Ice Caps: An Ecological Approach to *Poa* Control?

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For years I've watched golf superintendents and sports field managers try every possible new chemical to control annual bluegrass (*Poa annua*). There are some superintendents with whom I have wonderful, thought-provoking discussions on a regular basis about *P. annua* control. I have similar conversations with sports field managers. Just this week I had a phone call involving a field situation which has been going on for over 10 years, where *P. annua* continues to be a problem because the control is attempted sporadically with chemicals, often not at the ideal times, due to school policies.

At UW-Madison and other land grant universities, researchers have evaluated numerous herbicides and plant growth regulators for *P. annua* control. Several of these studies have been published in The Grass Roots (Stier and Gregos, 2001; Stier, 2004; Stier, 2007). At the Crop Science Society of America meetings the first week of November this year, at least eight research projects were presented for *P. annua* control using herbicides. In most cases the results were fair at best, and were more likely to be successful with fairway situations (Calhoun and Hathaway, 2010). *Poa annua* control on putting greens is more problematic. One of the most promising projects was presented by graduate student Marcus Jones working with Dr. Nick Christians at Iowa State University (Jones and Christians, 2010). In 2009, bispyrabic-sodium (Velocity®) applications to putting greens reduced *P. annua* amounts from 50% to 20% and all seemed well.

No researcher in their right mind makes recommendations based on a single year of data from a single site, however, because environmental variables are too important to ignore. The next year proved the point. In 2010, a similar amount of *P. annua* control was obtained, but at a tremendous cost. Much of the bentgrass was also killed, so much that I could't imagine any superintendent keeping their job if the product had been applied across any of their putting greens. The toxicity to bentgrass in 2010 was presumably due to the interaction of the herbicide and the hot, wet conditions in our region.

When *P. annua* control from single products or approaches has been less than desirable, we've tried systems approaches. In the golf course industry, fertilization levels have dropped and irrigation has been withheld. Occasionally new, dense turf varieties are tried with the hope they will block emergence of *P. annua*. We've even tried growing better types of *P. annua*, but to no avail (Stier and Hollman, 2003; Stier and Hollman, 2004).

Might the answer be simpler for northern turf areas? The winter of 2004-05 caused tremendous amounts of damage to putting greens in Wisconsin, Minnesota and Michigan. A quick, short January thaw accompanied by tremendous rainfall immediately followed by freezing conditions created layers of ice on putting greens across the region. By March superintendents were wor-

ried, many rightly so, that the *P. annua* on their putting greens wouldn't survive the winter. In all too many cases they were right.

Jerry Kershasky of Westmoor CC held a winterkill summit at which Bob Vavrek and I explained winterkill and potential solutions for turf recovery and prevention of ice-related damage in the future. University personnel from UW-Madison, University of Minnesota, and Michigan State University worked with the GCSAA to develop and send letters to general managers and owners of golf courses explaining the phenomenon. The incident spawned various articles in trade journals for superintendents over the next year, describing how ice kills turf and ways to thwart ice damage (Stier 2005a; 2005b; 2005c; Stier, 2006). Later that spring superintendents did everything possible to get turf cover back on the greens such as verticutting, overseeding, topdressing, even things to get *P. annua* seed in the soil to germinate.

Newer putting greens were less likely to suffer serious damage from ice cover than older putting greens because *P. annua* comprised a greater proportion of the turf on the older putting greens. As greens age, *P. annua* usually becomes the predominant species on putting greens in Wisconsin because management practices and biology favor *P. annua* more than creeping bentgrass. In many cases the amount of *P. annua* is not well-known because some ecotypes blend in too well with creeping bentgrass, and it's only when a catastrophe like ice cover occurs that the true amount of *P. annua* becomes evident.

At other times, superintendents are aware that *P. annua* has become an important part of the green, and various chemicals are applied to reduce if not eliminate it. Once the *P. annua* is prevalent, though, it's been difficult to eliminate enough *P. annua* while getting bentgrass to fill in without going through such a devastating killing of the turf that a superintendent wouldn't be worried about their job. At some point, many superintendents take on the unenviable task of convincing their club and members that it is necessary to do a course-wide greens reconstruction, a costly and exhaustive process.

If done right, the new greens can have little to no *P. annua* for the first several years after construction. Timing is critical: Murphy et al. (2005) showed seeding of new greens in mid-summer when high temperatures were unfavorable for *P. annua* seed germination produced relatively *P. annua*-free surfaces. If chemical applications begin soon enough after a new putting green is constructed, their regular application may be able to keep the amount of *P. annua* to a minimum. There are several problems with this approach, however. The first is that even the best chemicals don't consistently provide sufficient control. Cost and regulations also hamper their use; both factors are likely to worsen. The general trend in all plant production is to use less synthetic chemicals, and rely more on natural substances or better management practices.

When it comes to *P. annua* control, the only non-synthetic, selective agent with any promise is a specialized form of the bacterium *Xanthomonas campestris*, which causes bacterial wilt disease. While it has shown promise in controlled environment studies, it has not worked well enough in field trials to be a viable control strategy (Johnson, 1994; Zhou and Neal, 1995).

There's an old adage which states "Fight fire with fire". Ice kills grass primarily due to lack of oxygen, with *P. annua* more susceptible than creeping bentgrass (Castonguay et al., 2009). We also know that creeping bentgrass is relatively immune to ice damage. The landmark study by Beard (1964) showed that ice sheets, formed on previously frozen soil, killed 40% of annual bluegrass after 75 days without any death of

creeping bentgrass. Freezing of newly flooded soils killed about 50% of the *P. annua* after 90 days, without any death of creeping bentgrass.

I'm curious if superintendents could purposefully create ice caps on putting greens to prevent *P. annua* from ever becoming a dominant species. I know this is a scary, and perhaps absurd, thought to anyone whose greens had suffered unintentional ice damage. However, I'm not proposing this approach for greens with an extensive amount of *P. annua*. It would likely work best with greens which have relatively little *P. annua* in order to avoid extensive damage which would affect spring play.

In the late fall, after the course is closed and air and soil surface temperatures are below freezing, greens could be sprayed with water in thin layers to allow rapid freezing. Applying in thin layers would reduce the likelihood of the water simply pooling in low areas or running off the green. The idea would be to have the ice kill minor infestations, ideally scattered plants, of *P. annua* from which the surrounding bentgrass would readily grow over without the need for any overseeding or anyone even noticing some plants died. Not all greens would have to be treated in a given year. In fact, since *P. annua* encroachment is usually a slow, steady process, greens might likely only need treatment once every few years. Out-of-the-box thinking, perhaps, and a little scary, definitely. But after listening and seeing various permutations of the same old approaches tried after nearly 15 years, maybe its time for something different. If anyone wants to volunteer a nursery, chipping, or other low-profile green this winter for testing, let me know.

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