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Controlling Weeds in Cool Season Grasses

ISSN 0043-1753

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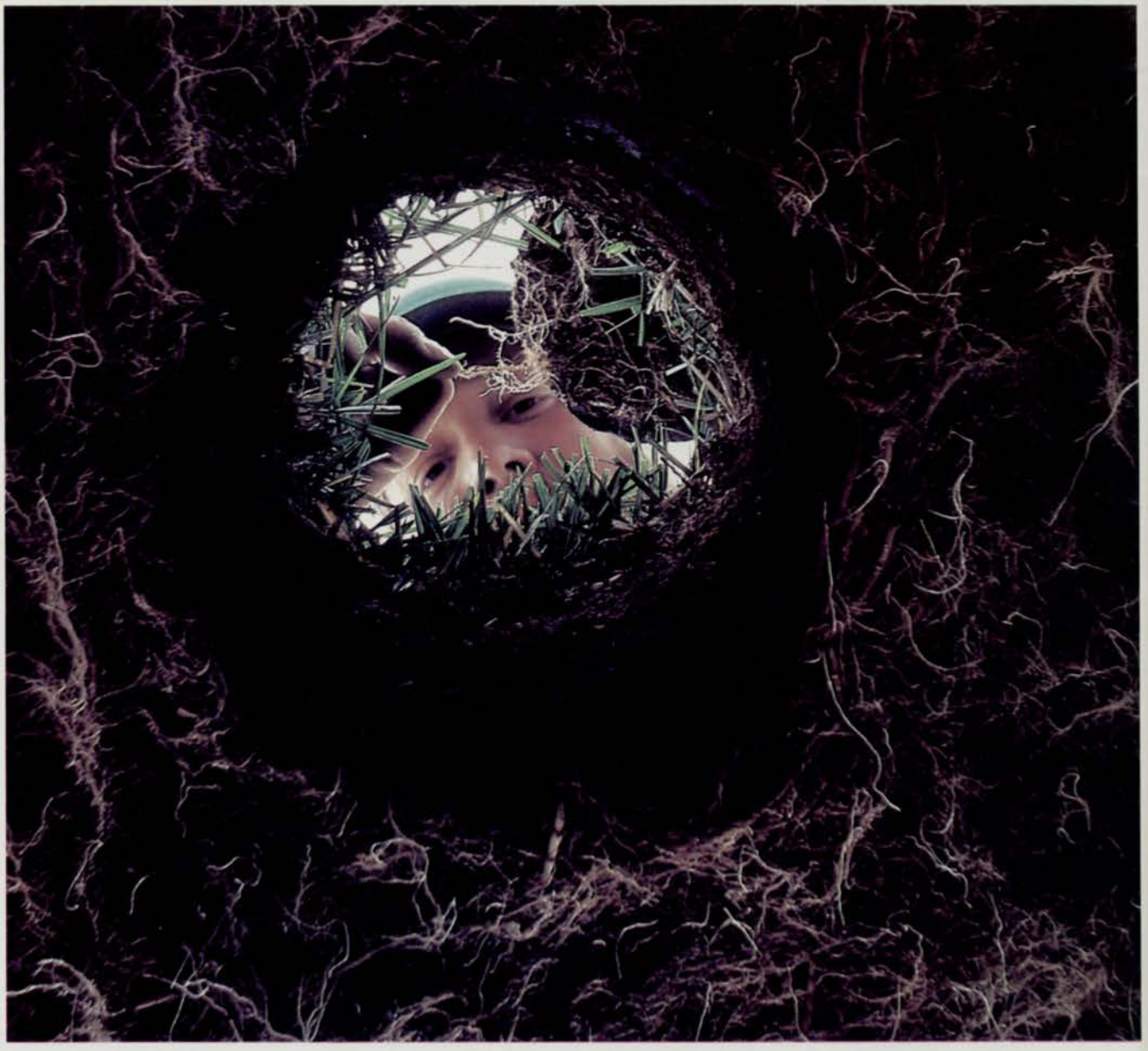

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Cover: Applying fumigant beneath the soil in a new seedbed. Photo by John Jagschitz.

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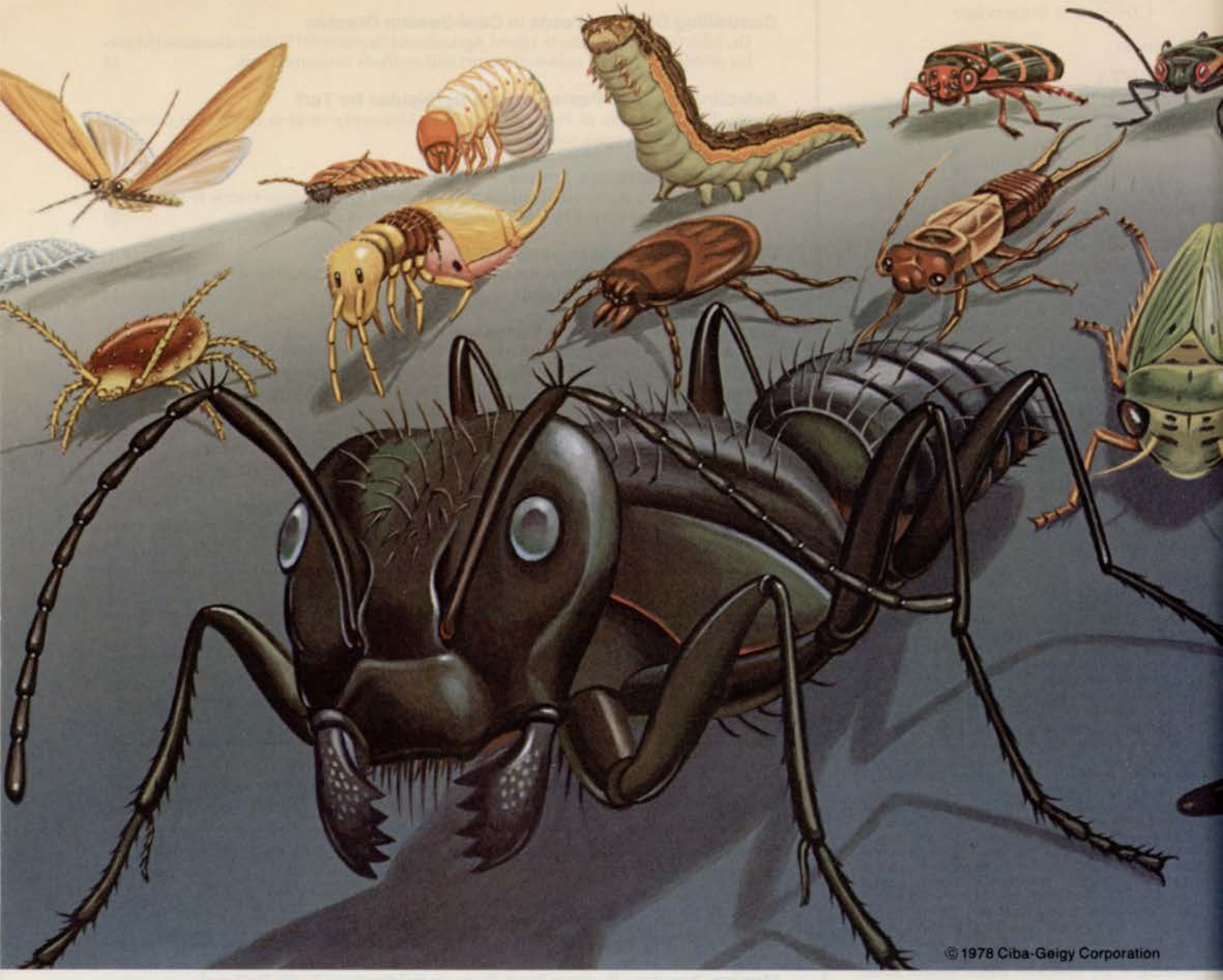

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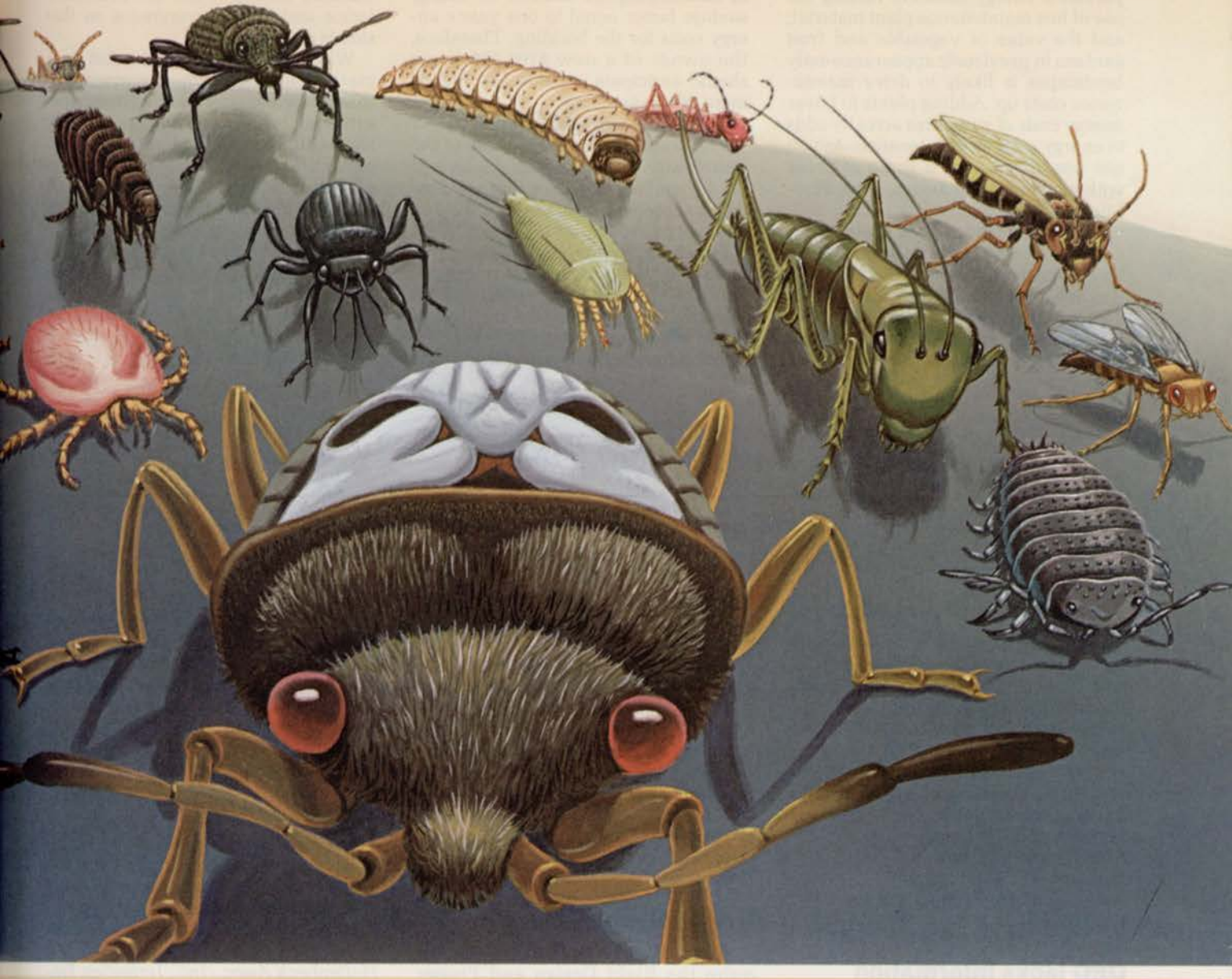

