

Tri-State Certified Crop Adviser Performance Objectives

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**PERFORMANCE OBJECTIVES
FOR THE
TRI-STATE CERTIFIED CROP ADVISER PROGRAM
ILLINOIS--INDIANA--OHIO**

INTRODUCTION

The Certified Crop Adviser (CCA) Program is an educational program with two main goals: to certify individuals who have passed a minimum competency examination and to establish a mechanism of continuing education for those already certified.

At the core of this program are the Competency Areas and Performance Objectives (P.O.'s). These describe the knowledge and skills that crop advisers consider important in order to carry out their duties.

The Competency Areas and P.O.'s outlined in this publication are the result of a cooperative effort by the Ohio, Indiana, and Illinois CCA Boards. The purpose of this Tri-State CCA initiative is to eliminate unnecessary duplication of time, effort, and expense spent on managing the minimum competency exam, and to coordinate mutual continuing education efforts. This document contains the Competency Areas and Performance Objectives that are common to the tri-state region.

To become certified, an individual must be competent in areas addressed in both the International and Tri-State P.O. documents. The Tri-State P.O.'s are intended to complement, not duplicate, the International P.O.'s. The Tri-State P.O.'s address areas of crop advising that are specific to the tri-state region.

The P.O.'s are dynamic and will be upgraded, changed and modified as the needs of crop advisers in the tri-state region evolve. While this is a cooperative effort, the authority and management of each state's CCA program remains with the state CCA boards.

J.J. Vorst
J.E. Wiercioch

2006

Tri-State Certified Crop Adviser

NUTRIENT MANAGEMENT COMPETENCY AREAS

1. Nutrient Movement in Soil and Water
2. Nutrient Application, Availability, and Uptake

Crop Nutrient Deficiencies

Soil Test Interpretation

5. Lime Application and Soil pH
6. Manures and Biosolids

7. Nutrient Management Planning

NUTRIENT MANAGEMENT

COMPETENCY AREA 1. NUTRIENT MOVEMENT IN SOIL AND WATER

1. Recognize how the following affect nutrient movement in soil and water
 - a. temperature and precipitation
 - b. soil physical, chemical, and biological properties
 - c. tillage
 - d. nutrient form
 - e. rate of application
 - f. time of application
 - g. method of application

COMPETENCY AREA 2. NUTRIENT APPLICATION, AVAILABILITY, AND UPTAKE

2. Recognize how the following affect nitrogen fertilization practices
 - a. soil texture
 - b. soil organic matter
 - c. crop rotation and crop grownsoil moisture
soil temperature
 - f. time and method of application
3. Describe how soil pH and soil nitrogen levels affect nitrogen fixation
4. Describe how to apply the following nitrogen fertilizers
 - a. anhydrous ammonia
 - b. urea
 - c. Urea/Ammonium-Nitrate (UAN) solutionsammonium sulfate
manure/biosolids
5. Recognize how the following affect phosphorus fertilization and uptake
soil texture
soil pH
soil test results
soil moisture
soil temperature
tillage system
crop rotation and crop grown
source of P
band vs. broadcast application
6. Recognize how the following factors affect potassium fertilization and availability to crops

- a. soil texture
 - b. soil test results
 - c. soil moisture
- tillage system
crop rotation and crop grown
cation exchange capacity (CEC)
- g. fall, winter, or spring application
7. List advantages and limitations of in-row and pop-up methods of applying K
 8. Describe environmental and economic impacts of the following on applying N, P, and K
 - a. time
 - b. method
 - c. form
 - d. use of stabilizers

COMPETENCY AREA 3. CROP NUTRIENT DEFICIENCIES

9. Recognize nitrogen deficiency symptoms in corn, soybeans, wheat, and alfalfa
10. Recognize phosphorus deficiency symptoms in corn, soybeans, wheat, and alfalfa
11. Recognize potassium deficiency symptoms in corn, soybeans, wheat, and alfalfa
12. Identify plant deficiency symptoms for the following
 - a. magnesium in corn
 - b. sulfur in corn
 - c. zinc in corn
 - d. boron in alfalfa
 - e. iron or manganese in soybeans
13. Describe how to apply nutrients for correcting deficiencies listed in #9-12
14. List soil characteristics and cropping systems that contribute to causing nutrient deficiencies listed #9-12
15. Describe environmental conditions that cause deficiencies in #9-12
16. Recognize how soil pH and phosphorus levels affect zinc availability

