



2018 INSECT RESISTANT MANAGEMENT STEWARDSHIP GUIDE

U.S. CORN AND COTTON-GROWING AREAS



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Protect and Preserve

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.

CORN

Game-Changing Innovation

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

Agrisure Artesian®

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 Viptera®

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.

Agrisure Duracade®

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 managment program.

Agrisure® Traits | E-Z Refuge products

E-Z Refuge® products offer an integrated seed blend to help meet grower demand for increased convenience. This provides 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?



The **brand suffix** changes as new technologies are introduced.

The **technology series** is indicated by the first number. The 3 technology series represents herbicide tolerance and the 5 technology series represents Agrisure Duracade.

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.

Grower Stewardship Agreement

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 into Syngenta is August 15th, 2018.

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

E-mail

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).



SYNGENTA SEEDS, LLC STEWARDSHIP AGREEMENT	
GROWER INFORMATION - Complete Section A OR Section B	
PLEASE PRINT CLEARLY	
Section A - For Individual (Sole Proprietorship) Grower	
Grower Name (Last First MI): _____	
Farming or "Doing Business As" (d/b/a/ Name): _____	
Address: _____ State: _____ Zip Code: _____	
City: _____ County: _____	
Business Phone: _____	
E-mail Address: _____	
Customer ID # (optional): _____	
Technology # (optional): _____	
Section B - For Business Entity Grower	
Business Name: _____	
Business Type (Check One):	
<input type="checkbox"/> Corporation <input type="checkbox"/> Limited Liability Company (LLC)	
<input type="checkbox"/> Partnership	
<input type="checkbox"/> Other - please specify: _____	
Principle Place of Business:	
Address: _____ State: _____ Zip Code: _____	
City: _____ County: _____	
Business Phone: _____	
Customer ID # (optional): _____	
Technology # (optional): _____	
Authorized Representative Name: _____	
E-mail Address: _____	
OFFICE USE ONLY	
Reseller Name: _____	
Reseller Number: _____	
Reseller Phone: _____	
Third Party Syngenta Licensee: _____	
Return Agreement using one of the methods below:	
Please keep a copy for your files.	
Mail:	
Syngenta Seeds, LLC, Attn: Stewardship	
2105 Wyovata Blvd.	
Minnetonka, MN 55305	
Fax: 1-800-858-3664, or email: syngenta.stewardship@syngenta.com	
STEWARDSHIP	
Grower agrees to read and comply with the provisions of the most current Insect Resistance Management Stewardship Guide ("Stewardship Guide"), as it may be unilaterally amended by Syngenta from time to time via paper or electronic means or by modification to www.syngentaseeds.com , or such other website as Syngenta may designate from time to time (the "Agrisure Website"), which is incorporated into and is a part of this Agreement. Syngenta may also unilaterally amend this Agreement to add or remove technologies included in the Licensed Technologies or to modify the list of the crops or plants to be defined below and third party licensors, by modification of the form Syngenta Seeds, LLC Stewardship Agreement on the Agrisure Website. Grower's use of the Licensed Technologies after posting of such form or Stewardship Guide further confirms Grower's agreement and consent to be bound by the new form of agreement and Stewardship Guide.	
This Agreement, once signed by Grower and provided to Syngenta, will remain in effect until terminated by Grower or Syngenta. This Agreement (including the most current Stewardship Guide and Form), together with the terms on the label of packaging containing seed products, constitute the entire agreement between Grower and Syngenta regarding the subject matter hereof and all prior negotiations and understandings between the Grower and Syngenta with respect to such subject matter are hereby superseded. Any prior stewardship agreements between Grower and Syngenta are hereby superseded.	
GROWER'S LIMITED USE LICENSES	
Grower acknowledges that the DAS Technologies are protected under one or more of the following U.S. patents: 6,573,240; 6,737,270; 6,218,188; 5,518,860; 5,518,877; 5,483,820; 5,503,328; 5,484,418; 6,103,670; 6,133,240; 5,550,474; 6,000,180; 6,037,380; 6,048,210; 6,048,212; 6,034,400; 6,040,019; 6,018,870; 6,038,400; 6,002,128 (collectively referred to as the "DAS Patents").	
Grower acknowledges that the Genesys RBZ Technology and RBZ Xtend Technologies are protected under one or more of the following U.S. patents: 5,737,084; 5,728,029; 6,049,090; 7,443,722; 7,408,781; 7,462,285; 7,812,224; 7,838,726; 7,884,262; 8,119,380; 8,501,407; 8,629,323 and RE 39,247 (collectively referred to as the "Monocult Patents").	
Grower acknowledges that the LibertyLink Technologies are protected under one or more of the following U.S. patents: 7,112,065; 5,648,024; 5,561,236; 5,508,830; and 5,739,082 and may also be subject to other intellectual property rights (hereinafter referred to as the "Bayer Patents").	
The DAS Patents, the Monocult Patents, the Bayer Patents, and the patents, patent applications, and PVPs owned or controlled by Syngenta and/or its affiliates which cover the Agrisure Technologies and the Genesys Technologies are collectively referred to as the "Patents".	
Revised 7/20/2018 For use in the United States only Page 1 of 2	