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OUTLOOK

The next two decades of landscape design and maintenance will test the knowledge of the best horticultural businessmen. Environmental, energy and cultural concerns will throw a myriad of conflicting objectives at the landscape manager. Unless he has the necessary background on each area, the professional can only maintain older methods and risk some of his business to a more progressive competitor.

Consider these present-day concerns: chemicals are being heavily scrutinized for harmful effects to any organism, regardless of economic importance; energy costs are forcing the use of low maintenance plant material; and the value of vegetable and fruit gardens in previously appearance-only landscapes is likely to drive maintenance costs up. Adding plants to lower energy costs of structures actually adds to energy costs of maintenance. As you can see, it becomes a game of chess with many possible moves, none absolutely correct.

The result is the need to evaluate the complete landscape instead of parts. A landscape designer should include garden areas in plans along with appropriate windbreaks and shade. The rubber stamp design may keep prices down, but it will not advance the state of the art. An installer must have knowledge of design beyond what looks good. It also requires landscape architects to reconsider their standard specifications for jobs.

The average cost of a single residence is rapidly approaching $100,000. Commercial construction costs can increase 20 to 30 percent between groundbreaking and completion. If you figure that a good landscape adds more than six percent to the value of the property, not considering energy savings, three percent of the building cost should be expected for an investment in landscaping. To this add an energy savings factor equal to one year's energy costs for the building. Therefore, the owner of a new $100,000 home should anticipate a landscape investment of at least $4,800.

This figure will be low, especially if the lot is sodded. A look at some of the award-winning projects by ALCA and NLA members indicates that residential landscape investments of $20,000 and more are common.

For energy savings to be realized in a landscape, the price has got to rise. To achieve the density needed for an effective wind screen, the number of plants must increase significantly.

To be convincing, the landscape contractor and architect must have the facts and the answers to conflicting objectives. They must have the answers at the time potential customers start asking questions. Garden center clerks and landscape contractors should be ready within the next two months, and certainly by this fall.

Energy conservation is not merely a cold weather concern. Air conditioning costs can dramatically increase utility costs during a hot summer. In the summer you strive to block southerly sun, yet in the winter the idea is to let that same southerly sun bask the building in warmth. Timing of leaf fall becomes a factor and use of evergreens on that side is discouraged.

What may be needed most is a method to alert property owners to these new considerations. Newspaper articles, television and radio talk shows, direct mail, and public appearances are needed immediately to educate the customer of the practical aspects of landscape materials, including structures such as arbors and trellises.

The complexity of landscaping today raises it above the level of trade to that of profession. It adds excitement to the occupation as well as opportunity for growth. We hope to reflect this vibrance in all future issues. **WTT**

WT&T

LETTERS

A classmate of Jim Watson

Your articles on the early years with all the pictures of the gentlemen (July-Oct. 1980) portray them so well. Bravo for publishing this.

We were fortunate to have known Jim Watson (October 1980 issue) for several years. He and my husband went to the same school. My husband is a landscape horticulturist. We thought so much of Jim Watson.

Mrs. George McGrath
University of Rhode Island
Agricultural Experiment Station
Kingston, RI

DED lacks information

The DED article by John L. Hart (November issue) is well written but does have some misinformation and serious omissions. We are very pleased to see a magazine such as Weeds Trees & Turf carry articles on DED and other diseases because the magazine does have wide circulation and people can profit from the information. It is important, however, to have these articles accurate and up-to-date.

Sincerely,
D W French,
Department Head
Department of Plant Pathology
University of Minnesota-Twin Cities

Irrigation consultants

Your feature "Irrigation Projects Require the Right Design and Proper Equipment" by Mike Morey in the October issue was one of the best I've seen on irrigation design.

Mr. Morey mentions The American Society of Irrigation Consultants—and I would like to contact this organization. Would you please send me their address, or if you do not have it, forward this letter to Mr. Morey.

Roger Loefgren
Indiana Irrigation
Carmel, IN

The American Society of Irrigation Consultants represents a small number of consultants to landscape architects and to contractors who work on projects that involve automatic systems. For further information, write to John Hollenbeck Assoc., Inc., Irrigation Design Consultants, 3086 Claremont Avenue, Berkeley, CA 94705.—Ed.

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GOLF COURSE

Turf conference offers West Coast exposure

The 52nd International Turfgrass Conference and Show presented by the Golf Course Superintendents' Association of America in Anaheim, California, Jan. 25-30, continued a four-year tradition of record attendance despite uncooperative weather and the spread out nature of the hotel facilities.

More than 7,000 golf superintendents, students, and other turf specialists filled the exhibit hall and conference rooms. The exhibit floor was exceptionally impressive despite economic conditions. Suppliers were clearly willing to make the investment for professional displays for this show. Hospitality suites were as elaborate as ever. RainBird's hospitality appeared to exceed others with a Gold Rush theme where each person panned and received a small amount of gold.

Once again, the research session was clearly well attended. An obvious reason is the collection of speakers for that session. For someone strongly interested in turf the session had to be impressive with nearly every major turf specialist in the country on the podium. In three hours the delegates heard Purdue University's Daniel, Californians Gibeault and Madison, Michigan's Rieke, Beard from Texas, Virginia's Couch, Washington's Goss, Arizona's Kneebone, Rhode Island's Skogley and Jackson, and Nebraska's Shearman.

Unfortunately at the same time a session on ornamental pest control was being held. Many superintendents were forced to miss the ornamental sessions on insect and disease control although tapes of all sessions are available. Florida's James Reinert, Ohio's David Nielsen, California's Elmore, and Ontario, Canada's Clayton Switzer thoroughly covered control problems from both northern and southern views.

News subjects covered during the educational sessions included building solar greenhouses by Connecticut superintendent Mark Fuller, integrated pond management by California's Kent

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Members of the Council of Tree & Landscape Appraisers met in Washington, DC, to review current activities and discuss future promotional and educational needs. Shown are (from left, seated) Ray Gustin, representing The International Society of Arboriculture; Chairman L.C. Chadwick, of The American Society of Consulting Arborists; (from left, standing) Fred Micha, The National Arborist Association; John Ferra, The American Association of Nurserymen; and Erik Haupt, representing The American Society of Consulting Arborists.

ECONOMY

Chemical industry expects good year

The chemical industry has bright prospects for 1981, according to a survey of member companies of the Chemical Manufacturers Association. The level of investments which these companies have planned demonstrate their faith that the country's economy will rebound and more production will be needed.

The members predict record shipments of $186 billion in 1981, which would be an increase of 16 percent over the expected 1980 level of $160.6 billion and exceed the 1970-1980 growth rate of 12.7 percent. Expected net income of $12.7 billion will mean an 18 percent increase, a significant improvement over the long-term average growth rate of 11.6 percent.

Chemical industry capital investment in the United States is expected to increase by 20 percent—an outlay of more than $11.5 billion. Capital investment by domestic firms abroad is expected to grow at an even higher rate of 30 percent.

The survey respondents feel that inflation will remain the major nonregulatory problem of 1981, fueled by significant growth rates in costs. For example, raw material costs are expected to increase by 14 percent, and fuel and energy costs at the rate of 16 percent.

ENERGY CONSERVATION

Study notes boom for energy-saving products

Fuel and power prices will jump 9 percent annually over the next 15 years, making investments in energy-saving materials increasingly advantageous, says Predicasts, Inc., a Cleveland-based business information and market research firm.

According to "Insulation & Energy Conservation in Housing," an analysis of the industry, escalating energy costs, government tax incentives and building specifications, and a generally healthy outlook for housing starts will combine to create an over $16 billion market for energy conservation products by the mid-1990's.

Until 1985, shipments of energy conservation products will grow at an average of 12 percent annually, reaching $7.6 billion, with the retrofit market expanding particularly rapidly.

CONFERENCE

Dr. Beard addresses turfgrass conference

Professional turf managers will be more important as the turf industry

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News *from page 8*

faces higher energy costs and a lower supply of water—and they can expect to command higher salaries.

This outlook was presented by Dr. J.B. Beard, professor of turf and crop physicology at Texas A&M University, at the 1981 Nebraska Turfgrass Conference and Show held January 12 to 14 in Omaha, Nebraska. The annual event is sponsored by the Nebraska Turfgrass Foundation, the Nebraska Cooperative Extension Service, and the University of Nebraska Department of Horticulture.

With high energy costs, conservation will be a high priority, Beard told the 575 turf professionals attending the conference. Trends to selective mowing of certain areas, use of more energy-efficient reel mowers, and increased use of large equipment are on the horizon, he stated.

Since nitrogen costs are higher, he said, "there is a need to accept a less deep green color in some areas and develop varieties that will hold their green color at lower nitrogen levels." He predicted more research on growth regulators to develop grasses which require less frequent mowing.

