



Winter Survival of Turfgrass

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In Canada, each year the effects of winter are felt from coast to coast. In some areas winter is benign while in others it is severe. Most years, the effects are minimal or at the very least, manageable. Unfortunately, the winter of 2018-19 was noteworthy in terms of its intensity throughout the country and, with the snow's departure, golf course superintendents and golfers were met with the potential reality of winterkill.

As this past Easter weekend unfolded, many courses had yet to open and were reeling from the effects of a very harsh off-season. Damage was significant throughout Canada with Ontario and select areas in the southern portion of the province being particularly hard hit. Reports from Alberta, Quebec and the Maritime provinces as well as the northern United States suggest damage was not only widespread but severe in many areas.

This article may not review the subject of winter damage completely, but it is good overview of the risks associated with winter in Canada and some of the practices that can mitigate those risks over time.

Winterkill

The term winterkill is broad and the reasons behind the death of golf course turfgrasses can vary greatly depending on very specific circumstances. Winterkill describes loss of turfgrass from a number of factors including: low temperatures, ice cover or ice encasement leading to anoxia (lack of oxygen), snow moulds, desiccation (the removal of moisture-usually found in high areas that are exposed to wind and cold) and crown hydration (the plant rehydrating and then refreezing during a thaw re-freeze cycle). Winter survival of turfgrass may vary greatly from province to province, city to city, golf course to golf course and even within the confines of a single golf course due to microclimates and specific weather events. Factors such as the turfgrass species present, soil types, volume of organic matter, and amount of tree cover or shade can individually or collectively have a dramatic effect on whether turfgrass survives or not.

Reducing the Risks

To reduce risks associated with overwintering in Canada, take the time to conduct a thorough property assessment, review annual management protocols and understand the risks to the golf course. In addition, gathering of data to benchmark key elements and conducting monitoring on an annual basis can provide direct information on whether risk factors are increasing or successfully being managed.

Managing risks is important because winterkill not only adversely affects turfgrass but also has a profound effect on the golf course operation as a whole. Similar to a vehicle requiring regular oil changes, if the golf course complex is not receiving sound preventative



maintenance and the performance of the course is not being monitored, risk of winterkill generally increases with time and age. The following checklist can serve as a guide to manage and minimize the risks of winter.

- Benchmark and collect ongoing data to ensure minimum water infiltration/hydraulic conductivity rates are maintained through proper cultural management.
- Benchmark and collect ongoing data related to organic matter and thatch accumulation to ensure volumes and levels are maintained through proper cultural management.
- Benchmark and collect ongoing data of soils, nutrient values, bulk densities and compaction to ensure minimum standards are maintained.
- Assess and ensure good surface drainage (including collar dams) and that both irrigation and runoff water are considered.
- Assess the impacts of shade and limit the impact of trees through clearing, selective removal and pruning as well as root pruning where required.
- Assess species composition and ensure creeping bentgrass populations are maximized.

Factors Impacting Winterkill

The final bullet point noted above is critical. Research conducted in Canada has shown that one of the reduced-risk strategies courses can undertake is to maximize creeping bentgrass populations within putting greens. This can be accomplished through maintenance, alterations to growing environments or the planned integration of creeping bentgrass through regrassing or reconstruction. All of these components should be addressed individually as well as in combination. Note that regrassing with creeping bentgrass alone without properly altering elements such as growing environments and rootzone dynamics will likely only result in a temporary fix and is not recommended.

Although many feel that annual bluegrass (or “poa” as it is commonly called) still provides a reasonable surface for putting and play, research has concluded this species is more likely to experience winterkill than creeping bentgrass, especially during severe winters. Annual bluegrass (AB) encased in ice begins to lose winter hardiness between 45 and 60 days as compared to creeping bentgrass (CB), which can survive ice encasement for 90 days and retain moderate hardiness levels for 150 days (Tompkins et al., 2004). Although prolonged ice encasement even in Canada is rare, CB does offer advantages when it comes to surviving winter, including breaking dormancy a bit later than AB, and surviving prolonged anoxic conditions such as what happens following saturated thawed soils.

