



Deep Roots: How Important Are They?

by Tony Koski

Photos courtesy: Tony Koski

During any visit to a sports facility, the turf manager and I inevitably touch upon the issue of rooting depth. In some cases the soil is probed to reveal deep, healthy, massive root development—of which the sports turf manager is justifiably proud. In other instances the field manager laments the shallow root development in his or her field. Interestingly, I have found that deep rooting does not necessarily guarantee excellent (or even average) playing conditions. And some of the best playing surfaces possess root systems of only average depth. Which begs the question: How important is the development of deep roots to the production of high quality sports turf?

What we learned in school

Every turf textbook ever written emphasizes the importance of deep, healthy roots to the production of high quality

turfgrass. In turf classes we talk about how mowing, fertilization, irrigation and soil compaction all influence rooting. We are conditioned—rightly so, I might add—to do everything possible to encourage the development of a deep and healthy root system. After all, roots supply the “top” with water and nutrients and they anchor the turf to the soil. There is no question that an extensive and healthy root system makes it easier to produce good quality turf. But do “good roots” guarantee that a sports turf surface



The weight of thick-cut sod, not deep, established roots, make it immediately usable for play. Courtesy: Tony Koski

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will be safe and playable, in terms of traction, smoothness and resiliency?

When rooting depth doesn't matter

A few years back I visited a new football field in Colorado. The sod had been down for approximately six months and it had yet to see a game, or even a single practice. School officials were concerned about the safety of the field and wanted me to evaluate it. As we approached the field, its visual appearance was excellent. However, I had taken only a few steps onto it when I knew there was a serious problem. Despite its age and excellent appearance, it felt like we were walking on quicksand! School officials were perplexed, to say the least. They were especially mystified by the fact that the roots on their new field were 14 to 15 inches deep—down to the very bottom of their new sand root zone. It seems that neither the architect nor the contractor knew anything about sports turf root zone construction (“Sand is sand. It’s all the same—isn’t it?”). The mixture of coarse sand and gravel allowed tremendous rooting to occur, but at the expense of stability. The entire field had to be rebuilt; an expensive lesson learned.

Consider another situation when deep rooting is non-existent: when one uses thick-cut sod. At most, you

have a rooting depth of 1.5 to 2 inches, depending upon how much soil is cut with the sod. This sod is typically cut in big rolls. It is the weight of the sod, combined with its large size, that makes it immediately usable for use as a sports turf. All efforts should certainly be made to encourage rooting into the underlying root zone to make it easier to care for the grass, but deep rooting is obviously not necessary in this scenario to provide a functional and safe playing surface.

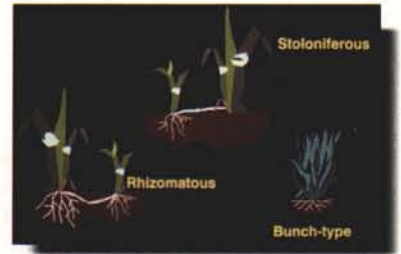


Figure 1



As fields mature, they are able to sustain greater levels of use.
Photo courtesy: Tony Koski

The age of the field

Rooting depths on new sand-based fields established from seed can be impressively deep, often down to the gravel drainage blanket. At the same time, these new fields can only sustain minimal amounts of use before they begin to show wear. Obviously, rooting depth in itself does not determine resistance to traffic damage. As the field matures it is able to withstand increasingly greater levels of use.

Continued on page 26

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By performing routine maintenance practices correctly, you can encourage the deepest possible rooting and still produce playing surface of optimal quality. Some of these practices might include:

- Construct fields using a root zone material that is stable, retains sufficient moisture and drains well.
- Install drainage to prevent accumulation of soil water—which excludes soil air.
- Use shallow core cultivation to reduce the effects of surface compaction.
- Use deep-tine cultivation to improve deep water and air penetration.
- Avoid excessive irrigation, which excludes oxygen and limits rooting depth.
- Mow at a height and frequency appropriate for the species and cultivar on the field.
- Apply only enough nitrogen to promote acceptable growth and recovery from traffic.
- Don't forget the importance of potassium and phosphorus—especially on sand fields.
- Use preemergent herbicides carefully; most of them can cause root pruning if misapplied.
- Topdress with acceptable materials and at a proper frequency to avoid layering at the surface.