Water quality may decline, Beard warned, as salt and boron levels build up with increased use of effluent. And the quantity of water available for turf also will be reduced. "We have far too many intensively managed turf areas that are overwatered."

MEETING

Weed science meeting held in Philadelphia

The 35th Annual Meeting of the Northeastern Weed Science Society, held January 6-8 at The Philadelphia Sheraton Hotel, drew more than 400 members.

About 140 scientific papers were presented on horticulture, ecology, agronomy, ornamentals, and forestry. "There was a lot of enthusiasm at the meeting because of the current nature of the papers," said Garry Schnappinger, NWSS president. "They discussed new chemical compounds and those that would be on the market in a year or so."

The keynote speaker, Dr. Jack D. Early, president of the National Agricultural Chemicals Association, spoke on "Pesticide Regulation: How Much Is Enough?" Dr. Early criticized the "unscientific handling of scientific data by regulatory officials," citing the recent recall of the proposed nitrite ban

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LANDSCAPE CONTRACTOR NEWS

Landscape costs increased 14% over 1979

A recent management survey conducted by the National Landscape Association reveals that all costs of plant materials, supplies, and services have risen overall 14 percent from 1979 to 1980.

The survey asked members from all regions of the country to indicate the percent of increase (or decrease) they experienced in landscape costs for 1980. The particular categories included trees, shrubs, evergreens, ground covers, fuel, fertilizer, mulch, freight, and labor. Fuel was by far the largest area of increased costs, rated at 30 percent on a national basis. Freight, fertilizer, and labor also rose a high percentage.

In regional variations, it was interesting to note that for most items the greatest increases as a region were experienced in the Southeast, while the smallest increases were noted in the Great Lakes area.

LANDSCAPE COST COMPARISONS 1980 vs 1979
(% Change from 1979)

Region	Trees	Shrubs	Ever-greens	Ground Covers	Fuel	Fertilizer	Mulch	Freight	Labor	Overall
Northeast	+12	+11	+13	+8	+27	+16	+13	+12	+13	+10
Southeast	+ 8	+13	+13	+8	+43	+22	+14	+18	+24	+19
Great Lakes	+ 6	+ 5	+ 7	+7	+28	+ 9	+ 8	+24	+15	+ 9
Plains	+10	+10	+11	+7	+25	+10	+12	+16	+13	+15
Others	+18	+13	+11	+8	+19	+17	+13	+23	+11	+15
National	**+12%**	**+10%**	**+11%**	**+7%**	**+30%**	**+15%**	**+12%**	**+18%**	**+13%**	**+14%**

Behnke installed as president of ASLA

William Behnke, a landscape architect from Cleveland, was installed as president of the American Society of Landscape Architects at the group's annual meeting last November.

To prepare for his service to ASLA, Behnke invited landscape architects from all over the U.S. and Canada to Cleveland to discuss how they might have more control over their economic destiny. After the meeting, he said, "Improvement of our financial potential need not lessen or endanger our professional ethics. Both improvement of the long range economic future and the need to maintain high standards of professionalism are possible."

Calvin Bishop, a Houston-based member, will serve as president-elect of the group. Vice presidents elected for 1981 include Donald Fox of Yosemite National Park and Brian Kubota of Kansas.

Also at the meeting, ASLA awarded their highest honor to William Grant Swain, president of GWSM, Inc., Landscape Architects, of Pittsburgh.

ALCA Field Day planned for Milwaukee

The student event of the year sponsored by the Associated Landscape Contractors of America and their student chapter at Milwaukee Area Technical College occurs April 3-5 at MATC in Milwaukee.

This event represents a chance for college students throughout the country to meet and compete in activities directly related to the skills necessary in the horticulture industry. It is also a time to meet with prospective employers in the landscape industry to discuss full or part-time employment.

Activities include identification of insects and plants, operating equipment and designing landscapes, and basic horticulture work with plants. For more information, write Milwaukee Area Technical College, North Campus Center, 5555 West Highland Rd., Mequon, WI 53092.


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The transmission has 8 forward speeds, starting with a 1 mph "creeper" gear to a transport gear that moves you along at a speed of around 12 mph.

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GOVERNMENT UPDATE

CAST asks EPA to dispose silvex by use

The president of the Council for Agricultural Science and Technology (CAST), R W Fogleman, has made the latest request to the Environmental Protection Agency to consider disposing of silvex by use rather than by incineration and burial.

Fogleman offered seven points to EPA Administrator Douglas Costle to consider. These include:

- The TCDD in silvex products would decompose in one day if they were applied to foliage as an herbicide or to soil as a fertilizer top dressing.
- TCDD in the solid products may last a long time if buried. Almost all of the TCDD in liquid silvex is decomposed if the incineration temperature is sufficiently high.
- Disposal of the silvex products by use would be a less expensive, more responsible use of public funds than disposal as hazardous wastes.
- If EPA goes ahead with the disposal of silvex as hazardous wastes, it "will be spending more than $26 million to dispose of less than 0.03 pound (one-half ounce) of TCDD."
- "To destroy at great cost and as hazardous wastes the silvex-bearing products that could otherwise be used to improve societal welfare without constituting a significant hazard is a waste of the valuable resources used to produce, transport, and dispose of them, as well as a misrepresentation of the character of the products to the public.

U.S. Government promotes tree planting

The government is encouraging home owners to plant trees around their homes to save energy and money.

"The trees can easily pay for themselves in fuel savings in a matter of a few years," says a USDA representative. The agency says that a row of trees can cut down wind and reduce home heating bills by as much as 20 percent.

The government's basic premise contends that trees help cool the home in summer, cut wind and cold air in the winter, increase the value of the home, attract birds, and clean the air.

Trucking deregulation bill is passed

A new trucking deregulation act makes it easier to obtain certification by the Interstate Commerce Commission. The act retains agricultural exemption (which includes nursery stock) and also eliminates the gateway requirements and circuitous route limitations imposed on motor carriers. Carriers now are permitted to carry mixed loads of both regulated and exempt commodities. Nursery stock may still be transported by nonregulated carriers.

AAN Traffic Consultants have published a booklet entitled "Trucking Deregulation: How Far It Actually Goes," available from Bohman Industrial Traffic Consultants, 335 East Broadway, Gardner, MA 01144. Prepaid orders are $8.95 each.

Government regulation will be curtailed

Government regulation will decrease in the Reagan Administration, owing to protests against the cost of government paperwork by the business community. No new regulations will be issued by agencies until the new Administration has had the opportunity to review them and determine whether they are needed.

Crop insurance amendment covers nurseries

The Federal crop insurance program has been amended to cover nursery crops. The amendment was requested by the American Association of Nurserymen and introduced by Representatives Panetta and Coehlo (D-Calif.). Under the provisions of the act, participation in a program is voluntary, and the Federal government will pay 30 of up to 65 percent of normal crop yield.

News *from page 11*

and the suspended use of the herbicide 2,4,5-T. Such actions, he said, have sparked anti-pesticide sentiment in many local areas and helped influence a growing trend by some states to outregulate the federal pesticide law.

To reverse this trend, the NWSS has recently launched a plan to offer expertise and advice to state pesticide associations in dealing with legislative issues. This plan includes legislative workshops and an enlarged media tour program for the coming year. Dr. Early also called for "an increased level of cooperation between state pesticide associations and allied agricultural and scientific groups."

On Wednesday, January 7th, a special symposium was held on biological weed control with the use of plant pathogens. Dr. D.S. Kenney of the Abbott Research Center, and Dr. S.W.T. Batra and Dr. Bob Enge, both of USDA, discussed this alternative method of control.

At a business meeting, Tom Watschke, weed control turf specialist at Pennsylvania State University, was elected vice president. The 1980 president-elect, R.B. Taylorson, automatically became president during 1981, and the new president-elect is Steve Dennis.

PEOPLE

Golf course builders elect new officers

The Golf Course Builders of America, an association of golf course contractors and industry suppliers, has elected Frank A. Underwood of Bowie, Texas, president. Mr. Underwood, who served as president in 1974 and 1975, succeeds Nick A. Siemens of Fresno, CA.

Robert Ryan, vice president of Moore Golf, Inc., in Culpeper, VA, was chosen vice president. Carl Hedlund and James J. Kirchdorfer were reelected secretary and treasurer.

ACQUISITION

Florida nurserymen buy plant exposition

The Florida Nurserymen and Growers Association has purchased The Tropical Plant Industries Exposition held annually in January at the Diplomat Hotel in Hollywood, Florida.

Terms of the sale call for FNGA to continue the annual exposition as a high-quality foliage show with at least a

Continues on page 82

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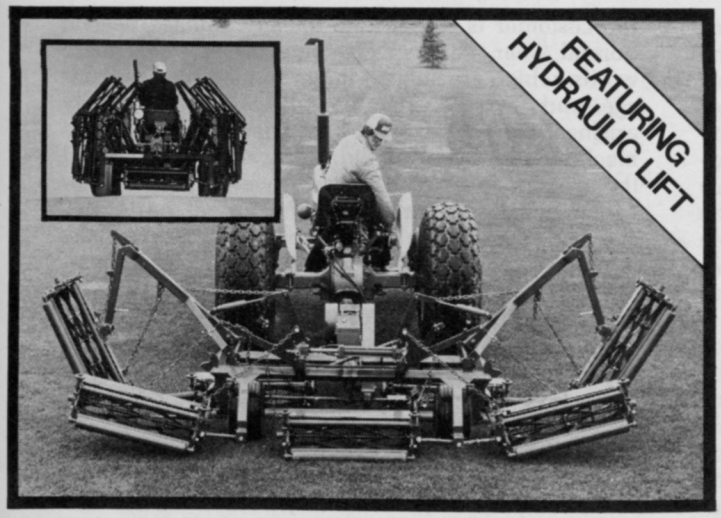

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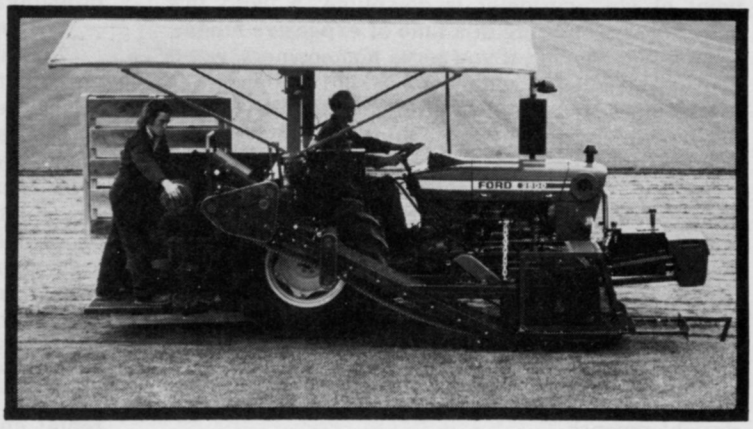

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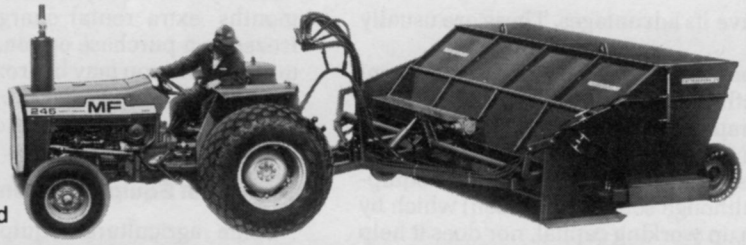

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The Turf Equipment People

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SHORT-TERM RENTALS MAY HELP YOU MATCH EQUIPMENT TO MARKET

New monthly feature to assist the landscape market with equipment purchase, rental, maintenance, and business management.

