WATER MANAGEMENT FOR GREENS

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With continued improvements in irrigation equipment for turf areas and a desire to immediately incorporate the latest research findings into management programs, it is often easy to overlook some of the simple basics in the water management of golf greens. Inadequate attention to the irrigation system for a green can lead to problems away from the green. Leaking heads can result in wet approaches that quickly develop into muddy, rutted and compacted areas. On the other hand, improper water management away from the green can present difficulties on the putting surface. Drainage patterns from the collar or fairway that pass through the green can create a zone of the green that receives more water and may increase disease and weed pressure. Additionally, pesticides may be carried onto the green in drainage runoff. Diversion of runoff water around the green can avoid many of these problems.

It is important to continually inspect and service turf irrigation equipment. Regular maintenance can minimize the damage and problems from leaks, breaks, low pressure, blocked nozzles and poor distribution. Irrigation heads that have settled should be brought back to the surface so that the water stream is not broken prematurely by the soil or turf around the head. The proper adjustment in the height of irrigation heads will also prevent puddling and soil particle contamination of the head. Periodic cleaning of the strainers and screens in lines and heads can improve irrigation efficiency and performance.

Schedule irrigation to match the infiltration rate of the soil. Each green within a given golf course will have varying infiltration rates due to differing soil construction, slope and thatch development. Greens constructed with a sandy soil can be watered deeply in one irrigation event. Greens with heavy soils may require two or more irrigation events to wet the soil deeply and avoid runoff. Compared to heavy soils, the soil beneath sandy greens will wet more rapidly in a vertical direction than in the horizontal plane. Therefore, it is critical to ensure a uniform coverage of the irrigation pattern. The infiltration rate for a green can be determined in a simple way by using a method described by Madison. Small containers can be placed in a row along the radius of the irrigation water stream. Once the system is activated, one can watch the soil along the radius for a period of time to observe when the irrigation water just enters the soil before the next pass of the head. The water collected in the can closest to this point is a measure of the infiltration that occurred during the chosen time period.

Recognition of water stress symptoms is essential to minimize turf injury and maximize conservation of water resources. Moderate levels of water stress have been demonstrated to enhance turf rooting compared to continual well watering regimes. Water stress symptoms within a green are most likely to develop along the perimeter and in high spots. Watching these areas for foot printing, increased yellowing of older leaves and folding or rolling of leaf blades will signal when irrigation of the entire green is necessary.

Localized dry spots continue to be a common problem for sandy soil greens. These spots are discrete areas that once dry are extremely difficult to rewet. Wilkinson and Miller (1978) observed that localized dry spots result from an organic coating of sand particles in the upper one inch of the soil surface. The cause of this hydrophobic (water repellent) coating is still unknown. Localized dry spots areas can be identified by removing a soil core from the green. Lay the core horizontally on the green and place drops of water along its length. If the core is simply dry, the droplets will quickly enter the thatch and soil. If the dry conditions are due to the thatch layer, the droplets will sit on the thatch, but will quickly enter the soil beneath. The droplets on a core from a localized dry spot will quickly enter the thatch, sit on the upper one inch layer of the sandy soil and quickly enter the soil beneath this zone.

Water management to keep the sandy soil from totally drying is an effective preventative measure, but overwatering carries the risk of developing shallow rooted turf and increased disease pressure. Once present, the soil within a localized dry spot can be rewetted by soil coring or with wetting agent applications. Soil coring creates a channel for water to pass through the surface layer where the problem is located. The water repellent layer can then be rewetted from the side and below, as well as from the soil surface. Unfortunately, soil coring is not always possible because of environmental conditions and/or play on the green. Wetting agent applications have been effective in the rewetting of localized dry spots.

The turf literature indicates that syringing has potential as a cultural procedure to enhance the performance of bentgrass greens during summer stress. Syringing is defined as the application of a small volume of water to the turf leaves to a) remove dew, frost or foreign matter, b) cool the turf canopy and c) prevent or correct wilt. The results of washing dew and foreign matter are readily apparent following syringing. Duff and Beard (1966) found that a noon syringing (0.25 inch of water) or 'Toronto' creeping bentgrass resulted in a 2 to 3 ^{o}F drop in canopy temperature that persisted for two hours. Hawes (1965) studied syringing effects on 'Astoria' colonial bentgrass using 0.12 inch applications of 66 ^{o}F water to turf at 11:30 a.m. and 3:00 p.m. He found that canopy temperatures were reduced 7 and 1.5 ^{o}F at 2 and 10 minutes after syringing. Canopy temperatures returned to presyringing levels with 15 to 30 minutes after treatment.

Studies at North Carolina State University during the last 4 years have examined the potential of syringing for moderating the canopy temperature and minimizing wilt on bentgrass golf greens. Application water volumes ranged from 0 to 0.21 inches. Time of syringing treatments included single 0.11 inch applications at 12:00, 1:00, 2:00, 3:00, or 4:00 p.m. Multiple treatments were at 12:00 and 2:00 p.m. (0.21 inch of total water applied), 1:00 and 2:00 p.m. (0.32 inch of total water applied), and hourly from 12:00 through 4:00 p.m. (0.53 inch of total water applied). The syringing water temperature ranged from 32 to 83 ^{o}F and the relative humidity ranged from 36 to 83% during the course of these trials.

The maximum canopy temperature moderation at 30 minutes after syringing was only 3 ^{o}F. Reductions in canopy temperature immediately (less than 30 minutes) following syringing ranged from 5 to 18 ^{o}F. Syringing treatments did not result in negative or positive effects to the turf quality during these

studies. However, disease potential, particularly Pythium, would be expected to increase with increased water applications, later syringing times and multiple syringing applications during a warm, humid period. These studies were conducted in the absence of wilt on the green. Current research at NCSU is examining the influence of syringing treatments on the prevention and relief of bentgrass water stress. In the absence of wilt, however, the routine syringing of bentgrass golf greens for moderation of canopy temperature must be reevaluated considering the small reductions that can be obtained and the substantial labor and water costs of this practice.

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