Evaluation of Annual Bluegrass Population Reduction Programs for Annual Bluegrass/ Creeping Bentgrass Fairway Turf

By Dr. Frank S. Rossi
Department of Horticulture
University of Wisconsin-Madison

Perspective

Of all the issues that face the golf turf industry in the temperate regions of the US, the question of managing or reducing annual bluegrass *(Poa annua)* populations is showing no signs of fading. Browsing through a text book from the 1920's, annual bluegrass was mentioned as a minor problem. During the next sixty years, populations would significantly increase as a result of increased traffic, lower mowing heights, changes in fertility, loss of the arsenate herbicides and automatic irrigation.

The increased populations were both a blessing and a bane. Until the release of more upright bentgrasses, I have seen no finer playing surface than a dense, upright stand of annual bluegrass. The challenges of managing annual bluegrass include susceptibility to summer stresses, such as heat, drought and diseases and winter stresses, such as freezing and ice encasement. Yet, the ability of annual bluegrass to produce seedheads and germinate from seed, often throughout the season, provides an ideal survival strategy where there is regular surface disruption.

Plant growth regulator technology became available, to selectively reduce or eliminate annual bluegrass growth without significant injury to the more desirable species such as creeping bentgrass. This technology was met with various levels of interest. A majority of superintendents experimented with them, while some integrated directly into their existing management scheme.

In the meantime, researchers have attempted to quantify the impact of cultural factors including plant growth regulators(PGR) on annual bluegrass populations. Results have indicated that cultural practices such as clipping removal, reduced irrigation frequency and fertility program can have a greater effect than PGR's.

The Questions

To properly quantify the ability of PGR's and a selective postemergence herbicide *(ProGrass)* to reduce annual bluegrass populations we initiated an experiment in April, 1993 on two golf courses in Wisconsin. Blackhawk Country Club (BCC) in Madison and North Shore Country Club (NSCC) in Mequon. These courses were selected for their different management regimes. Blackhawk Country Club is a 75 year old course that was initially planted to Kentucky bluegrass fairways that were mowed down to provide a closer lie. Also, the philosophy at BCC is to implement a series of management practices that enable annual bluegrass to thrive. In contrast, North Shore Country Club was seeded to creeping bentgrass fairways 25 to 30 years ago and has seen annual bluegrass populations increase over the years. In contrast to BCC, NSCC has decided to manage the course to favor the competitive advantage of bentgrass.

Every experiment we conduct is only as good the questions we are trying to answer. A clear understanding of the different management systems allows us to ask the following questions.

1. Do plant growth regulators and/or *Prograss* reduce annual bluegrass populations?
2. Do the PGR's or *ProGrass* reduce turf quality below an acceptable level?
3. Does overseeding with the new bentgrass cultivars in conjunction with chemical applications aid in the reduction of annual bluegrass?

Methodology

Data collection. The experiment began in April, 1993 with counts of annual bluegrass plants present in the plots before initiation of treatments. At first annual bluegrass populations were visually estimated. Following statistical analysis, this method was found to be imprecise. Therefore, we adapted the point quadrant method utilized by Gaussoin and Branham (1989). This involved the construction of 1 square foot frames with a string grid on 1 inch centers. This established 144 intersections. The frames were placed in the same plot area each time. If an annual bluegrass plant was found under the intersection of two strings in was recorded as a "hit". All the data will be reported as change in percent annual bluegrass relative to initial counts (referred to as covariate analysis). Interestingly, initial annual bluegrass populations ranged from 85 to 100% at BCC and 40 to 85% at NSCC.

Cultural Management. As mentioned earlier, management philosophies differed at the two locations.

However, while philosophies differed, management practices such as mowing, core cultivation and fungicide treatments were almost identical. The only difference evident with these practices was that BCC collects clippings from mid-May through Sept. 1; NSCC never collects clippings.

