and construction.

Effectiveness

Stream crossings reduce animal access, provide stable traffic paths and reduce the amount of nutrients and sediment entering water.

Additional Resources

NRCS Conservation Practice Standard 578

A ford installed as a stream crossing

VEGETATED TREATMENT AREAS (635) are strips of herbaceous cover used to reduce sediment and nutrient loadings as part of an agricultural waste management system.

Water Quality Benefits

- Reduces loadings of nutrients, organics, pathogens, and other contaminants in runoff
- Allows time for nutrient absorption

When to Use

Vegetated treatment areas are used as part of a waste management system whenever water quality can be improved through the treatment of wastewater.

Different types of treatment areas exist including rapid infiltration, overland flow and slow rate process treatment strips.

How to Establish

Locate treatment areas outside of floodplains whenever possible. Water entering these areas should be as sheet flow. The minimum width for vegetated treatment areas must be based on the latest US EPA guidelines.

Areas should be located on moderately or highly permeable soils. The appropriate length, width and slope of a treatment area depends on the type and purpose of the area being installed. Permanent vegetation that is tolerant of wet conditions should be established as soon as possible.

Treatment areas should not be located within 25 feet of an intermittent or perennial stream, unless there are no other feasible locations in order to maintain water quality benefits.

For more information, see *Additional Resources*.

Considerations and Costs

Avoid applying wastewater to treatment areas during inclement weather or when soil temperatures are below 39 degrees.

Maintenance includes periodic harvesting to encourage dense upright growth, repairing strips after heavy storms and re-planting as needed. Livestock should not be allowed onto treatment areas.

Costs associated with this practice may include materials, site preparation, installation, and maintenance.

Vegetated treatment areas are low in cost depending on materials and installation costs.

Effectiveness

In studies, treatment areas trapped 80-90% of solids in feedlot runoff with shallow and uniform flow, and removed 60% of total phosphorus and 70% of total nitrogen.

Additional Resources

NRCS Conservation Practice Standard 635
Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6
EPA Technology Transfer Process Design Manual for Land Treatment of Municipal Wastewater
UGA Georgia Cooperative Extension Service

Vegetated treatment areas can be used to address minimum requirements for CAFOs as defined by the U.S. EPA.

WASTE FACILITY CLOSURE (360) refers to the environmentally responsible closure of lagoons and waste storage ponds that are no longer used for their original purpose.

Water Quality Benefits

- Protects surface and groundwater quality by reducing the potential for nutrients entering water

When to Use

Agricultural waste facilities that are no longer utilized as part of a waste management system should be closed.

How to Establish

All federal, state and local regulations should be followed.

Remove any structure previously used for conveyance. Remove all liquid and as much slurry as possible from the impoundment and then backfill with earthen materials.

If sludge is not removed from waste facilities that are being converted to fresh water storage, the impoundment cannot be used for fish production.

Safety precautions and warnings should be utilized to protect both animals and humans from danger.

For more information, see *Additional Resources*.

Considerations and Costs

Additional measures may be necessary to minimize erosion and pollution of downstream water sources.

Plan to pump liquid and remove sludge when odors being carried downwind can be minimized.

Costs associated with this practice include site preparation, disposal of removed equipment, materials for backfilling and safety purposes, and monitoring and maintenance.

Contact your local conservation agent prior to beginning any closure project in order to fully understand maintenance requirements.

Closing unused waste facilities can be high in cost depending on the size of the impoundment and the amount of waste that must be removed.

Effectiveness

Closing unused waste storage facilities protects water quality by reducing the likelihood of residual nutrients entering water.

Additional Resources

NRCS Conservation Practice Standard 360
Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6

WASTE FACILITY COVERS (367) are used to maintain capacity and limit rainfall entering storage facilities in order to improve water and air quality as part of an agricultural waste management system.

Water Quality Benefits

- Reduces unexpected overflow of storage facilities
- Reduces excess nutrients from entering water sources

When to Use

Waste facility covers can be used on any waste collection system to reduce overflow, capture and control the release of emissions, and control the production and emission of biogases from storage facilities.

How to Establish

Covers being incorporated into a waste management system should meet all federal, state and local regulations.

Select covers with a service life of at least 10 years. Covers should allow gaseous emissions to pass through the membrane for release.

All storage facilities should have warning signs and fences to reduce hazards from unauthorized entry.

For more information, see *Additional Resources*.

Considerations and Costs

Covers can be substantial in cost but reduce accidental discharges. They also work well to address odor issues by controlling gaseous emissions.

Waste facility covers are high in cost.

Effectiveness

Waste facility covers protect the integrity and capacity of storage facilities and reduce the potential for overflows.

Additional Resources

NRCS Conservation Practice Standard 367

Waste facility covers can be part of the minimum requirements for CAFOS established by the U.S. EPA to address waste storage capacity.

WASTE STORAGE FACILITIES (313) are used to temporarily store animal manure, wastewater and contaminated runoff as part of an agricultural waste management system.

A stack house allows for litter storage until it can be used for other purposes or can be transported off-farm

Water Quality Benefits

- Reduces nutrient overloads in streams
- Allows time for chemical breakdown

When to Use

Waste storage facilities are typically used as part of a waste management plan and in conjunction with a NMP. Storage facilities should be built on sites that are suitable for construction and use.

Waste storage facilities include stack houses, tanks, and storage ponds.

How to Establish

Waste storage facilities should be planned, designed and constructed to meet all federal, state and local laws and regulations.

Locate manure storage facilities outside of floodplains whenever possible. These facilities should be located where impacts from facility failures such as overflows, accidental releases and liner failure will be minimal.

Permanent inlets should protect against erosion, tampering and accidental releases. Post safety notices to warn against potential danger.

Periodically removing solids will help maintain the capacity of a waste storage facility. This should be incorporated into the final design of a facility.

Runoff from other sources should be diverted away from waste storage facilities.

In order to maintain water quality benefits, waste storage facilities should not be located within 25 feet of an intermittent or perennial stream, unless there are no other feasible locations.

Contact your local conservation agency for more information on additional requirements and permits prior to beginning construction and to fully understand maintenance requirements.

For more information, see *Additional Resources*.

Considerations and Costs

Waste storage facilities should be located as close to sources of manure and polluted runoff as possible. Including side panels on stack houses can reduce exposure to rain and reduce runoff.

Consider incorporating a solid/liquid separation component into a waste management system to reduce the accumulation of solids in the storage facility.

Costs associated with this practice include installation and maintenance. Additional costs may result from updating existing management systems and incorporating new components.

Waste storage facilities are moderate to high in cost depending on the size of the operation, materials and installation costs.

Effectiveness

In studies, the amount of fecal coliform was reduced by 96% in litter that was stored for 2 weeks.

Additional Resources

NRCS Conservation Practice Standard 313
Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6

Waste storage facilities can be used to address manure storage in the minimum requirements for CAFOs established by the US EPA

WASTE TRANSFER (634) utilizes a conveyance system that transports manure to storage facilities, loading areas or agricultural land.

A truck is loaded for on-site manure transfer. Off-site manure transfers are monitored by the GDA

Water Quality Benefits

- Reduces nutrient loadings on operations with large animal populations
- Reduces potential soil and water quality degradation

When to Use

A waste transfer should be used as part of a planned manure management system or a NMP.

How to Establish

All federal, state and local regulations should be followed.

Reception pits should be able to maintain at least one-full day of manure production. When pits will also receive runoff, it is necessary to maintain the volume from a 25-year, 24-hour storm along with additional room for freeboard and emergency storage. Open structures should be covered and protected with gates or fences to minimize safety hazards. Install barriers around push-off ramps to prevent farm equipment from falling into facilities.

There are additional requirements for equipment hauling and land application. Costs for transporting litter depend on distance, type of litter and form of litter (dry or liquid).

For more information, see *Additional Resources*.

Considerations and Costs

Waste transfers are moderate in cost depending on the type of manure and the size of the transfer.

Effectiveness

Manure transfers promote the proper use of manure and reduce nutrient loads in soil. Manure transfers allow for the movement nutrients out of highly concentrated areas.

Additional Resources

NRCS Conservation Practice Standard 634
Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6

A solid separator

Animal manure handlers are regulated by the Georgia Department of Agriculture. Contact the GDA for more information on requirements.

WASTE TREATMENT LAGOONS (359) are used to biologically treat manure, wastewater and contaminated runoff as part of an agricultural waste management system.

Properly constructed and maintained lagoons reduce nutrients and sediment entering nearby sources

Water Quality Benefits

- Decreases nutrient loadings in water sources
- Reduces producer liability
- Improves soil structure and reduces negative water impacts

When to Use

Lagoons are a component of a waste management system and can be built when needed for treatment purposes, and where air and water pollution will not be a problem.

How to Establish

All federal, state and local regulations should be followed. Producers are responsible for obtaining all required permits. Locate lagoons outside of floodplains whenever possible. When not possible, protect lagoons from inundation or damage from a 25-year flood event. Inlets and outlets should be made of permanent, corrosion resistant materials. Erosion protection measures may be needed to ensure lagoon capacity. Post appropriate warning signs and safety protections.

Treatment lagoons are much larger than storage ponds, shallower in depth, and are designed to treat waste and reduce nutrients. In order to protect water quality, waste treatment lagoons should not be located within 25 feet of an intermittent or perennial stream unless there are no other feasible locations.

For more information, see *Additional Resources*.

Considerations and Costs

Locate lagoons as close to the source of waste as possible. Consider using a solid/liquid separation system to preserve lagoon capacity.

Costs associated with this practice include site preparation, materials, installation and maintenance. This may include monitoring and the removal and utilization of waste. An emergency response plan is necessary to address any emergency concerns.

Waste treatment lagoons are moderate to high in cost. Contact your local conservation agent prior to beginning a lagoon construction project in order to fully understand lagoon requirements.

Effectiveness

Lagoons have reduced nitrogen content in dairy manure as much as 80% in some studies.

Additional Resources

NRCS Conservation Practice Standard 359

Waste treatment lagoons can be part of the minimum requirements established by the U.S. EPA.

WATERING FACILITIES allow producers to provide livestock with alternative watering sources away from areas of environmental concern or where water supply is unable to meet demand. This includes watering ramps, spring development, troughs, tanks, pipeline and wells used for livestock watering purposes.

A concrete water trough offers livestock an alternative to drinking directly out of the creek and promotes water quality

Water Quality Benefits

- Conserves vegetative cover and reduces erosion by encouraging uniform grazing
- Protects water sources from contamination from animal manure
- Reduces nutrient and sediment loadings in water sources
- Reduces nutrient transport downstream
- Reduces streambed disturbances

When to Use

Watering facilities such as troughs or tanks can be used on any land where alternative water sources are needed to protect water quality.

Springs should only be developed where there is a dependable source of water for the planned use. Watering ramps can be used for alternative watering when other methods are not applicable.

Wells used as part of an alternative water source can be drilled, dug, bored, or jetted with sufficient available water.

How to Establish

Select a well-drained installation site where trail and flooding erosion are minimized.

Areas that can be potentially damaged by animals should be graveled or paved to reduce erosion and provide stable footing.

Watering facilities should have adequate capacity to meet the demands of livestock. Automatic water level controls and overflow valves can reduce overflow from watering facilities.

Pipelines are limited to 8 inches or less in diameter.

Watering facilities need to accommodate all livestock species and sizes that will be using a facility. Pipes should be protected from traffic, farm operations, freezing temperatures, fire, thermal expansion and contraction.

The capacity of pipeline should allow the watering system to provide a minimum watering capacity for the following species:

- Beef cattle/horses: 20 gallons per head per day
- Dairy cattle: 25 gallons per head per day
- Sheep/goats: 2 gallons per head per day

A watering system should be designed to have an working pressure that is equal to or less than 72% of the pressure rating for pipe and have a maximum velocity of 5ft/sec when flowing at design capacity. Check valves, backflow preventers and vents may be necessary.

For spring development, water collected for use is dependant on the type of spring. Collection trench-

es should be excavated into the impervious layer. Subsurface drains or a perforated pipe 3 inches or larger in diameter are also needed. Spring boxes and outlets should be properly installed to provide sediment traps. To prevent clogging, outlet pipes should be 1-inch in diameter.

Install watering ramps perpendicular to stream flow direction. Ramp width should not exceed 20 linear feet of the stream and should not extend more than 5 feet into a stream or to the stream center, whichever is less. Choose a ramp width that will minimize the amount of time animals spend in the water. The grade of a watering ramp should match the natural grade. Slope should not exceed 5 to 1. Always divert runoff away from ramps.

Fencing will be needed to prevent animal access to water other than by the ramp. This includes fencing around the ramp.

For more information, see *Additional Resources*.

Considerations and Costs

In order to prevent livestock congregating near ramps, locate feeders, salt blocks, and hay away from ramps. When possible, a grazing plan that reduces watering ramp use should be developed. Locating watering ramps outside of shaded areas can prevent animal loitering.

Costs associated with these practices include site preparation, materials, installation and maintenance. Maintenance may include checking for debris, algae, sludge and other materials, repairing leaks, checking automatic water level devices and outlets, removing obstructions, repairing erosive areas and maintaining pipes. Monitoring for erosion is also needed. To reduce erosion, revegetate disturbed areas as soon as possible after construction.

Developing springs may result in a decrease in surface water base flows.

Watering facilities are moderate to high in cost depending on the complexity of the facility, materials and construction costs. Watering ramps are moderate in cost depending on size, materials and construction costs. Spring development is moderate to high in cost.

Effectiveness

Watering facilities reduce the access and/or amount of time livestock spend in water. These facilities significantly reduce the amount of waste and sediment entering water.

Additional Resources

NRCS Conservation Practice Standard 516
NRCS Conservation Practice Standard 574
NRCS Conservation Practice Standard 614
NRCS Conservation Practice Standard 642

A watering ramp with fencing to limit access

Contact your local conservation agency prior to any spring development project for additional guidelines and requirements.

