Ecological Annual Bluegrass Management

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Annual bluegrass management is a perennial battle. Over the years, scores of management techniques and strategies have been employed in an attempt tip the scales in favor of creeping bentgrass over annual bluegrass. The popularity of the management techniques and chemical control strategies ebbs and flows like trends in fashion. An as in fashion, some of the bad ideas don't stick around very long, while the better strategies become part of the plan every season. Entire books have been written on these techniques, so I won't attempt to cover them here. I will, however, spend some time discussing the latest fashion, which is a comprehensive plan involving the use of low disturbance, low nitrogen, growth regulators, soil acidification, and iron. For lack of a better phrase, I am calling this approach "ecological annual bluegrass management". In this article, we'll take a look at each of the components of an ecological approach to annual bluegrass management based on some recent work done at the O.J. Noer Turfgrass Research and Education Facility and elsewhere.

Disturbance

Disturbance (i.e.) core cultivation, likely plays an important role in annual bluegrass invasion. Annual bluegrass spreads by prolific seed production, and those seeds need an opening in the canopy (bare soil) to germinate. We often create these opportunities for annual bluegrass by cultivating in spring and fall. Research tells us that annual bluegrass seed will germinate anytime temperature and moisture conditions are adequate (Vargas and Turgeon, 2004) which can be all year long in Wisconsin. Indeed, we can see the effect of disturbance on annual bluegrass invasion by comparing the putting greens at University Ridge Golf Course to the research putting greens at the O.J. Noer Facility. The annual bluegrass invasion at the University Ridge was so strong that they recently re-grassed their putting surfaces, but right next door, we lament at the lack of annual bluegrass on our plots which seems to be easily outcompeted by the bentgrass. We normally core cultivate at least once per year, but our greens lack the ball marks and traffic of the golf course which means there are fewer opportunities for annual bluegrass to establish and thrive.

There have been far too few studies on how cultivation affects annual bluegrass. Core cultivation will remain an important practice on fine textured playing surfaces to alleviate compaction. However, there is debate about the necessity of core cultivating sand root zones. Sand root zones are not nearly as susceptible to compaction, but are very susceptible to problems associated with organic matter accumulation. Core cultivation of sand root zones has been a strategy to manage this organic matter accumulation.

However, Dr. Roch Gaussoin and colleagues research at the University of Nebraska has shown that topdressing (not core cultivation) is the key practice for managing organic matter. In a massive survey, they found golf courses applying more than 18 cubic feet of sand per thousand square feet have lower organic matter levels than those applying less than that amount. While there still is a time and place for pulling cores on sand surfaces (layering issues comes to mind), there is a growing consensus that the most important management strategies on sand greens is frequent sand topdressing to dilute organic matter and bury the crown, and poking holes to temporarily increase the oxygen content of the root zone. This minimal approach to disturbance will likely reduce the opportunity for annual bluegrass invasion.

Nitrogen

The conventional wisdom says that high nitrogen fertilization favors annual bluegrass invasion. There have been many studies documenting this phenomenon. A study we conducted at Oconomowoc Golf Club over the past two years has also confirmed this notion. In that trial, we found that applying about 5 lbs of N/M to a majority bentgrass fairway led to a doubling of the annual bluegrass population in that two year period. The control plots received about 2 lbs of N/M and held steady at 12% annual bluegrass. One of the major challenges is finding that balance between nitrogen low enough to discourage annual bluegrass, but still enough for healthy bentgrass. It's impossible to say what the "right" amount is for because different soils will have different N needs, and different traffic levels dictate the amount required for recuperation. The best I can do is to tell you that in theory and practice more nitrogen will favor annual bluegrass invasion than less.

Growth Regulation

We've done quite a bit of work on growth regulation here at UW-Madison in the past six years. We've found that applying Primo every 200 growing degree days (base temperature 0°C) is the best for regulating the growth of bentgrass. What little data we have on annual bluegrass suggests that Primo causes slightly more growth regulation than on bentgrass, but the regulation lasts about the same 200 GDD. This suggests that Primo use may actually discourage annual bluegrass growth.

