

**Project Title: Fairway Conversion to Low-Mow Kentucky Bluegrass Using Annual Bluegrass
Herbicides Combined With Turf Seeding Time and Rate**

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Introduction:

Kentucky bluegrass has been widely used as a cool-season grass for golf course fairways. Unfortunately annual bluegrass has invaded most fairways established with older Kentucky bluegrass varieties. Golf Course Superintendents in the Midwest region are very interested in improving their fairway conditions by converting to the new generation of “low-mow Kentucky bluegrass” varieties. Jeff Wendel, CGCS, Executive Director of the Iowa Turfgrass Institute surveyed 223 Class A and SM members of Iowa GCSA. Eighty eight percent of the golf course superintendents responding indicated that they would consider fairway renovation if there were an effective means of controlling annual bluegrass during the establishment and grow-in phase; 70% favored low-mow Kentucky bluegrass, 10% creeping bentgrass, 4% no change, and 1% perennial ryegrass. Golf Course General Managers are reluctant to make the conversion without some type of assurance that the resources committed to a large fairway conversion project will yield a successful result. Infestation of annual bluegrass during the renovation process is the major reason for not converting to the newer Kentucky bluegrass varieties.

Rationale/description of problem:

Fairways make up the largest high quality turf area on the golf course. The Superintendent and General Manager need proven strategies and reasonable expectations for success before they are willing to take the risk of converting to improved grasses. Low-mow Kentucky bluegrass varieties have already proven themselves in many trials related to stress performance and playability; their performance as a mature stand of grass is not in question. Instead, the uncertainty involves the ability to make a successful conversion without having the fairway overrun with annual bluegrass.

Attempts to directly seed Kentucky bluegrass into an existing mixture of fairway grass without non-selective control of the existing turf has met with limited success. Koski and Newberry (2004) found that aerification, slit-seeding, chlorosulfuron, and high seed rates were ineffective in establishing Kentucky bluegrass into an existing stand of perennial ryegrass. They concluded that some form of non-selective control of the existing fairway grass and weeds is needed in order for Kentucky bluegrass to establish.

Establishment Season – Early September is the best time to establish Kentucky bluegrass. Unfortunately, renovation attempts at that time are usually over run by annual bluegrass competition. It is not uncommon to seed in early September following Roundup application only to find that you have 100% annual bluegrass by the following spring. One approach to reducing annual bluegrass competition is to select a seeding date when annual bluegrass will not germinate. Murphy, et.al. (2005) found that annual bluegrass competition was reduced to less than 20% cover when bentgrass was seeded in early-to-mid summer (June to August) compared to September and October seeding. Our trial will investigate the possibility of summer establishment of Kentucky bluegrass. Since Roundup will be used it is likely that other summer annual weeds will invade, however, new post emergence herbicides such as Drive and Quicksilver will be used to control grasses and broadleaf weeds during summer Kentucky bluegrass establishment. Also, mesotrione can be used at time of Kentucky bluegrass seeding to provide pre and post emergence control of summer annual weeds. Kentucky bluegrass was seeded in June, August, and September as described in table 1.

Seeding Rate – Any management strategy that rapidly covers the surface with turf will inhibit weed competition during establishment. The ability of rapidly establishing perennial ryegrass to compete with weeds and other grasses has been well documented. Traffic trials at Iowa State University using high

seeding rates have demonstrated advantages in turf cover and weed control with Kentucky bluegrass seeding rates beyond 7.5 lbs/1000sq.ft. Because we are seeding into a bare ground situation we anticipate that higher than normal Kentucky bluegrass seeding rates (5 lbs/1000sq.ft.) will speed turf cover and reduce annual bluegrass competition. Pre-germination is another technique that produces visible seedlings 5 days after planting. Although pre-germination will not be evaluated, we feel that high seeding rates and seed pre-germination can be part of an effective Kentucky bluegrass establishment strategy to increase competition against annual bluegrass.

