PROXOL® KILLS GRUBS AND SURFACE FEEDERS. *FAST!*

There's no need to wait over a month for a grub control to work. Economical Proxol 80SP insecticide readily penetrates thatch to work fast for an effective broad spectrum kill, including grubs and surface feeding sod webworms, armyworms, and cutworms.

You apply Proxol with the liquid application equipment you already have. So there's no need to haul spreaders and bulky packages on your rig, put up with package breakage and waste, or carry them in inventory. Proxol's convenient 2- and 5-lb. packages make measurement easy. Eliminates waste. You can even mix Proxol with other non-alkaline chemicals.

And you can rest easy with Proxol. Customer's children and pets are not exposed to a granular residue left on the turf. Proxol is easy on the environment, too. No unpleasant odor to offend customers. No long-term residual buildup in the soil.

Proxol kills grubs and surface feeders. Fast! And Proxol is conveniently available along with Acti-dione,® a broad spectrum fungicide, long used by golf course superintendents, to stop turf disease problems before they start.

For more information, send attached coupon.

Circle No. 131 on Reader Inquiry Card

Now marketed by

NOR-AM

NOR-AM CHEMICAL COMPANY
3509 Silverside Road, P.O. Box 7495
Wilmington, DE 19803

WRITE FOR MORE ABOUT BETTER TURF FROM NOR-AM®.

Send coupon to:
NOR-AM • P.O. Box 7495 • Wilmington, DE 19803

Name

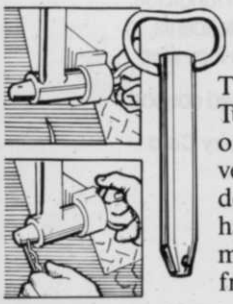
Address

City/State/Zip Code

NOR-AM
NOR-AM CHEMICAL COMPANY

WHAT MAKES THE CUSHMAN TURF-CARE SYSTEM WORTH THE INVESTMENT:

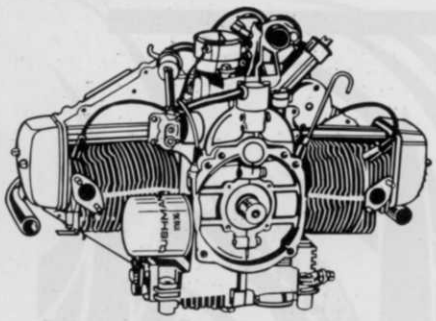
Aerating, hauling, dumping, spraying, seeding, spreading and top dressing — one vehicle does the work of a fleet of machines.



The Cushman Turf-Care System offers you a single vehicle that can do the work of a half dozen machines—at a fraction of the cost.

The exclusive Cushman pin disconnect system lets you attach and remove accessories in minutes.

A NEW 22-HP ENGINE.



The Cushman Turf-Truckster™ is now equipped with a new 22-hp gas engine.

It gives you the power to haul a full load uphill, without straining. It maintains a sure, steady speed while you're spraying or spreading.

And it's built tough. The crankshaft is forged alloy steel. The cylinder heads are reinforced for extra strength under stress. And the hydraulic pump is mounted to the engine for better service life and smooth operation.

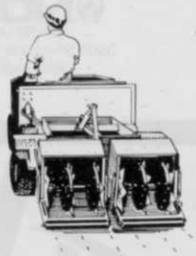
Team up the new 22-hp Turf-Truckster with any of the following accessories for a complete Turf-Care System.

THE AERATORS.

Because you have two types of turf to aerate, Cushman makes two aerator attachments for your Turf-Truckster.

The Greensaver® is ideal for greens and other delicate areas . . . while the Quick Aerator makes short work of big jobs (it covers a 46″ swath).

Both can be equipped with interchangeable coring or deep-slicing tines.



THE DUMP BOXES.

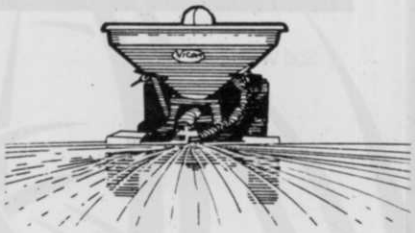
Again, you have a choice! Our Short Box is a high quality dump box . . . and our Flatbed/Box converts from flatbed carrier to dump box just by adding the bolt-on sides and tailgate. Both can be hydraulically dumped right from the driver's seat.

