

# Agronomy

Nebraska Career Development Event  
Handbook and Rules for 2022-2027

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## 1. EVENT PURPOSE

- a. The purpose of the Nebraska State Agronomy Career Development Event is to create interest and promote understanding in agronomy by providing opportunities for recognition through the demonstration of skills and proficiencies. It also gives students an opportunity to explore career opportunities available in agronomy and encourages students to pursue careers in agronomy.
- b. Agriculture Education courses that align with the Agronomy CDE include: Introduction to Agriculture, Food, and Natural Resources, Plant Science, Crop Management, or Agronomy.

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## 2. OBJECTIVES

### a. Team Activity Objectives

- I. Each team will apply their knowledge of basic agronomic principles & practices, by evaluating a field scenario provided to them, along with all the necessary reference information and mathematical formulas to answer specific questions.

### b. Individual Objectives

- I. Plant and Seed Identification (including crops and weeds): The foundation of all agronomic and horticultural cropping systems are built around the crop species themselves. Students will develop the ability to differentiate common agronomic and horticultural crops from each other, and from common and/or economically important weed species by:
  - i. Recognizing and utilizing unique identifying plant and/or seed characteristics to correctly distinguish crop or weed specimens from each other and identify the depicted specimens via high quality digital photographs, preserved specimens or fresh, live plant or seed samples.
  - ii. Developing a working knowledge of appropriate plant anatomy terminology to accurately and adequately describe plant specimens (not tested over). (See Appendix 1)
- II. Entomology: All effective and appropriate pest management plans require the correct identification of entomological pests and beneficial insects, as well as a comprehensive understanding for the various and complex life cycles. Students will demonstrate their mastery of this content area by:
  - i. Identifying common agronomic pest species using unique characteristics exhibiting in either larvae or adult specimens. (See Appendix 2)
  - ii. Correctly differentiating orders of entomological pests and beneficial species by matching depicted specimens with the appropriate life cycle.
  - iii. Correctly assigning depicted specimens into the ecological niches they occupy. (e.g. pest vs. beneficial, what plant component they damage). (See Appendix 2)
- III. Plant Diseases, Conditions, and Disorders: All effective and appropriate crop management plans require the correct identification of many different biotic and abiotic causal agents before any further action can be taken. Student will showcase this critical skill by:
  - i. Identifying common plant diseases, conditions, or disorders shown in various agronomic crops via high quality digital photographs, preserved specimens or fresh, live samples.
  - ii. Correctly distinguishing and categorizing the depicted plant disease, condition, or disorder into causal agent groups (e.g. bacterial, fungal, viral, environmental, etc).

- iii. Discerning the correct crop plant components damaged by the depicted causal agent. (See Appendix 3)
  - IV. Machinery/Equipment: The use of various types of machinery ranging from tillage operations to harvest have a long and storied application in agronomic fields. Recent advancements in precision-based technologies has further augmented these technologies and improved production efficiencies. Student will depict their content knowledge of this area by:
    - i. Differentiating commonly used agronomic machinery and precision-agriculture technologies.
    - ii. Identifying personal protection equipment and their applicable use. (See Appendix 4)
  - V. Soils: The basis of all agronomic systems and arguably all life on earth, the study of soils, soil characteristics and properties are the cornerstone to the science of Agronomy. Student will demonstrate their mastery of soil science content by:
    - i. Correctly identifying the processes and factors involved in the formation and development of soils.
    - ii. Analyzing common agronomic problems related to the physical and chemical soil properties and how they relate to soil water issues.
    - iii. Identifying environmental factors which influence soil erosion.
    - iv. Demonstrating their ability to locate and utilize data from Web Soil Survey reports, graphics or summaries.
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### 3. ELIGIBILITY

- a. The Agronomy CDE is a district qualifying event at the state level. The top 25% of schools in a district may qualify a team to the state CDE. Teams shall consist of four students. Schools must register a full team, however teams with less than four students may participate and will not be eligible to earn all points.
- b. Agriculture Education students currently in 9th-12th grade are eligible CDE contestants.
  - I. Students who have either won the state contest, and/or competed at the national level are not eligible to compete again at the state level.
- c. Team make-up:
  - I. Team size shall be four members, all of whom must be pre-registered as 'participant' or 'alternate'.
    - i. No exceptions will be made if a school or team is not registered.
    - ii. Incomplete teams ranging from one to three students are allowed if a school is unable to field a full team.
    - iii. All four team members will be scored and all four individual scores