SECTION FIVE

Irrigation Water Management Planning

Georgia's agriculture industry utilizes millions of gallons of water each year for irrigation purposes. Irrigated agriculture ranges from row crop farming to plant nurseries to orchards. Much of the concern with irrigation is with regard to efficiency, runoff and the capture and collection of runoff.

Many irrigation systems are inefficient and essentially waste water during the irrigating process. Irrigation efficiency may seem complicated; many producers may feel that their systems are simply too old to modify. In today's agricultural industry, producers have numerous opportunities to improve the efficiency of their system in a cost efficient way. Improved nozzles, metering, and computer software are all readily available to provide producers with a more efficient means of irrigating their cropland and monitoring plant water use.

Planning an irrigation schedule that best utilizes available water can reduce waste and runoff. Irrigation systems need to be routinely checked to ensure that water is being distributed uniformly and that there are no damaged pipes, sprinklers or nozzles. Irrigation meters provide producers with an accurate measurement of the amount of water that is applied to their crops and can also help identify pumping problems within their system. More information on the benefits of metering can be found in the UGA CES document, Water Meters as a Water Management Tool on Georgia Farms. An efficient system should range between 80 and 92% efficient. If a system is less than 80% efficient, producers should consider a system upgrade. There are several government sponsored irrigation system audit programs available and most system manufacturers can assist with an audit program.

Conservation practice components of Irrigation Water Management Planning section include:

Irrigation Tailwater Recovery System 447

Irrigation Water Management 449

Microirrigation 441

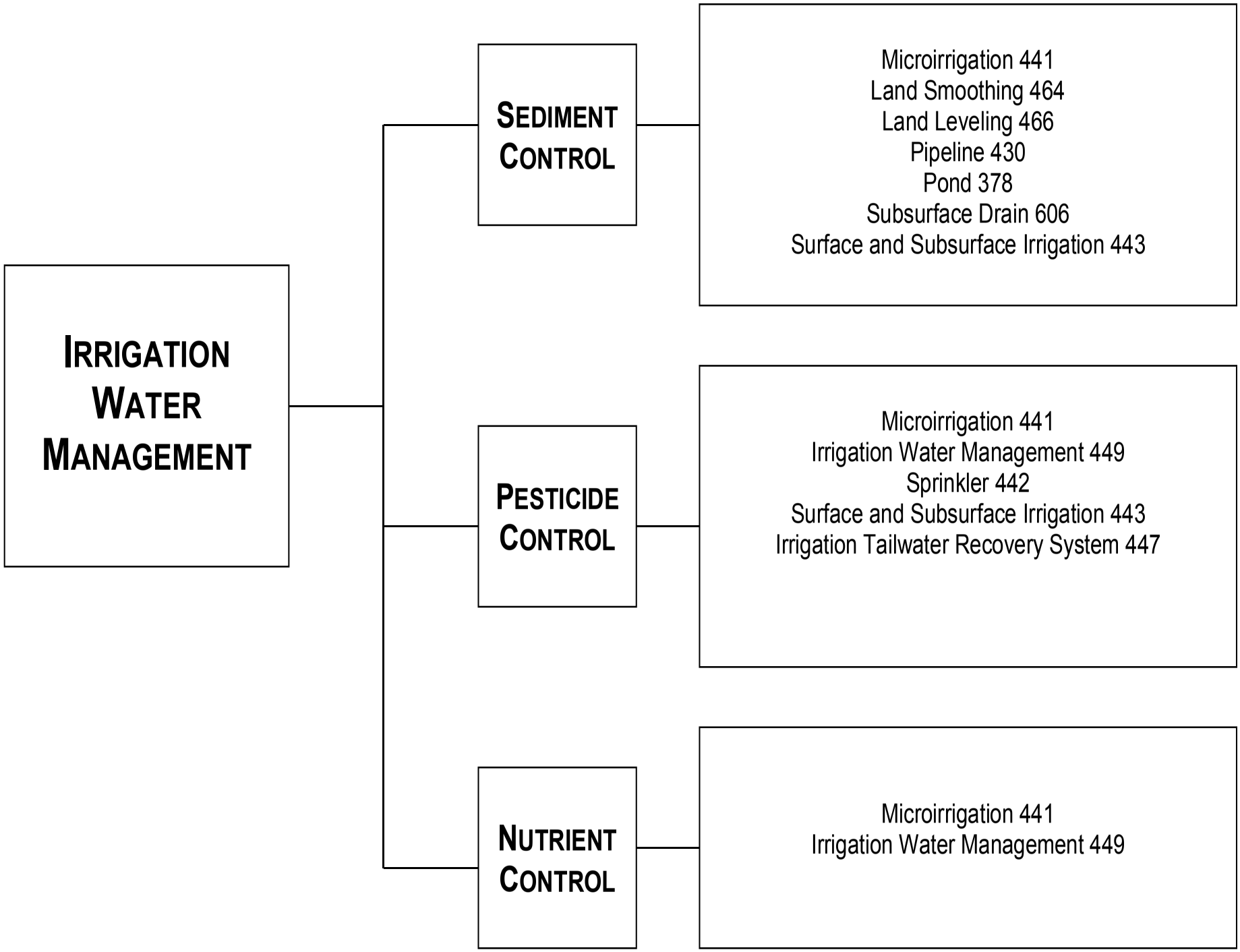
Pipeline 430

Pond 378

Sprinkler 442

Subsurface Drain 606

Surface & Subsurface Irrigation 443


IRRIGATION WATER MANAGEMENT
SEDIMENT CONTROL
Microirrigation 441
Land Smoothing 464
Land Leveling 466
Pipeline 430
Pond 378
Subsurface Drain 606
Surface and Subsurface Irrigation 443
PESTICIDE CONTROL
Microirrigation 441
Irrigation Water Management 449
Sprinkler 442
Surface and Subsurface Irrigation 443
Irrigation Tailwater Recovery System 447
NUTRIENT CONTROL
Microirrigation 441
Irrigation Water Management 449

IRRIGATION TAILWATER RECOVERY SYSTEMS (447) are designed to collect, store and transport tailwater for reuse in an irrigation system.

Water Quality Benefits

- Reduces runoff from fields
- Improves offsite water quality
- Traps sediment, sediment attached nutrients and chemicals from runoff water

When to Use

Tailwater recovery systems can be used with any irrigation system where runoff recovered from fields can be predicted, captured and reused.

How to Establish

Design storage facilities with adequate capacity to meet anticipated needs. Consider runoff volumes and rates, and anticipated application needs in determining storage facility size. Sumps, pits and storage facilities should be protected from erosion where applicable, and from storm events and sedimentation.

For more information, see *Additional Resources*.

Considerations and Costs

Consider any negative impacts on downstream flows and aquifer recharge volumes. Neighboring wetland hydrology may be altered by tailwater recovery and storage facilities.

Systems should be periodically inspected for damages; leaks and repairs should be made in a timely manner.

Contact your local conservation agent prior to beginning a tailwater recovery construction project in order to fully understand maintenance requirements.

Tailwater recovery systems are high in cost depending on size and material costs.

Effectiveness

In the greenhouse and container nursery industries, using a capture and reuse irrigation system has been found to reduce water use by 50% in studies.

Additional Resources

NRCS Conservation Practice Standard 447

IRRIGATION WATER MANAGEMENT (449) plans are designed to reduce irrigation water runoff by incorporating the rate, amount and timing of irrigation water into efficient water use planning.

A well designed and managed irrigation water management system can significantly reduce inefficient use

Water Quality Benefits

- Reduces soil erosion from irrigation
- Reduces nutrients and sediment in runoff
- Improves overall system efficiency
- Reduces leaching and deep percolation

When to Use

An irrigation water management (IWM) plan should be developed for all irrigated land and facilities.

How To Establish

Irrigation water management plans should address timing, capacity, application rates, and irrigation water collection and storage.

Numerous conservation practices are components of an irrigation water management plan. Irrigation water management should be a priority conservation concern. In developing an irrigation plan, consider all nutrients, chemicals and pesticides that may be applied. As part of these systems, planning may be needed to capture and store water for later use.

Costs and Considerations

Consider any impacts irrigation may have on wetlands, water related wildlife habitats, riparian areas, cultural resources and recreational opportunities. By controlling water application amounts, the potential for chemical and sediment transport in runoff can be significantly reduced.

Take care to manage nutrients, chemicals and pesticides, and to prevent transport into surface water and groundwater. Bordering irrigated land with grasses or legumes can reduce erosion.

Test water supplies prior to installing an irrigation system to ensure that the quantity and quality of water demanded can be achieved.

Costs associated with these practices include materials, installation, maintenance and repair. Inspect and repair all irrigation in a timely manner.

Irrigation systems can be moderate to high in cost.

Effectiveness

Irrigation management plans reduce the amount of water wasted and can also significantly reduce sediment, nutrients and insecticides entering water.

Additional Resources

NRCS Conservation Practice Standard 449

MICROIRRIGATION (441) is used as part of an irrigation system to efficiently apply water to the root zone of plants using low-pressure emitters.

Microirrigation allows for direct application of pesticides to individual plants

Water Quality Benefits

- Reduces soil erosion
- Improves water use efficiency
- Reduces sediment in runoff

When to Use

Microirrigation is ideal in areas where soil and topography can/needs to be irrigated and plants are compatible with microirrigation.

How to Establish

Design microirrigation systems to uniformly distribute water at an appropriate application rate. System capacity should account for losses due to evaporation, runoff, and percolation. Space emitters to adequately and uniformly provide water. Emitters can be drippers, microsprayers or misters.

For more information, see *Additional Resources.*

Considerations and Costs

Microirrigation is ideal for orchards, greenhouses, row crops, and residential and commercial landscapes. For small container nurseries with frequent container moving, microirrigation may not be ideal.

Microirrigation benefits include efficient water use, decreased foliar disease, and reduced opportunity for chemical loss and contamination. Microirrigation is also suited for chemigation.

Microsprayers work best with larger containers, as the flow rate may be too much for small plants. Multiple drippers may be needed for even water distribution. Drippers allow more plants to be irrigated at a time because of lower flow rates.

Test water supply prior to installation to ensure that both the quantity and quality of water demanded can be achieved. Microirrigation raises soil moisture levels which can reduce soil water storage capabilities, and can increase runoff. Plant growth rates and transpiration may decrease as a result of microirrigation.

Costs associated with this practice may include materials, installation and maintenance.

Microirrigation can be moderate in cost.

Effectiveness

Well-designed and managed microirrigation systems can potentially be 90-95% efficient. Converting field nurseries and container nurseries to microirrigation can provide an estimated 10% water savings. In studies, microirrigation has been found to be 74% efficient compared to conventional irrigation in vegetable production.

Additional Resources

NRCS Conservation Practice Standard 441

PIPELINES (430) are used to transport water for irrigation purposes.

Water Quality Benefits

- Allows for the transport of water for irrigation purposes without soil erosion or water loss resulting from evaporation or transpiration

When to Use

Pipelines can be installed when needed to transport water in a closed conduit from one point to another. Pipeline is used as a component of a irrigation system and is not a stand-alone conservation practice.

This practice standard is not applicable to surface gated pipes, sprinklers or microirrigation tubing.

How to Establish

Select pipeline materials that will withstand pressure, water surges and water hammer. Acceptable working pressure will be based on the type and diameter of pipe selected.

Valves or unions should be installed at low points in the pipe to allow for water drainage when necessary. Joints should be watertight, composed of a material that is compatible with pipe material and non-corrosive.

Depending on the type of piping material used, different specifications apply.

A check valve or back flow preventer may be needed to ensure the integrity of the system. If using pipeline as part of a chemigation system, a check valve should be installed.

Pipes should be protected from hazards such as traffic, farm operations, freezing temperatures, fire, thermal expansion and contraction.

Revegetate any disturbed areas as soon as possible to reduce erosion.

For more information, see *Additional Resources*.

Considerations and Costs

During installation, disturbed areas should be protected with erosion prevention structures. Consider visual impacts prior to installation.

Maintenance for pipelines includes periodically inspecting valves, pressure regulators, switches and other equipment for proper function. Filling rates should be monitored. Drain pipes during cold weather to prevent freezing and bursting.

Pipelines are moderate in cost depending on the size and length of the pipe.

Effectiveness

As part of an alternative water supply or a waste management system, pipelines indirectly reduce negative water quality impacts.

Additional Resources

NRCS Conservation Practice Standard 430

SPRINKLERS (442) are used to efficiently apply pressurized water through nozzles to irrigated areas.

Sprinklers can efficiently apply water to targeted areas

Water Quality Benefits

- Reduces excessive water loss
- Reduces erosion
- Reduces water quality impairments

When to use

Use sprinkler irrigation systems as part of an overall conservation plan. All sprinkler systems should have an irrigation water management (IWM) plan.

When wastewater is used for irrigation purposes, a nutrient management plan (NMP) must also be developed and maintained. See pages 2.3 and 2.28 for more information on NMPs.

How to Establish

Sprinkler systems should have adequate capacity to efficiently irrigate crops. Systems used to apply wastewater to crops require sufficiently sized nozzles to prevent clogging. Backflow and anti-siphon preventative measures should be incorporated into sprinkler systems.

For more information, see *Additional Resources*.

Considerations and Costs

Monitoring may be necessary at the center pivot to reduce excessive water application. Filtering may be needed to reduce clogging if the water source contains particulate matter, algae or other materials.

Other conservation practices can be utilized in a sprinkler system to prevent soil erosion and runoff; however, benefits gained from implementing other conservation practices are reduced over an irrigation system. Careful monitoring is necessary to ensure that conservation practices efficiently reduce erosion and runoff.

