



Standard Guide for Maintaining Cool Season Turfgrasses on Athletic Fields¹

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1. Scope

1.1 This guide covers the minimum requirements for maintaining cool season turfgrasses used for natural surface athletic fields. Practices covered include mowing, fertilization, irrigation, core cultivation, overseeding, and pest management.

1.2 The decisions involved in maintaining a quality natural playing surface should consider soil types, local climate and other factors; therefore, it is recommended that you contact your local cooperative extension service for more specific information on soils, and grass species and cultivars adapted to your area.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *athletic field, n*—a field constructed and utilized for conduct of various organized sporting events.

2.1.2 *cool season turfgrasses, n*—grass species widely adapted to cool temperate climates. Some species persist and are used in warm humid to warm subhumid climates; referred to as the transition zone. Cool season species commonly used for natural playing surfaces include Kentucky bluegrass, perennial ryegrass, tall fescue, fine leaf fescues, creeping bentgrass, and colonial bentgrass. Creeping and colonial bentgrasses are normally used only on croquet and lawn bowling courts.

2.1.3 *thatch, n*—an accumulation of undecomposed organic matter that can form at the soil surface in a turf.

3. Significance and Use

3.1 A dense, uniform stand of turfgrass on a playing surface improves the playing quality and safety of the field by providing firm footing for the athletes and by cushioning their

impact from falls or tackles. These standards are the minimum inputs required to provide such a surface. Various published guides have been used in the development of this guide (1-5).²

3.2 Field conditions may directly influence the frequency and type of athletic injuries occurring as a result of using the fields. While these standards do not guarantee that such injuries will be prevented, a well-maintained turf on a natural playing surface should minimize field-related injuries.

4. Apparatus

4.1 *General*—Experience and good judgment are important to match the proper type of equipment to the nature of the task to be performed.

4.1.1 *Mowing Equipment*—Mower types include reel, rotary, and flail; although, the latter type is not recommended for fine playing surfaces. A reel mower should be used for playing surfaces requiring mowing at less than 1.5 in. (3.8 cm). Mower blades should always be kept sharp and properly adjusted in accordance to manufacturer's recommendations. Mowing equipment should be operated in a speed range consistent with the manufacturer's recommendation.

4.1.2 *Spreaders*—Spreaders are necessary if dry fertilizer or pest control materials are to be applied. Spreader types may include drop, rotary (centrifugal, spinner), or oscillating. Spreaders should be calibrated to deliver the desired, labeled, or recommended rate of fertilizer or pest control product being applied.

4.1.3 *Sprayers*—Sprayers are necessary if liquid fertilizers or pest control materials are to be applied. Low pressure systems are recommended. Sprayers should be calibrated to deliver the desired, labeled, or recommended rate of fertilizer or pest control product being applied.

4.1.4 *Core Cultivators*—Core cultivation (aerification, coring) equipment relieves soil surface compaction. Core cultivators should be of the type that physically removes soil, such as a hollow tine or spoon. Cultivators with ½ to ¾ in. (13 to 19 mm) tines on 4 to 6 in. (100–150 mm) spacings should be used on all playing surfaces. Spikers, slicers, or similar types of equipment are not suitable for relieving surface compaction.

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² The boldface numbers in parentheses refers to the list of references at the end of this standard.

4.1.5 *Seeders*—Slit seeders should be used for any over-seeding or renovation operations. Slit seeders cut a groove into the soil and deposit the seed in the groove at a predetermined depth.

4.1.6 *Irrigation System or Equipment*—Ideally, some source of water should be available for irrigation. Systems can range from portable or permanently installed types.

4.1.7 *Soil Sampling Tubes*, used to sample soils for testing purposes.

5. Mowing

5.1 *Mowing (General)*—The periodic removal of excess shoot growth is necessary on natural surface playing fields.

5.2 *Mowing Height*—The mowing height of a natural surface athletic field will vary with the sport, turfgrass species, and time of the year. Adjust mowing heights accordingly, using Table 1.

5.3 *Mowing Frequency*—Fields should be mowed as often as necessary. No more than $\frac{1}{3}$ of the leaf surface should be cut off at any one mowing. Under normal growing conditions, this usually means every five to seven days for fields maintained at 1.5 in. (38 mm) or higher, two or three times a week for baseball infields and other closely mowed fields.

5.4 *Clipping Removal*—Fields maintained at a mowing height of 1 in. (25 mm) or higher do not require that the clippings be removed at mowing if mowed at the proper frequency. Only remove clippings if the grass is allowed to grow excessively high so that clippings would accumulate on the playing field surface. Playing surfaces maintained at one inch or shorter should have the clippings removed with each mowing.

