Reducing Field Compaction

by Dr. Coleman Y. Ward

Compaction on athletic fields can be attributed to the traffic of heavy use. It compresses soil particles and reduces aeration porosity, water infiltration, and water movement through the soil.

Compaction hardens a field by increasing its bulk density, which measures the weight of the soil per cubic centimeter. This increases impact rebound for athletes—that jarring effect players experience when their bodies contact another surface. As the field's bulk density increases relative to the density of the human body, the impact rebound increases proportionately.

Artificial turf provides a good example of this principle. These surfaces have a bulk density 2-1/2 times greater than the density of the human body. This accounts for the greater degree of internal injury in field-contact injury situations.

Problem areas

Athletic field compaction generally occurs in the top one to two inches of the soil profile. The greatest damage occurs where traffic is heavy and repetitive.

On baseball fields, compaction is greatest in and around home plate, along the first-base line, in the coaches' boxes, along the third-base grass line, in areas where players spill out of the dugout, and in the path between the mound and home plate.

Aerification creates a softer soil by reducing the bulk density, and it improves gas and water exchange in the soil. *Courtesy: Trusty & Assoc.*

Compaction develops on football fields in areas where players practice punting and field-goal kicking, at the center of the field between the two 30-yard lines, and from the 10-yard lines to the goal lines. Soccer field compaction is greatest at the goal mouth and in the free-kick zones.

On-field practices and performances by the band, cheerleader routines, and movement of players and coaches along the sidelines also contribute to compaction problems. These factors can be more damaging than actual games or practices.

Layering can also lead to compaction. Layers of differently textured materials within the soil profile disrupt the downward movement of air and water. The only way to rectify a layering situation without major field renovation is to aerify deeply enough to rupture those layers.

Avoid field compaction

The best way to avoid field compaction is to establish and maintain a good,

healthy turf. A thick turf canopy becomes its own cushion against traffic pressure.

Wet soils are more easily compressed than dry soils, so avoid field use when soil conditions are too wet; if possible, restrict or cancel practice or play. Work with coaches to move practice sites during individual sessions and from session to session to avoid concentrating traffic in the same spots. Urge them to make use of the sidelines, end zones, and other turf outside the playing surface.

If space and budgeted funds permit, develop several fields to spread out practices. If multiple fields aren't an option, develop alternate field layouts on the existing field.

On football or soccer practice fields, shift the playing area by painting field dimensions parallel to the existing field, but moved 10 to 20 feet from the existing field borders. You can also line two shorter practice fields over the top of the existing field, but perpendicular to it. Use portable soccer nets and football goal posts to set up alternative kicking practices.

Material removed during core aeration can be dragged back into the turf to control thatch. *Courtesy: Trusty & Assoc.*

Identify the problem

Sports turf managers can avoid and reduce compaction problems by paying attention to signals from the turf. Lack of vigor, change of color, thinning, reduced response to irrigation or fertilization, and weed invasion all indicate that turf is under stress. Compaction is a likely cause.

When compaction occurs, examine the field to determine the location, nature, and extent of the problem. Use a pentrometer or metal rod to probe the field, locate compacted areas, and gauge field hardness.

Use a soil-sampling probe or a length of hollow pipe to extract soil samples for examination. If soil is compacted, it usually breaks off of these samples at a straight line. It will come off in little sheets instead of crumbling across at an angle.

Once you see the type of materials being compacted and the depths at which problems are occurring, try to

determine the cause. If you can get to the root of the problem, you'll be better equipped to develop an effective solution.

Combat existing compaction

Compaction reduces root growth. Shorter, stunted roots have less ability to take up the water and nutrients necessary to support plant development, so reduced root growth equals reduced shoot growth. Turf becomes less tolerant to heat and drought, and more susceptible to weed invasion.

Start your program of compaction repair by attacking this problem directly. Give turf short-term assistance by adopting maintenance practices geared to the shorter root system.

Provide more frequent irrigation.

Solid-tine aeration is less disruptive than core aeration. The technique punches holes in turf without removing any material.
Courtesy: Trusty & Assoc.

One strategy to avoid compaction is to let the soil surface dry out as much as possible without adding stress to the turf. However, once compaction develops, the turf's water needs intensify.

Irrigate the field deeply immediately after a game, especially if there are several days between the game and the next intensive field use. This allows time for excess water to drain away. Adjust the timing of pre-game irrigation so the soil will be moist, but not saturated—irrigate thoroughly late Wednesday or early Thursday for a Friday night game.

Shorten intervals between fertilizations to insure that adequate nutrient resources are within reach of the shorter plant roots. Compacted areas may require double, or even triple the amount of irrigation and fertilization given to the remainder of the field.

If necessary, install additional drainage to alleviate overly wet conditions. Topdress with a light layer of calcined clay or another absorbent material to reduce surface water problems.

Thin, weak turf is susceptible to weed invasion. Follow standard IPM practices to reduce weed competition, and include judicious use of pesticides.

Aerification as a solution

The main method of compaction reduction is aerification. This longer-term solution creates a softer soil by reducing its bulk density. The technique puts holes in the turf and

gives the soil space to move in reaction to downward pressure.

Research by Dr. Robert Carrow of the University of Georgia and other researchers shows that core aerification provides the best means to soften soil and improve water and air exchange. Core aeration removes plugs of soil and leaves minimal compaction at the sides and base of the holes created.

Soil should be moist during core aeration to achieve proper penetration. Plan for a minimum depth of three to five inches. Soil cores may be removed from the surface or shattered and dragged back into the turf to control thatch. Because plugs of soil are removed, core aeration causes greater disruption to the playing surface than other forms of aeration.

Solid-tine (spike) aeration pokes holes in the soil without removing plugs. Compaction at the sides and base of the holes is a bit greater with this method, since the soil is packed into the hole rather than removed.

Solid-tine aeration can be very effective in reducing hardness and increasing air and water movement. Depths used for standard solid-tine aeration are similar to those of core aeration, but soil should be a bit drier to achieve better shattering and improve the overall effect.

Other aerating techniques are also available to handle particularly tough applications. Deep drilling, water injection, deep-tine, and shatter-core aeration can be used to reach deeper into the soil profile to penetrate deep layering situations.

It's important to keep cores open from the surface downward to promote positive air and water flow. If a hole is clogged for any reason, it may not function properly. In high-profile, high-visibility fields with close-cut turf, holes may be filled by topdressing with sand, sand-peat, a porous calcined product, or another suitable material to stabilize the hole.

Mix no more than five percent peat with the sand topdressing, even if the existing soil profile is 15 or 20 percent peat. By reducing the percentage of peat to about half of what's in the soil profile, you'll still be incorporating sufficient organic matter. You'll have a better infiltration rate, and it will be easier to filter the topdressing material into the holes.

Develop a comprehensive compaction-reduction program that incorporates prevention strategies, targeted compacted area maintenance procedures, and multiple aeration methods. Alternate your methods in accordance with causes of compaction, degree of compaction, field-use schedules, weather factors, and budgetary constraints. Problem areas might need an aeration schedule three times greater than the one used on the rest of the field. ❑

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