Ice Damage on Turf

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December rains have left many putting greens and tees in southern Wisconsin covered with two or more inches of solid ice. This, unfortunately, is not unusual and has led to the same questions that surface every time this happens. How long can I leave the ice intact before the turf is damaged? What's the most effective way to remove the ice? If I completely remove the ice, do I need to cover the turf?

Merely the fact that these same questions keep arising indicates that there are no definitive answers. Perhaps more concise answers will come out of next year's Wisconsin Golf Turf Symposium where the topic will be winter injury. In the meantime, let me share with you what is known about ice sheet damage and offer suggestions for dealing with the problem.

Research conducted by Dr. J. B. Beard nearly 30 years ago still remains as the most extensive body of knowledge regarding ice damage on turf. His findings allow me to address the question of how long ice sheets can remain in place before significant damage occurs. The answer depends to a large degree on the grasses you're dealing with. Improved creeping bentgrass varieties appear capable of surviving 150 days or more of continuous ice cover. Older varieties such as Washington and Seaside generally display damage after only 90 days. Least tolerant and of greatest concern on putting greens and tees is *Poa annua*. It starts to succumb after as few as 45 days under ice. Research with winter wheat suggests that these time limits are extended if sunlight is able to penetrate the ice. How much time is gained and whether or not the same is true for turfgrasses remains to be determined.

Should the ice be underlain by an inch or so of snow, then turfgrass survival times increase because the rate of accumulation of carbon dioxide, ethanol and toxic gasses is slowed. The period of time a snow layer adds to the survival time of bentgrasses is not clearly defined, but amounts to only about 15 days for annual bluegrass.

It is an observation of mine and one of my colleagues that the survival times given above vary depending on when in the season the ice sheets form. Damage seems to be much greater when the ice cover forms in late January or February than in November or December. I'm not sure why, but suspect it has to do with the prevalent view that ice *per se* is far less damaging than is turfgrass crown hydration and subsequent freezing during freeze-thaw cycles. Early ice sheeting frequently receives some type of remedial action such as removal or partial melting. When ice forms in February, the tendency is to "wait it out" since spring is not too far away. The net result may be more standing water and more crown hydration during thaws from late rather than early ice covers. Another possibility is that early ice is more likely to be covered with an insulating blanket of snow that prevents temporary thawing. Finally, turfgrass susceptibility to ice damage may well vary with time of winter. It is a well established fact that storage carbohydrate reserves decline very rapidly in turfgrass after December. It is conceivable that this markedly increases susceptibility to winter damage.

Once the decision is made to remove ice, the options for doing so are well established. Complete removal by mechanical means is one. A snow layer beneath the ice greatly enhances chances of doing so without damaging the turf. To me, complete removal is the preferred method of dealing with ice sheets. It removes a major source of water that forms during freeze-thaw cycles and reduces the potential for turfgrass crown hydration.

When turfgrass is completely encased in ice, mechanical removal of the ice without severely damaging the turf becomes very difficult. In this case the second option for dealing with ice needs to be considered. This is the practice of spreading a dark material on the exposed ice surface to absorb solar radiation and melt cavities in the ice. Any dark material will serve this purpose and the darker the better. Milorganite has long been used but materials such as charcoal and dry compost or highly decomposed peat will work as well.

Application of dark materials to ice surfaces has a lower success rate than does mechanical removal of the ice. One reason is that success is weather dependent. Unless application of the material is followed by two or more days of sunny days with temperatures in the high 20's or low 30's, chances of creating cavities that extend to the turf surface are not great. The success of this practice relies upon formation of cavities to the turf surface that allow for diffusion of gasses to and from the turfgrass. Another reason why mechanical removal of ice is favored over over selective melting is that the latter, by not removing the ice, does not significantly reduce the potential for turfgrass loss by way of crown hydration and freezing during freeze-thaw cycles.

If the ice thickness is an inch or less, a third option that has been used with success is breaking up the ice and not removing it. This can often be accomplished with minimal damage to the tee or green by removing any snow cover for a day or two and then driving a vehicle back and forth over the ice. Choosing a time when air temperatures are near freezing and putting tire chains on the vehicle is often helpful.

Finally, the answer to question #3. Yes, turf should never be left exposed for more than a day or two to dry winter winds. Covering of turf from which ice has been removed is essential. Where there is snow under the ice, simply leaving the snow in place will suffice. Otherwise, some type of cover needs to be applied. An inch or so of uncompacted snow make an excellent cover. Covering greens with snow can certainly be an arduous task, but can often be greatly simplified through the use of a lightweight snow thrower. Blow snow onto the center of the green first. Rake the snow to a uniform depth, taking care not to walk on the snow. Continue to work outward from the center of the green until the job is completed.

Covers other than snow can be used when available. Dry organic residues such as pine needles, chopped straw (winter wheat straw is preferred because it contains less weed seeds) or marsh hay are examples. These covers have to be removed in spring before growth of the turfgrass resumes. Fabric or mat covers may also be used, but present the problem of removal on warm days and replacement at night until the threat of nighttime temperatures below about 28 degrees passes.

Can ice sheet formation be avoided? Not entirely. Rain that freezes upon contact with cold turf will form ice sheets virtually anywhere. The problem can, however, often be lessened through improvement of surface drainage. More importantly, good surface drainage is vital if turfgrass crown hydration in winter is to be avoided. It seems to me that golf course architects have to be more aware of this need in our climate and factor it into their design of greens and tees. Efforts to improve turfgrass survival under ice through changes in late season mowing practices or heavy, late season potassium applications have had mixed results. They do not eliminate the need for ice removal or selective melting.