Sprinkler irrigation can impact the water budget, downstream flows and use, and can negatively impact downstream water quality. Users should consider water quality impacts from soil erosion and sediment transport.

Costs of sprinkler systems may include installation, maintenance and repair. Monitoring is needed to ensure the efficiency of a system.

Effectiveness

Sprinkler systems can be 50-95% efficient, depending on the type of the system, cultural practices and management.

Additional Resources

NRCS Conservation Practice Standard 442
NRCS National Engineering Handbook, Part 6

SUBSURFACE DRAINS (606) are underground drains used to collect and remove excess water.

Water Quality Benefits

- Regulates the water table and encourages vegetative growth
- Prevents water from entering wet and heavy use areas
- Regulates sub-irrigated or waste disposal areas
- Reduces runoff
- Increases soil infiltration
- Reduces sediment and attached pollutant transport into surface water

When to Use

Subsurface drains can be used in areas where it will be beneficial to lower the water table or control surface and groundwater.

Only use subsurface drains when required drainage has been installed and other conservation practices are not meeting the operational needs.

How to Establish

Before installing a subsurface drain, inspect the area to determine if the site is suited for a drain. Use the Georgia Drainage Guide to determine tile spacing and depth of placement.

To effectively control water, install drains at the proper depth, spacing and location based on site conditions, topography, groundwater conditions, crops, land use and outlets.

Cover depth is dependent on the type of soil: mineral soils (2 feet) and organic soils (2.5 feet).

Materials used in subsurface drains should meet strength and durability requirements for the site. Filters may be used around conduits to reduce surrounding soil movement into the conduit.

For more information, see *Additional Resources*.

Considerations and Costs

Consider water quality impacts such as sediment delivery, changes in nitrate delivery to downstream water users, changes in the delivery of dissolved substances into aquifers, downstream water temperature changes, and impacts on the visual quality of downstream water.

Subsurface drainage can encourage the transport of nitrate-nitrogen into surface water, and can promote mellower soil conditions and reduce compaction potential.

Using subsurface drains and wetlands together can reduce soluble pollutant loadings in surface waters. Most of the nitrate-nitrogen can be removed by wetlands during spring and summer.

Effectiveness

Subsurface drainage can potentially reduce total runoff by 29-65%, peak runoff by 15-30%, sediment loss by 16-65%, phosphorus loss by 45%, and soil bound nutrient loss by 30-50%.

Additional Resources

NRCS Conservation Practice Standard 606
Georgia Drainage Guide

SURFACE AND SUBSURFACE IRRIGATION SYSTEMS (443) are designed so that all necessary water control structures have been installed to efficiently distribute irrigation water.

Water Quality Benefits

- Efficiently uses water
- Reduces soil erosion
- Reduces water usage and lowers pumping costs

When to Use

These systems can be used to apply irrigation water and/or chemical and nutrient applications to areas of need.

How to Establish

All federal, state and local regulations should be met.

Land should be suitable for irrigation applications. Water supply should adequately meet quality and quantity demanded, and system capacity should be adequate to meet crop demands.

Irrigation systems should be designed to distribute water using sound application methods.

Locate head ditches and pipelines where irrigation water can be uniformly distributed without causing soil erosion.

For more information, see *Additional Resources*.

Considerations and Costs

Erosion control structures may be needed in areas with steeper slopes. For surface irrigation, seepage control measures may also be necessary.

Collection facilities for tailwater and excess runoff should be included as part of an irrigation system.

Consider impacts on surface and ground water quality before chemical and nutrient applications.

Also consider impacts on the water budget, volumes and rates of runoff, changes in plant growth and transpiration, downstream flows, surrounding habitats and the movement of sediment in runoff.

Costs associated with this practice may include installation, maintenance and repair. All equipment should be inspected periodically for damages and repaired in a timely manner.

Effectiveness

Subsurface irrigation can potentially reduce water usage by an estimated 25%.

Additional Resources

NRCS Conservation Practice Standard 443

SECTION SIX

Row Crop Management Planning

Row crop farming is a major agricultural sector in Middle and South Georgia. Cotton, peanuts, corn, wheat and soybeans are among the top crops grown in Georgia's fertile soils. Farmers spend a great deal of time planning and preparing land prior to each growing season. An estimated 70% of Georgia's farmland is considered to be prime farmland. Prime farmland has soil with the best combination of physical and chemical characteristics for producing food and fiber on a sustained basis with proper management. Soil is classified into capability classes based on limitations related to soil type and the need for conservation practices to reduce erosion potential. Prime farmland is separated into five classes with Class I soil having the least limitations to restrict use and Class IV having severe limitations that reduce planting choices and require careful management.

It is important to also consider the shape and slope of fields when designing a cropping system. It is better to adjust your cropping system to fit the land than to try to force the land to fit your system. By contour farming, you farm on or near the level across the slope rather than up and down the slope. Incorporating a ridged planting system along with contour farming can effectively reduce erosion and also improve infiltration. Numerous other conservation practices also work well to reduce erosion, increase water holding capacity, and improve soil tilth and organic matter on row cropped land.

As part of a row cropping operation, pesticides are frequently used to improve crop productivity by controlling insects, disease and weeds. In commercial nursery operations, pesticides are also used through drip irrigation and/or sprinkler systems. Pesticides can be a serious risk for humans and animals if improperly used. Many pesticides are broad spectrum and can be toxic to non-target species. The compounds that make up many pesticides can also be potential pollutants for surface and groundwater.

Integrated Pest Management (IPM) programs are used to reduce the use of and dependency on pesticides. Your local conservation agent can assist you in developing an IPM plan that best fits your operation. In addition, by reducing use, producers have the opportunity to reduce spending on pesticides. IPM provides producers with a plan that addresses application, container and excess chemical storage as well as safety. Planning in advance can promote a safer work environment for all employees as well as reduce injuries and illness from pesticide use.

It is important that any pesticide spill be properly contained and cleaned. Every operation that uses pesticides should have a spill kit with protective equipment listed on the label (safety glasses, gloves, proper clothing etc.), absorbent materials to contain the spill (cat litter, saw dust, sand, dirt), a scoop to gather contaminated absorbent material and a container to place the contaminated materials. Never hose down spills. Be sure to protect yourself and others while cleaning up a pesticide spill. Proper authorities should be notified immediately of spills on public roads or with large spills, leaks or pesticide fires.

Emergency information and emergency steps should be posted clearly for anyone that may come in contact with pesticides.

To prevent chemical mix-ups, be sure that all chemical containers are properly labeled and stored. Always keep chemicals out of the reach of children. Also keep all protective clothing located in the same area as chemicals are stored. After any pesticide application, be sure to rinse clothing prior to disposal. Follow all label directions for mixing, applying, storing and disposing of chemicals. According to the University of Georgia Pest Management website, nearly all pesticide accidents are the result of not following all of the directions, restrictions, and precautions on the label. If accidental exposure does occur, contact emergency personnel and follow label directions exactly. Do not induce vomiting unless the label indicates to do so. Seek medical attention if necessary.

Pesticides should never be transported inside of a passenger vehicle or with food, feed or other products that may come in contact with humans or animals. Pesticides should be properly labeled prior to transport. Pesticide storage should be located away from food or feed, and at least 100 feet from wells or other waterways. Store pesticides in a fire-resistant, well ventilated, well-lit, locked, and dry area that has a concrete floor. Pesticide storage areas should be protected from direct sunlight and should also be insulated.

Older pesticides can be recalled due to new discovery of environmental and human risk. It is not illegal to possess a cancelled or recalled pesticide. In order to use pesticides on the Restricted Use List, a person must be certified as a licensed applicator. Along with recalls, a re-collection program is often introduced to assist producers in disposing of recalled pesticides. Paying careful attention to announcements and working with extension agents to properly dispose of unwanted pesticides can save producers time, money and worry. Burying, burning or dumping any pesticide is illegal.

Pesticide containers can sometimes be disposed of in landfills with proper preparation. Producers should check with local landfills to see if they accept clean, empty pesticide containers. Plastic, metal or glass containers must first be pressure or triple washed and then must be punctured to prevent reuse. Paper bags should be shaken clean prior to landfill disposal.

The Georgia Department of Agriculture in cooperation with UGA Cooperative Extension Service, the Georgia Crop Production Alliance and the Georgia Farm Bureau has developed a pesticide disposal program known as Georgia Clean Day. Contact information can be found in Chapter 3 of this Manual.

Conservation practice components of Row Crop Management Planning section include:

Conservation Cover 327

Conservation Tillage (Residue Management)
No-Till 329
Mulch Till 345
Ridge Till 346

Contour Farming 330
Row Arrangement 557

Contour Strips
Buffer Strips 332
Stripcropping 585

Cover Crop 340

Crop Rotation 328

Diversion 362

Field Border 386

Field Stripcropping 586

Filter Strip 393

Grade Stabilization 410

Grassed Waterway 412

Integrated Pest Management 595

Nutrient Management 590

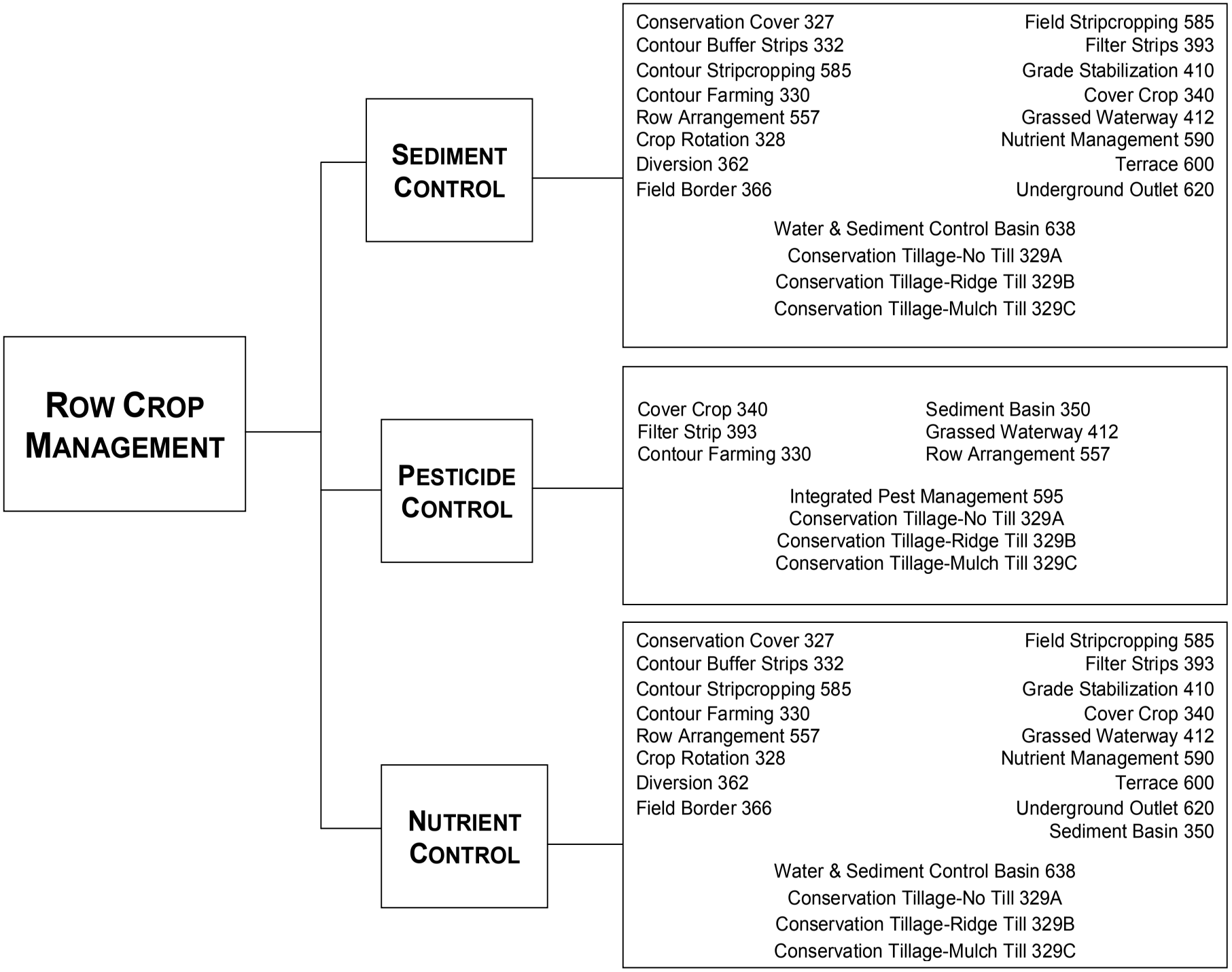
Scouting

Sediment Basin 350

Terrace 600

Water & Sediment Control Basin 638

Underground Outlet 620


ROW CROP MANAGEMENT
SEDIMENT CONTROL
Conservation Cover 327
Contour Buffer Strips 332
Contour Stripcropping 585
Contour Farming 330
Row Arrangement 557
Crop Rotation 328
Diversion 362
Field Border 366
Field Stripcropping 585
Filter Strips 393
Grade Stabilization 410
Cover Crop 340
Grassed Waterway 412
Nutrient Management 590
Terrace 600
Underground Outlet 620
Water & Sediment Control Basin 638
Conservation Tillage-No Till 329A
Conservation Tillage-Ridge Till 329B
Conservation Tillage-Mulch Till 329C
PESTICIDE CONTROL
Cover Crop 340
Filter Strip 393
Contour Farming 330
Sediment Basin 350
Grassed Waterway 412
Row Arrangement 557
Integrated Pest Management 595
Conservation Tillage-No Till 329A
Conservation Tillage-Ridge Till 329B
Conservation Tillage-Mulch Till 329C
NUTRIENT CONTROL
Conservation Cover 327
Contour Buffer Strips 332
Contour Stripcropping 585
Contour Farming 330
Row Arrangement 557
Crop Rotation 328
Diversion 362
Field Border 366
Field Stripcropping 585
Filter Strips 393
Grade Stabilization 410
Cover Crop 340
Grassed Waterway 412
Nutrient Management 590
Terrace 600
Underground Outlet 620
Sediment Basin 350
Water & Sediment Control Basin 638
Conservation Tillage-No Till 329A
Conservation Tillage-Ridge Till 329B
Conservation Tillage-Mulch Till 329C

CONSERVATION COVER (327) is the establishment and maintenance of permanent vegetative cover to protect soil and water resources on retired agricultural land.

