INSECT RESISTANCE MANAGEMENT STEWARDSHIP GUIDE
U.S. CORN AND COTTON-GROWING AREAS
A strong stewardship program is essential for protecting and preserving the long-term value of insect-protected trait technology. Syngenta provides responsible agriculture programs and information regarding the safe handling and storage of product.
GAME-CHANGING INNOVATION

The Agrisure® traits portfolio offers a range of technologies that help manage production challenges and protect genetic yield potential.

Agrisure® Artesian® corn hybrids maximize yield when it rains, and increase yield when it doesn’t. These elite hybrids convert water to grain more efficiently than other hybrids and represent a simple, effective way to help manage the unpredictability of weather. Available in combination with best-in-class insect control and herbicide tolerance traits, Artesian™ corn hybrids can help improve yield stability and consistency on virtually any corn acre.

Agrisure® Duracade® trait stacks offer the ultimate combination—the latest insect control traits in a wide choice of diverse, high-yielding elite genetics with a simple, 5% integrated E-Z Refuge® seed blend. Agrisure Duracade protects yield potential by controlling Western, Northern and Mexican corn rootworm. It offers a unique protein and multiple modes of action making it a key component in a corn rootworm management program.

Agrisure® Viptera® trait stacks provide the most comprehensive above-ground corn insect control, reducing insect feeding damage to ears and the subsequent development of molds and mycotoxins that result from the damage, to protect the quality of grain.

Products with the E-Z Refuge® seed bleed offer an integrated single-bag refuge to help meet grower demand for increased convenience. They provide dual modes of action on key pests and are designated by “E-Z Refuge” at the end of the trait stack name.
**WHAT’S IN A (TRAIT STACK) NAME?**

<table>
<thead>
<tr>
<th>Agrisure</th>
<th>Duracade</th>
<th>5</th>
<th>2</th>
<th>2</th>
<th>2</th>
<th>A</th>
<th>E-Z Refuge</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASTER BRAND</td>
<td>SUFFIX</td>
<td>TECHNOLOGY SERIES</td>
<td>BROAD LEPIDOPTERAN TRAIT</td>
<td>CORN BORER TRAIT</td>
<td>CORN ROOTWORM TRAIT</td>
<td>AGRISURE ARTESIAN HYBRID</td>
<td>INTEGRATED, SINGLE-BAG REFUGE</td>
</tr>
</tbody>
</table>

- The **brand suffix** changes as new technologies are introduced.
- The **technology series** is indicated by the first number.
- The **last three numerical identifiers** represent the number of modes of action in each hybrid for broad lepidopteran, corn borer and corn rootworm control.
- The **letter A** indicates that the hybrid is a water-optimized Agrisure Artesian hybrid.
- The **E-Z Refuge** descriptor follows the trait stack numerical identifiers for hybrids that are available as integrated, single-bag refuge products which contain 95 percent seed of a corn hybrid containing the trait stack and 5 percent seed of a hybrid without insect control traits.

*Note: The naming system does not apply to Agrisure 3000GT.*
A strong stewardship program is essential for helping to protect and preserve the long-term value of Agrisure trait technology. Embracing this responsibility provides growers with ongoing choices and helps to ensure they remain good stewards of the land.

**Prior to planting corn hybrids with Agrisure traits**, you are required to sign a Syngenta Seeds, LLC Stewardship Agreement. This agreement outlines the terms and conditions of growing hybrids with Agrisure traits, including the terms of a limited license under Syngenta’s intellectual property, compliance with Environmental Protection Agency (EPA)-mandated IRM programs and grain channeling requirements. **Deadline to have all completed agreements to Syngenta is August 15th, annually.**

Agreements may be sent using the following four methods:

**ONLINE**
WWW.AGCELERATE.COM
Click on Register or Login
For support using the AgCelerate tool, please call AgCelerate Customer Service at 1-866-784-4630
► Easy to sign and use
► Reduces paperwork
► Simple way for growers to manage their technology agreements across all trait providers

**ELECTRONIC STATEMENT**
Electronic signatures will only be accepted through agcelerate.com. Any other forms of electronic signatures will be rejected.

