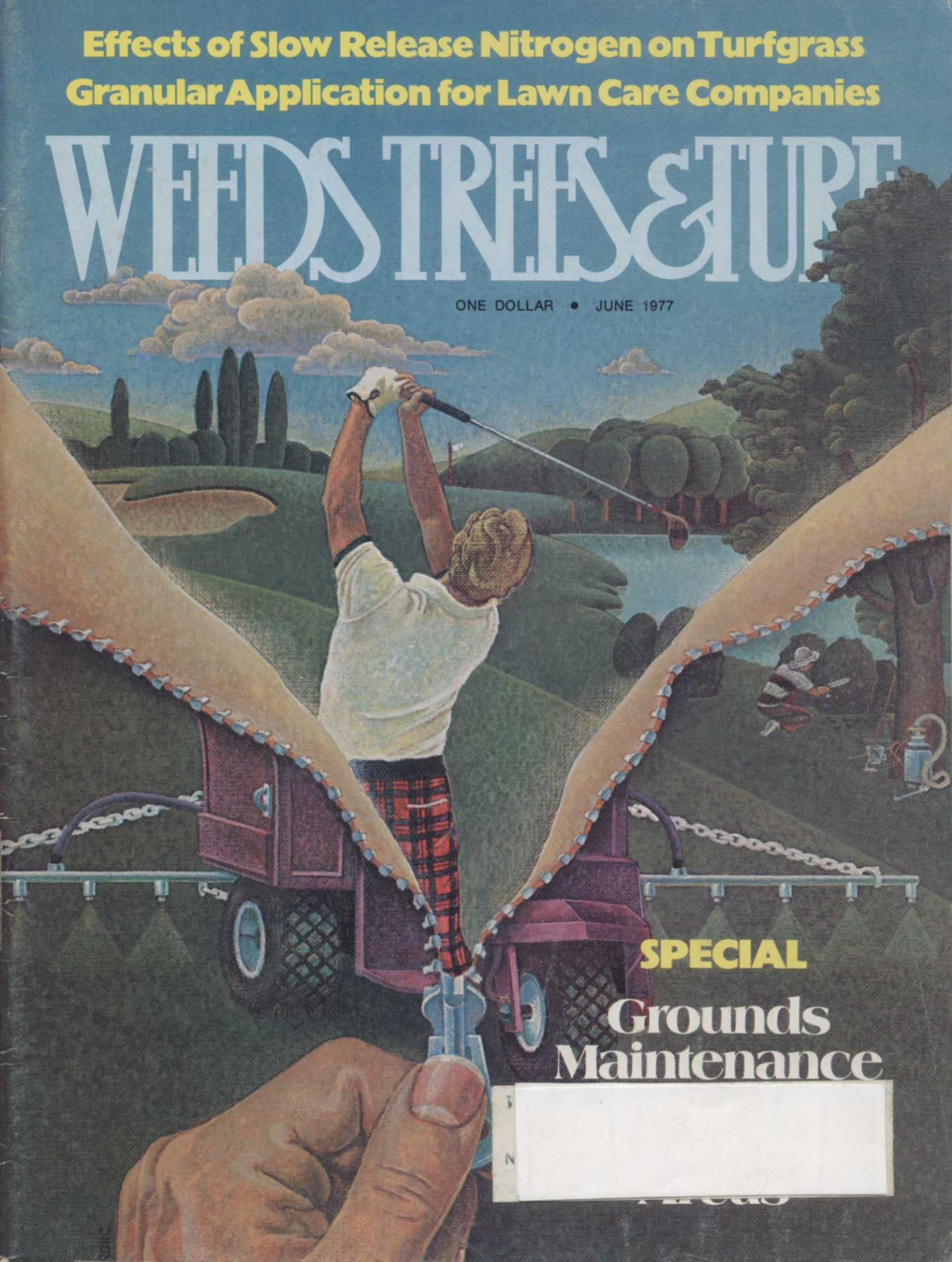
Effects of Slow Release Nitrogen on Turfgrass

Granular Application for Lawn Care Companies

WEEDS TREES & TURF

ONE DOLLAR • JUNE 1977



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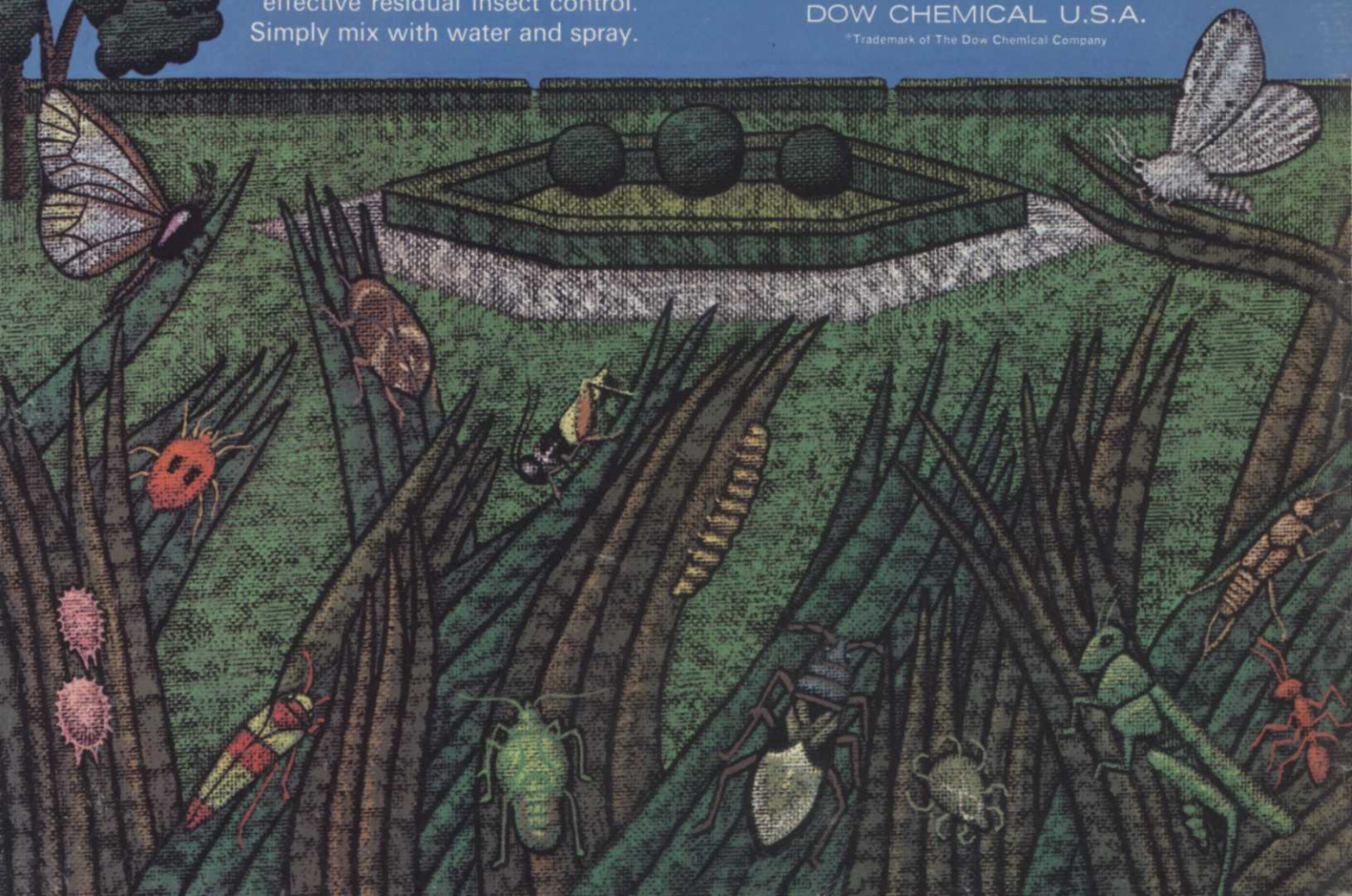

WEEDS TREES & TURF®

JUNE 1977, Vol. 16, No. 6

ON OUR COVER — This month we highlight grounds maintenance. For parks, see page 10, arboretums, page 22, and golf courses, page 26.

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TO OUR READERS

With delight and enthusiasm, we announce the birth of a new publication, hatched by WEEDS TREES & TURF. LAWN CARE INDUSTRY begins publication in July. This new venture is, perhaps, the most exciting news in the lawn maintenance segment of the vegetation management market.

The editorial program for LAWN CARE INDUSTRY will be directed to top management in chemical lawn care and maintenance programs. Readership will include presidents, owners, and managers concerned with this mushrooming billion dollar business serving the residential lawn care market.

I am personally grateful for the opportunity to participate in the creation of such a promising new publication. My associates and I are committed to doing everything we can to see that Lawn Care Industry serves its readers well. We look forward to hearing from you concerning any comments, questions, or suggestions you may have about LAWN CARE INDUSTRY and, as always, about WEEDS TREES & TURF.

This month we take a close look at that most important facet of our business, grounds maintenance. Because of the time of year, we planned to feature recreation areas.

Before choosing a golf course, we contacted the editors of GOLF BUSINESS for their suggestions. Chief Editor Dave Slaybaugh said there was no question as to the outstanding maintenance at Bel Air Country Club in Los Angeles. He also noted that GOLF BUSINESS had published an article on Bel Air's irrigation system. We immediately dispatched free lance writer Harold LeSieur to talk with Art Twombly, Bel Air's articulate superintendent. The results of the interview, on page 26, give some insight into how this lush course is kept that way.

For parks, we feature Independence National Historical Park in Philadelphia. Besieged by thousands of tourists during the Bicentennial, the park was kept in fine condition with careful attention to maintenance practices. And, a year later, the turfgrass is thriving. See page 10.

For arboretums, I chose the beautiful Holden, in Kirtland, Ohio. My husband introduced me to this marvelous experience several years ago, and today, we try to visit Holden at least twice a month for the incredible sense of peace the natural setting brings. Superintendent Marty Martin has done a fine job of maintaining the grounds, despite the fact that the maintenance budget has not increased proportionately with the phenomenal growth of the arboretum. See page 22.

Turfgrass expert Dr. James Wilkinson explains slow-release nitrogen on page 12. Dr. Wilkinson prepared this article exclusively for WEEDS TREES & TURF and has spent considerable time researching the subject.

Last month, in our Lawn Care Industry column, we printed a letter from Lawn-A-Mat president and founder Daniel Dorfman criticizing us for over-emphasizing liquid application for chemical lawn care in our March supplement. We invited Mr. Dorfman to tell us his story, granular application, which you will find on page 36. He makes a good case for this alternative.

WEEDS TREES & TURF appreciates all comments, pro or con. As Dr. Roger Funk of the Davey Tree Expert Company said, recently, "Criticisms or compliments — at least your readers are talking about your magazine and that's definitely a plus."

Gail D. Hogan

you might not see the difference . . . today

When you compare a Victa Kentucky bluegrass plant to another improved Kentucky bluegrass, the difference might not be readily apparent. Even in side-by-side turf plots, it's often difficult (sometimes impossible) to make a visual distinction on a given day.

Research studies at Scotts show that the most important differences between Victa and other improved bluegrasses appear in the seasons following establishment. These are the years when you have to live with your choice and you will find Victa makes maintaining showcase quality turf easier and less expensive. Fewer herbicides are needed because Victa's dense, vigorous growth habit means less weed encroachment. Victa's outstanding disease resistance results in reduced fungicide costs. And you should be especially pleased with the fact that Victa is a low growing (decumbent) variety. As such, it's likely to require fewer costly mowings, particularly in the always busy spring.

One last thought – blended or standing alone, Victa Kentucky bluegrass is a versatile performer that can handle your toughest turf assignments with unique good looks. And when your turf looks good, you do too.

VICTA Kentucky bluegrass

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Government News

Certain deviations from strict compliance with data requirements in the Section 3 registration guidelines have been ordered by Edwin L. Johnson, deputy assistant administrator for pesticide programs, EPA. Johnson has directed all Office of Pesticide Programs employees to use their own scientific judgment in determining whether deviations from the data requirements in the registration guidelines should be allowed.

Johnson has ordered the OPP employees to review old tests aside from the guidelines to determine whether health and safety determinations could be made without redoing studies under the new protocols in the guidelines; acceptance of studies from universities, foreign groups, etc. not sponsored by manufacturers, which do not meet exact specifications of protocols in the guidelines, but which "meet the basic statistical parameters of reliability," case-by-case application of scientific judment on allowing deviations from the guidelines' data requirements to formulated products.

EPA Administrator Douglas Costle said "no thanks" to increased funding for the Toxic Substances Control Act during testimony in early May. Costle said President Carter's revised budget request for TSCA of $29 million for fiscal 1978 respresents a "more than fourfold increase" and, "taking into account the practical limitations on how quickly an organization can be expanded and still remain effective, it seems to me that the $29 million request is quite adequate for fiscal year 1978."

The House Agriculture Committee's Subcommittee on Department Investigations, Oversight, and Research voted to extend FIFRA without amendments to March 31, 1978. Essentially, it is a six months extension, providing $43,500,000 for the period beginning October 1, 1976 and ending September 30, 1977, and $27,500,000 for the period beginning October 1, 1977 and ending March 31, 1978.

The House Subcommittee and the Senate Agriculture Committee removed FIFRA from the farm bill. In early June, concurrent hearings on FIFRA amendments are planned by the House Subcommittee and the Senate Agriculture Committee. Amendments beyond those proposed by the Environmental Protection Agency are certain to be considered during the June hearings.

EPA is reviewing registration of Lindane. If you have need for the chemical and your state extension entomologist confirms you have no equal or superior registered substitute, both you and he should file comments before June 17. Send information in triplicate to: Federal Register Section, Technical Services Division (WH-569), Office of Pesticide Programs, Room 401, East Tower, 401 M Street, S.W., Washington, D.C. 20460.

There's never been a herbicide like this before.

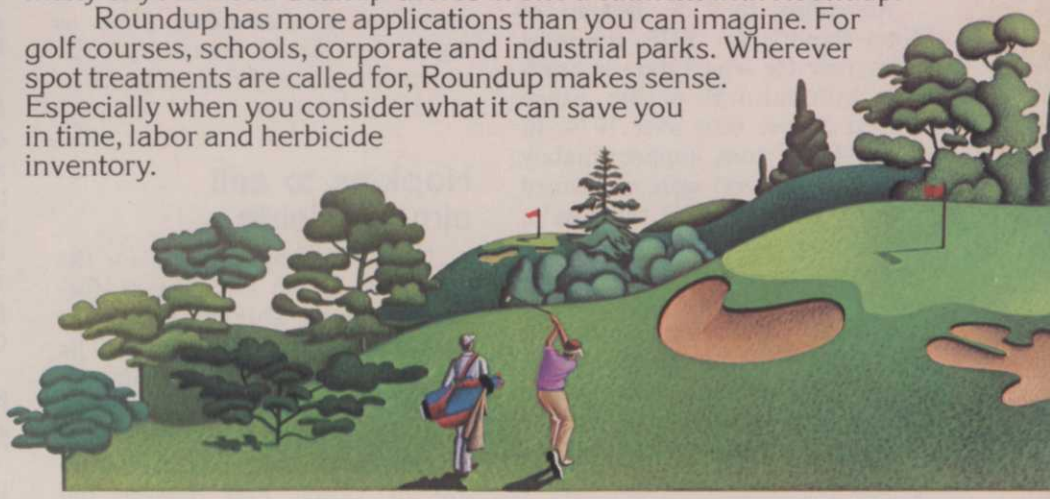
"Translocation" is the key.

Roundup is applied to the weed foliage, absorbed through the leaf surface, and "translocated" throughout the entire plant. In this way, Roundup effectively destroys most weeds—roots, rhizomes and all.

Roundup® herbicide by Monsanto is powerful enough to control many of the toughest annual and perennial weeds in one application.

Once, several different herbicides and frequent repeat treatments were needed. Now, one man with a backpack or tank sprayer can handle many of your weed cleanup chores in one treatment with Roundup.

Roundup has more applications than you can imagine. For golf courses, schools, corporate and industrial parks. Wherever spot treatments are called for, Roundup makes sense. Especially when you consider what it can save you in time, labor and herbicide inventory.



Roundup destroys most emerged annual and perennial grasses and weeds.

