

**Thatch is a layer of living and dead tissue located between the green vegetation and the soil surface.**



*Power raking combined with core cultivation was the preferred method of reducing excessive thatch accumulation in a study at the University of Nebraska.*

# Thatch Management

Knowing when thatch is beneficial and when it's troublesome can save otherwise doomed turf areas.

**T**hatch is a management consideration on most turfgrass sites.

It is a tightly interwoven layer of living and dead tissue existing between the green vegetation and soil surface. Its chemical composition is comprised primarily of lignin, cellulose and hemicellulose.

(This story was authored by Dr. Bruce Augustin, University of Florida; Dr. J.R. Hall III, Virginia Polytechnic Institute and State University; Dr. A. Martin Petrovic, Cornell University; and Dr. Robert Shearman, University of Nebraska. All are members of the WT&T Editorial Advisory Board.)

Often in older turf areas, one can observe two distinct layers in the thatch. There is a loose thatch top layer composed of growing lateral shoots and recently decaying matter. Beneath this layer is a dense bottom mat of peat-like material that is difficult to decompose.

The causes for thatch accumulation are numerous and all are not clearly understood.

However, it is reasonable to assume that thatch accumulates when organic matter production increases; it is difficult for the microbes involved in decomposition to keep pace. The

net result is thatch accumulation that must be handled by the turfgrass manager.

## Benefits

Small amounts of thatch can actually be beneficial.

A one-quarter inch layer of thatch can be useful in reducing moisture evaporation from the soil, insulating the crowns of grass tissue from extremes of cold and hot temperature, reducing annual weed seed germination, protecting the crown tissue from traffic damage and otherwise improving the turf.

Researchers generally agree that thatch should not be allowed to accumulate to levels in excess of 0.5 to 0.75 inch on lawns, sports or general turf sites. This level should be a quarter inch or less on golf greens. Accumulations greater than these generally result in thatch disadvantages outweighing any potential advantages (See Table 1).

### Accumulation rates

Turfgrass species and cultivars differ in their thatch accumulation rates.

Research at the University of Nebraska has demonstrated that vigorous,

### Small amounts of thatch can actually be beneficial.

actively-growing Kentucky bluegrasses with high lignin content are more prone to thatching than less vigorous ones (See Table 2).

This relationship is very important, since in most cases vigorous well-adapted turfgrass species and cultivars are preferred.

Thus, these vigorous, well-adapted species and cultivars will require more careful management to minimize the rate of thatch build-up.

Thatching tendency increases with mowing height. Kentucky bluegrass turfs mowed at two inches had twice the thatch accumulation of those mowed at one inch after four years of maintenance.

In a similar study, thatch accumulation at three inch mowing height was 67 percent greater than that at two inches. This relationship coincides with the fact that higher mowing heights produce vegetation with greater lignin, cellulose and hemicellulose contents, which are the primary chemical constituents of thatch.

Nitrogen fertilization has often been associated with increased thatch. However, research at Nebraska with Kentucky bluegrasses and creeping bentgrasses showed no difference in thatching tendency for nitrogen rates ranging from 0 to nine pounds N/1000 sq. ft.

Under these study conditions the organic matter decomposition was sufficient to keep pace with the organic matter production and thatch did not accumulate.

A Kentucky Bluegrass turf with 1.5 inch thatch accumulation was studied at the University of Nebraska turfgrass research facility. Power raking in combination with core cultivation practiced in the spring and fall

TABLE 1

## Advantages and Disadvantages of Thatch in a Turfgrass Community

### ADVANTAGES (When present in moderate amounts):

- Insulates the soil surface beneath the thatch layer
- Reduces soil compaction
- Increases the resiliency or cushioning effect of the turf
- Increases turfgrass wear tolerance\*

### DISADVANTAGES (When present in excessive amounts):

- Increases turfgrass environmental stress
- Reduces turfgrass to heat, cold, and drought
- Increases disease incidence
- Increases insect activity
- Increases puffiness, scalping, foot-printing, and spiking
- Increases proneness to localized dry spots
- Increases susceptibility to iron chlorosis
- Reduces activity of certain pesticides
- Increases phytotoxicity of certain pesticides

\*Research at the University of Nebraska indicates that wear tolerance increases with thatch accumulation until a critical point is reached, when wear tolerance decreases.