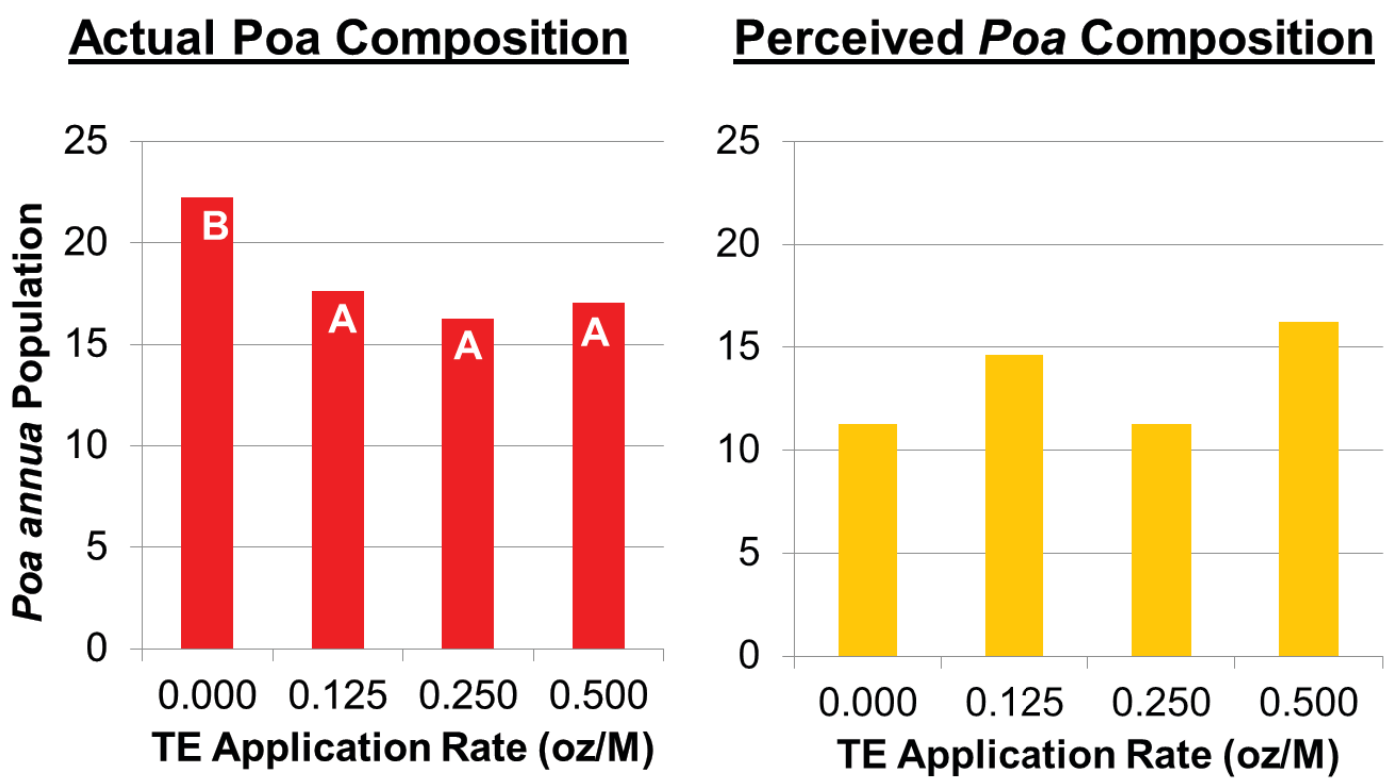

Figure 1. Superintendents underestimated the amount of annual bluegrass on plots not treated with Primo (they estimated 11%, when the actual was 22%). However, superintendents were fairly good at estimating the percent annual bluegrass on plot that had been treated with Primo (actual amount was 16-17%, while estimates ranged from 11-16%).

In a companion study, we found that two years of Primo applications at 200 GDD led to a 25% decrease in annual bluegrass populations at the O.J. Noer compared to non-regulated turf. However, Primo seems to make the annual bluegrass stand out more in a mixed stand, so superintendents notice it more easily. We found that superintendents attending field day underestimated the annual bluegrass in non-treated plots, but were pretty good at visually estimating the annual bluegrass in Primo treated plots. Even though the Primo plots had less annual bluegrass, it stood out more which led superintendents to believe it had more than the non-treated plots (Fig. 1). A counterpoint would be that Primo increases the summer stress tolerance of turf, so it can increase the survival of annual bluegrass during the summer. Suffice it to say that Primo probably doesn't have much of an effect one way or another on your annual bluegrass populations.

