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TECH CENTER

Minimizing compaction on athletic fields, golf courses

While turfgrass is not directly killed by compaction, it makes the plant susceptible to other stress factors.

■ As the American people turn more to outdoor physical activities for their recreation, increasing pressure is being placed upon recreational field managers and golf course superintendents who must cope with traffic levels never expected as little as 15 years ago.

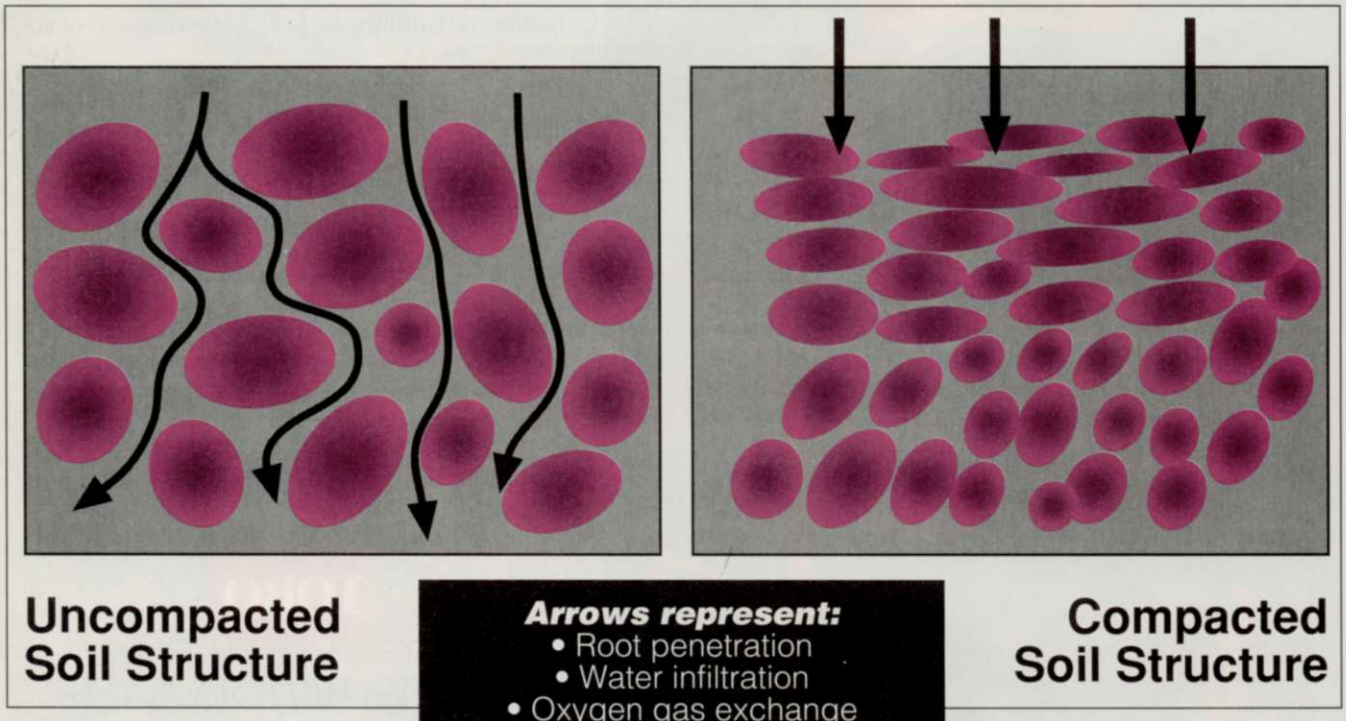
The average athletic field supervisor, unlike his counterparts of yore, must make turfgrassed fields available to youth baseball leagues, men's and women's softball leagues, soccer leagues, recreation softball and touch football leagues, and much, much more.

The average golf course superintendent watches in the neighborhood of 30,000 people play on his course every year—and in extreme instances will see upwards of 60,000 people on courses that are open throughout the year.

What results is usually not pretty: worn down, brown grass, trampled and "left for dead." Though most athletic field turf mixes are hardy breeds, they usually cannot cope with the effects of soil compaction, which steals their sustenance.

"Soil compaction caused by foot and vehicular traffic is a common problem of turfgrass areas," note Drs. Bill Daniel and

continued on page 24



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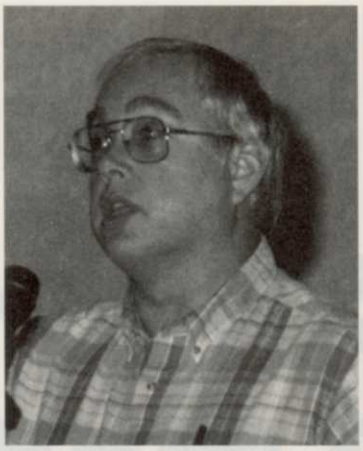
MILES

Most compaction in top three inches of soil, says Dr. James Beard



Grass uses 25-50 percent less water, non-compacted, says Dr. Bob Carrow.