**EMAIL**
GLG@KONNERTHCONSULTING.COM

**FAX**
800-643-8350

**MAIL**
Your Local Supplier or
Konnerth Consulting Attn: Stewardship
PO Box 316
New Melle, MO 63365

Only use one method; originals are not required. It is important that you keep a copy of the Syngenta Seeds, LLC Stewardship Agreement for your records.
If you have questions regarding the Stewardship Agreement or how to submit the form, please call 877-GRO-CORN (877-476-2676).
WHY PLANT A REFUGE?

Bacillus thuringiensis (Bt) proteins are toxic to specific pests such as the European corn borer (ECB or CB) and the corn rootworm (CRW or RW). As the number of acres exposed to these Bt products increases, so does the potential for target insect pests to develop a resistance to Bt traits. Therefore, in order to preserve this technology now and into the future, an Insect Resistance Management (IRM) plan was developed.

A major component of an IRM plan is to plant a refuge. The EPA requires a refuge on every farm that plants Bt corn hybrids. The EPA requires companies that market Bt corn hybrids to have structured refuge requirements and conduct a grower compliance program. IRM education and compliance are uniform across the U.S. corn industry to ensure a consistent IRM message.

REFUGE STRATEGY – HOW IT WORKS

The refuge maintains a population of insect pests susceptible to the Bt proteins produced in insect-protected Bt corn. These susceptible pests mate with any insect pests that are resistant to the Bt proteins. Susceptibility is then passed on to offspring, helping preserve the long-term effectiveness of insect-protected Bt corn products.

The U.S. Environmental Protection Agency (EPA) requires a refuge on every farm that plants insect-protected corn hybrids. Failure to plant the appropriate refuge jeopardizes your continued access to Agrisure technology.
INSECT RESISTANCE MANAGEMENT (IRM)

IRM COMPLIANCE ASSURANCE PROGRAM
Syngenta and other industry registrants have cooperatively developed the EPA-mandated IRM Compliance Assurance Program. This program requires corn seed companies to evaluate the extent to which growers are adhering to the IRM requirements and ensure that those who do not are brought back into compliance. Growers who do not meet IRM requirements for two years within a five-year period will be denied access to hybrids with Agrisure insect-protected traits in the third year as mandated by the EPA.

ON-FARM ASSESSMENTS
As part of the product registration with the EPA, Syngenta and other seed companies are required to conduct IRM assessments to help ensure growers are planting the correct refuge on their farms. Growers are selected using a set of risk-based criteria, and assessed with a series of questions that must be conducted in person with the grower or their representative. Following each on-farm assessment, it will be determined if the grower is in compliance.

All trait providers are required to participate and contract a third-party company to complete all assessments during the growing season (June – September).

Growers found to be out of compliance with the refuge requirements jeopardize their access to Bt corn products. They will receive a letter informing them of their compliance infraction, reminding them of their compliance obligations and the consequences of not adhering to the requirements. Included in each letter will be further information on how to develop and implement a suitable IRM program for their farm. Additionally, any grower found to be out of compliance will receive a follow-up IRM assessment the next growing season.

IRM TIP LINE
If you have any seed stewardship questions or become aware of individuals not following proper IRM practices as noted in this guide, please call the tips and complaints toll-free phone line at 1-877-GRO-CORN (1-877-476-2676).

Growers are encouraged to scout their fields. If unexpected damage is observed, please contact your seed reseller or company representative.
**CORN REFUGE REQUIREMENTS**

Size requirements are based on geography and product.

- **5% or 20% Refuge - Corn Growing Areas**
- **20% or 50% Refuge - Cotton Growing Areas**

The following states and counties are considered corn-growing areas, represented by light green shading:

- Alaska
- Arizona
- California
- Colorado
- Connecticut
- Delaware
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri (all counties except Dunklin, New Madrid, Pemiscot, Scott, & Stoddard)
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Dakota
- Ohio
- Oklahoma (all counties except Beckham, Caddo, Comanche, Custer, Greer, Harmon, Jackson, Kay, Kiowa, Tillman, & Washita)
- Oregon
- Pennsylvania
- Rhode Island
- South Dakota
- Tennessee (all counties except Carroll, Chester, Crockett, Dyer, Fayette, Franklin, Gibson, Hardeman, Hardin, Haywood, Lake, Lauderdale, Lincoln, Madison, Obion, Rutherford, Shelby, & Tipton)
- Texas (all counties except Carson, Dallam, Hanford, Hartley, Hutchinson, Lipscomb, Moore, Ochiltree, Roberts, & Sherman)
- Washington
- West Virginia
- Wisconsin
- Wyoming