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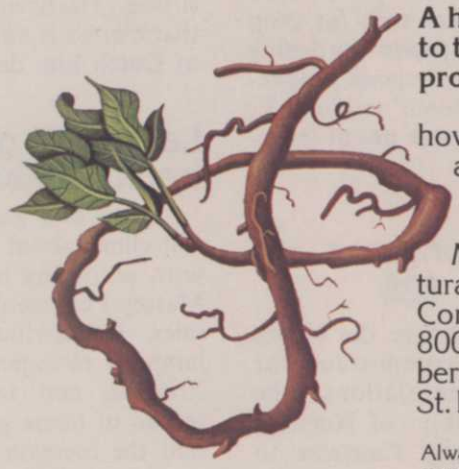

Roundup.
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To find out how to put Roundup at the root of your weed problems, write: Roundup, Monsanto Agricultural Products Company, C3NJ, 800 North Lindbergh Blvd., St. Louis, Mo. 63166.

Always read and carefully follow the Roundup label directions. RI 2/7

Roundup has no residual soil activity.

And you know what that can mean for your landscaping program. However, for seedling weed control, simply follow your Roundup treatment with an effective residual herbicide.

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Industry News

Perlite usage up 25 percent

According to U.S. Bureau of Mines Reports for 1975, the most recent year for which data is available, horticultural perlite usage climbed 25 per cent over 1974. In 1971, 11,500 tons (approximately 808,500 cubic feet) were consumed by this market. In 1975 this rose to 31,-520 tons (approximately 2,206,-400 cubic feet) — an increase in four years of 173 per cent.

Robert Milanese, managing director for the Perlite Institute, said "the impressive growth in use of horticultural perlite may be attributed to several factors including: increased awareness on the part of the home gardener and commercial grower of the benefits of proper soil aeration and drainage, the need to reclaim marginal soils for crop growth, more intensive gardening on existing land to increase productivity, the 'green boom' in the U.S., and a desire for more use of 'natural' materials."

AAN asks Congress for research $$$

In testimony before the House and Senate subcommittees for agricultural appropriations, the American Association of Nurserymen strongly urged Congress to appropriate adequate funds for horticultural research at Agricultural Research Service Laboratories, the National Arboretum, and state experiment stations.

"Horticulture is the second largest commodity classified as agriculture," AAN Executive Vice President Robert F. Lederer pointed out, "and our industry's product will play an increasingly important role in conserving and adding to our nation's resources. The drought in the West and increasing reports of dust storms in the Great Plains create an urgent need for an erosion control program.

"These programs will depend on plant material to conserve energy; aid in air and pollution improvement, noise abatement; serve as sight barriers; beautify our surroundings and bring us peace of mind."

Hopkins to sell elm fungicide

Correx, a fungicidal aid for the control of Dutch Elm disease, formerly sold by DuPont under the trade name of Lignasan BLP, will be available from Hopkins Agricultural Chemical Co., Madison, Wisc. in 1977.

Correx is not the ultimate in control of Dutch Elm disease, but researchers and Hasel, executive director of the Elm Research Institute, Harrisville, N.H., believe that Correx is an aid for the control of Dutch Elm disease.

Lawn and garden tractor sales up

Lawn and garden tractor sales will climb about eight percent this year, according to R. E. Drennan, Massey-Ferguson's vice president sales. He attributed the expected jump to resurgence in home construction and to the continuing spread of home gardening. He also said the increase level of the consumer's confidence in the economy was a factor.

300 turf experts attend Va. meeting

More than 300 turf professionals from Virginia and four neighboring states recently attended the 17th annual Virginia Turfgrass Conference at the Sheraton Motor Inn.

Theme of the two-day conference, sponsored by Virginia Tech's Extension Division and Virginia Turfgrass Council, was "From Seed to Success."

J. F. Shoulders, Tech Extension turf specialist, said the meeting was "most successful. It brought research, extension, management, and industry together."

Dr. W. R. Van Dresser, dean of Extension at Tech, chaired the conference's opening session on successful seedings. The session featured W. W. Huffine, professor of agronomy at Oklahoma State University at Stillwater, and Robert J. Peterson, sales representative for E. F. Burlington & Sons of Forest Grove, Ore.

New canker strain found in New York

A new virulent strain of Scleroderris canker has been identified for the first time in the United States. The outbreak has been identified in nine counties in New York's Adirondack Mountain area, covering 34,000 acres. Tree mortality has exceeded 90 percent on 2300 acres. Seriological work has shown that the new strain is identical to one present in Norway and Finland that has extensively damaged conifers in those countries.

A mild strain of the canker — caused by the fungus Scleroderris lagerberii — has been present in northeastern and lake states conifer nurseries, Christmas tree plantings and conifer forest plantations for the past 20 years. Chemical and cultural controls are available for these strains but not for the newly discovered one.

The American Association of Nurserymen has asked the Senate Appropriates Subcommittee on Interior and Related Agencies for a $200,000 for research aimed at the control, and if possible, eradication of the new strain.

New York State is anticipating promulgating an interior quarantine and expanded inspection to protect the non-infested areas of New York and the states to which N.Y. Christmas trees and conifer nursery stock is normally shipped.

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Independence National Park—Massive lawns for massive crowds

In anticipation of massive crowds visiting historic Independence National Historical Park in Philadelphia, during the Bicentennial, National Park Service officials were concerned over being able to maintain the quality and appearance of the approximately 30 acres of lawn in the park.

Pennfine Perennial Ryegrass, in a mixture with Kentucky bluegrass, was selected for use in the park for the Bicentennial. Pennfine was not new to the park. Various areas within the park were first seeded with it in the spring and fall of 1975 with good results. It was used alone in the area behind Carpenter's Hall at the same time another area was seeded with a Kentucky bluegrass mixture.

According to Howard Jeffries, horticulturist for the National Park Service, watering, fertilization, overseeding and pest control programs are the main concerns of the maintenance program for the lawns at Independence National Historical Park.

Watering of the grounds is done automatically by an irrigation system on a time clock basis. The system operates every third day for a 15-minute interval, and, depending on the amount of natural rainfall, it can be set for more or less frequent watering. The park is currently revising its irrigation system to standardize all the sprinkler heads and to achieve more uniform water distribution.

The fertilization program consists of applying, by mechanical spreader, two pounds of actual nitrogen in granular form per 1,000 square feet of lawn in mid-May, mid-July and again in late September.

Aeration of the ground areas that receive a lot of traffic and are heavily compacted is done in late March. The area is dragged to help

break up the cores and to prepare the soil for overseeding, if necessary. Considerable overseeding was done in the spring and fall of 1976. Independence Hall gardeners broadcast the seed mechanically and also by hand, in certain areas. Both repeated aeration and overseeding are necessary in problem areas receiving heavy foot traffic, such as Independence Square, according to Jeffries.

The pest control program involves putting down a broad spectrum fungicide in mid-March. This is done in those areas that have been susceptible to fungus problems in the past. In mid-April a preemergence crabgrass control is put down. A broadleaf killer is applied in mid-May with a follow-up application in mid-July. The fungicide also is applied again in mid-November.

In terms of performance, Jeffries commented, "Our maintenance program contributes greatly to the lawn's germination process, overall adaptability and in helping us to improve the appearance of the park grounds."

Germination in 4-5 days and developing deep roots quickly are both important considerations when a quick lawn cover is needed, and to help eliminate the problem of weed competition.

George Lucko, left, park chief of area services, and Joe Duich, professor of turfgrass science at Pennsylvania State University, examine the lawn behind Carpenter's Hall.

Jeffries emphasized the need for a strong turf in anticipation of the Fourth of July crowds. "As it turned out, over 2,000,000 people visited historic Philadelphia over the Bicentennial weekend," he said. "The bulk of them visited Independence National Historical Park, and there were no restrictions on the use of the lawn. Picnickers, tour groups and many active children were among those using the park heavily and consistently. The lawn held up well in terms of density during the heavy traffic. The few areas that did show signs of wear were quickly restored."

There are over 1,900 trees in the park, resulting in some dead shade areas throughout the day, and a lawn was needed that would also establish well in the heavily shaded areas, Jeffries said.

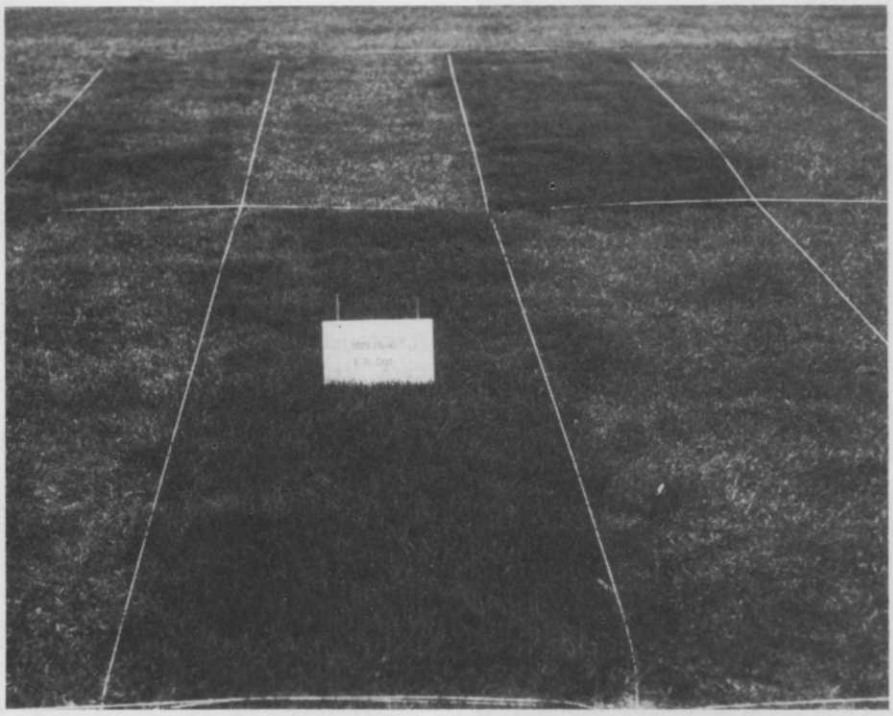
"Our overseeding has solved some other problems," he observed. "In the past, we had problems with diseases such as Fusarium and brown patch. We now have good resistance to these diseases and the park grounds have a pleasing overall appearance."

Similar to the overall traffic problems experienced during the Bicentennial weekend are the problem areas caused by compaction from people taking short cuts through the park. According to Jeffries, "The National Park Service doesn't want to destroy the natural beauty and historic significance of the park by adding a lot of walkways, so trampled areas develop quite easily. If a special event is held in a certain area of the park, the traffic to and from that area alone can cause compaction that did not exist previously. Our lawn is wearing well and has done a good job of reviving these problem areas in a minimum amount of time."

"In addition to a strong, permanent lawn that would come up quickly, be attractive, and withstand heavy use, the Park Service wanted a lawn that would allow a minimum amount of maintenance because of the size of the area, the way it is spread out and the large visitation that certain areas receive. These are the criteria we developed for the lawns at Independence National Historical Park," Jeffries said. □

Understanding Slow-Release Nitrogen

by Dr. James Wilkinson



Response of Kentucky bluegrass on April 1st to 3 kg N/are (6 lb. N/100 square feet) from IBDU applied the previous September. Plots to the right and left received similar rates of UF.

The use of slow-release nitrogen (or water-insoluble nitrogen [WIN] fertilizers on turf has grown steadily over the last few years. Despite the high cost of WIN compared to water-soluble nitrogen (WSN), WIN fertilizers continue to grow in popularity.

The characteristics of WIN and WSN fertilizers are summarized in Table 1. WSN fertilizers do offer some advantages over WIN, including rapid initial response, low cost, and high water solubility for liquid application. The use of such rapid release materials does have drawbacks, however: high potential for burn; production of a flush of growth after application at anything greater than moderate rates; relatively short residual, resulting in the need for frequent application; and the potential for significant N lost due to surface run-off and leaching.

Most of these problems associated with WSN can be minimized using any one of several commercially available WIN sources. WIN offers the primary advantage of a longer residual (longer response time) compared to WSN, allowing for higher application rates, together with reduced frequency of application and reduced labor costs. Other advantages of WIN include low burn hazard, and reduced potential for loss due to surface run-off and leaching. Disadvantages of WIN include the high cost per unit of N, and slow initial response.

There are five categories of WIN fertilizer available today:

1) ureaformaldehyde (UF)
2) isobutylidene diurea (IBDU)
3) sulfur coated urea (SCU)
4) plastic coated fertilizers
5) natural organics: activated sewage sludge, process tankage, seed meals, fish scrap, etc.

Many turf fertilization programs utilize a combination of WSN and WIN, taking advantage of the desirable characteristics of both. In order for the turf manager to effec-

Continued on page 14

TABLE I. Comparison of WSN and WIN fertilizers.

WSN	Characteristic	WIN
quick	response time	slow
short	residual	long
frequent	application frequency	infrequent
high	burn potential	low
high	water solubility	low
low	cost	high
high	surface run-off and leaching potential	low

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Slow-release

Continued

tively utilize slow-release N sources as part of a complete turf care program, he must be fully aware of the factors influencing N release from these materials. Factors such as soil moisture and temperature play a large role in the N release characteristics of the WIN fertilizers. If the influence of these factors is not understood, many people will be disappointed or misled as far as what type of turf response to expect.

A detailed description of each WIN source is summarized in Table 2. The following is an explanation of the N release mechanism involved for each WIN source to help the turf manager better understand the type of turf responses to expect from each material.

UF

Nitrogen is released from the insoluble fraction of UF as the result of microbial degradation. Therefore, any factor which increases or decreases microbial activity will have a similar effect on UF-nitrogen release.

UF-N release will reach a maximum when:

a. soils are warm (generally above 55° F.),

b. soil moisture is adequate, but not excessive,

c. soil oxygen is plentiful, and,

d. soil pH is near neutral.

These same factors have a similar effect on the growth rate of turf. As a result, N release from UF is maximized under conditions which are ideal for turfgrass growth. This could be important, for example, during a summer drought stress period. Cool-season turfgrasses will go dormant under these conditions, while N release from UF will be minimal because dry conditions minimize microbial activity. Excessive N release during such a period may be detrimental and hinder turf recovery when moisture becomes available.

Most UF materials contain a WSN fraction. Turf response to this fraction is not dependent on microbial activity. As a result, a rapid turf response can be expected, especially at higher rates. Most UF's contain at least 30 percent of their total N as water soluble.

It should be emphasized that all UF materials are not identical in terms of water solubility and N release characteristics. Some contain considerably more WSN than others. The solubility characteristics of UF materials are expressed in either of two ways: a). activity index, the traditional manner used to express UF solubility characteristics, and, b). ureaformaldehyde ratio, a more recently used expression of UF solubility characteristics.

Activity index: UF materials traditionally used for turf fertilization can be broken down into three fractions based upon solubility. Solubility is governed mainly by the length of the UF "chains", shorter chains being more soluble.

