

# Crop Scouting 101



## **Crop Science Investigation (CSI) Handbook**

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**\*\*\* All UNL Crop-Related information at \*\*\***

**<http://cropwatch.unl.edu>**

## Spots, Blots, Dots....What is causing the problem?

Everyday we see plants affected by something whether it is insects, diseases, or environmental stresses. But how do you tell what is causing the problem? We'll first begin with some pest and pathogen basics. This basic knowledge will help you diagnose problems in the future.



**Insects:** Insects are classified as animals with three pairs of legs (6 legs). In order to determine what type of insect is causing a problem, you need to understand what kind of damage different insect species can cause.

*Piercing/Sucking Mouthparts* allow fluids to be removed from the plant tissue. Typical symptoms include discoloration (yellow spotted appearance), wilting, distortion or curling of leaves. Pests with piercing-sucking mouthparts include aphids, plant bugs, scale insects, leafhoppers, and spider mites.

*Chewing Mouthparts* allow plant tissue to be devoured. Typical symptoms include holes in leaves, wood or fruit, skeletonizing of leaves, and tunneling in wood. Pests with chewing mouthparts include caterpillars, beetle adults and larvae, sawfly larvae, and grasshoppers.

A great resource on field crop insects can be found at <http://cropwatch.unl.edu/web/insect/home>

**Diseases:** Disease is the symptom you see as a result of a constant irritation to a plant. Pathogens are living organisms which can cause disease. Pathogens include fungi, bacteria, viruses, and nematodes. Below are some pathogen basics and the types of diseases they cause. A great resource for field crop diseases is <http://pdc.unl.edu>.

### *Fungi:*

Diseases: Root, stem, vascular (wilt), and fruit rots; foliar and fruit diseases; cankers

Environment: some prefer hot and dry, others cool and moist. Most have a resting structure to survive in soil or debris.

Integrated Pest Management (IPM): resistance, cultural, fungicides

### *Bacteria:*

Diseases: Wilts; foliar diseases; root and stem rots

Environment: Most favored by wet, cooler conditions with high humidity.

Need wounding provided by wind-driven rain and hail, insect vector, or natural opening such as stomata to enter plants.

IPM: Resistance, vector control, environmental changes, antibiotics for some plant species

### *Viruses:*

Disease symptoms: green/yellow mottled leaves, stunted, bushy plants, shoestringing of leaves, discoloration of seed

Environment: A vector is required to transfer virus-can be insect, human, mechanical (tools). Requires humidity. Sometimes seed transferred. Needs living host so often survives in vector instead of plant debris.  
IPM: Resistance, Control insect vector

*Nematodes:*

Disease symptoms: stunted bushy plants, knotted roots with numerous root hairs.  
Environment: Can be found in root or stem, can produce galls or cysts, move via water in field, equipment, animal/human movement, dirt/soil particles  
Survive in galls, cysts, roots, soil  
IPM: resistance, crop rotation, field management

**Environment:** Environment also plays a role in diagnosing a crop problem. Are the plants exposed to too much/too little sun, are they drought stressed or are they in an area with poor drainage? Is soil type, uneven irrigation, uneven nutrient or pesticide application causing the problem in the field? There are numerous factors to consider!

Some keys to diagnosing problems:

☞ Is there a pattern to the problem?

- Beginning at field edges (herbicide overlap, insect damage)
- Low areas (root rots, yellow/stunted plants due to standing water and lack of oxygen to roots)
- Side hills (wireworm damage, soil variation, nutrient problems)
- Disease damage may occur in patchy areas or random plants-rarely whole-fields affected. Large areas of fields affected are most often due to environment, pesticide or nutrient misapplications.

☞ Ask questions:

- When did you first notice the problem?
- Has this problem occurred in this field in the past?
- What was the previous crop?
- What herbicides/insecticides/nutrients were used this year so far? Last year?
- Where is the problem located in the field?
- \*\*When stumped-always dig up a plant and examine the roots and base of the plant, cut open the stalk, stems, etc.! Is there a good root system or has there been feeding? Are the roots compacted? Is there tunneling in the stem?\*\*\*

The next few pages provide examples and information on a few of the most common problems associated with various Nebraska-grown field crops. Some Web sites have also been provided for additional information. Best wishes in your crop scouting endeavors! For additional questions or for permission to re-use this material, please contact Jenny Rees at: [jrees2@unl.edu](mailto:jrees2@unl.edu).