- shall count towards the team total.
- II. All four team members are eligible for individual awards.
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## 4. RECOMMENDED ATTIRE

- a. All FFA members are encouraged to wear Official Dress and non-FFA members are encouraged to wear professional attire.
  - b. If FFA official dress is not worn, students will be issued name tags at registration identifying their names, school and group.
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## 5. REQUIRED SUPPLIES AND EQUIPMENT

- a. #2 Pencils
  - b. A calculator for basic arithmetic. (No cell phone calculators are allowed.)
  - c. A clean clipboard per student (Must be free of marks or notes.)
  - d. Participants must not bring any notes, training aids, any electronic communication items, purses or backpacks, or any other personal belongings.
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## 6. EVENT SCHEDULE

- a. Students will be divided into ten groups and are expected to remain in their assigned group until the team component.
  - b. After completing the ten, 13-minute individual rotations, students will then rejoin their team members for the team component in an 11th, 13-minute rotation.
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## 7. ANNUAL THEME

Topic areas for the Team Activity will rotate on a yearly basis through the following:

- |    |                                                                        |      |
|----|------------------------------------------------------------------------|------|
| a. | Alternative Crops (e.g. Dry Beans, Potato, Sugar Beet, Oilseeds, etc.) | 2023 |
| b. | Corn-Soybean Cropping Systems                                          | 2024 |
| c. | Wheat and Small Grains                                                 | 2025 |
| d. | Rangeland and Forage Production                                        | 2026 |

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## 8. EVENT FORMAT

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|----|---------------------------|---------------------------------------------|
| a. | Plants & Seeds:           | 5, 13-minute rotations of 15 samples each   |
| b. | Entomology:               | 1, 13-minute rotation of 15 Samples         |
| a. | Plant diseases/disorders: | 1, 13-minute rotation of 15 Samples         |
| b. | Machinery/PPE:            | 1, 13-minute rotation of 20 Samples         |
| c. | Soil science:             | 2, 13-minute rotations of 15 questions each |
| d. | Team component:           | 1, 13-minute rotation of 10-15 questions    |
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## 9. SCORING

Individual Event		Total Points
Plant & Seed Identification	(75 Specimen x 4 Points)	300
Entomology	(15 Specimens x 10 Points) (6 Points Specimen ID, 2 Points Damage, 2 Points Life Cycle)	150
Plant Diseases, Disorders, Conditions	(15 specimens x 10 points) (6 points ID, 2 points damage, 2 points biotic group)	150
Machinery & PPE	(20 x 3 points each)	60
Soil Science	(30 x 5 points each) (20 Questions derived from <i>From the Surface Down</i> and linked PASSeL websites) (10 Questions derived from Web Soil Survey (Resource links to follow))	150
<b>Total Score</b>		<b>810</b>

Team Event		Total Points
Individual Scores	(4 students x 810 points possible)	3240
Team Multiple Choice Component	(10-15 questions equaling 60 points)	60
<b>Total Score</b>		<b>3300</b>

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## 10. TIEBREAKER

- a. In the event of a tie at the individual level, students will be separated by:
    - I. Highest Plant & Seed identification score, then
    - II. Highest Entomology score, then
    - III. Highest Plant Disease/Disorder score
  - b. In the event of a tie at the team level, teams will be separated by:
    - I. Highest Plant & Seed identification team score, then
    - II. Highest Entomology team score, then
    - III. Highest Plant Disease/Disorder team score
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## 11. RESOURCE MATERIALS

- a. The following resources are provided for preparing for the Soil Science component
    - I. UNL PASSeL– Soil science homepage:  
<https://go.unl.edu/plantandsoilscienceelibrary>
      - i. Soil Biota and Nutrient Cycling
        1. <https://go.unl.edu/soilorganicmatter>
        2. <https://go.unl.edu/nitrogenasanutrient>
      - ii. Soil Chemical Properties
        1. <https://go.unl.edu/soilph>
      - iii. Soil Erosion, Conservation, and Water Quality
        1. <https://go.unl.edu/erosion>
      - iv. Soil Genesis and Development
        1. <https://go.unl.edu/soilformingfactors>
        2. <https://go.unl.edu/soilprofiledevelopment>
        3. <https://go.unl.edu/soilclassificationandgeography>
      - v. Soil Physical Properties
        1. <https://go.unl.edu/physicalpropertiessoilwater>
      - vi. USDA-NRCS– “From the Surface Down”:  
<https://go.unl.edu/usdafromsurfacedown>
      - vii. USDA-NRCS– “Web Soil Survey”:  
<https://go.unl.edu/websoilsurvey>
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## 12. PAST EXAMS

