

## Managing Soybean Defoliators

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Defoliation, leaf feeding of soybean leaves by insects, is the most commonly observed type of soybean insect injury, but soybean plants have the ability to compensate for insect defoliation. When making pest-management decisions, a crucial consideration is the size of the remaining leaf canopy and the soybeans' stage of growth.

Soybean defoliation is one of the most readily observed types of insect injury to soybean and can occur from emergence to harvest. In 2010, there were numerous reports of green cloverworm, southern corn rootworm, grasshoppers, bean leaf beetle, and yellow woollybear in Nebraska soybean fields. Nebraska soybean producers expressed a great deal of concern.

A complex of insects defoliate soybean in Nebraska. These include bean leaf beetle, imported longhorned weevil, grasshoppers, woollybear caterpillar, thistle caterpillar, green cloverworm, and a few others. Rarely does any single species reach population levels that defoliate soybean enough to cause economic damage, but the combined injury of two or more defoliating insects can result in economic damage.

This was observed in 1997 when the combined defoliation from grasshoppers and bean leaf beetles reached 50 percent in the soybean reproductive stage near Mead, Neb. When this occurs, multiple-species recommendations must be used. These can be multiple-species economic threshold tables, or more general "catch-all" defoliation level recommendations.

University of Nebraska–Lincoln Department of Entomology multiple-species economic threshold tables do not cover all of the different species of insect defoliators, so the following are more general soybean defoliation thresholds.

### Insect Defoliation and Yield Loss

Soybean plants have a great capacity to compensate for defoliation by insects. Research over the last 20 years has established that the key factor driving yield losses from defoliating insects is the degree that defoliation reduces light interception

of the soybean canopy. Soybean can lose tremendous leaf area without yield loss if the remaining leaves are still intercepting at least 90 percent of the incident light. So, in making pest management decisions about defoliating insects, a crucial consideration is the size of the remaining soybean canopy. Small canopies cannot tolerate as much leaf loss as large canopies.

Another consideration is when defoliation occurs. Unless severe, defoliation in vegetative stages usually doesn't cause yield loss. Reproductive stages are more sensitive. A final factor is growing conditions. When environmental conditions are very favorable for soybean development (e.g., adequate water), plants have a greater capacity for regrowth and compensation.

General guidelines can be used for defoliating insects that lack species-specific thresholds or when two or more different defoliating species are present and are expected to continue feeding. In vegetative (pre-flowering) stages, consider treatment if the insects are present and feeding, and defoliation will exceed 30 percent. In pod-forming or pod-filling stages, consider treatment if the insects are present and defoliation will exceed 20 percent.

These percentages can vary 5-10 percent, according to the stage or type of insect(s) present, environmental conditions, the specific stage of the soybean, and the size and condition of the canopy. For example, a larger canopy (leaf area) can tolerate more defoliation than a smaller canopy due to the greater leaf area in the larger canopy. Experience will have to be your guide when using these thresholds.

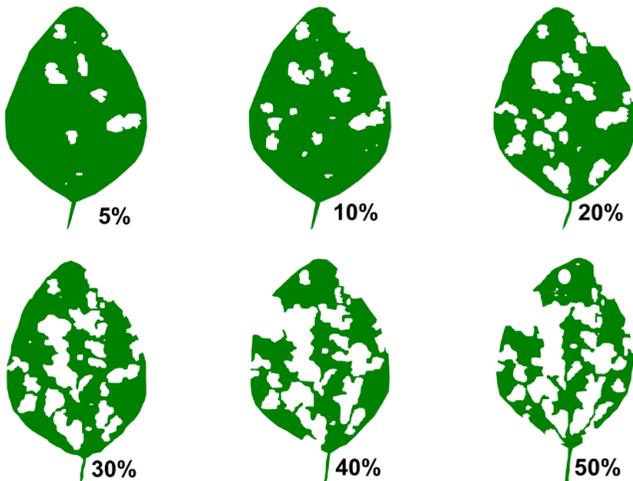
Defoliation is notoriously difficult to estimate and is almost always overestimated. This is because the injury is so dramatic and often not all parts of the canopy are considered when making defoliation estimates. Some insect species primarily feed in the upper part of the canopy (e.g., bean leaf beetle), and some feed lower in the canopy. Different portions of the canopy will suffer different levels of injury. Therefore, when estimating defoliation, the entire canopy, not just the injured portion, must be considered.