5.5 *Mowing Pattern*—Mowing direction should be varied with each successive mowing. Striping of fields due to mowing direction can be accomplished with one or two mowings prior to an event.

6. Fertilization

6.1 *Fertilization (General)*—Fertilization is essential for maintaining dense, vigorously growing natural turfgrass fields. Fertilizer rate, timing, source, and ratio will influence a natural turf's density, color, uniformity, recuperative ability, as well as its ability to tolerate wear, biological and environmental stresses.

TABLE 1 Mowing Heights

NOTE 1—Adjustments in mowing height should be made to accommodate the sport using the field. Mowing heights should be increased when the fields are not being used or when the mowing height does not influence the game.

Sports Field Use	Grass Species	Mowing Height
Baseball infields, field hockey fields	Kentucky bluegrass or Perennial ryegrass	0.75–2.5 in. (19 to 64 mm)
Baseball outfields; soccer, football, lacrosse, polo, and rugby fields	Kentucky bluegrass or Perennial ryegrass	1.5–2.5 in. (38 to 64 mm)
Intramural and multiple-use fields	Tall fescue	2.0–3.0 in. (51 to 76 mm)

6.2 *Soil Testing*—Soil testing should be performed on established fields every three to four years. More frequent testing (every one or two years) may be required on sand based fields or those having nutritional imbalances. Soil testing will identify nutrient deficiencies that may be corrected by supplemental fertilizer applications or by fertilizer selection. Soil testing will also identify changes needed in soil reaction (pH).

6.2.1 *Sampling*—A representative sample should be taken from each field. Using a soil sampling tube, pull out about 50 random samples per acre of turf, and combine them to obtain a representative sample. Samples should be taken from the soil surface to a depth of 2 to 4 in. (51 to 102 mm), or a depth recommended by the testing laboratory.

6.2.2 Remove the thatch and any stones or debris.

6.2.3 Thoroughly mix the cores and pull a 1-pt (0.5-L) sample from the composite to submit to the testing laboratory.

6.2.4 Provide as much information to the laboratory as possible, including the use of the area, grass species, past fertilization history, irrigation or not, clipping removal or not, age of the field, and other information the laboratory may request.

6.2.5 Submit the samples to a state or commercial soil testing laboratory. Maintain records of samples submitted, to include sampling date, soil testing laboratory, and results.

6.3 *Soil Reaction (pH)*—Soil pH should be maintained in a range of 6.0 to 7.0.

6.3.1 Lime should be applied as per soil test recommendations to increase soil pH. Lime materials may include pulverized or granular limestone, pelletized limestone, and hydrated lime. Use dolomitic liming materials if there is a need for additional magnesium in the soil. Apply lime in spring, or fall, or both, until the desired pH is attained.

6.3.2 Apply no more than 100 lbs of agricultural lime/1000 ft² (4900 kg/ha) per application on bluegrass, ryegrass, or tall fescue fields.

6.3.3 Elemental sulfur or ammonium based fertilizers can be used to decrease soil pH. Apply elemental sulfur at a rate not to exceed 5 lbs/1000 ft² (245 kg/ha) in the spring and fall until the desired soil pH is reached.

6.4 *Fertilizer Rate and Nitrogen Sources*—Cool season grass (Kentucky bluegrass, perennial ryegrass, and tall fescue) playing surfaces should receive fertilizer at a rate to deliver no less than $\frac{1}{2}$ lb of actual nitrogen per 1000 ft² (24 kg N/ha) per growing month. The need for higher rates will be dependent on climatic and soil conditions, irrigation practices, and intensity of use.

6.4.1 Quick-release nitrogen sources, such as ammonium phosphates, ammonium nitrate, urea, or ammonium sulfate should be applied at rates not to exceed 1 lb of actual nitrogen/1000 ft² per application (49 kg N/ha). Slow-release forms of nitrogen, such as sulfur-coated urea, IBDU, ureaform, polymer coated urea, polymer/sulfur coated urea, and natural organics may be applied at higher rates less frequently through the year, and are preferred for use on sandy soils. Many turfgrass fertilizers contain a combination of both quick and slow-release nitrogen sources, and usually are applied at a rate of 1 lb of actual nitrogen/1000 ft² (49 kg N/ha).

6.4.2 Starter fertilizers applied at the time of overseeding should be applied at a rate necessary to deliver 1 lb of actual nitrogen/1000 ft² (49 kg N/ha).