COMPETENCY AREA 4. SOIL TEST INTERPRETATION

17. Explain how the following items on a soil test report affect nutrient recommendations

CEC

soil pH

buffer pH

organic matter

P level

K level

g. Ca/Mg level

18. Explain why phosphorus recommendations differ between Bray and Mehlich soil test procedures

COMPETENCY AREA 5. LIME APPLICATION AND SOIL PH

19. Recognize how the following factors affect lime application

a. tillage system

b. crop rotation

c. crop grown

soil type

soil pH and buffer pH

f. timing of P application

20. Describe how dolomitic differs from calcitic limestone

21. Describe how fineness and purity influence lime quality

22. Recognize how soil pH affects nutrient availability

23. Describe appropriate uses of liquid or pelleted lime

COMPETENCY AREA 6. MANURES AND BIOSOLIDS

24. Describe how to determine amounts of nutrients available from manure/biosolids

25. Describe advantages and limitations of using manure/biosolids as nutrient sources

26. Describe effects of applying manures and biosolids on the environment

27. Describe timing and methods of applying manures and biosolids

28. List nutrient availability rates from biosolids

COMPETENCY AREA 7. NUTRIENT MANAGEMENT PLANNING

29. Name the agency responsible for overseeing Nutrient Management Plans
30. Use soil test reports to make economically and environmentally sound fertilizer recommendations
31. List the purposes of a nutrient management plan
32. Identify sources of information to meet legal requirements for nutrient management planning for your state

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SOIL AND WATER MANAGEMENT COMPETENCY AREAS

1. Natural Resource Conservation Issues
2. Soil Productivity and Environmental Management
3. Water Quality
4. Soil Erosion

SOIL AND WATER MANAGEMENT

COMPETENCY AREA 1. NATURAL RESOURCE CONSERVATION ISSUES

1. Describe how the following affect conservation of natural resources

sedimentation
soil erosion
nutrient transport
pesticide transport
manure management

Describe how the following practices affect soil and water conservation

residue management
nutrient management
pest management
buffer strips, riparian areas, field borders
cropping systems

Describe how the following conservation practices impact wildlife habitat

crop rotation
tillage/residue management
buffer strips, riparian areas, field borders

Identify costs/benefits associated with implementing conservation measures

Identify state and federal agencies involved with soil and water management

Define soil erosion tolerance level (T)

Define highly erodible land (HEL)

Describe land management practices recommended for HEL

List factors used by USDA to define a wetland (WL)

Describe how planned drainage and cropping systems affect the management of wetlands

COMPETENCY AREA 2. SOIL PRODUCTIVITY AND ENVIRONMENTAL MANAGEMENT

Explain how the following affect soil and crop productivity potential

soil nutrient level
tillage
crop rotation
soil organisms
drainage
cover crops
soil texture

Describe how the following factors influence soil temperature and moisture

plant cover
surface residue
tillage system
soil organic matter

Describe how the following influence soil compaction

- a. soil moisture
- b. soil texture
- c. organic matter
- d. tillage practices
- e. traffic patterns
- f. livestock

Explain how the following factors influence water infiltration into soil

plant cover
surface residue
tillage system
soil organic matter and soil organisms
soil texture
time of year

COMPETENCY AREA 3. WATER QUALITY

Define hypoxia

Define eutrophication

Describe how the following influence surface water quality

soil permeability
topography
cropping practices
drainage
pollutant characteristics
conservation buffer strips
soil test nutrient levels
tillage practices
livestock operations

