Protecting Corn from Corn Rootworms
Corn rootworm (CRW) protection methods should be utilized in corn fields at-planting when CRW pressure is expected to be high. Potential high-pressure fields include: 1) continuous corn operations, 2) fields subject to northern corn rootworm (NCRW) extended diapause populations, and 3) fields subject to western corn rootworm (WCRW) variant populations.

At-planting control measures include rotating to non-host crops, use of a dual mode of action (MOA) bacillus thuringiensis (B.t.) protected corn product, and use of a soil applied insecticide (SAI) with a conventional corn product or in combination with a single MOA B.t. protected corn product. Depending on planting date, the efficacy of a SAI may not be sufficient to protect corn roots when CRW larvae hatch. Conventional corn products without CRW protection are the most vulnerable to CRW larval damage. If root digs indicate that CRW larvae populations are potentially damaging, farmers with the ability to irrigate or cultivate may apply a potentially effective rescue SAI treatment.

Corn Rootworm Larval Identification
The larvae pass through three developmental stages or instars before pupating to become an adult CRW beetle (Figure 1). Each instar period lasts from 7 to 10 days. The larvae are slender, cream-colored and have brown heads and a dark plate on the top side of the tail. Mature 3rd instar larvae are about 1/2-inch long. Newly hatched or 1st instar CRW larvae are very small (less than 1/8-inch long) and may go unnoticed. First identification may occur when they reach the 2nd instar.

After the 3rd instar, the pupa forms. The pupa is white, somewhat translucent, and is dormant or non-feeding. Rescue insecticidal treatments applied during the pupa stage will be of no value for control.

Root Dig Sampling Method
Depending on the region and planting date, root digging to scout for CRW larvae should be underway by late-May to mid-June. In general, 50% larval hatch occurs when soils have accumulated about 700 degree-days (base 52° F).1

After CRW larvae have hatched and are actively feeding on corn, walk through a field in a “W” formation and dig two root balls at the end of each W leg for a total of 10 corn root balls. Carry the roots out of the field to a convenient location and place them into a bucket of water for washing. If corn rootworm larvae are present they should float to the surface. Early instars are small and can be easily mistaken for debris.

Economic Threshold
There is no established economic threshold for CRW larvae; however, agronomists have advised applying rescue treatments if there are 2 or 3 CRW larvae per plant.2

Rescue Treatment Options
Insecticides can be applied through an irrigation pivot (preferred) or by making lay-by cultivator applications (least effective). Regardless of application method, ample water by irrigation or rainfall is required to move the applied insecticide to the root zone.

Lay-by cultivator applied insecticide granules or spray should be applied to both sides of the corn row ahead of the cultivator equipment to allow for 2 to 3 inches of soil to cover the insecticide. If insecticides are applied through sprinkler irrigation equipment (chemigation), apply enough water to wet the root zone to the depth CRW control is needed. If soils are wet, allow enough soil drying to occur such that an application using a minimum amount of water will not produce surface runoff.

Labeled rescue insecticides for CRW control include those outlined on the next page and possibly others. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.
**Precept® Insecticide** (Restricted Use Pesticide)
Active ingredient: terbufos
Rate: 4-5 oz/1000 row ft
Application Method: cultivation
Other Information: Apply when CRW larvae activity is first observed. Application should be within 30 days of seedling emergence. Do not apply unless it can be incorporated. If an application was made at planting, do not apply a cultivator or post emergence treatment as only one application can be made per crop year.

**Cobalt® Insecticide or Cobalt® Advanced Insecticide** (Restricted Use Pesticides)
Active ingredients: Cobalt® Insecticide: chlorpyrifos and gamma cyhalothrin; Cobalt® Advanced Insecticide: chlorpyrifos and lambda-cyhalothrin
Rate: Cobalt® Insecticide (38-42 fl oz/acre)
Rate: Cobalt® Advanced Insecticide (32-42 fl oz/acre)
Application Methods: Cultivation and Chemigation
Other Information: A cultivation application of either product may be made in addition to an at-planting application of Lorsban® 15G insecticide. Application timing should coincide with 2nd instar larvae.