THE SPRAYERS.

Choose the capacity you need . . . our big 150-gallon sprayer or 100-gallon model. Both give you uniform spraying controlled by the Turf-Truckster's ground speed governor.

THE SPREADERS.

Two choices here, too. The 700-lb. capacity Vicon Spreader with a 45′ swath. Or the Spreader/Seeder with a 300-lb. capacity. Both give you smooth, uniform spreading because application rates are controlled by the Turf-Truckster's ground speed governor.



THE TOP DRESSER.

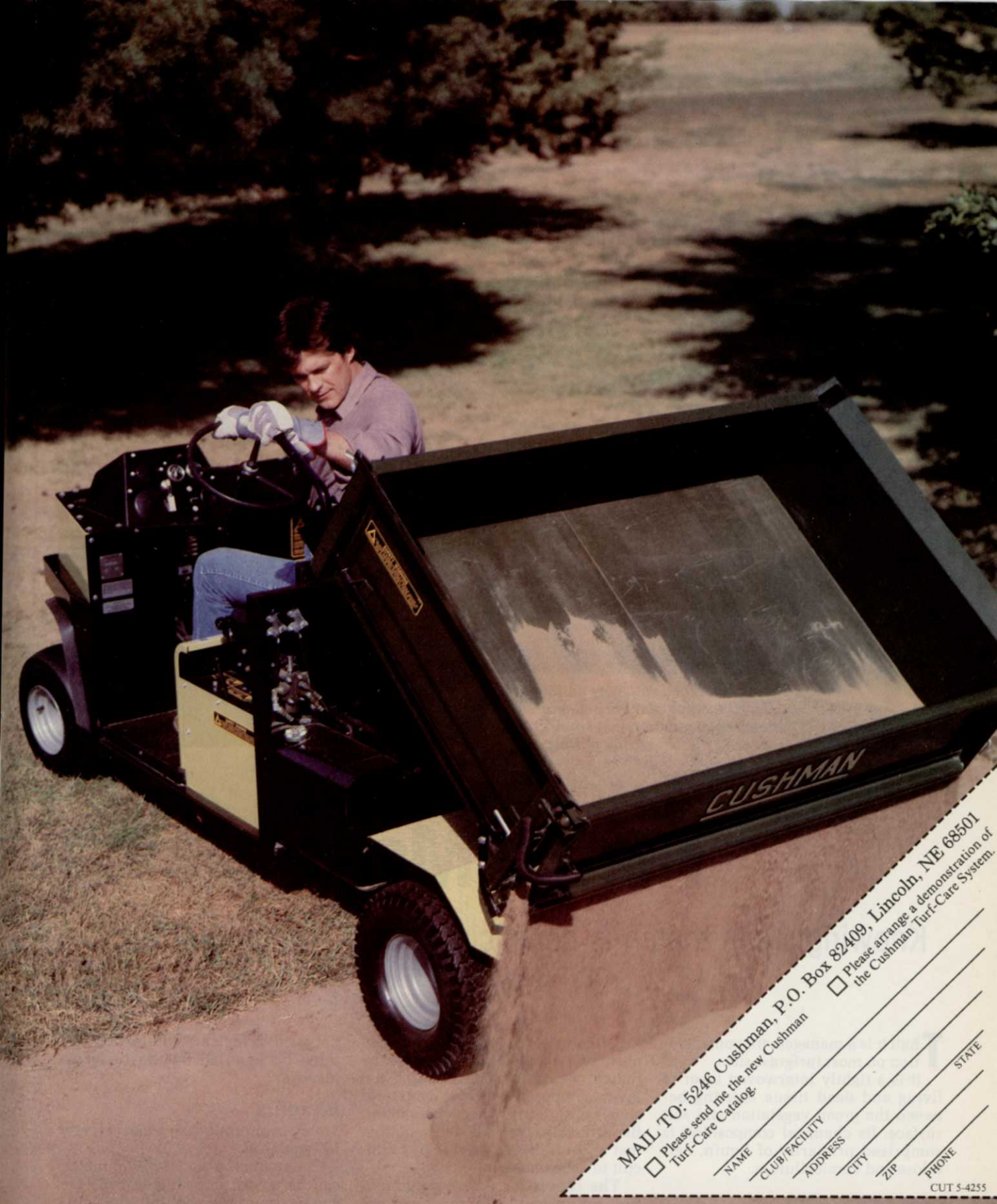
Everything from rock salt to powdered fertilizer can be uniformly spread across a 31½″ swath at a rate of up to 220′ per minute.

