



SWINE PRODUCTION

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FARM ASSESSMENT SYSTEM

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PRE-ASSESSMENT:

Why Should I Be Concerned?

With an expanding population and an increased sensitivity to air and water quality issues, swine producers need to be aware of the effects that their operations have on these issues. More importantly, producers need to have plans in place to address them. The two main areas of concern for swine producers are storage and handling of waste, and odors.

Improper handling of storage of animal wastes can result in nitrogen and phosphorus leakage which can result in contaminated drinking water. Poor quality drinking water presents significant health hazards to both humans and livestock. Therefore, it is important that all management practices associated with the handling of animal waste will be evaluated and poor practice eliminated.

Odors can originate from multiple sources on a swine farm; therefore it is important to evaluate all management practices of an operation. Some of the most common sources of odors include building ventilation systems, lagoons and land waste application systems. A proper understanding of how these sources can contribute to odors can help alleviate many of these problems. Not addressing odors can result in disagreements with neighbors as well as nuisance lawsuits.

How Does This Assessment Help Protect Drinking Water and the Environment?

- This assessment allows you to evaluate the environmental soundness of your farm and operational practices relating to your swine production practices.
- You are encouraged to complete the entire document.
- The assessment asks a series of questions about your swine production practices.
- The assessment evaluation uses your answers (rankings) to identify practices or structures at risk and should be modified to prevent pollution.
- The swine production facts gives an overview of sound environmental practices that can be used to prevent pollution caused directly by swine production.
- You are encouraged to develop an action plan based on your needs as identified by the assessment. The swine production practices facts, reference, and publication list can provide alternatives to current practices.
- Farm *A*Syst is a voluntary program.
- The assessment should be conducted by you for your use. If needed, a professional from the Georgia Cooperative Extension Service or one of the other partnership organizations can provide assistance in completing the assessment.
- No information from this assessment needs to leave your farm.

* Words found in italics are defined in the glossary.

ASSESSMENT:

Assessing Your Swine Production Practices

For each category listed on the left, read across to the right and circle the statement that best describes conditions on your farm. If a category does not apply, for example: land application, then skip the question. Once you have decided on the most appropriate answer, look above that description to find your rank number (4,3,2 or 1) and enter that number in the “RANK” column. The entire assessment should take less than 30 minutes. A glossary is on page 12 to clarify words found in italics throughout this assessment.

SWINE PRODUCTION PRACTICES					
	Low Risk (rank 4)	Low-Mod Risk (rank 3)	Mod-High Risk (rank 2)	High Risk (rank 1)	Rank
MANURE MANAGEMENT					
Nutrient Management Plan	Have a written Plan that is up to date and is followed. Manure is applied at recommended rates.	Have a written plan, but it is not followed completely.	Have an unwritten plan that is reasonable for the volume and acreage.	Have no plan.	
Records	Maintain up to date records on manure applications, animal numbers, manure productions, and equipment inspections.	Have records on manure applications, manure production, animal numbers, and equipment inspections but they are not all up to date.	Have some records on manure applications, manure productions, animal numbers, and equipment inspections but they are not complete.	Do not keep records.	
Emergency Action Plan	Have a written emergency action plan that is less than two years old.	Have a written emergency action plan that is two to five years old.	Have an emergency action plan but it is not written or is more than five years old.	Do not have an emergency action plan.	
WASTE STORAGE					
Manure Production	Amount of manure produced yearly or monthly is known based on production records.	Amount of manure produced can be estimated within 10% of actual production.	Amount of manure produced is roughly known.	Amount of manure produced is not known.	
Location of Lagoons or Pits	Located more than 500 feet from surface water or a well.	Located 100 to 500 feet from surface water or a well.	Located 25 to 100 feet from surface water or a well.	Located within 25 feet of surface water or a well.	

