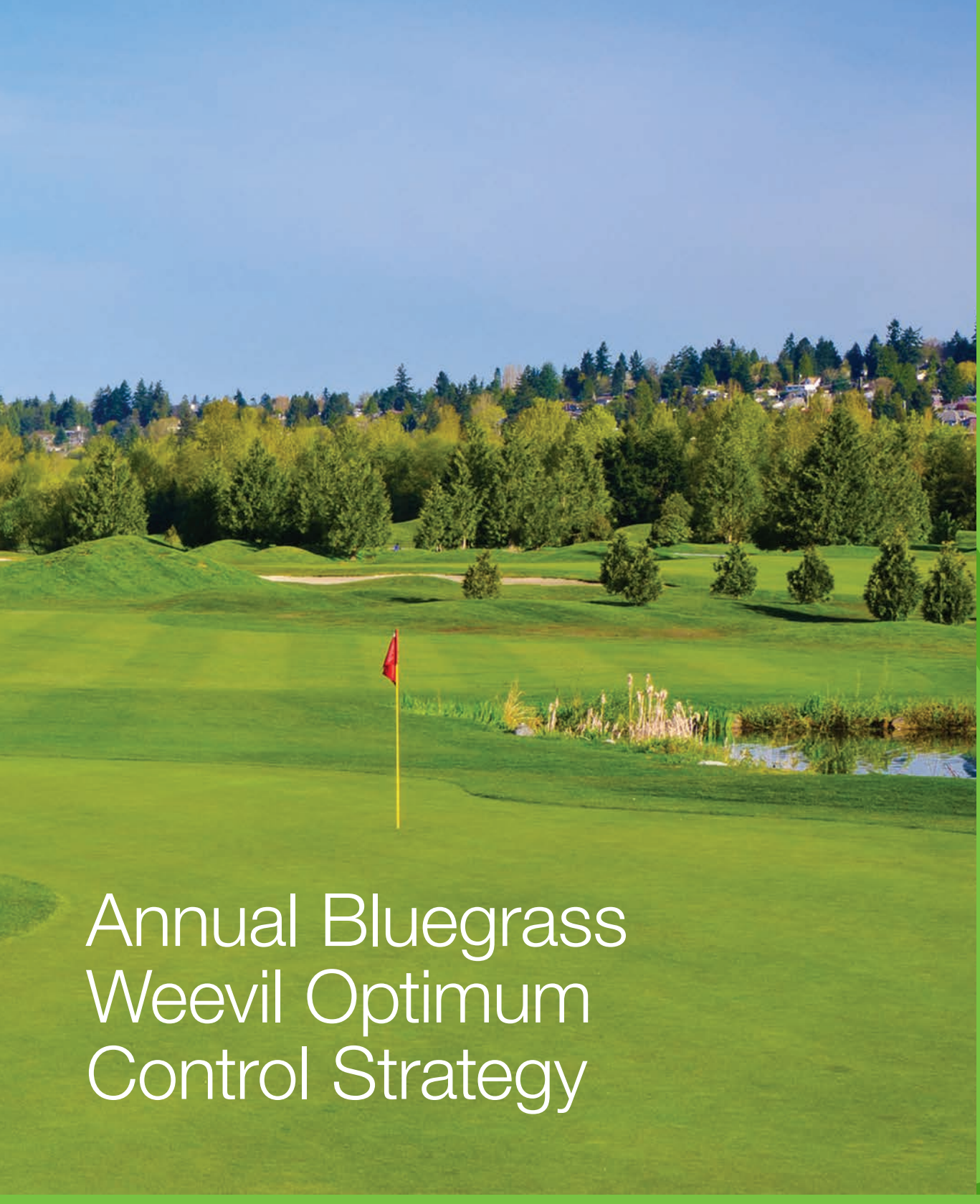


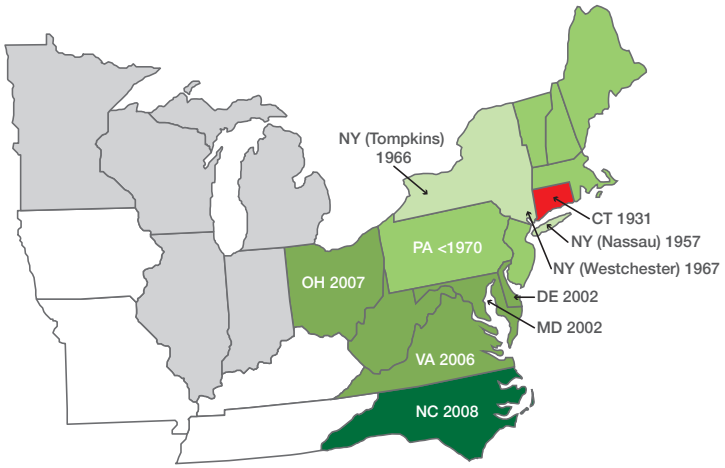
Annual Bluegrass Weevil Optimum Control Strategy

WeevilTrak℠

syngenta®

Distribution and Impact of the Annual Bluegrass Weevil

The annual bluegrass weevil (ABW) is the most troublesome insect pest for golf course superintendents in the northeastern and mid-Atlantic regions of the United States. ABW is largely a specialist on highly maintained *Poa annua*, damaging playing surfaces such as fairways, tees, approaches, collars and even greens. The pest can also cause damage to creeping bentgrass, though ABW damage to *Poa annua* is more significant. Once limited to southern New England, impact from the insect has spread over the past four decades to areas as far north as the Canadian provinces of Ontario and Quebec, to as far west as eastern Ohio and south to the mountains of North Carolina. Identifying and suppressing overwintered adults is key to controlling future generations of the pest.



Movement on Golf Courses

In the spring, starting as early as March, ABW adults move to susceptible golf course turf from adjacent overwintering sites such as litter along tree lines, in tall grass and other protected areas. From mid-April to May, overwintered females lay eggs in the stem or under the leaf sheaths of annual bluegrass. Then from late May through mid-June, larvae of this first generation cause extensive turf damage, first as stem borers and then as crown feeders.

In late June through early July, after pupation in the top layer of the soil, adults of the first generation emerge, feed, mate and lay eggs to start the cycle anew with a second and sometimes third generation. As the summer progresses, the life stages and generations become less synchronous, making it more difficult for golf course superintendents to interpret the life cycle and target the insect for control.

Early-season control of the first and second generation of ABW is vital for avoiding the problem posed by multiple generations and overlapping life stages in summer and fall. As such, Syngenta presents its Optimum Control Strategy to provide a season-long approach for managing ABW.