The following states and counties are considered cotton-growing areas, represented by blue shading:

- Alabama
- Arkansas
- Florida
- Georgia
- Louisiana
- Mississippi
- Missouri (only the counties of Dunklin, New Madrid, Pemiscot, Scott, & Stoddard)
- North Carolina
- Oklahoma (only the counties of Beckham, Caddo, Comanche, Custer, Greer, Harmon, Jackson, Kay, Kiowa, Tillman, & Washita)
- South Carolina
- Tennessee (only the counties of Carroll, Chester, Crockett, Dyer, Fayette, Franklin, Gibson, Hardeman, Hardin, Haywood, Lake, Lauderdale, Lincoln, Madison, Obion, Rutherford, Shelby, & Tipton)
- Texas (all counties except Carson, Dallam, Hanford, Hartley, Hutchinson, Lipscomb, Moore, Ochiltree, Roberts, & Sherman)
- Virginia (only the counties of Dinwiddie, Franklin City, Greensville, Isle of Wright, Northampton, Southampton, Suffolk City, Surrey, & Sussex)
CORN REFUGE REQUIREMENTS

SINGLE PEST REFUGE
A single pest refuge is a field that serves solely as a refuge for above-ground pests (e.g., European corn borer) or below-ground pests (e.g., corn rootworm), but not both. The single pest refuge approach can be used for both single Bt corn products and stacked Bt corn products (also known as the Separate Refuge option).

STACKED BT CORN PRODUCTS (E.G., AGRISURE VIPTERA® 3111)

COMMON REFUGE
A common refuge is a field or area of corn that serves as a refuge for both above-ground pests (e.g., European corn borer) and below-ground pests (e.g., corn rootworm) at the same time. The refuge can be within the Bt field or immediately adjacent to it.

STACKED BT CORN PRODUCTS (E.G., AGRISURE® 3000GT)
**CORN REFUGE REQUIREMENTS**

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>SIZE REQUIREMENT (CORN-GROWING REGION)</th>
<th>SIZE REQUIREMENT (COTTON-GROWING REGION)</th>
<th>DISTANCE REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrisure® 3000GT</td>
<td>20%</td>
<td>50%</td>
<td>Within or adjacent¹</td>
</tr>
<tr>
<td>Agrisure® 3010</td>
<td></td>
<td>20%</td>
<td>Within, adjacent, or up to 1/2 mile away</td>
</tr>
<tr>
<td>Agrisure® Viptera® 3110</td>
<td></td>
<td>5%</td>
<td>Within, adjacent, or up to 1/2 mile away</td>
</tr>
<tr>
<td>Agrisure® Viptera® 3111</td>
<td></td>
<td>20%</td>
<td>Within or adjacent¹</td>
</tr>
<tr>
<td>Agrisure® 3120</td>
<td>5%</td>
<td>20%</td>
<td>Within, adjacent, or up to 1/2 mile away</td>
</tr>
<tr>
<td>Agrisure® 3122</td>
<td></td>
<td>20%</td>
<td>Within or adjacent¹</td>
</tr>
<tr>
<td>Agrisure® Viptera® 3220</td>
<td>No additional refuge required</td>
<td>No additional refuge required</td>
<td>No additional refuge required</td>
</tr>
<tr>
<td>Agrisure® 3220 E-Z Refuge*</td>
<td>20% supplementa l refuge</td>
<td>Within, adjacent, or up to 1/2 mile away²</td>
<td></td>
</tr>
<tr>
<td>Agrisure® 3122 E-Z Refuge*</td>
<td>20% supplementa l refuge¹</td>
<td>Within or adjacent²</td>
<td></td>
</tr>
<tr>
<td>Agrisure® Viptera® 3320</td>
<td></td>
<td>20%</td>
<td>Within, adjacent, or up to 1/2 mile away²</td>
</tr>
<tr>
<td>Agrisure® Duracade® 5122</td>
<td></td>
<td>20% supplementa l refuge¹</td>
<td>Within or adjacent²</td>
</tr>
<tr>
<td>Agrisure® Duracade® 5222</td>
<td></td>
<td>20%</td>
<td>Within or adjacent²</td>
</tr>
</tbody>
</table>

