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Thatch Management

Thatch is the undecomposed or partially decomposed layer of living and dead grass stems, roots, rhizomes, stolons, and other organic matter that is found between the soil surface and grass blades. Thatch is a turf growth medium that is well aerated and compaction resistant, with poor water and nutrient holding capacities. Thatch develops as plant parts and other organic debris accumulate on the soil surface, when turf growth occurs at an excessive rate, and when both soil and weather conditions are unfavorable. Thatch becomes a problem when plant organic matter production exceeds the rate of decomposition. The rate of decomposition of the thatch layer depends on the turfgrass species, temperature, soil moisture level, soil pH, biological activity within the soil, and cultural practices.

Advantages and Disadvantages

There are both advantages and disadvantages to a thatch layer. This is dependent on the thickness of the thatch layer. The sport and turfgrass variety determine the desired thickness for thatch. Generally, the thatch layer should not exceed a ½ inch.



Photo courtesy of John Mascaro

Advantages of thatch maintained at a ½ inch or less:

- Increased resiliency.
- Increased wear tolerance.
- Increased impact absorption.
- Insulates soil against extreme temperature changes.

Disadvantages of thatch (thatch that is unmanaged over a ½ inch, this does not include thatch that is managed between ½ and 1 inch)

- Provides a desirable environment for turf insects. Insect injury is more severe on grasses with growth restricted to thatch.
- Provides conditions favorable for disease organisms. Disease injury is more severe on grasses with growth restricted to thatch.
- Promotes shallow rooting by limiting root and rhizome penetration into the soil.
- Can create hydrophobic turf.
- Can affect performance of ball roll and bounce.
- Can prevent seed establishment.
- Root concentration in thatch layer causes turf to become susceptible to heat, cold, drought, disease, and insect pests.
- Decreases pesticide effectiveness because thatch may prevent the pesticide from reaching the target pest, or the pesticide may be degraded before reaching the pest.
- Can create localized dry spots.
- Scalping can occur during mowing.
- Restricts movement of water into the soil.

A one inch layer of thatch may be desirable for football fields or other sports that involve cleated footwear and require sudden stops and turns that can rip turf. In this case, the thatch contributes to field playability during adverse conditions. Remember, thatch maintained at one inch requires increased attention to watering, mowing, and pest problems.

Thatch Management

Effectively Managing Thatch

Field samples can be taken to determine amounts of thatch present and if it is a problem. Thatch accumulation can vary across the field; therefore it is important to take a sample from various locations. Remove several pie shaped wedges consisting of soil and grass, and measure the amount of organic matter present at the soil surface.

Cultural Practices to Control Thatch

The maintenance a field receives contributes to thatch development.



Photo courtesy of John Mascaro

Mowing

Mowing frequency is dependent on the growth rate and desired height of the turfgrass. Fields should be mowed so that no more than 1/3 of the leaf blade is removed in a single cutting. Turf clippings do not contribute to thatch on well maintained fields where the 1/3 rule is followed. Turfgrass leaves are minor contributors to thatch because they are composed of 75 to 80% water and have little lignin. Lignin makes up a portion of plant cell walls and is resistant to decomposition. Rhizomes, stolons, and roots are greater contributors to thatch because they are made up of larger amounts of lignin.

On fields where more than 1/3 of the turfgrass leaf blade is removed, clippings should be removed while mowing via basket or bag collection or after mowing via vacuum, blower, or by hand.

Fertilization

Soil tests should be taken on a routine basis to determine that the correct nutrients are present in the soil, determine soil pH, and determine if lime is needed. Soil tests ensure overall soil health.

Based on soil test results, nutrients should be applied according to recommended rates. Nitrogen should not exceed the nutritional needs of turf. Excessive amounts of nitrogen stimulate production of stems and leaves. Increased production exceeds the rate of decomposition of plant parts and thatch may build up as a result. The soil can also be amended with phosphorus, potassium, and lime according to the soil analysis.

Irrigation

Deep and infrequent irrigation minimizes thatch accumulation. It encourages deep rooting of the turfgrass plants and contributes to overall health.

