Water Repellency and Localized Dry Spots (LDS)

Localized Dry Spots (isolated dry spots or "hot" spots) are usually characterized as patches of wilted or dried turf. These patches can range in size from a few centimeters to areas that cover large portions of green, tees, and surrounds. LDS is often associated with water repellency or hydrophobicity in the soil or root zone. LDS is a condition where turfgrass undergoes severe stress due to the lack of available water to turfgrass root systems. Water repellency can occur in a variety of soil types but coarse-textured, sandy soils are most likely to become water-repellent.

What Is Water Repellency?

Water is "polar" molecule, meaning that it has a negative region near the oxygen atom and a positive region near the hydrogen atoms. The positive region of water molecules is attracted to negative sites of soil surfaces (adhesion). **Adhesion must occur in order for water to attach to a soil surface**. Water molecules are also drawn towards the negative region of other water molecules (cohesion). Cohesion is the force or tension that holds a droplet of water together and is the force or tension that builds the level of water in the soil profile to the point where water is available to the plant. **The combination of adhesion and cohesion tensions of water is what allows the soil to hydrate ("wet") and rehydrate ("rewet")**.

Water molecules are not attracted to non-polar surfaces. Non-polar surfaces contain no negative sites and, therefore, cannot develop an adhesive force with water molecules at the liquid-solid interface. **When the adhesive forces between water molecules and a surface are less than the cohesive attraction between water molecules, the surface is said to be water-repellent or hydrophobic**.

What Causes Water Repellency in Soils?

Water repellency is common on sand-based soils used to construct greens and tees. Over time, organic compounds produced by the degradation of plant residues and through microbial activity will accumulate and coat soil particles and aggregates in the soil profile. As these coatings are subjected to higher temperatures and low moisture conditions, they will polymerize and form a wax-like hydrophobic (non-polar) layer.

Once soils become hydrophobic, they become nearly impossible to wet or re-wet, and most of the irrigation water runs off or rapidly moves through the soil profile in preferential pathways. The result is that the soil profile cannot retain sufficient water to accommodate the turf's water requirements. Turf may ultimately dry out or die if measures are not taken to correct the water-repellent condition.

Use of Soil Surfactants

The successful use of soil surfactants to address water repellency in thatch and soils is well documented. Surfactants vary widely in their chemical structure and performance characteristics. Therefore, it is important that the professional turf manager choose his/her surfactants based on how they influence hydration (wetting/drainage) and capillary flow (distribution/uniformity).

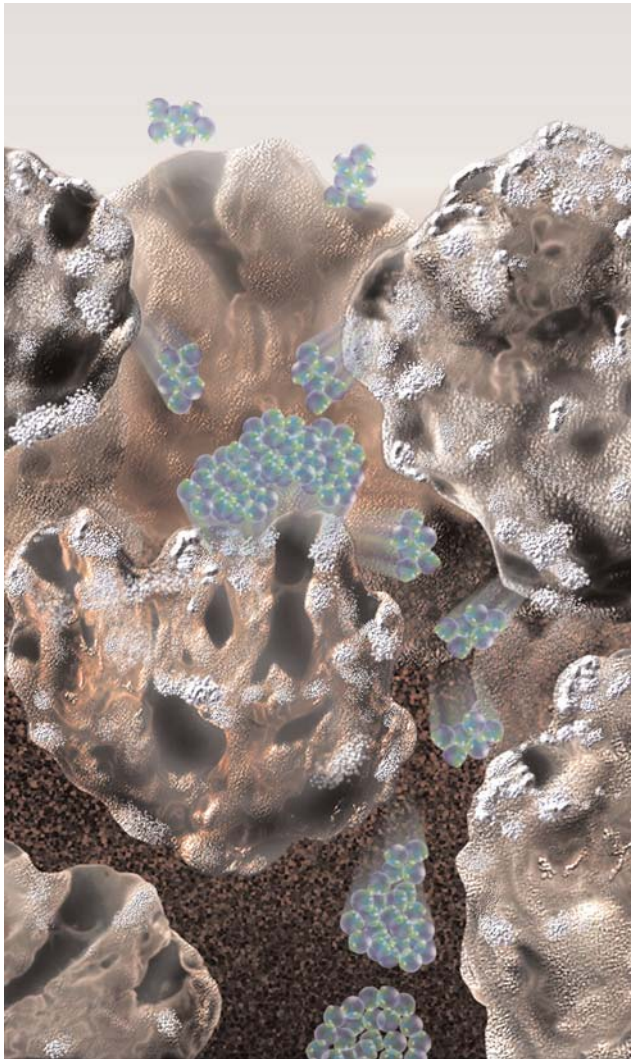

Figure 1. Graphic depiction of water molecules being repelled by non-polar (water-repellent) surface of soil particles.

FRAMEWORK

Localized dry spot (LDS) caused by water-repellent soil is a problem that goes beyond the cosmetic distractions of wilted or dried turf. **LDS is a strong signal to the professional turfgrass manager that a water-repellent condition exists that is seriously affecting the access of water and solutes to turfgrass root systems**. LDS is also an indication that water repellency has reached the point where turfgrass is under severe stress and may not recover unless treated immediately.

