What's wrong with this picture?

BY DR. JEFF KRANS

The turf on the football field in the photo on this page has excellent density, outstanding color, great uniformity, and no sign of any disease or insect problems. So, what's wrong?

The answer can be found in the picture, but not easily recognized without another piece of information—the game schedule. This turf has peaked 2 months before the first sporting event. Now you may not see this as a problem. After all, we all know that a manager is better off to have the turf ready early than late. Early turf beats late in most situations, but does early beat "on time" or "peak" turf performance?

Peak performance refers to turf growth and quality that maximizes (peaks) immediately before or at the start of play. The management strategy of peaking turf is not new to golf course superintendents, who will adjust cultural practices, nutrition, and water to peak turf just before a tournament, then readjust for everyday golf. The superintendent's adjustments in management are designed to match turf quality with player expectations over a season.

In sports turf, the common management strategy appears to be one of peaking the turf early, then holding quality. Both approaches have been successful and there is no doubt that golf and sport turfs are very different and may not even be comparable. The pressure on the sports turf manager to maintain quality turf at all times is intense and trying. The early peak, then hold strategy is a compelling choice given the high expectations of players, fans, coaches, and administrators for high quality turf no matter what the circumstance or season.

So, what is the best management strategy for growing turf on sports fields? The response may not lie in a comparison of golf and sports turf management, but in understanding the limits and biology of the turfgrass plant.

Knowledge of turfgrass growth and development is a fundamental requirement of good management. The first step in gaining this knowledge lies in the sequence of turfgrass growth and development. All grasses, including turf-types, have a continual pattern or expression of growth. In other words, when temperature, moisture, and light levels are adequate for plant activity, all structures grow continually. The continual growth of turf is especially true for turfgrass leaves and stems. In contrast to grasses, other plant types such as deciduous trees express flushes of growth. In trees, all of the leaf growth occurs in the spring, commonly referred to as a "spring flush." This flush is followed by the summer-long presence of the same leaves, then leaf senescence (growing old) and detachment in the fall. The tree example represents a single season of growth lasting 6-8 months depending on climate.

The continual and repeated growth sequence of the turfgrass leaf is a key factor in addressing how to peak turf. The turfgrass plant will follow a continual and repeated (old leaves are replaced by new leaves) as well as short (individual leaf longevity is only 2-4 weeks) growth sequence of (a) emergence, (b) function (c) senescence (growing old), and (d) detachment.

Emergence is the growth of the leaf blade and sheath from their respective growing points until both segments have fully expanded. The function sequence refers to a fully expanded leaf engaged in high photosynthesis (manufacture of plant food) and export of photosynthate (distribution of plant food). Senescence is a leaf growing old with low photosynthesis and no export of photosynthate. Detachment is the death stage with no contribution to plant health. The sequence of leaf emergence to detachment in grass is difficult to visualize because all events occur continually and concurrently among during a short time period (2-4 weeks).

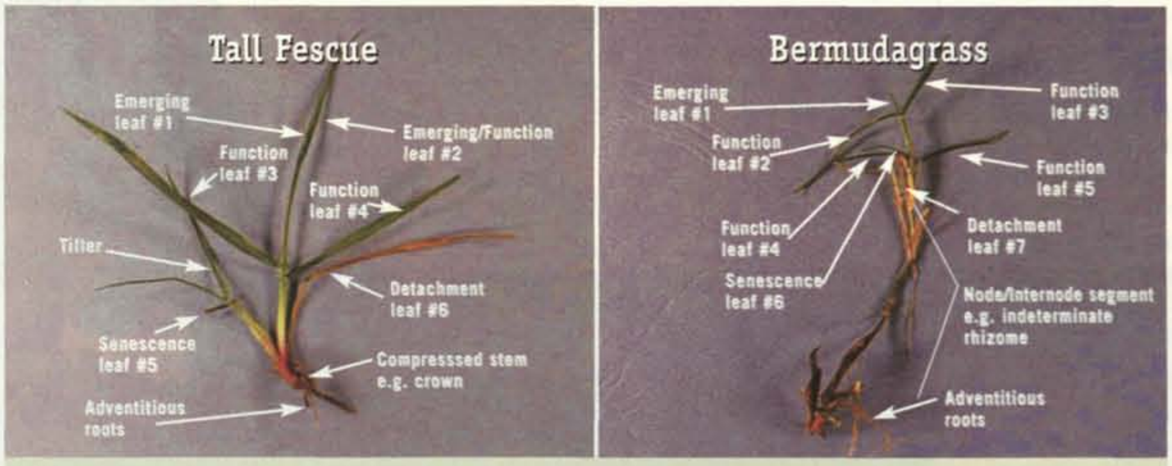
A bermudagrass football field with excellent quality turf, but 2 months away from the first game.

