Is Your Turf Conditioned for the Season?

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Just as an athlete's conditioning doesn't show up until the second half or last quarter of a game, good soil conditions often are not apparent until late in the season. Soil aeration is as important to field performance as aerobic conditioning is to an athlete. And just like an athlete, a field can't be conditioned overnight. A field should be on a conditioning program that begins before the season and continues throughout.

Sports fields become compacted by the weight of athletes and equipment. Soil particles are compressed together resulting in reduced pore space and increased soil density. Air, water and nutrient movement are decreased by the lack of pore space. Water infiltration and percolation are reduced, and roots struggle in the restrictive soil environment.

Generally, the first symptom of compaction is the reduction of leaf growth resulting in fewer clippings than normal after mowing. The second symptom is the development of drought stress symptoms in three to five days instead of the normal seven to ten days. Obviously as soils become more compacted water movement into the soil slows. It becomes more difficult to apply water slowly enough to prevent puddling or runoff. The shift to light, frequent irrigation simply increases the problem by encouraging shallow rooting and maintaining a moist surface.

The initial turf growth reduction further develops symptoms similar to nitrogen (N) deficiency (slow growth rate, decreased density, and sometimes leaf yellowing). Under compacted conditions, the root system is reduced and less viable. This results in a 10% to 30% reduction in fertilizer uptake. Increasing fertilizer applications (particularly N) often results in increased succulence, reduced carbohydrate reserves, and dramatically reduced rooting. Thus the additional fertilizer actually makes the grass less tolerant to traffic and other stress.

Generally, the last symptom of soil compaction but the first one often observed by the untrained eye is a reduction in turf density and the invasion of weeds such as annual bluegrass and goosegrass. Applying a herbicide to prevent or remove weeds will treat the secondary problem but do nothing to relieve the soil compaction.

Unlike pest problems, nitrogen deficiency or drought stress, soil compaction often exists long before the plant shows symptoms. So developing a preventive diagnostic system can be very helpful. Using something as simple as a soil probe or screwdriver can help determine the degree and depth of soil compaction.

The rates of soil compaction vary with soil texture, soil moisture when the area is used, and the amount of weight applied. Soils high in silt and clay compact quicker than sandy soils, and wet soils compact faster than dry soils. So field use on wet soils tends to result in more surface damage and greater soil compaction than the same activities on dry soils. Soil compaction from normal use occurs within the top one to three inches of the surface. Compaction deeper in the soil profile may be due to construction, the presence of different soil layers, or the natural density of the subsoil.

Compare aeration options with the degree of compaction, the depth of compaction, weather conditions, turf growth cycles, and field use schedules. Hollow tine aeration is the most common method and, in most cases, the most effective because soil cores are brought to the surface. These cores can then serve as topdressing and be dragged back into the turf. Normal aeration penetrates into the top three or four inches of soil.

Solid spike/tine aerators punch holes into the soil, creating openings without removing soil. Solid tine equipment that causes soil lifting and vibrating can be as effective or more effective than hollow tines.

Deep aeration extends below four-inches and helps improve both surface and deep soil problems. Frequent aeration to the same depth, may cause a layer of compaction at the penetration depth, thus using both shallow and deep aeration may be needed.

Although there are many lengths and diameters of tines available for core aeration, the general size is fl-inch in diameter and 3-6 inches long. Fields with serious compaction problems or standing surface water can benefit from deeper aeration by the use of tines up to one inch in diameter and 12 inches long.

All aeration practices will cause some compaction. The question becomes whether the aeration relieves more compaction than it causes. Hollow tines or spoons that remove soil cause less compaction around and below the tine than do solid tines. Normal coring will not increase weed problems after a preemergence herbicide is applied.

No one cultivation option is right for all conditions. Matching the cultivation method to turf growth cycles, weather conditions and field use will mean using

continued on page 5

Is Your Turf Conditioned for the Season?

continued from page 3

different types of cultivation at different times during the year. Often, annual deep cultivation should be combined with a shallow aeration program to achieve the best results.

The length of benefit resulting from each cultivation option must be evaluated. More damage can be tolerated when the benefits of treatment are long lasting. Procedures that bring soil to the surface must be scheduled not to disrupt play.

During the active growing season, most turfgrasses take two weeks to fully recover from the damage and disruption caused by core aeration. Even when the cores are dragged back into the soil and any tufts of thatch or grass are removed, the turf will require a recovery period. Grass roots need time to regenerate and spread deeper into the soil before top growth will reflect the benefits of the process. However, if soil compaction is really limiting growth, it is often necessary to sacrifice short term turf quality for long term field performance.

Most sports fields need a minimum of two cultivations per year. Perhaps the timing should be prior to early seasonal growth and then again prior to stress conditions that limit root growth, such as high temperatures and drought stress. For cool season grasses cultivation in spring and fall is common, while for warm season grasses, generally early spring and mid summer. Hot, dry weather and strong winds can cause the turf bordering aeration holes to dry out. Avoid aeration during those periods or irrigate to compensate for moisture loss.

Obviously, the closer aeration holes are, the more soil compaction should be relieved. Generally, a minimum spacing of aeration holes on 4-inch centers is needed to reduce compaction. Such spacing usually requires two to three passes of an aerator over a field. Some turf managers aerate every two weeks during intensive use and/or they will aerate only high traffic areas frequently.

Spiking and slicing are the penetration of solid metal blades into the soil resulting in channels that allow water and air to reach the root system. This method can also be used to promote lateral growth of bermudagrass, Kentucky bluegrass, and creeping bentgrass and to quicken the drying of constantly wet soil. The benefits of spiking and slicing are usually more short-term than those of hollow tine aeration. Since spiking and slicing blades are available in small sizes, this process can be used often without causing much surface disruption and is thus popular during heavy-use periods.

Soil moisture levels are critical during cultivation. Soil that is too dry is hard to penetrate and cultivation is less effective. Dry soils also put more stress on cultivation equipment. If the soil is too wet, there will be little soil movement in response to cultivation.

Aeration methods that do not produce much vibration, such as spoon type tines, should be used when moisture levels are near field capacity. Aeration methods that do cause lifting and vibration should be used when moisture levels are slightly below field capacity or about 24 hours after rainfall or irrigation.

Generally, the longer aeration holes remain open to the surface, the longer lasting the benefit. Once a hole is sealed, even if only at the surface, the benefits of air and water movement are significantly, if not totally, eliminated. Topdressing with sand helps keep the holes open. If topdressing is not practical, more frequent cultivation will be needed to overcome surface sealing.

Since significant root growth occurs at lower temperatures than leaf growth, fields that are heavily used going into winter probably should be core-aerated after use, unless winter desiccation is a common problem. Core aeration will improve the water/air relationship during this period and result in healthier turf the following year.

As with all sports turf maintenance practices, constant monitoring is necessary to evaluate the success of the program throughout the year and from year to year. Because quantifying aeration results is difficult, detailed record keeping will be needed. Record the type and timing of aeration procedures. Since wet soils compact more quickly than dry ones, note irrigation and rainfall in relation to field use. Also keep records of daily temperature ranges, the frequency of games and practices on each field and the times they take place, fertilization schedules, overseeding and topdressing procedures, and any other pertinent activities.

Note the effect of procedures on turf vigor, including any reductions in irrigation, fertilization, weed, insect, and disease control. Justifying budgets is generally more effective when accompanied by documentation.

Cultivation practices are as important as fertilization, weed control or any other cultural practice. Develop a cultivation program that meets field needs and the budget, but remember that even the best-prepared plans must be modified at times. Know what options are available and be flexible enough to adjust the plan to meet changing conditions and turf needs.