- a. 2018 Agronomy CDE Materials & Review Video: <https://go.unl.edu/agronomymaterials>
  - b. Agronomy 2011-2017: <https://go.unl.edu/agronomy2011-2017>
  - c. Agronomy 2009: <https://go.unl.edu/agronomy09>
  - d. Agronomy 2008: <https://go.unl.edu/agronomy08>
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## 13. POST-CDE DEBRIEFING OPPORTUNITY

- a. Upon the completion of the second CDE session, There will be a brief opportunity for students, teachers and coaches to review the contest material.
  - b. During the walkthrough, participants are welcome to ask questions, take notes and photograph specimens.
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# Appendix



## Appendix 1: Plant and Seed Specimen List

Weeds List			
Conforming with the Weed Science Society of America's standardized name list.			
ID #	Weed Name	Form	Latin Name
100	amaranth, Palmer	plant only	<i>Amaranthus palmeri</i>
101	barnyardgrass	plant or seed	<i>Echinochloa crus-galli</i>
102	bindweed, field	plant or seed	<i>Convolvulus arvensis</i>
103	brome, downy	plant only	<i>Bromus tectorum</i>
104	buckwheat, wild	plant or seed	<i>Fallopia convolvulus</i>
105	carrot, wild	plant or seed	<i>Daucus carota</i>
106	cheat	plant or seed	<i>Bromus secalinus</i>
107	chickweed, common	plant or seed	<i>Stellaria media</i>
108	cocklebur, common	plant or seed as bur	<i>Xanthium strumarium</i>
109	crabgrass, large	plant or seed	<i>Digitaria sanguinalis</i>
110	crownvetch, trailing	plant or seed	<i>Securigera varia</i>
111	dandelion	plant or seed	<i>Taraxacum officinale</i>
112	dock, curly	plant or seed	<i>Rumex crispus</i>
113	dodder	plant or seed	<i>Cuscuta spp.</i>
114	foxtail, giant	plant or seed	<i>Setaria faberi</i>
115	foxtail, green	plant or seed	<i>Setaria viridis</i>
116	foxtail, yellow	plant or seed	<i>Setaria pumila</i>
117	goatgrass, jointed	plant or seed	<i>Aegilops cylindrica</i>
118	groundcherry	plant or seed	<i>Physalis spp.</i>
119	groundsel, cressleaf	plant or seed	<i>Packera glabella</i>
120	horsenettle	plant or seed	<i>Solanum carolinense</i>
121	horseweed (marestail)	plant only	<i>Conyza canadensis</i>
122	jimsonweed	plant or seed	<i>Datura stramonium</i>
123	johnsongrass	plant or seed	<i>Sorghum halpense</i>
124	knapweed, Russian	plant only	<i>Rhaponticum repens</i>
125	knotweed, prostrate	plant or seed	<i>Polygonum aviculare</i>
126	kochia	plant or seed	<i>Bassia scoparia</i>
127	kudzu	plant only	<i>Pueraria montana var lobata</i>
128	lambsquarters, common	plant or seed	<i>Chenopodium album</i>
129	lettuce, prickly	plant or seed	<i>Lactuca serriola</i>
130	mallow, common	plant or seed	<i>Malva neglecta</i>
131	milkweed, common	plant or seed	<i>Asclepias syriaca</i>
132	morningglory	plant or seed	<i>Ipomoea spp.</i>
133	mustard, wild	plant or seed	<i>Sinapis arvensis</i>
134	nightshade, black	plant or seed	<i>Solanum nigrum</i>
135	nightshade, silverleaf	plant or seed	<i>Solanum elaeagnifolium Cav.</i>
136	nutsedge	plant or seed as nutlet	<i>Cyperus spp.</i>
137	oat, wild	plant or seed	<i>Avena fatua</i>
138	onion/garlic, wild	plant or seed	<i>Allium spp.</i>
139	pennycress, field	plant or seed	<i>Thlaspi arvense</i>
140	pigweed, redroot	plant or seed	<i>Amaranthus retroflexus</i>
141	plantain, broadleaf	plant or seed	<i>Plantago major</i>
142	plantain, buckhorn	plant or seed	<i>Plantago lanceolata</i>
143	puncturevine	plant or seed	<i>Tribulus terrestris</i>
144	purslane, common	plant or seed	<i>Portulaca oleracea</i>
145	quackgrass	plant or seed	<i>Elymus repens</i>

