Corn rootworm (CRW) is a pest that, if left unmanaged, can cause economic damage in most of the Corn Belt. Damage can result from root feeding while they are in larval form and from adult beetles clipping silks during pollination.

### Corn Rootworm (CRW) Management

<table>
<thead>
<tr>
<th>Species</th>
<th>Life Cycle</th>
<th>Management Concerns</th>
<th>Memory Trick</th>
</tr>
</thead>
</table>
| Northern Corn Rootworm       | • One generation per growing season  
Diabrotica barberi                     | Caution: Extended diapause — can stay dormant for multiple growing seasons             | Green beetles — Green Bay Packers are from way up NORTH                      |
| Western Corn Rootworm        | • One generation per growing season  
Diabrotica virgifera virgifera          | Caution: First-year corn is at risk due to the host of crops where eggs can be laid  
Populations Demonstrating Resistance  
1. Cry3Bb1 (Yieldgard CRW)  
2. mCry3A (Agrisure CRW)  
3. Cry34Ab1/35Ab1 (Herculex CRW) | Stripes look like the beetle has been branded by a cowboy out WEST                     |
| Southern Corn Rootworm       | • Multiple generations per growing season  
Diabrotica undecimpunctata howardi    | Rarely causes economic damage in the northern Corn Belt  
Known alias: Spotted cucumber beetle | Beetles have spots — everybody has a favorite vacation SPOT down SOUTH         |

- Beetles are attracted to, and feed on, pollen and corn silks. Females lay egg clusters at the base of the plant. The female will return to feed on silks and pollen until frost kills off both sexes.
- Eggs have a period of suspended development called diapause that prevents hatching during the winter or during dry periods when energy sources are scarce. After dormancy, when soil temperatures reach above 52° F, eggs will begin to develop. Rootworm larvae hatch after 680 to 770 GDUs accumulation in the spring.

**Tip:** When you start seeing lightning bugs at night is when corn rootworm larvae feeding usually begins.

- After the larvae emerge, they go through three instars defined by the length of the larva. NCRW and WCRW usually require four to eight weeks to finish the third instar. In SCRW in only takes two to three weeks to develop through the third instar.
- Most economic damage to corn occurs in the root systems during the larval stage.

### Corn Rootworm Larva

<table>
<thead>
<tr>
<th>Instar Stage</th>
<th>Size</th>
<th>Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Stage</td>
<td>&lt; 1/8 in.</td>
<td>Larvae feed mainly on the root hair and outer root tissues</td>
</tr>
<tr>
<td>2nd Stage</td>
<td>&lt; 1/8 in. to 3.8 in.</td>
<td>Larvae begin to feed on larger roots and can burrow into them and continue to feed</td>
</tr>
<tr>
<td>3rd Stage</td>
<td>3.8 in.+</td>
<td>Larvae begin to kill nodal roots</td>
</tr>
</tbody>
</table>
Root damage due to larval feeding may cause plants to show signs of nutrient or drought stress. In severe cases, the plant will remain short and enter reproductive growth early. Pollen shed and silk elongation take massive amounts of water, and the reproductive efficiency of corn suffers, ultimately reducing yield. After the third instar the larvae go through pupation, then adult CRW beetles emerge from the soils.

Adults feed on the silks of corn plants, and can reduce pollination, resulting in reduced kernel set and lower yield. The corn plant will continue to push silks out until the kernel is pollinated for up to about 10 days. Treatment of adult CRW beetles is usually not an effective method for reducing CRW populations, but severe cases of silk clipping occasionally warrant control. Silks clipped back to ½ in. or less with less than 50% pollination complete is cause for treatment.

Assess Damage: Three Methods
These are three strategies to assess how your rootworm control program is currently working and whether or not to make changes.

Drowning Roots
- Dig up an individual corn plant, leaving the soil around the root intact
- Soak the root ball in a bucket of water
- Raise and lower the plant in the water to loosen and remove soil
- Leave the roots in the bucket for two to three hours
- Larvae will float to the water surface. Observe the instar stage to project the immediate threat to the crop

Assign a Two-Digit Nodal Root Injury Score
- Dig up a plant and remove the soil from the roots
- Nodal roots develop in rings around the stalk — one at each node. Evaluate how many nodal and crown roots have been damaged or trimmed back by feeding within 1.5 in. of the crown. If all of the roots at one node have been pruned, assign the first digit of the score a one, if two nodes are pruned, a two
- If only a fraction of the roots are damaged, use a decimal
- A score of 1.5 means that one set of nodal roots is completely destroyed as well as half of another

The Traditional Scale

<table>
<thead>
<tr>
<th>Rating</th>
<th>Damage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No damage or only a few minor feeding scars</td>
</tr>
<tr>
<td>2</td>
<td>Feeding scars visible with no roots trimmed back within 1.5 in. of the crown</td>
</tr>
<tr>
<td>3</td>
<td>Several roots pruned back within 1.5 in. of the crown but not to the total of one complete node</td>
</tr>
<tr>
<td>4</td>
<td>One set of nodal roots completely destroyed</td>
</tr>
<tr>
<td>5</td>
<td>Two sets of nodal roots completely destroyed</td>
</tr>
<tr>
<td>6</td>
<td>Three or more nodal roots sets completely gone</td>
</tr>
</tbody>
</table>

Management:
Rootworm traits (Bt) in corn make control straightforward. Bt genes produce a protein that is toxic to CRW — the larvae must feed upon the roots to be affected by the protein. In cases of extreme pressure, consider rotating to products with a different protein, or products that express multiple proteins that control CRW.

Control methods beyond Bt traits include soil-applied insecticides and changing crop rotations to include a non-host crop.