Dave Johnstone has more than 15 years experience in the construction equipment market. He has managed product information to the construction and rental equipment markets and has worked for a rental industry association. He has hands-on experience with nearly all types of outdoor equipment. If you have topics you would like Dave to address, you may write him at 267 Willow St., New Haven, CT 06511.

You can blame computers and the U.S. Postal Service for it: market segmentation is increasing. Advent of the nine-digit ZIP code, which is being implemented this year and will spread to most parts of the country over the next couple of years, means that markets can be defined down to carrier routes, that is, to major buildings, to industrial parks, to high-rise residences. This probably means greater promotion expenditures. The curious thing about all this is that people on the whole are thinking more and more alike, but they believe their own positions to be unique, which is just as bad as if they were actually unique.

If you bid on a maintenance *or* installation contract, you may have your equipment specified for you by someone who has consulted a computer or who has a friend with that equipment. In any event, you're likely to have to field a lot more questions about completion time and equipment capacities than in the past. The time you spend on site preparation from the standpoint of your customer is downtime, a word that has a threatening ring in a time of expensive money. Even a homeowner, if you serve homeowners, wants you in and out fast without that kind of damage to fences that is too minor to prosecute, too irritating to forget—which again means equipment appropriately sized.

You can't very well go out and buy new equipment for each job or you would soon be bankrupt, and so you must find an alternative means of acquisition. It's not leasing, because leasing involves a longterm commitment, generally of a year or more.

It's renting, a concept that you may not have thought about recently. The disadvantage of renting is that you cannot depreciate the equipment (depreciation is a source of capital) but must treat the equipment as a straight expense.

Advantages of Renting

Renting does have its advantages. These are usually promoted as:

1. Conservation of capital. Renting equipment frees money for other uses. As such, it's relied on by many large corporations and public works people, especially at the end of budget periods. Renting does not really increase ease of borrowing money, since equipment is an asset (although somewhat frozen) which by depreciation frees up working capital, nor does it help contractors of any kind to obtain performance bonds.

2. Provided maintenance. Rental rates include full maintenance, but before committing yourself to an equipment source, you had best check out service capacity and willingness. Rental contracts specify that the customer is responsible for any damage beyond normal wear and tear (specified in precisely those words, which are subject to definition), for tire damage, and for safe operation (disclaimer of liability arising from operation of an intrinsically dangerous machine is probably invalid; if the rentor has modified the machine in any respect, as by welding controls together, he is treated as the manufacturer of the device). Ask to see the rentor's liability policy. Make certain the equipment is covered by his insurance, your insurance, or both. Many rentors offer a damage waiver, which usually adds 5 percent to the rental rate.

3. Savings in storage space, which only applies if the rental equipment is kept working.

4. Inventory control. Cost of theft (conversion) is usually borne by the rentor's insurance carrier. This has recently become a major reason for renting equipment.

5. Mobility. Regardless of job location, there is probably a rental facility in the near neighborhood.

6. Disposal cost is eliminated by renting.

7. Matching equipment to task—probably the most important reason—is made possible by rental.

8. Idle equipment time is minimized by rental.

9. Costs of personal property taxes and licenses are eliminated.

10. In many cases, you will be able to exercise a purchase option if you indicate your desire to do so at check-out of the equipment. Where purchase options are available, terms are variable. Following are some typical arrangements: If purchased within 30 days, renter recaptures 80% of rental charges; if within 60 days, 70%; if within 90 days, 60%; if within 120 days, 50%; if within 150 days, 40%; if within 180 days, 25%. Limit, 90 days; if purchased within 90 days, 85% of rental charges recaptured; if purchased within six months, 80% of rental charges. If cost has been amortized by rental, equipment is sold for "one or two months' extra rental charges." You are usually not frozen to a purchase option, if you say you may be interested; but you may be frozen out of one, if you do not express interest at sign-up time. Not all equipment dealers have rental plans; not all rental plans are available with purchase options.

Sources of Equipment Rentals

Some agricultural equipment dealers may offer rentals, but they would be in the minority (for rentals as opposed to longterm leases). Your primary sources will be construction equipment dealers and specialty rental yards. Of specialty rental yards, you may find your best sources among construction/industrial

equipment yards. Lawn & Garden specialists are sometimes helpful but concentrating on homeowners as most of them do, their equipment may be too light. Specialty rental yards don't usually advertise extensively beyond Direct Mail and the Yellow Pages.

Not Too Early To Promote Industrial Contracts, Even in Snow Belt

In fact, it's probably a little late but better late than never. Some people just can't be coerced into thinking Spring until Spring happens.

The key to industry (as you've already found, if you're doing industrial business) is offered by the purchasing agent in combination with whomever is responsible for building and grounds. If you don't know the latter, ask the switchboard operator. It's as easily learned as that.

In today's less than certain business climate, investment in grounds has probably been cut back (unless the industry is involved with the prospering computer field, all segments of which are marching merrily onward and can't be sold with a recession appeal).

You might score some points by breaking the approach formula and directing your promotion to the Chief Executive. Your "copy platform": an exterior beauty treatment by a professional at the start of the season will boost employee morale and enhance customer relations.

The contrast between the booming computer industry and other elements of the economy which are somewhat sagging is a perfect illustration of increasing market segmentation. Mismatched promotion can be as ineffective as mismatched equipment.

If you haven't planned a promotion program for the rest of the year, it's time to get going on it. First decision to make is where you want to be at the end of the year and then you have to allocate budget to get there. It's really no good to set your own budget by the competition or even according to last year's performance. You have to budget by this year's objective. And considering inflation, if you want to stay where you are, your business will have to increase by 12 to 13 percent. Your promotion budget should be boosted accordingly.

All other factors being equal, it's probably easiest to grow from your present customer list. Think for awhile about where most of your business comes from and concentrate on prospects who most resemble your current "customer profile." **WTT**

HERBICIDES FOR DIFFICULT WEEDS IN COOL SEASON TURFGRASSES

By John A. Jagschitz, Associate Professor in Turf, Rhode Island Agricultural Experimental Station, Kingston, RI

Most weeds can be controlled selectively in turfgrass areas with herbicides. However, a few weeds are extremely difficult to control. When turf becomes weak and thin these weeds invade and take over. Therefore, vigorously growing, competitive turf will help reduce weed problems and this is extremely important when the invading weeds are those which are difficult to control. To make grass grow at its best use adapted and improved turfgrasses, properly fertilize, mow and water, control insects and diseases, reduce traffic, etc. To have a successful weed control program, you must couple good management with the use of herbicides.

Sterilization of Soil

Weeds which are extremely difficult to control selectively might best be controlled before grass is established. These could include such weeds as annual bluegrass, bentgrass, nimblewill, quackgrass, velvetgrass, veronicas, etc. There are soil fumigants that will kill vegetative material and weed seed in the soil. Most weeds in turf come from seed already present in the soil. Some of the fumigants presently in use are: metham (VAPAM, VPM), methyl bromide (DOWFUME), and methyl-isothiocyanate (VORLEX). Depending on the material used and weather conditions, seedings have to be delayed for a few days to three weeks. Use of fumigants may be costly and should be handled carefully as they can be harmful. However, they can accomplish the job more quickly than employing tillage and fallowing techniques which may require several months or more to reduce weeds and weed seed in the soil.

Renovation Chemicals

There are chemicals that are not selective and will kill all vegetation on contact. Those herbicides which persist in the soil for only a short time or do not interfere with grass seedings are helpful for turf renovation. This technique is especially valuable for areas containing those weeds which are extremely difficult to control selectively. Materials such as glyphosate (ROUNDUP) and paraquat (PARAQUAT CL) are useful for this purpose. These chemicals are also useful for spot treatment of weeds. Glyphosate has provided consistent and complete kill of most grasses and broadleaf weeds and does not interfere with the establishment of grass from seed. Seedings made within a week after the use of paraquat, especially in a thatchy area, may produce a slightly reduced grass stand.

Specific Difficult Weed Problems

Goosegrass — This annual grass is not as easily controlled as is crabgrass. Since it germinates a few weeks later than crabgrass, better results might be obtained with preemergence herbicides if they are (1) applied later in the season and closer to the time of goosegrass germination so that a higher chemical concentration is present and (2) applied at the normal rate and time used for crabgrass control followed by a half-rate applied about six weeks later or just before the expected period of germination. We have found oxadiazon (RONSTAR) to be the most effective herbicide for preemergent control of goosegrass. However, oxadiazon is presently suggested for use only in Kentucky bluegrass turf. One can expect considerable bentgrass injury if used on putting greens.