Fraction:

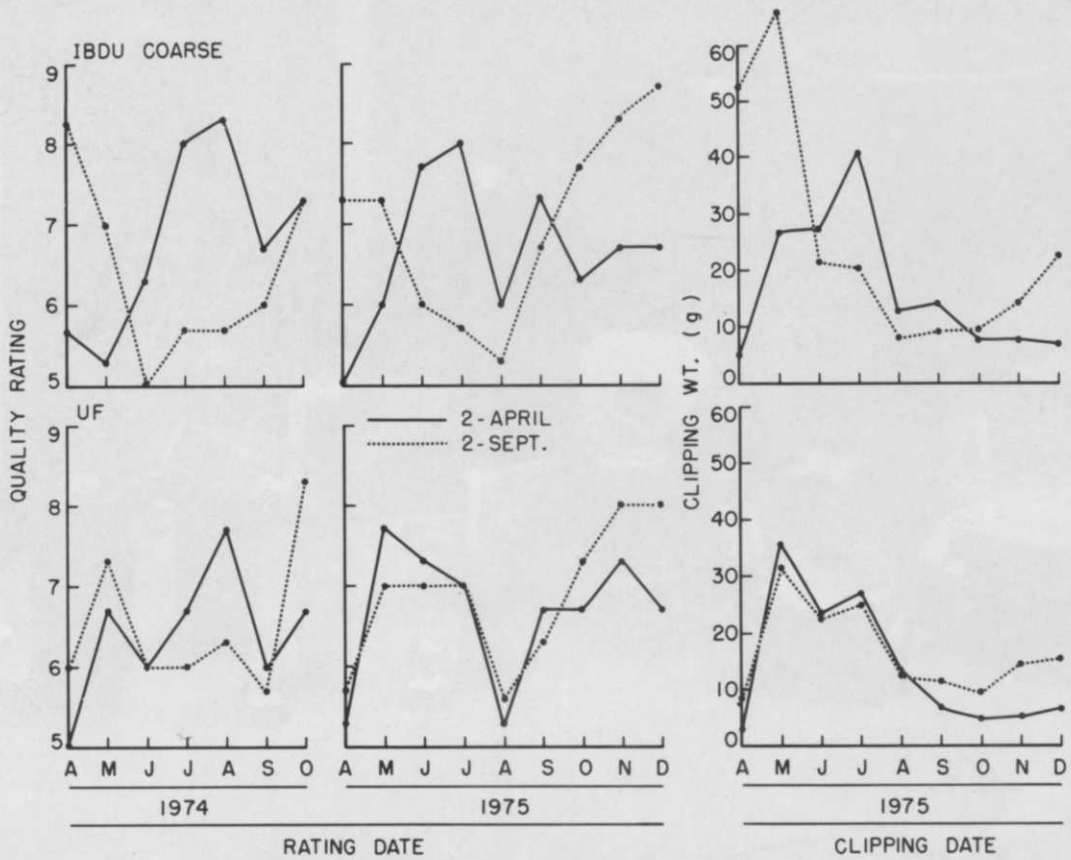
I. cold water soluble nitrogen (CWSN).

II. cold water insoluble nitrogen (CWINN).

III. hot water soluble nitrogen (HWIN).

N release from Fraction I is rapid and similar to soluble N sources. Fraction II is insoluble in cold water but soluble in hot water. N from

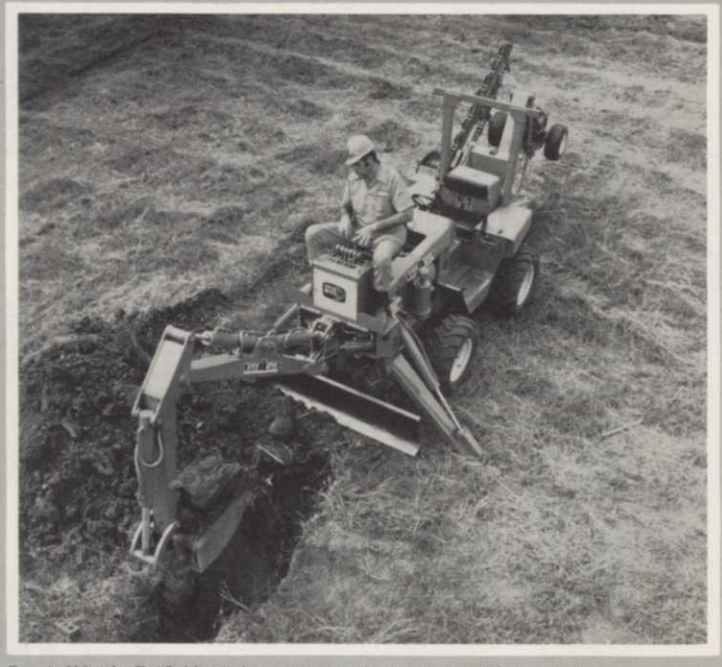
Continued on page 16



Turf quality and clipping wt. response of Kentucky bluegrass to April and September applications of IBDU and UF, each at 2 kg/are (4 lb./1000 square feet.)

Q. Why Modules and not Attachments?

A. There is a big difference between hang-on equipment attachments and Ditch Witch Modularmatics modules. An attachment usually is an afterthought to make a machine do something in addition to what it was designed to do. Ditch Witch's Modularmatic concept is a total underground equipment system including a basic underground vehicle with separate modules to do different jobs. All the elements of the Modularmatic system are designed specifically for one another as parts of a total system. What you get is a basic underground construction package that can do one job . . . or many jobs . . . whatever **you** need. Let your Ditch Witch dealer tell you more about our Modularmatic concept. For his name Call Toll Free (800) 654-6481. TWX 910-830-6580. Charles Machine Works, Inc., P. O. Box 66, Perry, Oklahoma 73077.



Ditch Witch R40 Modularmatic with utility backhoe and Combo modules.

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Slow-release

Continued

Fraction II is slowly available over a number of weeks. Fraction III is insoluble in hot water and becomes available to turf over a number of years.

The rate of N release from different UF materials can be expressed as an activity index:

$$A.I. = \frac{\%CWIN - \%HWIN}{\%CWIN}$$

The higher the AI, the more rapid the N release rate. A satisfactory UF should have a minimum AI of 40. A UF material with an AI below 40 would have very slow release properties. Many UF products such as Nitroform and Ureaform traditionally have been characterized using AI.

Ureaformaldehyde ratio: A more recently used expression of UF-N release characteristics is the urea:formaldehyde ratio. This ratio can be varied significantly during manufacturing and can result in large changes in the characteristics of the resulting UF material. A 1.3:1 ratio, typically found in materials such as Nitroform, yields a material with approximately 1/3 WSN and 2/3 WIN. A 1.9:1 ratio, as used today in materials such as Scott's Proturf line, has approximately 2/3 WSN and 1/3 WIN.

Numerous manufacturers are now beginning to produce UF materials with widely varying release properties. Nearly any combination of WSN and WIN can be achieved if careful controls are placed on the manufacturing process. One should always take care to be cognizant of the properties of the UF material he is considering for use. No one urea-formaldehyde ratio or activity index is optimum for use all the time. The ideal ratio will vary with season, turf species, location, and results desired.

IBDU

IBDU is a compound which goes into solution very slowly. The two factors primarily controlling the

Continued on page 18

TABLE 2. Comparison of several WIN fertilizers

	UF	IBDU	SCU	Plastic Coated Fertilizer	Natural Organics
% N	38 (% may vary in newer products)	31	32	Varies (10-20)	Varies (2-6)
Basis for Insolubility	Urea reacted with formaldehyde forming insoluble compound	Very low solubility in water	Urea encapsulated in sulfur (and sometimes wax)	Soluble fertilizer encapsulated in plastic	Nitrogen part of organic complex
Expression of Insolubility	Activity index or urea-formaldehyde ratio		Seven day dissolution rate		
Basis for Nitrogen Release	Microbial degradation	Slow dissolution	Microbial degradation of coating, and diffusion of urea out of granule	Diffusion of soluble fertilizer out of plastic coating	Microbial degradation
Primary Factors Influencing Rate of Nitrogen Release	Any factor influencing microbial activity; soil moisture, temperature, pH, nutrient content, oxygen.	Particle size, moisture availability	Coating thickness, moisture and temperature	Coating thickness, temperature, (moisture to a lesser degree)	Any factor influencing microbial activity; soil moisture, temperature, pH, nutrient content, oxygen
Primary Drawbacks	Low nitrogen recovery first 2-3 years of use	Poor initial response	Rapid release at high temperatures	Handling and application may destroy coating	Low analysis, high cost
Advantages	Some soluble nitrogen	Excellent low temperature response	More rapid initial release than most other WIN sources, some S provided	Complete fertilizers available	P and K often provided, may supply some micronutrients
Manufacturer/ Distributor	Hercules, O. M. Scott, plus numerous others	Swift Chemical Co.	Canadian Industries Limited	Sierra Chemical Co.	Numerous
Trade Name(s)	Nitroform, Powder blue, various ProTurf products, plus numerous others	Par Ex	Gold-N	Agriform (Osmocote)	Milorganite and many others

Slow-release

Continued

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The rate of N release from different UF materials can be expressed as an activity index:

$$\text{A.I.} = \frac{\%\text{CWIN}-\%\text{HWIN}}{\%\text{CWIN}}$$

The higher the AI, the more rapid the N release rate. A satisfactory UF should have a minimum AI of 40. A UF material with an AI below 40 would have very slow release properties. Many UF products such as Nitroform and Ureaform traditionally have been characterized using AI.

Ureaformaldehyde ratio: A more recently used expression of UF-N release characteristics is the urea:formaldehyde ratio. This ratio can be varied significantly during manufacturing and can result in large changes in the characteristics of the resulting UF material. A 1.3:1 ratio, typically found in materials such as Nitroform, yields a material with approximately 1/3 WSN and 2/3 WIN. A 1.9:1 ratio, as used today in materials such as Scott's ProTurf line, has approximately 2/3 WSN and 1/3 WIN.

Numerous manufacturers are now beginning to produce UF materials with widely varying release properties. Nearly any combination of WSN and WIN can be achieved if careful controls are placed on the manufacturing process. One should always take care to be cognizant of the properties of the UF material he is considering for use. No one urea-formaldehyde ratio or activity index is optimum for use all the time. The ideal ratio will vary with season, turf species, location, and results desired.

IBDU

IBDU is a compound which goes into solution very slowly. The two factors primarily controlling the

Continued on page 18

TABLE 2. Comparison of several WIN fertilizers

	UF	IBDU	SCU	Plastic Coated Fertilizer	Natural Organics
% N	38 (% may vary in newer products)	31	32	Varies (10-20)	Varies (2-6)
Basis for Insolubility	Urea reacted with formaldehyde forming insoluble compound	Very low solubility in water	Urea encapsulated in sulfur (and sometimes wax)	Soluble fertilizer encapsulated in plastic	Nitrogen part of organic complex
Expression of Insolubility	Activity index or urea-formaldehyde ratio		Seven day dissolution rate		
Basis for Nitrogen Release	Microbial degradation	Slow dissolution	Microbial degradation of coating, and diffusion of urea out of granule	Diffusion of soluble fertilizer out of plastic coating	Microbial degradation
Primary Factors Influencing Rate of Nitrogen Release	Any factor influencing microbial activity; soil moisture, temperature, pH, nutrient content, oxygen.	Particle size, moisture availability	Coating thickness, moisture and temperature	Coating thickness, temperature, (moisture to a lesser degree)	Any factor influencing microbial activity; soil moisture, temperature, pH, nutrient content, oxygen
Primary Drawbacks	Low nitrogen recovery first 2-3 years of use	Poor initial response	Rapid release at high temperatures	Handling and application may destroy coating	Low analysis, high cost
Advantages	Some soluble nitrogen	Excellent low temperature response	More rapid initial release than most other WIN sources, some S provided	Complete fertilizers available	P and K often provided, may supply some micronutrients
Manufacturer/ Distributor	Hercules, O. M. Scott, plus numerous others	Swift Chemical Co.	Canadian Industries Limited	Sierra Chemical Co.	Numerous
Trade Name(s)	Nitroform, Powder blue, various ProTurf products, plus numerous others	Par Ex	Gold-N	Agriform (Osmocote)	Milorganite and many others

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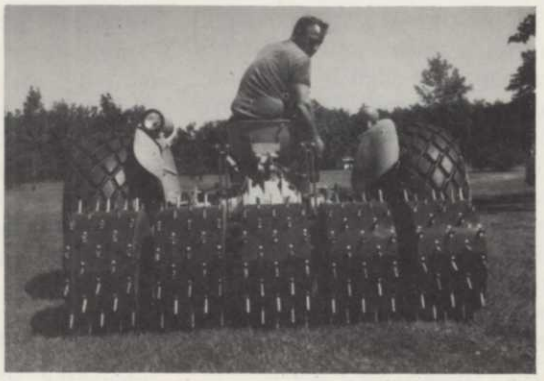

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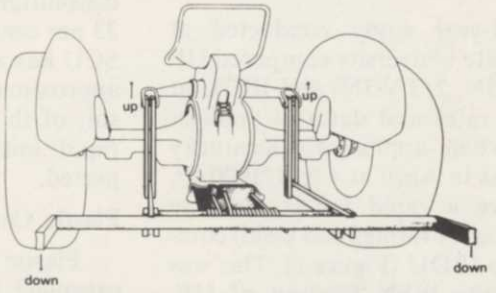

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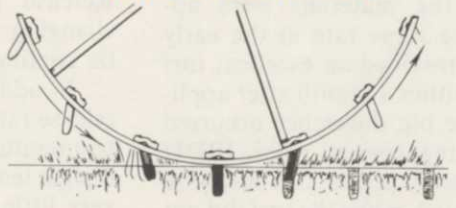

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Slow-release

Continued

rate of N release are: a) soil moisture — the more moisture available, the more rapid N release; and b) particle size — IBDU is available in both coarse and fine particle size, with the finer material having a more rapid N release rate. Also, release rate may be slightly faster under acid conditions. Temperature does have a limited effect on N release, but low temperatures do not substantially limit IBDU-N release as they would with UF.

IBDU repeatedly has been shown to provide a poor initial turf response. Turf response is minimal for the first 2-3 weeks after application. Once this period is past, however, response to IBDU appears excellent. Because of limited dependence on temperature for N release, fall applied IBDU will provide an excellent turf during late fall and spring.

A 3-year study conducted at Ohio State University compared UF (1/3 WSN, 2/3 WIN) and IBDU at various rates and dates of application. When applied to Kentucky bluegrass in April at 4 lbN/1000 ft², UF gave a rapid initial response (both quality ratings and yield) compared to IBDU (Figure 1). This was due to the WSN fraction of UF. During the summer and fall, however, turf response to the single spring application of UF and IBDU was similar.

When the materials were applied at the same rate in the early fall, both provided an excellent turf response within a month after application. The big difference occurred the following spring, when IBDU produced an excellent turf response in early spring, while the turf did not respond to fall applied UF until the soil warmed up in late May. Figure 2 shows a plot photographed April 1st, fertilized in September with 6 lb N/1000 ft² from IBDU, showing an excellent early spring response.

SCU

Sulfur coated urea has been in the experimental stage with the Tennessee Valley Authority for a number of years and has recently become commercially available. N release rate is based upon the thickness of the sulfur coating, moisture, and temperature. N is released by degradation of the sulfur coating and/or diffusion of urea through pores in the coating.

Release rate will increase with increasing soil moisture and temperature. The response to temperature is not due to microbial activity, but accelerated degradation of the sulfur coating. As a result, one drawback to SCU may be rapid N release with high temperatures when cool-season turfgrass become dormant. Turf research at numerous universities, however, has shown SCU to be an excellent N source.

Rate of N release from SCU is expressed as a 7-day dissolution rate. The higher the dissolution rate, the more WSN available. Turf research has been conducted at numerous universities on experimental SCU materials having 7-day dissolution rates ranging from 14 to 33 per cent. Commercially available SCU has a 7-day dissolution rate of approximately 30 per cent. As a result of this high dissolution rate, a rapid initial response can be expected.

Plastic Coated Fertilizers

Plastic coatings are used to encapsulate soluble sources of N, P, and K. Release of the fertilizer nutrients occurs when water dissolves the fertilizer salts, followed by diffusion of the salts out of the granule. Release patterns are varied by changing the thickness of the plastic coating.

In addition to coating thickness, release rate is governed primarily by temperature (increased release at higher temperatures). Moisture has very little influence on release rate, unless extremely droughty conditions prevail. Under droughty conditions, N release will be halted unless damage occurs to the coating due to drying. If coating damage does occur, N release will be very rapid.

Mechanical damage to the coating, creating rapid release of the nutrients, is a problem with plastic coated materials. Damage during shipment, application (especially with drop type spreaders), or by mowing after application (both the mower wheel traffic AND damage by the reels or rotary blades) can seriously alter the slow-release properties of plastic coated materials on turf.

Natural Organics

Despite their high cost and low analysis, this group of slow-release materials continues to be used extensively as a slow-release N source on turf. The materials are by-products or waste materials. Analysis of these materials varies widely and even varies considerably for any one product. Materials used include activated sewage sludge, process tankage, fish scrap, seed meals, dried manure, etc. Milorganite, an activated sewage sludge, is perhaps the most widely used natural organic fertilizer on turf.

N release is by microbial breakdown, therefore, the same factors effecting N release from the WIN fraction of UF will influence N release from the natural organics.

One slight advantage to the natural organics is that they may supply some micronutrients, but this varies widely depending upon source. They usually contain small amounts of P and K in addition to N.