## Scouting Defoliation

To predict if defoliation will exceed 30 percent for the vegetative stage or 20 percent for the pod-forming or pod-filling stages, the current injury must be estimated. The following steps are suggested:

1. Remove a trifoliolate leaf from the top, middle, and lower third of 10 randomly selected plants.
2. Discard the most and least damaged leaflet from each trifoliolate leaf. This will leave 30 leaflets.
3. Compare the 30 leaflets with the leaflets in *Figure 1* and determine the average level of defoliation.
4. Repeat steps 1-3 at four or more randomly selected locations in the field.

The Nebraska Extension publication EC1589 can be used for scouting. If treatment is warranted, identify the defoliating insect(s) and use the insecticide guides found at the UNL Department of Entomology website: <http://entomology.unl.edu/instabls/soydefol.shtml>.



**Figure 1. Insect defoliation levels of soybean leaflets**

Most of the commonly used foliar insecticides are effective against most soybean defoliators.

### Bean leaf beetle, *Cerotoma trifurcata* —

Adults are about ¼ inch long and can be green, yellow, tan, or red. There is always a black triangle located behind the head on the wing covers (called elytra). There are two generations of bean leaf beetles per year in Nebraska. Bean leaf beetles can be found in soybean from emergence until senescence.



**Bean leaf beetle photo by James A. Kalisch**

### Blister Beetles, *Epicauta* spp. —

Ashgray blister beetle and striped blister adults can be found feeding on soybean late in the season. They are ½ to 1 inch long with the head broader than the prothorax. Blister beetles are beneficial in that they parasitize grasshopper eggs and their populations can be higher the year following high grasshopper populations.



**Ashgray blister beetle photo by James A. Kalisch**



**Striped blister beetle photo by James A. Kalisch**

### Imported longhorned weevil, *Calomycterus setarius* –

They are flightless, gray-brown weevils about ¼ inch long. As they are flightless they usually will be found in higher numbers in edges of fields. Rarely do populations reach economically damaging levels, but they do add to complexes of defoliators in soybean fields.



**Imported longhorned weevil photo by Tim Miller**

### Grasshoppers –

A number of grasshopper species can cause defoliation in soybean. Each species has a single generation per year. Both nymphs and adults should be considered when scouting. Treatment of field margins should be considered when there are ≥20 grasshoppers per square yard. More information can be found in the NebGuide G1627, *A Guide to Grasshopper Control in Cropland*.



**Redlegged grasshopper nymph photo by Leon G. Higley**



**Redlegged grasshopper photo by James A. Kalisch**

**Southern corn rootworm, *Diabrotica undecimpunctata howardi* –**

Adult southern corn rootworm beetles are about 3/8 inch long, yellow to light green, and have 12 black spots on the wing covers (called elytra). This insect is rarely in numbers high enough to warrant treatment directly, but they do contribute to overall defoliation.



**Southern corn rootworm beetle photo by James A. Kalisch**

**Yellow woollybear, *Spilosoma virginica* –**

These are hairy caterpillars that can range in color from white to dark brown or reddish. There are two generations per year, and they are typically more abundant in drier years. Populations tend to crash due to disease.



**Yellow woollybear caterpillar photo by Leroy Peters**



**Yellow woollybear caterpillar photo by James A. Kalisch**



**Yellow woollybear caterpillar photo by James A. Kalisch**

**Loopers –**

Multiple species of loopers can be found in soybean fields. They are pale green and can be distinguished from green clover worm by the presence of two pairs of prolegs. Loopers typically add to a complex of defoliators in soybean fields.



**Soybean looper photo by Marlin E. Rice**



**Cabbage looper photo by James A. Kalisch**

**Green clover worm, *Plathypena scabra* –**

These are light green caterpillars with two thin, white stripes along each side of the body. They can be distinguished from loopers by the presence of three pairs of prolegs. Parasites and diseases commonly will keep green clover worms under control. Therefore, it is very important to watch for parasitized and diseased worms.



**Green cloverworm photo by David L. Keith**

**Various caterpillars –**

Besides the caterpillars already mentioned, a number of other caterpillars can defoliate soybean. The other species include yellowstriped armyworm (*Spodoptera ornithogalli*), fall armyworm (*Spodoptera frugiperda*), corn earworm (*Helicoverpa zea*), European corn borer (*Ostrinia nubilalis*), and thistle caterpillar (*Vanessa cardui*). These caterpillars add to a complex of defoliators in soybean fields.



**Thistle caterpillar photo by Wayne J. Ohnesorg**

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