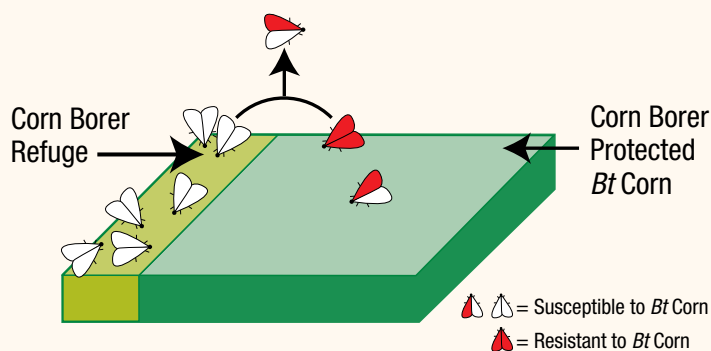
Why Plant A Refuge?

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.



Planting Refuges, Preserving Technology

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) is a series of production practices that delay or prevent pests from developing resistance to *Bt* 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.

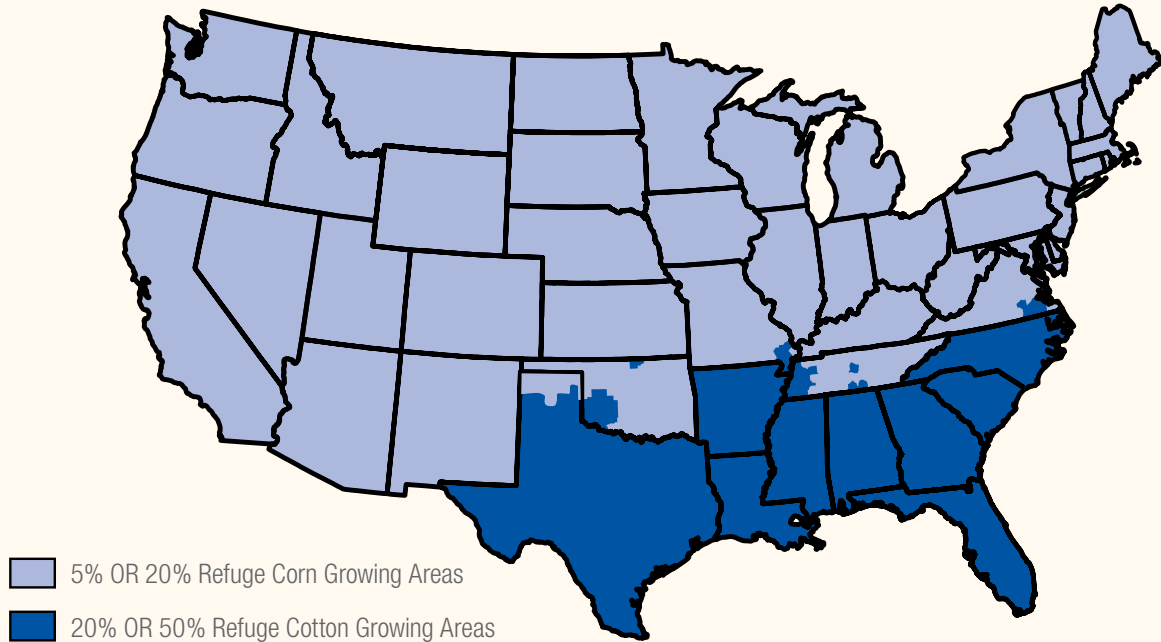
IRM Tip Line

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



The following states and counties are considered corn-growing areas. Represented by light blue shading.

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

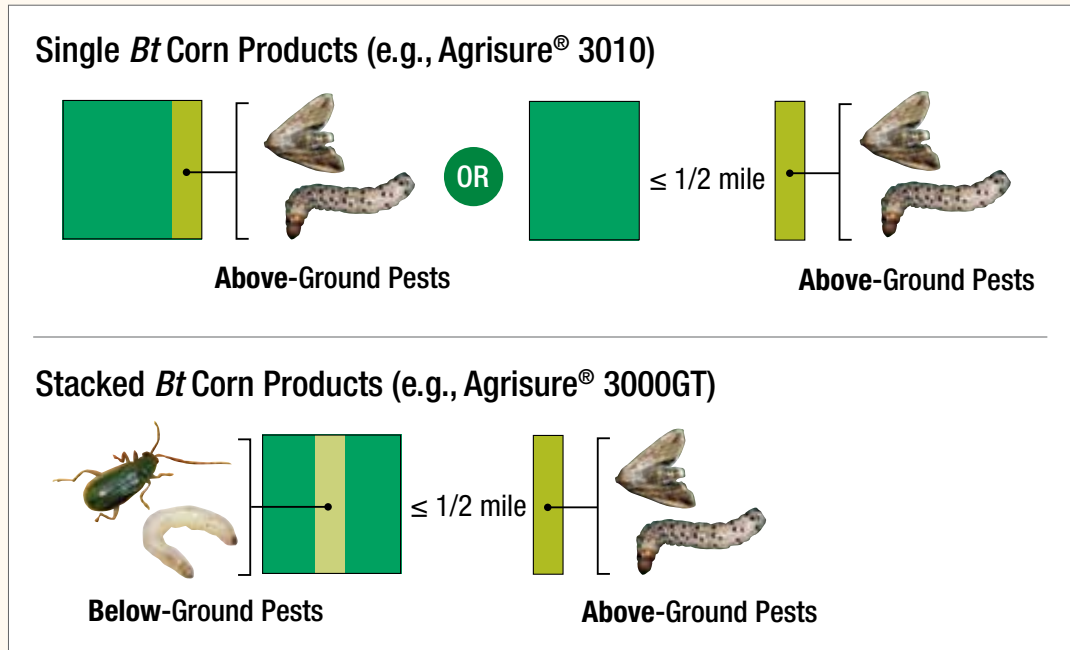
The following states and counties are considered cotton-growing areas. Represented by dark blue shading.

Alabama	North 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, Greenville, Isle of Wright, Northampton, Southampton, Suffolk City, Surrey, & Sussex)
Arkansas	Oklahoma (only the counties of Beckham, Caddo, Comanche, Custer, Greer, Harmon, Jackson, Kay, Kiowa, Tillman, & Washita)			
Florida				
Georgia	South Carolina			
Louisiana				
Mississippi				
Missouri (only the counties of Dunklin, New Madrid, Pemiscot, Scott, & Stoddard)				

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).














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.