The main advantage of WIN over WSN sources is their longer residual, allowing for the use of high N rates applied at a reduced frequency. One application per year of WIN, however, generally has not proven to be satisfactory in terms of year long turf quality. Research has shown that at least two applications per year of most WIN sources is necessary to maintain an acceptable level of turf quality. There appears to be no real advantage to more frequent application. These general conclusions regarding the application frequency of WIN sources most likely would not apply to intensively managed turf (i.e. golf greens) where extremely careful control is required over N nutrition. □

Dr. James Wilkinson is currently director of research for Chem-Lawn Corp.

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The long, thin line at Holden

"Prime horticultural displays in key areas of the Holden Arboretum every day of the year for the benefit, enjoyment, and education of all visitors are my objectives for 1977," says Winfried K. (Marty) Martin, superintendent of maintenance.

If past efforts are reliable indicators, Martin will succeed this year in achieving a garden-like appearance of the complex's Thayer Center, rhododendron collection, and Corning Lake area. He will accomplish this while deploying men and equipment over an additional 11 major and 3 minor areas, an enormous task involving the care of 7,000 species and subspecies of cultivars.

Arboretum maintenance is somewhat of an uphill struggle for Martin. This stems partly from the fact that the arboretum has grown in leaps and bounds from an original 100-acre tract in 1931. Holden directors have invested wisely in the future through programs emphasizing the acquisition of land and the

preservation of natural eco-systems. Holden is therefore a relatively "young" arboretum, and one that has expanded more rapidly than allocations for the care of such vast grounds. This also may be translated into a great potential, or bright future, for "the world's largest" arboretum.

In total, the arboretum consists of 2,643 acres in northeast Ohio — about 25 mi east of Cleveland and 15 mi south of Lake Erie. Over half of this hilly Western Reserve land is preserved as forest and monitored by a naturalist. The remaining grounds range from a public-entrance area, which is highly maintained, to outlying areas providing a natural transition into the woods. In fact, naturalist considerations sometimes outweigh those of grounds care, keeping maintenance at lower levels than desired by Martin.

Scattered throughout Holden's in-between areas are its famous collections — planned, organized plantings of trees and shrubs that

Continued on page 24

Holden, nature's "work of art"

One of the world's largest "museums of woody plants," The Holden Arboretum in northeast Ohio is a 2,643-acre showcase for over 7,000 different species, varieties, and cultivars of trees, shrubs, and vines. Native and foreign plants under cultivation range from exotic nut trees to ornamental shrubs. Collections, or living displays, include a wild-flower garden, experimental nurseries, a hillside of azaleas, maples, and viburnums, and entire forest eco-systems replete with deer, birds, and small animals.

The reach of the arboretum extends from nearby communities to international arboreal circles. Plant material, seeds, and scion wood are exchanged with arboretums and botanical gardens throughout the temperate world. New plants are propagated in the nurseries, which are also used to test unusual and foreign trees and shrubs for aesthetic appeal and climatical hardiness. Hundreds of woody plants are given annually to municipalities, churches, schools, and hospitals.

A resident staff of experts — arborists, horticulturists, and naturalists — direct Holden programs, hold talks and demonstrations, conduct youth and adult classes, serve as public consultants, and provide services such as plant/disease identification and species recommendation. These activities are multiplied through many volunteers from the Western Reserve area, plus representatives of universities in Cleveland (25 mi west of the Arboretum). Grounds of the four-square-mile complex are open to members throughout the year, and to the public from April through October.

Holden Arboretum hosts a multitude of activities from special events, to picnics and field days, to lazy summer afternoons by a pond.

Holden *Continued*

Sixteen operations in four categories keep Holden's eight-man crew busy the year-round. This force is supplemented by part-time high-school students, summer interns from colleges, and member volunteers. The arboretum annually attracts about 100,000 visitors and 20,000 school children. Gates are opened to the public in April when over 100 varieties of crab apples start blossoming. Visitation remains high with the blooming of lilacs and rhododendrons in May and June, respectively. Attendance slackens for two and a half months, then peaks again during the fall coloring in September and October.

are maintained at medium to low maintenance levels. Increased maintenance would provide a more effective setting for some of the collections, says Martin, especially the shrubs in certain public areas.

The arboretum's 5-tractor/7-truck fleet and 8-man crew are spread pretty thin over the 1,300 acres under maintenance. Martin jokingly refers to his task as one of "keeping things together with baling wire and C-clamps." He is slightly apologetic about less-than-desired maintenance levels. He is firmly dedicated to his job, present and future. And he is very serious about constantly improving appearance levels as much as possible within the constraints of funds, manpower, and equipment.

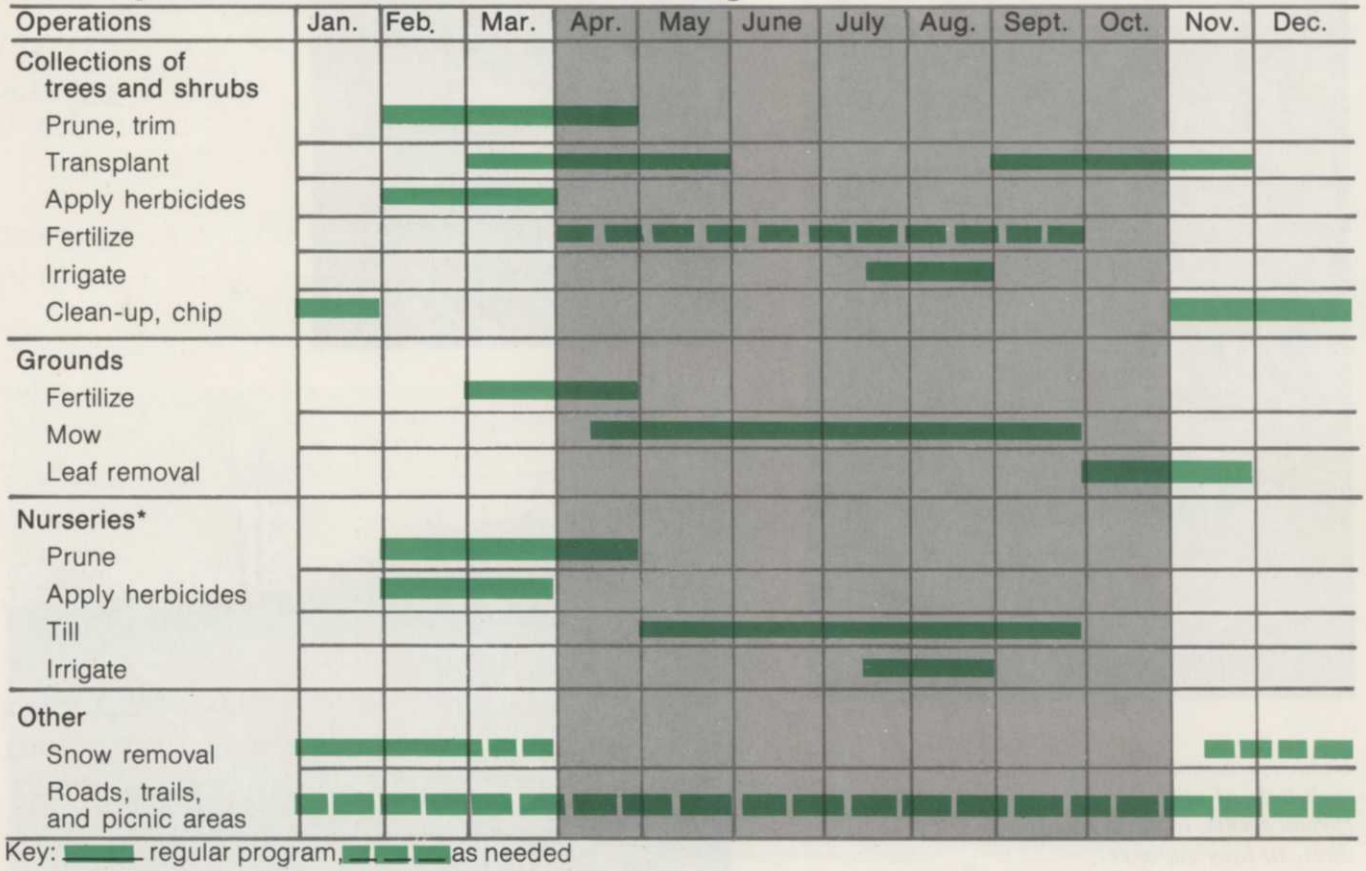
Nonetheless, Martin is intent on transforming Holden into a truly great arboretum. He wants to equal or surpass European arboretums of which he is quite knowledgeable. Trained in silva-culture, Martin was a forest ranger for the Bavarian government until 1953. His first 15 years in the U.S. were devoted to machinery maintenance. He joined Holden in 1968 and became its grounds superintendent in early 1974.

The grounds crew consists of Martin, one janitor, two maintenance men and four gardeners. This year-round force is supplemented by two part-time students from a nearby vocational school, a student from one college in the spring, a student from another college in the fall, and eight summer interns — men and women majoring in horticulture at various universities. In addition, members of the arboretum volunteer to care for the wildflower garden.

Student workers offer much-needed labor and represent potential additions to the staff. But they require considerable supervision, especially when certain equipment, operations, or plantings are involved. Attracting and keeping com-

Continued on page 45

Blending Maintenance with Public Viewing



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Maintaining California's gemstone—Bel Air Country Club

by Harold LeSieur

Players arrive at 10th green, after tee shots across canyon and walk over fabled suspension bridge. Vistas of magnificent trees abound and frame each hole at Bel Air.

Architecture of the famous Bel Air golf course, located in one of the most affluent sections of California, began 50 years ago and has culminated today in one of the show place courses in the nation. Site of the 76th Amateur USGA Championship tournament in 1976, this proud club boasts some of the biggest names in the Hollywood entertainment industry and Los Angeles business world as regular players and members.

Hardly discernible from well-known Sunset Boulevard, and near Beverly Hills and the University of California at Los Angeles (UCLA), this course of over 100 acres lies nestled in the steep terrain of the Santa Monica mountains, the exclusive Bel Air section. With elevations varying from a high of 662 feet to a low of 429 feet above sea level (not very far away), layout of some tees (such as the fabled 10th, across a broad canyon) presented special challenges. To illustrate the magnificent vistas possible from this course, from the 17th tee, Bel Air golfers can view distant snow-covered San Bernardino mountains in the winter. Fewer than 600 families can be members of this exclusive club and enjoy such privileges, and there is said never to be an opening which is not immediately filled.

To maintain this gemstone in Southern California's hillsides at the peak of its natural beauty requires a staff and golf course superintendent with a high experience level, a sizeable investment in equipment, and a cooperative management — all of which the Bel Air Country Club has in abundance.

Focus for the model Bel Air maintenance program is 38 year veteran Ardyce Twombly, who received a 1976 Citation of Performance Award from the GCSAA in recognition of his superior job in course preparation at the club. Although he now enjoys conveniences unknown in his earlier golf course maintenance days, Twombly and his assistant superintendent Charles "Bud" McDonald still report to work often near dawn, to ready the course for early players. Together they supervise a crew of 2 foremen, 6 section men responsible for three greens apiece, a mechanic, an equipment operator, 2 clubhouse gardeners and a labor gang of 6 "all-around" hands. Unusual to many maintenance crews, management attention at Bel Air results in a noticeable spirit of pride, and is reflected in course and maintenance center cleanliness. Few scraps of paper escape the watchful eyes of Art Twombly and his helpers!

Modern maintenance center saves money

The golf course maintenance center has finally graduated from the "barn" designation to the status of control center for an important part of total club management. Not at all clubs yet, but surely at the Bel Air Country Club, strong Board of Governors' support was extended to Twombly's plans for a modern maintenance control area. "I knew what I wanted for a new building since my experience at my other three positions told me exactly what I did not want", says Twombly.

Twombly came up the "hard

Continued on page 28

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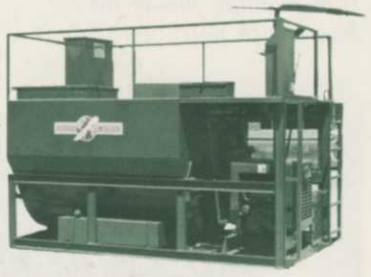

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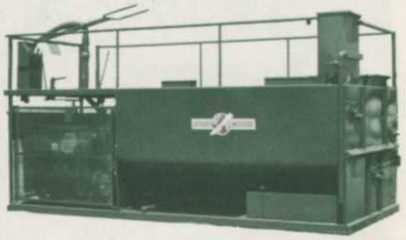

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Pot nursery sits near maintenance center allowing easy access for transplanting flower flats into 4-inch pots.

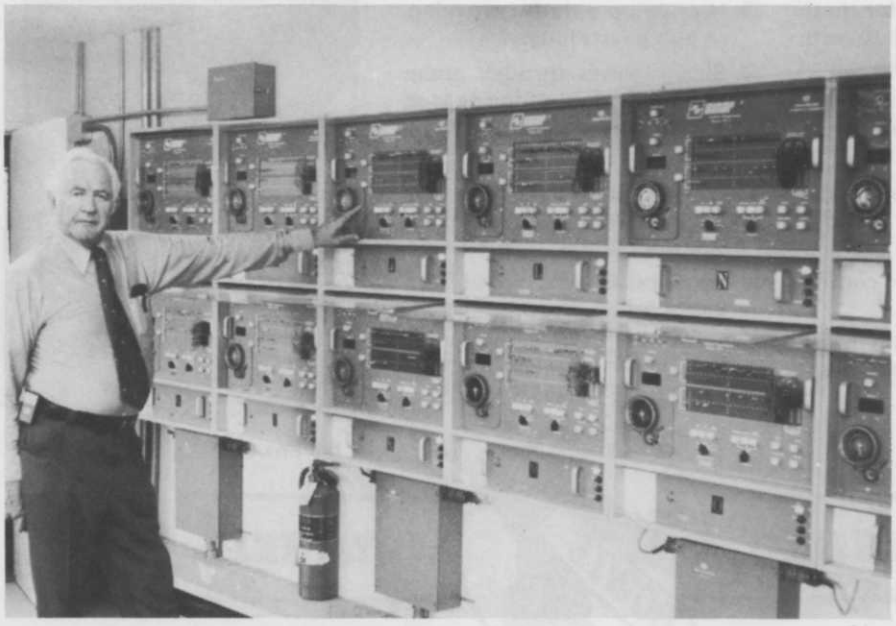
Tractor operator tows 9 gang fairway mower on way to maintenance center.

Bel Air *continued*

way" in golf course maintenance, during days when maintenance was relegated to repairs in the snow because there was no room in the "shacks". Today he basks in the reflected glory of a handsome course and enjoys the conveniences of a well-equipped 50 x 250 foot maintenance center. On first view, one sees massive counterbalanced truck doors, adequate carload lot storage space, separate mechanic's area and double locked chemical and seed rooms, plus locker and lunch rooms for workers and a spacious office for the superintendent. Room is provided to store indoors an impressive list of maintenance equipment.

These gains were not won all that easily, since Bel Air's maintenance staff experienced many frustrating months of hassles over building permits, neighbors who objected, and construction difficulties. Not the least project was the installation of 25 miles of irrigation piping, over a course which spans one mile and over 100 acres of hilly terrain. Today, this remarkable system is controlled automatically from the superintendent's office.

Twombly observes that no one plans the maintenance center nor thinks about equipment storage and repair, usually looking at this as a good place to save club money. Accordingly, he says, the superintendent must take the lead to show the cost savings possible. "When building a new club I strongly suggest that the superintendent, club officials, the golf course and club house architect, and the maintenance building designer work together on the master plan before it is submitted for final approval," is Twombly's sage advice.



Superintendent Art Twombly explains operation of Binar Control system. installed in his office to permit easy automated operation of 25-mile sprinkler irrigation system.

Plantings beautify hillsides

A tour in Art Twombly's golf cart can be both a pleasant and unexpected experience. Pleasant is the enjoyment of flowering plants of diverse colors, unobstructed by preoccupation with making a satisfactory golf course. Unexpected? A sudden meeting with entertainer Lawrence Welk! Returning from a brisk game, Welk is a member and regular player at Bel Air, along with a Hollywood directory of famous

Continued on page 32

How to avoid paying for more than you need. Or getting less than you want.

A tractor that's too big for the job is an unnecessary waste of capital.

While one that's too small ends up wasting time and costing money.

The secret is selection. And that's why John Deere provides a range of tractors and options that lets you match the equipment to the task.

The John Deere 2040 Tractor is powered by a 40-hp diesel engine with an 8-speed constant mesh transmission and the hydraulic power to handle most any attachment.

