Localized Dry Spot – Part II Understanding its Causes and Management Approaches

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B. "Chemical" and Biological Treatments

There are a number of soil amendment and treatment materials that can be quite effective in improving moisture availability to turfgrass where LDS exists. The degree of each materials effectiveness is directly tied to the nature and degree of the problem and the essential workings of the specific material.

Soil Wetting Agents (or Soil Penetrants)

"Wetting agent" and "penetrant" are common names applied to products that belong to a *class* of chemicals known as **SURFACTANTS.** They are "Surface Active" agents. The performance qualities of a surfactant depend upon the specific chemical nature of the surfactant molecule. In general, all surfactants can be positioned somewhere within the *"Surfactant Property Triangle"* shown in Figure 3.

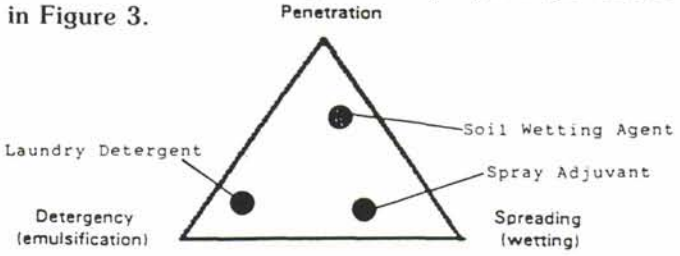

FIGURE 3- *Surfactant Characteristics*

While all surfactants exhibit some degree of all three of the properties, surfactants should be selected depending upon the emphasis needed, usually penetration and wetting. Their use will depend upon the nature of the LDS, and experimentation with application frequency and rates may be required to achieve maximum improvement. This may call for either treating only the LDS area or making a general application on the entire green and following with a heavier localized rate in the LDS area. In the case of poor infiltration, we may want to lightly treat only the high areas and slopes; this may be especially true on high sand content greens where heavier applications could actually magnify leaching. In cases of hydrophobic conditions caused by soil particle coatings, we may want to apply at very heavy rates to ensure emulsification (detergent) activity. The danger of the heavy rates, of course, is direct damage to the turfgrass if inadequately irrigated. While wetting agents can and will improve moisture movement in the soil, their effectiveness in any given situation correlates directly to their surfactant qualities and method of use.

Humid Acid

The unique characteristics of the humic acid fraction (as separated from the ulmic and fulvic fractions) of humus material make it arguably the single most useful soil amendment material available for managing LDS. Humic Acid is a long chain polymer with an extremely polar nature which has two distinct and decidedly beneficial ef-

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fects on soils in general and different LDS problems in particular (Figure 4). In instances of excessive gravitational water and hydrophobic soil coating conditions, introduction of humic acid coats sand and hydrophobic particles with appropriate negative affinity to hold cations. Additionally, humic itself is moderately hydrophylic; that is, it has quasi-hygroscopic characteristics enabling it to hold up to ten times its weight in moisture in an essentially capillary state. Water-content humic acid can also be absorbed by roots and taken into the plant where the absorbed water is released and the humic itself contributes to lignin formation. In the case of compacted and other hygroscopic water soil conditions, such as those with heavy clay and organic matter concentrations, humic acid's powerful polarity literally forces negatively charged colloids to separate and break apart, freeing up previously tied up cations and moisture and improving soil tilth and the soil's capacity for capillary water. In either situation, humic acid has distinct buffering properties which decrease the impact of accumulated salts.

HA Imparts Polarity to Sand Particles. **HA Forces Negative Colloids (Clay O.M.) Apart, Improving Friability and Tilth.**

Figure 4 — Humic Acid in Soils

Of course, humic acid, like all materials, has limitations.

As a long chain polymer, it normally reacts with each soil particle as it makes contact. Thus, it will not give the degree of immediate relief from symptoms of severe infiltration and percolation problems as will penetrants. It can only work on the soil it reaches. In some LDS situations, it is reasonable to think of soil wetting agents or penetrants as addressing the immediate symptoms and humic acid as addressing the long range cure. Elapsed time between beginning humic treatments and noticeable improvement can vary considerably depending on the cause and degree of the problem at hand. For instance, immediate moisture retention improvement might occur when humic is applied to a high sand mix, though the erosive effects of irrigation will diminish and then eradicate the humic over time, requiring re-application. On the other hand, several applications of concentrated humic, in conjunction with periodic aerification may be required before highly noticeable soil tilth improvement is achieved in a heavily compacted or layered area. All commercially available granular humic acid products and many liquids have significant fulvic acid contents. Such products may contribute to the "coating" phenomenon discussed earlier, particularly on sand mix greens. Finally, significant soil modification requires reasonably high rates of concentrated (above 10%) humic content. Do not expect