There is a slight difference in irrigation practices between the two locations. Both systems utilized "as required" or "based on soil probing" approaches. However, frequency at BCC was light applications nightly approximately 0.1"/night, while NSCC was every other, or every 2 nights, up to 0.3"/application. Interestingly, this typically significant factor (irrigation) was rendered moot by excessive rainfall in the wet year of 1993.

The most significant difference between the management systems was in their N fertility programs. BCC uses *Milorganite* almost exclusively to maintain quality throughout the entire season to supply 2.5 to 4# N/M/year with dormant application made late fall. NSCC applies a total of 2.5# N/M/year with Nutralene, with the last application made at the end of September.

Chemical applications were based on label recommendations and consultations with technical representatives when available. Specifically, *Scott's Fertilizer* plus TGR was applied at 3.8# product/M (1/2 rate application—supplying 0.45#N/M) and *Cutless* and *Primo* were applied at 0.5oz/M. All plant growth regulator treatments were applied twice per year at approximately 6 to 8 week intervals (at least 2 weeks after overseedings), 18-May and 6-July, 1993 then 26-April and 14-June, 1994. *ProGrass* applications of 1.5 oz./M were made at 3 week intervals (7 weeks after fall overseeding) 27-October, 10 & 24-November, 1993 then 9 & 23-November and 7-December, 1994.

Overseeding. The increased availability of new bentgrass cultivars prompted the inclusion of Putter, Cato, Providence and SR1020 as an overseeding variable compared to traditional Penncross overseeding. In 1993, overseeding was conducted 4-May and 8-September, 1993 using slit seeders to overseed individual plots. Then in 1994 on 12-April (prior to seedhead emergence) and 21-September, the plots were core cultivated, dragged to disturb the plugs and then each plot was seeded by hand. The core cultivation was decided to be a more efficient means of overseeding based on our experience with individual plot work.

Results

General Observations. The wet year of 1993 nullified all treatment effects, including any influence location may have exerted. It is important to note, very little if any seedhead production occurred in 1993. This suggests that annual bluegrass was never under stress. Furthermore, the documented seasonal shifts in annual bluegrass populations were not observed at either location in 1993.

In contrast, 1994 was a more typical growing season except for the cool, dry spring that resulted in one of the greatest flush of annual bluegrass seedheads in recent memory. Also, there was a significant difference between the locations with regard to annual bluegrass reduction.

Overseeding. There was no significant difference between the bentgrass cultivars, therefore, all data is presented after combining cultivar treatments. If the existing bentgrass turf was Penncross, that would have made cultivar identification necessary. In hindsight, it would have been difficult to prove if the cultivars exerted an effect. Therefore, this variable will be replaced in 1995 with additional treatment rates and timings.

Location Effect. The tabulated data indicate that population shifts were greater at NSCC than BCC. Additionally, as a result of higher initial annual bluegrass populations, the BCC plots appeared to be injured more severely and took longer to recover.

One could speculate on the climactic difference between the locations. Specifically, in 1994 it remained drier and cooler at NSCC, along Lake Michigan, on the average than at BCC. Still, it might be more useful to suggest that populations at BCC started at a higher level and it may take longer to make significant strides in reducing those populations. Especially since clipping removal, practiced throughout the season at BCC, has been shown in previous research to play a significant part in reducing annual bluegrass populations.

Researchers have shown that amount of irrigation could be less important than frequency when considering annual bluegrass populations. More frequent irrigation tends to favor annual bluegrass over bentgrass. In contrast, one study investigating the influence of overseeding on annual bluegrass populations found better bentgrass germination under frequent irrigation, but smaller population shifts.

Treatment Effects. In general, the treatments reduced turf quality 1 week after application. In some cases quality was reduced below an acceptable level, but always returned to an acceptable level within 3 weeks. However, personal communications with the superintendents revealed concerns regarding the difference between a small plot and 35 to 40 acres of fairways with reduced quality. This would certainly challenge the communication skills of our best superintendents.

