Playing Par with Jack Frost

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As winter begins, the golfer lays aside his clubs for a time and settles down to watch football. But, loving the game, our minds quickly return to golf , and our bodies avidly follow. Thus we encounter an age-old problem: morning delays to allow the frost to clear or enable the green surface to thaw. Often a confrontation arises between the golf professional and/or the superintendent on one side and club members on the other. Consider the problems of playing greens in the winter when frost or freezing occurs, and why play must be delayed, or even prevented, for a period of time.

Everyone knows frost must clear off the grass before play can begin, but few people know why. Frost on the grass blades tells us that the water inside the leaves is frozen. Remember that water is the primary component of plant tissue. When this water is frozen, traffic on the turf causes the ice crystals in the cells to puncture through the cell walls, killing the plant tissue. Little damage is done to the crowns (growing points) or roots if only a light frost appears; however, when the frost is heavy, cell disruption may occur at the crown, thus killing the entire plant. Frost damage symptoms include white to light tan leaves where traffic has passed.

Traffic damage can be minimized by melting the frost with a light syringing of the greens when soil and air temperatures are above freezing. The simplest approach is to avoid traffic until the frost melts.

Another dangerous situation exists when the soil is completely frozen to the surface but the grass blades have thawed. Provided there is no frost or ice on the grass under this condition, then limited foot traffic creates little damage, if any.

At these times, heavy traffic or golf carts should be restricted from greens, tees and even fairways. This is the most favorable winter conditions, because when the soil is frozen it does not allow as much penetration of compaction and spikes, thus preventing damage to the grass roots. Since the blades are not frozen, they retain the resiliency needed to withstand light foot traffic.

Traffic damage on frozen turf areas usually occurs during periods of freezing or thawing. The most devastating situation occurs when the grass blades and the upper one-half to one inch of soil has thawed, but the ground beneath their level remains frozen. Traffic will create a shearing action of the roots, rhizomes, and crown tissues at this time. This is comparable to cutting the plant tissue from the underlying root system with a sod cutter. Complete kill of leaves, crowns, and rhizomes can occur if the temperatures soon drop below 20Â° F. Symptoms from this severe injury include whitish to dark brown leaves that may mat on the surface.

Once temperatures allow thawing to a depth of three to four inches, the probability of turf damage declines since about 75 percent of the root system is in the upper four inches of soil. Frequently soil probing is the only positive way to effectively monitor the freezing level. Traffic should be adjusted accordingly.

Understanding the effects of traffic must be carried one step further. Cart and foot traffic can be devastating to dormant bermudagrass, and golfers don't realize the damage traffic funneling can cause. They must use golf cart roads. The illustrations that show damage from winter traffic are all from courses that have light play, less than 22,000 rounds of golf per year. Imaging the potential for damage on more intensely played courses.

Preparing the turfgrass for winter dormancy or semi-dormancy is a continuous, year-round process, but, unfortunately, winter preparation is often forgotten until fall. If summer and winter extremes were never experienced, there would be no need for careful and judicious programs involving the proper balances of pesticides, fertilizers, and cultural practices. But these two extremes are realities, and proper management is essential to maintain good turf covers throughout the stress periods.

Fertilization in the late summer to early fall, using a high-potassium and low-nitrogen material, will not only insure a good foliage growth rate, but it will also maintain vigorous rhizome and root development to begin the hardening off process for winter. Adequate potassium in the late summer encourages hardening off of the grass in the fall, a condition that increases storage and assimilation of carbohydrate reserves. Nitrogen overfertilization in the fall prevents adequate carbohydrate reserves from being stored and stimulates excessive foliage growth. This adds to thatch buildup and produces a lush turf that is very susceptible to cold weather damage.

Phosphorus and potassium, a blend of minor and micronutrients, along with the lower rates of nitrogen, balances the nutrient requirements of the grass and provides maximum winter hardiness. Remember, one of the functions of potassium is to improve winter hardiness of the grass, because potassium tends to reduce the amount of water in

the plant cells and acts as an antifreeze to lower the freezing point of the plant. This is very beneficial in reducing low-temperature stress or damage that can quickly occur on turf. The use of heavier potassium applications in the fall is based on already proper soil nutrition levels, which should be tested annually. Regardless of the nutritional condition of the grass, no fertilizer application can offset winter damage imposed by traffic.