146	ragweed, common	plant or seed	<i>Ambrosia artemisiifolia</i>
147	ragweed, giant	plant or seed	<i>Ambrosia trifida</i>
148	Russian-thistle	plant or seed	<i>Salsola tragus</i>
149	sandbur, field	plant or seed	<i>Cenchrus spinifex Cav.</i>
150	shepherd's-purse	plant or seed	<i>Capsella bursa-pastoris</i>
151	sicklepod	plant or seed	<i>Senna obtusifolia</i>
152	smartweed	plant or seed	<i>Persicaria spp.</i>
153	sowthistle	plant or seed	<i>Sonchus spp.</i>
154	spurge, leafy	plant or seed	<i>Euphorbia esula</i>
155	spurge, prostrate	plant only	<i>Euphorbia prostrata</i>
156	sunflower, common	plant or seed	<i>Helianthus annuus</i>
157	tansy mustard	plant or seed	<i>Descurainia pinnata</i>
158	thistle, bull	plant or seed	<i>Cirsium vulgare</i>
159	thistle, Canada	plant or seed	<i>Cirsium arvense</i>
160	velvetleaf	plant or seed	<i>Abutilon theophrasti</i>
161	waterhemp	plant only	<i>Amaranthus tuberculatus</i>

## Crops List

Conforming with the United States Department of Agriculture plant database.

ID #	Crop Name	Form	Scientific Name
200	alfalfa	plant or seed	<i>Medicago sativa</i>
201	barley	plant or seed	<i>Hordeum vulgare</i>
203	bermudagrass	plant or seed	<i>Cynodon dactylon</i>
204	black bean	seed only	<i>Phaseolus vulgaris</i>
205	broccoli	plant only	<i>Brassica oleracea var. italica</i>
260	buckwheat	plant or seed	<i>Fagopyrum sagittatum</i>
206	cabbage	plant only	<i>Brassica oleracea</i>
207	canola	plant or seed	<i>Brassica napus</i>
208	cantaloupe	plant or seed	<i>Cucumis melo var. cantalupensis</i>
209	carrot	root provided	<i>Daucus carota L. var. sativus</i>
210	cauliflower	plant only	<i>Brassica oleracea var. botrytis</i>
237	cereal rye	plant or seed	<i>Secale cereale</i>
211	chickpea	seed only	<i>Cicer arietinum</i>
212	chili pepper	plant or seed	<i>Capsicum annum</i>
213	corn	plant only	<i>Zea mays</i>
214	cotton	plant or seed	<i>Gossypium hirsutum</i>
215	cranberry	plant only	<i>Vaccinium macrocarpon</i>
216	cucumber	plant or seed	<i>Cucumis sativus</i>
217	dent corn	seed only	<i>Zea mays var. indentata</i>
202	dry bean	plant only	<i>Phaseolus vulgaris</i>
218	durum wheat	seed only	<i>Triticum durum</i>
219	flax	plant or seed	<i>Linum usitatissimum</i>
220	hops	plant only	<i>Humulus lupulus</i>
221	Kentucky bluegrass	plant or seed	<i>Poa pratensis</i>
222	lentil	plant or seed	<i>Lens culinaris</i>
223	lettuce	plant or seed	<i>Lactuca sativa</i>
224	lima bean	seed only	<i>Phaseolus lunatus</i>
225	oat	plant or seed	<i>Avena sativa</i>
226	onion	plant or seed	<i>Allium cepa</i>
227	orchardgrass	plant or seed	<i>Dactylis glomerata</i>
229	pea	plant or seed	<i>Pisum Sativum</i>
228	peanut	plant or seed	<i>Arachis hypogaea</i>
230	pinto bean	seed only	<i>Phaseolus vulgaris</i>
231	popcorn	seed only	<i>Zea mays var. everta</i>
232	potato	plant only	<i>Solanum tuberosum</i>
233	red bean	seed only	<i>Phaseolus vulgaris</i>
234	red clover	plant or seed	<i>Trifolium pratense</i>

