



Winter turf damage from heaving.

WINTER PROBLEMS — What They Look Like — What to do About Them

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Winter turf problems can be deadly, unpredictable, and the worst problems those who work with turf can encounter. The problems though, are not insolvable. We can examine how turf is damaged during the winter and, where possible, explain what can be done to lessen the problem.

Turf Killed at Time of Freezing

If the plant has not had time to "harden" properly it may die at the initial freeze. In this case, the plant is rapidly growing and may be in a rather succulent condition with a high content of water in its cellular structure. Water is

in the sap solution and in intercellular spaces as well as within the cell proper. When rapid freezing occurs, ice crystals form within the cell, and the protoplasm (the vital part of the cell) may become disorganized. Intercellular ice of this kind will almost always cause severe damage or death.

When the plant is "hardened" by the gradual onset of cold weather and a slowing down of the growth process, the tissues lose much of their free water and the sap solution becomes more concentrated. Biochemical and biophysical changes cause the protoplasm to become hydrated with water in a "bound" or unfreezable form and death is less likely to occur.

When slow freezing occurs, water is slowly drawn out of the cells and all freezable water is crystallized in the intercellular spaces. If such a condition is not prolonged, the plant may escape injury.

Turf Killed at Time of Thaw

When freezing occurs, water is pulled from the cells and the cell wall is pulled inward. The protoplasm in the cell becomes plasmolized, or balled up. Unless the protoplasm is well supplied with bound or unfreezable water, it becomes brittle. Upon thawing, water rushes back into the cell through the highly permeable cell wall, and the protoplasm may be stretched and subjected to shear forces sufficient to destroy it. Under these conditions, turf is killed at time of thaw.

Turf Killed While Frozen

The work done by Dr. Jack Le Bean, of Lethbridge Experiment Station in Alberta, Canada, indicates that fungi in plants produce gases while the plant is frozen. These gases may cause death. This production of toxic gas and traffic on frozen turf are the two main causes of turf death while still in a frozen state.

Turf Killed After Thawing

Many of the common pathogens associated with winter injury are apparently very active, and their destruction may be most pronounced just after thawing begins and when the plant is striving to re-initiate growth.

When frozen soil begins to thaw, heaving may also occur. Heaving may cause a large portion of the root system to be pulled off. If crown tissue has also been damaged, little of the plant is left to support continued growth, and death occurs when the immediate energy supply is exhausted.

Desiccation

Desiccation is the drying out of soil and plant tissues. It may cause severe damage in winter if adequate moisture is not maintained. In the absence of snow cover, moisture may be lost from frozen soil by sublimation. This means that the moisture may pass directly from solid to gas without becoming a liquid which is of course the only form available to the plant. When this happens, plants simply die from drought.

Ice Sheets

The most comprehensive work on ice sheet damage has been done by Dr. James Beard of Michigan State University. Some of the mechanisms of ice sheet damage suggested by Dr. Beard are the depletion of oxygen, the accumulation of carbon dioxide and the leaching of cellular constituents. Although Dr. Beard has thus far reached no definite conclusions on the matter, his work indicates that direct effects of low temperature may be more important than any of the mechanisms of ice sheet damage.

What to Do When Winterkill Occurs

1. Water lightly and regularly until the plant can re-establish its root system.
2. Where no plant is left, replant following whatever renovation is possible with spiker and perhaps some vertical mowing or vertical slicing.
3. Gentle treatment of the turf as if the entire damaged portion were all new seedlings, which in effect it is, is called for.

Winter injury has been so widespread and severe recently that numerous experiment stations have begun to study the matter more critically. There has been a renewed interest in soil warming by the use of electric heating cables and in the use of various types of coverings.

Winterkill:

Learn The Cause, Improve The Cure

by JAMES W. TIMMERMAN, Agronomist, USGA Green Section

Within the last five years, golf courses in the Northern United States have experienced winter injury as severe as any in history.

What are the causes of winterkill and what is known of their destructive action?

The ravages of winter are easily classed into six categories:

ASSOCIATED ICE SHEET DAMAGE

The extensive damage suffered from ice sheets during the 1961-62 winter season prompted considerable research. Investigated causes of ice sheet damage include:

1. Oxygen suffocation under the ice sheet.