SWINE PRODUCTION PRACTICES

	Low Risk (rank 4)	Low-Mod Risk (rank 3)	Mod-High Risk (rank 2)	High Risk (rank 1)	Rank
Lagoon or Pit Design and Construction	Designed, installed, and maintained according to Natural Resource Conservation Service (NRCS) or Professional Engineer (PE) specifications. Large enough to handle sludge, 90 to 180 days waste-water and storm water.	Designed and installed according to NRCS or PE specifications, but not maintained according to specifications. Production capacity has increased since design and implementation.	No NRCS or PE design and installation specifications. Constructed in silt loam, loam, clay loam, or silty clay soils. Water table deeper than 20 feet.	No NRCS or PE design and installation specifications. Constructed in sand or sandy loam soil with no clay layer. Water table shallower than 20 feet.	
Lagoon Capacity	Has <i>freeboard</i> allowance of 2 feet or greater. In addition to storm storage.	Designed by NRCS or a PE but freeboard allowance is unknown.	Has some heavy rain capacity, specifics not known or overflow has occurred in the past.	Has no freeboard allowance or overflow occurs more than once a year.	
Lagoon Inspection	Inspected weekly and records are kept. No wet spots evident.	Inspected monthly.	Inspected less frequently than monthly.	Not inspected regularly. Wet spots evident.	
Liquid Level in Lagoon or Pit	Have monitoring equipment, check and record levels daily.	Have monitoring equipment and check weekly or monthly and record.	Have monitoring equipment, but check levels less than once a month.	Do not have monitoring equipment and do not check the level.	
Sludge Level in Lagoons	Have checked within the last 2 years and the level is less than 2 feet.	Have checked within the last 5 years and level is less than 2 feet.	Have not checked the sludge level in the last 5 years.	Have never checked the sludge level and the lagoon is over 10 years old.	
WASTE STORAGE					
Soil Testing	Test yearly.	Test every 3 years.	Test less frequently than every 3 years.	Not tested.	
Manure Testing	Test every year.	Test ever 2 years.	Test less frequently than every 2 years.	Do not test.	
Land Application	All waste is spread at least 100 feet from wells and surface water.	Most waste is spread at least 100 feet from well and surface water.	Most waste is spread at least 50 feet from well and surface water.	Most waste is spread within 50 feet of well and surface water.	
Manure Handling Equipment Mainenance	Equipment is inspected weekly and maintained on a scheduled basis.	Equipment is inspected montly and maintained on a regular schedule.	Equipment is inspected at least yearly and maintenance is done on a scheduled basis.	Equipment is not inspected or maintained on a scheduled basis.	

SWINE PRODUCTION PRACTICES

	Low Risk (rank 4)	Low-Mod Risk (rank 3)	Mod-High Risk (rank 2)	High Risk (rank 1)	Rank
Well Testing	Test yearly for bacteria and nitrates.	Test yearly for bacteria and at least every 3 years for nitrates.	Test at least every 3 years for bacteria and nitrates.	Test for bacteria and nitrates less frequently than every 3 years.	
ODOR					
Complaints	Neighbors have not complained.	Neighbors have complained only occasionally in the last 3 years.	Neighbors have complained several times in the last 3 years.	Neighbors have complained several times within the last year.	
Neighbor Notification	Always notify neighbors when odor levels may be high such as when applying manure to land.	Usually notify neighbors when odor levels may be high.	Sometimes notify neighbors when odor levels may be high.	Never notify neighbors when odor levels may be high.	
Building Manure Removal	Removed, scraped, or flushed from building more than once a day. Barns kept clean of dust and feed waste.	Removed from buildings once a day. Barns kept clean of dust and feed waste at least monthly.	Removed every 2 to 7 days. Barns cleaned of dust and feed less than once a month.	Removed less frequently than once a week.	
Manure Storage	Stored in an enclosed structure or covered with a plastic covering or spread daily.	Contains bedding and stored as a solid or stored as a liquid with a crust covering or stored for less than 1 week.	Stored for more than 1 week as a liquid that is covered some of the time or there are wind breaks around the storage facility.	Stored as a liquid with no covering and no wind breaks.	
Manure Application	Always applied only on dry days before 2pm and not on weekends or holidays. Wind direction is considered.	Usually applied on dry days before 2pm and usually not on weekends or holidays.	Sometimes applied during wet weather, in the late afternoons, or on weekends or holidays.	Rarely consider weather conditions, time of day, and day of the week when manure is applied.	
ANIMAL DISPOSAL					
Dead Animal Disposal	Disposed of in an approved manner such as incineration or composting within 24 hours of discovery.	Disposed of in an approved manner within 48 hours of discovery.	Sometimes disposed of inappropriately or sometimes more than 48 hours after discovery.	Disposed of as necessary and when time permits.	

