



Spraying weeds provides a quick fix. A long-term solution is to modify the soil to favor grass, which will gradually smother out weeds. Photos courtesy: Don Arenberg.

# The Dirt On Soil — Natural Turf Management, Part 2

By Don Arenberg

**A**fter my staff and I could not find that synthetic chemicals directly caused turfgrass problems, we abandoned this part of our project. We noticed, however, that the check plots (areas not treated with chemicals) contained interesting results: turfgrass with healthier, more massive, deeper roots and with more numerous rhizomes and stolons; better soil structure that improved health and vigor; and fewer diseases and weeds.

It's important to remember that turfgrasses are basically factories. These live factories produce finished products (carbohydrates, proteins, amino acids and other basic components) that make up necessary enzymes, hormones and organic compounds. These necessary products produce leaves, crowns, roots, rhizomes, stolons and seeds that yield healthy, aggressive plants.

These factories receive many of their basic raw materials from the soil. Besides water and all forms of nutrients, the soil contains microorganisms that provide enzymes, hormones and various natural organic products. The organic products combine with nutrient elements and other ingredients that plants absorb through roots to manufacture vital end-products for optimum growth. Fertilizers do not supply these natural products. Rather, soil microorganisms are

the key to supplying the majority of these natural raw materials.

A large majority of turfgrass problems occur not only when the plant's requirements are not met but when wrong or harmful materials are supplied in place of the right products. Problems develop, for instance, when turfgrass cannot obtain from the soil all the raw materials balanced to the requirements of the plant or when the grass cannot use or produce its essential finished products. When this occurs, the plant will begin to produce incomplete, slightly different end-products that will not fulfill the needs of the specific turfgrass. The resulting plant response may or may not initially show visual signs of weakening, but physiologically the decline within the plant proceeds.

## Conditions For Health

As plants become established, the soil changes to favor the more aggressive plant. One change involves the variety and quantity of soil microorganisms. Each plant requires specific soil microbes to obtain optimum growth. These microorganisms include a large array of families such as bacteria, fungus, yeasts, molds, viruses, algae and others. Special varieties within the families accomplish specific tasks. The microorganisms work alone and in groups to accomplish essential reactions and to create by-products necessary for improving the soil.

Certain microbes and groups, for instance, decompose dead matter into organic compounds that enrich the soil and feed other microbes. Other microbes absorb and reduce accumulations of toxic substances such as animal salts from urine and excessive ingredients from leaching, weathering and incomplete soil reactions. Some specialized groups solubilize nutrient elements from rocks and other materials, making them available for root absorption. Others release essential enzymes, hormones and specific organic compounds to aid in the plant's development of roots, rhizomes and stolons and to stimulate the production of "key" products necessary for the plant's total health. Finally, as a plant becomes dominant, microorganisms associated with the plant species develop within the soil. Some of these microbes fight off pathogens and predators by attacking disease organisms and the germinating seeds of other plants.

## Unhealthy Soil

Besides microbes that grow under healthy conditions, there are microorganisms that develop under less desirable conditions and which are basically detrimental to the growth of turfgrass. When this occurs, the turfgrass microbes die, the grass fades away, and another plant and its soil microbes take over the area. This second plant will grow aggressively until the soil changes again.



This plant growth and death, a continual occurrence in nature, is defined as "plant succession."

Humans, unknowingly, cause plant succession to occur more quickly and harmfully. In their attempt to grow more playable, attractive turfgrass with chemicals, people cause many plant and soil changes that are unnatural to plant succession. The following represents a few problems unnatural chemicals can stimulate.

*Fungicides* are designed to kill plant pathogenic diseases and perform well against their targets. Eventually they wash into the soil where they continue their deadly action. Being non-selective, they kill soil microbes, including essential ones. Natural soil and plant reactions change or cease occurring, causing other problems to develop.

*Fertilizers*. Most contain soluble salts of nutrient elements, unnatural chelates and synthetic organic compounds not found in nature. Salts from frequent applications of these fertilizers will

eventually kill turfgrass roots, forcing surface root growth and causing internal water holding and usage problems. Salts can kill beneficial soil microbes, dramatically reducing turfgrass health. The lack of beneficial microbes also causes compacted soils and stimulates unhealthy anaerobic microbial growths. Another problem with commercial fertilizers is that they do not contain all the nutrients and other ingredients required and in the right proportions for the individual conditions of the turfgrasses. Thus, a turfgrass will be unable to manufacture products necessary for its survival. For instance, too much nitrogen produces fast leaf growth and better appearing turf, but the plant develops fat cells and thin cell walls, which begin weakening the plant, making it more susceptible to disease and other problems.

*Herbicides* are unnatural chemicals designed to kill either broad ranges or selected plants. Initially, the targeted weeds are killed, but these unnatural materials do not react harmoniously in

the soil or within the turfgrass. The result is immediate or delayed undesirable plant and/or soil reactions.

*Management* can cause negative reactions. Too much water, too frequently or at one time, can be dangerous, especially after chemicals have reduced the number of essential soil microbes. Weaker grass requires more immediately available water to stay alive.

Basically, synthetic chemicals do not cause specific problems, but they do disturb natural plant reactions so dynamically that the turfgrass or soil slowly declines. On the plus side, many of these chemicals provide quick and complete cures for many problems. As we'll see later in this series, by mastering and programming their reactions, we can use these chemicals to our benefit while helping essential natural reactions. □

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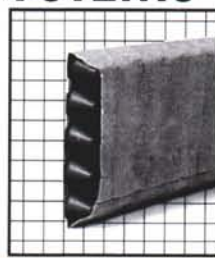
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