Designed for golf-course maintenance and other similar large-acreage mowing jobs, the 2040 is probably more than you need for most residential lawn work.

So we offer the 10-hp 210 Tractor. Plus 12-, 14-, 16-, and 19.9-hp models to give you a choice and the exact power size you need.

Which means there's a John Deere Tractor just right for the job you have to do.

You also get fast parts availability, flexible financing, and the value of reliable quality that's been a tradition at John Deere for more than a century.

All reasons why "Nothing Runs Like a Deere."

In any size you need.

JOHN DEERE

Nothing Runs Like a Deere®

WIPE OUT WITH BANVEL® 4S...

Banvel herbicides are broadleaf weed "specialists" designed for professional turf programs.

As a professional turf man you have a reputation to be proud of. And, rightly so! Your skill, knowledge and effort shows in the beauty and quality of your turf. So why take chances with understrength herbicides? Herbicides that get some broadleaf weeds but leave you with repeated deep-rooted problems—such as dandelions and plantain. Banvel 4S and Banvel +2,4D control all the major broadleaf weeds, and most of the time with just one application. Check the chart and compare your weed problems with the herbicides available.

Here's why Banvel herbicides are the professionals' choice for weed control

- When used as directed Banvel will not harm trees, ornamentals or grass—it just eliminates weeds.
- No season restrictions. Lay down Banvel from early spring to late fall—all through the growing season.
- Rain will not affect Banvel. It keeps working because it translocates—penetrates leaves and is absorbed through roots to attack every part of the weed.
- Banvel is not a soil sterilant. There is no residual reaction from Banvel as it is broken down in the soil by bacterial action. It is biodegradable.
- No special spraying equipment necessary. It is easy to clean out of equipment after use.
- Mixes readily with hard or soft water.
- Easily stored through winter months without losing potency.

WEEDS

BANVEL®+2,4D

herbicides...

Herbicide and Broadleaf Weed Susceptibility

Weed	2,4-D	Silvex	Meco-prop	Dicamba
Bindweed	S	S-I	S-I	S
Bittercress	S	S-I	S-I	S
Black medic	R	S-I	I	S
Buttercup	S-I	I	I	S
Carpetweed	S	S	S	S
Chickweed, common	R	S	S-I	S
Mouse-ear	I-R	S	S-I	S
Chicory	S	S	S	S
Clover, crimson	S	S	S	S
Hop	I	S	S	S
White	I	S	S	S
Cranesbill	S	S-I	S-I	S
Daisy, oxeye	I	I	I	I
Dandelion	S	S	S	S
Dock	I	I-R	I-R	S
Dogfennel	I	S	I	S
Garlic, wild	S-I	R	R	S-I
Ground ivy	I-R	S-I	I	S-I
Hawkweed	S-I	R	R	S-I
Henbit	I	S	I	S
Knapweed, spotted	I	S-I	I	S
Knawel	R	S	I	S
Knotweed	R	I	I	S
Lambsquarter	S	S	S	S
Lespedeza	I-R	S	S	S
Mugwort	I	I-R	I-R	S-I
Mustards	S	S-I	I	S
Nutsedge	I	R	R	R
Onion, wild	I	R	R	S-I
Ornamental plants	S-I	S-I	S-I	S
Woodsorrel	R	S	R	I
Pennycress	S	S-I	I	S
Pepperweed	S	S-I	S-I	S
Pigweed	S	S	S	S
Plantains	S	I	I-R	I-R
Poison ivy	I	S	R	S-I
Pony foot	S	I	I	S-I
Prostrate spurge	I	I	I	S
Purslane	I	S-I	R	S
Red sorrel	R	I	R	S
Shepherdspurse	S	S	S-I	S
Speedwell	I-R	I-R	I-R	I-R
Spotted spurge	I-R	I	S-I	S-I
Thistle, musk, curl	S	I	I	S
Thistle, Canada	I	I	I	S
Vegetables	S	S	S	S
Wild carrot	S	S-I	S-I	S
Wild strawberry	R	I	R	S-I
Yarrow	I	I-R	I-R	S
Yellow rocket	S-I	I	I	S-I

S = weed susceptible; I = intermediate, good control at times with high rates, sometimes poor, usually require more than one treatment; R = resistant weeds in most instances.

Chart reprinted by permission, S. Wayne Bingham, Ph. D.

"Two" is better!

Some weeds simply aren't affected by single herbicide treatment. But Banvel +2,4D has an "additive effect" in that the two herbicides get weeds that one alone just weakens.

Banvel herbicides—products for professional turf men

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Circle 124 on free information card

Maintenance Equipment Package at Bel Air Course

1—tractor with 9-gang fairway mower.
2—tractors for rough and intermediate-rough mowing.
2—utility tractors with power take off.
1—front end loader and excavator.
1—1½-ton dump truck with stake body.
1—½-ton pickup truck.
1—¾-ton pickup truck.
1—200-gallon greens sprayer (insecticides & fungicides).
1—150-gallon fairway herbicide sprayer.
13—30-inch pull-type rough mowers.
3—greens and tees aerifiers.
1—fairway aerifier.
1—fairway renovator or dethatcher.
1—Howard turf quaker.
1—power spiker for greens and tees.
1—Mattaway (tee renovator or dethatcher).
2—sweepers for fairways and roughs.
1—small sweeper for tunnels.
1—8-foot drop spreader.
1—Lilly rotary spreader.
2—small rotary spreaders.
1—small drop spreader.
1—top soil spreader for greens and tees.
1—power drag mat.
2—Ren-o-Thins (verti-cut machines).
1—Hahn 3-gang machine for dethatching.
14—22-inch greens and tee mowers.
1—72-inch rotary mower.
2—small rotary mowers
1—Rogers seeder and renovator.
1—Danasner digger with 4 augers.
1—Ditch Witch.
6—haulsters or trucksters.
1—Superintendent's cart.
1—Assistant superintendent's cart.
1—Ryan sod cutter.
—Power take-off equipment, as appropriate.

Bel Air *continued*

personages. Some of these notables live within sight of the Bel Air course, and such a tour reveals past or present residences of Conrad Hilton, Alfred Hitchcock, Charles Bronson, Ray Milland, Mary Tyler Moore and even the late Howard Hughes.

"We are always trying to improve and beautify the Bel Air course even further," confides Twombly, although he modestly disclaims the labels of "outstanding" or "famous" for his handiwork. Nevertheless, a systematic tour of all 18 holes reveals many plantings and decorative features which did not exist before Twombly's arrival.

Bel Air is situated on very hilly terrain, so that large hillside areas have required attention and coverage. Responding to this need, Twombly and his crew have planted azaleas, bottle brush and bougainvillea, presenting striking shades of red, with scarlet ice plant and daisies decorating the frequent sandstone outcroppings of this park-like course. Again, ice plant, ivy and African daisies are used in profusion to break-up the "monotony" of unlimited grass.

Along walkways and roadsides, one may see liberal use of the hibiscus plant, and shielding the edges of certain tees or greens from surrounding homes are colorful, high hedges of the golden nugget shrub. Mindful of feminine members, Twombly has thoughtfully provided gazanias to surround several ladies' tees, and even a bed of pansies on one tee, out of the line of play.

At the main entrance to Bel Air Bay Club, members are welcomed by generous plantings of exotic blooming flowers, principally gardenias, camellias and azaleas. This pleasing array is shaded by ficus trees. At one time, rather than discard some of these attractive trees, which required removal from the driveway entrance, they were salvaged and used to separate two different fairways.

In order to economize, Twombly and his crew buy flats of small plants and hand-transplant into 4-inch boxes. During a recent two week period, 20 such flats were transplanted. Based on a purchase price of $8 for 64 plants, and repotting into the 4-inch size (which sell normally at 70¢ to 80¢ each), the savings more than justified the trouble involved.

Trees emphasize beauty, require maintenance

Flowers and flowering shrubs contribute charm, but what adds explanation points to this picturesque setting are the many varied and dignified trees. Sycamores, Brazilian peppers, jacarandas, junipers and a large variety of eucalyptus, pines and even fruit trees provide fresh vistas from each tee.

Included in the pine family are the Monterey, Leppo and Italian Stone varieties. Flowering eucalyptus, borrowed from Australia, is a favorite, and orange, peach and pear trees lend a particular California feeling to the Bel Air course.

Behind the scenes of this majestic beauty are occasional problems, and saving elderly sycamore specimens is one. Where trunks have been weakened by natural causes, Bel Air has hired outside tree experts to tie these large beauties together, and to anchor points, with wire cabling. When a limb or branch becomes diseased some many inches in diameter, where possible it is removed and the wound chemically treated to save the tree.

The Bel Air staff attends to its own tree maintenance, as much as possible, but does not hesitate to call in outside services for pruning taller trees involving more hazards. To do otherwise, Twombly admits, would be to require exorbitant insurance coverage. Smaller tree varieties, however, are pruned at least every one or two years by his staff, depending upon requirements. New trees and shrubs are continuously planted, year -round.

Manicured turf requires dedication

No element of a golf course can be more important than tees, fairways and greens, and maintenance of this "backbone" of any course

Continued on page 34

TURF TRUCKSTER SYSTEM.

Because the flexibility of the Cushman Turf-Care System saves you time and money. Here's how!

The System is built around the rugged, versatile 18 hp Turf-Truckster, 3-or 4-wheel model. With this one power source and options, you can haul, spray, spike, spread and top dress. And save as much as 35% on equipment in the process.

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must necessarily demand major attention from the groundskeeper and his staff. Caring for the beautifully-landscaped Bel Air turf requires not only careful attention to irrigation needs, and a careful schedule of mowing, but a dedicated campaign of weed grass elimination. Mowing at Bel Air is a seven-day per week proposition for greens, and not less than five days weekly for all fairways, with weekend mowings often necessary under California's productive growing climate.

Bermuda is the majority planting on all fairways. A hybrid bermuda is sometimes utilized to provide a smoother fairway area, where appropriate. On greens, every effort is made to maintain a maximum of bent grass. Here, as on fairways, open warfare is waged against Poa annua and kikuyugrass. Poa looks good in winter months, when bermuda browns, but in summer months this pest turns brown and unsightly. Additionally, Poa annua (or annual blue grass) grows as a clumpy grass, which golfers do not appreciate.

Weapons used to combat Poa annua and kikuyugrass include overseeding with desirable grasses, such as bermuda, bent and rye, and pre-emergence treatment with Mallinkrodt's Pre-San in the case of Poa annua and Monsanto's Roundup versus kikuyugrass. Betasan also has been found useful, in fall months, to prevent seed germination by Poa annua.

Unique automatic irrigation system

How to water "wall-to-wall", without overwatering and runoff, or underwatering and dry spots, a 124 acre course set in scenic but steep hills was the question faced by Bel Air maintenance professionals. With the old hydraulic system, first constructed of oil field pipe in the 1920's, "You either had to water everything or shut everything off." To this statement of the problem, expressed by assistant superintendent Charles "Bud" McDonald, could be added the problem of how to adjust an irrigation system — other than by hand watering — to the vagaries of weather.

An ideal answer to these problems, which has become the pride and joy of superintendent Twombly, is an automatic irrigation system using the Johns-Manville Binar control system. From his office, Twombly can choose from among a large number of irrigation options, simply by selecting appropriate settings on 21 different central programmers. Each programmer panel controls 26 to 28 valves out on the golf course, and two sprinkler heads per valve (rather than 16, under the old system) can be individually set for times varying from 2½ to 60 minutes.

Flexibility is built into this system, and allows "programmed watering" at short intervals, say a 20 minute watering of hillsides in the morning, then another 20 minutes four hours later — with complete water absorption and no run-off as the bonus. Adding to this flexibility are alternate programs, permitting an additional 50 percent to 100 percent time over the original setting, for hot, dry spells, or a fraction of the base setting (such as 75 percent) when weather is overcast and courses still moist. Again, if one portion of the course requires more water than another, adjustments can easily be "plugged in". In short, "for everything, there is a setting." Twombly and his department are proud that they helped install this system, over a five month period, and feel as a result "each of us knows where every valve is located." This becomes quite an advantage, when emergency measures are necessary, or even routine inspection. Since no system can be operated 100 percent automatically, without checking, Bel Air maintenance personnel "eye ball" inspect each of the 1500 sprinklers weekly, to insure correct operation. Then, if dry or brown areas are spotted, quick couplers are available throughout the course to permit rapid, supplementary watering.

An even easier way to spot water is available to the Twombly crew. At various points on the course are underground control boxes to which they can connect portable command units. If the manual override button has first been pushed at the central programmers in the office, these portable units can be used to set off groups of sprinkler heads for up to one-half hour each. An even newer wrinkle is a special device recently acquired which allows overriding even the central programmers. This equipment has obvious advantages during power outages or earthquakes (not infrequent in California), and can be run from the battery terminals or even cigarette lighter of any vehicle.

A rain gauge installed on the maintenance building roof also can cause a manual override of this irrigation control system, and a quarter inch of rain will shut down the whole works. From rain to drought, according to Twombly, "We have found that the automatic system will do anything we want it to do, providing it is installed properly and we don't ask it to do too much." To this he adds, "Having just gone through a seven month drought, we can safely say we've proved it will operate in California."

For frosting on the cake, the Bel Air automatic irrigation system contributes to much-needed water conservation, saving 30 to 40 percent over the old, hydraulic system. To emphasize the point, Twombly's crew even hand-rakes all drainage culverts to remove accumulated debris, replacing the former water wash-down procedures.

Pesticides role in preventive maintenance

Preventive maintenance is the fundamental remedy for fungus and, insect and weed pests, explains Twombly, requiring at least three spray rigs in continuous use. Seven different fungicides are employed in this program — against such hazards as fusarium, melting-out and rust (on grasses) — not less than once every three weeks, and sometimes twice weekly.

Insecticides are also applied with the same tractor-driven spray equipment, on an "as necessary" basis, following visual inspection. Cutworm and sod webworm are the chief pests. After greens are spiked or aerated by machine, these insects prefer to lay their eggs in the air pas-

Continued on page 41

Chemical Lawn Care, the growingest new marketplace.

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Contact Dick Foster, Ad Director, 9800 Detroit Ave., Cleveland, Ohio

LAWN CARE INDUSTRY

Granular application — The Lawn-A-Mat story

by Daniel Dorfman

When I founded Lawn-A-Mat Chemical & Equipment Corp. on Long Island in 1961, there was no lawn care industry as it is structured today. Those landscape gardeners who specialized in applying fertilizer, seed and control chemicals to residential lawns did most of the work manually, and, of course, had to charge for their labor, raising the cost to the homeowner so that their services were affordable only by the relatively affluent.

The development of the multi-purpose Lawn-A-Mat combine, towed by a small tractor which could aerate, roll and dispense several dry materials uniformly, accurately and simultaneously, was only the first step in this revolution. Almost as important were the marketing methods we pioneered.

It should be noted also that the Lawn-A-Mat combine is equipped with spray capabilities so that liq-

Above, the all-purpose combine can cover irregular properties with relative ease and can be backed into corners when necessary. Below, the rig is transported to the job site by a trailer then backed off in a matter of seconds.

uid applications can be made on a selective basis where necessary.

We realized early in the game that the best piece of equipment on earth will not bring in a single customer if it is not merchandised properly. Our selling theme then, as it remains today, is that we will deliver and apply top quality products to a customer's lawn for approximately what it would cost if the customer bought equivalent products at his local garden center, carried them home, and had all the equipment to do the hard work of applying them to his lawn.

The multi-purpose combine, unique and efficient as it is, was simply the vehicle that dramatized this key point. We believed then, and we still do, that the American public is brand name conscious, and wants assurance that he is getting all that he is paying for. Therefore, from the very outset, we have emphasized the fact that the Lawn-A-Mat customer is buying guaranteed Lawn-A-Mat products with our brand name, "Lawn-A-Magic".

The other major factor which loomed importantly in our planning was who would actually be delivering and applying these products to the customer's lawn. My options at the very outset were clear. I could embark on a program of company-owned operations, with many employees and the inevitable red tape and personnel problems that would arise as I expanded, or I could franchise my equipment and concept.

I chose the route of franchising, because I believed, and still do, that few employees will ever do the kind of conscientious job or render the caliber of personalized, thoughtful service that the concerned, owner of his own business can offer.