Water Quality Benefits

- Protects and improves water quality by reducing soil erosion
- Reduces sediment entering watering sources
- Increases soil infiltration

When to Use

Conservation cover is typically used when land is/has been retired from agricultural production or on land that requires permanent cover to decrease soil erosion and water quality degradation.

For a more temporary cover, please see Cover Crops on page 2.60.

How to Establish

Native plant species that are adapted to the site are recommended for conservation cover. Plant according to proper horticultural practices, planting methods and seeding rates to ensure establishment.

Chemical treatments are not recommended for this conservation practice.

For more information, see *Additional Resources*.

Considerations and Costs

Consider a rotating mowing schedule to encourage plant and wildlife diversity.

Costs associated with conservation cover include seed and plant materials as well as labor costs associated with preparing, planting and maintaining cover.

During primary nesting periods for grassland species (May 1-September 30 in Georgia), maintenance activities should be avoided.

During the growing season, mowing may be necessary to reduce competition.

Conservation cover is low in cost depending on plant material costs.

Effectiveness

Conservation cover can potentially reduce erosion and sedimentation up to 90%.

Additional Resources

NRCS Conservation Practice Standard 327

CONSERVATION TILLAGE (329, 345, 346), also known as residue management, reduces erosion, maintains and improves soil organic matter and conserves soil moisture by managing plant residue on the soil surface year-round. This includes no tillage (strip tillage), ridge tillage and mulch tillage.

Cotton growing in no-till

Water Quality Benefits

- Reduces erosion
- Reduces soil detachment
- Reduces sediment and sediment attached particles entering water sources
- Increases infiltration

Types of Conservation Tillage

Any tillage and planting system that maintains at least 30% residue cover on the soil surface after planting is considered conservation tillage.

No-Till/Strip Tillage (329)—Fields are seeded in narrow slots of tilled or residue free strips of previously untilled soil; soil is undisturbed from one planting to the next; nutrients are injected into the soil rather than broadcasted; planting is done in a narrow bed.

No-till is a one-pass planting and fertilizer operation in which soil and surface residues are minimally disturbed. No-till conserves water, reduces erosion, maintains organic matter content at a high level, and sustains economic productivity.

Mulch Tillage (345)—Leaving or spreading crop residue onto fields prior to or after planting to reduce erosion in fields where the entire surface is tilled prior to planting; or soil is tilled prior to planting and residue is left on soil as a mulch.

Ridge Tillage (346)—Fields are seeded in preformed ridges alternated with furrows protected by crop residue; soil is undisturbed from one planting to the next. Nutrients are injected into the soil rather than broadcasted; planting is on ridges of rows. Soil is left undisturbed from previous crop harvest until new crop is planted.

When to Use

Conservation tillage practices can be used on any agricultural operation.

How to Establish

Initially, plant crops that produce high residue for conservation tillage. For mulch tillage, spread residue after crop has been planted to reduce erosion. In some cases, re-mulching may be necessary in order to maintain adequate cover, especially when baling and heavy grazing may lower the mulch cover content.

When ridge tilling, it is necessary to maintain ridge height throughout the field.

For more information, see *Additional Resources*.

Considerations and Costs

Ridge tilling requires stable outlets with ridges to direct runoff to areas of concentrated flow. Conservation practices such as grassed waterways or water and sediment control basins can be used to

protect concentrated flow areas.

No-tillage may require more chemical inputs in order to control weeds.

Residue management is low to moderate in cost.

Effectiveness

No-till systems can potentially reduce herbicide runoff by up to 70% compared to conventional systems with dry weather.

Thirty percent cover can potentially reduce soil erosion by 50-60% compared to conventional tillage.

In a 5-year study conducted in the Piedmont region of Georgia, runoff from no-tilling was 22% less during cropping periods and 35% less during fallow periods compared to conservation tillage.

Additional Resources

NRCS Conservation Practice Standard 329
NRCS Conservation Practice Standard 345
NRCS Conservation Practice Standard 346

Immature corn growing in no-till

CONTOUR FARMING (330) is a system of tilling, planting and performing other farming operations on or near the contour of a field to reduce erosion and prevent runoff entering into water sources.

Onions growing in contoured rows

Water Quality Benefits

- Slows overland water flow
- Reduces runoff and sediment detachment
- Increases infiltration and captures sediment
- Allows more time for nutrient absorption to remove excess nutrients from runoff

When to Use

Contour farming works best on fields with a slope between 2-10%. Contour farming does not work well on rolling topography with irregular slope variations.

Row arrangement can also be used as part of a contour farming system to promote efficient water use and to control water flow and direction on sloping land.

How to Establish

Establish a key line around the area to be contour farmed as a base line for arranging rows. Key lines should have a slope of 2%. Key lines located near an outlet can be 3%. Either a natural or constructed outlet is necessary to capture water flowing from contour-farmed fields. Grassed waterways work well to control the rate of water flow into outlets and reduce gully erosion.

Ridges for crop rows are built by tilling on or near the contour of a field. These ridges slow water flow, increase infiltration rates and capture sediment in runoff.

Row arrangement should complement farm size and type as well as any equipment being used. Rows should be arranged to move excess water from fields into surface ditches.

For more information, see *Additional Resources*.

Considerations and Costs

Unless permanently established, key lines will have to be re-determined every year. Permanent key lines can be established using grass.

Additional costs associated with this practice may include establishing grassed waterways and constructing outlets for water flow. Crop row ridges should be monitored for washes that may increase runoff from fields.

Contour farming and row arrangement are both low in cost.

Effectiveness

Sediment runoff models indicate that contour farming can be 25-50% effective in reducing soil loss.

In studies, contour farming has reduced erosion rates by 5-30% in Georgia, depending on the slope of land and row ridge height.

Additional Resources

NRCS Conservation Practice Standard 330
NRCS Conservation Practice Standard 557

CONTOUR STRIPS (332 & 585) are used to reduce soil erosion, slow sediment transport and reduce runoff entering into water sources.

Contour strips slow surface water flow leaving fields and reduces erosion

Water Quality Benefits

- Reduces soil erosion from water and wind
- Reduces sediment transport into water sources
- Slows surface water flow and traps sediment

When to Use

There are several types of contour strip systems. Contour stripcropping is a planting system that alternates fallow strips with cropping strips of equal width. Contour buffer strips are permanent strips planted along a field contour and are most suitable on land with a slope of 4-8%.

How to Establish

For contour stripcropping, two or more strips of equal width should be as close to the contour of a field as possible. Stable outlets are needed to capture diverted surface runoff and reduce concentrated flow erosion. Grassed waterways, field borders, filter strips, water and sediment control basins and underground outlets are acceptable stable outlets.

Grade contour buffer strips to align as closely as possible with the contour. Strips should be a minimum of 15 feet wide at the narrowest point to control sheet and rill erosion. Grasses or grass-legume mixtures are ideal for contour buffer strips; to reduce sediment transport, plant sod-forming vegetation.

Considerations and Costs

When designing a stripcropping system, plan for equipment traffic and movement into design. Remove sediment build-up along strip edges periodically to maintain the efficiency of a stripcropping system.

Contour strips are typically used in contour farming. Conservation cover can be used in permanent contour strips. When planting permanent strips, be sure to use plants/crops resistant to herbicides used on harvested crops.

Costs associated with these practices may include site preparation, seed and fertilizer, maintenance and repair.

These practices are low in cost, depending on the width and length and type of vegetation established.

Effectiveness

Contour stripcropping can potentially reduce soil erosion by 50-60%; contour buffer strips can potentially reduce soil erosion 20-75%.

Additional Resources

NRCS Conservation Practice Standard 332
NRCS Conservation Practice Standard 585

COVER CROPS (340) such as close-growing grasses, legumes and forages are planted as a temporary cover to reduce soil erosion, capture and use excess nutrients, and improve soil quality.

Cover crops protect the soil and provide soil stability

Water Quality Benefits

- Reduces soil erosion
- Reduces nutrients and pesticides in runoff
- Reduces nitrogen leaching
- Promotes nutrient absorption and utilization

When to Use

Cover crops can be established where vegetative cover is needed to reduce erosion and to utilize excess nutrients from previous crops. Cover crops can be planted after low residue crops to reduce erosion.

Plants incorporate nitrogen into tissue as they grow and reduce nitrogen leaching into groundwater. Roots anchor soil, decrease erosion and minimize phosphorus losses.

For permanent cover, please see Conservation Cover on page 2.55.

How to Establish

Establish cover crops during critical erosion periods and prior to the leaf drop of preceding crops to allow time for establishment. Select plant species that best match the nutrient and pest management plans of an operation.

Delaying cover crop harvesting as much as possible will maximize plant biomass production.

For more information, see *Additional Resources*.

Considerations and Costs

Herbicides used on cover crops should be compatible with the next crop.

Plant cover crops to allow adequate time for establishment. Whenever possible, plant crops that can be used on-site for other purposes.

To utilize cover crops in a feeding system, select plants that are palatable to animals. If planted for nutrient uptake, select crop varieties that will use the maximum amount of nutrients.

Cover crops are low in cost depending on the type of vegetation established.

Effectiveness

Covers crops can potentially reduce erosion by 40-60% and herbicide residues by nearly 40%.

Additional Resources

NRCS Conservation Practice Standard 340

CROP ROTATION (328) is a system where cropping is performed in recurring sequence in order to reduce soil erosion and runoff entering water bodies.

Water Quality Benefits

- Decreases runoff and erosion
- Improves soil tilth and increases organic matter
- Breaks disease, insect and weed life cycles
- Improves nutrient utilization

When to Use

Crop rotation can be used on any land where crops are grown other than pasture land and hayland. Plan rotation to balance plant nutrients in soil using legumes. Select crops with deep rooting systems. Avoid crop species that will require equipment in the area during wet periods to promote infiltration and reduce compaction.

How to Establish

Select crops for rotation that compliment each other and improve overall soil composition. During the first year after establishment, fertilizer may be needed to encourage plant growth. Legumes require one planting season to before nitrogen fixation will begin.

For more information, see *Additional Resources*.

Considerations and Costs

Crop rotation requires more intensive management and planning. Select crops that will provide sufficient biomass to reduce erosion.

Legumes used in crop rotation provide nitrogen for the next crop. Follow legumes with crops that have high nutrient requirements.

Normal planting costs will apply. However, additional fertilizer costs may be necessary during the first year following planting.

For more information on different types of crop rotation, please contact your local conservation agent.

Crop rotation is low in cost.

Effectiveness

When properly managed, crop rotation can potentially reduce soil erosion by 40-50%.

Additional Resources

NRCS Conservation Practice Standard 328

DIVERSIONS (362) are permanently vegetated strips established across a slope to redirect water to areas of need.

A grassed diversion is planted to redirect water from a slope and also traps nutrients and sediment in runoff

Water Quality Benefits

- Diverts runoff water away from water sources
- Reduces sediment and nutrient transport
- Reduces gully erosion and flooding
- Increases infiltration

When to Use

Diversions can be used to control runoff water by installing a channel across the slope of a field.

How to Establish

Diversions protecting agricultural land should have a minimum capacity to maintain peak runoff from a 10-year frequency storm. Channels should be designed with stable slopes and minimum ridge top widths of 4 feet. For diversions with less than 10 acres of drainage area upland, ridge tops may be 3 feet wide.

Avoid installing diversions below high sediment producing areas. Diversions used to reduce or prohibit water from entering into wetlands can change a wetland's hydrology.

All diversions must have a safe and stable outlet with adequate capacity and convey runoff to a point where outflow will not cause damage. Diversions should also have an operation and maintenance plan.

For more information, see *Additional Resources.*

Considerations and Costs

Design diversions to accommodate equipment. Keep equipment and machinery out of the area until vegetation is established.

Maintenance may include repairing and replacing damaged components, maintaining capacity (ridge height and outlet elevations), clearing outlets and re-distributing sediment build-up, clearing trees and brush and maintaining vegetative cover.

Contact your local conservation agent prior to beginning a diversion construction project in order to fully understand maintenance requirements.

Diversions are low to moderate in cost, depending on materials, construction, size and maintenance costs.

Effectiveness

In cropland, diversions can potentially reduce soil erosion 30-60%.

Additional Resources

NRCS Conservation Practice Standard 362

FIELD BORDERS (386) are permanently vegetated borders established around fields and pastures to reduce soil erosion.

Field borders protect water quality by reducing erosion and filtering runoff

Water Quality Benefits

- Slows runoff leaving fields and pastures
- Reduces sediment and nutrients entering water sources
- Increases nutrient absorption
- Protects water quality and reduces soil erosion

When to Use

Field borders can be used around the edges of cropland and to connect other buffer practices within a field. When established alongside a water source, borders are called riparian buffers. See page 2.83 for more information on riparian herbaceous cover and page 2.81 for riparian forest buffers.

Field borders can also be used to eliminate sloping end rows, headlands, and other areas where concentrated water flows may occur.

How to Establish

Field borders should be at least 20 feet wide for traditional use and should accommodate equipment used for planting, fertilizing or harvesting crops. Select adapted species of permanent grasses, legumes and/or shrubs. A minimum of 80% year-round vegetation cover is ideal. When field borders are being established for wildlife purposes, a minimum width of 30 feet is required.