From: Thatch Symposium, Weeds/Trees/Turf, April 1979.

TABLE 2

## Thatch Accumulation for Kentucky Bluegrass, Tall Fescue, and Creeping Bentgrass Cultivars\*

Kentucky Bluegrasses	Tall Fescues	Creeping Bentgrasses
Touchdown (High)	Adventure (High)	Penncross (High)
Glade	Clemfine	Penneagle
Baron	Falcon	Toronto
Victoria	Olympic	Prominent
Sydsport	(Medium)	(Medium)
Adelphi (Medium)	Rebel	Emerald
Bensun	Jaguar	Cohansey
Parade	Mustang	Congressional
Aquila	Kentucky 31	Seaside
Park	(Low)	(Low)
Rugby (Low)		

\* Based on relative levels (i.e. high, medium, and low of thatching).

was the most effective means of reducing the accumulated thatch when compared to power raking or core cultivation alone.

Core cultivation reduced thatch and increased bulk density when compared to the untreated thatchy turf.

In a golf green study core cultiva-

tion in combination with vertical mowing and light, frequent topdressing was most effective in minimizing thatch build-up.

Auburn University has examined thatch buildup on bermudagrass, looking specifically at nitrogen source, core aeration, vertical mowing and sand topdressing.

Researchers there noted that after three seasons of observation, 12 pounds N/1000 sq. ft./year of activated sewage sludge fertilizer produced significantly more thatch (17 percent) than 12 pounds N/1000 sq. ft./year from ammonium nitrate.

In this study, where aeration cores were collected, no significant decrease in thatch buildup was brought about by increasing the frequency of core aeration from two times per year to five times per year.

Vertical mowing lightly 12 times per year produced no less thatch than two light vertical mowings.

Topdressing once per year produced 37 percent more thatch than a four topdressing per year program that applied 2.5 times as much topdressing.

The experiment was conducted under golf green maintenance conditions and mowed at 1/4 inch mowing height<sup>1</sup>.

University of Illinois research on Kentucky bluegrass thatch buildup as it is affected by mulching mowers and nitrogen level suggests slightly higher thatch buildup resulted from higher nitrogen levels, with six pounds N/1000 sq. ft./year.

Turf quality comparisons indicated that on most rates turf quality was superior when clippings were returned. This effect was less noticeable at the six pound rate than at the lower rates.

Greater thatch buildup was noted in plots mowed once every two weeks than in those mowed more frequently.

Over the three growing seasons, the plots mowed once per week with a mulching mower produced 26 percent less thatch build up than the plots mowed once per week with a conventional rotary mower returning clippings. Removing clippings in this study did not significantly reduce thatch buildup<sup>2</sup>.

Other work at the University of Illinois has illustrated thatchy Kentucky bluegrass turf will degrade diazinon more rapidly than turfs with no thatch, given equal irrigation management. Three weeks after diazinon application to turf with a one-inch thatch layer receiving daily irrigation, only seven percent of the applied diazinon remained. The same turf irrigated every four days retained 33 percent diazinon after three weeks<sup>3</sup>.

Turf without thatch, irrigated every four days, retained 47 percent of the applied diazinon after three weeks.

## In the Northeast

There are six major problems associated with thatch on cool season

turfgrass found in the Northeast.

First, when an excessive thatch layer exists (greater than one inch), the turfgrass stand is less tolerant of stress conditions. This is primarily due to the greater temperature extremes found in thatch as compared to soil, and to the fact that most of the turfgrass root system is contained in this zone of greater temperature fluctuation (higher and lower temperatures than soil).