\*Note: All pictures are from UNL unless otherwise specified.\*



## Alfalfa:



**Name:** Phytophthora Root Rot (protist)

**Species Affected:** Alfalfa

**Time of Year:** Cool (65°F), wet soils in early spring. Also observed in summer.

**Description:** Seedlings-uneven emergence, rotted, discolored roots, death. Established plants: Wilt during heat, discolored roots, rotted/missing taproot, thin stands. Moved via water, machinery, and animals.

**Control:** Resistant varieties, improve drainage, seed treatment with metalaxyl/mefenoxam (Apron), rotate out for 2-3 years, irrigation management, applying fungicides on established plants is not effective.



**Name:** Spring Black Stem (fungus)

**Species Affected:** Alfalfa

**Time of Year:** May in cool, wet conditions

**Description:** Dark spots on leaves and stems, leaves fall off plants. Aids in crown/root rot. Problem during first cutting.

**Control:** Harvest early to prevent leaf loss.



**Name:** Alfalfa Weevil (chewing mouthparts)

**Species Affected:** Alfalfa

**Time of Year:** small holes eaten in leaves at the growing tip during April and May. Primarily damages first cutting and/or regrowth of second crop.

**Description:** Skeletonized leaves/buds, no regrowth or greenup after first cutting.

**Control:** Resistance, timely hay cutting, remove windrows and bales as soon as possible. Chemical-threshold if there are 20 or more larvae per sweep and early harvest is more than one week away, treatment may be warranted.



**Name:** Potato leafhopper (piercing/sucking mouthparts)

**Species Affected:** Alfalfa, soybeans, potatoes, clover

**Time of Year:** Summer- more severe in cuttings 2 and 3

**Description:** Feeding on plant fluids results in symptoms similar to drought or disease. Yellow discoloration at the tips occurs in a "V" pattern-called hopperburn. Severe infestation results in stunting and death of stems.

**Control:** **Resistance,** begin sampling their fields in late May and June and to continue on at least a weekly, chemical control-please check threshold guidelines at

<http://www.ianrpubs.unl.edu/epublic/pages/publicationD.jsp?publicationId=559>



<http://www.uvm.edu/pss/vtcrop/s/?Page=articles/PotLeafHop.ht>

## Corn:



**Name:** Anthracnose (fungus)

**Species Affected:** Corn

**Time of Year:** High temperature and long periods of wet weather favor the leaf blight and top die-back phases beginning in early-mid June. High temperature and plant stress following pollination favor the stalk rot phase

**Description:** Leaf blight lesions occur in early-mid June, are irregular in shape, and can expand to encompass most of the leaf. Anthracnose also causes top die-back where the tassels die leaving a green band in the middle of the plant. It can also cause stalk rot where black discoloration can occur under the sheath tissue and in the nodes when the stalk is split.

**Control:** Resistance (although may not have resistance to all phases of disease), tillage to break up infected residue, crop rotation. No fungicides are labeled for anthracnose.



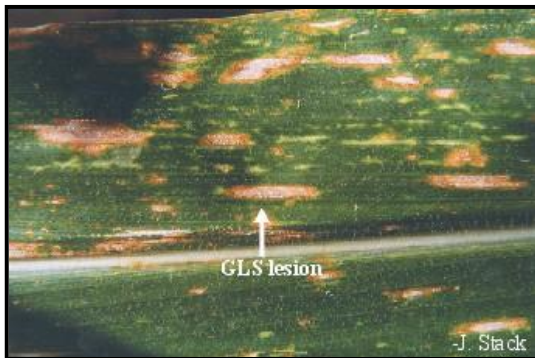
**Name:** Bacterial top and stalk rot (bacteria)

**Species Affected:** Corn and sorghum

**Time of Year:** Anytime during growing season with high temperatures and high relative humidity. It can occur after heavy rainfall-particularly with high winds and hail or where pivot irrigation is used.