Number of Areas Ranked _____

Ranking Total _____

(Number of questions answered, if all answered, should total 21.)

(Sum of all numbers in the "RANK" Column)

ASSESSMENT EVALUATION:

What Do I Do with These Rankings?

STEP 1: Identify Areas That Have Been Determined to be at Risk

Low risk practices (4s) are ideal and should be your goal. Low to moderate risk practices (3s) provide reasonable protection. Moderate to high risk practices (2s) provide inadequate protection in many circumstances. High risk practices (1s) are inadequate and pose a high risk for causing environmental, health, economic, or regulatory problems.

High risk practices, rankings of “1” require immediate attention. Some may only require little effort to correct, while others could be major or costly and may require planning or prioritizing before you take action. All activities identified as “high risk” or “1s” should be listed in the action plan. Rankings of “2s” should be examined in greater detail to determine the exact level of risk and attention given accordingly.

STEP 2: Determine Your Swine Risk Ranking

The Swine Risk Ranking provides a general idea of how your swine production practices might be affecting your ground and surface water, contaminating your soil and affecting your air quality.

Use the Rankings Total and the Total Number of Areas Ranked as determined from the questionnaire portion of this assessment to determine the Swine Risk Ranking.

RANKINGS TOTAL ÷ TOTAL NUMBER OF AREAS RANKED = SWINE RISK RANKING

_____ ÷ _____ = _____

SWINE RISK RANKING LEVEL OF RISK

3.6 to 4 Low Risk
2.6 to 3.5 Low to Moderate Risk
1.6 to 2.5 Moderate Risk
1.0 to 1.5 High Risk

This ranking gives you an idea of how your swine production practices might be affecting your drinking water. This ranking should serve only as a very general guide, and not as a precise diagnosis since it represents the average of many individual rankings.

STEP 3: Read the Information/Fact Section on Improving Your Swine Production Practices.

While reading, think how you could modify your practices to address some of your moderate and high risk areas. If you have any questions that are not addressed in the swine production practices facts portion of this assessment, consult the references in the back of the publication or contact your county Extension agent.

STEP 4: Transfer Information to the Total Farm Assessment

If you are completing this assessment as part of a “Total Farm Assessment,” also transfer your swine risk ranking and your identified high risk practices to the overall farm assessment.

SWINE PRODUCTION FACTS:

Swine Waste Management

Proper swine production practices can minimize the impact of the farm on groundwater, surface water and air quality. Knowing how to store, handle and dispose of wastes properly can result in better production, better nutrient utilization, a safer environment and reduced complaints.

Nutrient Management Plan

A *nutrient management plan* is a method of accounting for all of the wastes produced on a farm. The plan can be used as a strategy for the storage and use of the wastes produced by a given farm.

The *nutrient management plan* must be developed for the specific number and type of animals on a farm. The plan should address all aspects of waste management including:

- **Storage** – site, size, and type,
- **Land application** – land needs, timing, frequency, soil testing, manure testing, and crops grown, and
- **Handling and transportation** – equipment calibrations and inspections.

Records

Accurate records should be maintained for all manure application and storage practices. Things that should be recorded include the amount, time and location of manure applications, the amount of manure produced, the number of animals on the farm, equipment inspections, dead animal disposals and the waste levels in storage facilities. Any manure sold or otherwise removed from the farm should also be recorded.

Emergency action plan

An up to date emergency action plan should be written and readily available in case an emergency situation arises. The emergency plan should contain

specific actions to be taken in an emergency. These actions may include shutting off valves and turning on emergency pumps. A list of emergency contact people should be clearly posted with their phone numbers.

In addition, all employees should be familiar with the plan and know where it is located. Proper preparation can help control an emergency before it escalates into a serious pollution problem.

WASTE STORAGE FACILITIES

Facility Location

To ensure proper drainage and waste flow as well as to minimize odor production and dispersal, a waste storage facility site must be carefully selected. When planning a new facility, attempt to locate the facility with plenty of distance from wells and neighbors. Identify the prevailing winds and account for them in siting the facility.

Also, try to locate new facilities down slope from any water supply to minimize the chance of water contamination.