Second, thatchy turf uses water less efficiently than non-thatchy turf. Again, this is due to a concentration of

---

## ... once a site is heavily thatched, the only effective method is to completely remove the old sod and reestablish the site.

---

the root system in a more porous, less water-holding medium than soil. Thatchy sites can have poor water penetrability (hydrophobic) once the thatch has become dried, allowing for the waste of either irrigation or rainfall.

Third, thatch provides the medium for insects and diseases to live and thrive in.

Certain fungi live on dead and/or dying organic matter in the thatch most of the time. However, when the environmental conditions favor the fungi, it can spread rapidly and attack healthy turf. Some surface feeding insects can live during the growing season or overwinter in the thatch zone.

Fourth, thatch can alter the effectiveness of pesticides and/or increase the chance of phytotoxicity from the pesticide. Many of the insecticides used for grub control are readily bound or tied up by the thatch and do not easily reach the soil to kill the grubs.

Herbicides, like preemergence crabgrass materials, can cause considerably more damage to turf on heavily thatched sites since the root system of the turf is in greater contact with the herbicides.

Fifth, it is extremely costly to renovate or reestablish a heavily thatched site. This is further complicated since on many areas (lawns, parks, etc.) mechanical methods of dethatching are used to remove thatch.

Cornell University found that only 5 percent or less of the thatch is re-

moved by dethatcher. This suggests that once a site is heavily thatched, the only effective method is to completely remove the old sod and reestablish the site.

Sixth, applied nitrogen is less likely to be used by the plant on thatchy sites than non-thatchy turf. This is especially true for water soluble nitrogen sources for which it has been shown that a high percentage of the nitrogen can be lost back to the atmosphere. Research on thatch in the Northeast is primarily limited to the University of Maryland and to Cornell University.

Dr. Peter Dernoeden, University of Maryland, is conducting research on the effects of composted sewage sludge on thatch development.

Dr. Jack Murray of the USDA observed that less thatch occurred on plots treated with composted sewage sludge than on plots treated with other nitrogen sources.

## In Florida

Thatch management is an important part of turf culture in Florida. It is a subject homeowners and condominium dwellers recognize, but know very little about. It is usually left up to the professional turf manager to deal with the causes of thatch build-up, cultural problems caused by thatch and ultimately, its removal.

The thickness of thatch in warm season grasses is generally greater than in cool season grasses because of vigorous stoloniferous growth and the coarse texture. It is not uncommon to find a St. Augustinegrass lawn where you literally sink up to your ankles in six inches of thatch, composed of layer upon layer of stolons.

Almost no thatch layers are to be found in some very old bahiagrass, centipedegrass and St. Augustinegrass lawns where there have been minimal turf maintenance practices over the years.

In these lawns, the decomposition of debris is at a rate equal to or greater than the rate of turf production. High temperatures for long periods of the year and fluctuating moisture conditions cause rapid oxidation of organic matter by bacterial and fungal organisms in Florida. A similar situation exists in the drained organic soils of the Everglades agricultural areas which are subsidizing (oxidizing) at the rate of one inch per year. So one can use the environment, to some extent, to help control thatch in Florida.

Many questionable practices are performed on Florida turf areas in the name of thatch control.

Scalping is often done in the early spring. While it may remove some of

the upper stolons and decrease the sponginess, scalping does not remove the majority of the thatch layer.

This practice can harm turf quality if the turf is not nursed back to health. Power raking is frequently used in some areas. It can remove some of the loose upper thatch layer debris, but is not effective in removing the denser mat layer. It is not a substitute for vertical mowing.

Another of the practices found in Florida is "sanding." This is a very heavy topdressing (sometimes up to several inches) applied to turf. Of course, this practice creates thick layers in the soil and all kinds of problems.

We see many of the cultural practices used on golf courses applied to other urban turf areas. These practices might be appropriate on a golf course where they are used on a regular and proper basis. But on other turf areas, it is questionable how effective these practices can be if they are being done only sporadically by someone who does not understand the consequences.