For more information, see *Additional Resources*.

Considerations and Costs

Costs associated with this practice may include site preparation, seed/planting materials, and fertilizer and maintenance costs. Maintenance costs may include sediment removal, shaping and reseeding border areas, weed treatment, and repairing damages from weather or equipment.

Select plant species that are tolerant to heavy traffic, sediment deposition and chemicals used in a cropping system. Narrow strips of stiff-stemmed upright grasses can increase trapping efficiency. Keep grass at least one foot tall when heavy erosion is expected.

Field borders are low in cost depending on the type of vegetation established.

Effectiveness

Field borders can remove up to 50-80% of nutrients and sediment, 50% of pesticides, 60% of pathogens, and 60-80% of nitrogen and phosphorus depending on the width, slope, cover and density of vegetative cover.

Additional Resources

NRCS Conservation Practice Standard 386

FIELD STRIPCROPPING (586) is a planting system in which crops are grown in alternating strips with grasses to reduce soil erosion and runoff.

A field stripcropping system is used to reduce erosion and runoff by anchoring soil between cropping rows

Water Quality Benefits

- Reduces erosion
- Slows and reduces runoff from fields
- Reduces nutrient and sediment transport into water sources

When to Use

Field stripcropping works on sloping cropland where contour stripcropping is not possible and on rolling topography.

How to Establish

This practice works best on cropland with a slope exceeding 15%. Strips should be the same width and run parallel to each other.

Select row grade and ridge height to reduce erosion as best as possible. All runoff from stripcropping should be directed to stable outlets.

Plant strips with a close growing vegetation strip and a clean-tilled crop/fallow strip alternating. Potential highly erosive strips should never be located adjacent to each other.

For more information, see *Additional Resources*.

Considerations and Costs

Consider planting strips of permanent vegetation or grass that can be used for grazing and hay production. It may be necessary and ideal to incorporate other erosion control practices to further reduce erosion and runoff.

Plan strips to accommodate traffic patterns and equipment that will be used on fields.

Costs associated with this practice may include site preparation, seed and fertilizer, and equipment and maintenance costs.

Maintenance associated with this practice may include mowing permanent strips and maintaining adequate cover to manage runoff.

Field stripcropping is low in cost depending on the length and width, and the type of vegetation established.

Effectiveness

Sediment runoff models indicate that field stripcropping can be 75% effective in reducing soil loss.

Additional Resources

NRCS Conservation Practice Standard 586

FILTER STRIPS (393) are strips of vegetation that are located between cropland, grazing land or disturbed areas and water sources to protect water quality.

Filter strips protect water quality by filtering runoff, removing sediment and nutrients

Water Quality Benefits

- Traps sediment, attached nutrients and pesticides
- Slows surface runoff
- Improves infiltration

When to Use

Use filter strips as part of a conservation plan where land-altering activities may increase environmental damage.

Filter strips are not planted along waterways. For this type of planting, see Riparian Herbaceous Cover (390) on page 2.83.

Filter strips are not designed to filter manure, wastewater or runoff from AFOs.

How to Establish

Filter strips can be planted in either a single planting species or in a mixture of grasses, legumes and/or forbs. Select plants with stiff stems and a high stem density near the ground surface.

Plant filter strips in adequate time before the irrigation season begins to allow for strong root establishment that can handle sediment deposits and runoff.

The minimum flow length of any filter strip is 20 feet. The appropriate flow length for a filter strip should be based on the width of the flood plain and the percent slope of the field. Your local conservation agent can help you determine the appropriate filter strip length and width for your site.

For more information, see *Additional Resources*.

Considerations and Costs

Filter strips should not be used as part of a cropping system. Choose strip locations that will reduce runoff, and increase infiltration and groundwater recharge. Select plants that are tolerant to herbicides used in nearby cropping systems.

Since larger soil/organic particles settle out more rapidly than smaller particles, longer strips may be necessary to remove finer particles. Wider strips and appropriate flow lengths improve the likelihood of a filter strip capturing particulates.

Costs associated with this practice include site preparation, seed/plant costs and maintenance. Periodically harvesting filter strips will promote vegetative growth.

Sediment build-up removal may be needed to maintain overall filter strip function. Weed control and fertilizer costs may also be associated with filter strips. In some cases, light grazing can be used to control growth.

During periods of heavy rain, filter strips can flood

and result in large loads of pollutants entering surface water.

Filter strips are moderate in cost depending the length and width of strips, and the type of vegetation established.

Effectiveness

Properly installed and maintained filter strips can potentially remove up to 50-80% of nutrients and sediment, 50% of pesticides, 60% of pathogens, and 60-80% of nitrogen and phosphorus in runoff depending on the width, slope, cover and density of the vegetative cover.

Additional Resources

NRCS Conservation Practice Standard 393
UGA Cooperative Extension Service

GRADE STABILIZATION STRUCTURES (410) work by allowing water to move to a lower elevation without causing soil erosion.

Water Quality Benefits
- Reduces erosive channel flow
- Reduces soil erosion

When to Use
Grade stabilization structures can be used in both natural and artificial channels to prevent gullies.

How to Establish
All federal, state and local regulations should be met.

Design grade stabilization structures for stability and function. Typically, structures are regulated by the height and capacity of water that the structure must sustain. Embankment dams, pond sized dams, full-flow open structures, island type structures, and side inlet drainage structures are all considered grade stabilization structures and have specifications. Please see NRCS Conservation Practice Standard 410 for more information.

Protective fencing, caution signs and/or lifesaving equipment may be required.

For more information, see *Additional Resources*.

Considerations and Costs
Consider visual impacts. It may be necessary to revegetate disturbed and surrounding areas in order to improve the effectiveness of a structure.

Costs associated with this practice may include site preparation, materials, structure establishment and maintenance.

Maintenance may include periodic inspections and repairs of the structure.

Contact your local conservation agent prior to beginning any grade stabilization projects in order to fully understand maintenance requirements.

Grade stabilization structures are moderate to high in cost depending on materials, size and construction.

Effectiveness
Grade stabilization structures have the potential to reduce suspended solids originating from unstable areas by 75-90%.

Additional Resources
NRCS Conservation Practice Standard 410

GRASSED WATERWAYS (412) are natural or constructed channels seeded with grass that are established within a field to slow the flow of water, re-direct excess water from fields, and to prevent soil and gully erosion.

Grassed waterways slow runoff and allow more time for nutrient absorption and sediment capture.

Water Quality Benefits

- Slows runoff
- Reduces gully erosion
- Captures sediment attached nutrients in runoff and reduces entry into water sources

When to Use

Grassed waterways should be used in areas where water conveyance capacity and vegetative protection can control erosion from concentrated runoff.

How to Establish

Grassed waterways should have the capacity to handle expected peak runoff from a 10-year, 24-hour storm. Grassed waterways should be constructed and vegetated at least 1 year prior to installing terraces and diversions. Typically, it is easier to establish vegetation from September to December. The minimum top width for agricultural waterways in Georgia is 25 feet, depending on structure design. A stable outlet is mandatory with this practice.

For more information, see *Additional Resources*.

Considerations and Costs

Before installing a grassed waterway, consider impacts on the surrounding environment. Grassed waterways work well with riparian buffers and filter strips.

Initial costs may include site preparation, materials and installation. Mulch, rock, straw, hay bales, dikes, filter fences or runoff diversions may be used to promote plant establishment. Stable outlets are needed to prevent gully formation.

Maintenance costs associated with this practice include maintaining waterway capacity, vegetative cover and outlet stability. Contact any local conservation agent prior to constructing a grassed waterway project in order to fully understand maintenance requirements.

Grassed waterways are moderate to high in cost depending on the length and width of the waterway and material costs.

Effectiveness

Grassed waterways have been found to reduce soil erosion by 60-80% from the flow area and herbicide runoff by 78% in studies.

Additional Resources

NRCS Conservation Practice Standard 412

INTEGRATED PEST MANAGEMENT (595) plans use environmentally sensitive practices to control weeds, insects and disease on fields and pastures and reduce potential negative effects on humans, and soil and water quality.

A pesticide field application

Water Quality Benefits

- Reduces pesticides/herbicides entering water sources
- Protects aquatic species and habitats from detrimental chemicals
- Reduces the degradation of water resources

When To Use

An integrated pest management (IPM) program should be developed whenever pests necessitate management.

How To Establish

Integrated pest management involves a review of past pest problems and then the development of a management program that plans for future pest control necessity.

IPM is a program that balances economics, efficiency and environmental risk. IPM combines prevention, avoidance, monitoring and suppression into one plan. IPM plans should be incorporated into irrigation water management plans where applicable to manage environmental risks and reduce water contamination. Plans should include a plan map and soil map, location of sensitive areas and setbacks, an environmental risk analysis, and an operation/maintenance plan.

Select pesticides with a lower half-life and a lower potential for leaving application sites through run-off and leaching.

For more information, see *Additional Resources*.

Considerations and Costs

In addition to developing a plan for chemical use, mitigation plans that address emergency and liability issues should be developed. Emergency plans should include procedures that address chemical exposure as well as provide emergency phone numbers.

IPM plans should be developed to comply with all federal, state and local regulations.

Follow all label requirements and post signs (where mandated) around sites where chemical applications will be or have been applied.

Take preventative measures to reduce pests prior to treatment. This may include using pest-free seeds and cleaning equipment between fields among other general management practices.

In addition to chemicals, costs may include soil testing, equipment and maintenance, and the upkeep and maintenance of nozzle tips, hoses and gauges.

Pest management records are essential in protecting users from liability issues. Clear, easy to understand records should be kept for at least 2 years. Check with federal, state and local regulations for additional requirements.

A buffer zone of 50-100 feet is recommended from wells and surface water for safety.

Pest management is low to moderate in cost.

Effectiveness

Using IPM has the potential to decrease pesticide use 40-50% within 5 years and 70-80% within 10 years without sacrificing crop yields or grower profits.

Additional Resources

NRCS Conservation Practice Standard 595
Georgia Pest Management Handbook

Proper chemical disposal is a minimum requirement for all CAFOs. Contact the Georgia Department of Agriculture for more information.

SCOUTING is the utilization of available research and thorough field investigation to determine when pests reach a sufficient threshold to require pesticide treatment.

By scouting, the necessity for pesticides can be significantly reduced.

Water Quality Benefits

- Reduces pesticide applications which decreases the opportunity for pesticide transport in runoff

When to Use

Scouting is an essential part of an integrated pest management plan for crop and orchard operations.

How to Establish

Scouting is the regular inspection of crops and orchards for insects and their damage in order to get an accurate estimate of the type of insects in a field and damage to fields. This is determined by inspecting a representative sample of plants or plant parts from each field.

The sample size of inspection should be based on the type of insects you are looking for. This sample size may change in response to insects found on the field. Scouting is a careful process in which either an entire plant or plant parts are inspected for insects, or evidence of insects or eggs that can result in infestation if not treated.

Peanut pests in Georgia may include Wireworms, Southern Corn Rootworms, Thrips, Lesser Corn Borers, Corn Earworms, Fall Armyworms, Spider Mites, Velvetbean Caterpillars and other insect species.

Cotton pests in Georgia may include Thrips, Aphids, Plant Bugs, Stink Bugs, Cotton Bollworms, Tobacco Budworms, Fall Armyworms, Beet Armyworms, Boll Weevils (currently in containment phase), European Corn Borers and other insect species.

Corn pests in Georgia may include Corn Earworm, Fall Armyworm, Beet Armyworm, European Corn Borer, Lesser Cornstalk Borers and other insect species.

Tobacco pests in Georgia may include Thrips, Tobacco Budworms, Fall Armyworms, Beet Armyworms and other insect species.

Soybean pests in Georgia may include Corn earworms, Beet Armyworms, Velvetbean Caterpillars, Lesser Corn Borers, Stink Bugs, Aphids and other insect species.

In addition to scouting cultivated crops, pecan and apple orchards and commercial vegetable fields are often scouted for pests. In North Georgia, apples are inspected for Codling Moths, Oriental Fruit Moths, and Tufted Apple Bud Moths. Pheromone traps have been developed for apple orchards that monitor adult populations and help growers determine when to treat for these pests. The ideal treatment time is the time frame between when larvae are hatched and then grow to caterpillars. This management system allows growers to be much more precise in their insecticide applications and lower costs.

Pheromone traps are available commercially that use synthesized scents from one sex of an insect to attract and trap either sex (Boll Weevils) or the opposite sex (most moths).

Another method of insect control is through the promotion of beneficial insects. Beneficial insects are either predators that prey on insect pests or parasites that live within the host insect. Beneficial insects include Bug-Eyed Bugs, Minute Pirate Bugs, Fire Ants, and Cotesia Wasps.

In order to reduce insecticide resistance, it is best to alternate the use of insecticide classes on different generations of insects during the season.

Considerations and Costs

Through scouting reports, producers can determine which insecticide applications are needed and appropriate application rates.

Scouting is low in cost, especially when compared to costs associated with frequent insecticide applications.

Effectiveness

Scouting can significantly reduce insecticides being transported in runoff.

Additional Resources

Georgia Cotton Producers Guide
University of Georgia Entomology Dept.

Pests can be detrimental to crops without proper management and treatment

SEDIMENT BASINS (350) capture and store debris or sediment in runoff leaving fields or pastures.

Water Quality Benefits

- Reduces sediment transport into water sources
- Reduces gullying
- Reduces nutrient and chemical transport

When to Use

Sediment basins can be used in areas with irregular slopes and where other erosion control measures have been installed and are not efficient in controlling sediment transport.

How to Establish

Sediment basin capacity should be at least 67 cubic yards per acre from the primary or emergency spillway. If sediment will be removed periodically, basin capacity can be reduced by the same proportion.

Disturbed areas should be re-vegetated as soon as possible to reduce erosion. If possible, use native species when re-vegetating.