Framework soil surfactant is a non-ionic surfactant chemistries tailored to allow the turfgrass manager to quickly restore and maintain soil mois- ture above the critical soil water content level of the soil profile to encourage recovery of turf under water-repellent related stress (LDS). When used according to label directions, Framework will act on water-repellent soils to:

- Establish a corrective pattern of hydration and rehydration to meet the water requirements of turfgrass under stress caused by hydrophobicity (LDS)
- Is a 90 day preventive program for LDS and repellency
- Promote a consistent distribution and retention of applied water
- Improve water penetration and infiltration into the soil profile

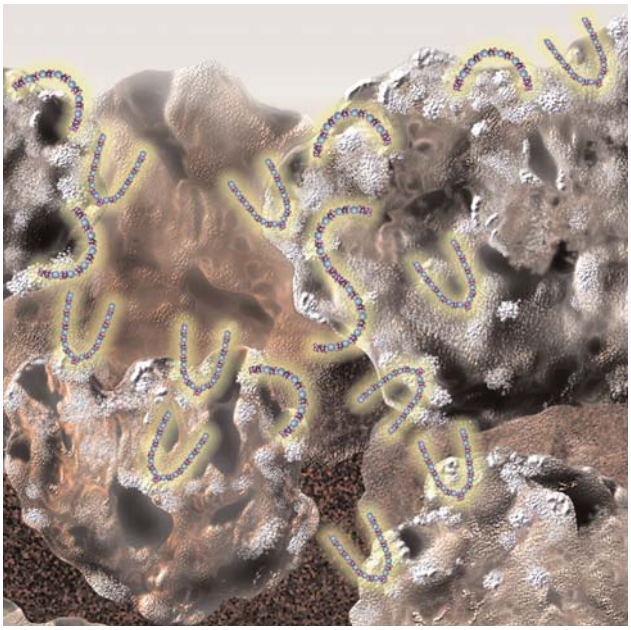

Figure1. Framework Mode-of-Action
Graphic depiction of Framework surfactants attaching to water-repellent (non-polar) surface of sand particles.

How Does Framework Work?

When Framework surfactant is applied to the soil profile, they attach to water-repellent (non-polar) areas on soil particles (Fig. 1) and create sites where water can attach to the soil surface (adhesion). Adhesion is strongly associated with hydration or "wetting" of the soil surface. The surfactant in Framework was carefully selected for its ability to attach to highly water-repellent soils and establish optimum hydration ("wetting") patterns and deep penetration.

Once adhesion of the water molecules is restored on the water repellent soils by the Framework surfactant molecules, soil moisture in the soil profile can now be managed at levels that meet the requirements of the turfgrass (Fig2). Framework maintains a 90 day residual presence on water repellent soils particles that allows rehydration (rewetting) and deep uniform penetration.

As excess water builds on the surfactant amended soil surface, it is pulled downward by gravity and capillary suction to continue its vertical and horizontal movement through the soil matrix. Providing firm fast conditions on playing surfaces.

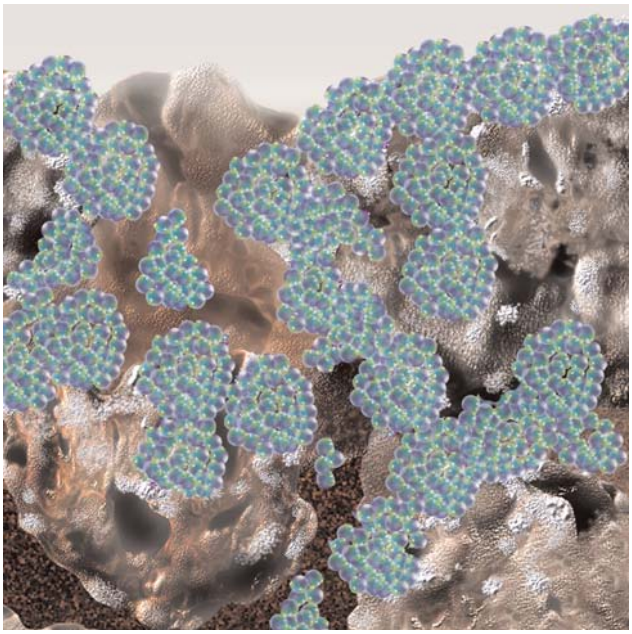

Figure 2. Graphic depiction of water building on Framework amended soil profile through cohesion. Excess water is pulled downward and through the soil profile via gravity and capillary suction. Achieving firm and fast conditions.

USE DIRECTIONS

Apply Framework as a preventive program. Apply at 8 oz. per 1000 sq. ft. Wait 7 to 10 days for second application. Framework should be sprayed at 8 oz. per 1000 sq. ft. in 2 gallons of water per 1000 sq. ft. Framework can be applied in application at 16 oz. per1000 sq. ft. in 5 gallons of water per 1000 sq. ft.

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