Explain how the following influence ground water quality

- pollutant characteristics
- topography
- nutrient type, form and time of application
- water table depth
- soil permeability
- restrictive layers
- soil test nutrient levels
- sinkholes
- exposed sand and gravel
- abandoned wells
- livestock lots

Describe fertilizer application practices that reduce nutrient loss from a field

List manure management practices that protect water quality

Define total maximum daily load (TMDL)

Describe how the following affect water quality

- sediments
- nutrients
- pathogens
- pesticides

Describe soil characteristics that affect rate of liquid manure application

Explain how application setbacks reduce the risk of water contamination

COMPETENCY AREA 4. SOIL EROSION

Describe how soil erosion affects the following

- water quality
- waterway, stream, and lake sedimentation
- soil productivity potential

Describe how to measure soil loss from the following

- sheet and rill erosion
- gully erosion
- wind erosion
- streambank erosion

Describe how the following management practices affect sheet and rill erosion

- tillage practices
- crop rotation
- cover crops
- row spacing and direction

Describe how the following management practices affect erosion by wind

residue management

surface roughness

row direction

crop strip width

windbreak

cross wind strips

cover crops

Describe how water and sediment control basins, grassed waterways, and grade stabilization structures affect erosion

Describe how wind erosion damages growing crops

Describe how to use the line transect method to measure crop residue

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INTEGRATED PEST MANAGEMENT COMPETENCY AREAS

1. Integrated Pest Management (IPM) Principles and Concepts
2. Insect Management
3. Crop Disease Management
4. Weed Management
5. Health, Safety, and Environmental Stewardship of Pesticides
6. Pesticide Performance and Application

INTEGRATED PEST MANAGEMENT

COMPETENCY AREA 1. INTEGRATED PEST MANAGEMENT (IPM) PRINCIPLES AND CONCEPTS

Explain how the following factors influence field scouting

sampling pattern
pest life cycle
sampling time and frequency
field history
pest population level

Describe how the following environmental factors affect pest management recommendations

low temperature stress
drought
heat stress
excessive moisture

Describe pest problems associated with the following tillage systems

intensive
reduced
no-till

List factors to consider when determining the effectiveness of cultural, mechanical, or biological pest control methods

COMPETENCY AREA 2. INSECT MANAGEMENT

Identify the following pests at the life stages indicated below

Adult

aphids
bean leaf beetle
flea beetle
potato leafhopper
spider mites

Adult and Larval

corn rootworms
corn borers
Hessian fly
Japanese beetle

Larval

alfalfa weevil
armyworm
cutworms
earworms
white grubs
seedcorn maggot
stalk borer
Grape colaspis
Wireworm

Identify crop injury symptoms caused by each pest in objective #5

Describe management alternatives for each pest in objective #5

Explain how the following insect characteristics influence pest management decisions
developmental time and period of activity
host plants for egg, larval, pupal, adult or nymph insect life stages
site of insect feeding on plant
insect mobility

Explain how an insect's overwintering and oversummering strategies affect pest management decisions

Describe how the following cropping practices affect potential crop damage from insects
planting date
harvest date
tillage method
weed control method
hybrid and variety selection
crop rotation

Explain consequences of applying organophosphate insecticides and ALS-inhibiting herbicides or herbicides containing mesotrione in the same field

Explain why refuge design in insect resistant crops may vary with insect species

COMPETENCY AREA 3. CROP DISEASE MANAGEMENT

Identify the symptoms of the following crop diseases

<u>Corn</u>	<u>Soybeans</u>
ear rots gray leaf spot corn leaf blights seedling blights stalk rots Maize Dwarf Mosaic virus	brown stem rot phytophthora root rot seedling blights soybean cyst nematode sudden death syndrome sclerotinia stem rot bean pod mottle virus

Wheat

barley yellow dwarf virus
head scab
powdery mildews
rusts
septoria glume blotch
septoria leaf blotch complex