Principle spillways and emergency spillways are required to protect the integrity of a sediment basin. Follow NRCS guidelines for installation. Design dams, spillways and drainage facilities according to NRCS standards.

Fencing will be needed to prevent animal access.

Permits are the responsibility of the owner to obtain. These include Georgia 401 Clean Water Certification, Section 404 of the Clean Water Act permits, and authorization from the Department of Natural Resources, Fish and Wildlife Division in addition to any local permits that may be necessary.

Water enters sediment basins through inlets. Sediment filters out while in the basin and then water exits via a stable outlet. Basins should be routinely cleaned out in order to ensure the integrity of the structure. Please see NRCS Conservation Practice Standard 350 for additional requirements.

For more information, see *Additional Resources*.

Considerations and Costs

Sediment basins designed to capture and store debris and sediment from fields are prohibited from waters of the U.S., which includes all intermittent or perennial streams or wetlands. Contact the U.S. Army Corps of Engineers for more information on appropriate sites for sediment basins.

Larger sediment basins can negatively impact downstream habitats by reducing peak discharge rates.

Costs associated with this practice may include planning and design, permitting, site preparation, installation, maintenance and repairs, and mitigation.

Basins require periodic cleaning to maintain capacity, depending on the amount of sediment entering the basin. Remove fill material in a way that protects the design of the basin. Sediment should be land applied to promote soil fertility and enhance topography. Sediment should never enter streams during sediment removal or disposal. Never redistribute sediment downstream from an embankment or adjacent to a stream or floodplain.

Contact your local conservation agent prior to beginning any sediment basin construction project in order to fully understand maintenance requirements.

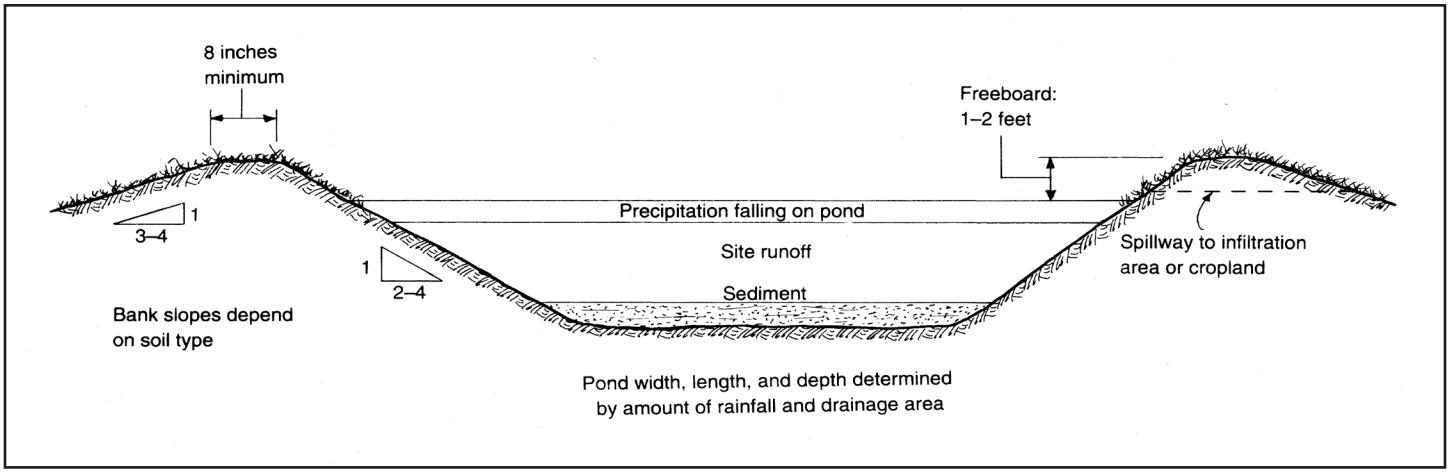
Sediment basins are moderate to high in cost depending on size, material costs and construction.

Effectiveness

Sediment basins can potentially remove 75-95% of sediment from water entering basins. Sediment basins are estimated to reduce insecticide and herbicide losses by 10%.

Additional Resources

NRCS Conservation Practice Standard 350
Manual for Erosion and Sediment Control in GA



Source: NRAES On-Farm Composting Handbook, 1992. Natural Resource, Agriculture and Engineering Service., NREAS-S4, 152 Riley Robb Hall, Cooperative Extension, Ithaca, NY 1483-5702

TERRACES (600) are built across field slopes to capture runoff water from fields and to safely convey it to stable outlets.

Terraces are used in numerous cropping systems to reduce erosion and protect soil resources

Water Quality Benefits

- Reduces soil erosion
- Conserves water resources
- Reduces nutrients and sediment entering water sources
- Reduces gully erosion
- Increases infiltration

When to Use

Terraces can be used where erosion is a problem or concern, water conservation is necessary, or where an agricultural operation can be improved by use.

How to Establish

Terraces should have a capacity to control runoff from a 10-year, 24-hour storm. Terraces should be proportional to the land slope and should have adequate outlets to contain water. Ridges should be a minimum of 2 feet wide.

For more information, see *Additional Resources*.

Considerations and Costs

Before installing terraces, consider impacts on the water budget, and water quality and quantity. Terraces may also impact downstream flow. Also consider effects of erosion, sediment movement, and pathogens on water quality. If improperly installed, terraces can cause gully erosion. Vegetation may be necessary to further reduce erosion.

Costs associated with this practice include site preparation, materials, installation and maintenance. Maintenance includes maintaining terrace capacity and keeping outlets clear of sediment build-up.

Terraces can effectively maintain and conserve soil moisture but can also negatively impact groundwater by significantly increasing infiltration rates.

Contact your local conservation agent prior to beginning a terracing project in order to fully understand maintenance requirements.

Terraces are low to moderate in cost.

Effectiveness

Level terraces have been found to reduce sediment by 85-95%, total nitrogen by 20%, and total phosphorus by 70% in studies.

Additional Resources

NRCS Conservation Practice Standard 600

WATER & SEDIMENT CONTROL BASINS (638) are used to temporarily capture runoff leaving agricultural fields, trap sediment, reduce soil erosion and improve water quality.

Water Quality Benefits

- Reduces watercourse and gully erosion
- Protects down gradient water bodies from runoff flow
- Improves downstream water quality

When to Use

Water and sediment control basins are typically placed above and below terraces but do not replace terraces. Basins are ideal for land with irregular topography.

How to Establish

Follow all federal, state and local regulations. These basins should be used in conjunction with other conservation practices.

Water and sediment control basins located both above and below terraces reduce excessive maintenance and operation problems. Plan spacing and location adapted to farm equipment operation. Re-vegetate disturbed areas not intended for cropping as soon as possible.

These basins should be no higher than 15 feet from the natural ground. Basin capacity should be large enough to control runoff from a 10-year, 24-hour frequency storm.

For more information, see *Additional Resources*.

Considerations and Costs

Water and sediment control basins are designed to be part of an overall erosion control program. They do not control erosion at the source. Consider impacts on streams and wetlands prior to installation. These basins may impact downstream flows and raise water temperature which can impact aquatic habitats.

Costs associated with this practice include site preparation, installation, and maintenance. Maintenance includes periodic monitoring of sediment levels and inlets, and repairing erosion problems on embankments.

Periodic cleaning may be needed to maintain capacity, depending on the amount of sediment entering the basin. Remove fill material in a way that protects the design of the basin. Sediment can be land applied to promote soil fertility and enhance topography but should never enter streams during sediment removal or disposal. Never redistribute sediment downstream from the embankment, or adjacent to a stream or floodplain.

Contact your local conservation agent prior to basin construction in order to fully understand maintenance requirements.

Water and sedimentation control basins are moderate in cost depending on size, materials and construction.

Effectiveness

Water and sediment control basins can potentially reduce suspended solids in runoff by 40-60%.

Additional Resources

NRCS Conservation Practice Standard 638

UNDERGROUND OUTLETS (620) are used to collect surface water and convey it to safe outlets.

Water Quality Benefits

- Reduces erosion
- Decreases sediment in runoff
- Decreases nutrient and chemical transport into water sources
- Reduces farm runoff entering streams and waterways
- Reduces gully erosion

When to Use

Underground outlets are used as part of a drainage system to remove excess surface water. Outlets remove water from terraces, diversions, subsurface drains, surface drains and other sources.

How to Establish

Underground outlets should have the capacity to manage the expected quantity of water from a system. Inlets should be of appropriate material and size to effectively transport water. Guards are necessary to prevent animal and rodent entry.

Water exiting underground outlets should not enter into a surface water body such as a pond, stream or wetland without first traveling through filtering practices such as settling ponds or filter strips.

For more information, see *Additional Resources*.

Considerations and Costs

Consider impacts on the water budget, downstream flow and use, wetlands and water related habitats. It is also important to consider negative water quality impacts resulting from agrichemicals in water from these systems. Effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances carried in runoff should also be considered in the design of a drainage system.

Costs associated with this practice include site preparation, materials, installation, and maintenance. Maintenance may include cleaning inlets, trash and collection guards, repairing leaks or broken lines, and general monitoring.

Underground outlets should not be used for grade stabilization. Underground outlets are smaller than grade stabilization structures. For more information on Grade Stabilization Structures, see page 2.67.

Underground outlets are moderate in cost depending on materials and construction costs.

Effectiveness

When properly installed and maintained, underground outlets can be beneficial in reducing sediment and nutrients in runoff.

Additional Resources

NRCS Conservation Practice Standard 620

SECTION SEVEN

Wetlands & Stream Protection Management Planning

Stream water quality and protection has become a major environmental concern in recent years. Agricultural operations are receiving more attention for their impacts on water quality than ever before. As a result, more farmers are working to protect streams, creeks, ponds, and other water sources from damage.

In addition, regulatory requirements for agricultural operations are increasing each year. It is becoming a common struggle for farmers to meet regulatory requirements while also maintaining a profitable operation. More effort is now being put into voluntary programs that offer cost-share assistance for protecting water sources from agricultural environmental damage.

The practices listed in this section all address stream protection and management to protect and conserve natural resources.

Conservation practices included in the Wetlands & Stream Protection Management Planning section include:

Channel Bed Stabilization 584

Riparian Forest Buffer 391

Riparian Herbaceous Cover 390

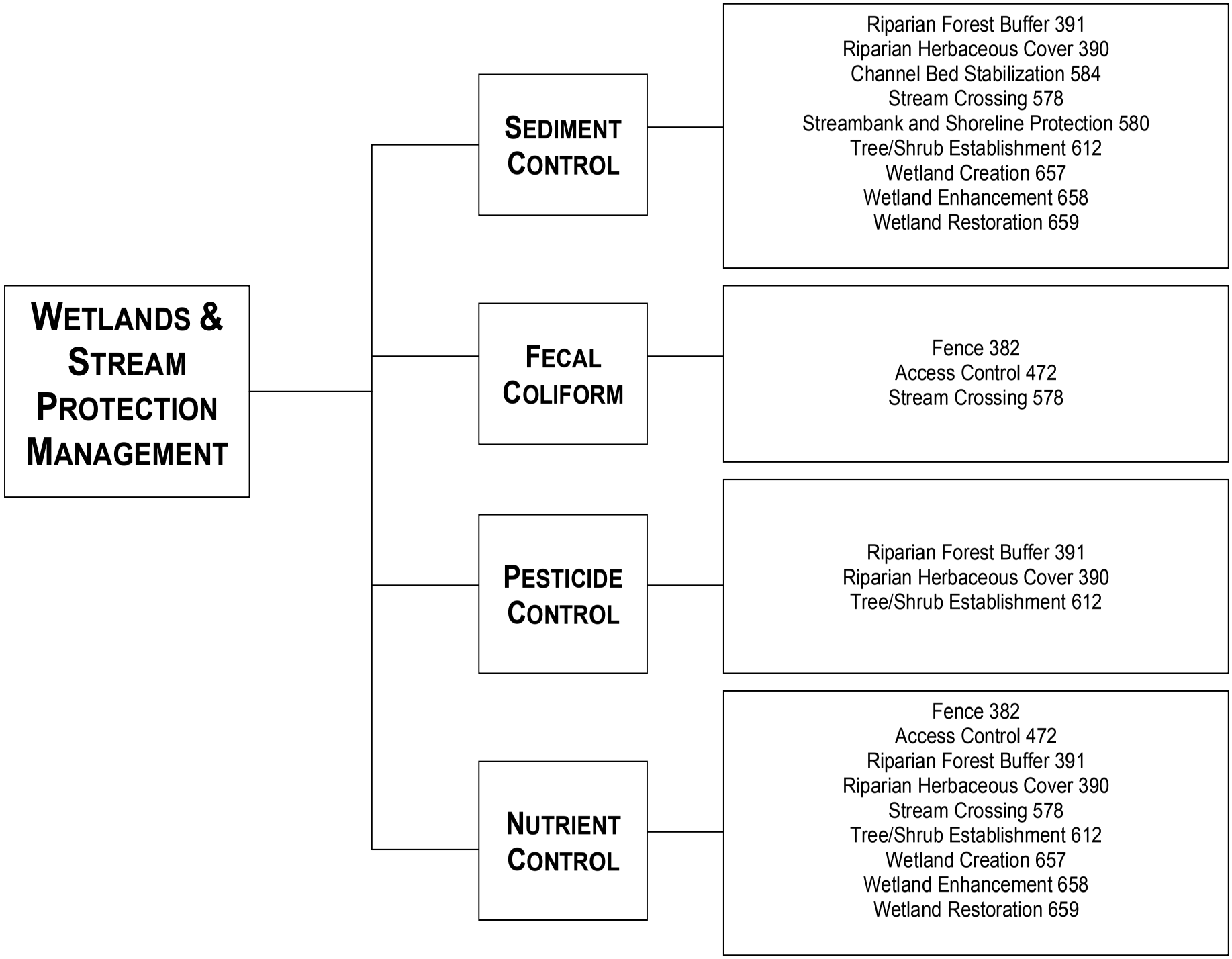
Streambank and Shoreline Protection 580

Tree/Shrub Establishment 612

Wetland Creation 658

Wetland Enhancement 659

Wetland Restoration 657


WETLANDS & STREAM PROTECTION MANAGEMENT
SEDIMENT CONTROL
Riparian Forest Buffer 391
Riparian Herbaceous Cover 390
Channel Bed Stabilization 584
Stream Crossing 578
Streambank and Shoreline Protection 580
Tree/Shrub Establishment 612
Wetland Creation 657
Wetland Enhancement 658
Wetland Restoration 659
FECAL COLIFORM
Fence 382
Access Control 472
Stream Crossing 578
PESTICIDE CONTROL
Riparian Forest Buffer 391
Riparian Herbaceous Cover 390
Tree/Shrub Establishment 612
NUTRIENT CONTROL
Fence 382
Access Control 472
Riparian Forest Buffer 391
Riparian Herbaceous Cover 390
Stream Crossing 578
Tree/Shrub Establishment 612
Wetland Creation 657
Wetland Enhancement 658
Wetland Restoration 659

CHANNEL BED STABILIZATION (584) includes actions that can be taken to stabilize or strengthen the bed or bottom of a channel.