235	red wheat	seed only	<i>Triticum aestivum</i>
236	rice	plant or seed	<i>Oryza sativa</i>
238	safflower	plant or seed	<i>Carthamus tinctorius</i>
239	sorghum	plant or seed	<i>Sorghum bicolor</i>
240	soybean	plant or seed	<i>Glycine max</i>
241	spinach	plant or seed	<i>Spinacia oleracea</i>
242	squash	plant or seed	<i>Curcubita pepo</i>
243	strawberry	plant only	<i>Fragaria L.</i>
244	Sudangrass	seed only	<i>Sorghum bicolor</i>
245	sugar beet	plant or seed	<i>Beta vulgaris</i>
246	sugarcane	plant only	<i>Saccharum L.</i>
247	sunflower	plant or seed	<i>Helianthus annuus</i>
248	sweet corn	seed only	<i>Zea mays var. saccharata</i>
249	sweet potato	plant only	<i>Ipomoea batatas</i>
250	sweetclover	plant or seed	<i>Melilotus albus</i>
251	tall fescue	plant or seed	<i>Festuca arundinacea</i>
252	timothy	plant or seed	<i>Phleum pratense</i>
253	tobacco	plant or seed	<i>Nicotiana tabacum</i>
254	tomato	plant or seed	<i>Lycopersicon esculentum</i>
255	watermelon	plant or seed	<i>Citrullus lanatus</i>
256	wheat	plant only	<i>Triticum aestivum</i>
257	white bean	seed only	<i>Phaseolus vulgaris</i>
258	white clover	plant or seed	<i>Trifolium repens</i>
259	white wheat	seed only	<i>Triticum aestivum</i>