Annual bluegrass *(Poa Annua)* — There is no simple or easy method of control. The best approach will include proper management, use of correct grass species or varieties, and the aid of chemicals as a tool for the elimination of annual bluegrass. Preemergent herbicides such as benefin (BALAN), bensulide (BETASAN, PRE-SAN, etc.), DCPA (DACTHAL) and oxadiazon (RONSTAR) are suggested for use in preventive programs. We have had good results with bensulide. These preemergent herbicides are only effective if applied before annual bluegrass germi-

Sterilizing soil and reseeding after weeds have been removed can make a big difference in the appearance of turf. Background, left, is sterilized soil; background, right, shows growth after weed-free seeding; and foreground shows normal weed cover.

Patch-like appearance of annual bluegrass in this Kentucky bluegrass lawn works its way into turf stands throughout the northern half of the country. *Poa annua* is the bane of many turf managers.

nates. They do not kill established plants.

Since some annual bluegrass plants live for several years, one can easily see why preemergent herbicides will show good results only if used in a preventive program where the initial amount of annual bluegrass can be tolerated. Annual bluegrass seed can germinate from spring through fall, although peak germination usually takes place in late summer. For the preventive program to be successful, a herbicide barrier must exist in the turf during the entire germination period. A full herbicide rate is suggested for late summer (August) with a half-rate in early spring (March-April). If crabgrass and other annual summer grasses are a problem, then a full spring rate should be used or an additional half-rate should be applied in late spring. Other materials such as maleic hydrazide and chlorflurenol (MH + CF, PO-SAN) are used in an attempt to prevent annual bluegrass seed production and reduce the plant population. This technique has had some success but it depends upon (1) the amount and longevity of viable seed already present in the soil and (2) seed yields being eliminated during the entire growing season.

Endothall (ENDOTHAL) and linuron (LOROX) are two herbicides suggested for postemergence control of annual bluegrass. With these compounds, one can expect some turfgrass discoloration or injury. Usually the injury is temporary and the grass recovers. Linuron is only suggested for use in Kentucky bluegrass turf since other grasses (bentgrass, fescue, and ryegrass) can be seriously injured. These postemergent herbicides might provide the best results if used at low rates and at frequent intervals so that a gradual removal of annual bluegrass takes place. This would be especially true in turf areas where the annual bluegrass population exceeds 15 percent. One could tolerate 15 percent brown turf, as dead annual bluegrass plants, but could you tolerate half your turf being dead because half of it was annual bluegrass. If turf contains more than 50 percent annual bluegrass, you might consider renovation chemicals as discussed earlier. A postemergent program will require proper management to encourage the perennial grasses to fill in and the use of a preemergence herbicide to prevent the establishment of bluegrass plants from seed. As can be seen, there is no simple or easy method for annual bluegrass control.

Bentgrass as a Weed — Under some situations, bentgrass can be considered a weed. It is very difficult to control selectively. As was discussed for postemergence annual bluegrass control, endothall or linuron in Kentucky bluegrass turf might offer the best chance of success. Others have suggested the use of endothall or silvex (presently banned from use) at high rates in Kentucky bluegrass during the hot summer. Some suggest control by the use of leaf herbicides accompanied by very close mowing of the bentgrass - Kentucky bluegrass turf in the fall.

Nutsedge — Selective control of nutsedge in cool-season grass areas can be obtained by using bentazon (BASAGRAN) or the methanearsonates, such as: AMA, DSMA, MAMA, MSMA, etc. Two applications of either material at low rates and at a 10-day interval are more effective than a single high rate. Control is usually more complete when treatments are made in early summer rather than late spring. Possibly this is related to timing the herbicide application with the emergence of most plants from nutlets (tubers). The methanearsonates are used at the same rates and with the same techniques suggested for their use in postemergence crabgrass control. Some turfgrass discoloration can be expected. However, if crabgrass is present, then one should choose these materials to obtain control of both crabgrass and nutsedge since bentazon does not control crabgrass. However, if no crabgrass problem exists, the material of choice should be bentazon. It is more effective and most grasses are more tolerant of it. It can also be used in seedling turfgrass (not perennial ryegrass) and will provide some control of annual broadleaf weeds.

Broadleaf Weeds — To control most weeds, use a mixture of 2,4-D with either one or two of the following: dicamba (BANVEL), dichlorprop (2,4-DP), or mecoprop (MCPP). With difficult to control broadleaf weeds, one can make a second application about three weeks later and probably achieve better results. In putting green turf to control clover, chickweed, or pearlwort, one might consider dicamba or mecoprop. Knotweed or red sorrel may best be controlled with mixtures containing dicamba while oxalis may best be controlled with mixtures containing dichlorprop.

Creeping speedwell — Researchers in New York and Pennsylvania have obtained good control of this weed by using DCPA (DACTHAL). They applied DCPA at the rate of 12 pounds active ingredient per acre in the spring to established stands of creeping speedwell. They had slightly better results with 6 pounds in May and another 6 pounds in June. Check the label or consult recent recommendations as to the need for follow-up treatments. Endothall has been used in the past for control but some turfgrass discoloration can be expected and some weed regrowth will usually occur.

Prostrate Spurge — Earlier trials in California and more recent ones in Rhode Island have shown that DCPA (DACTHAL) will provide preemergent control of spurge. Siduron (TUPERSAN), another preemergent herbicide, also provided some spurge control but the results were not as consistent as those obtained with DCPA. The rates and timing of these preemergent herbicides were similar to those used for crabgrass control. In trials with postemergent treatments, the most effective material with the least potential for injury to cool season turfgrasses, especially putting green bentgrasses, was bromoxynil (BROMINAL, BUCTRIL). This herbicide is generally used for seedling broadleaf weed control in new grass seedings. The optimum rate appears to be 1 to 2 pounds per acre which

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A slicer-seeder does renovation seeding after vegetation has been killed by herbicides.

Write **134** on reader service card

PREEMERGENCE AND POSTEMERGENCE ALTERNATIVES FOR WEED CONTROL

By T. L. Watschke, Associate Professor of Turfgrass Science, The Pennsylvania State University

Turfgrass chemical weed control has evolved from a non-selective, spot treatment approach prior to 1944 to selective broad spectrum programs during the 1970's. With a few exceptions, almost all broadleaf weeds could be controlled selectively in turf until the Environmental Protection Agency (EPA) action against silvex in February, 1979. The loss of silvex has reduced the completeness of broadleaf weed control in turf, but hopefully the problems that have been created can be resolved with existing technology. Action by EPA against any other currently used selective broadleaf herbicides for turf would cause a significant reduction in weed control capability for turf managers. Successful weed control is the result of the following steps: 1) identification of the weed, 2) recognition and implementation of proper cultural control practices, and 3) selection and proper application of herbicide. The following is a review of some of the currently available pre- and post-emergence herbicides.

Cultural Practices

Weeds are excellent indicators of soil conditions, use of an area, and its management. For example, compaction, pH, poor drainage, low fertility (particularly nitrogen), and poor structure are soil conditions that may be indicated by the presence of certain weeds. Inappropriate mowing and irrigation practices can make certain weed species more competitive than turfgrasses. The lack of good disease and insect control programs can result in weakened turf that is easily invaded by weeds. The objective of sound cultural weed control practices (in reality—good management) is to eliminate voids in the turf stand where weeds can get their start. Without space to grow the weeds cannot compete.

Preemergence Control

The primary preemergence herbicides used on cool season turfgrasses are benefin, bensulide, DCPA, and siduron. The rate of control will vary depending on formulation, timing of application, soil type, rainfall, location, and other factors. Regardless of the material used, the most important factor is the timing of application. These materials must be applied prior to the germination of the weed species that is to be controlled. Ideally, application should be made 7-10 days prior to the anticipated germination of the weed.

Benefin is a 2.5 G granular product recommended for use at 2 pounds of active ingredient per acre (ai/A). This material provides excellent control and may cause minor injury to fine fescues. Benefin is labeled for multiple season application which allows for second applications (when needed) to eliminate late season germination. Benefin is not recommended for use on bentgrasses.

Bensulide is formulated in both granular and liquid forms. It is recommended for use at 7.5 pounds ai/A for the control of smooth crabgrass. Bensulide has good safety on all cool season grasses and provides excellent control. Bensulide also provides good preemergence control of annual bluegrass.

DCPA is formulated in both wettable and granular forms. It is recommended for use at 10.5 pounds ai/A and provides excellent control. DCPA may cause minor injury to fine fescues, but the injury is not permanent. DCPA is not labeled for use on bentgrasses.

Siduron is most commonly marketed in the wettable powder form (50 W). It is recommended for use at 12 pounds ai/A. Siduron may be used in a seedbed at 6 pounds ai/A to control summer annual grasses without inhibiting the germination of the desired species. Siduron also has early postemergence activity, but is recommended for use preemergence. Due to solubility, siduron may not be as effective as the others for season-long control in wet years. Repeat applications may be required.

Postemergence Control

Postemergence control of summer annual grassy weeds may be necessary and the best materials to use are the organic arsenicals (AMA, CMA, DSMA, MAMA, and MSMA). These materials require multiple applications and are generally not as effective as preemergence materials.

Selective postemergence broadleaf weed control is primarily accomplished through the use of 2,4-D, MCPP, dicamba, and various combinations. When the weed population consists of dandelions and plantains 2,4-D alone provides satisfactory control. The recommended rate of 2,4-D is 1 pound ai/A from liquid formulations and 2 pounds ai/A for granules. However, in most situations, the spectrum of weeds present usually includes those that 2,4-D alone will not sufficiently control. Fall applications are preferred for controlling dandelions because early spring flowering will be avoided. Spring applications are also successful and preferred over summer application. For the control of wild onion and wild garlic, the ester formulation of 2,4-D should be used in the spring at a rate of 1 pound ai/A.

Dicamba is recommended at the rate of 0.5 pound ai/A for the control of knotweed, spurge, clover, and other legume type weeds. However, if dandelion and plantain are part of the stand, 2,4-D and dicamba should be combined at the rates of 1 and 0.25 pound of ai/A, respectively. This combination controls a broader spectrum of weeds with a lower dicamba rate than when it is used alone due to a synergistic effect which results from the combination. Dicamba used alone should not be applied under the dripline of ornamentals.

Mecoprop (MCPP) is effective on many of the weeds controlled by dicamba, but is rarely used alone except for weed control in bentgrass. It may also be used alone in situations where ornamentals are involved, as applications of MCPP under the dripline can be safely accomplished.

