

# **Turfgrass Reestablishment Techniques Following Winterkill**

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## Introduction and Rationale

Winterkill is a general term that is used to define turf loss during the winter. Winterkill can be caused by a combination of factors including crown hydration, desiccation, low temperature kill, ice sheets, and snow mold. Due to the unpredictability of environmental factors, and differences in other factors such as surface drainage, the occurrence of winterkill on golf courses is variable and can vary greatly between golf courses and even across the same golf course.

In general, annual bluegrass (*Poa annua*) greens and fairways are the most susceptible to crown hydration injury. During the warm days of late winter, annual bluegrass plants start to take up water (hydrate). Potential for injury exists when a day or two of warm daytime temperatures in late winter is followed-up with a rapid freeze. The most common time for winterkill associated with crown hydration and refreezing to occur is during the late winter and early spring when there is snowmelt or rainfall and then refreezing of the water that has not drained away. Crown hydration is a problem during these events because ice crystal formation can occur in the crown of the plant. Ice crystal formation will rupture the plant cells and ultimately cause the plant to die.

Annual bluegrass is more susceptible to crown hydration injury because it emerges from dormancy and begins taking up water earlier than creeping bentgrass. Creeping bentgrass remains dormant longer, and therefore does not take up water and is not as susceptible to crown hydration injury during the late winter period.

Reestablishing turfgrass in damaged areas can be very challenging in the spring due to cool, cloudy conditions that often persist. Due to the scattered kill patterns often resulting from winterkill, seeding can be difficult. Inter-seeding creeping bentgrass into dead areas on the greens has given mixed results. General thinking in the turfgrass industry is that reseeded damaged greens with the low mow, high density creeping bentgrasses, such as the A and G series, or the new *Poa*-aggressive bentgrass varieties such as T-1 or Alpha is the best option. However on greens that are predominantly annual bluegrass, some golf course superintendents have tried to encourage the annual bluegrass to reestablish the damaged areas by simply scratching the surface of the dead areas to allow the annual bluegrass to germinate or by harvesting annual bluegrass seedheads by collecting clippings and then spreading them on the damaged areas of the green.

Currently there are many different programs proposed for reestablishing either *Poa annua* or creeping bentgrass putting greens following winterkill but few if any of these techniques have been proven through research to be the best. This research will determine the effects of fertilization programs, turfgrass cultivar or species, and protective covers on turfgrass reestablishment. The most important benefit to superintendents that we aim to determine is what reestablishment methods can be used to speed recovery from winterkill damage and reduce the time golf course putting greens need to be closed in the spring.

## **Objectives**

Determine the effect of creeping bentgrass cultivar or annual bluegrass, fertilizer program, and protective covers on reestablishment of a creeping bentgrass and annual bluegrass putting green.

## **Materials and Methods**

Research will be conducted at the Hancock Turfgrass Research Center on the campus of Michigan State University. Two putting greens, creeping bentgrass and *Poa annua*, will be sprayed with a non-selective herbicide in late winter of 2007 to simulate winterkill injury.

The experimental design for each putting green will be a 4 cultivar/species x 2 nutritional program x 2 cover factorial with three replications. As soon as weather conditions permit in the spring the damaged green will be seeded with three creeping bentgrass cultivars and annual bluegrass. The creeping bentgrass cultivars A4, Providence, and T-1 will be seeded into the damaged putting green. Prior to seeding, the job-saver aerator attachment will be used to create a dimpled depression in the green where the seed can germinate. Annual bluegrass seed heads will be collected from an adjacent putting green by collecting clippings following mowing. The seed heads will then be spread onto the plots to facilitate germination. Immediately following seeding and application of the annual bluegrass clippings/seed head mix a light sand topdressing will be applied to all plots.

A starter fertilizer (19-26-5) will be applied at 0.5 lb. N/1000 ft.<sup>2</sup> at seeding. Starting at the first sign of turfgrass emergence there will be two fertilizer treatments:

1. Granular starter fertilizer (19-26-5) applied at 0.3 lb. N/1000 ft.<sup>2</sup>/every three weeks.
2. Urea (46-0-0) applied in solution weekly at 0.1 lb. N/1000 ft.<sup>2</sup>

The third factor that will be investigated is the use of a protective plastic cover. The presence or absence of a simple transparent plastic cover will be assessed. The cover will be placed on the plots every night when air temperatures are expected to be below 50 °F.

## **Data Collection**

Reestablishment of plots will be assessed using visual estimates of percent coverage and computer analysis by taking digital pictures and using SigmaScan computer software to determine percent coverage. Visual quality measurements will also be recorded. Time of seedling emergence and days to complete cover will be assessed. Temperature sensors will be used to quantify temperature differences that might occur due to the cover treatments.

## **Results**

We have now conducted this research for two years, an initial year of research was conducted prior to GCSAA funding of the project.

### **2006**

Results indicated that there were no differences between the two creeping bentgrass cultivars in rate of reestablishment of the plots. The creeping bentgrass plots were deemed to be established approximately 8 weeks after seeding. The annual bluegrass treatment of trying to reintroduce seed heads to the putting green for reestablishment was not successful and primarily resulted in algae and moss infestation. There were no consistent significant differences in the cover treatment or the fertilizer treatments.

### **2007**

In 2007 we repeated the research from 2006 with some minor changes. We added an additional creeping bentgrass cultivar, T-1, and we killed both a predominantly creeping bentgrass green and a predominantly annual bluegrass putting green. As in our initial trial in 2006, there were no significant differences in the rate of turfgrass establishment among the creeping bentgrass cultivars. The creeping bentgrass cultivars did establish quicker than trying to use annual bluegrass seedheads collected from adjacent areas and introducing the seed into the killed area. Once again we did not see a fertilizer treatment effect nor did we see a cover effect with the one exception of there being a positive effect of using protective covers on the creeping bentgrass cultivar A-4. Overall, the rate of establishment for the turfgrass on the previously 100% annual bluegrass putting green was faster than the predominantly creeping bentgrass putting green. We believe the difference in establishment rate was due to rootzone mix effects. The annual bluegrass putting green has a native soil rootzone profile while the creeping bentgrass putting green has a USGA specified sand based rootzone. The moisture holding capacity and nutrient holding capacity of the native soil annual bluegrass putting green were likely factors in enhancing turfgrass reestablishment.

### **Projected activities: Nov. 2007 through May, 2008**

A creeping bentgrass and annual bluegrass green will be sprayed with a non-selective herbicide in the autumn of 2007. These plot areas will be used for the reestablishment trial to be conducted in the spring of 2008. The plot area will be seeded in the spring as soon as weather conditions permit. Upon conclusion of 2<sup>nd</sup> year of research in the summer of 2008, research results will be prepared for publication in a refereed scientific journal and an extension fact sheet containing recommendations will be prepared.

Figure 1. 2007 Turfgrass quality ratings for the creeping bentgrass putting green that was reestablished following simulated winterkill.