Alfalfa

phytophthora
anthracnose
bacterial wilt
leaf spots

yellow nutsedge the following factors affect the severity of crop disease (damage)
 barnyard grass burcucumber morningglories
 Canada thistle
 common cocklebur
 common lambsquarters
 common milkweed
 common ragweed
 giant ragweed
 dandelion
 eastern black nightshade
 hemp dogbane
 jimsonweed
 purple deadnettle
 common chickweed

Describe how the following factors affect plant disease management
 time of infection
 stage of crop development
 environmental stresses

COMPETENCY AREA 4. WEED MANAGEMENT

Weed Identification and Biology

Identify the following vegetative structures of grass weeds

- ligule
- auricle
- blade
- sheath
- underground structures
- hairs

Identify broadleaf weeds using the following characteristics

- cotyledon shape
- true leaf shape
- leaf arrangement
- underground structures
- seed structure

Use stem shape to differentiate sedges from grasses

Identify the following weeds at seedling, vegetative and reproductive growth stages

Sedges and Grasses

Broadleaves

Broadleaves

yellow nutsedge
barnyardgrass
crabgrasses
fall panicum
giant foxtail
green foxtail
yellow foxtail
Johnsongrass
quackgrass
shattercane
woolly cupgrass

Bindweeds
burcucumber
Canada thistle
common cocklebur
common lambsquarters
common milkweed
common ragweed
giant ragweed
dandelion
eastern black nightshade
hemp dogbane
jimsonweed

horseweed (marestail)
morningglories
pigweeds
pokeweed
smartweeds
velvetleaf
waterhemp
wild carrot
wild garlic
wild mustard
wild onion
purple deadnettle
common chickweed
henbit

Classify each weed in #19 as winter annual, summer annual, biennial, or perennial

Explain how tillage systems affect weed populations and species

Weed Control

Describe plant damage symptoms for corn and soybeans caused by the following herbicide mode of action groups

amino acid synthesis inhibitors
cell growth inhibitors
cell membrane disruptors
growing point disintegrators
growth regulators
photosynthesis inhibitors
pigment inhibitors

Describe how to use the following cultural and mechanical methods to control weeds

crop rotation
plant population and row spacing
tillage and cultivation
cover crops and mulching
planting date of crop
herbicide tolerant crop systems
proper soil fertility and pH

Weed Resistance Management

List factors that cause weeds to develop resistance to herbicides

List methods that can help prevent weeds from developing herbicide resistance

Describe how to manage herbicide resistant weed populations

COMPETENCY AREA 5. HEALTH, SAFETY, AND ENVIRONMENTAL STEWARDSHIP OF PESTICIDES

Explain how the following chemical factors influence the persistence and carryover of pesticides within a field environment

microbial degradation
photodegradation
chemical breakdown
volatility
sorption

Explain how the following environmental factors influence the persistence and carryover of pesticides within a field environment

soil pH
moisture
temperature
leaching
soil erosion

Explain how the pesticide signal words Caution, Warning, and Danger relate to LD₅₀

List sources of information about your state's pesticide laws

List record keeping requirements related to pesticides

State the legal responsibilities of making pesticide recommendations

Using information on a label or Material Safety Data Sheet (MSDS), determine the following

toxicity
handling precautions
first aid procedures
safety information
environmental hazards
dosage or use rate
application restrictions
Re-Entry Interval (REI)

COMPETENCY AREA 6. PESTICIDE PERFORMANCE AND APPLICATION

Pesticide Performance

Recognize how soil and environmental factors affect pesticide performance

Explain how timing of application affects pesticide performance

Describe how to use the following information to develop a pest management program

field pest history
severity of infestation
crop growth stage
application method
potential for economic return
previous pesticide applications
non-pesticide alternatives

Describe how the following factors affect liquid pesticide performance

spray pattern
spray pressure
application rate
application speed
adjuvants
pesticide compatibility
carrier
mixing order
wind speed

Pesticide Application

Describe the physical properties of the following pesticide formulations

water soluble liquids
water soluble powders
wettable powders
emulsifiable concentrates
water dispersible granules
pellets
granules