Dealing with compaction can save money, says Dr. Jack Hall.

Compaction *from page 22*

Ray Freeborg in their "Turf Manager's Handbook."

"In a nine-year study of compaction on a putting green in Virginia, the air porosity decreased from 21 to 17 percent while infiltration was reduced from 45 to 32 cm./hr. Heavy compaction caused a 22 percent lower air porosity and a 46 percent lower infiltration rate when compared to normal maintenance."

Do not mistake wear damage with damage caused by compaction. Excessive traffic can destroy leaf tissue (wear), leaving root systems intact. But compaction can cause much more serious damage, to the roots.

From the top—Most compaction occurs within two to three inches of the surface, says Dr. Jim Beard in his well-known text "Turfgrass: Science and Culture." Yes, but in reality, it is the top *one inch* of the soil that is most radically affected.

Because soil particles are so tightly compressed in compacted situations, there is little air space to allow water and gas to infiltrate the soil and work their wonders on the turfgrass plant's root system. Eventually, the roots may die altogether.

Different soils react differently to increased traffic. Fine textured soils like silts and clays are far more easily compacted. At the other end of the spectrum, certain coarse textured sands resist compaction.

Compaction potential, notes Dr. Beard, *continued on page 26*

What compaction does:

- Destroys soil structure; increases soil bulk density; increases small pore space, decreases large pore space.
- Contributes to lower air porosity, lack of soil aeration; increases carbon dioxide in soil; decreases oxygen diffusion.
- Contributes to reduced water infiltration and percolation; increases surface water runoff; increases water evaporative losses; decreases leaf water potential; decreases drought hardiness; increases need for irrigation.
- Causes greater soil temperature extremes; increases heat conductivity and canopy temperatures.
- Decreases nutrient and pesticide movement; decreases nitrogen use efficiency; decreases plants' stored food reserves; increases need for herbicides and fungicides; increases proneness to wilt and disease.

Sources: various

Alleviating compaction:

- Use species/cultivars adapted to your area and cultural level.
- Control traffic through scheduling and design.
- Cultivate as often as necessary.
- Adjust other management programs: develop good drainage, irrigate as deeply and infrequently as possible; keep nitrogen levels adequate but not high.
- Modify the soil chemically (use gypsum for heavy, salt-affected soils).
- Modify the soil physically (add sand or organic matter to heavy clay soils).
- Install paver systems, as a last resort.

Source: Dr. R.N. Carrow

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Quality Network

Compaction *from page 24*

is influenced by:

1) soil texture (coarse texture = less compaction)
2) severity of pressure (lighter traffic = less compaction)
3) frequency of pressure (less traffic = less compaction)
4) amount of vegetation (more vegetation = less compaction)
5) soil water content (dry soil = less compaction)

Other problems—As soils become more compacted, other problems find a window of opportunity. Dr. A.J. Turgeon, in "Turfgrass Management," reports:

"Turfgrass communities growing in compacted soil are often invaded by various weed species [such as goosegrass, knotweed and annual bluegrass]. Some weeds that typically grow under these conditions may possess the capacity to transmit foliar-absorbed oxygen to their roots to satisfy respiratory requirements. Thus, specific weeds may have a definite advantage over many turfgrasses through their ability to persist under these conditions."

Besides weeds, other problems crop up like decreased drought resistance, wilt, and some diseases.

"Turfgrass growing under compacted conditions," observes Dr. J.R. Hall III, "has less stored food reserve, more succulent tissue, and greater proneness to wilt and disease. This lack of growth and competitiveness often leads to greater need for irrigation, herbicides and fungicides. Dealing with compaction can therefore save money in the long run."

Dr. R.N. Carrow adds another cost factor to the equation: grass plants use 25 to 50 percent less water under non-compacted versus compacted conditions, but low infiltration rates under compaction make irrigation very difficult. "The grower often finds it necessary to irrigate with low quantities of water on a frequent basis," he notes, "which greatly increases evaporational losses. Therefore, total water use actually becomes greater under compacted conditions."

Cultivation—The number one cultural practice that helps to alleviate soil compaction is cultivation (aeration/aerification). But proper timing is critical.

"Cool-season (grasses) generally require heavy aerification spring and fall with additional cultivation if traffic is heavy," says Dr. Hall. "Warm-season bermudagrasses are best aerified as soon as they have greened up in the spring and through the summer growing period.

