

**CERTIFIED CROP ADVISER PERFORMANCE OBJECTIVES  
FOR THE SOUTHEAST**

**ALABAMA-FLORIDA-GEORGIA-SOUTH CAROLINA**



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## FOREWORD

Performance Objectives for the Southeast Region (Alabama, Florida, Georgia, and South Carolina) were developed by members of the Alabama, Florida, Georgia, and South Carolina Certified Crop Adviser Boards, individual Certified Crop Advisers, and faculty selected from soil, crop, and plant science departments at Auburn University, Clemson University, the University of Georgia, and the University of Florida. They are reviewed periodically by practicing Certified Crop Advisers and representatives of the four Southeast Region CCA Boards to reflect changes in technology and continuing relevance.

Alabama CCA Board

Florida CCA Board

Georgia CCA Board

South Carolina CCA Board

## INTRODUCTION

These Performance Objectives provide guidance to individuals preparing for the Southeast Region Certified Crop Adviser Exam. They supplement the International Performance Objectives and emphasize certain aspects of nutrient, soil and water, pest, and crop management principles that are of particular importance in the Southeast Atlantic Coastal Plain and Piedmont regions. Exam questions are based on these Performance Objectives and the International Performance Objectives as they apply to providing advice to crop producers in this region.

As is true of the International Performance Objectives, the Southeast Performance Objectives outline the knowledge and skill areas that Certified Crop Advisers in this region have indicated they need in order to effectively carry out their duties. Performance Objectives cover the minimum level of fundamental principles considered essential for effective crop advising. Continuing education programs pursued after individuals achieve certification expand upon these principles and cover with greater rigor the four technical areas as well as changes in science and technology, and topics important to development as a professional. Thus, Performance Objectives are a first step in the continuing process of professional development.

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<b>KEY SOUTHEAST REGION CROPS</b>				
Blueberries	Corn	Cotton	Cover Crop: Grass/legume/brassica mixes	Cucurbits
Forages: Bermuda grass Bahia grass Fescue	Orchard Crops: Pecans, Citrus, Peaches	Peanut	Peppers	Small grains
Soybeans	Strawberries	Tobacco	Tomato	Turf

Certified Crop Advisers in the Southeast Region should be familiar with the crops listed in the box above. Although there are a number of other crops grown in the region that are very important locally, these Performance Objectives and the corresponding Local Board Exam will focus on the crops indicated in the table above.

## **NUTRIENT MANAGEMENT**

### **COMPETENCY AREA 1: Nutrient Transformation and Mobility in Soils Common to the Southeast**

1. Describe how mineralization affects soil nitrogen, phosphorus and sulfur availability in the Southeast and the factors that affect nitrogen immobilization.
2. Describe carbon cycling.
3. Divide the essential elements into two groups, 1) those that are prone to leaching, and 2) those that are not likely to be leached from surface soil horizons in significant amounts.
4. Describe the importance of clay content, depth to the argillic horizon (clay layer), and subsoiling in soil sampling and nutrient management of S, K, and Mg.
5. Describe how nutrient mobility can affect scheduling of nutrient applications.
6. Describe the tendency for phosphorus to be moved overland into surface water or leached and moved through the subsurface to water bodies.
7. Describe the soil colloids that predominate in the Southeast.
8. Recognize how depth of sampling is related to tillage method and/or land-use and depth to clay layer.

### **COMPETENCY AREA 2: Soil pH Management**

1. List the elements that become deficient in Coastal Plain soils when the pH is raised too high.
2. Explain how soil pH would exceed pH 8.5.
3. Describe how organic matter content of the soil affects the management of soil acidity.
4. Explain the difference between active soil acidity and exchangeable acidity.
5. Explain how nitrogen fertilizer sources can influence soil acidity.
6. Explain how elemental sulfur can be used to lower soil pH.
7. Explain what determines an effective liming source as per state laws.
8. Describe buffer pH, water pH, and target pH (for crops).
9. Explain the differences between gypsum and lime.

### **COMPETENCY AREA 3: Soil Testing and Plant Analysis: Understanding Approaches and Recommendation Philosophies**

1. Compare soil test recommendations based on basic cation saturation ratio vs sufficiency level.
2. Relate % base saturation and pH in kaolinitic soils and non-kaolinitic soils.
3. Understand the regionality of soil test extractants.