In addition to the checklist above, the following are additional actions that can be taken to minimize risks in the shorter term to prepare for winter. First, as temperatures begin to decline, it is suggested that mowing heights be raised. How many of you have collars that survive right beside putting green height turf that has perished? These increases will increase photosynthetic potential and subsequently increase carbohydrate storage in order to improve upon the plant's abilities to survive winter. In combination with raising your mowing height, it is also recommended that a proper and balanced plant nutrition strategy be planned and executed to improve health and growth prior to winter. Next, various forms of cultivation can be done to improve both soil and turfgrass health. Core aeration should be executed to increase oxygen availability in the rootzone and to enhance and promote water movement. The intent is to prevent water logging prior to freezing as saturated soil conditions can increase the likelihood of ice formation and prolonged anoxia. Depending on soil types, additional cultivation in the form of deep tine aeration may also be required to enhance water movement. Deep vertical mowing may be beneficial to reduce surface organic matter levels if they are deemed to be excessive. Depending on site characteristics, another practice that is often advocated is adding a thick layer of topdressing sand to putting greens prior to winter. This would likely be done separately from fall aeration events where only enough sand is applied to backfill and properly bridge aeration holes. This additional topdressing event will create a protective layer on the surface and protect the crowns of the plant from desiccation and extremes in temperatures, but caution must be exercised as to not smother the turfgrass. Finally, an important part of winter preparation is the application of preventative fungicides to combat winter diseases. Both grey and pink snow moulds are common throughout most of Canada and obviously must be dealt with on a preventative basis.

Covers for the Greens

Finally, there is the debate over the use of covers for the greens. There are various, specific types of covers, but most will fall into three distinct categories: permeable, impermeable, and hybrids of the two.

In areas of Canada where prolonged snow or ice cover is a common occurrence, the use of impermeable covers is somewhat common. Their use is seen in parts of Quebec, northern and eastern Ontario, Alberta and the Maritime Provinces. That said, it must be noted that the use of impermeable covers does not guarantee that winter injury will not occur. As impermeable covers do not allow for adequate gas exchange, anoxic conditions can occur under the covers and lead to extensive damage unless venting events are scheduled throughout the winter months. Additionally, the covers must be sealed properly to ensure that water is not able to weep underneath the tarp as this could lead to ice formation with little to no chance for a melt through the winter season.

The other major type of cover is a permeable version. These types of covers allow water to penetrate the cover and are especially useful for prevention of desiccation (excessive drying of the turf plants), as well as for warming the turf and soil to increase snow-melt and speed up spring recovery and greening. These covers are often used in the Prairie Provinces, where greens are exposed to cold winds and susceptible to desiccation throughout the winter season. However, they are not recommended where numerous thaw/re-freeze events occur as they will not prevent the formation of ice due to their permeability to water.

Although many have looked at covers as requiring intensive off-season management and the costs being high, consider return on investment calculations when exploring the option. Losses to your course or club's brand equity and their annual cash flows can quickly reach seven figures when dealing with severe winterkill.

Communicate with the Customer (golfer)

While owners and golf course superintendents can take all the necessary precautions, no amount of winter preparation - including tarping, topdressing, ensuring proper drainage, fungicide applications and proactive plant nutrition - can unequivocally ensure a golf course free of winterkill come spring. With so many unpredictable weather-related factors at work, it is important to note that there is no fail safe or "silver bullet" to prevent the damage that can occur and completely ensure the health of an entire golf course, even with a pure stand of creeping bentgrass in place.

It is also important to remember that golf course and turfgrass management is a service-based industry and without golfers there is no reason to manage turfgrasses intensively. There may be a number of reasons why you migrated to the golf business, but we have to remember that ultimately, we are working every day to provide a stand of turfgrass for golfers to enjoy. To accomplish this we are always trying to balance the needs of the turf with those of the customer, and unfortunately, the two are rarely in perfect alignment. With the constant potential for winter injury and the challenge of executing the various assessments and practices noted within this article, one of the most important tasks of those in the golf industry is focused communication. Always be in frequent communication with your clientele, ideally proactively, letting them know what is planned as well as what is currently being done and why it is done. Emphasize that all practices are about improving their experience whenever and wherever possible.

Lastly, use communication and education to get golfers to do their part, especially in circumstances where we are forced into recovery mode after another long and severe winter. Have them respect all rules and signage and educate them that new seed, plugs or sod are easily damaged by traffic. Additionally, be patient and communicate the efforts of the golf course superintendent and their teams. The professional in them will be working overtime to see things take a turn for the better and normal playing conditions return.

Silver Lining?

In the face of adversity, there is typically a silver lining. If site conditions and management protocols are reviewed and proactive changes are made, we should see environments less conducive to AB in general. In conjunction with changes to site conditions and the integration of new CB via seed, sod or plugs at many courses, we should see reduced risks for many and more resistance to damage in the winters ahead.