Regardless of whether the actual applications are liquid or granular, the human element cannot be eliminated from the lawn care business. The most technically ingenious spray nozzle ever designed to dispense precise droplets of water at exact rates of flow will not prevent the human applicator from holding it in one place an instant too long and burning it or missing an area entirely. Until such time as computerized, automated robots actually handle the spray equipment, the danger of human error is always present.

Even our automated Lawn-A-Mat combine, which has undergone constant improvement and upgrading over the years and which I believe to be the finest piece of equipment of its kind, is subject to human error despite any amount of training given our franchisees. If the operator is careless enough not to steer it in the prescribed patterns, the applications will not be uniform.

However, with granular materials which are formulated for controlled, timed release, any possible damage from operator negligence is minimized.

We have always emphasized and driven home the point that the Lawn-A-Mat man is a local businessman who has to live in the community with his customers for a long time, and not some faceless cog of a large distant company. Because of this, we believe he can and does do a more careful job.

Right here on Long Island, where we started, soil conditions can vary considerably within two miles of a given location. I'm sure this can apply to most sections of the country. The local franchised operator understands the specific needs of his operating area. He doesn't come in with a broad spectrum application program designed for a large region and apply it indiscriminately in his local area.

The Lawn-A-Mat man is taught to work closely and personally with his local extension service agent so that he may constantly keep abreast of all developments affecting lawn care in his specific bread and butter territory. How can a company using a generalized approach equal such neighborhood-tailored expertise, regardless of the high powered research and advisory staff it may have at some distant office? We, too, retain highly regarded turf advisors, but there is no substitute for a knowledgeable local operator.

Then, there are the little extras that are so important. The Lawn-A-Mat man has a first name, and his customer knows it. The Lawn-A-Mat man can be talked to, and will personally tell the customer why he is applying certain materials and not applying others.

The landscape gardener thinking about going full-scale into the lawn care business should also consider the cost of acquiring customers. Any way you slice it, he will have to make a sizeable investment in equipment, and, in order to justify a large capital investment, he will have to generate a high volume of business relatively fast.

This involves a combination of sophisticated marketing techniques. It is no longer enough to pass out a few leaflets in a neighborhood, which is often all that is necessary to obtain customers for mowing, clean-ups and hedge and shrub trimming. A many-pronged advertising and promotional program must be undertaken, and this costs money too. What your advertising says, how it says it and the media in which it is placed can be all important and make or break an independent start-up operator.

The advertising must not be misleading. Many consumers these days are quick to report apparent misrepresentation or extravagant claims to the local consumer fraud bureau office. In a highly competitive situation there is a great temptation to promise the customer a lush, thick, richly green lawn virtually before the sun goes down on the day of the first application.

Some spray operators, because their method of application does

Lawn-A-Mat

produce rapid cosmetic results, are sometimes tempted to do this. In the long run, this can debase the credibility of our overall industry. Thus, spray companies with an eye to the future, are of course careful to avoid misleading overstatement of this kind.

And then we have the question of aerating (spiking) and seeding.

Although there seems to be no uniformity of opinion about the benefits of spiking, most respected authorities agree that it can do no harm at the very least. There are those who feel strongly that timely spiking can help control thatch build-up, may play a significant role in reducing the odds against certain kinds of fungus infestation and contributes significantly to the passage of air, moisture, nutrients, lime, etc. into the soil.

The new spray operator should consider that most of his first time customers will have poor lawns to start, often neglected and heavily thatched. How do the water-borne nutrients and control chemicals get down to the root zone in places where they cannot seep through the thatch? Does the new spray operator recommend mechanical de-thatching prior to his applications? Does he "farm out" the de-thatching job or does he do it himself?

The spiking, we have found in our almost 20 years of experience around the country, significantly enhances the results of both bare spot seeding and overseeding on established lawns, because the holes act as catch basins for some of the seed, reducing washing away and contributing to a higher germination percentage.

Our franchisees are taught how to present the benefits of a planned total program of aeration, seeding, feeding and chemical controls at timely intervals in a way that is clearly understood by the homeowner. This is extremely important if the lawn application specialist is to build a long-term business on a solid foundation.

The level of expectation of the new customer must not be made unreasonably high. The customer must understand that building a healthy sound lawn takes time and any landscape gardener seeking to market himself as a lawn specialist should be very careful not to oversell and make the customer expect more than he and Mother Nature can deliver.

We have found that the best way to maintain a constructive long-term relationship with any customer is to de-emphasize the idea of service. We concentrate on the idea that good products, properly applied at the right time will produce the best possible results . . . if we have help from the homeowner himself and cooperation from Mother Nature.

If the homeowner does not mow and water properly or if unseasonal weather creates problems, our experience shows that no amount of effort by a lawn applicator can produce perfect results every time. Otherwise, there would be no need for the continual search for new and better control chemicals and improved seed varieties.

We learned this from long experience. Some of our franchisees have attempted at times, contrary to company guidelines, to emphasize service, in the process suggesting to the customer that service alone will produce magical results. They learned to their despair, after a particularly moist spring followed by an unusually blistering summer, that their best service efforts fall short of producing the expected results because of these factors beyond their control.

Strong, hard-hitting advertising can produce new customers who will give a new applicator a try. But the customer must be educated properly so that he expects only what is reasonable, if the applicator is to build a solid long-term business.

Pricing is another factor. We have economy programs and we have what we call our comprehensive Greenskeeper Care Program, to suit the standards and wallets of different types of customers. Even with our complete Greenskeeper Care Program, we are careful to explain that we are not guaranteeing a picture lawn overnight but the customer can expect a healthy good looking lawn in a reasonable time.

Although our franchisees are not obligated to purchase materials from us (most do), they are required to use materials that have been tested and found to be equivalent to our own "Lawn-A-Magic" products. It is our insistence on quality control that helps give the homeowner in all parts of the country where we operate the confidence that he is getting what he is paying for. This in turn bolsters our reputation and the credibility of our name and, in the long run, means more business and greater profits for our franchisees and us.

Another hazard avoided by the use of granular materials is wind drift. We know of no spray equipment which completely eliminates this danger. Aside from the possible damage to nearby ornamentals, windy days often mean lost work time, usually during the busiest season for the lawn applicator. This is a consideration which would not be minimized. Heavy rainstorms which can cause rapid run-off of materials are also more of a factor with liquid applications than with granular.

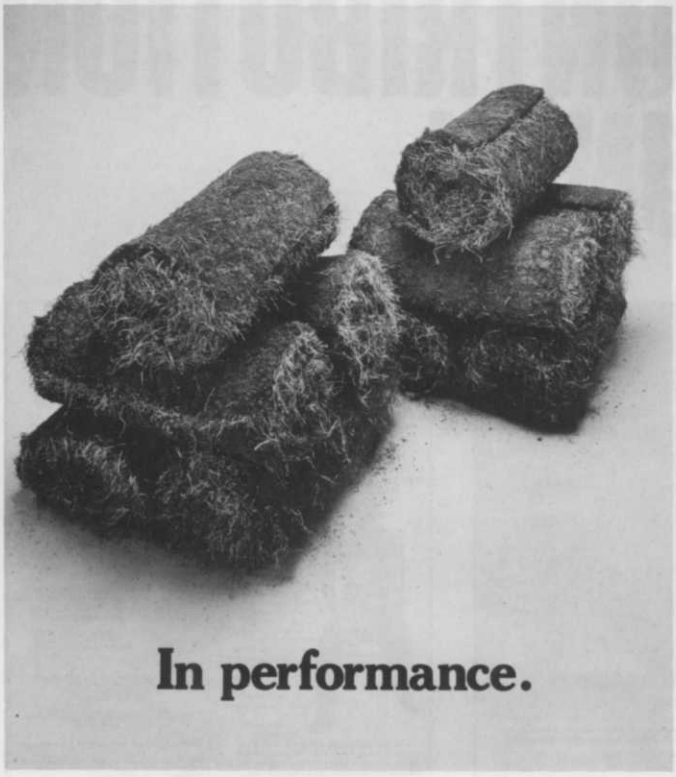
Throughout the country there are many families with two generations of Lawn-A-Mat customers; where the parents started with us almost twenty years ago and their children later bought their own homes and became customers. We think this is the best testimonial to the staying power of the concept of dry applications, reasonably priced and carefully and conscientiously done by a local entrepreneur.

You need not own a Lawn-A-Mat franchise to do it our way. By now our methods, programs and general procedures are well known and have been adopted by quite a few others.

Although the Lawn-A-Mat name is a potent marketing asset in many parts of the country, it is not indispensable to operating a profitable healthy applicator business and those who are contemplating full-fledged entry into this specialized field should consider our "dry" record carefully before discarding this time-tested approach. □

Daniel Dorfman is founder and president of Lawn-A-Mat Chemical & Equipment Corp. He submitted his story as a result of our March Lawn Care Supplement.

How our Ryan sod cutter stacks up to their sod harvester.



In performance.

In price.

Using one man, our Ryan Heavy-Duty Sod Cutter with sulky will cut and roll just as much sod, just as fast as a sod harvester.

It will cut it in widths from 12″ to 18″. In lengths from 1 foot to 9 feet. In thicknesses up to 2½″. And in more different conditions (like damp or even wet) than a sod harvester.

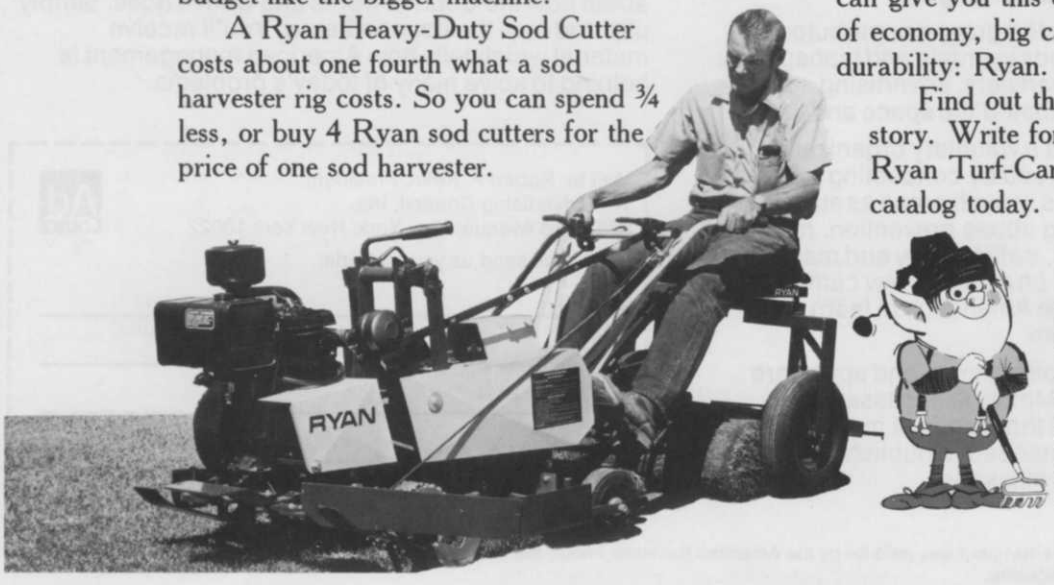
What it won't do is cut into your budget like the bigger machine.

A Ryan Heavy-Duty Sod Cutter costs about one fourth what a sod harvester rig costs. So you can spend ¾ less, or buy 4 Ryan sod cutters for the price of one sod harvester.

And the H.D. Sod Cutter will continue to save you money with its rugged dependability and low maintenance. You get a smooth, precise cutter that is as economical as it is capable.

Other people have tried to match Ryan performance ever since we started making sod cutters, over 28 years ago. But there's still only one company that can give you this combination of economy, big capacity and durability: Ryan.

Find out the whole story. Write for your free Ryan Turf-Care Equipment catalog today.



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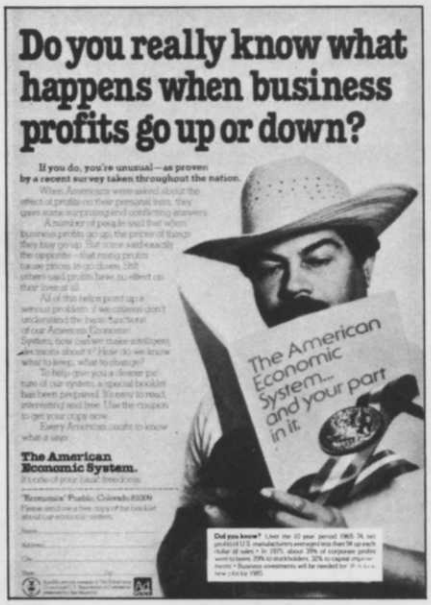

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Maintaining Bel Air

Continued

sages thus created. Bel Air maintenance experts find that Diazinon, Dursban or Proxol are all effective in combating these types of insect pests.

Equipment used in this control program presently consists of a 200-gallon fungicide and insecticide sprayer, for greens only, plus a 150-gallon sprayer containing herbicides for fairways and roughs, and a 50-gallon herbicide spray rig for small weed control jobs. Each rig contains its own motor and compressor and is drawn by tractor, and careful attention is paid to insure there is no mixup in pesticides, since this could result in killing desirable grasses.

Still a gleam-in-the-eye, Twombly enthusiastically describes his "next" piece of new equipment, a 300-gallon spray rig rated at 600 p.s.i. pressure. This will enable Bel Air maintenance professionals to reach their tallest trees, formerly reserved for outside maintenance crews at least three days each year.

A final piece of equipment, shown with pride, is a foam marker rig. This unique device dispenses a trail of foam, to show personnel where herbicides have been sprayed or fertilizers placed, thereby preventing wasteful or even tragic mistakes.

Fertilization tailored to needs

A fertilization program for Bel Air Country Club must take into account a predominately acid soil rich in phosphate (P_2O_5). Since Poa annua thrives on phosphate, little or none can be applied. Consequently, a 20-0-16 blend (as Scott Greens Fertilizer) is a favored mix. In winter months, a supplementary dressing of potash (K_2O) is often applied, preferably in the form of potash nitrate (KNO_3) or sulfate of potash (K_2SO_4) straights.

High nitrogen fertilizers are favored, during cooler weather, for fast greening of turf. Examples are a 20-0-0 with trace elements (Scotts' Pro Turf) or a complete mix such as a 16-4-7 (as Best Fast Green). The pelletized form is generally preferable, to insure ease of application and no setting-up in the sacks.

Supplementary soil conditioners are found helpful at Bel Air, such as gypsum to provide better water penetration, and limestone to neutralize excess soil acidity. This latter condition was found to prevail in certain areas, with a soil pH in the 4 to 5 range, from repeated dosages with sulfate of ammonia. Twombly reports that such treat-

Continued on page 42

ments finally failed to produce adequate grass growth, and after a soil analysis to detect the cause, limestone was tried with notable success. During hot summer months, especially July and August, a low nitrogen, slow-release fertilizer (Milorganite) is used to keep grass growing slowly and steadily, without hazard of burning. In addition to fairways, tees and greens, this is even used on roughs and around trees.

In addition to Milorganite, trees are fed with other slow-release fertilizers. For this purpose, holes are drilled in the ground at the drip line and fertilizers poured in.