Most frequently, broadleaf weed populations on home lawns consists of many different types of weeds. Consequently, 2,4-D, MCPP, and dicamba are com-

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SPRAY UNITS ARE BECOMING MULTI-USE, MORE EFFICIENT

By Ruth Messinger, Contributing Editor

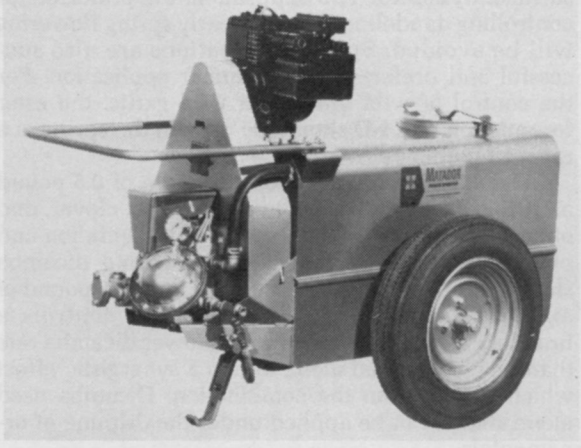
Spraying equipment for lawns, trees, and golf courses has become more versatile, according to a survey of the latest equipment manufacturers in the field. "The contract applicator that fertilizes lawns also takes care of shade trees and shrubs, either with a separate piece of equipment or in one unit that performs both functions," says Roger Cohill, president of Agrotec. Some new spraying equipment comes with tanks which have two compartments to hold different materials for varied applications. Other models contain larger-capacity tanks mounted on trucks and trailers that can cover large areas of foliage and turf.

Accessories such as hose reels, spray wands, and guns send streams of pesticides into the tallest trees. Improved pumps supply more power, allowing the use of a wide variety of materials—herbicides, fungicides, insecticides, fertilizers, and suspension mixes.

Besides keeping the capital investment down, this multi-purpose approach has the advantage of saving fuel costs. "People want more gallons per hour of herbicides, pesticides, and fertilizer," says one distributor.

An emphasis on quality rather than quantity is another trend reported by spraying manufacturers. Lawn care companies and arborists are demanding concentrated sprays that use less water, more exact coverage of spray areas, and pumps that can handle different types of chemicals.

Contract applicators are diversifying to provide more service to their customers," says Tom Seyward, vice president of Tuflex. "Not only will they come to treat the lawn, but they will spray the trees and shrubbery, and go inside the home to treat for ants, silverfish, German cockroaches, and any other pests."



Hudson Matador Sprayer has a tank capacity of 15-100 gallons. Its pump develops 250 or 300 pounds of pressure.

Among the versatile sprayers introduced recently is the Hudson Matador Power Sprayer, whose 15- to 100-gallon tank capacity fills the needs of almost any power-spraying job—from covering large turf areas to spraying high into trees. Its heavy steel tank with Endurall epoxy-coated liner resists corrosion, and the piston pumps develop up to 250 or 300 pounds of pressure. A power-jet agitator keeps materials mixed for uniform discharge. Write **901** on reader service card.

E-Z Rake's Model 83 E-Z Spray for spraying herbicides, pesticides, and liquid fertilizer comes with a new remote wand for reaching shrubs and trees. The wand features a convenient on-off valve that changes quickly from boom to wand spray, and the wand spray stream can attain a height of 20 feet. This model can be used with most riding mowers or garden tractors equipped with 12-volt electrical systems. Write **902** on reader service card.

Minnesota Wanner has introduced a lawn care industry model, KW-C560-SLC, that meets the requirements of most commercial applicators and includes a 560-gallon capacity tank. The unit mounts on a heavy structural steel base frame and easily attaches to a flatbed truck or a one-ton pickup.

The company's tandem trailer-mounted, mechanical invert sprayer, the KW-MC12ETTX5, is also equipped with a 560-gallon tank. The 500-gallon water compartment has a 16-inch manhole, and the 60-gallon chemical section is fitted with a two-inch pressure vacuum fill cap. Write **903** on reader service card.

Friend Mfg. Co. offers multi-purpose, high-pressure sprayers—the Comander C and D series—with 100- to 300-gallon capacity and piston or diaphragm pumps capable of 7 gpm or 14 gpm up to 450 psi. The trailer and skid models are corrosion-resistant.

Friend has also redesigned its 200- gallon PTO air-sprayer, the AK-II. New distribution piping at the fan housing makes this sprayer useful for orchards with trees up to 16 feet high, as well as for vineyards and dwarf plantings. Another improvement is a diaphragm pump that delivers over 13 gpm at 400 psi, making AK-II effective for gun-spraying. Write **904** on reader service card.

Hahn's self-propelled sprayer, called "Spray Pro," applies fungicide, herbicide, insecticide, and liquid fertilizer to golf greens, grounds, and lawns. It is

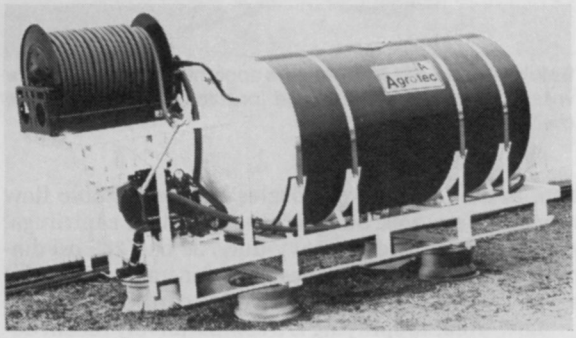
Hahn's Spray-Pro is self-propelled. It has a 160-gallon poly tank, centrifugal pump, and 15-foot boom.

equipped with a 15-foot, three-section folding boom. The 19 boom outlets provide precision application not possible with a handgun. Other features are a 160-gallon polytank with jet agitation and a centrifugal pump (100 psi maximum, 55 gpm maximum). An op-

tional spreader for sand, seeds, fertilizer, or lime—or a utility bed—replaces the tank in minutes. Write **905** on reader service card.

Another new self-propelled sprayer for multiple use is available in several models from Maruyama. The operator can manage both traveling and spraying from the driver's seat. The fiberglass-reinforced plastic tanks are corrosion-resistant, and liquids are automatically agitated. A spray gun and 20-in. spray hose are optional. Write **906** on reader service card.

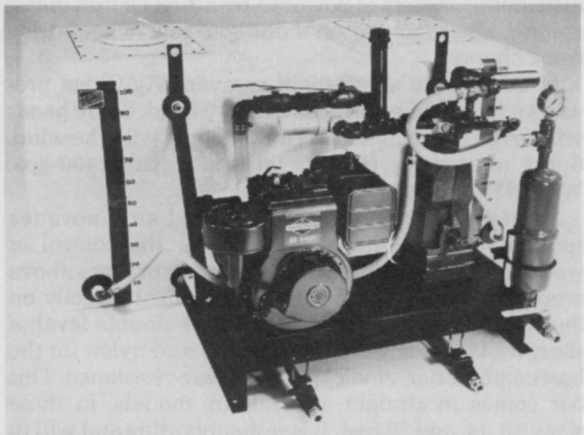
For the applicator who needs a tall tree sprayer, Agrotec offers the ES4705, equipped with a four-piston, cast-iron Hypro pump powered by an industrial 16-hp Briggs & Stratton engine with a 12-volt electric starter. An electric rewind hose reel is standard, with 100 feet of ¾-inch high pressure hose.



Agrotec's ES 4905 skid sprayer comes with a 55- to 500-gallon tank and a wide range of pressures and volumes.

Agrotec's ES4903 and ES4905, which feature hydraulic agitation, can mix fertilizer. The high-pressure centrifugal pump has enough volume to cover large areas of lawn quickly and accurately, and the necessary pressure to spray shrubbery and trees up to 30 feet in height. Write **907** on reader service card.

A single-cylinder, medium-pressure Dobbins sprayer by Master Manufacturing Co. can spray all types of pesticides, herbicides, soluble fertilizers, and disinfectants. This sprayer has a trailer hitch with parking stand for attachment to riding tractors. It comes with a four-nozzle, five-foot boom that provides 6½ feet of spray coverage. The non-corrosive, polyethylene tank holds 30 gallons, and the piston pump delivers up to 2.5 gpm at 300 psi. An 18-inch orchard gun can hand spray a solid stream or a fine mist. Write **908** on reader service card.



With a tank divided into two 100-gallon compartments, the Tuflex 200 can apply two chemicals to a lawn at one time.

Tuflex's PC 300 offers greater diversification in a single unit. It is divided into two 150-gallon compartments and designed to mount behind the cab of a standard pickup truck. By using the separate compartments, a lawn-care company can apply two chemicals to a lawn at a time without mixing them, thereby saving time and money. The divided tank also eliminates the need for separate pieces of equipment for pesticides and fertilizer. A smaller model, the PC 200, is composed of two 100-gallon compartments.

"We are also developing a PC 500 sprayer on the same design as our PC 800 and the 1200, but with a scaled-down tank because of the industry's demand for smaller trucks that take less fuel to run," says Tom Seyward. Write **909** on reader service card.

To satisfy the demand for exact spray coverage, The Broyhill Company has introduced MicroMax spray nozzles, which apply low volumes of herbicide yet obtain adequate weed control. These applicators maintain a consistent droplet size and uniform pattern width through the use of rotary atomization. Droplets are large enough not to drift, but small enough to give thorough coverage without waste and dangerous runoff. Due to the low volume, at 12 mph a 200-gallon tank will cover 130 acres, saving water, water-support equipment, and fill-up time. The amount of water required is as low as 1½ gallons per acre," says Craig Broyhill, the company's sales manager. WRITE **910** on reader service card.

A Broyhill sprayer with MicroMax Rotary Spray Nozzle applies chemicals to a lawn in controlled droplet sizes.

Micro-Gen Equipment Corp. embodies the principle of ultra low dosage through controlled droplet size in its Model G-9 sprayer. The pickup-truck-mounted unit sprays insecticide into the air in the form of fog, which remains in suspension for a long time and destroys flying insects. It may be sprayed on a golf course early in the morning before play begins, or the preceding evening. Another feature of the G-9, digital flow control, delivers greater accuracy in insecticide flow and shows the actual flow rate to a tenth of an ounce per minute. Write **911** on reader service card.

