What to do with a hard field

BY DR. BARRY STEWART

Last summer there was very little rain in northeast Mississippi during August and September. Grass stands on non-irrigated turf thinned out, the soil dried out, and athletic fields became very hard, so hard that they would be unsafe to play on. Granted this was an extreme case and when needed rain began to fall these fields quickly softened. Here's what you can do about hardness and unsafe conditions.

Most athletic fields become hard due to traffic. We set off to build firm fields but not hard ones. Traffic is a combination of wear and soil compaction. Wear contributes to increased hardness by removing biomass that provides cushion and impact absorption. Compaction forces more soil particles into a given volume resulting in a denser soil with decreased pore space. As a soil becomes denser its particles have less freedom of movement. The soil becomes more rigid and harder.

A similar thing happens when native soil fields become dry. The particles bind together as the clay minerals are de-watered and the soil becomes more rigid. When the soil is re-wetted water films return to the soil particles and provide lubrication to allow the particle to move over each other more freely.

You have some tools at your disposal that will give a pretty good indication whether a field that is too hard or too soft. I think every field manager should own a pair of cleats and should get out and run around on his field from time to time. If it feels like your cleats are not penetrating the surface then it is likely too hard. Your soil sampling probe and pocketknife can also help you locate hard areas or give an indication of how hard your surface is. If you cannot push the soil probe more than a 1/4 inch into the surface or cannot push your pocketknife into the soil using only your thumb then you have a hard field or at least a hard spot. Move around, get a picture of the whole field, see if there are isolated hard spots or if the whole field is hard.

Mowing height

The presence of a thick healthy cover of a desirable turfgrass species is a large factor in providing a safe playing surface. You should keep in mind the relationship between cutting height and turf density before making a knee jerk reaction and growing the grass taller to keep

the field from getting hard. Research on bermudagrass has shown that raising the cutting height from low cutting heights (1/2 inch) to more moderate heights (3/4 to 1 inch) increased the impact adsorption of the surface. Additional increases in cutting height only slightly increased the impact absorption. As cutting height is raised shoot density declines. This means we have fewer shoots located close to the surface and most likely longer blades of grass. The blades are more prone to wear and once they are worn away there are fewer growing points to grow back from than in a more closely mowed turf, thus the recuperative potential of the turf is decreased.

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The biomass of a dense turf is a factor in modifying surface hardness, but turf density also serves to regulate soil water content. On nearly every field I have been on the hardest spots are those in which the turf is thin. When turf gets thin the soil is allowed to bake in the hot summer sun, the clays contract and the soil becomes very hard. The grow habit of a grass can play a role in surface hardness. Grasses with a prostrate or lateral growth habit tend to form a mat of biomass on the soil surface, not only providing cushioning but also retaining soil moisture. A more upright growing variety allows more evaporation from the soil surface resulting in a drier harder soil.

I have research plots that compare MS-Choice bermudagrass, a prostrate growing variety and common bermudagrass that has a more open canopy. In the heat of a Mississippi August the MS Choice has a surface hardness that would be very playable while the common bermudagrass would be too hard to play on even though both grasses are receiving the same amount of water.

Cultural practices such as core aerifying and topdressing provide some loose material at the surface that has not been compacted and are key operations in maintaining a safe playing surface. Research has shown time and time again that the most effective treatment for maintaining a soft playing surface is core aerification. In addition core aerification creates macro pores, reduces bulk density and improves internal drainage. Core aerification can be used as a cure for hard compacted fields but is better used as a tool to prevent fields from becoming compacted. In addition aerification and topdressing will improve growing conditions and give you a better chance of maintaining a healthy dense turf.

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Water management that does not allow field to get too dry, growing a healthy dense turf and core aerification are key elements in dealing with hard fields as well as avoiding their occurrence. **ST**

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Getting technical

As a researcher I measure surface hardness with a Clegg Impact Soil Tester (CIST). It is a simple device, a cylindrical mass is dropped down a guide tube and an accelerometer measures how fast the mass comes to a stop when it impacts a surface. The accelerometer sends an electronic signal to a recorder that displays the result in units of Gmax that is measured in gravities (g). Surfaces with high Gmax value are hard surfaces while low Gmax values indicate a softer surface.

For example a concrete sidewalk has a Gmax of 1400-1500 while a high quality athletic field may have a Gmax of 80. CISTs are commercially available for about $2,000. Using them to determine the impact attenuation of a football field is outlined in ASTM Standard F 1702. Unfortunately, this standard does not contain a Gmax value that is characteristic of a field that is too soft or too hard for play.

Following the method in this standard my personal experience suggests that a Gmax number between 75 and 95 is preferred and Gmax values from 30 to 130 are acceptable for American football. A number you will see in some literature is 200 but that number comes from ASTM Standard F 1936. That standard uses a device similar in configuration to a CIST but with a much heavier mass (10 kg) of differing dimensions. The device used in ASTM F 1936 is not commercially available but some researchers and artificial turf companies have had them custom built for about $15,000. Due to differing masses and methodology the two methods should not be compared and the standard of 200 Gmax (ASTM 1936) is not applicable to CIST. A Gmax of 200 using a 2.25 kg CIST and the method in ASTM 1702 indicates a very hard field.

There may come a day when these types of measurements are commonplace on athletic fields but today these devices are largely research tools.–Barry Stewart