Corn Refuge Requirements

Product	Size Requirement (Corn-growing Region)	Size Requirement (Cotton-growing Region)	Distance Requirements
 Agrisure 3010	20%	50%	Within, adjacent, or up to 1/2 mile away
 Agrisure Artesian[®] 3010A	20%	50%	Within, adjacent, or up to 1/2 mile away
 Agrisure Artesian[®] 3011A	20%	50%	Within or adjacent ¹
 Agrisure 3000GT	20%	50%	Within or adjacent ¹
 Agrisure Viptera[®] 3110	20%	20%	Within, adjacent, or up to 1/2 mile away
 Agrisure Viptera[®] 3111	20%	20%	Within or adjacent ¹
 Agrisure Viptera[®] 3220 E-Z Refuge [®]	No additional refuge required	20% supplemental refuge	Within, adjacent, or up to 1/2 mile away ²
 Agrisure 3120 E-Z Refuge [®]	No additional refuge required	20% supplemental refuge	Within, adjacent, or up to 1/2 mile away ²
 Agrisure 3122 E-Z Refuge [®]	No additional refuge required	20% supplemental refuge ¹	Within or adjacent ²
 Agrisure Duracade[®] 5122 E-Z Refuge [®]	No additional refuge required	20% supplemental refuge ¹	Within or adjacent ²
 Agrisure Duracade[®] 5222 E-Z Refuge [®]	No additional refuge required	20% supplemental refuge ¹	Within or adjacent ²

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.

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



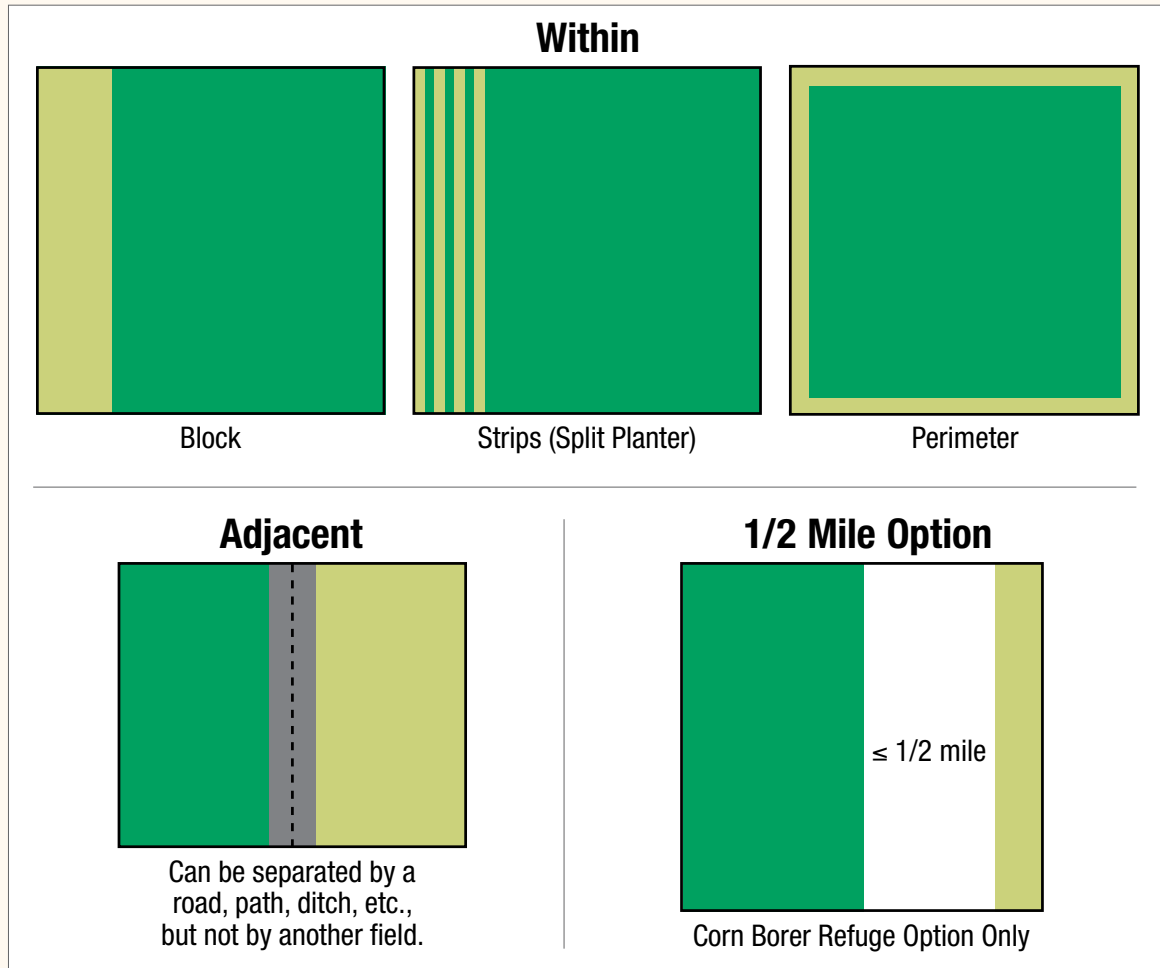
Important: Always read and follow label and bag tag instructions. Consult bag tags for E-Z Refuge product herbicide options. Only those labeled GT/LL may be sprayed with glufosinate ammonium based herbicides. LibertyLink[®], Liberty[®] and the Water Droplet logo are registered trademarks of Bayer. HERCULEX[®] and the HERCULEX Shield are trademarks of Dow AgroSciences 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 a ½ mile of the field.