Solo's 451 and 452 PTO Mistblowers also offer a saving through high-concentrate, low-volume applica-

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Spray Units *from page 23*

Solo's 451 and 452 Mistblowers apply high-concentrate, low-volume spray and are designed for tractors with horsepower over 18.

tion. Individual blower nozzles have adjustable flow rate and direction. Solo 451 comes with a centrifugal pump, and 452 uses a heavy-duty, 20 bar/285 psi diaphragm pump. Both are designed for tractors of 18 hp and up. Write **912** on reader service card.

"Low-volume spraying is a comparatively recent development," says Bill Plymat, advertising manager of Ag-Chem Equipment Co. "Most sprayers are old-fashioned dilute, but more and more growers are turning to this technique." Nurserymen and Christmas tree growers use his company's Ag-Tec equipment. The line of six low-volume sprayers applies fungicides, pesticides, and nutrients.

Specifically designed for the large citrus grower and commercial applicator, the Ag-Tec self-propelled Model 6013-500 Double Citrus Head uses high-air velocity and low-volume spray heads for spraying. It has a 500-gallon tank of stainless steel and is permanently mounted on a one-ton, four-wheel-drive truck chassis that accommodates a 350-cubic inch GMC engine with dual rear wheels.

For very tall trees with dense foliage, Ag-Chem presents Model 6013-500 Orchard Head. A single orchard head gives extra top reach and thorough coverage. The distribution system is powered by a 3-53 Detroit diesel engine, also mounted on a one-ton, four-wheel-drive truck chassis.

In addition to a variety of sprayers, Ag-Chem provides a choice of nine types of spray head. Some heads will cover 180° at one time; others spray with the wind. Spray rates range from as little as 6 gpa to 100 gpa. Write **913** on reader service card.

Hustler Corporation has introduced an innovative sprayer—an aluminum wick bar for the control of weeds in skip rows and those six inches or more above crop height. The wick bar rubs chemical directly on the weeds, not on the ground. It has a double level of short wicks, loosely woven of cotton and nylon for the best combination of wicking and wear-resistance. This bar comes in straight and folding models, in three sizes: 10, 14, and 20 feet. It is self-supporting and will fit a variety of tractors. Write **914** on reader service card.

Continues on page 26

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Smithco. employs another novel approach to spraying. Its Hydra-Ject chemical injection system destroys grub worms and mole crickets that cause damage to turfgrass by attacking roots and rhizomes below the surface of the soil. The tractor PTO-driven sprayer comes with a 300- or 500-gallon fiberglass tank with mechanical agitation, and a 25 gpm pump in a 0 to 800 psi. Stainless steel nozzles have a #0001 range to produce the best pattern, penetration, and discharge rate (180 to 190 gallons per acre at 3 mph). Penetration depth ranges from 1 inch to 3 inches, depending on operating pressure and soil conditions. Write **915** on reader service card.

Westheffer has a newly designed 320-gallon lawn and tree care spray unit. An electric start 8-hp gasoline engine drives the Myers pump, mechanical agitation system, and belt drive reel. The sprayer features an

A 320-gallon lawn and tree care spray system by Westheffer has an electric start 8-hp gasoline engine.

easy-to-clean strainer system for use with crushed fertilizers and wettable powders. The stainless steel tank is vented with a 16-inch manway which has a 10-inch opening lid. The same unit is available with a 520-gallon tank. Write **916** on reader service card.

FMC offers recently upgraded DO35 sprayers in four tank sizes—300, 500, 900, and 1,000 gallons—and a psi of 700. These sprayers are specifically designed to be truck-mounted for shade tree spraying. The engine controls, including starter, choke, and throttle, are accessible to the operator from a curbside location. Each stainless steel tank is fitted with a full-length mechanical paddle blade agitator which is easily engaged or disengaged. An optional spray gun, the Model 785, is equipped with an on/off trigger and an adjustable spray pattern control. Write **917** on reader service card.

A 50-gallon fiberglass tank sprayer from Myers comes in three models. The 6-50E has a Briggs & Stratton gasoline engine that runs on 5 hp and a piston pump that operates at 300 pounds pressure. The 6-50PT, which is PTO-driven, is a trailer-mounted sprayer with 13-inch wheels. Model 6-50TM, also PTO-driven, has a 6-gallon piston pump and is designed for tractor-mounting. A trailer is available, complete with 15-inch wheels and jack stand, as well as 15-foot stainless steel booms, and a hose reel mounting kit and spray gun. Write **918** on reader service card.

As a result of the development of new chemicals and more sophisticated spraying techniques, the demand for skilled professional applicators grows greater. Homeowners, who now travel less and spend more time at home and in the green spaces near their homes, are closely scrutinizing the maintenance of turf, trees, and ornamentals. In this environment and with lawn care specialists and others diversifying their work, modern, high technology spraying equipment will be needed more than ever. **WTT**

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RHODODENDRONS FLOURISH WITH COMPANION PLANTINGS IN ACID SOIL

By Douglas Chapman, Horticulturist, Dow Gardens, Midland, MI

Rhododendron is a low maintenance, broad-leaved, evergreen shrub (ericaceous) which can provide color from mid-April through July. This color can vary from deep red to clear white, with the most common color being magenta. Selection of the correct species and/or cultivar can result in a shrub 2 to 3 feet in height or one 10 to 15 feet in height. Many cultivars are hardy from Chicago to Michigan to Boston and south. These hardy specimens provide a gene pool for breeding colorful, disease-resistant, and hardy rhododendrons. Many nurseries have been instrumental in the development of new rhododendron cultivars, but Anthony Shammarello in South Euclid, Ohio and Ed Mezzitt in Hopkinton, Massachusetts have been leaders. Some of the hardy species for the northern Midwest and Northeast include *Rhododendron carolinianum, R. catawbiense, R. fortunei, R.* X *laetivirens, R. maximum, R. mucronulatum,* and *R. smirnowii.*

Carolina Rhododendron *(Rhododendron carolinianum)* is native to North America. It is the outstanding shrubby evergreen rhododendron with a maximum height of 6 to 8 feet, and becomes a broad upright oval at maturity. *R. carolinianum* is very adaptable from partial sun to shade. (Generally speaking, the smaller the rhododendron leaf, the more sun the plant will take.) The large-leaved rhododendrons must be planted in shade where smaller leaf forms will take at least 6 to 8 hours of sun. Carolina Rhododendron is extremely susceptible to Phytophthora; therefore, good soil drainage is important. This hardy rhododendron flowers early to mid-May. The normal species color ranges from magenta to pink, although there is an album form readily available in the trade. This outstanding evergreen is an annual flowerer with numerous flowers per terminal, making it probably the outstanding early spring flowering form. The most widely-known and adaptive hybrid of Carolina Rhododendron is PJM Rhododendron, named after its breeder, Peter James Mezzitt. This hybrid is outstanding throughout the Midwest in foundation, natural, or mass plantings as an understory. It requires little maintenance, responds fairly well to slightly alkaline (well-watered) soils, and will thrive in full or partial sun. In addition to its annual display of magenta flowers, it does have a maroonish fall leaf color which is an extremely desirable characteristic for the otherwise drab winter months.

Catawba Rhododendron *(Rhododendron catawbiense),* another native North American rhododendron, provides the hardiness in the breeding of North American cultivars. This native grows 8 to 10 feet in height with a medium-sized leaf that ranges 3 to 6 inches in length and 1½ to 2 inches in width. Catawba Rhododendron flowers late in May with 14 to 20 trusses per flower. The flower buds are perfectly hardy to -30° F. It prefers a minimum of 50 percent to a maximum of 80 percent shade and is quite compatible in mass or naturalistic plantings under oak or pine. A few of the cultivars which are outstanding and flourish as far north as Midland, Michigan are as follows:

CULTIVAR	COLOR
'Album Elegans'	mauve, fading to white
'America'	dark red
'Blue Peter'	dark red
'Boule de Neige'	white
'Boule de Rose'	rose-pink
'Caractacus'	magenta-red
'Catawbiense Alba'	white
'Catawbiense Boursalt'	crimson-red
'H.H. Hunnewell'	lilac-red
'Henrietta Sargent'	rose-pink
'Henry'	red to deep purple
'Ignatius Sargent'	rose-crimson
'King Tut'	bright red with white blotch, leaves dark purple
'Lady Armstrong'	carmine
'Mrs. C.S. Sargent'	carmine-rose
'Parson's Grandiflora'	magenta
'Pinnacle'	pink
'President Lincoln'	mauve
'Purpureum Elegans'	deep purple
'Roseum Elegans'	magenta

Continues on page 32

The most widely known and adaptive hybrid of Carolina Rhododendron *(Rhododendron carolinianum),* PJM Rhododendron, makes an outstanding display in foundation, natural, and mass plantings. It was named after its breeder, Peter James Mezzitt.

One of the many fine cultivars of Catawba Rhododendron *(Rhododendron catawbiense),* is 'America', whose flower buds stay hardy in -30°. It fits well in mass or naturalistic plantings under oak or pine.

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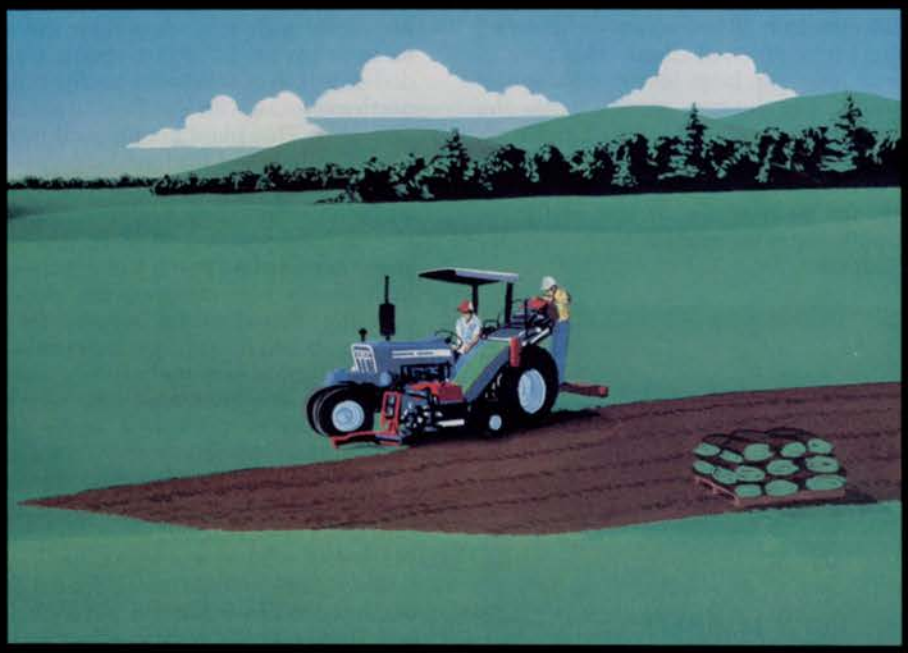

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Rhododendrons *from page 30*

In general, the hardy mid-sized rhododendrons available for planting throughout the Northeast or northern Midwest usually have Catawbiense as one of the parents.