Optimum Control Strategy at a Glance

The Syngenta ABW Optimum Control Strategy features multiple insecticides with proven activity against ABW. For years, superintendents relied primarily on one class of chemistry (pyrethroids) for adulticide applications to control ABW. Now, additional products and modes of action (MOAs) have become invaluable additions to the ABW arsenal:

- Acelepryn® insecticide *(Chlorantraniliprole)*
- Provaunt® insecticide or Provaunt WDG insecticide *(Indoxacarb)*
- Ference® insecticide *(Cyantraniliprole)*

Acelepryn targets early-stage ABW larvae while Provaunt and Provaunt WDG target late-stage ABW larvae. Ference is recommended as a summer application to provide control of the asynchronous summer populations while controlling larvae inside the stem (first through second instar) and larvae outside of the stem (third through fifth instar). When teamed up with a pyrethroid such as Scimitar® GC insecticide to control overwintered ABW adults, this powerhouse control strategy helps ensure season-long control of ABW.

Optimum Control Strategy Summary (for First Generation ABW Control)

Insecticide Treatment program	1st Generation		
	Stage 1 - Overwintered Adults	**Stage 2 - Early Instar (inside of stem)**	**Stage 3 - Late Instar (outside of stem)**
	Scimitar® GC 10 fl. oz./A or *Chlorpyrifos* 1 lb. ai/A	Acelepryn® 12 fl. oz./A	Ference® 12 fl. oz./A
Timing	Application is based on Growing Degree Days (GDD) and ABW activity. Some areas may require two applications spaced 14 days apart. Early to mid-April Forsythia half green half gold	Application should be applied prior to egg hatch to ensure Acelepryn is in the transpiration stream prior to larvae feeding. Late April to early May Dogwood full bloom	Application should be applied when the third stage larvae exit the stem to feed on the crown and surface roots. Mid-May to early June Rhododendron catawbiensis full bloom