Equipment package impressive

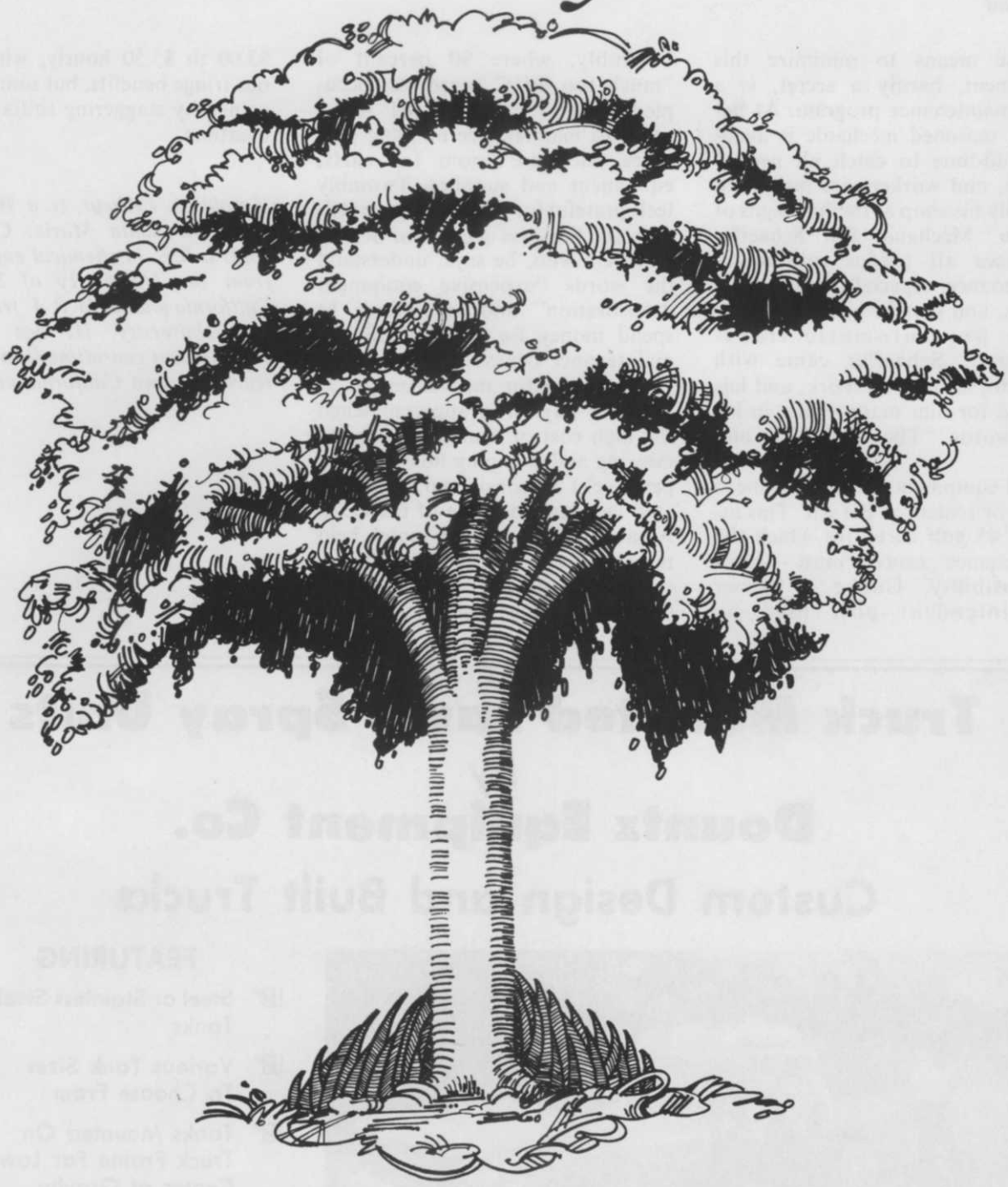
At today's prices, the value of maintenance equipment owned by Bel Air Country Club exceeds $220,000, on a replacement cost basis. Unlike many courses, Bel Air is bisected by a public roadway and is so hilly as to require four separate, underground tunnels (one 400 feet long) to permit players a full eighteen holes of golf. Some mowing equipment is kept at the fourteenth green, instead of transporting across the public road, and the total equipment investment is thereby increased. Again, with escalating costs of labor, Twombly feels that as much mechanization as possible is justified.

An impressive list of maintenance equipment at Bel Air is summarized in the chart. One of the most-used items is a tractor-drawn, 9 gang hydraulic mower.

Rising replacement costs for equipment are well illustrated by the Bel Air capital improvement program. Spending for this purpose has risen to approximately $20,000 per year, up from only $10,000 a few years ago. To illustrate, a 22-inch walking mower costing $626.46 in 1973, now commands a sales price of $959.30. Again, a 200 gallon spray rig dramatically shows the effects of inflation: a $1,700 item in 1972, now exacts $3,142 to replace.

Continued on page 44

The Stately Elm



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Maintaining Bel Air

Continued

One means to minimize this investment, hardly a secret, is a good maintenance program. At Bel Air, a seasoned mechanic is available full-time to catch all needed repairs, and workers are instructed to notify his shop at the first signs of trouble. Mechanic Bill Schaeffer practices all trades related to maintenance, especially enjoys electronics, and says he can do "everything but automatic transmissions." Schaeffer came with Twombly from New York, and has worked for him many years, in his own words "Through thick and thin."

All equipment is owned, none is leased or rented, at Bel Air. This includes 45 golf carts, for which the maintenance center must accept responsibility. Unlike a former superintendent post held by Twombly, where 90 percent of "much too little" space was occupied by golf carts, at Bel Air a spacious maintenance building provides adequate room for carts, equipment and supplies. Twombly feels grateful for the progressive attitude and business acumen of Bel Air members who, he says, understand the words "expensive equipment deterioration" and are willing to spend money for a more efficient maintenance operation.

The need for mechanization to conserve payroll is apparent when the high cost of overtime labor for mowing and changing holes (7 days per week) is considered. Exaggerated last year, because of the U. S. Amateur Championship match held there, Bel Air is seeking a 10 percent to 15 percent cut in overtime during 1977. Pay scale ranges from $3.00 to $5.50 hourly, with generous fringe benefits, but some relief is gained by staggering shifts to avoid overtime. □

Harold A LeSieur is a free lance writer in Santa Maria, Calif. He holds a B.E. in chemical engineering from the University of Southern California and an M.B.A. from Stanford University. He has his own management consulting firm and also teaches at two California colleges.

Holden *Continued*

petent help is always a problem, with the higher wages of nearby landscapers often luring away the more experienced help.

Three 32-hp diesel units and two older utility models comprise the tractor fleet, along with four 15-hp compact tractors and two interchangeable power units. The major attachments are two 60-in. flail mowers, three 60-in. rotary mowers, one 72-in. disk harrow, one front-end blade, four angle-type snow blades, and allied units for the compacts and power units.

Small powered tools at Holden include a push mower, 18-in. rotary tiller, 30-in. rotary tiller, leaf blower, and two chain saws. Three large self-powered units are a 500-gal. sprayer, portable irrigation pump, and wood chipper. The next item on Martin's most-wanted list is a backhoe. His truck fleet consists of two four-wheel drive models, a 1 ½-ton stake-bed and, a 1 ½-ton dump type, a ¼-ton pickup, and a van.

The busiest season is in the fall when containerized nursery material is transplanted. There are 20 acres of nursery on the main grounds, plus green house, and a much larger network of nurseries on a nearby 600-acre tract of land.

Weather permitting, most leaf removal and chipping operations are performed in the fall. Snow removal proved to be an especially big job last winter, when county plows were unable to get anywhere near Holden. The jury is still out on how much damage the harsh '76-77 winter did to plant material. Some evergreens and test plants are visibly affected, but Martin is waiting until June to assess the full extent of damage.

An annual affair at Holden is operation of a Sugar Bush. The maples yielded 250 gal. of syrup this spring under the tutelage of nearby Amish farmers, who also are called on to make building repairs.

Main preparation for the tourist season involves clean-up, trimming, and mowing operations. Applications of Casoron herbicide are made in the spring. Pests are not much of a problem at Holden, says Martin, but he uses Malathion when necessary. The only recurring pests seem to be birch borer, scale in general, and leaf mites on holly. Grounds are fertilized in the spring, whereas shrub/tree collections receive random applications through the spring and summer. The irrigation period occurs during late-July and August.

This year's goals — prime displays in key areas — will be attained in part through close cooperation with a new horticulturist, Peter Bristol, and the plant propagator, Steve Lamore. Also, the landscape design for Thayer Center is being revised, increasing the amounts of labor and concentrated supervision, in order to ensure speedy performance of work and an improved finished appearance.

A consistent, long-term management plan is being formulated for Holden's prize rhododendron collection — one that Martin hopes "to be proud of" when he retires.

Continued on page 46

Holden *Continued*

This collection presently consists of about 3,000 plants in 25 beds featuring 325 different cultivars and species.

Also under development is an even longer term master plan. Although still tentative, it has key provisions allowing much higher levels of maintenance and calling for the establishment of a mini-arboretum within the complex, with maintenance and appearance levels of the first rank.

For now, Martin has a budget of $300,000 for labor, equipment, and supplies (double the amount of two years ago). Regardless of funds, Martin and his men consistently achieve yearly incremental improvements in maintenance operations. Some of the chief reasons for this lie in his management techniques.

At the outset, Martin broke down the arboretum into a hierarchy of 14 key areas. Many of them are further divided into subareas. The breakdown enabled him to rank the areas according to maintenance priorities based on amount of visitor traffic and density of plantings in a collection. The payoff for all this is evident in a coherent system for scheduling manpower and equipment — an imperative when there is not enough of either to go around.

For example, areas with dense plantings and/or heavy visitor traffic are mostly likely to be mowed with push or compact-tractor mowers. Remote and open areas of the arboretum are mowed less often with 60-in.-wide flail or rotary units mounted on utility tractors.

Another management tool of Martin's is a scheme for monitoring work performed in each area on a daily basis. This is accomplished through time slips, or sheets, which are turned in by each crewman for each site he worked at that day. These records help to plan daily and weekly work routines, and are essential in calculating the annual distribution of hours spent on various areas. Such a breakdown is pitted against appearance levels — those achieved versus those desired — and used in setting new maintenance objectives for the coming year.

The time-slip system promotes smooth execution of work anywhere in the four-square-mile arboretum. It also helps to minimize the number of daily rounds Martin and a ¾-ton pickup must make over a complex having an end-to-end distance of four miles. As it is, supervisory rounds and administrative details keep Martin from spending more than 20% of his time performing on-site work with his men. Eventually, he hopes to get this figure into the 40% to 50% range.

Two foremen help Martin to maintain Holden's far-flung collections of woody plants. One foreman is responsible for the multi-faceted main-display area, which includes Thayer Center. The other is in charge of the prestigious rhododendron and quercus collections. At peak times, a foreman can request the help of other crewmen. Mini-task forces are thus hastily formed, but they are just as quickly abandoned and redeployed as soon as the critical jobs are completed. □

Hemlock scale spreading among evergreens

An extensive survey for the hemlock scale by the Connecticut Agricultural Experiment Station shows that the insect is more widespread and attacks a greater variety of evergreens than previously thought.

Dr. Mark McClure, an entomologist at the Experiment Station, said that all 16 towns within a triangle running from Greenwich to Danbury to Stratford are infested. In all, 279 locations in 31 towns were checked for hemlock scale.

The elongate hemlock scale, which throughout most of its life looks more like a fish scale than the insect it is, attacks the underside of needles and feeds on sap. It prefers new needles, and primarily attacks the bottom branches. It may kill a hemlock within a few years.

McClure found the heaviest infestations in Greenwich, Stamford, New Cannan and Ridgefield. "There was not a single uninfested site among 52 samples in these towns," he said.

McClure said that the distribution of the hemlock scale is as would be expected for such a wind-dispersed insect. It was introduced in Queens, N.Y. in 1908, and has since spread slowly into southeastern Connecticut.

An exception is an isolated heavy infestation in a part of New Haven, which McClure says probably resulted from the scale being brought there by man rather than carried by the wind.

McClure spent last summer looking at insect parasites and predators that could possibly be used in biological control of the scale. In some towns, he found one parasite which commonly kills 40 to 50 percent of the scale.

But this winter in Ridgefield, where he was investigating an area of hemlocks that was heavily infested, McClure found another parasite that kills between 80 and 99 percent of the hemlock scales.

McClure and Michael Ferigione also found that exotic firs, spruces, pines and hemlocks that had not previously been reported as hosts for the scale were being successfully attacked. □

Tent caterpillars can be controlled

Tent caterpillars are everywhere this year but the damage that they have done by feeding on the foliage of trees will generally not harm the trees.

This is the opinion of Keith Kennedy, extension entomologist at Michigan State University. "There is plenty of time for the trees to put out new leaves and continue storing up food for the winter," he adds.

Though tent caterpillars will feed on a wide variety of shade and fruit trees, their preferred hosts are wild cherry and apple. The female moths lay their eggs on these species in late July and early August.

The caterpillars typically hatch in mid-April, spin their distinctive tents in the crotches of the host tree, and crawl out to feed on the emerging leaves. If the caterpillars are out before the leaves, they will feed on the leaf buds.

The early warm temperatures this spring brought the caterpillars out earlier than usual, Kennedy observes. Without a cloak of foliage to conceal them, their tents have been highly visible, and concerned laymen have deluged foresters and entomologists with calls and requests for help and advice.

"Because their favorite food trees aren't of much economic value, tent caterpillars aren't usually considered a problem," says Kennedy. "They will get into valuable trees, however, if they deplete their original food supply."

Kennedy offers the following precautions to prevent damage:

If you can reach the tents, prune them out and destroy the worms. If tents are too numerous, you can spray.

The safest material for controlling these is *Bacillus thuringiensis*, a bacterial disease that affects only the worms. Though it does not kill them at once, it does stop their feeding within a few hours.

The chemical insecticides Sevin, Diazinon and malathion may also be used against tent caterpillars.

"Don't wait until the mature caterpillars — one and a half to two inches long, dark brown with black heads, a light stripe down the middle of the back, and black and blue spots on each body segment — are wandering down from the trees to find a place to spin their cocoons," Kennedy says. "Chemical and bacterial controls are much more effective on the caterpillars when they are small." □

Management essential for Xmas tree farms

Each Christmas season depletes Christmas tree reserves of nearly 30 million pines, spruces, firs, cedars and balsams. This heavy toll for decking the halls could present a considerable rotation or replacement problem if tree farmers weren't prepared. Fortunately, many meet the situation with careful and even creative plans.

Theoretically, replacement fills a one to one ratio. When a tree is cut, a sapling replaces it. According to Donald McNeil, executive director of the National Christmas Tree Growers Association, Milwaukee, a new season may require two to three saplings to replace a harvested tree if weather or other factors damage or kill the new trees. Which species to plant depends upon marketing possibilities, maturation rates and soils; rotation sharpens a human and animal element, as well.

John Sester, state forester of Illinois Division of Forestry, Springfield, and owner of 10 acres of Christmas trees, stressed maturation and public demands. Growing a six foot pine takes five to six years for red pine, seven to eight for scotch, and eight to nine years for white pine, he said. Firs require eight to 10 years; spruces average 10 to 12. McNeil said scotch pine is the most popular tree species with Douglas fir placing second and balsam close behind. Spruces, white and red pine, and cedar also adorn homes.

Saplings are selected by age. The most economical saplings are known as 3-0, the number indicating that they grew in the seed bed for three years with no years in a transplant bed. 3-1 trees sell and have an advantage of one year in a transplant bed although Sester said he considered the extra cost unnecessary.

Tree sources also differ. State supported nurseries in Illinois grow species sold at 12 inches from the root collar to the top of the saplings while private stock is six to eight inches high.

Planting is best done as soon as possible. Saplings must remain moist and cool and stored along the north side of a building. If planting waits for a longer period, "heeling in" is recommended. This is done by digging a V-shaped trench and positioning the sapling in it, then covering it with enough soil and water.

For planting, a temperature of 40 to 50 degrees and overcast weather provides the ideal start. March and April are best planting

Continued on page 50

Xmas tree farm management

Continued from page 49

months in most regions. Watch for sunshine or windiness which can dry roots. Rain soon after planting is another plus.

Sester advised planting no closer than six by six feet, although he prefers eight by six feet to allow for easier mowing, weed control and to prevent shading of lower branches. Any species can grow together, side by side, since only distance regulates their well-being, Sester said. Sapling can thrive beside a stump. However, Sester noted that white pine start with greater difficulty but last once they begin to grow.

Seventy five to 80 percent survival is average for each year. McNeil said 1976 planting suffered and will need replacement since many saplings failed to endure the double clout of summer drought and the harsh winter.

After planting, a one or two week check for three months protects the tree from encroaching dangers of weeds, insects or animals. Bagworm, field mice, deer and choking weeds may threaten. Checking also benefits the grower since trees protect and flourish upon agricultural wasteland too poor to support corn. Instead, the trees offer beauty, erosion control and encourage wildlife.

After June, mowing becomes necessary to combat weeds that would grow over saplings and blur distinct tree rows. But the saplings themselves don't need special care until their third or fourth year when "shearing" begins. Shearing, the careful shaping of trees by cutting, usually happens in June, Sester said. Its purpose is to provide a bushier, more conical and aesthetic looking tree for the buyer.

There are alternatives in planting. The soil can support planting cycles without damage, Sester explained, so no special crops are needed for rotation. Yet, the grower can use the fields to support other crops while waiting six or more years for the first tree harvest. Barley, oats, soybeans, and sorghum, as "nurse crops," cut weed growth and yield grains for lifestock. By planting one half or a normal seedling of grains and keeping them for several years, the grower gets a yield until trees grow too tall and interfere. At this time, energies are best directed toward the trees.