Several factors influence a particular grass strain's tendencies for winter injury or death. These include (a) hardiness of the plant, (b) freezing rate, and (c) length of time frozen. Usually the more rapidly the freezing occurs, the higher the temperature at which kill is observed. If a sudden severe cold front develops, the turf will be damaged to a much greater extent if this hardening off process is not fully encouraged. A perfect example of this is the winter of 1983 - 1984.

Another important winter preparation is late summer or early fall aerification of cool-season grasses to establish a proper soil-to-air-to-water ratio in the soil and to remove compaction so that growth rates of rhizomes and roots are at their highest level. Growing conditions for the root system should be as favorable as possible in the spring and fall so that maximum root elongation and branching allow the grass to build up the necessary root system for surviving stress periods. Coring in the late summer or early fall, along with vertical mowing and topdressing of cool-season grasses, will check thatch and reestablish the best growing conditions. Initiation of new plants through rhizome and stolon activity occurs, therefore, at one of the optimal times of the year.

The importance of developing a strong and adequate root system for the winter months has already been mentioned, but its importance should be re-emphasized through the function of the root system during the low-temperature stresses of winter. When adequate carbohydrate reserves are developed in the root system, the turfgrass plant has a reserve food supply that can be used when the grass plant is not able to conduct photosynthesis. If a root system is not developed in the fall, or if the grass plants are sheared off from the root system by play on partially thawed greens in the winter, it is unable to use the stored carbohydrates, and the plants starve to death. As better growing conditions develop again in the spring, whatever carbohydrate reserve is left in the healthy grass plant will be used to initiate new growth. Many turfgrasses now die if the root system has been removed from the crown portion of the plant or if an inadequate supply of carbohydrates was stored in the fall.

Another problem with playing partially thawed greens is the tremendous tracking or footprinting created by heaving action at the frost line in the soil. Since soils do not thaw or freeze uniformly throughout the putting surface, some areas on the greens may be softer than others, thus accentuating the effects of tracking or footprinting. Footprinting is further enhanced when a frozen subsurface disrupts water percolation, leaving a wet layer on top.

Now the superintendent is faced with a real dilemma and a difficult decision. Should such greens be removed from play (using alternate winter greens if they're available) until complete thawing occurs, or should the regular greens be aerified in the early spring to check upper profile compaction and improve the soil-to-water-to-air ratio in the root zone? If they are aerified in the early spring, the superintendent and members can anticipate an increased crop of Poa annua on the greens later in the spring and summer (with all of its attending problems)! It's not an easy choice. Many other circumstances must and will influence the final decision. For example, what percentage of the members play in the late winter and early spring and how important is that play compared to quality putting surfaces later in the year? It's a decision to be shared by the green committee, the superintendent and perhaps even the Board of Directors.

Assessing winter injury on warm-season grasses can easily be initiated in late winter just before spring green-up. The easiest method is to collect five to ten plugs from suspect winter kill areas and pot them in a greenhouse or similar light and temperature conditions. This provides an excellent representative evaluation of winter damage. Renovation plans, etc., if needed, may be made early. Healthy areas should green-up nicely in two to three weeks, and weaker areas will green-up accordingly, if at all.

Many letters and articles are published every year in an attempt to educate golfers to the potential problems of playing on frozen or partially frozen turfgrass areas. Golf course superintendents or club officials should educate golfers in the fall regarding the problems with playing frozen greens so the golfers themselves have a better understanding of the damage that occurs when traffic is imposed on frozen or partially frozen turf. In most cases, informing golfers of suspended play due to frozen greens is inadequate and sounds more like an excuse than a reason. However, if care is taken to educate members through a seminar, newsletter in the golf shop, or a handout distributed directly, it will help members understand exactly what happens when foot traffic is placed on frozen and partially frozen putting surfaces, and it also informs them of winter traffic damage to the turf in general. Perhaps most important of all, it gives the membership, through the green committee, the opportunity to decide if alternative winter greens should be provided and are economically justified under their conditions.

If the golf course superintendents and other club officials make a concentrated effort to educate their membership as to why traffic is not allowed on the golf course on particular winter days, they will gain support and will eliminate the current Saturday morning standoffs at the pro shop and the descriptive name-calling sessions which inevitably arise.