Refuge size is calculated by applying the appropriate percentage (e.g., 20%, 50%) to the TOTAL CORN ACRES.

¹ Assumes a common corn borer and rootworm refuge. Alternatively, a separate rootworm refuge within or adjacent to the Bt field and a corn borer refuge up to 1/2 mile away could be planted.

² Only applicable in the cotton-growing region where a supplemental 20% refuge is required for this product.

These products may be offered as Agrisure Artesian® corn hybrids, which convert water to grain more efficiently. Artesian® corn hybrids are designated by an ‘A’ at the end of the trait stack name. These products have the same refuge requirements as their non-Artesian counterparts listed above.

The Agrisure® 3010 trait stack was previously sold as Agrisure® GT/CB/LL.

Important: Always read and follow label and bag tag instructions; only those labeled as tolerant to glufosinate may be sprayed with glufosinate ammonium-based herbicides. LibertyLink®, Liberty® and the Water Droplet logo are registered trademarks of BASF Corporation. HERCULEX® and the HERCULEX Shield are trademarks of Dow AgroSciences, LLC. HERCULEX Insect Protection technology by Dow AgroSciences. YieldGard® VT Pro™ is a trademark of Monsanto Technology LLC.
CORN REFUGE REQUIREMENTS

REFUGE PLANTING OPTIONS
Refuge can be planted as a block, strips within the field, perimeter around the field, adjacent or a separate block within 1/2 mile of the field.
- 1/2 mile option may only be used for corn borer refuge
- A neighbor’s field does NOT meet the refuge requirements

WITHIN

- BLOCK
- STRIPS (SPLIT PLANTER)
- PERIMETER

ADJACENT

- CAN BE SEPARATED BY A ROAD, PATH, DITCH, ETC., BUT NOT BY ANOTHER FIELD

1/2 MILE OPTION

- CORN BORER REFUGE OPTION ONLY

REMINDER: When calculating a refuge, the calculation must be based on total corn acres.
CORN REFUGE REQUIREMENTS

STRIP REFUGE
Four Row Minimum – Strips, blocks, or perimeter refuges must be a minimum of four contiguous rows wide to provide ample space for bug mating.

TREATMENT
Corn Borer Treatment – Non-Bt foliar insecticide treatments for corn borer control may be applied only if economic thresholds are reached for one or more pests. Economic thresholds will be determined using methods recommended by local or regional professionals (e.g., Extension Service agents, crop consultants).

Corn Rootworm Treatment – Insecticide treatments for control of corn rootworm larvae may be applied. If rootworm adults are present at time of foliar applications, then corn fields with the Agrisure trait must be treated in a similar manner as the refuge.

REFUGE MANAGEMENT
Refuge should be planted with a hybrid that is agronomically similar to and managed similar to your corn with Agrisure traits.

If a rootworm refuge is planted in a field that is in a crop rotation system, the corn hybrids with Agrisure traits must also be planted in a field that is in a crop rotation system.

If the rootworm refuge is planted on continuous corn, the corn hybrids with Agrisure traits may be planted on either continuous or in a crop rotation system.
BAG TAG LABELING

Before filling your planter, always check the bag tag to ensure you know the refuge size requirement.

Important grower information. This hybrid requires you to plant:

- **20% refuge** Corn-growing regions
- **50% refuge** Cotton-growing regions

For additional refuge planning tools please visit www.irmcalculator.com.
CALCULATING YOUR CORN REFUGE

REFUGE CALCULATOR
The National Corn Growers Association (NCGA) in collaboration with the industry has developed a free web-based calculator to help growers plan how to meet the minimum refuge requirements for each of the Bt corn products on their farm.