Describe the pattern form, relative droplet size, proper pattern overlap, operating pressure, and primary uses of the following nozzle types

standard flat fan
even flat fan
flood tip
air injection

List consequences of inadequate spray tank cleaning

Distinguish spray particle drift from volatilization

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CROP MANAGEMENT COMPETENCY AREAS:

Cropping Decisions

Hybrid and Variety Selection

Crop Growth, Development, and Diagnostics

Crop Harvesting, Handling, and Storage

Managing Agronomic Information

CROP MANAGEMENT

COMPETENCY AREA 1. CROPPING DECISIONS

Compare and contrast continuous and rotational crop systems

Describe how the following affect management decisions within a rotational system

pest resistance
pest persistence
crop traits

Describe environmental and economic factors which influence selection of a tillage system

List advantages and limitations of intensive, reduced, strip-till, and no-till systems

Describe consequences of planting corn, soybeans, or wheat earlier or later than optimum

Describe how row spacing affects the following

weed control
disease control
crop yield
interplant competition
lodging

Describe how the following factors influence optimum population

soil type
planting date
hybrid and variety
row spacing

List advantages and limitations of growing pure grass or legume stands versus mixed stands

COMPETENCY AREA 2. HYBRID AND VARIETY SELECTION

Describe how the following characteristics influence hybrid and variety selection:

maturity rating for corn, soybeans, and wheat
lodging resistance in corn, soybeans, and wheat
pest resistance in corn, soybeans, wheat, and alfalfa
winter hardiness of wheat and alfalfa
intended end use of corn, soybeans, wheat, and alfalfa

Describe how planting date affects hybrid and variety selection

Describe how tillage systems affect hybrid and variety selection

Describe the advantages and limitations of growing the following:

herbicide resistant crops
insect resistant crops
disease resistant crops
non-GM crops

Describe the agronomic and economic advantages and limitations of growing value-added crops

COMPETENCY AREA 3. CROP GROWTH, DEVELOPMENT, AND DIAGNOSTICS

Use the Iowa State system to identify corn and soybean growth stages

Identify the location of growing points through V6 stage of corn and soybeans

Identify the soybean growth stage when nitrogen fixation begins

Use the Feeke's scale to identify each of the following growth stages in wheat

emergence
tillering
jointing
boot
flag leaf emergence
physiological maturity

Describe how corn, soybeans, and wheat respond to row spacing, population, and in-row plant spacing variation

Describe physical damage to corn, soybeans, wheat, and alfalfa from

hail
frost
flooding
drought

Identify the most susceptible growth stage of corn, soybeans, wheat, and alfalfa for each type of damage in #19

Use the following factors to make a replant decision

type and level of crop damage
crop growth stage
date
potential yield
weather

Identify the following growth stages of alfalfa

vegetative
flowering
one-tenth bloom
full bloom

Identify wheat and alfalfa frost heaving damage

COMPETENCY AREA 4. CROP HARVESTING, HANDLING, AND STORAGE

Describe how the following factors affect harvest practices and timing

crop moisture
drying cost
weather forecast
forage growth stage
pest population and activity
susceptibility to lodging

Identify the following causes of harvest loss in corn, soybeans, wheat, and forages due to

machine operation
environmental conditions
nutrient deficiencies
pest infestations

Describe how storage moisture, temperature, and pests affect grain quality and marketability

Describe harvest, handling, and storage practices for identity-preserved (IP) crops

Describe how timing and frequency of perennial forage harvest affects

legume/grass mix
stand longevity
forage quality
annual yield

COMPETENCY AREA 5. MANAGING AGRONOMIC INFORMATION

Describe how the following affect reliability of agronomic trials:

weather variability
field variability
number of locations
number of treatments
number of replications

Develop an agronomic trial to compare treatment effects

Relate site specific information to yield map variability

RESOURCE MATERIALS FOR THE TRI-STATE CERTIFIED CROP ADVISER PROGRAM

The Certified Crop Adviser (CCA) Program is an educational program with two main goals: to certify individuals who have passed a minimum competency examination, and to establish a mechanism of continuing education for those already certified. More information can be found about the program by visiting the CCA homepage at www.agronomy.org/cca/

This document contains resource materials that address the competency areas and performance objectives of the Tri-State Certified Crop Adviser Program. It is intended to provide guidance, for those seeking certification, on where to obtain information about knowledge and skills used by CCA's.