Lagoons

Lagoons should be located more than 100 feet from surface water or a well. Furthermore, they should be designed and installed according to NRCS specifications. The size of the lagoon should be determined by calculating the amount of manure and waste water produced for the specific operation. The lagoon should have the storage capacity for sludge, 90 to 180 days of waste water and storm water. The lagoon should have the *freeboard* capacity for a 25 year, 24 hour rainfall event to prevent possible overflow.

Once installed, lagoons should be scheduled for regular inspections and maintenance. Lagoons should be inspected at least once a month for signs of erosion or other weaknesses. The walls of the lagoon

should be mowed regularly and free from trees and rodent burrows. Additionally, liquid levels should be monitored daily to rule out leaking. Under normal conditions, liquid levels may rise or fall 0.3 to 0.5 inches per day. Sludge levels should be checked every year to avoid excess build up. Over two feet of sludge in a lagoon is an indication that sludge should be removed.

Manure Storage Containers

Manure storage containers are different from lagoons because lagoons are designed to degrade manure. Storage ponds or containers simply hold the manure until it is disposed of elsewhere. Storage container designs are similar to lagoons and must be designed to hold sludge, waste water and rain water. However storage facilities do not have a treatment volume of water.

Manure Handling

Manure contains material that can be a valuable nutrient source for the production of crops. However, the same components that make manure valuable for crops can also be pollutants if they can enter natural waters. In order for manure to be used effectively without becoming a source of pollution, it must be handled and applied accurately and safely.

- During handling and transport, manure can end up as a pollutant if any of the following occur:
- Leaking or discharge occurs during transportation or storage.
- Over application of nutrients to fields.
- Application of manure too close to water sources.
- Manure runoff from fields.
- Application of manure to frozen ground.
- Application of manure too far in advance of a growing season.

To avoid these potential problems, the following practices should be implemented.

Manure transport. Manure transport equipment should be free from leaks and should be checked and maintained on a regular basis.

Manure Testing. The composition of the waste should be determined at least once every two years. Samples should be collected after agitation or by simultaneously collecting from the top and bottom of the lagoon or pit. An accurate analysis of the manure will aid in the precise application of nutrients.

Soil Testing. Soils that will receive wastes should be tested at least once every three years. Soil testing will confirm the rate and frequency of manure application. Knowledge of the soil composition can help minimize nutrient build up and ensure sufficient nutrient application.

Manure application rate. After the composition of the manure has been determined and an analysis of the soil nutrients has been conducted, an application rate can be calculated. Typical application rates for manure are between 3,000 and 7,000 gallons per acre. When lagoon water is used, the rate may be higher. To prevent excesses or deficiencies in applications, it is important that the application equipment be calibrated correctly and tested on a regular basis. Furthermore, all manure applications should be logged with the dates and locations of the applications recorded. Accurate records are essential when addressing odor and water contamination complaints.

Manure application. The timing and location of manure application is critical to reducing the opportunity for contaminating water and minimizing odor complaints. The following practices should be followed:

- Manure should not be applied within 200 ft of surface or ground water or a well.
- Applications should also not be made on slopes with a grade greater than 15% or before an expected rainfall.
- Applications to crop land should be made just before the crop is planted.
- Manure should never be applied to frozen ground.

- To help reduce odor complaints, manure should be applied during times when neighbors will be least affected. Typically, wastes should be applied only on dry days before 2 pm and not on weekends or holidays. Notifying neighbors of application times can also help reduce complaints.

Well Testing. To evaluate the effects of manure application and storage, wells should be tested yearly for bacteria and nitrates. Increases in the levels of either of these should result in an evaluation of the *nutrient management plan* and corrective action.

Odors

Avoiding odor or nuisance complaints has become a challenge to livestock producers everywhere. As populations expand, people unfamiliar with livestock are residing closer and closer to livestock operations. Consequently, it is important to educate neighbors on livestock management practices that may be viewed as negatively impacting property values and the quality of life of residents. Taking the extra effort to avoid confrontation can lead to better relations and can possibly avoid potential lawsuits.

Odor is a complex issue because many factors contribute to odor. Reducing odors is a matter of understanding the causes of odors and emissions and adopting the best management practices available to control them.