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Greater traffic tolerance results from the development and maturation of the turf at the surface: stems, shoots, rhizomes and/or stolons, crowns and roots (Fig. 1).

All of these plant parts combine to form a matrix, with the root zone, that is better able to resist damage caused by sports turf traffic. This explains why a sodded field (assuming a mature, good quality sod) can be used sooner and with greater intensity than a seeded field, all other factors being equal.

Species Differences

We know that some turf species, like tall fescue and perennial ryegrass, tend to form significantly deeper roots than Kentucky bluegrass. Yet most players and turf managers would contend that, all other factors being equal, traction is better on bluegrass. The rhizome network formed by the bluegrass creates a stability that the bunch grasses (ryegrass and tall fescue) cannot achieve. Bermudagrass provides even greater stability and wearability than bluegrass because it forms both rhizomes and stolons.

The scourge of athletic fields everywhere, annual bluegrass, presents a special problem for the sports turf manager. Its tendency to form very shallow roots, combined with its habit of growing as a bunch grass or by stolons (the perennial types), creates patches that are easily torn and divoted by larger, stronger athletes. Deep rooting can provide an acceptable level of stability for bunch type or stoloniferous grasses, but rhizome-forming grasses with average rooting depth will generally exhibit greater sports turf stability than a deeply rooted bunch-type species.

Encouraging deep roots is still important

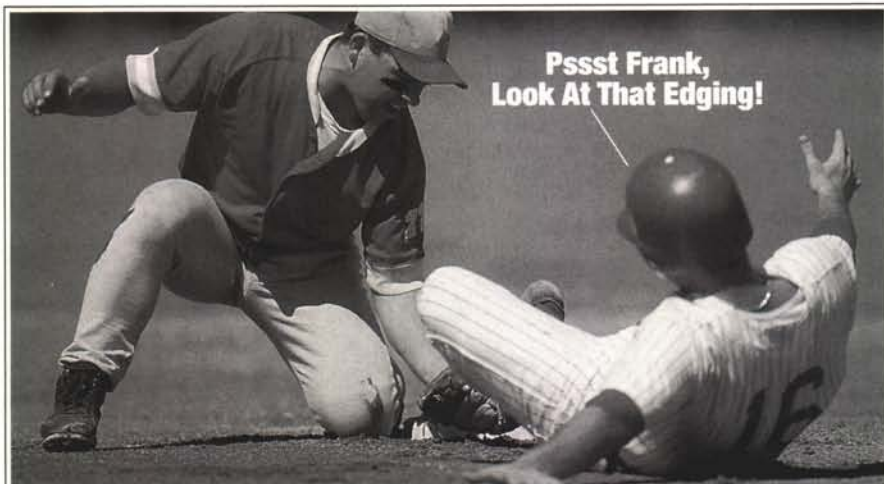
The purpose of this article is not to discount the importance of healthy root systems. Rather, it is to point out that overall rooting depth is probably not the most important factor in producing a smooth, stable, fast and safe athletic surface. More important are such factors as root zone composition, species growth habit (bunch vs. creeping) and maturity level of the field. The production

of a great athletic surface depends on the development of a stable surface matrix of shoots, stems and roots—and not on striving for 14 inches of healthy roots.

Of course, successful sports turf managers are often able to accomplish both goals. Deep, healthy roots make it easier to develop the high

quality playing surface, but by themselves are not the reason that a field is safe and playable.

Tony Koski is assistant professor/extension with the Horticulture Department of Colorado State University, Fort Collins, Colo.



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