Annual Bluegrass Control - There are no pre-emergence herbicides that effectively control annual bluegrass without harming Kentucky bluegrass seed establishment. Branham (2005) demonstrated that foliar pendimethalin applied post emergent and sequentially in the fall will substantially reduce annual bluegrass. Apparently the foliar treatments in October and November reduce annual bluegrass rooting, making the annual bluegrass more susceptible to desiccation during the winter and following spring. Weakened plants that survive the winter can also be killed with a final application the following April. Tenacity (mesotrione) is a new herbicide labeled for post emergence control of annual bluegrass in Kentucky bluegrass. Sequential applications of mesotrione in the fall have provided control of annual bluegrass (Branham, 2006). Mesotrione has excellent safety on seedling and established Kentucky bluegrass. Cooler temperatures are required for effective control of annual bluegrass with mesotrione, which would fit perfectly in a Kentucky bluegrass establishment plan. Tenacity and Pendulum EC (pendimethalin) were applied postemergent to annual bluegrass in the fall of 2007 as described in table 1.

A mono stand of the low-mow Kentucky bluegrass varieties provides an exceptional fairway playing surface. Superintendents are hesitant to recommend these superior grasses to their Golf Course because Kentucky bluegrass is usually overtaken by annual bluegrass during establishment. A combined approach that optimizes seeding time, seeding rate, and annual bluegrass herbicides has a greater chance for success than the current approach of Roundup and fall seeding that inevitably results in annual bluegrass dominated fairways. Exact strategies need to be developed to remove existing vegetation, rapidly establish Kentucky bluegrass, and effectively control the impending onslaught of endemic annual bluegrass. Once this is accomplished the Golf Course Superintendent and General Manager will be able to make reasonable decisions involving costs, anticipated benefits, and potential lost revenue from course closer.

Objectives:

1. To determine specific herbicide and seeding strategies that can be used to successfully convert existing cool season grass fairways to improved low-mow Kentucky bluegrass varieties with minimal annual bluegrass infestation.
2. To determine the most cost effective strategy for converting existing cool season fairways to the new generation of improved low-mow Kentucky bluegrass varieties.

Results:

All seeding and herbicide treatments were applied as described in table 1 for the following locations: Twin Pines Golf Course – Jeff Schmidt, CGCS; Traer Country Club, Mike Evertsen; and Homewood Golf Course – Kevin James. Fall establishment data for Kentucky bluegrass and annual bluegrass are still being gathered; however there are some observations that can be made before the data are analyzed.

Seeding dates and rates– The June and August seeding dates have completely filled with turf, but the mixture is dominated with approximately 80% annual bluegrass and 20% Kentucky bluegrass. Increasing Kentucky bluegrass seeding rate from 2.5 to 5.0 lbs/1000 sqft did not seem to increase the amount of Kentucky bluegrass in the stand of grass. The plots were verticut in 4 different directions followed by drop seeding and hand raking. It appears that all of the seed developed in the vertical groves that were made during the final pass with the vertical mower. Since the seed is developing in a smaller area, fixed by the space of the vertical groves, there may have been no advantage to adding more seed into this already maximized space. Likewise, seeding in June or August did not seem to limit the ability of annual bluegrass to dominate the stand of grass. At this point the September seeding appeared to favor Kentucky bluegrass with approximately 40% annual bluegrass cover, 40% Kentucky bluegrass cover, and 20% bare soil.

Herbicide treatments – The most promising observation has been with applications of Tenacity. After the first application of Tenacity in early October the annual bluegrass begins to yellow. After the second application of Tenacity the annual bluegrass turns white. After the third application of Tenacity the annual bluegrass turns brown and has begun to shrivel. If the annual bluegrass continues to decline then it appears that the September seeding of Kentucky bluegrass may dominate the stand by the summer of 2008. There has been no phyto-toxicity observed on Kentucky bluegrass from either Tenacity or Pendulum in this trial. Pendulum has resulted in a weakened appearance of annual bluegrass but no visual loss in annual bluegrass cover. We anticipate better separation of treatments in May 2008 when annual bluegrass visibility peaks during seedhead production. The plot areas established in 2007 have been treated and are being evaluated during an establishment phase from 22 June 2007 through 30 May 2008 and during the year following establishment from 15 June 2008 to 30 May 2009. Likewise, the plots established in 2008 will be evaluated during the establishment year from 22 June 2008 to 30 May 2009 and during the following year from 15 June 2009 through 30 May 2010.

As an outgrowth of this trial a separate companion trial with 10 additional treatments to further refine herbicide timing and rate of Tenacity and Pendulum application for September seeded Kentucky bluegrass was developed. Early results indicate that Tenacity can be used to substantially injure, if not kill, annual bluegrass during autumn establishment of Kentucky bluegrass. While we are optimistic about these results, it will take a couple of growing seasons with repeat applications of herbicide to determine if the improved varieties of Kentucky bluegrass can establish and dominate in the presence of annual bluegrass competition.