Sources of odors

Odors and emissions from swine operations originate from multiple sources including:

- **Ammonia** – Ammonia is produced by the breakdown of urea in urine. Bacteria convert ammonia into nitrite which increases the acidity of the soil and water where the reaction takes place.
- **Hydrogen Sulfide** – Hydrogen sulfide is the product of bacterial reactions that occur during the breakdown of sulfur containing waste products such as amino acids. Hydrogen sulfide in *aerobic* conditions oxidizes and forms particulate matter that is capable of moving through air currents.

- **Methane and Carbon Dioxide** – Methane and carbon dioxide are gases produced by anaerobic respiration and fermentation. These gases absorb infrared light and convert it to heat energy. It has been suggested that a build up of these gases will cause and increase in global temperatures resulting in the “*greenhouse effect*” where increased temperatures disrupt ecosystems.

- **Volatile Organic Compounds** – Volatile organic compounds are produced as end products and intermediates of many bacterial reactions. Volatile organic compounds are known for producing a variety of unpleasant odors. The environmental impact of these compounds is not known.

- **Particulate matter** – particulate matter made up of small particles of organic and inorganic material are also produced on livestock operations. These particles can originate from feed, skin, soil, feces, or gases (which form salts). Some small particles (0.5 to 2.5 um) can travel deep into the lungs and cause chronic health problems while others (>0.5 um) are trapped in the upper respiratory tract and are generally considered as only a health nuisance.

Reducing Odors

The following management practices can help reduce odors and emissions and the complaints that they may generate.

Filter Barriers Ground cover and trees can be used to reduce the transport of odors by acting as barriers and filtering the odors. Three places at strategic downwind points on a farm can be very effective in breaking the flow pattern of odors.

Building cleanliness Removing building wastes regularly can reduce odor production by minimizing the surface area of the waste. Buildings that have waste removed multiple times a day produce less odors than building that let manure sit for days before removal. Keeping fans and vents clean of dust particles can also reduce the accumulation of odors of the particles and minimize the dispersion of the particles into the atmosphere.

Feed and water Reducing feed and water losses can lower the loading rate of the waste system. High feed and water losses will add to the odor producing capability of the system. Additionally, diets should be formulated to maximize nutrient utilization to reduce the excretion of nutrients into the feces and urine. Feeding diets with synthetic amino acids instead of complex proteins can reduce excess nitrogen production.

Waste storage Several things can be done to reduce the odor production capacity of storage facilities. Various treatment agents can alter the microbial populations of systems and thereby alter the production of volatile compounds. Covering systems can reduce the flow of compounds from the surface of the system as well as reduce the radiant heat applied to the system.

Land application Applying wastes to soils results in a high volatilization rate for many odorous compounds. Efforts to reduce the nuisance of spreading wastes should focus on the timing of the application. Spreading should occur at times when neighbors have their lowest outdoor activity. Also, spreading when conditions encourage volatilization (dry windy days) reduces the overall amount of time for odor production. During the spreading process, efforts should be made to minimize exposure to air. Injecting the waste directly into the soil can greatly reduce odor production.

In addition to the above management practices, it is always a good policy to be neighborly. Notify neighbors of intentions to spread or agitate manure and be willing to modify plans if potential conflicts arise. Avoiding conflicts can be much easier than resolving them.

Animal Disposal

Disposing of dead animals should be done in a timely and approved method. Animals may be disposed of by composting, *incineration*, burial, or rendering. Regardless of the method used, dead animals should be disposed of as quickly as possible to avoid odor and pollution risks.

GLOSSARY:

Swine Management

Freeboard: Distance between the maximum waterline and the top of the wall of a storage container or lagoon.

Nutrient Management Plan: A farm specific plan for managing wastes. The plan should account for all wastes produced and how it will be handled.

Wind Breaks: Trees, bushes, or structures placed to disrupt wind flow.

Aerobic: An environment with oxygen.

Greenhouse Effect: A theory describing the trapping of the sun's heat in the atmosphere of the earth causing global temperatures to rise.

Incineration: To burn.