However, class B growth regulators like flurprimidol and paclobutrazol, have shown the potential to reduce annual bluegrass populations. On that same fairway at Oconomowoc Golf Club described above, we found applying Trimmit at 16 oz/A every 300 growing degree days (base temperature 0°C, about every three weeks in summer) led to a fairly large reduction in annual bluegrass populations (from 12% to 5%). This high rate of Trimmit had a negative effect on the visual turfgrass quality, however, and this must be factored into the decision process. In the photo below, you can see that reapplying Trimmit every 300 GDD led to a more rapid decline in annual bluegrass than in the other two plots in each row which were treated with Trimmit at the labeled rate, or nothing at all (Fig. 2).

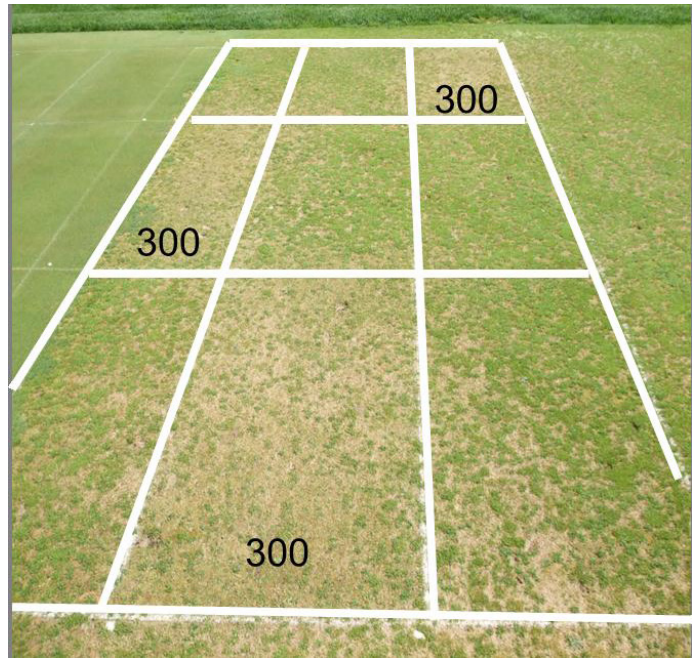

Figure 2: Trimmit injures annual bluegrass more severely when applied at 300 growing degree days (about every three weeks in mid-summer). The other two plots in each row, which look similar, are either Trimmit applied every seven weeks or non-treated. Photo: Bill Kreuser.

Irrigation

We won't spend much time on irrigation. You've surely heard that high moisture levels favor annual bluegrass and I will not dispel this notion. Annual bluegrass is shallow rooted, so only has access to the moisture in the top few inches of the root zone. Creeping bentgrass roots are often twice as deep (or more), so it has a lower irrigation requirement. In our trial at Oconomowoc, however, we found no difference in annual bluegrass populations after two years from plots that received normal irrigation compared to those receiving the same amount plus a thorough hand-watering once per week. The best advice is to use soil moisture meters to fine tune the irrigation distribution in the soil. Turn off heads in wet areas and increase the runtimes for heads in dry areas. Improve subsurface drainage at every opportunity. By improving drainage and maintaining soil moisture in the ideal range, you'll ensure that excess moisture isn't playing a role in favoring annual bluegrass.

Iron and Root Zone Acidification

Iron and root zone acidification is probably the newest fashion in annual bluegrass management. The previous strategies have been around for awhile, and are likely here to stay. While iron has long been used to enhance color, the rates I've been seeing of late are out of this world. Up to 40 oz/M or iron per month — that's 2.5 lbs/M! This high rate of iron is being used to mask very low nitrogen application rates and to reduce root zone pH which may favor creeping bentgrass. Defining optimum pH is not an easy task; some authors claim annual bluegrass can tolerate lower pH than creeping bentgrass, while others have stated the opposite. Dr. Max Schlossberg at Penn State has been fine tuning the optimum pH range for bentgrass and finds improved growth and quality when soil pH is less than 7.0. For maximum nitrogen availability, I prefer to keep the soil pH above 5.5 units. Because soil pH influences everything from grass growth to diseases to nutrient availability, I think we could benefit from having more science on this topic.

Back to iron, when I first heard of these high rates I became worried about unintended side effects – particularly the possibility of forming impervious of iron layers in the soil which is something Glen Obear and I have been documenting for the past few years (Fig. 3). We are still investigating the formation of these iron layers, and have not ruled out high rates of iron application as contributing to them.