Literature Cited:

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Branham, 2006. 2006 Illinois Turfgrass Research Report, Personal communication.

Koski, Tony; Newberry, James. 2004. USGA Green Section Record. January/February. 42(1): p. 6-7

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Table 1. Fairway renovation treatments and justification using different establishment times, Kentucky bluegrass seed rates, and post emergence herbicides to control annual bluegrass (AB).				
TRT	Establishment Strategy	Seed Rate Lb/1000 sqft	Post Emerge AB Herbicides	Justification/Comments
Mid Summer Establishment Strategy – Roundup 15 June 3 lbs ai/A, Ky bluegrass seeded 22 June				
1	Mid summer Roundup Seed normal rate Fall Post emerge PreM	2.5	Pendimethalin Oct, Nov, Apr	Mid Summer Strategy - Anticipate that it will be too hot for annual bluegrass to germinate in mid summer, but Kentucky bluegrass will still establish. This is possible because Drive, Quicksilver and even Mesotrione are newer herbicides that control summer weeds while establishing Kentucky bluegrass. High seeding rates of Kentucky bluegrass may reduce weeds, speed establishment, and reduce period when course is closed. Fall post emerge applications of Pendimethalin and Mesotrione will control annual bluegrass that could germinate in early September.
2	Mid summer Roundup Seed normal rate Fall Post emerge Mesotrione	2.5	Mesotrione Oct 10, 20, 30	
3	Control – no AB herbicide	2.5	None	
4	Same as Trt 1, substitute high seed rate	5	Pendimethalin Oct, Nov, Apr	
5	Same as Trt 2, substitute high seed rate	5	Mesotrione Oct 10, 20, 30	
6	Same as trt 3, substitute high seed rate	5	None	
Late Summer Establishment Strategy – Roundup 1 Aug 3 lbs ai/A, Ky bluegrass seeded 7 Aug				
7	Late summer Roundup Seed normal rate Fall Post emerge PreM	2.5	Pendimethalin Oct, Nov, Apr	Late Summer Strategy – Similar strategy to mid-summer, however this timing would further reduce course closure by allowing play to continue until 1 August. Annual bluegrass starts germinating the first week of September, therefore this seeding time still allows Kentucky bluegrass to begin establishment prior to competition with annual bluegrass. Fall post emerge applications of Pendimethalin and Mesotrione will control annual bluegrass that could germinate in early September.
8	Late summer Roundup Seed normal rate Fall Post emerge Mesotrione	2.5	Mesotrione Oct 10, 20, 30	
9	Control – no AB herbicide	2.5	None	
10	Same as Trt 7, substitute high seed rate	5	Pendimethalin Oct, Nov, Apr	
11	Same as Trt 8, substitute high seed rate	5	Mesotrione Oct 10, 20, 30	
12	Same as trt 9, substitute high seed rate	5	None	
Early Fall Establishment Strategy – Roundup 1 Sept 3 lbs ai/A, Ky bluegrass seeded 7 Sept				
13	Early Fall Roundup Seed normal rate Fall Post emerge PreM	2.5	Pendimethalin Oct, Nov, Apr	Early Fall Strategy – This is the traditional time for fairway renovation. We expect that this will be the best timing for course closure, but anticipate maximum annual bluegrass invasion. Fall post emerge applications of Pendimethalin and Mesotrione will control annual bluegrass that will definitely germinate in September. Out of all the treatments in the study we expect the high seeding rate and post emergence control with Mesotrione, trt 17, to be the most successful and most practical.
14	Earl Fall Roundup Seed normal rate Fall Post emerge Mesotrione	2.5	Mesotrione Oct 10, 20, 30	
15	Control – no AB herbicide	2.5	None	
16	Same as Trt 13, substitute high seed rate	5	Pendimethalin Oct, Nov, Apr	
17	Same as Trt 14, substitute high seed rate	5	Mesotrione Oct 10, 20, 30	
18	Same as trt 15, substitute high seed rate	5	None	



Figure 1. Twin Pines Golf Course Cedar Rapids, IA. Picture taken 2 November 2007. Yellow plots are the response of annual bluegrass to Tenacity.



Figure 2. Twin Pines Golf Course Cedar Rapids, IA. Picture taken 2 November 2007. Yellow and white plants are the response of annual bluegrass after two fall applications of Tenacity. No phytotoxicity on Kentucky bluegrass seeded on 7 September 2007.