* Application timing varies based on geography. **Visit WeevilTrak.com for precise timing applications.**

The Challenge of Controlling ABW

There are many reasons ABW is difficult to manage:

1. Early spring weather conditions determine when ABW adults become active.
2. Once active, ABW cycle through reproductive stages quickly, producing up to three or four generations in any given season.
3. Larvae from ABW reproduction develop at different rates.
4. Treatment products vary based on ABW life cycle stages.
5. Detecting, monitoring and tracking ABW development requires multiple techniques.

Weather Conditions

Since no two springs are alike, ABW behavior may differ greatly from one year to the next. In ideal circumstances, winter transitions to summer, with gradually warming spring weather and intermittent rain events. Under these conditions, overwintered adults move back to the golf course during a relatively short period of time, resulting in a narrow period of intense egg-laying activity. When this occurs, one or two well-timed insecticide applications can successfully maintain ABW populations below damaging levels for most or all of the season.

When Springtime Weather Does Not Cooperate

However, spring does not usually provide a gradual transition from winter to summer. April and May are usually marked by alternate periods of unseasonably warm and cool weather, and some years endure prolonged periods of rainy weather. These varying conditions greatly impact the behavior of overwintered adults and result in wide extremes in the intensity and duration of egg-laying and subsequent larval development. So, instead of a narrow window of egg-laying, there may be two peaks or even a prolonged period when eggs are deposited and larvae subsequently damage turf.

When adult activity is irregular, and the associated egg-laying prolonged, then the subsequent larval development will be less synchronous and harder to interpret. The opportunity for an adulticide application may be missed, and the need for a larvicidal application may be overlooked, at least until the annual bluegrass plant quickly fades during the combined stress of the first hot or dry spell in June and the injury of rapidly developing larvae.

ABW management is further complicated by the fact that differing microclimates on an individual course can result in up to a 10-day difference in the life cycle. An open fairway with a southern exposure, for example, will experience earlier egg hatch and quicker larval development than a nearby fairway with a northern exposure and border of evergreen trees. It is unlikely that a single insecticide application could be made with the proper timing for the control of insects for both fairways.

Successful spring management of ABW does not always mean turf will be free of damage through the summer months. Even the most successful control programs will not eradicate ABW populations. In years when high populations are present, enough ABW may survive into the summer months to cause damage from second or third generation larvae. This is especially true considering that summer weather conditions place annual bluegrass under tremendous stress. Low-level ABW feeding can cause unacceptable damage in the heat of July and August, but not in April and May when plants are vigorously growing.

Generational Control Depends on Early Detection and Proper Timing of Spring Applications

The key to successful ABW control is proper decision-making on the timing of early-season treatments. **Missing an opportunity to control ABW early in the spring often means dealing with them all summer long.**

The Syngenta WeevilTrak℠ platform contains a history of GDD information that has been thoroughly reviewed to refine when the treatments in the Optimum Control Strategy should be applied. For many years, superintendents have used forsythia bloom stage as a primary plant phenological indicator for initiating a monitoring and control program for adults.

While phenological indicators are important, GDD offer another tool to monitor ABW development because of the precise manner in which heat accumulation in the spring is recorded. GDD monitoring devices are strategically placed on WeevilTrak monitoring courses to identify the latest date that the various treatments of the Optimum Control Strategy should be applied.

Adult Scouting in the Spring – Stage One

Adult scouting is most essential in the two-to-three week period before the WeevilTrak stage one "flag" has been raised, indicating that the first adulticide treatment should be applied.

During the Stage One period, direct observations of ABW activity on an individual golf course may override the information that is being provided by WeevilTrak. For example, if a substantial number of ABW adults are observed before Stage One has been declared by WeevilTrak, then the first treatment should be applied as soon as weather and course conditions allow.