**Description:** Discoloration begins in the leaf sheath area and progresses into the stalk where it rapidly spreads up the stalk. Stalk decay is observed by a foul odor and easily removing the top of the plant from the stalk. Any plant node can be affected. A slimy rot and internal discoloration is present upon splitting the stalk. This disease will be randomly found throughout a field instead of distinct patterns or patchy areas.

**Control:** Tillage to destroy residue. Some resistance may be present but it is commonly not listed with hybrid disease information.



**Name:** Gray Leaf Spot (fungus)

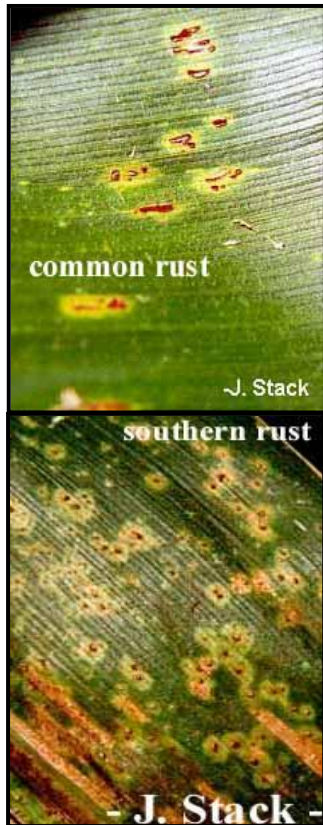
**Species Affected:** Corn

**Time of Year:** Primarily during reproductive stages. Favored by temperatures between 70-90°F, relative humidity above 90% for at least 12 hours, and leaf wetness for at least 12 hours (dew, rain, irrigation).

**Description:** Immature lesions are easily confused with other fungal diseases, however, mature lesions are brown/gray rectangular-shaped and restricted by leaf veins. Holding the leaf up to the light, usually a

yellow halo (margin) can be observed around the lesion. Lesions expand resulting in blighting of leaves. The disease begins on lower leaves and works its way up the plant. This disease can pre-condition infected plants to stalk rot so scouting for stalk rot is necessary.

**Control:** There is no complete resistance to GLS, but some hybrids have higher tolerance levels. Fungicides can be used where economical prior to dough stage. Tillage breaks up residue where pathogen survives. Crop rotation helps break the disease cycle.



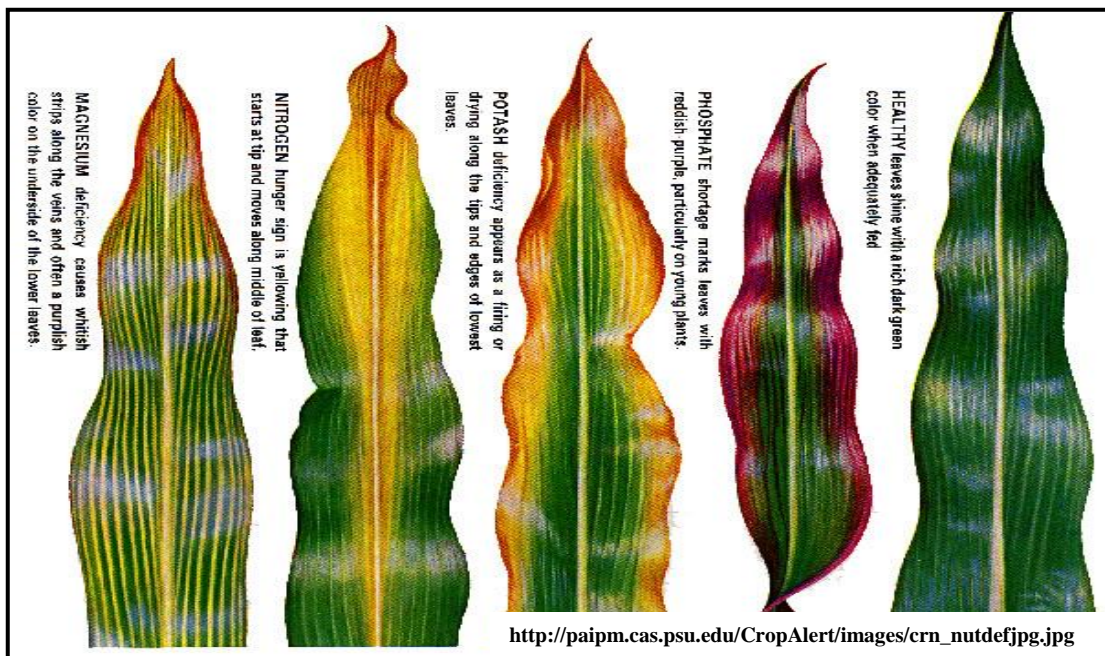
**Name :** Common and Southern Rust (fungus)