"In one interesting case a man did plant Christmas trees and planted sorghum between the rows," Sester recalled. "He harvested this for his livestock until the trees got too big. All he did was get something off it for three to four years." □

People on the Move

Gerald E. Farrens, vice president and general manager of Farrens Tree Surgeons, Inc., Jacksonville, Fla., has been elected president of the National Arborist Association. Farrens, a graduate of Rollins College, is a member of the American Society of Consulting Arborists and has served on the Board of Governors of the International Society of Arboriculture.

M. Scott West III has been named midwestern district sales manager for Outboard Marine Corporation's Cushman and Ryan product lines. His territory includes Arkansas, Colorado, Kansas, Missouri, Nebraska, and Oklahoma.

Dr. Lawrence R. Schreiber has been named research leader at the Nursery Crops Research Laboratory, a facility of the U.S.D.A.'s Agricultural Research Service near Delaware, Ohio.

Dr. Schreiber has been a research plant pathologist at the laboratory since he joined ARS in 1961. He has worked on improving trees for use in urban environments through breeding and selection to increase resistance to disease and pollution stresses. He received his B.S. from Northwestern University and his M.S. and Ph.D. from Purdue University.

Promotion of **Mark D. Lyle** to product manager in the project development group of the agricultural chemicals division has been announced by Stauffer Chemical Co..

In his new position Lyle will be responsible for the marketing and product development of Dyfonate, Trithion, Aspon, and Seven-4-Flowable. He joined the company in 1973 as a sales representative in North Dakota.

Professor Vincent C. Smith of Alfred State Agricultural and Technical College department of ornamental horticulture has retired after 30 years on the faculty. Professor Smith, who served as department chairman for 24 years, is the author of several articles on floriculture and has served as a consultant for golf courses and athletic fields.

E. F. Burlingham & Sons announces management changes following the death of C. G. Burlingham, president and chairman. **George W. Burlingham,** formerly vice president, moves to president and chairman. **Robert J. Peterson,** who joined the company as an agronomist, is a director and vice president of seed promotion and public relations. **R. B. Loomis** becomes vice president of finance in addition to secretary-treasurer. □

Aphid "alarm" defined to aid in pest control

Cornell University scientists have defined the chemicals used by aphids to signal danger in their insect communities.

Moreover, the entomologists say it may be possible to use this knowledge to manipulate these chemical alarms and protect valued crops against insect damage.

William S. Bowers, professor of entomology at the N.Y. State Agricultural Experiment Station, Geneva, a unit of Cornell University, and Chikao Nishino, a post-doctoral associate, explain their findings in the May 6 issue of the journal "Science."

Their coauthors are Michael E. Montgomery, a post-doctoral associate, and Prof. Lowell R. Nault, of the Ohio Agricultural Research and Development Center, and Mervin W. Nielson (Ph.D.) of the U.S. Department of Agriculture.

Bowers explained that, in nature, when an aphid is attacked it secretes, in a dying gasp, a chemical warning to its cohorts. The response of fellow aphids, which are tiny herbivorous insects commonly called plant lice and known for their ability to cause feeding damage and transmit plant diseases, is to walk, fall or leap away from the plant and the oncoming enemy.

Five years ago, Bowers and his colleagues isolated and identified an alarm chemical, called trans-beta-farnesene, used by two subfamilies of aphids. Recently, he has discovered a new alarm chemical called germacrene A, used by different species of aphids, which is a serious pest of forage crops.

Isolation of these chemicals from insects is noteworthy because they are extremely unstable. For example, when an aphid secretes germacrene A, the chemical alarm degrades within 15 seconds. This instability ensures that the alarm chemical breaks down soon after the predator moves on, thus enabling the aphids to return to the feeding site.

But now Cornell scientists have manipulated the alarm system and have synthesized a stable chemical capable of deterring the insects from returning to their feeding site for an extended period.

"We have approached this problem through the successful synthesis of several simple analogs of trans-beta-farnesene, which are not quite exact copies of the real chemical alarm," said Bowers. "These analogs retain the warning quality of the natural chemical alarms but are considerably more stable than the natural chemicals. It may also be possible to develop analogs of the second chemical alarm, germacrene A," he added.

Bowers said that his chemical analogs, which have already been tested under laboratory conditions, will be given field tests this summer.

The research was supported, in part, by the National Science Foundation. □

Healthier walnut and apple trees possible

Healthier, more vigorous apple and walnut trees may result thanks to technique developed by University of Missouri-Columbia plant pathologists.

"We adapted a technique used by the flower industry," reported Dr. Daniel Millikan. "It allows us to eliminate brown line in apples, a disorder which seriously hampers our export of nursery stock, because Canada has a quarantine against it.

"A further modification of the technique can be used to eliminate 'bunch' and 'ambers' in walnut, disorders which reduce walnut production efficiency."

Bunching of the terminal branches of the walnut tree makes the tree more susceptible to winter kill. The result is a devitalized, less productive tree.

Ambering in walnut meat causes flavor to be bitter or sour.

The methods for producing apples and walnuts free of bunching and ambering were reported recently at a joint meeting of the Missouri and Illinois academies of science, at the University of Missouri-St. Louis by Millikan's doctorial candidates, Shu-Ching Huang and Anna Lenartowicz.

Basically, the technique involves using tip meristem, a growing point in the plant. A microscopic piece of the growing point is removed from an infected plant in a sterile medium (free from bacteria and fungus). Then, with proper nutrition, it is grown into a vigorous disease-free plant.

"This plant can then serve as a source of healthy material for variety that was previously universally infected." said Millikan.

"This plant material can then be grafted onto another rootstock, and we can produce a disease-free tree that can be sold in Canada.

The tree will not only be more vigorous, but it will be a more efficient producer, because other virus problems will be eliminated, too."

Millikan said past experience with this technique on cherries resulted in 20 percent more trees being produced per acre.

"Besides," said Millikan, "all the trees were more uniform — all Grade A — which sold for about 20 percent more than lower grade."

He said that nurserymen will use his technique to completely eliminate brown line in five years.

"The result will be better, more efficient production which will ultimately benefit the consumer," he added. "Right now, brown line cuts nurserymen's production by about 30 percent. In the case of walnuts, the elimination of ambering and bunching will take a little longer."□

Some ryegrasses can minimize raggedness

Perennial ryegrasses have come a long way in their development and use the past decade and possess several favorable characteristics, but there is some good along with the bad. Raggedness from mowing is a particular problem with many of them.

Results from a University of California field experiment at San Jose indicate that the variety of perennial ryegrass you plant is a more important factor than the level of fertilization you apply to minimize raggedness from mowing.

The experiment was conducted by David L. Hanson, UC Cooperative Extension farm advisor for San Mateo County. He reported his findings during the Turf & Landscape Institute program held recently in Anaheim. The program is presented annually by UC Cooperative Extension and is sponsored by the Southern California Turfgrass Council and other supporting landscape associations. More than 1,100 persons turned out for this year's program.

Hanson established a series of varietal plots in the spring of 1974 at the UC Deciduous Fruit Field Station at San Jose to see what effect nitrogen fertilization would have on the cuttability of perennial ryegrasses. New varieties available at that time were included in the trial: Manhattan, Pennfine, Lamora, Linn, NK-100, and NK-S321.

The seed bed was prepared in a normal manner. Super-phosphate was applied at a rate of one pound of actual phosphorous per 1000 square feet. Seeding was by hand at a rate of six pounds per 1000 square feet in the 5 by 15-foot plots.

After allowing the grasses to establish themselves for four months, three fertilizer treatments of one and a half, three, and six pounds of actual nitrogen per 1000 square feet per year were applied across the varietal plots. For the next seven months, the plots were rated every other week for their cuttability (raggedness), as well as their color, texture, density, pest activity, and uniformity. At certain times of the year, Hanson noted, there were no apparent differences in the raggedness of the species mowed. A 30-inch reel mower, sharpened every month, was used in the test.

At the end of one year, all of the data collected was statistically analyzed to determine the significance of difference in fertilization and the differences by variety with respect to their raggedness from cutting.

Using a 0 to 10 scale (0 being something like a stand of mowed, and 10 being a clean-cut turfgrass stand), the six-pound rate of actual nitrogen per 1000 square feet per year resulted in an average cuttability score on all varieties of 4.9. The three-pound and one and a half pound rates resulted in lower average scores.

A comparison of the results by variety at all fertilization rates showed that in this trial Manhattan had the cleanest cutting quality with a score of 6.0. NK-S321 was next with 5.4, followed by Pennifine at 5.0 and Lamora at 4.7. □

Tissue culture reproduction shows promise

Improved plants, duplicated vegetatively by tissue culture (rather than sexually by seed) are identical to the parent, can be obtained more rapidly than by seed, and can be disease-free.

Texas Agricultural Experiment Station (TAES) scientists have found plant tissue culture techniques to be a valuable tool for studies of plant development, viral elimination from infected stocks, rapid clonal multiplication, pharmaceutical production, genetics, and crop improvement.

Plant parts can be grown in isolation and in environments of controlled nutrition, light, temperature and humidity.

Culture media have been developed that permit growth of cells and tissues of many plants in test tubes. Plant cells or tissues placed on appropriate media can be grown as a dividing mass of cells that can then be induced to form shoots or roots and complete plants.

According to Drs. Roberta H. Smith and H. James Price, plant physiologists and geneticists with TAES, plant cell cultures and the ability to manipulate them in test tubes have brought about much interest in the potential application of somatic cell (body cells other than germ cells) genetics for crop improvement.

Cell cultures may be employed in screening for disease resistance among cells. In one case, mutant plants have shown a greater resistance to infection than the variety from which they were derived.

Selection from other traits, such as insecticide and herbicide resistance, nematode resistance, improved nutritional quality, heat or cold tolerance, and salinity tolerance is a potential of cell cultures.

The biochemical constitution of plant tissues can be selected through screening of mutants at the cell level.

Previous research indicated that there is a potential to raise the level of specific amino acids and hence the nutritional quality of the plants.

Tissue culture techniques have been very effective in studying basic physiological growth and propagation of herbaceous angiosperms (flowering plants) and should be used to obtain similar information on woody plants.

The problem in the past has been due to the difficulty in culturing tissue from woody plants in test tubes.

Research indicates that there is a tremendous potential for tissue propagation of desirable pecan rootsticks in large numbers. □

Meeting Dates

American Association of Nurserymen's 102nd Annual Convention/Oregon Association of Nurserymen's Farwest Nursery, Garden, and Supply Trade Show, Seattle Center, Seattle, Wash., July 16-20.

American Sod Producers Association Annual Summer Convention & Field Days, St. Paul Radisson Hotel, St. Paul, Minn., July 20-22.

Illinois Landscape Contractors Association Annual Summer Field Day, Matt Tures Sons Nursery, Huntley, Ill., Aug. 3.

Plant Growth Regulator Working Group Annual Technical Meeting, Arlington Hotel, Hot Springs, Ark., Aug. 9-11.

International Society of Arboriculture Annual Convention, Philadelphia Marriott, Pa., Aug. 14-18.

USDA Turfgrass Field Day, Beltsville Agricultural Research Center West, Beltsville, Md., Aug. 24.

Mt. Lake Right-of-Way Management Council Annual Meeting, Sheraton Motor Lodge, Charlottesville, Va., Sept. 12-14.

Virginia Tech Turfgrass Field Days and Trade Show, Stadium & Turfgrass Research Center, Blacksburg, Va., Sept. 21-22.

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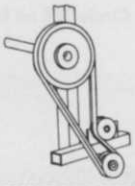

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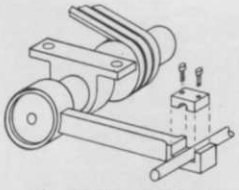

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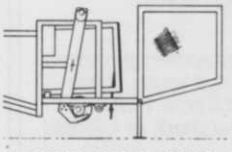

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Products

Marwald announces the Perfect KV-220 flail chopper. It's designed for quick and efficient chopping and pulverizing of orchard, grove and vine prunings and branches up to 3" in diameter. The KV-220 also mulches grass, weeds and scrub brush. The KV-220 has an adjustable cutting height of 3/4" to 4-3/4", a cutting width of 7'3" and can also be offset 7'3".

Circle 701 on free information card

Addition of two lawn sweepers now expands Massey-Ferguson's line of lawn and garden care tractor accessories series. Measuring 38" in the MF3860 and 31" in the MF3160 series, the models are manufactured with driver-adjustable brush height control.

Circle 702 on free information card

The 2000 series of bronze electric remote control turf valves by Royal Coach Sprinklers, Inc. conserve water and regulate water flow to avoid runoff. Constructed in stainless steel U-frame solenoid and totally encapsulated with 18/30 volt, 50 or 60 hertz, 2.0 watt coil, the valves feature a finger control brass bleed plug to flush the valve without bothering its wiring or body.

Circle 703 on free information card

TH Manufacturing Co., Inc. now introduces its trim & hoe edging blade designed for work with gasoline powered edgers. The edger makes a clean, neat 1-5/8" line to form an attractive grass boundary. It works with equal skill as a right handed or left handed edger.

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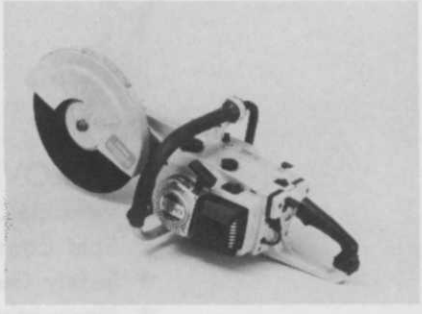

Echo's cut-off saw attachment for its 60S, 601S, 602VL, 702VL, and 1001VL models uses a 12" blade to cut through such hard surfaces as steel brick, aluminum, iron pipe, concrete and asphalt. Its wrap around handle lends the saw for easier horizontal and vertical cuts through more efficient balance and acts as a handle to keep the blade off the floor.

Circle 705 on free information card

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Up to 50% Finer Than Any Other Ryegrass!

Diplomat: A variety of turf-type perennial ryegrass with leaves so fine in texture that – when compared to 8 other popular turf-type ryegrasses – it proved to be the finest. As much as 50% finer.

Diplomat scored highest in other important qualities too. It produced more tillers per unit area for a more uniformly dense stand of many upright plants giving an excellently manicured appearance.

Diplomat scored highest 3 years in succession in overall turf quality. Number one among commercially available ryegrasses as proven by tests performed at Rutgers University.

Use **Diplomat** where fine, turf-type perennial ryegrass is important: golf courses, athletic fields, parks . . .anywhere excellence is a must.

Diplomat is also well suited for fall overseeding bermudagrasses on southern golf courses. **Diplomat** joins with Yorktown Ryegrass and Jamestown Chewings Fescue in providing a superb cool season playing surface on greens, tees and fairways.

Variety	Turf Quality 9 = Best Avg. 1972-73	Turf Quality 9 = Best Avg. 1974-75	Turf Quality 9 = Best Avg. 1976	Tillers per 100 sq. cm.	Leaf Width mm.
Diplomat	7.3	6.2	6.4	352	1.6
Citation	7.1	6.0	6.3	321	2.0
Manhattan	6.8	4.8	5.1	288	1.9
Pennfine	6.5	5.4	5.3	322	1.8
NK-200	5.0	4.1	3.9	202	2.3
Pelo	4.4	3.0	3.2	251	2.2
NK-100	4.1	2.7	2.6	220	2.3
Barenza	3.6	3.6	3.4	191	2.4
Oregon Common	2.7	2.6	2.2	206	2.3

Performance tests of perennial ryegrass varieties at Rutgers University, New Brunswick, N.J.
Tests mowed at 3/4-inch and maintained at moderate to high fertility at all seasons.

In Southern California field tests in 1975-76, Diplomat was one of the top four perennial ryegrass varieties in overall performance. In addition, Diplomat showed these benefits:

- High tolerance to smog.
- Good rust resistance.
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Report by University of California Cooperative Extension.

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VERMEER No. 6 stump cutter, good condition, $2350.00. John Bean 55 GPM sprayer on International truck, good condition, $1500.00. Paul Bunyan Tree Service, 201 747-5555 after 6 p.m. 462-2466 (201)

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