4. Identify the common soil test methods (Mehlich I and Mehlich III) used in the region for estimating plant available nutrients and lime requirement and differentiate between the following terms as used to describe nutrient concentrations in soil:
  - a. total.
  - b. extractable.
  - c. available.
  - d. exchangeable.
5. Know how to interpret soil, plant tissue, and manure test reports.
6. Describe the components of a soil testing program (sampling, testing methods, interpretation, etc.) and the potential limitations involved in each with respect to recommendations.
7. Describe the following combinations of crop and visual nutrient deficiency symptoms:
  - a. corn: nitrogen, phosphorus, potassium, sulfur, and zinc.
  - b. small grains: nitrogen, sulfur, and phosphorus.
  - c. soybean: manganese, potassium, and magnesium.
  - d. tomatoes: nitrogen, calcium, and iron.
8. Recognize the importance of taking soil samples and plant tissue analysis when trouble shooting.
9. Describe what plant part to sample for plant tissue analysis of corn, tomato, and small grain.

**COMPETENCY AREA 4: Nutrient Recommendations and Scheduling Applications Based on Soil Test Results Using Various Sampling Approaches**

1. Recognize that Cu toxicity or deficiency may occur with some crops when grown on soils containing 10% or more soil organic matter.
2. Compare the approximate plant available nitrogen and phosphorus concentrations of the following organic sources:
  - a. legumes.
  - b. animal manure.
  - c. biosolids.
  - d. composts.
3. Define and calculate agronomic rate for manure and other organic wastes based on the following parameters:
  - a. nitrogen content.
  - b. phosphorus content.
  - c. calcium carbonate equivalent.
4. Describe how nutrient mobility in soil can influence method of application, timing of application, and placement of nitrogen and phosphorus fertilizer.
5. Describe the potential for crop response to nutrient application when soil test levels are Low, Medium, High, or Very High.
6. Explain the potential benefits of using both topsoil and subsoil samples for fertilizer recommendations.
7. Describe how crop rotations or multiple cropping affect scheduling of fertilization.

8. Describe conditions that may require manure and waste application rates to be limited by phosphorus content, alkalinity, or chemical characteristics other than the material's nitrogen concentration.
9. Describe how soil test results should be used to determine agronomic application rates for animal manure.
10. List the considerations involved in developing a nutrient management plan for confined animal feeding operations.
11. Describe the importance of maintaining crop, soil, and water management records in confirming that a nutrient management plan is functioning properly.

#### **COMPETENCY AREA 5: Emerging Technologies for Fertilizer Management**

1. Remote sensing technologies (NIR, NDVI, AI, drone, satellite imagery).
2. Significance of GPS, GIS, mapping technologies.
3. Variable rate application equipment.
4. Define RTK (Real Time Kinetics).
5. Enhanced efficiency fertilizer technologies.

#### **COMPETENCY AREA 6: Waste and Biosolids Management**

1. Significance of sampling and testing waste and biosolids for nutrient management.
2. Describe proper sampling and application techniques.
3. Explain potential problems with use of biosolids and other waste as nutrient sources including:
  - a. issues with heavy metal accumulations
  - b. issues related to surface and groundwater with N and P
4. Synchronization of nutrient availability in relation to plant uptake.

### **SOIL AND WATER MANAGEMENT**

#### **COMPETENCY AREA 1: Basic Soil Characteristics: Chemistry, Physics, Biology, Morphology, and Classification**

1. Describe how soil environment and ecology affect
  - a. soil structure
  - b. soil productivity.
  - c. soil drainage.
  - d. water storage and availability.
  - e. relationship between bulk density and root distribution and penetration
2. Explain why soil depth to the argillic horizon is important in soils.

3. Know the difference between 2:1 and 1:1 clays.
4. Distinguish between macropore flow and finger flow (sandy soils).
5. Distinguish between Alfisols, Entisols, Ultisols, and Spodosols.
6. Define soil classification terms Typic, Arenic, Grossarenic.
7. Demonstrate the ability to identify soil map units.
8. Explain a soil water retention curve.

#### **COMPETENCY AREA 2: Erosion, Crusting and Compaction**

1. Explain how tillage affects the rate of erosion by water.
2. Describe how soil crusting affects water movement and gas exchange.
3. Describe the physical process of soil erosion by water and wind.
4. Explain how tillage can affect bulk density.
5. Describe how farming operations can cause or alleviate compaction.

#### **COMPETENCY AREA 3: Conservation Tillage and Cover Crops**

1. Describe how tillage and cropping system affect soil structure.
2. List the cover crops most useful for improving soil health..
3. Compare and contrast nitrogen management for a crop following cover crops of small grains, legumes, and cover crop mixtures.
4. Describe the limitations of cover cropping with conservation tillage compared to conventional tillage.
5. Describe the limitations of conservation tillage without a cover crop compared to conventional tillage.

#### **COMPETENCY AREA 4: Soil Health**

1. Relate soil health to basic soil characteristics.
2. Understand biological systems associated with soil health.
3. Define soil sustainability and soil health.
4. Describe tests that are available to test for soil health.
5. Understand the carbon cycle.
6. Understand the relationship that carbon storage/sequestration and organic matter have in the soil.