**Species Affected:** Corn

**Time of Year:** Common rust may be seen in June favored by cool temperatures (60-80° F) and high humidity. Southern rust doesn't occur until July and is favored by high humidity and high temperatures (80-90°F).

**Description:** *Common Rust:* Early lesions are small, circular to elongate and occur in clusters. When the fungus erupts through the leaf surface, brown-red pustules may be found on both leaf surfaces and are more elongated/oblong in shape. They are also sparsely spread over the leaf instead of in clusters. *Southern Rust:* Early lesions are small and circular to oval. The fungus will produce orange, cinnamon-red pustules on only the upper leaf. These lesions are smaller than common rust and are circular in shape compared to common rust. Lesions may also be found on stalk, husk, and leaf sheath tissue and favorable conditions can result in leaf blight. **Control:** Resistant varieties for both common and southern rust. Fungicides may be necessary in seed production fields. \*Note: Rust pathogens need a living host to survive the winter. Thus, they cannot survive the winter in Nebraska but blow north every year on wind currents.

**Nutrient Deficiencies:**



Information on corn insects: <http://cropwatch.unl.edu/web/corn/insectmgt>



**Name:** European Corn Borer (chewing mouthparts)

**Species Affected:** Corn

**Time of Year:** *1<sup>st</sup> generation:* late June into early July.

*2<sup>nd</sup> generation:* late July, August, and sometime September. Larvae survive winter in corn debris.

**Description:** Whitish-gray caterpillar with small black spots on body and shiny black head from 1/8-1 inch long. Feeds on leaf tissue creating “shot hole” effect. Also feeds on pollen and later bores into stalk.

**Control:** Resistance, crop rotation, debris management.

*1<sup>st</sup> generation economic threshold:* Examine 25 corn plants in a row at 4 locations in the field. Note the percent of total plant whorls with feeding damage; unroll several damaged whorls, record number of live worms per plant. Note size of worms. Depends on price of corn, yield potential, cost of application, and number of larvae, 3 - 5% loss per borer that reaches maturity per plant. *2<sup>nd</sup> generation economic threshold:* Examine 10 plants at 5

field locations. 25-50% of plants with an egg mass (white and flat like fish scales near underside midrib) and corn at blister stage or earlier.



**Name:** Western Bean Cutworm (chewing mouthparts)

**Species Affected:** Corn

**Time of Year:** July, August, and September primarily in sandy areas but becoming more widespread elsewhere.

**Description:** White, pearly egg masses occur on upper side of leaves near midribs and turn dark purple right before larvae hatch. Larvae are dark brown/purple with faint diamond shaped markings on their backs. Older larvae are gray to pinkish-brown, and three short, white stripes run lengthwise on the first segment behind the head. Larvae feed on grain in the ear; multiple cutworms may occur in a single ear, greatly reducing grain yield. If pollination has not occurred, young larvae may keep silks chewed back, interfering with pollination.

**Control:** Examine upper leaf surface of leaves above ear leaf for egg masses and the tassel, silks, and ear tips for young larvae on 10 plants in 5 locations in the field. Treat if 8% of the plants are infested with newly hatched larvae in tassels and/or eggs on leaves, and corn is at least 95% tasseled. If corn is at milk stage before eggs are laid, no treatment is needed.