A FREE DEMONSTRATION

See the Cushman Turf-Care System in action. Call toll-free:

1-800-228-4444.

Circle No. 111 on Reader Inquiry Card



MAIL TO: 5246 Cushman, P.O. Box 82409, Lincoln, NE 68501

☐ Please send me the new Cushman Turf-Care Catalog.

☐ Please arrange a demonstration of the Cushman Turf-Care System.

NAME

CLUB/FACILITY

ADDRESS

CITY

STATE

ZIP

PHONE

CUT 5-4255

CUSHMAN®

It works harder because it's built better.

*Outboard Marine Corporation, 1983.
All rights reserved.

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.

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

Small amounts of thatch can actually be beneficial.

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 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 cultivation 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 aerification, vertical mowing and sand topdressing.

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
Victa	Olympic	Prominent
Sydsport	*(Medium)*	*(Medium)*
Adelphi	Rebel	Emerald
(Medium)	Jaguar	Cohansey
Bensun	Mustang	Congressional
Parade	Kentucky 31	Seaside
Aquila	*(Low)*	*(Low)*
Park		
Rugby		
(Low)		

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

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 aerification 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[1].

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[2].

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[3].

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 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.

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

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 removed 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.

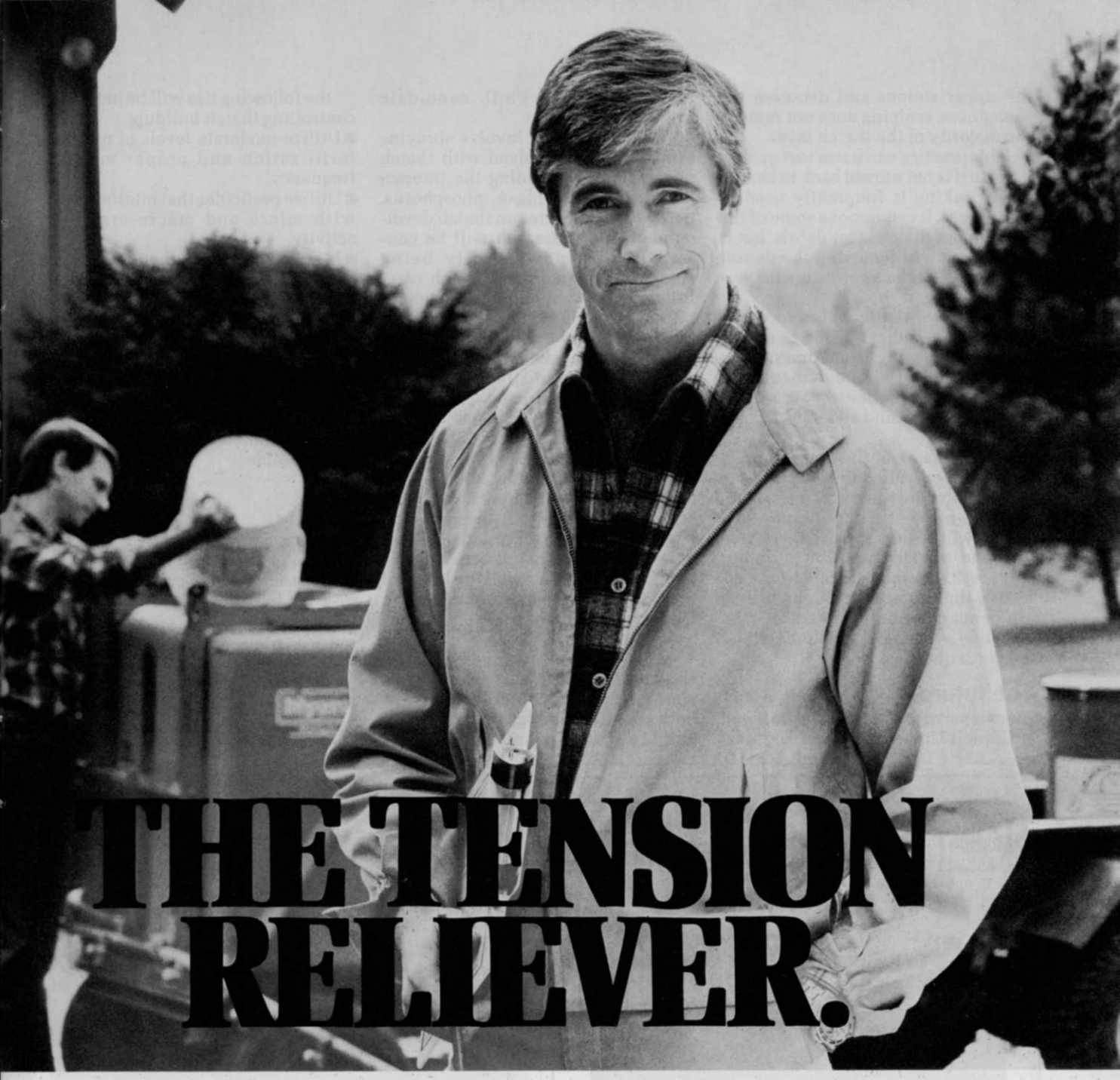
The thickness of thatch in warm season grasses is generally greater than in cool season grasses because of vigorous stoloniferious growth and the coarse texture. It is not uncommon to find a St. Augustinegrass lawn where you literally sink up to your ankles in six inches of thatch, composed of layer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