- ½ mile option may only be used for corn borer refuge
- A neighbor's field does NOT meet the refuge requirements



Reminder: when calculating a refuge, the calculation must be based on total corn acres.

Corn Refuge Requirements

Strip Refuge

4 Row Minimum – Strips, blocks, or perimeter refuges must be a minimum of 4 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.

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.

Calculating Your Corn Refuge

Refuge Calculator

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 smart phone
- 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



Scan this QR code to start planning your refuge today.

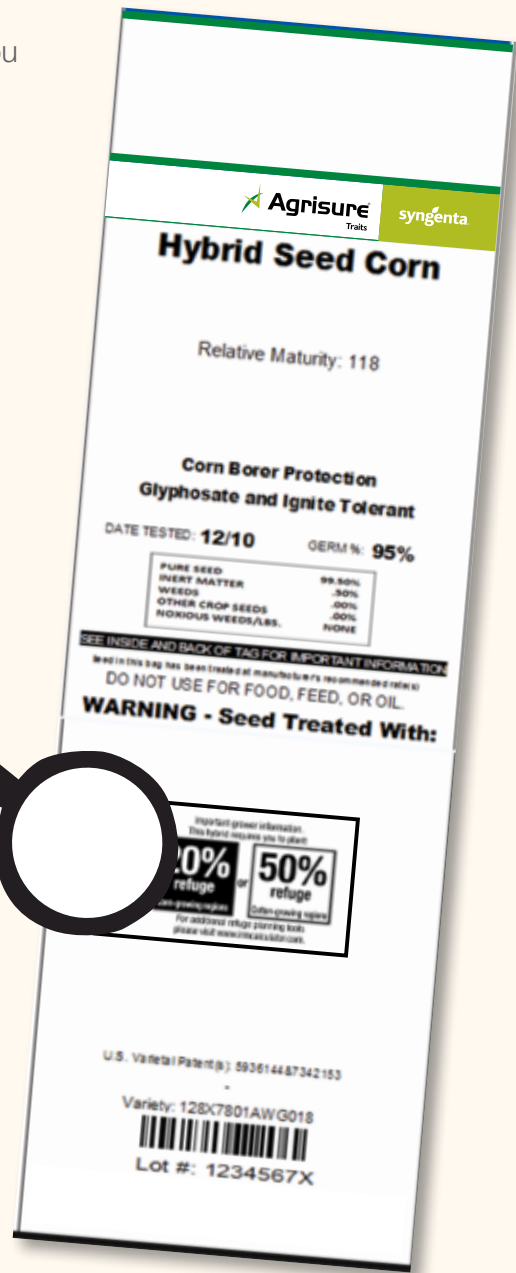
Bag Tag Labeling

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	or	50% refuge
Corn-growing regions		Cotton-growing regions

For additional refuge planning tools
please visit www.irmcalculator.com.