How to Scout for Adult Activity

Adult scouting on golf courses can be accomplished through a variety of techniques:

- Soap flushes
- Soil core sampling
- Checking mower baskets
- Visual examination of the turf
- Pitfall traps
- Vacuum sampling with modified leaf blowers

Visit **YouTube.com/SyngentaTurf** to watch videos about how to scout for adult ABW activity.

Soap flushing and pitfall trapping are the preferred methods because they expose adults that would have been overlooked low in the turf profile. Plus, both are easy to use on multiple areas of the course. One drawback of pitfall traps is finding a place to install them at the beginning of the season where they cause no visual disruption to play. It is also tricky to position them where ABW adults are reliably present each and every year.

Sentinel sites, or areas where the ABW is most likely to occur, are good to establish because scouting efforts can be focused there. It is also a good practice to keep some of those areas free of insecticide applications so fluctuations in ABW populations can be tracked.

WeevilTrak: A Customized Guide for the Optimum Control Strategy

WeevilTrak works with a network of university entomologists and key turfgrass consultants in the northeastern United States to track first generation ABW development throughout the region. First generation control is critical in controlling ABW outbreaks. WeevilTrak researchers serve as a ground force for first generation ABW control, upon which the recommendations for control of later generations are based.

In cooperation with superintendents across dozens of golf courses that host ABW populations, this research network monitors:

- GDD accumulations
- Timing of the first appearance of ABW adults and the development of ABW larvae
- Other observations on insect activity
- Phenological plant indicators

This information is used to recommend the proper application timing of each component of the Optimum Control Strategy (first and second generation ABW) and is available on **WeevilTrak.com** to all golf course superintendents and other pest management practitioners. Blog posts from industry-leading researchers, which provide timely information about ABW activity and advice on scouting and controlling them using the Optimum Control Strategy, are also available with a free WeevilTrak subscription.

Optimum Control Strategy

With the documentation of pyrethroid resistance in certain ABW populations – primarily in southern New England – this program incorporates a range of insecticides with different MOAs. The program anticipates the worst-case scenario of a prolonged period of egg-laying by overwintered ABW adults and recognizes that, under some circumstances, even high levels of control of first generation larvae will not completely prevent damage by summer generations of ABW.

First Generation Control

The treatment schedule below is for the first generation of ABW activity on golf courses. Subsequent ABW generation treatment recommendations are based on first generation tracking by WeevilTrak researchers.

FIRST APPLICATION (Stage One): The first application uses Scimitar GC as an adulticide at a recommended rate of 10 fl. oz./A in late March to early May. Timing of this application will be based on GDD and refined according to observations on plant phenology and ABW activity. Be sure to carefully monitor for adults and **check WeevilTrak.com for proper timing in your area**.

Scimitar® GC Insecticide

The adulticide application accomplishes three important tasks:

1. Reduces overall ABW pressure by killing adults on contact as they move from overwintering sites into areas of highly managed annual bluegrass. Roughs that are adjacent to ABW overwintering sites can also be treated, so they act as buffer zones.
2. Prevents early egg-laying by overwintered ABW females.
3. Allows Acelepryn to be applied slightly later in the season so you have insecticide protection for roughly two months.

For areas with suspected resistance to pyrethroids, an application of *chlorpyrifos* at 1 lb. ai/A is a viable substitute for Scimitar GC.

Scimitar® GC is a Restricted Use Pesticide.

SECOND APPLICATION (Stage Two): Although Acelepryn is highly active against ABW larvae, timing is critical because effective control depends on the systemic uptake of Acelepryn by the plant. It is important to have Acelepryn moving in the transpiration stream of the plant when the ABW larvae hatch and begin to chew their way into the stem in late April to mid-May.

Acelepryn® Insecticide

Evidence shows Acelepryn will provide high levels of ABW control when applied three weeks before hatch. The timing of this application will be made roughly two to three weeks after the first application of Scimitar GC and will be based on GDD monitoring **(check WeevilTrak.com for proper timing in your area)**.

Applying Acelepryn at 12 fl. oz./A is critical and provides:

1. About three weeks of ABW larval control.
2. Season-long control of white grubs.
3. Season-long control of caterpillars.