Water Quality Benefits

- Reduces sedimentation
- Protects streambed integrity and aquatic habitats

When to Use

Channel bed stabilization is used to alter bed depth and adjust sediment transport when normal maintenance is not sufficient.

How to Establish

Stream channel stability is based on the materials that are part of the channel bottom and the ability to maintain stream peak flows, velocities and volumes.

Re-vegetating disturbed areas around a channel can reduce additional erosion.

In addition, effort should be taken to protect and ensure wildlife habitats and migration needs.

For more information, see *Additional Resources*.

Considerations and Costs

Channel stabilization may temporarily increase soil erosion. Producers should minimize these impacts as much as possible.

Producers should avoid channel clearing whenever possible to protect and maintain aquatic habitats.

A maintenance plan is needed for general operation, use and maintenance.

Contact your local conservation agent prior to beginning any stream channel stabilization project in order to fully understand maintenance requirements.

Channel stabilization is moderate to high in cost.

Effectiveness

Channel bed stabilization can, in the long run, significantly reduce soil erosion and sedimentation entering water.

Additional Resources

NRCS Conservation Practice Standard 584
NRCS Stream Corridor Restoration Manual

RIPARIAN FOREST BUFFERS (391) use trees or shrubs to reduce sediment, organic matter, nutrients and pesticides in surface runoff alongside watercourses.

Riparian forest buffers provide additional habitats for wildlife and promote water quality

Water Quality Benefits

- Reduces soil erosion
- Reduces sediment transport into water sources
- Reduces nutrient loadings in water sources
- Provides shade and lowers aquatic temperature

When to Use

Use forest buffers on areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands and in areas with groundwater recharge capable of supporting woody vegetation.

When establishing new riparian areas between forestland and water bodies, follow streamside management zone (SMZ) guidelines in the Georgia Best Management Practices for Forestry Manual.

These areas can be used for very limited livestock grazing and hay harvesting.

How to Establish

Prepare site to support the type of forest buffer zone that will be established. Use native trees and shrubs that are noninvasive. Plants and trees need time to establish and should be planted when growth will be promoted. Fertilizer may be needed. In addition, livestock and equipment should be kept out of forest buffers until plants and trees are established.

For more information, see *Additional Resources*.

Considerations and Costs

Use Zone 2 buffers on sites that receive nutrient, sediment and animal waste applications where additional protection is needed to reduce soil erosion and water contamination.

Use Zone 3 buffers on sites adjacent to cropland and highly erodible areas to filter sediment, address concentrated flow erosion, and maintain sheet flow. For Zone 3 buffers, follow standards and specifications for filter strips.

Maintenance and labor costs may include sediment build-up removal and periodic inspections to ensure proper function.

Forest buffers are moderate in cost depending on the type of vegetation established.

Effectiveness

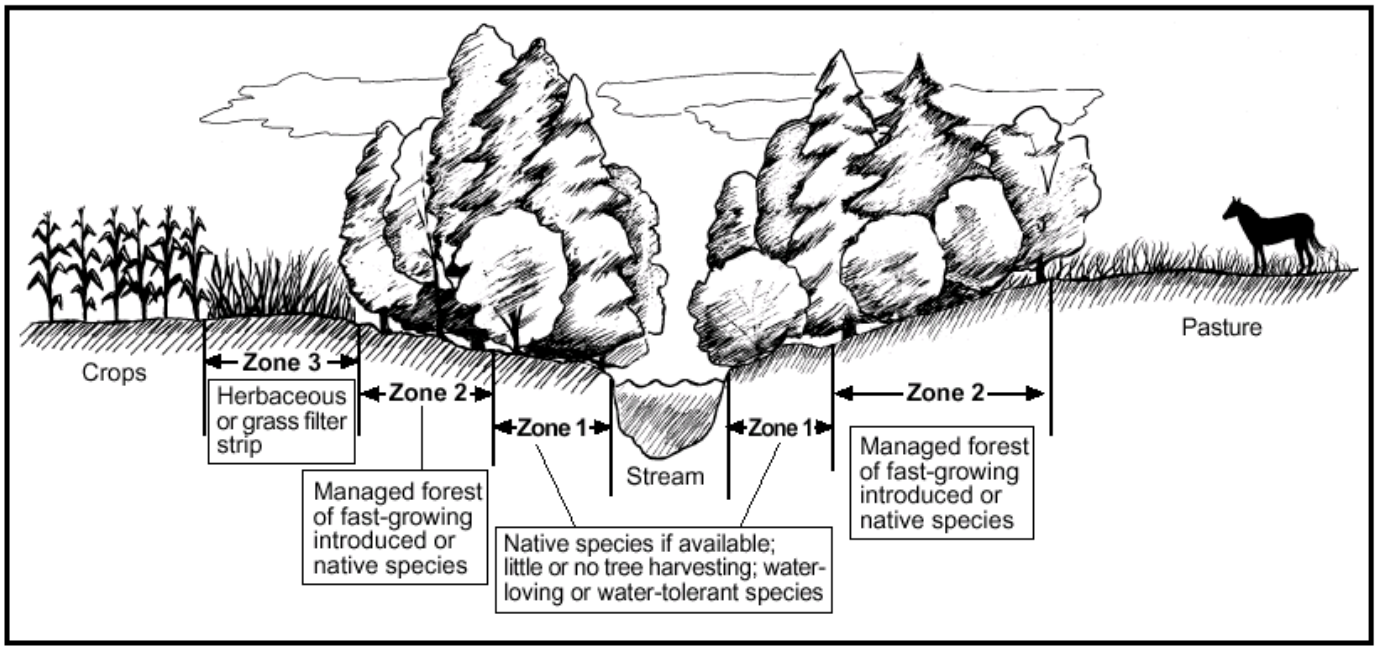
Riparian forest buffers removed 25-85% of nitrogen, 50-75% of phosphorus and 50-75% of sediment in runoff in addition to the acreage converted to forests in studies.

Restored Zone 3 buffers removed 60% of nitrogen and 65% of phosphorus entering from manure application sites to an adjacent water source in one Georgia research study. Grass buffers alone removed 45% of the nitrogen and 20% of the phosphorus from the same sites.

Additional Resources

NRCS Conservation Standard 391

Georgia's Best Management Practices for Forestry Manual



Zone 1 is the area closest to the water body course. Zone 2 is adjacent to and up-gradient from Zone 1 (a minimum of 15 feet). Zone 2 plantings intercept sediment, nutrients, pesticides and other pollutants in surface and subsurface water flows (a minimum of 20 feet). Zone 3 is established if periodic and excessive water flows, erosion and sediment from upslope fields or tracts are anticipated. Zone 3 is generally of herbaceous plants or grass and a diversion or terrace, if needed.

Source: NRCS Conservation Practice Job Sheet 391

Riparian Forest Buffers are called Stream Management Zones by the Georgia Forestry Commission. For more information, see the Georgia Best Management Practices for Forestry Manual

RIPARIAN HERBACEOUS COVER (390) uses grasses, grass-like plants and forbs to protect water quality, provide wildlife habitats and to stabilize streambanks and channels.

Riparian herbaceous cover protects water resources and enhances aquatic habitats

Water Quality Benefits

- Reduces soil erosion
- Reduces sediment transport into water sources
- Reduces nutrient loadings in water sources

When to Use

Riparian herbaceous cover is ideal where runoff can be a problem from pastures and cropland. Riparian cover is used between areas of agricultural land and water bodies. When establishing new riparian areas between forestland and water bodies, follow streamside management zone (SMZ) guidelines in the Georgia Best Management Practices for Forestry Manual.

Riparian Herbaceous Cover areas are not filter strips. Please see page 2.65 for information on filter strips.

How to Establish

The size of a riparian area varies according to use. Use native plant species whenever possible. Avoid harvesting or grazing these areas until plants are established. Then harvest or graze on a carefully monitored rotational schedule. Normal maintenance is required to ensure the function of a riparian herbaceous cover area. Herbaceous cover works best to provide soil stability when used in conjunction with planting shrubs and trees.

For more information, see *Additional Resources*.

Considerations and Costs

Costs associated with riparian herbaceous cover areas include site preparation, seed and plant materials and maintenance.

Herbaceous cover is low to moderate in cost depending on the type of vegetation established.

Effectiveness

Riparian herbaceous cover can potentially reduce nitrogen by 17-58%, phosphorus by 50-75%, and sediment by 50-75%. Riparian herbaceous cover effectiveness depends on maintaining sheet flow across the buffer and increasing infiltration and subsurface flow.

Additional Resources

NRCS Conservation Practice Standard 390
Georgia Best Management Practices for Forestry Manual

STREAMBANK AND SHORELINE PROTECTION (580) is the stabilization and protection of streams, constructed channels and shorelines in order to reduce erosion and water quality degradation.

A stream revetment was used to reduce and prevent streambank erosion along with revegetation

Water Quality Benefits

- Reduces erosion and loss of land
- Protects and maintains water flow and storage capacity
- Can be used to protect and improve stream corridors for wildlife and aquatic species
- Lowers total sediment and nutrient loads entering water bodies
- Provides shade and lowers aquatic temperature

When to Use

This practice can be applied to the streambanks of natural or constructed channels or shorelines that are susceptible to erosion. This type of practice is NOT applicable to ocean fronts or associated areas.

Prior to initiating work in any water body, including wetlands, contact the U.S. Army Corps of Engineers for additional requirements.

How to Establish

All federal, state and local regulations should be followed in the installation process.

Permits are the responsibility of the owner to obtain. These include Georgia 401 Clean Water Certification, Section 404 of the Clean Water Act permits, and authorization from the Department of Natural Resources, Fish and Wildlife Division in addition to any local permits that may be necessary.

Prior to installation, an assessment of the project area should be performed to identify unstable and erosive areas.

Install protective measures to protect streams from up-gradient runoff. The channel grade should be stable and based on a prior field assessment when permanent measures are installed.

Limit the removal of obstructions whenever possible as they provide ideal aquatic habitats. It may be necessary to clear channels when obstructions and/or debris (stumps, fallen trees, etc.) cause erosion or interrupt channel flow and function.

Use materials that cause minimal visual impacts, and maintain or compliment the existing landscape. Protective measures should have a minimal impact on the existing wildlife and habitat.

Disturbed areas should be re-vegetated as soon as possible with plant species that are native or adapted to the local ecosystem. Livestock should be excluded until plants are established, and then use appropriate grazing practices.

For more information, see *Additional Resources*.

Considerations and Costs

Additional protection may be necessary to protect surrounding habitats. Consider implementing other conservation practices to further protect water quality and reduce erosion.

Costs associated with this practice may include site preparation, materials, installation, maintenance, and the re-vegetation of surrounding areas.

Contact your local conservation agent prior to beginning a streambank or shoreline protection project in order to fully understand maintenance requirements.

Streambank and shoreline protection is moderate to high in cost depending on the size and length of the protection area.

Effectiveness

Streambank and shoreline protection can significantly reduce erosion and sediment entering water.

Additional Resources

NRCS Conservation Practice Standard 580
Georgia EPD

A streambank restoration project along the Etowah River

TREE/SHRUB ESTABLISHMENT (612) can be utilized for long-term erosion control by slowing runoff and allowing more time for nutrient absorption.

Water Quality Benefits

- Reduces erosion and runoff in the long-run
- Improves infiltration
- Reduces percolation in soil

When to Use

Trees and shrubs can be planted in areas where woody plants can be maintained.

How to Establish

Prepare site for plant/seedling installation. Plant tree seedlings, shrubs and seeds according to proper horticultural practices. Seedlings should ideally be planted between December 1 and March 15. The ideal planting time for deciduous shrubs is in late winter and is in early fall for evergreen shrubs.

Plant cuttings at least 4 to 6 inches above the ground and 14 to 16 inches below the ground. Planted areas need to be protected from livestock and wildlife until fully established. Depending on the site, it may be necessary to mulch, and to provide supplemental water or other treatments to promote plant establishment and growth.

When planting pines for wood production, 600-700 trees per acre is standard. 900-1,200 trees per acre is recommended on highly erodible lands.

For more information, see *Additional Resources*.

Considerations and Costs

Using locally adapted seed, seedlings or cuttings will encourage viability of plants. Space seeds, seedlings and cuttings appropriately. Consider future activities on the site prior to installation.

Costs associated with this practice may include materials, site preparation, installation, maintenance, protection and repair.