We have been applying high rates (40 oz/M/month) of iron to a putting green at the O.J. Noer Facility for two years. The color response is incredible (see below) and lasts for about two weeks, which is our reapplication interval. In fact, the color response from the iron is strong enough to mask the visual difference between a plot receiving 0.1 lbs N/M/month with iron and 0.4 lbs N/M/month without iron. Similarly, the iron hides the bentgrass "injury" from Trimmit. I put injury in quotes because I am not sure how else to describe it, but if you are a Trimmit user, you know what I mean. In addition to the masking effect, we found a 50% reduction in dollar spot on the plots treated with iron (Fig. 4). However, at Oconomowoc Golf Club iron applications had no effect on annual bluegrass populations over the two year study period. Granted, the iron rates were lower (12 oz/M/month), and the soil type was less resistant to pH change than a sand might be.

Figure 3. An impermeable iron layer at the sand/gravel interface in a USGA putting green. Photo: Glen Obear

Figure 4. This picture shows the masking effect of iron, and also the reduction in dollar spot disease. Photo: Glen Obear.

While the benefits of very high iron may sound tempting, I am believer in "everything in moderation" and the recent trend towards extreme iron rates has me a bit worried. We will continue to closely monitor our high iron plots to see what happens over the long term. For now, I suggest using only moderate rates of iron and perhaps trying other soil acidification strategies like elemental sulfur or ammonium thiosulfate if soil pH reduction is your goal.

New Chemical Control?

The excitement over PoaCure is palatable. This product has been promoted to take annual bluegrass out very slowly, and has a wide margin of safety on creeping bentgrass. We have been testing it since spring 2012, and we have certainly seen the "very slowly" aspect. In fact, we observed no injury or reductions in annual bluegrass on a putting green at Oconomowoc Golf Club through fall. However, OGC's superintendent, Mr. Dustin Riley, sent me the picture below (Fig. 5) from an application he made in fall where the yellowing of the annual bluegrass is evident. I look forward to tracking the progress of the trials and hope to report some good news at the end of next season.

In summary, there are many management techniques available to you for annual bluegrass management. Obviously, none of these techniques are sufficient for total eradication. If there was a tried and true method, we wouldn't be talking about this and researching year after year. Each golf course setting is unique and we hope you can use the information we've generated to improve (or at least not hinder) your annual bluegrass control efforts.

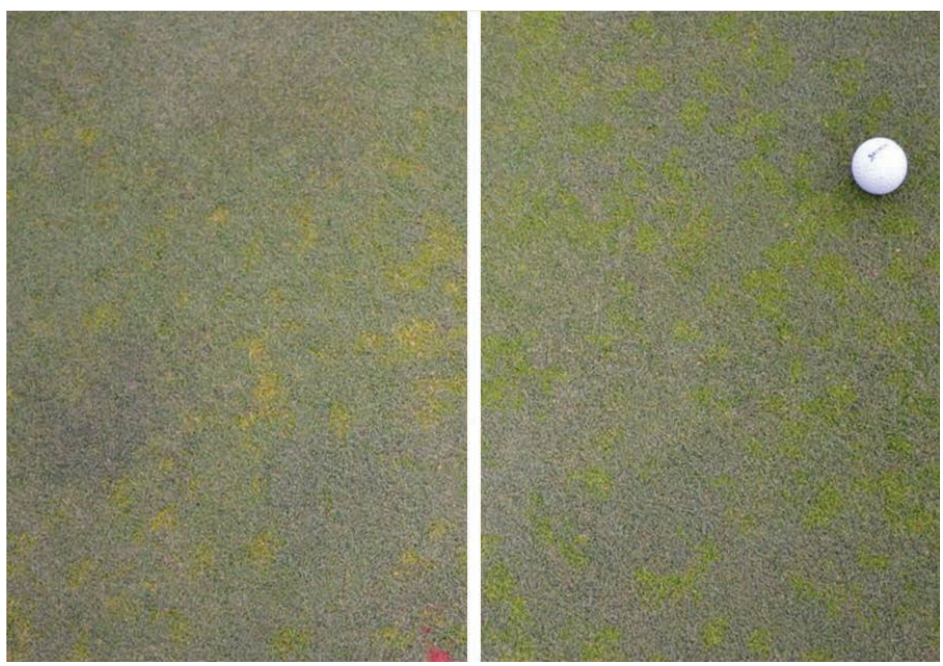

Figure 5. The plot on the left was treated with PoaCure seven weeks prior to taking this picture at Oconomowoc Golf Club. The plot on the right was untreated. Photo: Dustin Riley