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**THE CAUSES OF LATE WINTER -
EARLY SPRING DAMAGE TO TURFGRASS**

During late winter-early spring fluctuating temperatures and waterlogged, partially frozen soil produce conditions that cause the loss of turf. This loss may be the direct or indirect result of one or more of these phenomena. Direct damage or kill of the permanent grass may occur at any point of the freeze - frozen - thaw cycle so characteristic of this season. Indirect injury may result from attacks by disease producing organisms (mostly snowmold and other low temperature fungi) and by traffic on frozen and partially frozen turfgrass areas.

Turfgrass may be destroyed - **at the time it freezes, during the time it's frozen, during the time it's thawing, or after it's thawed** and growth has begun. Some killing probably occurs during each of these periods. This cycle of freezing, frozen, thawing may be repeated several times during each winter and early spring. When associated with intermittent growth in late winter-early spring, damage may be severe. Death as the plant freezes happens most often in the late fall-early winter, but may occur after a period of growth (particularly rapid growth) in the spring when a sudden drop in temperature occurs. This is most damaging when the grass plants are in a non-hardened condition. Ice crystals form **within** the cells and this disruption of the protoplasm may cause death. Too, repeated cycles in the spring will **exhaust food reserves upon which the plants must draw** to initiate growth. For this reason, *Poa annua* is especially vulnerable.

Death during the time the plant is frozen is unlikely to occur unless it is subjected to traffic. This will seldom occur if a good snow cover exists, which is the case most often during the winter months. However, play during the time period under discussion may cause mechanical damage either by attrition or from pressure which forces the ice crystals through the cells, thereby puncturing them and causing death. Play during time the grass is covered with frost has the same effect.

Death at the time of thawing depends on the amount and the state of the "bound" water within the cell (intra-cellular water). Unless adequate bound water is present in the protoplasm, death may result if thawing is rapid or if inter-cellular water re-enters the cell too rapidly. In the latter case, the cell wall is permeable but the protoplasm is unable to absorb the water. Prolonged cold may be conducive to death because it contributes to brittleness of the protoplasm and, if contact (from traffic) is made, the plant is highly susceptible to damage.

Causes Relating to Traffic

Grass will initiate growth during the warmer periods of late winter-early spring. If the season is characterized by widely fluctuating temperatures, the grass is vulnerable to the freeze-frozen-thaw growth cycle with its attendant problems. Too, the environment produced is highly conducive to disease development. Thus, this may be the most critical phase of the turf management program facing the golf course superintendent. And, he often finds his turf management programs (and, therefore, himself) in direct conflict with the golfing membership, especially those desirous of playing a few early rounds.

Mechanical injury by traffic on partially frozen or wet soil may be immediately evident (visible) or delayed (invisible). Visible injuries (soil displacement) are the footprints and ruts caused by foot and vehicular traffic - sliding and slipping, walking or rolling - on partially frozen or saturated soil. Invisible injury stems from soil compaction.

Although this type of mechanical damage is not confined to the winter months, soil compaction may be far more damaging during this period than generally recognized. Traffic on partially frozen or wet soil, without the protection of living grass, will exert greater pressure (hence, more compacting force) than during the normal growing season. This results, subsequently, in poor growth and may explain "problem areas" which show up in spring and summer for no apparent reason. Cupping areas are particularly vulnerable in this respect.

Traffic on frosted turf causes the frost crystals to puncture leaf cells and kill the grass. Removal of frost, or preventing play when the grass is frosted, is essential.

Control of traffic during vulnerable periods does not always contribute to harmony between early golfing members and the less enthusiastic golfing and non-golfing members. The responsibility for control rests with the club officials - president, green chairman, superintendent and golf professional.

Causes Relating to Ice Sheets and Ponged Water

Turfgrasses, although essentially dormant during the winter months, nevertheless, carry on metabolic (growth) activity, particularly respiration. During late winter-early spring, as growth activity increases, the grass may **suffocate** (a) if diffusion of atmospheric and soil gases is reduced or stopped; (b) if excess carbon dioxide accumulates, or (c) if oxygen supplies are reduced to a minimum. Such conditions exist under ice sheets in poorly drained areas where the soil remains

saturated for extended periods and, under flooded conditions when ponded or standing water persists. The higher the temperature, the shorter the period of time that the grass can survive these adverse conditions.

Under limited (and rare) conditions, ice sheets and ponded water may act as a lens. When this happens, the sun's rays are magnified to the point where the excessive heat produced may cause a burning or scalding of the turfgrass.

Causes Related to Reduced Water Intake

Desiccation is a "wilting" phenomenon. Like wilt, which occurs during the normal growing season, desiccation occurs when evapotranspiration exceeds water intake. This inability of the roots to absorb water, or for the plant to transport it to or through its system, may result from a shallow, poorly branched root system; diseased vascular system, or, from a reduced or restricted soil water supply. Limited soil moisture may be the result of a "dry" soil (not enough water) or of a frozen or partially frozen soil (water unavailable to the root because of its physical state). Thus, the roots simply cannot take in enough water to offset that being lost by the plant and it "desiccates" or dries up - it wilts. Although more serious during periods when the soil is "on the dry side" or partially frozen, desiccation on high windswept sites may occur at any time. The increased air movement causes excessive transpiration and under limited or reduced soil moisture conditions, the plants may die unless protected.

In late winter-early spring, before the irrigation system has been activated, damage from desiccation may be severe. Water hauled in spray tanks or by other means and applied to critical sites will preclude or minimize loss.

Protective Measures

Techniques and procedures that protect, avoid and correct the damage that occurs in late winter-early spring are well known to and understood by the golf course superintendent. For the most part, protective measures relate to production of a healthy vigorous grass and to the control, to the extent possible, of the soil-plant environment. When these factors are adversely impacted by anomalous conditions of weather, poor construction or inadequate equipment and supplies, the responsibility for loss of turfgrass must be shared.

**J. R. Watson, Vice President
The Toro Company**

TO PREVENT WINTER DAMAGE

Question: Our golf course superintendent prohibits play when there is frost on the ground. Is this good practice and if so, why?

Answer: When turfgrass plants with a frost cover experience foot or vehicular traffic, permanent damage frequently occurs because walls of plant cells are ruptured. Also, it is possible that the crown of the plant may be damaged, which could result in permanent turf loss. A weakened plant provides an ideal opportunity for weed and disease invasion and a decrease in plant density for the summer stress months. The golf course superintendent has the interest of the majority of players in mind, and he is interested in the maximum use of the course for all seasons when he faces the decision to close the course because of inclement weather.

USGA Green Section Record



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