"Spring cultivation should be done early enough to allow Kentucky bluegrass, tall fescue or perennial ryegrass time to heal before crabgrass germination begins in late April or early May," adds Dr. Hall. "This is not as critical if good pre-emergence herbicides are applied.

"Aerification too early in the spring or too late in the fall when the turf is not competitive may increase the potential for annual weed invasion. Likewise, aerification during periods of limited moisture may aggravate limited moisture conditions by increasing evaporative water loss from the soil."

Other procedures for halting the problems of soil compaction are listed in the accompanying tables (page 30).

—Jerry Roche

Ammonium sulfate fertilizer suppresses summer patch

■ Researchers at Rutgers University in New Jersey have found that using ammonium sulfate fertilizer (21-0-0-24S) suppresses summer patch by changing soil acidity, according to Dr. Joseph Heckman.

Dr. David Thompson, Rutgers plant pathologist, explains: "Ammonium sulfate reduces the soil pH almost immediately, and

continued on page 30

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For more information about the complete line of Triaform fertilizers, contact your Scott Tech Rep. Or call 1-800-543-0006.

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Sulfate *from page 26*

that has been shown to suppress summer patch in our tests on Kentucky bluegrass."

Thompson notes that the commonly-used fertilizer urea will lower the pH somewhat in the long term, but in the short term it actually encourages summer patch. Tests showed a 60 to 80 percent reduction in summer patch when ammonium sulfate was applied, compared to a 35 to 45 percent reduction with suflur-coated urea. And, after two years, there was no significant reduction at all of the pH when urea fertilizer was used.

What is it?—Summer patch affects cool-season grasses such as Kentucky bluegrass, annual bluegrass and fine fescue. It generally occurs on turf that has been established for more than two years. The fungus remains dormant over the winter months but thrives in hot, humid summer weather.

Summer patch attacks the grass roots and produces small circular patches of turfgrass that is dead above the ground. The patches may enlarge and blend into one another, resulting in large ragged areas of straw-colored grass and a very unsightly lawn.

Rutgers turf specialist Jim Murphy says that continued use of ammonium sulfate can virtually wipe out the summer patch fungus.

"In 1992, on test plots where ammonium sulfate had been applied for three years, we saw no summer patch at all and didn't need to use any fungicides. On plots without ammonium sulfate, we saw substantial disease activity.

"The summer patch suppression we saw in 1992 was likely influenced by the mild sumer weather last year. But that underlines the strong effect that ammonium sulfate fertilizer alone had on the disease.

Check soil pH—When using ammonium sulfate over a period of time, you may need to apply lime to maintain a favorable soil pH, Dr. Heckman points out.

"A soil pH level of 6.0 to 6.5 (slightly acidic) is ideal for most turfgrass species. You should have a reliable soil test performed every two to three years, and adjust to a pH of 6.0 where summer patch is known to occur."

Golf course superintendents who use ammonium sulfate regularly say it promotes early green-up when applied in the spring. They also apply it in the fall to keep plants stronger and more disease-resistant over the winter.

Not all commercial lawn fertilizers contain ammonium sulfate. Read labels or ask your fertilizer dealer for further information.

Cultivation improves water relations on compacted soils by:

- ***Improved infiltration/percolation***
  - –reduces runoff
  - –allows for better irrigation programming
  - –reduces evaporation losses
- ***Enhanced root extension***
  - –by improving physical conditions
  - –by altering chemical properties when cultivation is used to inject lime, gypsum, phosphorus
- ***Greater root viability***
  - –primarily by enhancing soil O_2 status
  - –by reducing penetration resistance

Source: Dr. R.N. Carrow

Cultivation Treatments Enhancing Soil Water Uptake By Turfgrass Roots[1]

PROCEDURE	APPLICATIONS/YR.	ENHANCED WATER EXTRACTION Frequency[2] %	Magnitude[3] %
Floyd McKay Deep Drill	2	100	50 to 120
Aerway Slicer	2	100	38 to 41
hollow tine core aeration	2	50	38
Verti-Drain + hollow tine core aeration	2+2	45	28 to 96
Yeager-Twose Turf Conditioner + lime	2	30	13 to 32
Verti-Drain	2	20	30 to 70
Yeager-Twose Turf Conditioner + gypsum	2	7	27

[1]*Studies conducted on a compacted Cecil sandy clay loam*

[2]*Frequency (%) = percent of water extraction measurements that exhibited greater water extraction than the compacted control*

[3]*Magnitude (%) = percent increase in water extraction over the compacted control*

Source: Dr. R. N. Carrow