AQUA-GRO.® management tool. AQUA-GRO is a blend of non-ionic organic wetting agents, 100% active ingredient with residual effectiveness in all soils.

You can worry about turf problems caused by too much or too little water, or you can use AQUA-GRO, the water

AQUA-GRO ELIMINATES LOCALIZED DRY SPOTS ...AND COMPACTION.

AQUA-GRO is the specially formulated wetting agent that reduces water surface tension ensuring faster, more uniform penetration and drainage, through hard-to-wet soils and thatch.

AQUA-GRO also relieves compaction by improving water penetration, drainage and aeration in high traffic areas. There's less need to aerify, or resort to costly rebuilding.

AQUA-GRO INCREASES FERTILIZER AND PESTICIDE ACTIVITY.

You get more from your turf chemical investment with AQUA-GRO. Turf chemicals are uniformly distributed throughout AQUA-GRO treated soils, so chemicals are used by plants more efficiently. And AQUA-GRO helps turf chemicals penetrate thatch.

AQUA-GRO REDUCES WATERING COSTS 30-50%.

AQUA-GRO reduces irrigation costs, because water is used more efficiently. There's less run-off and less evaporation... you use less water, plants get more. AQUA-GRO helps you get your turf through the hottest weather. And AQUA-GRO lasts, because it won't leach.

Let AQUA-GRO relieve your tension. Available in liquid concentrate or spreadable granular formulations from your AQUA-GRO distributor.

AQUATROLS CORPORATION OF AMERICA, INC.
1432 Union Avenue, Pennsauken, New Jersey 08110

For free illustrated brochure and more information call TOLL FREE 800-257-7797, in N.J. 609-665-1130.

Circle No. 101 on Reader Inquiry Card

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. Martin 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 aerification, 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

[1]White, R.H. and Ray Dickens. 1984. Thatch Accumulation in Bermudagrass as Influenced by Cultural Practices. Agronomy J. 76:19-22.

[2]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.

[3]Branham, B.E. and D.J. Wehner. 1985. The Fate of Diazinon Applied to Thatched Turf. Agronomy J. Vol 77:101-104.

WELLS CARGO

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.