REFERENCES:

CONTACTS AND REFERENCES			
Organization	Responsibilities	Address	Phone Number
Animal and Dairy Sciences Department University of Georgia	Information about swine facilities and management	Animal and Dairy Sciences Complex Athens, GA 30602	706-542-2581
Biological & Agricultural Engineering Department, University of Georgia	Information about waste management facilities	Extension Unit, Driftmire Engineering Center Athens, GA 30602	706-542-2154
Agricultural Pollution Prevention (P2AD)	Pollution prevention strategies	University of Georgia Driftmire Engineering Center Athens, GA 30602	706-542-2154
Georgia Pork Producers Association	Georgia swine industry information	3920 Arkwright Road, Suite 135 Macon, GA 31210	229-477-8200
National Pork Producers Council	General information on the swine industry	1776 NW 114th Stree Clive, IA 50306	515-223-2600
Georgia Environmental Protection Division (EPD)	State regulations on waste handling systems	205 Butler St. SE, Floyd Towers East Suite 1066 Atlanta, GA 30334	404-657-5947

NOTES:

PUBLICATIONS:

University of Georgia, Cooperative Extension Service Athens, Georgia 30602

- Animal Waste and the Environment, Circular 827
- Confinement: The Complete Solution to Animal Waste Management, Bulletin 1137
- Land Application of Livestock and Poultry Manure, Leaflet 378
- Your Drinking Water: Nitrates, Circular 819-5
- Calibration of Manure Spreaders, Circular 825
- Well Head Protection for Farm Wells, Circular 819-3
- AWARE: Animal Waste Awareness in research and Extension, www.bae.uga.edu/outreach/aware

State Soil and Water Conservation Commission P.O. Box 8024 Athens, GA 30603

- Agricultural Best Management Practices for Protecting Water in Georgia
- Livestock Waste Facilities Handbook, MWPS-18

National Pork Producers Council 1776 NW 114th Street Clive, IA 50306

- National Pork Producers Council www.nppc.org
- Environmental Assurance Program
- On-Farm Odor/Environmental Assistance Program

Appendix #1 (Sample)

Emergency Action Plan (Sample)

Farm Name, Location: Windy Hill Farm, 302 Farm Lane

If you have a manure emergency...

- (1) Shut off all flow into the storage area.**
- (2) Assess the extent of the emergency and determine how much help is needed**
- (3) Contact the Emergency Response Team Leader:**
 - 111-555-5543: Frank Farrow
 - 111-555-5556: Fred Farrow (alternate leader)
- (4) Give the team leader the following information.**
 - Your name
 - Farm ID Number
 - Description of the emergency
 - Estimates of the amounts, area covered, and distance traveled from manure storage
 - Whether manure has reached ditches, waterways or streams
 - Any obvious damage: employee injury, fish kill, or property damage?
 - What is being done, assistance needed
- (5) Team Leader Contacts cooperators, contractors, emergency officials, environmental authorities, media, as needed.** **environ**
- (6) Build a containment dam down-stream from the discharge area, then progressively build additional dams upstream.**
 - Add soil to the berm of the manure storage area.
 - Remove manure from the discharge area with a trash pump if necessary.
 - Pump wastes from the manure storage at a normal rate to lower the volume in storage.

Taken from the NPPC Pollution Prevention Strategies Module.

Emergency Action Plan

Farm Name, Location: _____

If you have a manure emergency...

(1) First Containment Step

(2) Assess the extent of the emergency and determine how much help is needed.

(3) Contact the emergency response team leader.

- Name: _____ Phone: _____
- Name: _____ Phone: _____

(4) Give the Team Leader the following information:

- Your name
- Farm ID Number
- Description of the emergency
- Estimates of the amounts, area covered, and distance traveled from manure storage
- Whether manure has reached ditches, waterways or streams
- Any obvious damage: employee injury, fish kill, or property damage?
- What is being done, assistance needed

(5) Write your own Follow-Up Containment Steps here.

- _____
- _____
- _____
- _____

The Georgia Farm Assessment System is a cooperative project of the Pollution Prevention Assistance Division, Georgia Department of Natural Resources, the University of Georgia, College of Agricultural and Environmental Sciences, Cooperative Extension Service, the State Soil and Water Conservation Commission and the USDA, Natural Resources Conservation Service.



The Publication of this document was financed in part through a grant from the U.S. Environmental Protection Agency under provisions of Section 319(h) of the Federal Water Pollution Control Act, as amended, and with the cooperation of the Environmental Protection Division and the Pollution Prevention Assistance Division of the Georgia Department of Natural Resources, and the State Soil and Water Conservation Commission.

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Layout, Design and Typesetting:

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Bulletin 1153-12

July 1999

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, The University of Georgia College of Agriculture and Environmental Sciences, University of Georgia.