For example, new turfgrass leaves are continually emerging from their growing points while existing leaves (originated from the same growing point) are passing through the other sequences of growth. Leaves that emerge from a single growing point arise in concert with other leaves and the number of leaves exposed at any one time per growing point is limited to 4 to 8 depending on conditions. In addition, the lifetime of an individual leaf is short, ranging from only 2-4 weeks depending on species, cultural practices, and environmental conditions. The pattern of leaf emergence to detachment from a single growing point can go on indefinitely provided the growing point remains alive or viable. To gain a sense of the sequence and pattern of leaf growth, leaves of tall fescue and bermudagrass are labeled to illustrate the different stages of growth (See next page).

These pictures represent only a snap shot in time that identifies the growth sequence of each leaf and do not demonstrate the dynamic and continual process of leaf growth. In practical terms, the individual leaves mowed today will not be the same leaves mowed 3-4 weeks in the future. The future leaves will be new leaves and today's leaves will be dead.

Management can affect the continual sequence of turfgrass leaf growth. In fact, the manipulation of the number of leaves can be a useful and powerful tool in managing quality turf. One direct means to manipulate the number and sequence of leaves is nitrogen fertilizer. Nitrogen will stimulate the frequency, alter the sequence, and change the size of leaves. Multiple applications of nitrogen stimulate leaf emergence resulting in a greater than normal number of leaves exposed from a single growing point (an increase in shoot density). This response can be used to peak turf. Peaking turf with high nitrogen will have consequences however, which fall into two categories of plant affects - a sudden loss of turf quality and the predisposition of the plant to pest and environmental stresses.

The sudden lost of turf quality will come 2-4 weeks after the repeated nitrogen applications have accelerated leaf emergence and thereby causing a higher than normal number of leaves to emerge. This higher than normal "unit" of leaves will eventually pass along the growth sequence. In other words, the leaf unit will emerge, function, senesce, and finally detach or die. Therefore, 2-4 weeks down the road, the unit flush of new leaves will result in a unit "flush" of detachment (death). In practical terms, pushing turf with nitrogen to get a "bounce" in turf quality is great, but how great will the "bounce" in leaf detachment be 2-4 weeks down the road?



Tall fescue and bermudagrass plants illustrating stages of leaf quality and growth sequences. Leaves are labeled according to stage of growth for a single point in time. This illustration does not exemplify the dynamic and concurrent nature of leaf growth and development in grass.

The other consequence of a larger than normal number of leaves emerging at one time is the predisposition of the plant to suffer from pest and environmental stresses. In this case, pest and environmental stresses are disease, insect, and nematode invasion as well as injury from heat, cold, and drought extremes. The scenario of high shoot density predisposing turf to injury has been well documented in research studies, but predisposition is not a guarantee of injury. After all, chemical controls are available for nearly all invasions of turfgrass pests, and most environmental stresses can be countered with cultural management. Yet, is the predisposition of turf to injury a sound management strategy?

The consequences of the nitrogen bounce both up and down and the predisposition of turf to pest and environmental stresses are determined by the biology of the plant. There is also no doubt that the strategy to peak turf on time coincides better with the plant and sound management than to peak early, then hold until game day. So, what are the practices that one should use to peak turf on time and avoid the consequences of holding turf quality? In my next article, I will discuss management practices to grow quality sports turf within the limits of the biology of plant and sound management. **ST**

Jeff Krans, Ph.D. is a professor of agronomy at Mississippi State University and SPORTSTURF's technical editor.