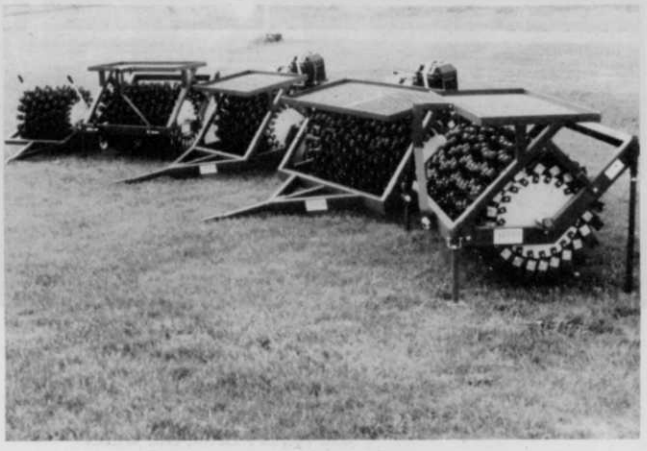
We have manufacturing sales & service facilities in IN, GA, TX, & UT and a national network of dealers to serve you.

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

Circle No. 151 on Reader Inquiry Card

TERRACARE AERATORS

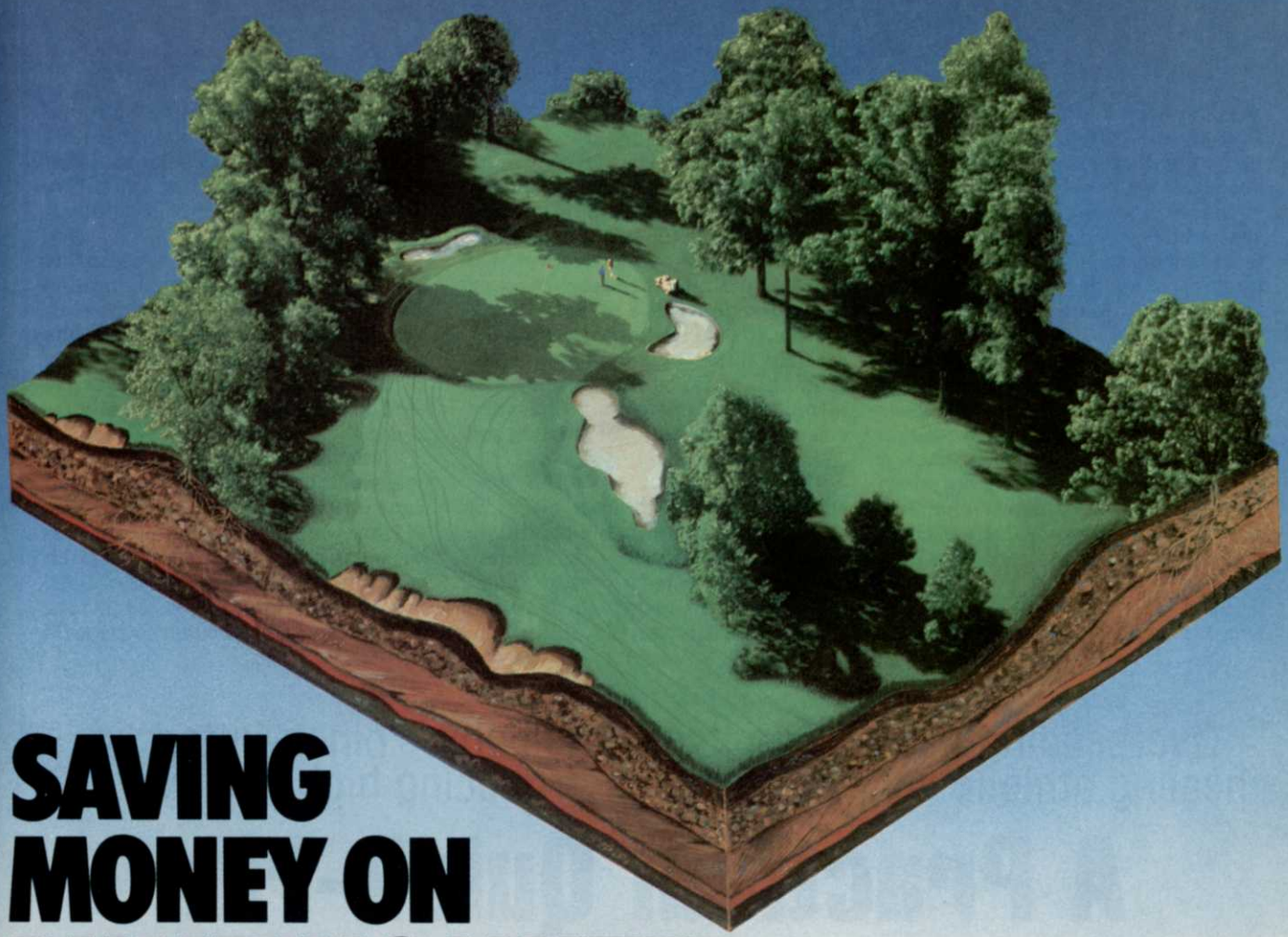


Your Fast, Easy Method to Aerate

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



SAVING MONEY ON PUMPING WATER HAS NEVER LOOKED SO GOOD.

How pumps powered with Franklin submersible motors can make your corner of the world green and quiet. And save you money, too.

Saving time saves you dollars. A submersible pump powered by a Franklin motor can be installed in one-third the time it takes for an above-ground line-shaft turbine.

And with a submersible pump, you won't have line shaft vibration and alignment problems, or any need for lubrication cost and troublesome ratchets.

Submersible pumps and Franklin motors economically keep your grounds lush, green and quiet.

A submersible eliminates expensive, energy-gobbling friction losses in a long drive shaft and multiple bearings.

Yet submersibles do more than save you dollars. Working quietly underground, a submersible keeps your view beautifully quiet. Built to run underwater, a submersible can't be flood-damaged. And submersibles are virtually vandal and varmint-proof.

To learn more about the advantages of submersible pumps equipped with Franklin motors, call Franklin Electric's Jim Hayes today at (219) 824-2900. Or write Franklin Electric Company, 400 East Spring Street, Bluffton, Indiana 46714.

Franklin Electric

Water for a Thirsty World

Overseeding has proven itself a valuable "pinch-hitter" in healing athletic field scars and in producing high quality turf.

A Practical Quick-Fix

by Dr. Norman Hummel, Cornell University

In mid-March athletic fields in the northern United States show the scars of battles won and lost the previous fall.