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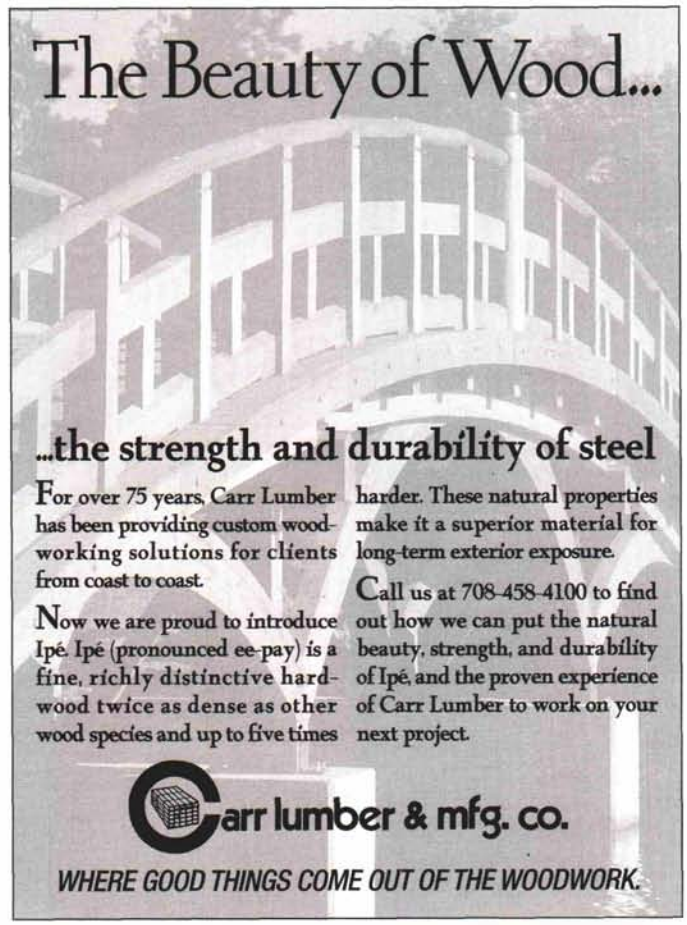

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it from low humic acid concentration products or low active ingredient application rates. Remember that we are attempting to alter the characteristics of around two million pounds of material per acre in the upper six inches of soil. It will take some active ingredient to accomplish that.

3. Sodium Reduction Materials

Excessive soil salts are the scourge of plant growth. Through the ages conquering armies salted the fields of their foes to ensure that their enemies would not rise again to smite them down. Salt ties up nutrients and can even cause the phenomenon of "soil collapse". But above all else, salt is a moisture thief.

Hopefully, Mother Nature's rain and intelligent irrigation practices wil leach enough sodium to preclude damaging build-ups. However, receding water tables and roadway run-off have enormously increased salts in irrigation water supplies, increasing the need for amendments. Traditionally, sulfur and bulk calcium materials (gypsum, lime, etc.) have been applied. Sulfur's long term effects are of dubious merit; the calcium materials are effective but are slow acting, have limited solubility, and provide only a couple of months of reasonably high activity in the soil. More rapid responses can be obtained from sulfuric acid and calcium chloride, but each of these can create distinct soil problems of their own such as the destruction of microorganisms populations. While liquid calciums have been around for many years, a major innovation — cyclic acid chelation — is proving to be a great improvement over the traditional liquid products. The cyclic acid chelation increases effective calcium activity by as much as eight times by solubilizing otherwise unavailable calcium reserves of the soil, thus activating additional calcium for sodium reduction.

4. Thatch Reduction Compounds

Undecomposed thatch reduction compounds are relatively new in the market place. Dead (or dormant) grass is composed of up to 90% cellulose, and all newer products seem to rely on cellulase, the enzyme which breaks down non-chlorophyll producing (dead) cellulose. Some products consist of microorganisms which in turn manufacture cellulase. Others package the cellulase itself. Both will accelerate thatch decomposition. The limitations of microbial products are the obvious delay in cellulase availability and the certainty that the microorganisms will not remain in a non-sustaining environment. Products containing cellulase itself are somewhat subject to the erosive effects of irrigation, though the active ingredient **is** actually absorbed by the dead cellulose. Both the microorganisms and cellulase itself are relatively inactive below 60° F and increasingly active as temperatures rise above that mark. The decomposition of thatch is a slow process by nature. These products can accelerate thatch reduction, but do not expect radical activity in a week or two. Some products contain nitrogen, presumably to feed the microorganisms, and humic acid to promote a more desirable habitat for the microorganisms.

5. Fungicides

Fairy Ring is a fungus, and provided that the fungi reside in the upper inch or so of the soil the condition sometimes responds favorably to fork tyning, wetting agents, and the high label rate of Prostar or Benlate. At least one old hand states, "If you don't tyne first, you're wasting your time and money."

Causes and Management

All of the management measures can be valuable in dealing with LDS.

So what should any given turf manager do?

An LDS problem may require from a single to multiple management measures. More and more, management measures may be preventative or curative and may address either the actual causes or their symptoms.

First, discover what are the factors causing the scarcity of available water. This will typically involve careful physical inspection by soil horizons and interpretation of soil analysis. It will involve understanding of original and reconstruction materials and past management practices and historical events. It may also involve analysis of the water supply. In short, be Sherlock Holmes and identify the culprits.

Second, understand the various tools available for combating your conditions — what they will and will not do to improve your situation.

Third, formulate and diligently implement a plan of action utilizing the appropriate measures to counteract the problem or problems identified.

Fourth, adjust your management practices to discourage re-occurrences of LDS. It is always better to diagnose and treat a problem early, but the very best cure is preventative maintenance.

In the real world there is no such thing as perfect soil for turfgrass growth, or, if there is, wait a few months and it won't be. We are attempting to manage a moving target. Localized Dry Spot is one of many challenges facing today's superintendent. It is an especially difficult one, and one that seems to be increasing in incidence, particularly as "spec" greens gather age. The bad news is that LDS is difficult to manage. The good news is that it **can** be managed if we are willing to work at it.

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