All chemical treatments significantly reduced annual bluegrass populations compared to untreated plots, where populations increased. The PGR treatments performed similarly except for *TGR*, which did reduce annual bluegrass populations compared to untreated plots, but less than the other PGR's. Also, TGR applications reduced turf quality at BCC more than the other treatments, but as

mentioned earlier, was able to recover to an acceptable level within 3 weeks.

ProGrass treatments are being evaluated based on one year's worth of data. Applications made in Fall, 1994 will be evaluated in the Spring, 1995. Still, population shifts following one year were dramatic as evidenced by the 15% reduction at NSCC. However, the injury sustained by the annual bluegrass populations is frightening. The bentgrass turf is unaffected, therefore the reduction in turf quality is a indication of the annual bluegrass populations present in the plots. Clearly, this is an aggressive approach to reducing annual bluegrass and, as suggested by AgrEvo, not to be implemented unless annual populations are less than 40%.

Interestingly, while the annual bluegrass takes on an almost bleached white appearance, it is not completely killed. I made several regular observations at BCC where annual bluegrass plants were regrowing through the bleached tissue. Also, as the plots recovered in 1994, the annual bluegrass did not produce seedheads which actually resulted in a higher quality turf than might have been expected.

Summary

The decision to manage or reduce annual bluegrass, is not one to be taken lightly and in my mind must be made. Many superintendents walk the line between the two systems, either failing to recognize the difference in management required or not willing to chance the risk of committing and occasionally losing some grass to winterkill—of course this is where communication comes in!

The results of the first two years of this study are fairly clear. If you do nothing to reduce annual bluegrass culturally, populations will increase. I would recommend, at least collect clippings. The answer to the question whether chemicals can reduce annual bluegrass populations is yes, however, based on our work, it comes at a price. Turf quality can be reduced below an acceptable level for up to 2 weeks, depending on the chemical. We will continue this work with different rates and timings to attempt to reduce injury, but, will the result be a more gradual shift in populations.

It is important to not overlook the lack of effect from the wet year of 1993, which if you remember, followed a severe dose of winter injury. Environmental influences still exert the strongest effect on plant populations. Even new golf courses that choose to keep bentgrass, must be on preventative annual bluegrass management programs.

Finally, I feel that the benefit of using the different bentgrass cultivars is still an important question that we will address in the years to come. Specifically, is one bentgrass more competitive under chemical treatments than another?

This study is just beginning and I caution you to not draw specific conclusions. Rather, use this information in conjunction with other studies and your own observations to choose the right course of action. Good Luck!

Annual Bluegrass Population and Turfgrass Quality Responses to Plant Growth Regulators and ProGrass.

	2 Year Change in % Annual Bluegrass Population		Turfgrass Quality 1 Wk After Treatment*		Turfgrass Quality 3 Wk After Treatment*	
Treatment	**BCC**	**NSCC**	**BCC**	**NSCC**	**BCC**	**NSCC**
Untreated	7.7	3.1	7.5	7.3	8.2	8.4
Fertilizer + TGR	-0.2	-12.2	4.2	5.5	6.2	7.1
Primo	-8.5	-18.7	6.1	6.6	7.2	7.5
Cutless	-6.4	-13.1	5.8	6.3	6.8	7.4
LSD (0.05)	4.7	7.2	1.1	0.8	1.3	1.1

	2 Year Change in % Annual Bluegrass Population		Turfgrass Quality April 1994^		Turfgrass Quality May 1994^	
Treatment	**BCC**	**NSCC**	**BCC**	**NSCC**	**BCC**	**NSCC**
ProGrass	-9.2	-15.2	1.3	3.6	6.8	7.4
LSD (0.05)	4.7	7.2	1.1	0.8	1.3	1.1

"*/ Turfgrass quality ratings taken 1 week and 3 weeks after applications and combined over the two application dates. Quality ratings are based on visual assessment with 1=poor turf, 6=acceptable turf, 9=excellent turf."

"^/ Turfgrass quality ratings taken following fall applications of ProGrass in April and May 1994. Quality ratings are based on visual assessment with 1=poor turf, 6=acceptable turf, 9=excellent turf."