6.5 *Fertilization Timing*—The dates of a fertilizer application should be adjusted to suit schedules and environmental conditions. In general, fertilizer should be applied at any time of overseeding, in the spring (slow release sources preferred), early fall, and late fall. Irrigated cool season grasses may be lightly fertilized in the summer with slow release nitrogen sources.

6.5.1 Fertilizer should not be applied to dormant turf or turf under environmental stress (heat or dryness) during the growing season.

6.6 *Fertilizer Ratio*—The ratio of nitrogen to phosphorus to potassium should be based on a soil test. In lieu of a soil test report, use a fertilizer with a 4-1-2 or similar ratio.

6.6.1 Fertilizers applied at the time of overseeding should have a 3-4-1, 1-2-1 or similar ratio indicating a higher percentage of P₂O₅ than N or K₂O.

7. Core Cultivation

7.1 *Core Cultivation (General)*—Core cultivation is an effective means to alleviate surface compaction and is necessary to obtain an acceptable playing surface.

7.2 Core cultivate natural fields monthly when the turf is actively growing.

7.2.1 Do not core cultivate a natural turf surface when the turf is under heat or drought stress.

7.3 Cultivate in a minimum of three directions.

7.3.1 Severely compacted areas, such as goal mouths, may require more passes to alleviate compaction.

7.4 Allow cores to dry.

7.5 Break up the cores by dragging with a drag mat or piece of chain link fence or by pulverizing with a rotary or vertical mower.

7.6 Irrigate if possible to alleviate stress caused by coring.

8. Irrigation

8.1 Irrigate natural turf sports fields to replenish moisture lost from the root zone, which is about 1 to 1.5 in. (25 to 38 mm) per week for Kentucky bluegrass and tall fescue during periods without natural precipitation.

8.1.1 On sandy soils, apply ½ to ¾ in. (13 to 19 mm) of water every two to four days during periods without natural precipitation.

8.2 Water early in the morning, when evaporative losses are minimal. Light watering in midafternoon is acceptable to cool the turfgrass during periods of high temperature.

9. Overseeding

9.1 *Overseeding (General)*—Natural surface athletic fields often are worn to the extent that they will not recover through normal cultural practices. Such surfaces should be overseeded a minimum of once a year. In some cases, overseeding may be done during the playing season.

9.2 *Overseeding During the Off-Season:*

9.2.1 While overseeding cool season grasses is best done in the early fall, consideration should be given also to times of the year when the fields are used minimally to allow for the establishment of the seeded areas.

9.2.2 Mow the field as short as possible without causing turf injury, and remove any debris from the field surface.

9.2.3 Core aerify the field in a minimum of four directions, leaving the cores.

9.2.4 Apply a high phosphorus starter fertilizer as described in 6.4.2 and 6.6.1.

9.2.5 Overseed using a disk-type seeder. Set the machine to deliver 20 lbs of Kentucky bluegrass, 40 lbs of perennial ryegrass, or 60 lbs of tall fescue per acre (22, 45, or 67 kg/ha), and seed in two directions; lengthwise and diagonally across the field. Do not use Kentucky bluegrass for overseeding unless the field can be put out of use for several weeks following overseeding.

9.2.6 Drag the field with a drag mat or piece of chain link fence.

9.2.7 If spring seeded, apply siduron at the recommended label rate to prevent annual grass germination.

9.2.8 Maintain the area at the shorter mowing height until germination is visible.

9.2.9 Water the field as necessary to keep the soil surface moist.

9.3 Overseeding during the playing season.

9.3.1 Perennial ryegrass is the preferred grass species for this overseeding because of its quick germination rate.

9.3.2 Slit seed in heavily worn areas at a rate of 4 to 6 lbs of perennial ryegrass/1000 ft² (195 to 293 kg/ha). Broadcast or slit seed on the remainder of the field at a rate of 2 to 3 lbs/1000 ft² (98 to 146 kg/ha).

9.3.3 Divots from play should be filled with a mixture of 10 parts soil to 1 part seed (by volume) shortly after each athletic event.

10. Pest Management

10.1 Pest problems such as weeds are common on natural sports fields. Diseases and insects are less common, but still occur. Properly identify the pest before selecting a control strategy. Least toxic pest control measures proven to be efficacious should be given precedence over synthetic chemical methods. Contact your cooperative extension service for assistance in pest identification and selection of the most appropriate pest control strategy in your region or state. Users of pesticides are responsible for making sure that the intended use complies with current local, state, or federal regulations and conforms with the product label.

11. Keywords

11.1 athletic field; cool-season turfgrass; core cultivation; fertilization; irrigation; overseeding; mowing; pest control

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