THIRD APPLICATION (Stage Three): The third treatment needed to target first generation ABW larvae is an application of Ference during mid-May to early June to control all first through fifth instar larvae. This application is critical because June is often when the first period of notably hot weather occurs in the Northeast, which makes annual bluegrass exceptionally vulnerable to damage. Ference is highly effective against asynchronous ABW populations, making it the best choice to round off first generation applications.

Ference® Insecticide

Applying Ference at 12 fl. oz./A is important to:

1. Provide systemic control of ABW at all larval stages (first through fifth instar).
2. Control asynchronous larval populations that may be present.

Summer Generation Control

First generation ABW populations may reach more than 300 larvae per square foot of turfgrass if left uncontrolled. Under such extreme population pressure, even programs that provide exceptionally high levels of control will allow a certain number of ABW to survive and produce second and third generations throughout the summer.

FOURTH APPLICATION (Stage Four): The first generation adults that generally appear in mid- to late June are prime targets for another adulticide application using Scimitar GC, or a *chlorpyrifos* product. As the adults reproduce, ABW populations usually become asynchronous, meaning that all life stages are present at the same time and there often is no single dominant stage.

FIFTH APPLICATION (Stage Five): For further control of second generation adults and late instar, the Optimum Control Strategy recommends the first application of Provaunt or Provaunt WDG.

Provaunt® Insecticide

Applying Provaunt at 12 oz./A or Provaunt WDG at 18 oz./A is important to:

Provaunt® WDG Insecticide

1. Target early third instar larvae as they emerge from the stem and move to feed on the crown of the plant.
2. Provide two to three weeks of residual control, which will strengthen the management program for the second generation larvae.

It is recommended to water-in Provaunt or Provaunt WDG applications with .05 - .10 inches of water immediately after application.

Scimitar® GC is a Restricted Use Pesticide.

Optimum Control Strategy Summary (for Second Generation ABW Control)

Insecticide Treatment program	2nd Larval Generation			3rd Larval Generation (if needed)
	Stage 4 - Adults	**Stage 5 - Adults and Late Instar**	**Stage 6 - Asynchronous larvae**	**Stage 7**
	Scimitar® GC 10 fl. oz./A or *Chlorpyrifos* 1 lb. ai/A	Provaunt® 12oz./A or Provaunt WDG 18 oz./A*	Ference® 12 fl. oz./A	Provaunt 12 oz./A or Provaunt WDG 18 oz./A
Timing	Application is based on the presence of adults. Mid- to late June	Application should be applied about 7 to 14 days after adulticide. Late June to early July	Application should be applied about 14 to 21 days after Provaunt or Provaunt WDG. Late July to early August	Application should be applied about 21 to 28 days after Ference. Late August to early September

* Application timing varies based on geography. **Visit WeevilTrak.com for precise timing applications.**
** Application is recommended if there is a high population of adults with the presence of callow and mature adults.

SIXTH APPLICATION (Stage Six): Late July through early August is prime time for another insecticide application to reinforce control of instar larvae ABW. Ference is recommended for this application because it is highly effective against asynchronous larval populations that may be present in the first, second and/or third generation from July to September.

An application of Ference at the rate of 12 fl. oz./A in this time period should carry most courses through to the end of the year.

SEVENTH APPLICATION (Stage Seven – if needed): If a third generation of ABW larvae becomes present and increases the asynchronous summer population in late August and early September, Provaunt can be applied at a rate of 12 oz./A, or Provaunt WDG can be applied at a rate of 18 oz./A, 21 to 28 days after the Ference application to extend control of the asynchronous larvae population.

Visit WeevilTrak.com and register today for a proven, programmatic approach to controlling ABW.

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Additional Resources

Koppenhöfer A.M., Alm S.R., Cowles R.A., McGraw B.A., Swier S., Vittum P.J. 2012. Controlling annual bluegrass weevil: optimal timing and rates. Golf Course Management, March 2012, 98-104.

Koppenhöfer A.M., Alm S.R., Cowles R.A., McGraw B.A., Swier S., Vittum P.J. 2012. Managing pyrethroid-susceptible annual bluegrass weevil. Golf Course Management, April 2012, 104-110.

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