## Appendix 2: Entomology Specimen List

### ENTOMOLOGY SPECIMEN LIST

ID #	Common Name	Latin Names, Order: Family for Possible Specimens	Life Cycle	Econ. Impact
11.	Alfalfa weevil, adult or larva	<i>Hyperica postica</i> , Coleoptera:Curculionidae	Complete - A	V
12.	Aphid	various species, Homoptera:Aphididae	Incomplete - B	R
13.	Armyworm adult	<i>Pseudaletia unipuncta</i> , Lepidoptera:Noctuidae (true armyworm)	Complete - A	IS
		<i>Spodoptera frugiperda</i> , Lepidoptera:Noctuidae (fall armyworm)		
		<i>Spodoptera exigua</i> , Lepidoptera:Noctuidae (beet armyworm)		
14.	Armyworm larva	<i>Pseudaletia unipuncta</i> , Lepidoptera:Noctuidae (true armyworm)	Complete - A	V
		<i>Spodoptera frugiperda</i> , Lepidoptera:Noctuidae (fall armyworm)		
		<i>Spodoptera exigua</i> , Lepidoptera:Noctuidae (beet armyworm)		
15.	Bean leaf beetle	<i>Cerotoma trifurcata</i> , Coleoptera:Chrysomelidae	Complete - A	F and V
16.	Blister beetle	<i>Epicauta pennsylvanica</i> , Coleoptera:Meloidae (black blister beetle)	Complete - A	V
		<i>Epicauta pestifera</i> , Coleoptera:Meloidae (marginated blister beetle)		
		<i>Epicauta vittata</i> , Coleoptera:Meloidae (striped blister beetle)		
17.	Boll weevil	<i>Anthonomis grandis grandis</i> , Coleoptera:Curculionidae	Complete - A	F
18.	Chinch bug	<i>Blissus leucoptera</i> , Hemiptera:Lygaeidae	Incomplete - B	R
19.	Colorado potato beetle, adult or larva	<i>Leptinotarsa decemlineata</i> , Coleoptera:Chrysomelidae	Complete - A	V
20.	Corn Earworm adult	<i>Helicoverpa zea</i> , Lepidoptera:Noctuidae	Complete - A	IS
21.	Corn Earworm larva	<i>Helicoverpa zea</i> , Lepidoptera:Noctuidae	Complete - A	F and V
22.	Corn rootworm adult	<i>Diabrotica barberi</i> , Coleoptera:Chrysomelidae (northern)	Complete - A	F and V
		<i>Diabrotica undecimpunctata howardii</i> , Coleoptera:Chrysomelidae (southern)		
		<i>Diabrotica vergifera</i> , Coleoptera:Chrysomelidae (western)		
23.	Corn rootworm larva	<i>Diabrotica sp.</i> , Coleoptera:Chrysomelidae	Complete - A	V
24.	Cutworm adult	<i>Agrotis epsilon</i> , Lepidoptera:Noctuidae (black cutworm)	Complete - A	IS
		<i>Peridroma saucia</i> , Lepidoptera:Noctuidae (variegated cutworm)		
		<i>Striacosta albicosta</i> , Lepidoptera:Noctuidae (western bean cutworm)		
25.	Cutworm larva	<i>Agrotis epsilon</i> , Lepidoptera:Noctuidae (black cutworm)	Complete - A	V
		<i>Peridroma saucia</i> , Lepidoptera:Noctuidae (variegated cutworm)		
		<i>Striacosta albicosta</i> , Lepidoptera:Noctuidae (western bean cutworm)		
26.	European corn borer adult	<i>Ostrinia nubilalis</i> , Lepidoptera:Pyrilidae	Complete - A	IS
27.	European corn borer larva	<i>Ostrinia nubilalis</i> , Lepidoptera:Pyrilidae	Complete - A	F and V
28.	Field cricket	<i>Gryllus sp.</i> , Orthoptera:Gryllidae	Incomplete - B	F
29.	Flea beetle	<i>Chaetocnema pulicaria</i> , Coleoptera:Chrysomelidae (corn flea beetle)	Complete - A	V
		<i>Systema blanda</i> , Coleoptera:Chrysomelidae (palestriped flea beetle)		
		<i>Phyllotreta striolata</i> , Coleoptera:Chrysomelidae (striped flea beetle)		
30.	Grain weevil	<i>Sitophilus granarius</i> , Coleoptera:Curculionidae (granary weevil)	Complete - A	F
		<i>Sitophilus oryzae</i> , Coleoptera:Curculionidae (rice weevil)		
31.	Grasshopper	various species, Orthoptera:Acrididae	Incomplete - B	V
32.	Green lacewing	<i>Chrysopa sp.</i> , Neuroptera:Chrysopidae	Complete - A	B
33.	Honeybee	<i>Apis mellifera</i> , Hymenoptera:Apidae	Complete - A	B
34.	Imported cabbageworm	<i>Pieris rapae</i> , Lepidoptera:Pieridae	Complete - A	F and V
35.	Japanese beetle	<i>Popilla japonica</i> , Coleoptera:Scarabaeidae	Complete - A	F and V
36.	Lady beetle adult or larva	various species, Coleoptera:Coccinellidae	Complete - A	B
37.	Leafhopper	<i>Empoasca fabae</i> , Homoptera:Cicadellidae (potato leafhopper)	Incomplete - B	R
38.	Mexican bean beetle, adult or larva	<i>Epilachna varivestis</i> , Coleoptera:Coccinellidae	Complete - A	F and V
39.	Saltmarsh caterpillar	<i>Estigmene acrea</i> , Lepidoptera:Arctiidae	Complete - A	V
40.	Spider mite	various species, Trombidiformes:Tetranychidae	Incomplete - B	V
41.	Spittlebug	various species, Hemiptera:Cercopidae	Incomplete - B	R
42.	Squash bug	<i>Anasa tristis</i> , Hemiptera:Coreidae		R
43.	Stink bug	various species, Hemiptera:Pentatomidae	Incomplete - B	R
44.	Striped cucumber beetle	<i>Acalymma vittatum</i> , Coleoptera:Chrysomelidae	Complete - A	F and V
45.	Tarnished plant bug	<i>Lygus lineolaris</i> , Hemiptera:Miridae	Incomplete - B	R
46.	Thrips	various species, Thysanoptera:Thripidae	Complete - A	V
47.	Tomato or tobacco hornworm	<i>Manduca sp.</i> , Lepidoptera:Sphingidae	Complete - A	F and V

48.	whitefly	various species, <i>Homoptera: Aleyrodidae</i>	Incomplete - B	V
49.	wireworm	various species, <i>Coleoptera: Elateridae</i>	Complete - A	V
<b>Economic impact key:</b>				
B (Beneficial); F (fruit/flower destruction); IS (indicator species); R (removal of plant fluids); V (vegetative part destruction)				

