Fighting desiccation: Should we water turf in the winter?
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The dramatic temperature swings, lack precipitation or snow cover, and relentless winds felt across the North Central US this winter have increased the chance of turfgrass winterkill. While winterkill can occur for a variety of reasons (see http://turf.unl.edu/pdfctarticles/march%20winterkill.pdf), the dry and unseasonably warm weather this January has increased the concern for desiccation injury. Desiccation can occur whenever water loss (evapotranspiration) exceeds water absorption and causes plant cells to dry out. It can happen any time of the year and, over a period of time, constant desiccation injury can turn lethal. Winter desiccation often occurs when the soil is frozen and water is unavailable to plant roots. It is especially problematic on sunny, dry, and windy days when the air temperature is above freezing but the soil is dry or frozen. This causes turfgrass leaves and, more importantly, crowns to become dehydrated and die. Exposed and elevated sites or turf grown on soils with low water holding capacity are most susceptible to winter desiccation injury.

Over the decades, turfgrass managers have experimented with a variety of products and practices to combat winter desiccation injury. Heavy application of sand topdressing, turfgrass covers, snow fences or wind-breaks, and anti-desiccants have been used to help prevent desiccation injury. While many turfgrass managers have generally seen good success with many of these techniques, winterkill from desiccation injury can still be problematic. Despite widespread winterkill concern, turfgrass research to both prevent and recover from winter desiccation injury is lacking. Winter weather variability from one year to the next and nearly continuous snow cover at many turfgrass research centers in the northern US are the main reasons for the shortage of desiccation data.

Heavy sand topdressing of high value turf at the end of the growing season is one of the most common practices used to protect crowns from desiccation. It's frequently cited in textbooks, trade magazines, and extension articles (Beard, 1973; Koski, 1996). Most sources suggest topdressing sand be applied after the final mowing of the year at a depth of 1/8 to 1/4 inch. The theory is that sand topdressing protects the crowns from the wind and limits rapid changes in crown temperature. Bigelow et al. (2005) found that application of 300 lbs of sand per 1000 ft^2 (roughly 0.04 inch depth) or more increased spring green-up of a creeping bentgrass putting green compared to the non-treated control and sand color wasn't important. Sand application rate and color did not drastically increase canopy temperature. It is possible that sand topdressing helped prevent desiccation injury; however the amount of snow cover during the study was not reported. An obvious drawback of heavy late season sand topdressing is removal of the sand in spring which can quickly dull freshly sharpened reels.

Covers are sometimes used to prevent winterkill. Early research found that various turfgrass covers made from viscose-rayon-polyester and excelsior mat provided both temperature insulation and desiccation protection (Beard, 1969). Polyester blankets and polypropylene covers also sustained leaf moisture and improved spring green-up (Roberts, 1986). The heavy covers also reduced light transmission and caused yellow turf leaves in early spring. More recently, Dr. Minner at Iowa State University found that both permeable Evergreen and impermeable Green Jacket covers helped prevent winterkill and enhanced spring green-up but conceded that desiccation injury can still occur with covers (Minner et al., 2006; Valverde and Minner, 2007). Canadian researchers demonstrated that thin, commercially, available covers provided little insulation except when placed over several inches of insulating material such as stray, haw, or wood fibers (Dionne et al., 1999). Desiccation injury is more uncommon in eastern Canada because of prevalent snow cover. While these covers may be useful to protect against the bitter cold in eastern Canada, they may be problematic in the Great Plains region where air temperatures can be well above freezing during periods of winter.

Anti-desiccants or antitranspirants are products that reduce water loss and may limit winter desiccation injury. They either form a protective coating around foliage or close plant stomata. A few golf course superintendents in the northern Great Plains routinely use anti-desiccant products such as Transfilm (PBI-Gordon) to reduce winter desiccation injury (Aylard, 2000). Beard (1969) found that a common anti-desiccant derived from pine tar, Wiltpruf, did not prevent desiccation compared to the control. Additionally, the anti-desiccant Leaf Shield did not

reduce desiccation injury, however soil moisture wasn't limiting during that study with 72 days of continuous snow cover (Valverde and Minner, 2007). Applications of anti-desiccants were also found to reduce spring green-up after 90 consecutive days of snow cover (Minner and Valverde, 2002). This may be favorable for winter tolerance and help prevent premature spring green-up during mid-winter thaws. For the same reason, turfgrass paints and colorants may actually reduce winter hardiness because they typically increase spring green-up (Valverde and Minner, 2007). More research is required to understand how anti-desiccants and pigments affect desiccation injury when season long snow cover is absent and also to understand if forcing spring green-up with pigments is good or bad.

All the methods described above focus on preventing water from leaving the plant. That brings us to the question that's commonly brought up during this time of year. Should we be irrigating turfgrass in the winter to prevent desiccation injury? Unfortunately there hasn't been research focused on winter irrigation, yet many superintendents in the western Great Planes have secondary frost resistant irrigation systems to water during warm dry periods of winter (Latham, 1991). Watering during the winter can be a challenge. Irrigation systems aren't easily turned on and off, crew resources can be limited during the offseason, and equipment to carry and deliver large quantities of water may cause traffic damage if it's even available. It also bring up several other questions such as, how much water needs to be applied and how frequently, is there the potential to deacclimate the turf with irrigation during warm weather in the middle of winter, should water be applied when the soil is frozen, and is it even beneficial? Clearly more research needs to be conducted.

Despite a lack of research data, the current UNL recommendation is to lightly irrigate high value turf on dry sunny days when the air temperature is well above freezing where feasible. The goal is to rehydrate plant crowns (and lower leaves) back to a survivable level and restore soil moisture at the surface. Avoid excessive quantities of water which may fill soil pores or runoff and present an icing hazard when cold temperatures return. Also avoid trafficking high value turf area as winter drought, like summer drought, increases the risk of traffic injury. These recommendations may be refined in the future as we conduct more research on the topic.

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