SPORTS TURF MANAGER

... for safe, natural sports turf

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2005 TURFGRASS SYMPOSIUM

February 21-22, 2005. Mark your calendar now! This year's premier turfgrass educational event will be held at the University of Guelph. It will feature a wide range of seminars on topics such as irrigation, IPM, sod production and best practices for turf management. See page 4 for details.

CITY OF GUELPH

Managing for Healthy Root Systems

DR. ERIC LYONS, UNIVERSITY OF GUELPH, FIELD DAY COVERAGE

Roots provide many important functions for plants. They acquire water and nutrients from the soil. In fact, everything plants need to grow, with the exception of light and carbon dioxide, are absorbed through the roots. One of the most important functions of plant roots to athletic field managers is that roots provide anchorage for the plant. In the case of turfgrasses, the dense fibrous root system provides the soil stability needed for a high quality playing surface.

In order to manage for a healthy root system, it is important to look at what defines a healthy root-zone. An ecologist may define a healthy root-zone as a heterogeneous soil environment that provides for the maximum amount of biodiversity. At the same time, an agronomist may define a healthy root-zone as a sustainable soil environment that provides the maximum crop yield, year in and year out, with limited inputs. The determination of health in the case of a root-zone is dependent on what it must provide the plants to maintain the desired outcome. A healthy root-zone in turfgrass systems is one that provides a dense, consistent turf canopy with the associated dense, fibrous root system. The goal of turf managers is to create this system within the confines of their monetary and temporal limitations. The following is a prioritized list of management considerations that affect the ability of turfgrass to form the dense fibrous root system that is desired.

Mowing

Hey, I thought this was an article about root-zones? Well, it is, but we still cannot get too far removed from the basics of turf management and plant biology. There are two things to consider: mowing height and mowing frequency. Decreasing mowing height often increases tiller... → page 7

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REMEMBER THAT JUST LIKE TURF MANAGERS, TURF PLANTS ARE UNDERGOING THE SAME BALANCING ACT...

... density and creates a finer textured turf, both of which are desirable on playing surfaces. In conjunction, decreasing mowing height reduces the amount of photosynthates (energy from photosynthesis) that the plant can allocate to roots for the creation of our desired root system. Fortunately for the stability of the playing surface, the roots are usually fairly dense in the top 4 cm, even under the lower mowing heights. The plants will be less able to attain water and nutrient from deeper in the soil profile. Turf managers must consider their ability to provide the other requirements such as irrigation and nutrients then weigh what mowing height is appropriate.

Another consideration in deciding on mowing height is the frequency that the turf can be mowed. When mowing, only one third of the height of the plant should be removed. For example to mow turf at 6 cm it should not grow higher than 9 cm between mowing cycles, 3 cm of growth. In the case of turf mowed at 3 cm, it should not grow higher than 4.5 cm, 1.5 cm of growth. As mowing height decreases, frequency of mowing increases. If more than one third of the height of the turf is removed, it can adversely affect root growth. The plant will not have enough leaf area to create enough photosynthates to support its root system, causing root dieback and a general decline in turf health. Also, mowing too infrequently can cause increased thatch build up which will be addressed in a later section.

Irrigation

While many fields do not have the option, luxury or availability of irrigation, the control of water is a great way to control root growth. The most important thing to remember when considering how roots interact with soil water is that roots grow to where the water is located. If light, frequent irrigation is implemented then root growth will be relatively shallow and not very dense. Deep, infrequent irrigation is much more desirable. It is also important to remember what type of soil is present. Sandy soils drain more quickly than clay soils and hold less water. Clay soils hold more water than a sandy soil but a lower percentage of the water is available to the plant. While not enough water is a concern in root management, too much water and insufficient drainage are also typical problems. Most of the time the soil cannot be modified without great expense although proper thatch management can help.

Fertility

It has been said that you cannot have too much of a good thing. In the case of fertility on athletic fields, this statement could not be more false. With excessive fertility, specifically nitrogen, the root mass of most plants, including turfgrass, decreases. One of the primary functions of roots is to absorb nutrients. When excessive nutrients are present, the plant has evolved mechanisms to limit root growth. Increased nitrogen fertility also increases shoot growth making it much more difficult to maintain the desired canopy height and mowing intervals. In contrast, if inadequate nutrients are present all growth is limited and the root system generally will be larger in proportion to the whole plant. However, the overall root system will be smaller and the turf will not be able to maintain an acceptable playing surface.

The importance of soil testing can never be stressed enough. Typically, turf managers apply excess nutrients or apply combinations of nutrients in such a way that excessive phosphorus is applied to reach the desired nitrogen level. Soil tests will also provide insights to the pH of the soil and the need for liming. Rarely are micronutrients limiting and should only be applied if soil or tissue testing recommends.

Thatch Control and Aeration

Thatch is a part of any actively growing turf system. In the case of athletic fields, it can actually provide a small buffer protecting the soil from excessive wear. While thatch has good aeration and compaction resistance, it is accompanied by poor water and nutrient retention. If an excessive thatch layer forms it will prevent rooting into the soil and will result in a mat-like turf that is susceptible to drought and divoting. Thatch can be controlled with topdressing, de-thatching machines, vertical mowers and most commonly, aeration.

Topdressing with a material with a bulk density higher than the thatch (such as sand or soil) creates an environment more conducive to the breakdown and decomposition of the thatch. While aeration is primarily implemented to relieve compaction, it acts as a way of mixing the thatch layer with the soil from the cores thus controlling thatch. One thing to remember about core aerification is that repeated aeration at the same depth can create a compaction layer at the depth of the cores. If 5 cm cores are pulled consistently over time a severe compaction layer can form at 5 cm that can inhibit drainage and rooting deeper into the soil profile. The solution is to vary the depth of aeration and, if possible, occasionally implement a deep tine aeration scheme.

Balancing Act

As with everything we do these days, managing healthy root systems in turf is a balancing act. We can provide too much of a good thing. If a lower height of cut is desired then most likely increased mowing frequency and irrigation will be needed. The thing to remember is that plants are also undergoing the same balancing act. Turf plants optimize allocation of photosynthates to acquiring water and nutrients (roots) or to photosynthate production (shoots). The job of the turf manager is to understand this balancing act and manipulate it to result in optimal growth of both roots and shoots in order to provide the best possible playing surface. ♦