An excessive thatch layer may mean the majority of turfgrass roots are concentrated in the thatch layer. Thatch creates a temporary water table in turf systems, which becomes a problem when roots are concentrated in the thatch layer. As water is applied to the turf, it moves through the thatch layer quickly until it contacts the underlying, finer textured soil layer. Depending on the rate of water application, water entering the thatch layer may exceed the infiltration rate of the underlying soil. Thatch dries from a combination of water infiltrating the soil and evaporation. Once water infiltrates the underlying soil, there is no upward movement of water from the finer textured soil to the coarser textured thatch. Regardless of how wet the soil is, the thatch dries out. As a result, if plant roots are concentrated in the thatch layer, turfgrass plants do not have access to water. If this is the case, lighter, more frequent irrigation may be necessary to maintain the turf until the thatch can be properly managed.

Thatch Management

Seeding

The growth rate and growth habit of turfgrass species contribute to thatch. Species with rhizomes and stolons tend to have the greatest thatch accumulation.

Moderate to Heavy Thatch	Low to Moderate Thatch	Low or does not produce thatch
Bermudagrass	Buffalograss	Tall Fescue
Zoysiagrass	Creeping Red Fescue	Perennial Ryegrass
Creeping Bentgrass		
Kentucky Bluegrass		

Blending turfgrass cultivars with various thatching tendencies can reduce the rate of thatch buildup.

Pest Control

Insecticides and fungicides should only be used on fields when necessary, as this may decrease beneficial microbe and earthworm populations. Earthworms and soil microbes are the primary means by which thatch breaks down. Earthworms digest thatch, improve soil aeration and drainage, and introduce soil and microorganisms into the thatch. Proper soil pH, soil aeration, and adequate soil moisture can all encourage these populations.

Microbial Products

There are microbial products available in the marketplace that report controlling thatch. STMA encourages you to talk with vendors and practitioners for recommendations to fit your specific needs.

Topdressing

Applying topdressing to the field surface can dilute the buildup of organic residues by mixing thatch with the topdressing product. Topdressing also adds microbes to the soil to help break down thatch. Although topdressing alone controls thatch, topdressing used in combination with hollow tine cultivation and/or vertical mowing is the most effective at controlling thatch.

Topdressing product particle size should always match rootzone particle size to maintain uniformity of the turf profile. If a sand cap system is the goal, topdressing particle sizes should always match that which has been previously applied.

Topdressing can be applied at 1/8-1/4 inch depending on the field management goals. Topdressing can be performed as often as needed depending on turfgrass variety, field management program, and schedule for field use. This generally works out to two to four times per year. Less frequent topdressing can lead to layering in the soil profile, which can be detrimental. These layers lead to reduced soil water movement, air movement, and root growth.



Photo courtesy of Richard Calarco, CSFM

Mechanical Removal of Thatch

Thatch should only be removed before or during periods of active turfgrass growth. This will ensure recovery from injury that may result during removal. Fertilizer can also be applied to aid in recovery. Application rates are generally 0.5-1 lb. N / 1000 sq. ft. depending on time of the year and aggressiveness of the dethatching program. An herbicide application can also be made to prevent weed encroachment. Do not dethatch during periods of environmental or plant stress.

Thatch Management

Vertical Mowing / Dethatching / Power Raking

Vertical mower blades cut vertically into the turf canopy, sever lateral stems, and remove thatch. The most effective removal occurs when the blades penetrate the thatch layer and lightly strike the underlying soil. The debris vertical mowing brings to the surface should be removed for best results. The soil should have some moisture so thatch can be sliced and lifted. If soil is excessively wet, the turf will be torn and pulled. Soil that is too dry will inhibit tines from cutting into the soil and cause stress to the equipment.

Hollow Tine / Core Cultivation

Core cultivation minimizes and reduces thatch accumulation, modifies its physical characteristics, and removes certain amounts of thatch. Cores can be broken down and redistributed throughout the thatch, or removed. Reincorporation modifies the physical and chemical qualities of the thatch and improves it as a growing medium. It also enhances thatch breakdown by improving conditions for microbial activity. Core cultivation also benefits soil environments by relieving soil compaction, improving water infiltration, and oxygenating soil.

Core cultivation causes less injury and surface disruption than vertical mowing. It is not as effective as vertical mowing regarding thatch removal, but it still remains an essential practice for field health.

Sodding

Installing brand new sod may be the best way to deal with excessive thatch. Intensive vertical mowing, core cultivation, and topdressing would be needed to control thatch over 2 inches. If applying sod, be sure that the growing medium matches the rootzone already present on the field. Sod should be inspected to ensure it does not have an excessive thatch layer.

Sports turf managers can effectively manage thatch with proper cultural practices and mechanical removal. A thatch management program should be developed for all athletic fields to successfully manage these surfaces and ultimately provide a safe, playable athletic surface.

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