## Appendix 3: Plant Disease/Disorder Specimen List

PLANT DISEASE & DISORDERS SPECIMEN LIST					
ID#	ITEM	CATEGORIES	ECONOMIC IMPACT	LATIN NAME IF APPLICABLE	
NUTRITIONAL DEFICIENCIES: (Shown in Corn, Soybeans, Wheat, or Alfalfa)					
11	Iron (Fe) Chlorosis	Nutritional- E	Damage to Foliage- B	--	
12	Nitrogen (N) Deficiency	Nutritional- E	Damage to Foliage- B	--	
13	Phosphorus (P) Deficiency	Nutritional- E	Damage to Foliage- B	--	
14	Potassium (K) Deficiency	Nutritional- E	Damage to Foliage- B	--	
ENVIRONMENTAL DAMAGE: (Shown in any Crop)					
15	Drought Damage	Environmental- C	Damage to Foliage- B	--	
16	Frost Damage	Environmental- C	Damage to Foliage- B	--	
17	Hail Damage	Environmental- C	Damage to Foliage- B	--	
18	Wind Damage	Environmental- C	Damage to Roots/Stem- C	--	
SMALL GRAINS: (Shown in Wheat, Oat, Barley or Rye)					
19	Ergot	Fungal- D	Damage to Fruit/Flower- A	Claviceps purpurea	
20	Fusarium head blight	Fungal- D	Damage to Fruit/Flower- A	Fusarium gramineum	
21	Loose smut	Fungal- D	Damage to Fruit/Flower- A	Ustilago tritici	
22	Powdery Mildew	Fungal- D	Damage to Foliage- B	Erysiphe graminis	
23	Rust	Fungal- D	Damage to Foliage- B	Puccinia (Genus)	
24	Wheat streak mosaic virus	Viral- F	Damage to Foliage- B	Tritimovirus (Genus)	
CORN/SORGHUM: (Shown in either Corn or Sorghum only)					
25	Charcoal Rot	Fungal- D	Damage to Roots/Stem- C	Macrophomina phaseolina	
26	Common Corn Smut	Fungal- D	Multiple- Photo will depict	Ustilago maydis	
27	Corn Ear Rot (Aspergillus, Fusarium, Gibberella)	Fungal- D	Damage to Fruit/Flower- A	Various Spp.	
28	Corn Stalk Rot (Fusarium, Gibberella)	Fungal- D	Damage to Roots/Stem- C	Fusarium verticillioides, Gibberella zea	
29	Goss's Wilt	Bacterial- A	Damage to Foliage- B	Clabibacter michiganensis subsp. nebraskensis	
30	Grey Leaf Spot	Fungal- D	Damage to Foliage- B	Cercospora zea-maydis	
31	Northern Corn Leaf Blight	Fungal-E	Damage to Foliage- B	Exserohilum turcicum	
SOYBEAN: (Shown only in Soybean)					
32	Bacterial Blight	Bacterial- A	Damage to Foliage- B	Pseudomonas syringae pv. glycinea	
33	Bean Pod Mottle Virus (plant or seed)	Viral- F	Damage to Multiple- D	Comovirus (Genus)	
34	Frogeye Leafspot	Fungal- D	Damage to Foliage- B	Cercospora sojina	
35	Purple Stain (seed only)	Fungal- D	Damage to Fruit/ Flower- A	Cercospora kikuchii	
36	Soybean Cyst Nematode	Nematodes- G	Damage to Roots/Stems- C	Heterodera glycines	
37	Sudden Death Syndrome	Fungal- D	Damage to Multiple- D	Fusarium virguliforme	
SUGAR BEETS: (Shown only in Sugar Beets)					
38	Cercospora Leaf Spot	Fungal- D	Damage to Foliage- B	Cercospora beticola	
39	Rhizoctonia Root & Crown Rot	Fungal- D	Damage to Roots/Stem- C	Rhizoctonia solani	
ALFALFA: (Shown only in Alfalfa)					
40	Common Leaf Spot	Fungal- D	Damage to Foliage- B	Pseudopeziza medicaginis	
41	Phytophthora Root Rot	Water Mold- E	Damage to Roots/Stem- C	Phytophthora megasperma	
POTATO: (Shown only in Potato)					
42	Late Blight of Potato	Water Mold- E	Damage to Multiple- D	Phytophthora infestans	
CHEMICAL: (Shown on any Crop or Weed)					
43	Herbicide (Example will be one of the following)			Product Examples	
	HG #4 (Growth Regulators)		Chemical- B	Damage to Roots/Stems- C	Dicamba, 2,4-D
	HG #10, #14, #21 (Various Contact Herbicides)		Chemical- B	Damage to Foliage- B	Liberty, Cobra, Gramoxone
	HG #2, #9 (Amino Acid Synthesis inhibitors)		Chemical- B	Multiple- Photo will depict	Permit (ALS), Roundup
	HG #5-7 (PS 2 Inhibitors)		Chemical- B	Damage to Foliage- B	Atrazine