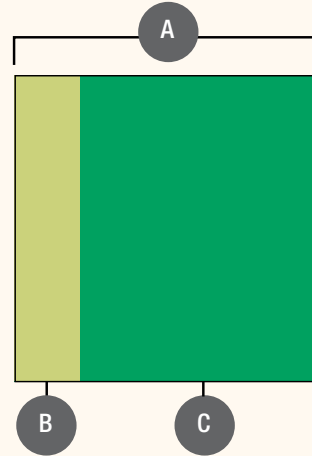
Calculating IRM Refuge Size

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 page 15.

- A** Total Corn Acres*
- B** Refuge Acres
- C** *Bt* Acres
- %** Percent of Required Refuge – Based on total corn acres

* Includes all corn acres that are infield or adjacent to each other and will be allocated to the *Bt* product and its associated refuge



The Wrong Way to Calculate

(Example shown is for a 20% refuge product where the grower plans to plant 160 acres of *Bt* corn)

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 $\text{C } 160 \times \% 20\% = \text{B } 32$

The Correct Way to Calculate

(Example shown is for a 20% refuge product where the grower plans to plant 200 acres of total corn)

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 $\text{A } 200 \times \% 20\% = \text{B } 40$ ✓

Your Field $\text{ } \times \text{ } = \text{ }$

NEXT subtract your refuge acres from your total corn acres.

This is your maximum ***Bt* ACRES**.

Example $\text{A } 200 - \text{B } 40 = \text{C } 160$

Your Field $\text{ } - \text{ } = \text{ }$

CORN ROOTWORM BEST MANAGEMENT PRACTICES



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

CROP ROTATION



PRODUCTS WITH MULTIPLE CRW *B.T.* TRAITS



SOIL, SEED OR FOLIAR-APPLIED INSECTICIDES



ASSESS RISK

- Did you plant corn rootworm traits for consecutive years in the same fields?
- Did you notice large populations of corn rootworm beetles?
- Did you observe root injury from corn rootworm larvae?
- Are your fields planted to continuous corn?



CORN ROOTWORM BEST MANAGEMENT PRACTICES



TAKE ACTION

Rotate Crops — *at least every 3rd year if any of the following:*

- In long-term continuous corn system
- Corn rootworm populations are high
- Experiencing problems with corn rootworm trait performance

In areas where rotational-resistant corn rootworm variants exist, such as extended diapause eggs or soybean, corn rootworm management options may be needed the following year

Rotate Traits

- Preferred: Switch to products with multiple corn rootworm *B.t.* traits versus single-traited products
- Do not plant the same single *B.t.*-traited product in the same field for 3 consecutive years
- If using a product with multiple corn rootworm *B.t.* traits is not an option, rotate to a different *B.t.*-traited product

Plant the Required Refuge

Manage Corn Rootworm (CRW) with Insecticide:

ADULT CRW

- Scout fields for CRW adults during silking stage (typically July and August) as adult corn rootworm beetles feed on corn silks and may reduce yield
- 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

- Prescriptive use of soil-applied insecticides may be warranted based on field/trait history and CRW populations
- A soil insecticide should be considered to protect yield on a single *B.t.*-traited product that has not performed as expected
- Soil-applied insecticides for CRW protection should NOT be necessary for products with multiple CRW *B.t.* traits

CORN ROOTWORM (CRW) MANAGEMENT PLANNING GUIDE

IS CROP ROTATION AN OPTION?

YES

Plant Different Crop — SOYBEANS



NO

Low CRW Population < 1 beetle per plant

- Utilize seed treatments *–or–*
- Plant non-*B.t.* product and use soil insecticides *–or–*
- Plant products with multiple CRW traits

High CRW Population > 1 beetle per plant

- Plant products with multiple CRW traits *–or–*
- Rotate to a different *B.t.*-traited product every 2 years *–or–*
- Plant non-*B.t.* product and use soil insecticides

All corn rootworm photos by Marlin E. Rice

Culy, Edwards & Cornelius. 1992. Journal of Economic Entomology 85: 2440-2446.

To manage larval root injury, please utilize university extension and/or your seed company representative to determine the need for soil-applied insecticides or high rate seed treatments.

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