This calculator can be downloaded at www.irmcalculator.com.

FREE REFUGE CALCULATOR

WHY THIS FREE TOOL IS GOOD:
- Downloadable on your smartphone
- Will calculate amount of refuge needed based upon your growing area and trait(s) you’re planting
- Calculate quantity of standard seed bags to purchase
- Displays possible planting options for your products
Reminder: when calculating a refuge, the calculation must be based on total corn acres. This section outlines the right and wrong way to calculate a refuge.

Refer to this diagram for the examples provided on below.

**THE WRONG WAY TO CALCULATE**

Do **NOT** multiply the amount of Bt acres or seed by the percent of refuge required. This is **NOT** the correct minimum refuge size.

Example: 

\[ \text{Total Corn Acres} \times \text{Percent of Refuge} = \text{Refuge Acres} \]

**THE CORRECT WAY TO CALCULATE**

**START** with the **TOTAL** number of corn acres you want to plant in an area. **Multiply by the** **PERCENT** of refuge required for the Bt trait. **This is your minimum REFUGE ACRES.**

Example: 

\[ \text{A} \times \%20\% = \text{B} \]

Your Field: 

\[ \text{X} \]

**NEXT** subtract your refuge acres from your total corn acres. **This is your maximum Bt ACRES.**

Example: 

\[ \text{A} - \text{B} = \text{C} \]

Your Field: 

\[ \text{-} \]
CORN ROOTWORM
BEST MANAGEMENT PRACTICES

To effectively manage corn rootworm (CRW), implement a multiyear plan that includes a variety of tactics.

CROP ROTATION
PRODUCTS WITH MULTIPLE CRW BT TRAITS
SEED, SOIL OR FOLIAR-APPLIED INSECTICIDES

ASSESS RISK
- Did you plant the same CRW traits for consecutive years in the same fields?
- Did you notice large populations of CRW beetles?
- Did you observe root injury from CRW larvae?
- Are your fields planted to continuous corn?
CORN ROOTWORM
BEST MANAGEMENT PRACTICES

1. PLANT THE REQUIRED REFUGE

2. ROTATE CROPS
Rotate at least every third year if any of the following apply:
- In long-term continuous corn system
- CRW populations are high
- Experiencing problems with CRW trait performance

In areas where rotational-resistant CRW variants exist, such as extended diapause eggs or soybeans, CRW management options may be needed the following year.

3. ROTATE TRAITS
Use Bt hybrids with multiple modes of action for CRW control whenever possible.
If using a hybrid with multiple modes of action for CRW control is not an option, rotate to a different Bt-traited hybrid that controls CRW.
Use a non-Bt-traited hybrid with insecticide.

MANAGE CRW WITH INSECTICIDES

Adult CRW Management Considerations
Scout fields for CRW adults during silking stage (typically July and August) as adult CRW beetles feed on corn silks and may reduce yield.
Foliar sprays may be an option if CRW beetle populations reach an economic threshold for damage (~1 beetle per plant).1
Follow university extension service or local crop consultant recommendations for products, rates and proper timing of adult spray applications for reducing CRW beetle populations.
Multiple sprays may be necessary.

Larval CRW Management Considerations
The application of an insecticide to the soil surface, in furrows, and/or incorporated into the soil (referred to as “soil-applied insecticide,” “soil insecticide” or “SAI”) is not recommended for control of CRW in Bt-traited corn hybrids except under limited circumstances.
Consult with extension, consultants or other local experts for recommendations when considering a combination of CRW traits and soil-applied insecticides.
SAIs should not be necessary for CRW control with pyramided CRW-traited Bt corn hybrids.

FURTHER ASSISTANCE

Stewardship Information
www.greenleafgenetics.com and click under Stewardship

Stewardship Support and IRM Tips Line
1-877-GRO-CORN (1-877-476-2676)

Stewardship Support and Agreement Submission
glg@konnerthconsulting.com

Regulatory and Market Status of Agricultural Biotechnology Products
www.biotradestatus.com

Take Action Education Platform
www.IWillTakeAction.com

Agrisure Duracade Support
844-559-1500 or duracade@gavilon.com