## Appendix 4: Machinery/PPE Specimen List

Machinery/PPE Specimen List			
ID#	Name	ID#	Name
11	Air seeder (tool and air cart together)	51	Irrigation - traveling gun
12	Anemometer	52	Irrigation - center-pivot
13	Anhydrous applicator with tank	53	Liquid manure tank/applicator (includes draglines)
14	Articulated tractor (wheeled only type tractor)	54	Manure sampling kit
15	Auger platform head for combine	55	Manure spreader
16	Backpack sprayer	56	Module builder
17	Bale wagon (kick or flat)	57	Moldboard plow
18	Bed shaper	58	Nurse tank trailer
19	Belt pickup head for the combine	59	Pea harvester
20	Broadcast fertilizer spreader	60	Peanut digger
21	Chemigation unit for irrigation	61	Plastic layer
22	Combine (may be displayed with harvesting head attached)	62	Potato harvester
23	Conveyor/Elevator/Auger	63	PPE (all equipment)
24	Corn head for combine	64	Pressure gauge
25	Cotton picker	65	PTO shaft
26	Cotton stripper	66	Rotary hoe
27	Rolling harrow	67	Round baler
28	Disk	68	Row crop cultivator
29	Disk chisel	69	Row crop tractor (wheeled only tractor)
30	Draper head for combine or swather	70	Row independent forage harvester head (kemper head)
31	Drawn planter	71	Skid steer
32	Dry fertilizer density scale	72	Soil penetrometer
33	Field cultivator	73	Soil probe (for collection of soil sample)
34	Field shovel	74	Soil sample bag
35	Forage harvester (with harvesting head attached)	75	Soil thermometer
36	GPS receiver	76	Specialty tractor (orchard, narrow, low profile, high clearance)
37	Grain bin/leg	77	Sprayer
38	Grain drill (includes no-till)	78	Sprayer nozzle
39	Grain dryer	79	Square baler (large or small)
40	Gravity wagon	80	Strip tiller
41	Hand hoe	81	Sugar beet harvester
42	Hay merger	82	Swather (drawn or self-propelled)
43	Hay mower/conditioner (disk, reel/drawn, 3 pt., or self-propelled)	83	Sweep net
44	Hay rake (reel or wheel)	84	Tensiometer
45	Hearing protection	85	Tissue sample bag
46	Hitch pin	86	Tracked tractor (any configuration of tracks on a tractor)
47	Hydraulic cylinder/hose	87	Vegetable transplanter
48	In-line ripper	88	Virtual terminal/monitor/controller
49	Integral planter	89	V-ripper
50	Irrigation - lateral	90	Wheel loader





Agronomic Disorders																											
Identification										Agents					Parts of Plants Damaged												
Example																											
S : # options	1	2	3	4	5	7	0	1	2	3	4	5	6	8	9	Bacteria	Chemical	Environmental	Fungal/Water Mold	Nutritional	Virus	Nematodes	Fruit or Flower	Foliage	Roots or Stems	Multiple Components	
	Tens Digit					Ones Digit																					
	1	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	2	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	3	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	4	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	5	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	6	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	7	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	8	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	9	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	10	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	11	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	12	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
	13	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D
14	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D	
15	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	A	B	C	D	

Insect Identification																								
Identification										Economic Impact					Life Cycle									
Example																								
S : # options	1	2	3	4	5	7	0	1	2	3	4	5	6	8	9	Beneficial	Fruit/Flower Destruction	Removal of Plant Fluids	Vegetative Part Destruction	Indicator Species	Multiple Fruit/Flower and Vegetative Part Destruction	Complete	Incomplete	
	Tens Digit					Ones Digit																		
	1	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	2	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	3	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	4	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	5	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	6	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	7	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	8	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	9	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	10	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	11	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	12	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
	13	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B
14	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B	
15	1	2	3	4	5	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	A	B	



