

Now is the Winter of our Discontent

Chuck Barber, St. Charles Country Club

William Shakespeare wrote this line in Richard III. I believe the bard's intention was to set the tone of the play about King Richard III of England as a self-loathing, cruel despot. What it means for us is spring is here and winter has gone. The forecast is for a high of 30 tomorrow (3/22/2014) and snow but I'm confident that what feels like an eternal winter will release its grip soon.

Some of the ways we measure a winter's characteristics are snowfall, temperatures, days of snow cover, and ice cover. I won't rehash any of that here because I'm fairly certain that we all have vivid memories of winter 2013/2014. The expression goes that misery loves company so I figured I would try and get the word out that many superintendents in the area might be struggling with damaged turf, for a variety of reasons, as we (slowly) emerge from this winter.



Low spots that have accumulated prolonged periods of ice cover may be troublesome once the growing season begins.

(between cells) causing a decrease in water potential outside the cell. The cell begins to move out of the cell toward the ice crystals in the intercellular spaces and subsequently freezes. Thus, dehydration occurs within the cell. The colder the temperatures the more water travels down the gradient toward the frozen water. At 14 °F (-10°C), 90% of the osmotically active cellular water will move out of the cell into intercellular spaces (Thomashow, 1998).

Continuous Ice Cover Injury

The reasons commonly proposed for ice injury are the buildup of toxic gases and/or the development of anoxic conditions, and the loss of cold hardiness. It appears that carbon dioxide (CO₂) accumulation under ice cover is a major contributor to the death of herbaceous plants (Freyman and Brink, 1967). Intermittent



The snow slowly recedes off the 12th Green at St. Charles Country Club to reveal what is underneath.

Why does injury occur on cool-season grasses? CDGA Director of Turfgrass Programs, Dr. Ed Nangle, Ph.D. tells us here:

Freeze Injury

Although turfgrasses undergo cold acclimation, freeze injury is a potential problem on cool season turfgrasses like annual bluegrass (*Poa annua*) and perennial ryegrass (*Lolium perenne*) Freeze injury and conversely tolerance is due in large part to how the turfgrass plant reacts to cell dehydration. As temperatures drop below freezing water within the plant freezes intercellularly

thawing helped eliminate the CO2 buildup and injury to the plants in this study did not occur (Freyman and Brink, 1967). The loss of cold hardiness under ice cover occurs and varies among turfgrass species. Under continuous ice cover annual bluegrass loses its cold hardiness, while creeping bentgrass is not affected (Thompkins et al., 2004). The loss of cold hardiness in annual bluegrass is likely due to the anoxia (lack of oxygen) conditions that develop under an ice cover (Thompkins et al., 2004).

Ice Formation in Association with Freeze Injury

In areas where continuous ice cover for over 45 days is unlikely due to winter weather patterns being broken due to intermittent periods of thawing, ice formation can play a role in freeze injury. Under this scenario a rapid drop in temperature resulting in freezing water around the growing point during late winter or early spring can cause freeze injury primarily to *Poa annua*.

The critical precursor to freeze injury is the loss of cold hardiness through dehardening and subsequent re-hydration of the annual bluegrass crown region. Continuous ice covers as previously mentioned contribute to the decline in cold hardiness. However, the most important factor regulating de-hardening is temperature (Tompkins et al., 2002). In annual bluegrass the de-hardening process can occur quickly when soil temperatures exceed 46 F (8°C) for 48 hours (Tompkins et al., 1996).



A green suffering from damage from ice formation around the crown of the plant - that pulls water out of the plant cells.

Proactive Attempts

What can we do to mitigate winter injury potential? I will refer to the good Dr. Nangle again.

1. Produce a healthy plant going into the winter. A weak *Poa annua* plant with low carbohydrate storage is not going to tolerate ice cover or be resistant to freeze injury as a healthy plant. Shaded areas are more prone to freeze injury than sunny areas, probably due to the carbohydrate status of *Poa annua* (Rossi, 2003).
2. Eliminate poorly drained areas. *Poa annua* growing in areas where water accumulates is at high risk to rapid freezing during freeze/thaw cycles.
3. Provide drainage for removal of water from excessively wet

areas. During freeze/thaw cycles the presence of excessive moisture can enhance freeze injury.

4. Reduce thatch. A significant thatch layer results in the plant's growing point to lose contact with the soil as it elevates into the thatch layer. This will expose the plant more readily to freezing temperatures.
5. Potassium fertilization. In turfgrasses potassium is often applied for increasing the chances of winter survival. Potassium is an ion that helps lower the osmotic potential of the cell decreasing water the potential for water flow from the cell.
6. Reduce the likelihood of excessive growth going into the winter. Overstimulation of growth promotes succulent high water content cells that are more likely to encounter freeze injury.
7. Reduce shading. Although not fully researched, a degree of correlation has occurred with freeze injury and degree of shading. Shading may contribute to increased freeze injury due to plant cells tend to be:
 - more succulent in shade and have larger intercellular spaces,
 - lower carbohydrate levels, which may influence water potential, as well as the energy requirements of the turf
 - shaded areas tend to be wetter, which may contribute to the severity of freeze/thaw cycles in late winter.



We all know how problematic shade can be in the summer but we forget how much it can contribute to winter damage as well by slowing soil warming and snow / ice melt.

Communication and Resources

How are you communicating injury or potential injury to your customers, owners, members or managers? The USGA has a video on sampling frozen turf to determine if injury has occurred. It can be found on YouTube, search terms USGA turf sample ice.

Further, they have a video on the importance of winter weather concerns here:

<https://www.youtube.com/watch?v=ROHZofjndkA>

Make sure everyone who needs to know about injury or potential injury stays informed as spring progresses. Provide



The damage from the winter that would never end won't be really apparent for several more weeks as soil and air temperatures begin to climb and stay.

information on where injury has occurred, any potential reasons for why it occurred, what can be done to recover from that injury and the corrective steps that will be implemented to provide healthy turf moving forward

For those of you who make it out of winter unscathed, congratulations. For those of you who didn't, you are not alone and there are resources available to help you communicate and recover. I for one am cautiously optimistic that we will have a great 2014 golf season here in the area. THINK SPRING! @



Samples from a predominantly Poa annua putting surface are troublesome as they are checked for life.



Bentgrass samples taken from the same golf course appear to be in much better health and will spark many conversations this spring about bentgrass conversions.

For Turfnet subscribers, the #WORSTWINTEREVER webinar can be found in their archives, and some are available to non-subscribers as well.

The USGA is another source for information through their regional updates and don't forget about the CDGA Turf Program.