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This publication includes lecture notes of papers presented at the 2002 New Jersey Turfgrass Expo. Publication of these lectures provides a readily available source of information covering a wide range of topics and includes technical and popular presentations of importance to the turfgrass industry.

This proceedings also includes research papers that contain original research findings and reviews of selected subjects in turfgrass science. These papers are presented primarily to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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MOWING MANAGEMENT AS IT AFFECTS TURF QUALITY

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There are four basic cultural keys to maintaining a healthy vigorous turf for use as a sports playing surface. These include the (i) use of adapted turfgrass species, (ii) maintenance of soil quality (health), (iii) practice of sound mowing principles, and (iv) proper use of irrigation. Other supplementary practices may be useful in sports turf management; however, neglect or mismanagement in the any of the four basic keys above will make it difficult to produce a quality playing surface. This article describes important principles of mowing turfgrass.

MOWING HEIGHT

The lowest mowing height possible for a turf is a function of a number of factors including the turfgrass species and variety, mowing frequency, environmental conditions, and available management resources. Tall fescue is a species with good tolerance to heat, drought, and some pests and is best mowed at height of 2 inches or more. At lower heights, tall fescue will thin out over time and become infested with weeds. Perennial ryegrass is an excellent species for overseeding and has good- to excellent wear tolerance. Perennial ryegrass can be mowed as low as 0.5 inch; however, the species will require regular irrigation and pesticides with mowing at heights less than 2 inches. Kentucky bluegrass has excellent divot strength and recuperative capacity. Certain varieties can tolerate mowing as low as 0.75 inch. As with perennial ryegrass, lower mowing requires greater management inputs to maintain turf. Management intensity of Kentucky bluegrass is highly dependent on the variety.

The budget and labor constraints of many school and municipal operations will typically not allow mowing lower than 2 to 2.5 inches for a majority of fields. In some cases, specialized mowing, for a limited time,

is possible for high priority playing fields. Increasing mowing frequency will often improve turf and playing quality without lower mowing height.

Mowing at the low end of the species tolerance range will stimulate shoot growth, increase tillering/shoot density, and encourage a finer leaf texture. These desirable effects are useful for better playing conditions. Unfortunately, some detrimental effects can be produced at low mowing heights including increased leaf succulence, reduced carbohydrate (food) reserves, and decreased root, stolon, and rhizome growth.

MOWING FREQUENCY

Mowing frequency is determined by the "1/3rd rule," which refers to the concept that no more than one-third of the height of the turf canopy is cut in a single mowing. For example, a turf mowed at 2 inches should be no more than 3 inches high when it is mowed (1 inch is cut off the 3 inch high turf, thus "1/3rd").

Lower mowing requires greater mowing frequency because shoot growth is stimulated as the height is reduced. Thus, more frequent mowing is needed to keep up with the greater growth and avoid scalping of the turf. Some examples of minimum mowing frequencies include mowing three times per at a 1.5 inch or less, two times per week at 2 inches, and once a week at 3 inches. Infrequent mowing at low heights results in scalping and long-term decline of turf quality.

Increasing mowing frequency without lowering the mowing height is one immediate adjustment in a mowing program that can quickly improve turf and playing quality. Mowing more often than the mini-

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mum required (less than one-third) has the advantage that is less stressful to the turf compared to lowering the mowing height to achieve better quality. More frequent mowing results in less leaf tissue being removed in a single mowing and allows the turf to better adapt to the height of cut compared to a less frequent mowing program.

SPRING MOWING STRATEGIES

As spring temperatures and moisture conditions become more favorable for growth, winter dormancy begins to break in turf and green-up develops as new shoots emerge. Rapid shoot growth and minimal environmental stresses at this time of year can lull turf managers into a secure mind-set that problems will be minimal. It is critical at this time to use proper mowing frequency and cutting heights along with very modest to minimal nitrogen fertilization to maintain good root growth.

Peak shoot growth will occur at temperatures of 60 to 75°F during the spring. Furthermore, roots are extending deeper into the profile during spring. Carbohydrates are depleted rapidly during peak growth, thus timely mowing is critical to avoid removing no more than one-third of the leaf tissue, which further strains the carbohydrate supply of the turfgrass plants. Excessive defoliation (scalping) will cause cessation of root growth and possibly dieback. Additionally, recovery from scalping will be much slower than a manager might expect due to the low carbohydrate supply. Turf with low vigor and density in the spring will allow weeds such as crabgrass and goosegrass to invade.

An unfortunate scenario in the spring involves wet (rainy) weather that interrupts the mowing schedule. Shoot growth becomes excessive and it is difficult to maintain the turf at the desired height. It is best to return to original mowing height over a series of mowings, decreasing the cutting height with each successive mowing. For example, if conditions result in a 5-inch turf height and the desired mowing height is 2 inches, the next mowing should be at 3.5 inches followed by a mowing at 2.5 inches and finally mowing at the desired 2 inches. If feasible, it is also helpful to increase the mowing frequency during the time that the turf height is being reduced.

SUMMER MOWING STRATEGIES

Mowing frequency can often decrease during the slower shoot growth period of summer caused by high

temperature and drought stresses. For example, if mowing twice a week is needed in spring, it may be feasible to reduce mowing to once every 7 to 10 days. It is also important to stop mowing when the turf is wilting (severe drought). Mowing traffic over wilted turf will severely damage plant tissues and should be avoided.

Fields under an intensive low mowing program will require a more frequent supply of water either through rainfall or irrigation. Lower mowing develops a shallower root system which limits the supply of water from the soil.

Increasing the mowing height on out-of-play fields during summer will improve tolerance to heat and drought stress. It is important, however, for a turf manager to anticipate how much time will be required to return to the desired lower height. Depending on the change in height, it is likely to require weeks for the turf to readjust to lower mowing height. Lowering the mowing height too quickly will reduce the vigor and density of the turf, and ultimately, the durability and playability will be compromised.

LATE SUMMER AND EARLY AUTUMN STRATEGIES

Late summer and early autumn is a good time to lower mowing heights. Although shoot growth is more vigorous during this period, it is not as aggressive as in spring and therefore the mowing frequency will not be as high. Mowing can be performed rather infrequently as autumn progresses without detriment to the turf. Environmental stresses are typically lower at this time, which improves vigor of the turf at lower mowing heights.

The increase in shoot density caused by lower mowing is enhanced in autumn because the turfgrass plants are also tillering more aggressively in response to the shorter daylengths of autumn. This increase in turf density with lower mowing will be enhanced when combined with a late season nitrogen fertilization program.

BASE MOWING ON QUALITY DEMANDS AND RESOURCES

Intensive mowing management is expensive and, therefore, the facility must have budget and labor to be properly implemented. The mowing program should be based on an understanding of the playing quality expectations as well as available resources.

Mowing heights for sports that involve the roll of a ball (e.g., soccer, baseball, softball, field hockey) should be between 0.75 to 2.25 inches. Sports that have a greater demand for stability and footing (e.g., football, lacrosse) are best mowed at heights between 1.5 and 3 inches. Mowing heights at the higher end of these ranges is strongly suggested when operational resources and manpower are limited.