Meanwhile, spring sports teams are already practicing and softball teams are organizing for their summer leagues. The damaged turf must somehow be readied to provide a playable surface for upcoming sports events.

The practice of overseeding is often the only means of providing a turfgrass cover on athletic fields from year to year. There are also times when a home lawn or other turfgrass areas succumb to disease, insects, chemical damage or environmental stress. Here, too, overseeding offers a practical means of repairing the damage and improving the overall quality of the turf.

Hummel is on the extension faculty, turfgrass management, Cornell University).

Overseeding is a partial renovation process used to improve damaged turfgrass areas. Overseeding becomes necessary when the turf is damaged to an extent that it cannot recover with standard maintenance practices, such as fertilization. It is a selective tillage process that falls short of completely reestablishing the entire area. Overseeding can also be used as a means of introducing more desirable grass species or cultivars into an existing sod.

Timing

One of the more difficult places on which to maintain turf is an athletic field. The intense wear that athletic fields are subjected to make annual overseeding necessary to maintain turfgrass quality and playability.

Early fall would be the optimum time to overseed an athletic field because the warm days, cool nights, and adequate precipitation are conducive to rapid establishment of cool season grasses.

However, it is usually necessary to have the field in playable condition much sooner in the year. A more realistic time to overseed is mid to late spring. Dormant seeding in early winter should be avoided because seed germination could be greatly reduced by seed rot.

Honeycomb seeding is a method of overseeding that many old-timers and some not-so-old-timers swear by.

Honeycomb seeding should be performed in mid-February to late March in the northern United States. Seed should be divided into three or four

continued on page 34

A flexible-tine harrow *is an effective method of preparing a site for overseeding.*