**Name:** Corn rootworm (chewing mouthparts)

**Species Affected:** Corn

**Time of Year:** Larvae: Late May, June, mid-July Beetles: mid-July to first frost

**Description:** Small whitish larvae up to 1/2" long with black to dark brown head and anal plate. Three types of rootworm beetles: Northern, Western, and Southern. Northern are green, yellow-green, or tan without stripes and are 1/6-1/4" long. Westerns are yellow with black stripes with males sometimes almost black. They are 1/6" to 1/4" long. Southern are yellow with 12 black spots (also known as 12 spotted cucumber beetle). Damage: Larvae feed and eventually tunnel into corn roots causing root reduction, girdling of stems near plant base, and leaning plants. Beetles feed on pollen, silks, and "scrape" leaf tissue leaving behind white, translucent areas on leaves.

**Control:** Dig up 2 plants at each of 5 locations with the soil from 6 - 8" around the plant. Sift soil over a sheet of black plastic looking for 1/32" to 1/2" long larvae. Flotation

method can be used (1 lb. salt/1 gallon water). No economic threshold available for larvae. An average of 2 - 3 larvae per plant has been used by some consultants to determine the need for emergency controls. There are also recommendations for controlling beetles found at the weblink below. Beetles clipping silks below 1/2" will result in poor pollination.



**Name:** Wireworm (chewing mouthparts)

**Species Affected:** Corn

**Time of Year:** April, May, and June

**Description:** Larvae are hard-bodied, light tan to reddish tan, long, flat or nearly rounded. Up to 1" long. Larvae feed on the seed before germination or on the seedling below the soil line. Affected seedlings exhibit a wilted whorl that is easily removed.

**Control:** No rescue (post emergence) treatment. Use soil insecticide or seed treatment if have wireworm pressure-use traps to find out. Baited traps: 1/2 cup

each untreated wheat and corn placed ~ 4" deep in the soil; cover with small sheet black plastic and cover the black plastic with clear plastic. Trap left in soil undisturbed for 2 - 3 weeks before planting can predict wireworm damage potential. Average of one or more wireworms per baited trap. If damage is severe early, may need to replant.

**\*\*\*Excellent Resource on determining the cause of abnormal corn ears with pictures and explanations:** [http://agcrops.osu.edu/specialists/corn/specialist-announcements/AbnormalCornEarsPoster\\_000.pdf/view](http://agcrops.osu.edu/specialists/corn/specialist-announcements/AbnormalCornEarsPoster_000.pdf/view)



## Soybeans:

Information on soybean insects: <http://cropwatch.unl.edu/web/soybeans/insectmgt>



**Name:** Bean Leaf Beetle (chewing mouthparts)

**Species Affected:** Soybeans

**Time of Year:** Early planted beans also during pod set (R3)

**Description:** Beetles vary in color but can be identified by triangle behind their thorax.

**Management:** Avoid early season/first planted beans. If plant early-include a systemic seed treatment. No thresholds but beans can withstand a great deal of defoliation. Vector bean pod mottle virus which can affect seed quality. Beetles feeding on pods can also damage beans and affect quality.



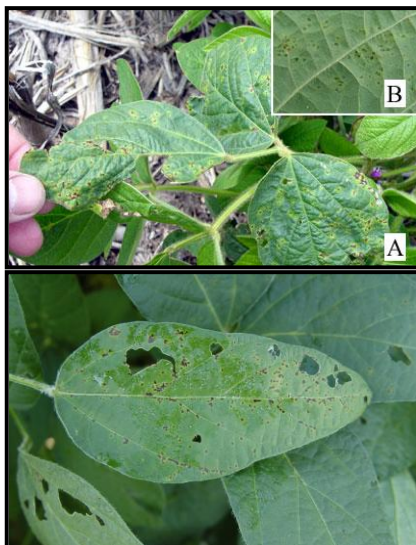
**Name:** Soybean Aphids (piercing-sucking mouthparts)

**Species Affected:** Soybeans

**Time of Year:** Later planted beans. Usually seen during reproductive stages in NE during cooler temps. (70's). **Description:** Yellow-green in color, 1/16" long, with two black tail pipes (cornicles) on the rear of the abdomen. Only colony-forming aphid on soybeans and can reproduce rapidly producing several generations a year. Found on the undersides of leaves but can also be found on stems. They remove sap and can vector soybean

mosaic virus.