**Counter® 15G or Counter® 20G** (Restricted Use Pesticides)
Lock’n Load® and SmartBox® Systems
Active ingredient: terbufos
Rate: Counter® 15G (8 oz/1000 row ft)
Rate: Counter® 20G (6 oz/1000 row ft)
Application Method: cultivation
Other Information: If application of either insecticide is made at planting, do not make post emergence or cultivation time treatments. Do not graze or cut for forage within 30 days of treatment. ALS-inhibiting herbicides should not be used if Counter® 15G or Counter® 20G were applied at the time of planting. Counter® 15G or Counter® 20G may be applied 7 days after application of ALS-inhibiting herbicides.

**Force® 3G Insecticide** (Restricted Use Pesticide)
Conventional and SmartBox® Systems
Active ingredient: tefluthrin
Rate: 4-5 oz/1000 row ft
Application Method: cultivation
Other Information: Application should be within 30 days of seedling emergence. Apply when CRW larvae activity is first observed. If Force® 3G is used at-planting, do not apply a cultivator or post emergence treatment as only one application can be made per crop year.

**Lorsban® 4E, Govern® 4E, Hatcher®, Warhawk®, Yuma® 4E** (Restricted Use Pesticides)
Active ingredient: chlorpyrifos phosphorothioate
Rate: 2 pts/acre
Application Methods: cultivation and chemigation
Other Information: A cultivation application of Lorsban® 4E, Govern® 4E, Hatcher®, Warhawk®, or Yuma® 4E may be made in addition to an at-planting application of Lorsban® 15G. Pre-harvest interval of 21 days before harvest of grain, ears, forage, or fodder.

**Lorsban® 15G** (Restricted Use Pesticide)
Conventional and SmartBox® Systems
Active ingredient: chlorpyrifos
Rate: 8 oz/1000 row ft
Application Method: cultivation
Other Information: Pre-harvest interval of 35 days for grain. Do not allow meat or dairy animals to graze in treated areas or harvest treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not feed treated corn fodder to meat or dairy animals within 35 days after last treatment.

**Thimet® 20-G** (Restricted Use Pesticide)
Lock’n Load®, EZ Load®, and SmartBox® Systems
Active ingredient: phorate
Rate: 4.5 - 6.0 oz/1000 row ft
Application Method: cultivation
Other Information: Do not harvest, graze, or cut forage within 30 days of last treatment. If used at-planting, do not apply a cultivator or post emergence treatment as only one application can be made per crop year.

**Follow Up**

Fields that require a rescue treatment are probably candidates for adult management as well. Be sure to continue scouting and managing adults as the season progresses to help ensure lower CRW pressures not only for this season, but the next growing season as well.

**Sources:**

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For additional resources on this topic, contact your local seed representative or visit your seed brand website.

**Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. SOME OF THE PRODUCTS DISCUSSED HEREIN MAY BE RESTRICTED USE PESTICIDES. Precept® Insecticide is a restricted use pesticide and is not registered in all states. The distribution, sale, or use of an unregistered pesticide is a violation of federal and/or state law and is strictly prohibited. Check with your local Monsanto dealer or representative for the product registration status in your state. Tank mixtures: The applicable labeling for each product must be in the possession of the user at the time of application. Follow applicable use instructions, including application rates, precautions and restrictions of each product used in the tank mixture. Monsanto has not tested all tank mix product formulations for compatibility or performance other than specifically listed by brand name. Always predetermine the compatibility of tank mixtures by mixing small proportional quantities in advance. Precept® is a trademark of Monsanto Technology LLC. Some of the product(s) discussed herein are restricted use pesticides and may not be registered in all states. The distribution, sale, or use of an unregistered pesticide is a violation of federal and/or state law and is strictly prohibited. Check with your local dealer or product representative for the product registration status in your state. Genuity® and Precept® are registered trademarks of Monsanto Technology LLC. All other trademarks are the property of their respective owners. ©2016 Monsanto Company. 130607023015 03142016LGM