### The future

An extensive project is being initiated at Cornell University under Dr. Mar-

tin Petrovic and Ph.D. candidate Robert Vavrek, Jr.

This project will involve studying several factors involved with thatch development, including the interactive effects of nitrogen, phosphorus, potassium and water on thatch development. This research will be conducted in a new facility being completed this summer which carefully controls and monitors water applied, and excludes rainfall by a rain-activated moveable greenhouse called a rainout shelter.

This tenth-acre site will provide useful information on predicting thatch accumulation as related to fertility and water.

Vavrek will also study the effects of microarthropods (mites, etc.) on the thatch development process. Some researchers believe that these insects have little effect on organic matter breakdown (i.e. thatch breakdown), but it has been found that the levels of these types of insects are very high in the turfgrass ecosystem.

### Control tips

University research is bringing us closer to a better understanding of how cultural practices affect thatch buildup. From a practical standpoint,

the following tips will be helpful in controlling thatch buildup:

- Utilize moderate levels of nitrogen fertilization and proper mowing frequency.
- Utilize pesticides that interfere least with micro and macro-organism activity.
- Maintain the pH in the thatch layer at a level conducive to microbial activity 6.0 to 6.5.
- Maintain a favorable organic matter decomposition environment through core aeration, topdressing and maintaining favorable carbon to nitrogen ratios (25-30 to 1) in thatch.
- Choose cultivars and species that have lower thatching potential whenever possible.

WT&T

### Literature Cited

<sup>1</sup>White, R.H. and Ray Dickens. 1984. Thatch Accumulation in Bermudagrass as Influenced by Cultural Practices. *Agronomy J.* 76:19-22.

<sup>2</sup>Haley, J.E., D.J. Whener, T.J. Fermanian and A.J. Turgeon. 1985. Comparison of Conventional and Mulching Mowers for Kentucky Bluegrass Maintenance. *HortScience* 20(1):105-107.

<sup>3</sup>Branham, B.E. and D.J. Wehner. 1985. The Fate of Diazinon Applied to Thatched Turf. *Agronomy J.* Vol 77:101-104.



## A GREAT TRAILER for TURF MANAGEMENT!



There is a Capacity to Fill Your Needs from 1-Ton to 5-Ton

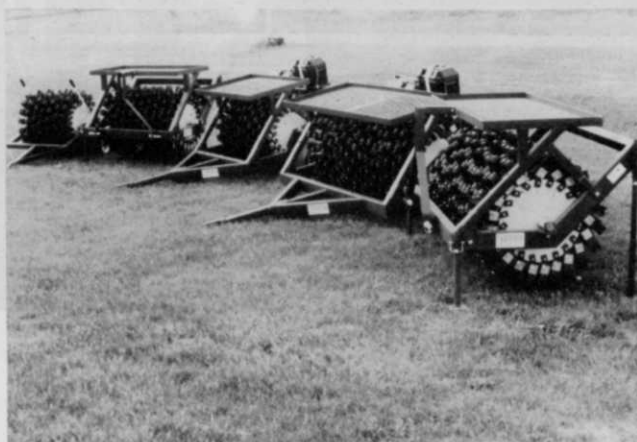
Steel structured for maximum life and minimum maintenance. Wells Cargo trailers are an easy, economical, efficient way to haul nursery stock, fertilizer, seed, sprayers, implements, mowers . . . everything your job requires.

We have manufacturing sales & service facilities in IN, GA, TX, & UT and a national network of dealers to serve you.

For FREE literature call TOLL FREE 1-800-348-7553 or write

**Wells Cargo, Inc.**  
P.O. Box 728-595  
Elkhart, IN 46515  
(219) 264-9661

## TERRACARE AERATORS



### Your Fast, Easy Method to Aerate

The low maintenance and ease of operation will pay for Terra in very short time. Your Terra will leave the surface in excellent condition.

**TERRACARE**  
PRODUCTS CO., INC.

P.O. Box 506  
Pardeeville, Wisconsin 53954  
Circle No. 141 on Reader Inquiry Card