#### **COMPETENCY AREA 5: Irrigation Methods and Scheduling**

1. List and compare and contrast methods for measuring soil moisture for irrigation scheduling.
2. Describe how the water balance equation can be used for irrigation scheduling.

3. Describe how water potential can be used for irrigation scheduling.
4. Identify emerging technologies in irrigation management.
5. Describe the following irrigation methods:
  - a. drip/trickle (micro-irrigation).
  - b. subsurface.
  - c. overhead.
6. Define irrigation water use efficiency (IWUE) and water use efficiency (WUE) and understand conditions influencing the effectiveness of irrigation:
  - a. needs according to plant growth stage.
  - b. soil properties and landscape characteristics.
  - c. equipment calibration and uniformity.

#### **COMPETENCY AREA 6: Irrigation Water Quality**

1. Describe how high bicarbonate concentration in irrigation water is managed.
2. Understand how acidic water can affect irrigation systems.
3. Describe how salinity concentration in irrigation water is managed.
4. Explain testing and interpretation of irrigation water analyses.
5. Define electrical conductivity/salinity and its importance in irrigation water quality.
6. Understand the difference between surface, subsurface, and groundwater irrigation water sources.

#### **COMPETENCY AREA 7: Water Quality Impacts**

1. Define the term watershed and criteria used to delineate.
2. Identify reasons for water quality impairments.
3. Describe processes that transport contaminants into surface waters and groundwater:
  - a. nitrogen.
  - b. phosphorus.
  - c. potassium.
  - d. bacteria.
  - e. pesticides.
4. Describe practices to prevent contaminants movement into surface and groundwater.
5. Describe the relationship between water quality and federal regulations such as TMDLs, CAFOs, and NPDES.
6. Understand the Phosphorus Index, its components, and the implications for downstream impacts.
7. Identify areas that are susceptible to nitrate leaching and the implications for groundwater and public health.

## PEST MANAGEMENT

### COMPETENCY AREA 1: Fundamentals of Integrated Pest Management (IPM)

1. Explain the benefits and limitations of the following pest management practices in the Southeast:
  - a. alternating pesticides.
  - b. crop rotation.
  - c. use of biological controls.
  - d. varietal resistance.
2. Describe pest problems associated with the following tillage systems:
  - a. conventional tillage.
  - b. conservation tillage.
  - c. moving from one tillage system to the other.
3. Describe IPM methods for controlling the following common pests:
  - a. perennial versus annual weeds.
  - b. grasses and broadleaf weeds.
  - c. nematodes.
  - d. corn earworm.
  - e. fusarium wilt.
  - f. tomato spotted wilt virus.
4. Describe the advantages and limitations of chemical versus cultural management of plant pests in the Southeast.
5. Distinguish general resistance, race specific resistance, and tolerance.
6. Distinguish systemic and non-systemic pesticides.
7. Given a specific case situation, make economically and environmentally sound pest management recommendations.
8. Describe the effects of soil moisture, temperature, pH, and other environmental factors on pesticide effectiveness and persistence.
9. Explain the use and importance of scouting as an IPM tool.

## COMPETENCY AREA 2: Weed Management

1. Know general characteristics about the following weeds in the Southeast:

arrowleaf	dog fennel	primrose
bahia grass	fall panicum	ryegrass
blackberry/dewberry	horsenettle	sicklepod
bermudagrass	Johnsongrass	sowthistle
bull thistle	marestail	tropical spiderwort
cogongrass	Morningglory species	wild mustard
common cocklebur	Palmer amaranth (pigweed)	yellow and purple nutsedge
crabgrass	prickly sida	

2. Describe the anatomical features and growth habits that can be used to identify the weeds listed in the above PO (Comp. Area 2, PO 1).
3. Describe how the following weed characteristics affect the ability of weeds to survive and be competitive:
- growth rate of crop.
  - germination and emergence.
  - shade tolerance.
  - life cycle.
  - allelopathy
4. Classify the weeds listed above (Comp. Area 2, PO 1) as annual, perennial, or biennial.
5. List the factors affecting the performance of a post emergence herbicide:
- plant vigor.
  - weed growth stage.
  - herbicide effectiveness.
  - plant growth stage.
  - water quality, e.g., pH.
  - tank mix compatibility.
  - sprayer tip particle size
  - leaf pubescence
6. Define the mode of action for the following herbicide families:
- triazines.
  - sulfonyl ureas.
  - phenoxys.
  - dinitroanilines.
  - imidazolinone.

- Describe advantages and disadvantages of preplant incorporated, preemergence, and postemergence herbicide applications.

