Cold Weather Management

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What are you doing with regard to winter kill on your sports fields this year? Field safety also includes trying to prevent winter injury to your turf by using good management practices. Winter kill is defined as any injury to turf during winter. These injuries include low temperature kill, desiccation, low temperature diseases (see the cover article on snow mould), ice cover damage, and heaving. I have seen a Merion Kentucky bluegrass field dead from low temperature kill. The grass leaves were a whitish brown and then turned a dark brown. Leaves were limp, just like a mat on the ground. Temperatures had exceeded -30°C. There was very little snow that year, and the field was quite exposed to drying winds.

Cold Hardening

Cold hardening is the first process that occurs as the grass plant goes into winter dormancy. It is an adjustment in the plant's growth. Shoot growth slows gradually over a three to four week period to maximize hardiness while temperatures are still above freezing (2-7°C). There is an increase in carbohydrate levels and a decrease in the tissue hydration level. During the cold hardening process, the water content in the grass plant may be lowered from 85% to 60% depending on the species and cultural practices employed. What should you do at this stage?

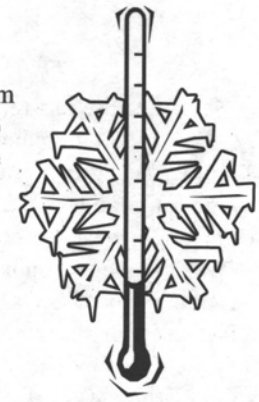
- ♦ Check your field for surface and subsurface drainage.
- ♦ Raise mowing heights during the hardening process.
- ♦ Boost potassium levels.
- ♦ Avoid high nitrogen (N) levels. Fall fertilization is an acceptable practice using a high N analysis fertilizer after the grass has gone into dormancy (usually late Oct., early Nov.).
- ♦ Maintain adequate phosphorous levels.

Low Temperature Stress

At -15 to -24°C, roots tend to be cooler than shoots. With low temperature stress, ice crystals form and damage the protoplasm through fracturing. (Protoplasm is the jelly-like substance of plant and animal cells basic to all life processes.) Crown hydration is not a cause of low temperature stress. If the area is poorly drained, the leaves can take on a water-soaked whitish brown colour as the plant loses chlorophyll (its characteristic green colour). Examine the individual plants crown/node meristematic tissue. It should be firm and white. If it is brown and mushy, you have a problem. Bring in the same plugs, add moisture, and examine. The root tissue will have larger cells. All leaves and roots can be killed. Turf will survive as long as long as meristematic tissue in the crown of plants and in the nodes of shoots survives. Select cold hardy cultivars as well as species.

Low Temperature Kill (-5 to -20°C)

The northern adaptation of ryegrasses and tall fescues is restricted by low temperature kill. Soil temperature is more important than air temperature in causing low temperature kill. There are four situations when it can occur: (1) during freezing, (2) after freezing when an equilibrium is reached, (3) during thawing, and (4) after thawing. Factors which influence the absolute killing temperature are:



- ♦ plant hardiness level
- ♦ degree of tissue hydration
- ♦ number of freeze-thaw cycles
- ♦ shaded risk - low carbohydrates
- ♦ repeated freezing and thawing
- ♦ saturated turf

In a simulation chamber, there was no kill in rough bluegrass or in creeping bentgrass at -10°C. Weakest were the ryegrasses. Stress tolerance was maximized by balancing nitrogen to potash by a ratio of 3:2.

Ice Cover

This is where oxygen is excluded from the meristem, and toxic levels of carbon dioxide accumulate in the meristem under the ice. Dr. James Beard was the first scientist to investigate the effect of winter injury on cool season turf in the 1960s. He took plugs of turf, creeping bentgrass, Kentucky bluegrass, and annual bluegrass and allowed them to harden fully in the Michigan area. They were then placed in glass jars that were filled with water and slowly frozen to form dense clear ice. He found that the bent and Kentucky bluegrass were not killed after 100 days and survived without significant injury. Annual bluegrass (*Poa annua*) was killed at 90 days.

Turf kill associated with ice cover typically occurs during the freezing or thawing period when standing water hydrates the crown/node meristematic tissue. Cell protoplasts are crushed, and crowns are not affected. With sleds, toboggans, and foot traffic, damage is minimized as long as an inch of frozen snow cover is present on traffic paths and wet slushy conditions do not exist (-7°C).

Desiccation

This is a major cause of winter kill. Desiccation is usually more severe on elevated areas, sites exposed to excessive drying winds, or areas where surface water run-off is high. Typically, leaves are a distinct white and remain erect in high dry areas.

Some recommendations are the use of organic mulches, brush or synthetic covers, or windbreaks such as shrub plantings or snow fences. Covers may be solid plastic or ventilated, and the integrity of the seams is very important. Covers keep water off the crowns. They should be installed before the soil freezes or first snowfall, and the area must be covered properly. First, remove all clippings and leaves. Second, ensure fungicides for snow mould control have been applied, and lastly, put the cover in place and stake it.

Covers should be removed when there is a low probability of winter injury and before excessive shoot growth occurs. Record temperatures and keep a daily log. Preventative maintenance is

the key. Moderate nitrogen and control thatch on turf. As for soil, perform no late corings and do not leave holes open. Adjust your fall irrigation to maintain adequate soil moisture to avoid winter drought, saturated soil, or standing water, and reduce thatch accumulation.

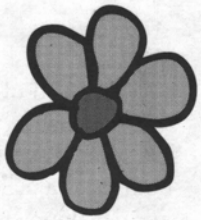
Conclusion

It is the wise sports turf manager who will increase vigilance on his/her fields following this article. In areas where there is a lack of snow cover, increasing freeze-thaw cycles, or little rainfall, desiccation may become a problem. Conversely, areas of high winter traffic, i.e. outdoor ice rinks, may have to be located away from sports fields. A little preventative maintenance can result in a field or fields that are ready for play after surviving a harsh winter relatively unscathed. Have you filled in those low areas where water may accumulate? Have you raised your cutting heights? These and other issues may be particularly important when groups are asking or demanding to be allowed on the fields earlier in spring. Begin planning now! ♦

References

- ♦ Pam Charbonneau, OMAFRA Turf Specialist, GTI Advisor, February 17, 1998.
- ♦ J.B. Beard, Ontario Turfgrass Symposium - notes, Winter Turf Problems, January 1997.
- ♦ J.M. Roberts, University of New Hampshire, Golf Course Management, October 1993.

Communities in Bloom



YOUR ASSOCIATION was well represented at the Communities in Bloom First Annual Symposium on Parks, Grounds, and Open Spaces on September 24th and 25th in Winnipeg, Manitoba. STA member/director Dr. Bob Sheard represented the Association, addressing the topic *Design and Construction of Sports Turf Fields*. STA member Vic Hergott was also on the speaker roster with a presentation entitled *It's Time to Stop Playing Around.* ♦