Tree and shrub establishment is low to moderate in cost depending on materials and installation costs.

Effectiveness

As an added benefit to reducing soil erosion, trees have been found to reduce dust particles from poultry houses by 50% in studies and can potentially reduce energy costs by providing shading. Species that work well include Leland Cypress, Red Cedar and White Pine.

Additional Resources

NRCS Conservation Practice 612

The Georgia Forestry Commission has an annual seedling sale for purchases of pine and hardwood seedlings. Visit the GFC website for more information.

WETLAND CREATION, ENHANCEMENT AND RESTORATION (657, 658, & 659) is the establishment, modification or restoration of a wetland to improve and protect water quality.

A restored wetland provides habitats for wildlife and can trap nutrients

Water Quality Benefits

- Reduces nutrient loadings
- Provides and protects native species habitats
- Can improve water quality associated with degraded wetlands
- Can reduce chemical contaminants

When to Use

Creating a wetland is ideal in areas where wetland conditions can be established and maintained by modifying drainage.

Enhancing existing wetlands can improve overall habitat and water quality, and may improve the many functions of a wetland. Restoring a wetland can provide habitats for wildlife.

Large wetland restoration projects can generate income when used to mitigate wetland losses elsewhere. Prior to any wetlands project, contact the U.S. Army Corps of Engineers for additional requirements.

How to Establish

All federal, state and local regulations should be followed. Landowners must obtain all required permits before beginning a restorative process.

Except where seasonal, wetlands require a permanent water source. Examine natural wetlands in the area as a guide for restoring a wetland. Vegetation established in wetlands should be adapted to the area as well as to wet conditions.

Permits are the responsibility of the owner to obtain. These include Georgia 401 Clean Water Certification, Section 404 of the Clean Water Act permits, and authorization from the Department of Natural Resources, Fish and Wildlife Division in addition to any local permits that may be necessary.

For more information, see *Additional Resources*.

Considerations and Costs

Consider any impacts of changes in the volume and rate of runoff, infiltration, evaporation, and transpiration on the water budget that may result from these practices. Producers should also consider any impacts on downstream flows and wildlife habitats prior to creating or modifying a wetland.

Costs associated with wetland creation include planning and design, site preparation, seed/plant materials, and other costs that result from altering water flows and establishing vegetative buffers.

Costs associated with enhancing and restoring wetlands may include drainage modification, additional plant materials, soil improvement costs, expansion costs, etc.

Contact your local conservation agent prior to beginning a wetlands project in order to fully understand maintenance requirements.

Wetland creation is moderately high to high in cost. Wetland enhancement is low in cost. Wetland restoration is moderate in cost.

Effectiveness

Restored wetland buffers with an up slope grass strip and down slope planted pines and hardwoods retained or removed 59% of nitrogen and 66% of phosphorus entering from adjacent manure application sites in studies.

Additional Resources

NRCS Conservation Practice Standard 657
NRCS Conservation Practice Standard 658
NRCS Conservation Practice Standard 659

Wetlands offer nesting sites for wood ducks and other wildlife

Fencing can be used to protect established wetlands and also to prohibit livestock access for restoration projects.

Chapter 3: Additional Information

Georgia Agricultural Organizations Information

Georgia Agribusiness Council
P.O. Box 119
Commerce, GA 30529
706-336-6830
800-726-2474
http://www.ga-agribusiness.org

Georgia Cattlemen's Association
P.O. Box 24510
Macon, GA 31212
478-474-6560
http://www.gabeef.org

Georgia Cotton Commission
401 Larry Walker Parkway, Suite A
P.O. BOX 1464
Perry, GA 31069
(478) 988-4235
http://www.georgiacottoncommission.org

Georgia Crop Improvement Association
2425 South Milledge Avenue
Athens, GA 30605
(706) 542-2351
http://certifiedseed.org

Georgia Farm Bureau
1620 Bass Road
Macon, GA 31210
(478) 474-8411
http://www.gfb.org

Georgia Fruit and Vegetable Growers Association
P.O. BOX 2945
LaGrange, GA 30241
(706) 845-8200
(877) 994-3842
http://www.gfvga.org

Georgia Milk Producers, Inc.
1641 New High Shoals Road, Suite 5
Watkinsville, GA 30677
(706) 310-0020
(800) 337-0555
http://www.gamilk.org

Georgia Peanut Commission
P.O. BOX 967
Tifton, GA 31793
(229) 386-3470
http://www.gapeanuts.com

Georgia Poultry Federation
P.O. BOX 763
Gainesville, GA 30503
(770) 532-0473
http://www.gapf.org

Georgia Wildlife Federation
11600 Hazelbrand Road
Covington, GA 30014
(770) 787-7887
http://www.gwf.org

Georgia State Agencies Information

Georgia Department of Agriculture
19 Martin Luther King, Jr. Drive SW
Atlanta, GA 30334
(404) 656-3685
www.agr.georgia.gov

Georgia Department of Natural Resources
Commissioner's Office
2 Martin Luther King, Jr. Drive SE
Suite 1252 East Tower
Atlanta, GA 30334
(404) 656-3500
www.gadnr.org/

Georgia Environmental Protection Division
2 Martin Luther King Jr., Drive
Suite 1152, East Tower
Atlanta, GA 30334-9000
(888) 373-5947---General Information
(404) 656-4863---Emergency Response
www.gaepd.org

Georgia Forestry Commission
Macon Office
5645 Riggins Mill Road
Dry Branch, GA 31020
(800) GATREES
(478) 751-3500
www.gatrees.org

Georgia Soil and Water Conservation Commission
P.O. BOX 8024
Athens, GA 30603
(706) 552-4470
www.gaswcc.georgia.gov

University of Georgia Cooperative Extension Service
http://extension.uga.edu/

Northeast District
University of Georgia
302 Hoke Smith Building
Athens, GA 30602-4256
(706) 542-3179

Northwest District
UGA-Griffin Campus
1109 Experiment Street
Flynt Bldg., Room 227
Griffin, GA 30223-1731
(706) 542-1060

Southeast District
P.O. Box 8112, GSU
Statesboro, GA 30460-8112
(912) 681-0177

Southwest District
2360 Rainwater Road
UGA Tifton Campus Conference Center
Tifton, GA 31793-5766
(229) 386-3413

University of Georgia Cooperative Extension Service
Animal Waste Awareness in Research and Extension (A.W.A.R.E)
1420 Experiment Station Road
Athens, GA 30602
(706) 310-3464
http://agp2.org/aware

Federal Agencies Information

U.S. Army Corps of Engineers
Savannah District
100 West Oglethorpe Avenue
Savannah, GA 31401
(912) 652-5279
www.sas.usace.army.mil/

U.S. Department of Agriculture
1400 Independence Avenue, S.W.
Washington, D.C. 20250
(202) 720-2791
(Information Response, M-F
8:30 a.m.-5 p.m. EST)
http://www.usda.gov

U.S.D.A. Farm Service Agency
Public Affairs Staff
1400 Independence Avenue, S.W.
STOP 0506
Washington, D.C. 20250-0506
(202) 720-7809
http://www.fsa.usda.gov

U.S. Environmental Protection Agency
Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303
(404) 562-9900
(800) 241-1754
http://www.epa.gov/region4/

U.S. Fish and Wildlife Service
Region 4
1875 Century Blvd, Suite 404
Atlanta, GA 30345-3319
(404) 679-4000
800-344 WILD
(M-F, 8 a.m.-8 p.m., EST)
http://www.fws.gov/southeast

U.S. Geological Service
National Headquarters
12201 Sunrise Valley Drive
Reston, VA 20192
(703) 648-5953
(6:30 a.m.-6:30 p.m.)
888-ASK-USGS
http://www.usgs.gov/

USGS Georgia Water Science Center
1700 Corporate Drive
Norcross, GA 30093
(678) 924-6700
http://ga.water.usgs.gov/

U.S. Natural Resources Conservation Service
National Headquarters
Conservation Communication Staff
P.O. BOX 2890
Washington, D.C. 20013
http://www.nrcs.usda.gov

Georgia Office
355 East Hancock Avenue
Athens, GA 30601-2775
http://www.ga.nrcs.usda.gov

Pesticide Emergency Contact Information

Poison Control Center
(Human or Animal)
(800) 222-1222

Georgia Department of Natural Resources
(Non-game Endangered Species)
(706) 761-3035

Georgia DNR Environmental Division Response Team
(Pesticide fires, spills, leaks)
(800) 241-4113

Georgia State Patrol
*GSP on mobile phones

U.S. Fish and Wildlife Service
(800) 344-WILD (9453)

Pesticide Information (Non-Emergency)

National Pesticide Information Center
(General Information on toxicology, environmental hazards, etc)
M-F, 10:30 a.m.-6:30 p.m. EST
(800) 858-7378

National Response Center
(Refers caller to proper government agency for hazardous materials)
Operates 365 days a year, 24 hours a day
(800) 424-8802

UGA Cooperative Extension Service
(800)-ASK-UGA1

Pesticide Disposal

Georgia Department of Agriculture
(404) 656-4958
(800) 282-5852

EPA Hazardous Waste Hotline (Superfund)
(800) 424-9346

Georgia Clean Day Pesticide Disposal Program Information
(404)656-4958
http://agr.georgia.gov/pesticide-container-recycling-pesticide-waste-disposal.aspx

Pesticide Information Online

CropLife America
www.croplifeamerica.org

EPA Office of Pesticide Programs
www.epa.gov/pesticides/

EPA List of Restricted Use Pesticides
www.epa.gov/opprd001/rup/

UGA Center for Invasive Species and Ecosystem Health
(Georgia Integrated Pest Management Manual)
www.bugwood.org

National IPM Centers
www.ipmcenters.org

National Pesticide Telecommunications Network
http://npic.orst.edu

U.S. Fish and Wildlife Service—Endangered Species
www.fws.gov/index.html

For Additional Information

Georgia Cotton Production Guide
Insect Management
www.ugacotton.com/production-guide/

Georgia Drainage Guide
Contact your local NRCS Service Center

Georgia Forestry Best Management Practices
www.gatrees.org/forest-management/water-quality/bmps/manual

Georgia NRCS Conservation Practice Standards and Specifications
Section 4
http://efotg.nrcs.usda.gov/treemenuFS.aspx

Georgia Poultry Federation Litter Market
www.galitter.org

Georgia Rules and Regulations for Water Quality Control, Chapter 391-3-6
www.gaepd.org/Documents/Water QualityStandards.html

Manual for Erosion & Sediment Control in Georgia
Field Manual for Erosion & Sediment Control in Georgia
www.gaswcc.org/docs/green_book_Sed.pdf

UGA Cooperative Extension Service Georgia Pest Management Handbook
http://www.ent.uga.edu/pmh/

UGA Entomology Department
http://www.ent.uga.edu/

U.S.D.A NRCS National Engineering Handbook
Part 652: Irrigation Guide
http://directives.sc.egov.usda.gov/viewerFS.aspx?hid=21431

UGA CES "Water Meters as a Water Management Tool on Georgia Farms"
www.caes.uga.edu/publications/pubDetail.cfm?pk_id=7423

MANDATORY FEDERAL BEST MANAGEMENT PRACTICES FOR ROADS IN WETLANDS

These BMPs which must be applied to satisfy this provision shall include those detailed BMPs described in the state's approved program description pursuant to the requirements of the Clean Water Act, Section 404 (40 CFR Part 233.22(i)), and shall also include the following baseline provisions. This list of mandatory BMPs is quoted from the US Army Corps of Engineers Regulatory Program Regulations, Permits for Discharges of Dredged or Fill Materials into Waters of the United States.

1. Permanent roads and temporary access roads (for farm purposes) in waters of the U.S. shall be held to the minimum feasible number, width, and total length consistent with the purpose of specific farming operations, and local topographic and climatic conditions;
2. All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters of the U.S;
3. The road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows;
4. The fill shall be properly stabilized and maintained during and following construction to prevent erosion;
5. Discharges of dredged or fill material into waters of the U.S. to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers, or other heavy equipment within waters of the U.S. (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself;
6. In designing, constructing and maintaining roads, vegetate disturbances in the waters of the U.S. shall be kept at a minimum;
7. The design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body;
8. Borrow material shall be taken from upland sources wherever feasible;
9. The discharges shall not take or jeopardize the continued existence of a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species;
10. Discharges into breeding and nesting areas for waterfowl, spawning areas, and wetlands shall be avoided if less harmful alternatives exist;
11. The discharge shall not be located in the proximity of a public water supply intake;
12. The discharge shall not occur in areas of concentrated shellfish production;
13. The discharge shall not occur in a component of the National Wild and Scenic River System;
14. The discharge of material shall consist of suitable material free from toxic pollutants in toxic amounts, and;
15. All temporary fills shall be removed in their entirety and the area restored to its original elevation.

Georgia Soil & Water Conservation Commission
P.O. Box 8024
4310 Lexington Road
Athens, GA 30603
706-552-4470 (phone)
706-552-4480 (fax)

Brent L. Dykes, Executive Director
William R. Fulmer, Rural Water Resources Program Manager

GSWCC Programs

319 Cost Share Projects
Landowner cost-share assistance program to develop nutrient management plans and install best management practices to protect water quality and promote soil and water conservation.

Partners for Fish & Wildlife Streambank Restoration Program
(In conjunction with the U.S. Fish & Wildlife Service)
Landowner cost-share assistance program funding projects that protect, restore and enhance stream banks with fencing, stream buffers (minimum requirement of 25-foot buffer), streambank restoration or wildlife enhancement structures.

Metering Program
Assists agricultural water uses in conserving ground water and surface water by quantifying actual water use, conserving existing water through irrigation audits and reducing dependence on ground water and surface water supplies through agricultural water catchments

gaswcc.georgia.gov

GSWCC Regions &
Soil and Water Conservation Districts