**Management:** Scout fields in late June picking up 5 plants in 5 areas of the field. Estimate the number of aphids/plant. Economic threshold is 250 aphids/plant. Also look for predators like lady beetles and lacewings. If they are controlling the population, spraying would not be warranted.



**Name:** Bacterial leaf blight and pustule (bacteria)

**Species Affected:** Soybeans

**Time of Year:** Bacterial blight (cooler temps), Bacterial pustule (warmer temps)

**Description:** Bacterial blight: dark angular leaf spots with yellow margins, often occurring after rain storms with hail and/or wind in the upper-mid canopy. Bacterial pustule: small, raised, dark red-brown lesions on leaves found in the upper to mid canopy.

**Management:** Neither is a major yield-limiting soybean disease.



**Name:** Septoria Brown Spot (fungus)  
**Species Affected:** Soybeans  
**Time of Year:** Entire growing season.  
**Description:** Lower leaves develop small brown spots followed by yellowing and senescence of lower leaves.  
**Management:** Not a major yield-limiting soybean disease but looks similar to soybean rust and bacterial pustule.



**Name:** Soybean Rust (fungus)  
**Species Affected:** Soybeans  
**Time of Year:** Reproductive stages, favored by humidity and temperatures in the 80's.  
**Description:** Lower leaves develop small brown spots followed by yellowing and death of leaves. Severely affected plants result in defoliation and severe yield loss. Soybean rust has not been found in Nebraska. Must come into Nebraska via wind-blown spores.  
**Management:** Fungicides.

**Wheat:** Excellent resource: <http://cropwatch.unl.edu/wheat>



**Name:** Wheat Streak Mosaic Virus (virus)  
**Species Affected:** Wheat  
**Time of Year:** Wheat curl mites vector the virus in the fall and disease symptoms occur when temperatures reach 70°F.  
**Description:** Yellow-green discoloration on leaves. Yellow patchy areas of fields begin along field edges and eventually move across the field. Severe infections result in browning and death of plants.  
**Management:** Control the wheat curl mite by destroying volunteer wheat in all neighboring fields at least two weeks prior to planting winter wheat.



**Name:** Leaf, Stem, and Stripe Rust (fungus)

**Species Affected:** Wheat  
**Time of Year:** Can occur in fall with high humidity. Most often occur in spring. High humidity and favorable temps listed below.  
**Description:** *Leaf:* orange-red pustules form on leaves (mid-70's). *Stem:* red-brown pustules form along leaves and stems (65-85°F). *Stripe:* yellow pustules form in lines along leaf veins (55-75°F).  
**Management:** Rust pathogens enter Nebraska via wind-blown spores. Resistance is available for stem rust as it's the most





yield-limiting. Some resistance is available for leaf and stripe rust. Fungicides may be used for rust prevention and to kill rust once it's in the field. No economic thresholds but further information can be found at:

<http://www.ianrpubs.unl.edu/epublic/pages/publicationD.jsp?publicationId=310>



**Name:** White heads

**Species Affected:** Wheat

**Time of Year:** Head emergence

**Description:** Heads appear white in color with no grain fill. Could be caused by frost earlier in season, fungal scab, take all disease, or wheat stem maggot. White, or pink-colored fungal growth may also be evident on heads affected by scab. Maggots may be present in stems affected by wheat stem maggot and heads will pull out easily from stem-scattered plants will have white heads. Plants affected with take all disease will have a black shiny appearance at their base and root damage. This disease is favored by moisture and large patches of the field will be affected. Heat and drought stress may also cause white heads.

**Management:** There's no way to control damage due to frost or drought.

Use seed treatments and crop rotations away from wheat and corn to manage scab. Take all disease can be managed through crop rotations, proper soil fertility, and eliminating grassy weeds.

### ***Beneficial Insects:***

These are some insects to be on the lookout for as they are actually beneficial (eat problem insects such as aphids and mites) in the field. Identifying both the larval and adult stages is critical as the larval stages are vigorous predators! Lady beetles are on the left and green lacewings are on the right.

