

determining sites for cup locations are available from the USGA upon request.

**S**EVERAL TYPES of cultural programs are critical to the success of any effort made to develop a consistently true, smooth putting surface. Top-dressing is well known for all the biological and chemical properties it contributes to turf, but it is also a major factor involved in the playability of that turf. Best results are obtained when light quantities ( $\frac{1}{4}$ - $\frac{1}{2}$  cubic yd./5,000 sq. ft.) of topdressing are applied on a regular basis, perhaps once per month or every three weeks. However, frequent topdressing is not necessarily a prerequisite to top-quality greens, especially when grooming techniques and other cultural programs are utilized in the most positive manner.

In terms of playability, best results are achieved with minimum use of fertilizer and water. In the spectrum of maintenance programs, at one extreme are the golf superintendents in cool season turfgrass regions who

use just slightly more than 1 lb. N/1,000 sq. ft./year and who do not turn on the irrigation system until late June or early July. At the other extreme are those superintendents who use 8-10 lbs. N/1,000 sq. ft./year and who begin irrigating their courses as soon as play begins in the spring.

A good average for fertilizer use on cool season turfgrass species is about  $\frac{1}{2}$  lb. N/1,000 sq. ft. per growing month. This figure may be adjusted up or down depending on many factors, including size of greens, turfgrass species involved, amount of play, types of soils, irrigation and precipitation rates, etc. In the past, fertilizer recommendations were based on the highest rate of fertilizer that would produce a response in terms of growth and appearance. Today, fertility programs should be geared toward using as little fertilizer as possible while still providing acceptable color and adequate growth. As far as playability is concerned, recent research has shown that as fertilizer rates increase, the speed of the greens decreases.

The speed and consistency of greens is greatly affected by water use practices. As a general guideline, putting green turf should be kept as dry and firm as possible while not putting the grass under undue stress. Maintaining a wet, lush turf provides an inferior playing surface by reducing green speed, increasing soil compaction and producing greater wear injury, especially in the vicinity of the hole. Any temptation to irrigate because of players' claims that the greens are hard should be avoided. Hard greens are improved by aerification and the use of an appropriate topdressing material, not by overwatering.

Grooming greens to play their best is one of the most important duties of the golf course superintendent. By properly using and maintaining his greens mowers, setting high standards with respect to routine maintenance operations, and utilizing topdressing, fertilization and irrigation programs in a positive manner, the golf course superintendent can provide a reasonably fast, consistently smooth and true playing surface for the golfers at his course.

## Fertility - Using Lower Levels Of Nitrogen

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**O**NE OF THE most important decisions a superintendent must make is the determination of the rate and frequency of fertilizer applications to putting greens. Although other nutrients are also essential and cannot be overlooked, nitrogen is the most critical nutrient in terms of its effect on the management and playability of bentgrass putting surfaces.

Because of its critical importance, one might expect that a high degree of agreement among turf professionals would exist with regard to the appropriate rate, frequency and timing of nitrogen applications. Actually, the contrary is true; there are many and varied ideas and opinions on this subject. Many of the differences of opinion are the result of the varying climatic conditions, management practices, and amount of traffic bentgrass greens are subjected to. However, another explanation for the lack of agreement may be the result of different interpretations of the response of bentgrass to nitrogen applications.

Nitrogen is often used in an effort to stimulate growth and color in bentgrasses. Research and field experiences have shown that bentgrasses certainly do exhibit growth and color responses to nitrogen applications, even when the existing nitrogen fertility level is high. Controlling growth and color through nitrogen applications can be an effective turf management practice. Too much importance should not be placed on growth and color, however.

Growth is definitely needed to maintain a fine putting green. It assures adequate density, promotes the healing of ball marks and worn areas around previous cup locations, and allows regular mowing to restore a high-quality surface. But as growth exceeds an optimum rate, the additional growth is no longer needed and is undesirable for several reasons. These include a greater tendency toward thatch accumulation, a reduced tolerance to stress, and an increased need for water. Certainly good color is a desirable characteristic, but it is definitely not critical

to the playing quality of greens. From the maintenance viewpoint, therefore, it does not seem wise to force color with added nitrogen, because it also stimulates growth and creates other detrimental effects.

It seems that through the years, as the response of bentgrass to high nitrogen fertility levels was being discovered and investigated, a misconception developed. Its observed growth and color response to high nitrogen fertility levels has too often been interpreted as an indication that bentgrasses require a high nitrogen fertility level. There is no particular reason why response should be interpreted as a requirement for higher nitrogen fertility levels, but it is because of that interpretation that many have applied more nitrogen than the plant actually needs.

**I**N ADDITION to the agronomic problems associated with the excessive growth from high nitrogen fertility, additional problems are generated