Resources for the Tri-State Certified Crop Adviser Program

Nutrient Management and Soil and Water Management

1. *Soil Science & Management* by Edward J. Plaster, 3rd ed., © 1997, Delmar Publishers: Albany NY
2. *Fundamentals of Soil Science* by Henry D. Foth, 8th ed., © 1990, John Wiley & Sons Publishing: NYC NY
3. *The Nature and Properties of Soils* by Nyle C. Brady & Ray R. Weil, 12th ed., © 1999, Prentice Hall: Upper Saddle River NJ
4. *Soils in our Environment* by Roy L. Donahue & Raymond W. Miller, 7th ed., © 1995, Prentice Hall: Englewood Cliffs NJ
5. *Soil Fertility* by Boyd G. Ellis & Henry D. Foth, 2nd ed., © 1997, CRC Press: Boca Raton FL
6. *Soils in our Environment* by Duane T. Gardiner & Raymond W. Miller, 8th ed., © 1998, Prentice Hall: Upper Saddle River NJ
7. *Soils and Soil Fertility* by Louis M. Thompson & Frederick R. Troeh, 5th ed., © 1993, Oxford University Press: NYC NY
8. *Natural Resource Conservation* by D. D. Chiras & Oliver S. Owen, 6th ed., © 1995, Prentice Hall: Upper Saddle River NJ

Integrated Pest Management

1. *Applied Weed Science* by Carole A. Lembi & Merrill A. Ross, 2nd ed., © 1999, Prentice Hall: Upper Saddle River NJ
2. *Seed Corn Pest Management Manual for the Midwest* by multiple authors, Rev. 4/1995, Purdue University Pest Management Program,

- Purdue Cooperative Extension Service, and the Department of Botany & Plant Pathology
3. *Pest Management* by G. A. Matthews, © 1984, Longman Group Ltd: NYC NY
 4. *The Science of Entomology* by William S. Romoser & John G. Stoffolano Jr., 4th ed., © 1998, WCB/McGraw-Hill: NYC NY
 5. *The Standard Pesticide User's Guide* by Bert L. Bohmont, 5th ed., © 2000, Prentice Hall: Upper Saddle River NJ
 6. *Entomology & Pest Management* by Larry P. Pedigo, 4th ed., © 2002, Prentice Hall: Upper Saddle River NJ
 7. *The Biochemistry & Uses of Pesticides* by Kenneth A. Hassall, 2nd ed., © 1990, VCH Publishers Inc: NYC NY
 8. *Application Technology for Crop Protection* by G. A. Matthews & E. C. Hislop, © 1993, CAB Int'l: UK
 9. *Pesticide Application Methods* by G. A. Matthews, 2nd ed., © 1992, Longman Group UK Ltd: UK
 10. *Chemical Exposures: Low Levels & High Stakes* by Nicholas A. Ashford & Claudia S. Miller, © 1991, Van Nostrand Reinhold: NYC NY
 11. *Pesticides: Minimizing the Risks* by Ronald J. Kuhr & Nancy N. Ragsdale, © 1987, American Chemical Society: Wash DC
 12. *Pesticide Application: Principles & Practice* by P. T. Haskell, © 1985, Clarendon Press: Oxford
 13. *CD-AY-3 Broadleaf Weed Seedling Identification*, Purdue University Media Distribution Center