**COMPETENCY AREA 3: Insect Management**

- Identify and classify by feeding habit, crops attacked, and life cycle the following pests:

aphids	European corn borer	nematode species
armyworm species	grubs	Southern corn rootworm
billbug	Hessian fly	stink bugs
cereal leaf beetle	Japanese beetle	thrips
corn earworm	leafhoppers	two-spotted spider mites
cutworm species	lesser cornstalk borer	white fly
decet stem borer	looper species	wireworm

- Describe the potential adverse effects of insecticides on beneficial insects.
- Understand the importance of the following beneficial insects in IPM:

assassin bugs	minute pirate bug
big-eyed bug	predatory mites
damsel bugs	predatory stink bugs
fire ants	predatory wasps
lacewings	syrphid fly
ladybugs	

- Understand and be able to explain the use of refuges as a resistance management tool.
- Understand how insects can be vectors of disease.

#### COMPETENCY AREA 4: Disease Management

1. Identify each of the following diseases by host-plant symptoms:

altinaria leaf spot	fusarium wilt	septoria leafspot
anthracnose	grey leaf spot	smut
bacterial blight	holcus leaf spot	southern corn leaf blight
cylindricadium black rot	northern leaf blight	southern corn rust
cotton leaf roll virus	phytophthora root rot	stalk rots
downey mildew	powdery mildew	tar spot
frogeye leaf spot	Pythium	target spot
fusarium head blight	sclerotinia stem rot	tomato spotted wilt virus

2. Describe the potential for certain insects to serve as vectors for plant diseases.

#### COMPETENCY AREA 5: Pesticide Application and Environmental Considerations

1. Describe performance of each of the following nozzle types and explain what conditions would favor their selection for pesticide application:
  - a. standard flat fan.
  - b. even flat fan.
  - c. hollow cone.
  - d. flood tip.
  - e. air induction nozzles.
2. Explain how weather conditions, pesticide properties, formulation and additives affect spray drift and spray volatilization.
3. Describe how soil, climatic, and antagonistic factors affect the performance of preplant incorporated, preemergence, and postemergence applied pesticides.
4. Describe how weather factors can affect herbicide carryover from year to year.
5. Explain how the following factors interact to influence the migration of pesticides into groundwater and surface water:
  - a. soil texture and organic matter content.
  - b. pesticide persistence.
  - c. pesticide solubility
  - d. potential for erosion and runoff.
  - e. depth to water table.
  - f. distance to surface water
  - g. filter strips and buffer zones.
6. Describe issues affecting pollinators and BMPs to protect pollinators.

## **COMPETENCY AREA 6: Organic Pest Management**

1. Define organic pest management.
2. Differentiate between organic pest management and integrated pest management.
3. Describe organic pest management options in fruit, vegetable, and field crop production.
4. Describe the difference between organic and certified organic.
5. Explain the role of cover crops in organic weed control.
6. Explain the importance of crop rotation on organic crop production.

## **CROP MANAGEMENT**

### **COMPETENCY AREA 1: Basic Crop Science**

1. Describe the basic plant physiological processes involved in growth and development:
  - a. the function of xylem and phloem.
  - b. photosynthesis and respiration.
  - c. crop growth stages and physiological maturity of the key crops in the Southeast Region.
  - d. C3 and C4 plants
2. Describe the factors that control seed quality.
3. Understand and be able to identify types of root systems for the key crops in the Southeast Region and identify the role the root systems play in plant development.

### **COMPETENCY AREA 2: Application of Soil Conservation Principles**

1. List the crops most useful as cover crops and conditions that favor their selection.
2. Identify the following about cover crops:
  - a. common species that can be selected for cover cropping.
  - b. how species or mixes can be used to meet desired goals.
  - c. describe the advantages and disadvantages of cover crops species.
3. Describe the factors to consider when adopting a conservation tillage system.

### **COMPETENCY AREA 3: Information Specific to Crops of Major Importance in the Southeast**

1. Describe the growth and management practices from planting to harvest for the listed key crops grown in the Southeast.
2. Describe how changing the following planting systems would impact soil and water conservation:
  - a. wide row to a narrow row.
  - b. bare ground to raised bed under plastic mulch.

- c. dryland to the different methods of irrigation.
3. Describe factors that influence the planting, establishment, and maintenance of tall fescue, coastal bermudagrass, alfalfa, and grass-legume-brassica mixtures.
4. Describe methods and equipment used for planting the following:
  - a. sprigged turf grasses.
  - b. seeded turf grasses.
  - c. small grains.
  - d. corn.
  - e. soybean.
  - f. transplanted vegetables
  - g. direct seeded vegetables
5. Explain how nutrient imbalances can affect forage quality and animal performance.

#### **COMPETENCY AREA 4: Genetically Modified Crops**

1. Define a genetically modified organism (GMO) and identify the most common GMO crops being grown in the Southeast.
2. List the most common concerns among the general public with regards to acceptance of GMO crops.
3. Explain the importance of finding alternative crops for the Southeast and helping farmers to identify and develop a niche market.
4. Describe the debate concerning GMO crops and pollinators.