Crop Management & Production Systems

1. *Crop Science: Principles & Practice* by Russell E. Mullen, 2nd ed., © 1995, Burgess Publishing: Edina MN
2. *Modern Corn & Soybean Production* by multiple authors, 1st ed., © 2000, MSCP Publications: Champaign IL
3. *Crop Production* by James J. Vorst, 5th ed., © 1998, Stipes Publishing LLC: Champaign IL
4. *Sustainable Agriculture Systems* by J. L. Hartfield & D. L. Karlen, © 1994, Lewis Publishers: Boca Raton FL
5. *Sustainable Agricultural Systems* by several editors, © 1990, Soil & Water Conservation Society
6. *How a Corn Plant Develops: Special Report #48* by several authors, Rev. 1/1997, Iowa State University: Ames IA
7. *How a Soybean Plant Develops: Special Report #53* by several authors, Rev. 6/1997, Iowa State University: Ames IA
8. *Agry375 - Crop Production Systems* by Lee E. Schweitzer, 2001 ed., Purdue University School of Agriculture
9. *Corn & Soybean Field Guide* by multiple editors, 2004 ed., Purdue Crop Diagnostic Training & Research Center and Purdue Pest Management

Program: West Lafayette IN

10. *CD-AY-1 Corn Growth, Development, & Diagnostics: Germination to Knee High*, Purdue University Media Distribution Center
11. *CD-AY-2 Corn Growth, Development, & Diagnostics: Knee High to Maturity*, Purdue University Media Distribution Center
12. *Forage Field Guide* by multiple editors, 2003 ed., Purdue Crop Diagnostic Training & Research Center: West Lafayette, IN
13. *Corn, Soybean, Wheat, and Alfalfa Field Guide* by multiple editors, 2002 ed., Ohio State University Extension

USEFUL WEBSITES

1. Purdue Agronomy Extension Publications: www.ces.purdue.edu/extmedia/agronomy.htm
2. Weed Science Society of America: www.wssa.net
3. National Corn Growers Association: www.ncga.com
4. Herbicide Safety Information: www.cdms.net/manuf/manuf.asp
5. Herbicide Safety Information: www.greenbook.net
6. Herbicide Injury Symptoms: www.btny.purdue.edu/extension/weeds/herbinj/injuryherb1.html
7. Weed Science: www.weedscience.com
8. Extensive Corn related Information: www.kingcorn.org
9. Hybrid & Variety Performance: vt.cropsci.uiuc.edu/
10. Purdue Agricultural Extension Publications: www.agcom.purdue.edu/AgCom/Pubs/menu.htm
11. Purdue Agronomy OnLine: www.agry.purdue.edu
12. Various Soybean Information: www.stratsoy.uiuc.edu
13. Integrated Pest Management: www.gemplers.com
14. Midwest Corn Insect Diagnostic guide: HYPERLINK "http://muextension.missouri.edu/xplor/manuals/m00166.htm" <http://muextension.missouri.edu/xplor/manuals/m00166.htm>
15. Purdue Entomology Extension Publications: HYPERLINK "http://www.entm.purdue.edu/Entomology/ext/targets/e-series/e-list.htm" <http://www.entm.purdue.edu/Entomology/ext/targets/e-series/e-list.htm>
16. Purdue Entomology Image Links: <http://www.entm.purdue.edu/entomology/courses/307b/images.html>
17. Purdue Botany Extension Publications: <http://www.btny.purdue.edu/Pubs/>
18. Purdue Botany Extension Links: HYPERLINK "http://www.btny.purdue.edu/Extension/" <http://www.btny.purdue.edu/Extension/>
19. NRCS-Natural Resources Conservation Service: www.nrcs.usda.gov
20. Ohio State University-Ohioline links: HYPERLINK "http://ohioline.osu.edu/index.html" <http://ohioline.osu.edu/index.html>
21. National Sustainable Agriculture Information Service: HYPERLINK "http://www.attra.org" <http://www.attra.org>
22. Corn information: HYPERLINK "http://corn.osu.edu" <http://corn.osu.edu>
23. Tillage, Manure Management, and Water Quality: HYPERLINK "http://www.extension.iastate.edu/Publications/PM1901H.pdf" <http://www.extension.iastate.edu/Publications/PM1901H.pdf>

- www.extension.iastate.edu/Publications/PM1901H.pdf
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