Fortune Rhododendron *(Rhododendron fortunei)* is the outstanding introduction of China. This 10 to 15 foot upright shrub has long, large leaves with scarlet bracts which accompany the new growth below the bud (another desirable as well as identifying characteristic). The pink to white blossoms are in full bloom during the end of May. *R. fortunei* is not only a good compatible plant for many of the narrow-leaf evergreens, such as pine, but is an outstanding understory with Scarlet or Bur Oak.

Fortune Rhododendron *(Rhododendron fortunei)*, introduced from China, has long, large leaves with scarlet bracts which accompany the new growth below the bud.

Wilson Rhododendron *(X Rhododendron laetivirens)* is a hybrid of *R. carolinianum*. It is perfectly hardy through the Boston area and in protected sites as far north as Midland, Michigan. It is a small rhododendron, growing 2 to 4 feet in height, being broader than tall. Its glossy, sharp evergreen leaf is similar to the foliage of Mountain Laurel. The flower of this outstanding evergreen shrub is pink to magenta but is not dependable in more northern latitudes. The plant integrates well in rock gardens, foundation plantings, or mass plantings under oak and pine.

Rosebay Rhododendron *(Rhododendron maximum)*, the giant of the native North American rhododendrons, reaches an average height of 10 to 15 feet in the Northeast, but ranges in height from 4 feet in Canada to an ultimate of 40 feet in North Carolina. Its leaves are large (4 to 8 inches in length) and 2 to 2½ inches in width. Rosebay Rhododendron requires deep shade and fertile, well-drained soil, often thriving in bogs. Its pale pink to white flowers appear in July but are not as effective as *R. catawbiense* since the new growth often surrounds these late-appearing flowers. *R. maximum* is an outstanding woodsy species which naturalizes well. Its flower buds are perfectly hardy to -25° F.

Korean Rhododendron *(Rhododendron mucronulatum)*, a deciduous rhododendron from China, is 6 to 8 feet in height, being rather an erect shrub. It is one of the earliest of the rhododendrons to flower, usually being quite showy in late April, or about the same time as Magnolia stellata flowers. Its flower buds are perfectly hardy to -25° F. The flower color is normally a magenta, but a clear pink variety is available. These flowers are somewhat trumpet-shaped, being 1 to 1¾ inches in length. The flowers themselves resist frost extremely well, extending their life even if temperatures as low as -27° F. are encountered. Korean Rhododendron requires some sunlight; therefore, west to north exposure with less than 50 percent shade is most desirable. This plant adapts well in woodsy, naturalized plantings and fits foundation plantings.

Smirnow Rhododendron *(Rhododendron smirnowii)* is an outstanding evergreen shrub, growing 6 to 8 feet in height with a 10 to 12 foot spread. The dark green leaves often reach 3 to 7 inches in length with a light brown tomentose on the underside. This outstanding rhododendron is noted for its bright green foliage. Its late flowering which peaks during late May or early June is extremely showy. This annual flowering shrub integrates well into woodsy settings. The flower color is a magenta to rosy-pink, depending upon the seed source.

The real key to growing rhododendrons is to understand their requirements. These requirements include: protection from sun and wind, high humidity, acid soil pH (below pH 7.0), and high organic soils.

The soil pH should range from 4.5 to 5.5. The best additives to lower the soil pH include sulfur or iron sulfate. Aluminum sulfate will adjust the soil pH down but can cause phosphorus and other elements to be chemically unavailable. In soils where iron chlorosis continues to be a problem, EDTA chelated iron is best to correct this problem.

Organic matter is important to provide moisture and nutrients to this shallow-rooted shrub. This organic matter can be composted oak leaves, pine needles, pine bark, or animal manure.

Fertilizing should be kept to a minimum or not applied at all. If one is considering annual fertilizer, then a 0-20-20 or low nitrogen organic fertilizer would be best, e.g., cottonseed meal, fish meal, or tankage. The application of nitrogen can reduce or limit flowering while resulting in leggy plants.

Rhododendrons are one of the lowest maintenance plants available for Northeast and Midwestern sites. They flourish when grown in companion plantings which include pine *(Pinus)*, Scarlet and Bur Oak *(Quercus)*, crab apple *(Malus)*, dogwood *(Cornus)*, redbud *(Cercis)*, Mountain Silverbell *(Halesia)*, Japanese Katsuratree *(Cercidiphyllum)*, Black Gum *(Nyssa)*, and Sweet Gum *(Liquidambar)*. Rhododendrons are not companions with maple *(Acer)*, serviceberry *(Amelanchier)*, spruce *(Picea)*, or juniper *(Juniperus)*. Rhododendrons will flourish in the Midwest if planted as understories in well-drained sites. The only maintenance that need be done, after initially acidifying the soil, is the annual application of organic matter, e.g., leaf mold, pine needles, or peat moss. Artificial irrigation with alkaline Midwest water can cause a problem; therefore, in Wisconsin, Michigan, and the Great Lakes States artificial irrigation is not desirable or needed. Rainfall is generally high enough to preclude irrigation. Companion plantings make rhododendrons work! Rhododendron is truly the aristocrat of broadleaved evergreens which requires little or no maintenance. **WTT**

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TURF MANAGEMENT ENERGY USE IS REEVALUATED IN FLORIDA

As energy becomes more precious, many uses of it will be scrutinized. Energy consumed in the management of turf is high, higher than agricultural production. Philip Busey and Evert Burt of the University of Florida Agricultural Research Center have studied energy use for turf and have drawn some conclusions.

1. Turf energy use is high.
2. Considerable savings in energy use can be obtained through better management and better grasses.
3. The energy use question is inseparable from other aspects of turf culture. In many ways the energy question translates into a vehicle for studying better management, and getting that point across to turf managers.

Beside the reevaluation of turf maintenance practices and turfgrass selection, Busey and Burt analyze individual turf systems. "It appeared to me that in order to do an energy budget, or to have any meaningful way of looking at possible savings, it would be necessary to do an analysis of existing practices and/or design efficient turf systems ahead of time," Busey says. He designed a Turfgrass Management Audit/Maintenance Plan. "For larger areas, a similar analysis could be done with greater emphasis on detailing existing vegetation, soils and seasonal variations."

Busey and Burt have revealed basic energy use relationships which can be applied to other areas. Their findings were reported in the Proceedings of the Florida State Horticultural Society. Excerpts from this publication follow.

Turfgrass maintenance costs were 27.5 trillion BTU in Florida in 1974. This value was equal to approximately 1.5% of Florida's fuel expenditures, and 28% of the total energy used in agricultural production in Florida, in 1974. Turf energy costs were calculated based on all expenditures in the maintenance of established plantings, primarily fuel, equipment, fertilizer, water, labor, and pesticides, in that order. Benefits to Florida from turf include a landscape surface compatible with high density activity, erosion control, groundwater replenishment, and possibly reduced heat load in and around buildings. These benefits can be achieved through the use of lower maintenance species, proper management, and the tailoring of new varieties that are better adapted. Extension of present and future turfgrass technology can contribute to the savings in energy and other environmental costs.

Utility Analysis and the Choice of Species

Grasses vary in both the costs of upkeep and in the level of use that they can withstand. Current Florida fertilizer recommendations range from a low of 15g N/m²/year (3 lb/1000 ft²/year) for centipedegrass, *Eremochloa ophiuroides* (12) to a high of 60g N/m²/year (12 lb/1000 ft²/year) for hybrid bermudagrass, *Cynodon X magenissii* (13). Rates of mowing and irrigation also vary and it has been customary to ascribe a generalized cultural intensity to various species (1). Cultural intensity differences among species, which can also be equated with energy costs, are closely related to different relative growth rates among species (Table 1).

Bermudagrass, which grows rapidly and has a high maintenance cost, is the only species capable of withstanding both very heavy traffic from sports activities, and very close mowing. These features, combined with a rich green color and fine texture, make bermudagrass the most attractive turf to many. In contrast, bahiagrass grows slowly and also has relatively low requirements for fertilizer, mowing, and water. At the same time bahiagrass is generally regarded as the least attractive species. Its tall, open habit of growth, and its slow recovery from damage, makes it relatively unsuited for use in high traffic areas. The biological characteristics of grasses are closely related to their maintenance requirements and their usefulness.

Thus, it is possible to simultaneously evaluate the maintenance costs and the usefulness of different species in the landscape, and thereby analyze which kind of grass is best suited for particular use requirements. Based on estimated costs, we would not recommend

Continues on page 40

Table 1. Management costs for various turf species, arranged from the most intensive in cultural requirements (bermudagrass) to the least intensive (centipedegrass). Fertilizer, mowing, and water requirements have been modified from Florida recommendations, according to the authors' preferences for southern Florida, in order to achieve dependable high utility. Some rates can be reduced substantially.

Species	Fertilization	Mowing	Irrigation	Estimated cost[z]	Growth rate[y]
	g N/m²/yr	times/yr	cm/yr	$/1000 sq ft/yr	%/day
Hybrid bermudagrass, *Cynodon X magenissii*	60	50-300	200	70	7.9
Zoysiagrass, *Zoysia japonica*	30	30	130	35	5.0
St. Augustinegrass, *Stenotaphrum secundatum*	30	35	130	35	4.8
Bahiagrass, *Paspalum notatum*	15	12[x]	60	15[w]	2.1
Centipedegrass, *Eremochloa ophiuroides*	10[v]	20	60	15	1.8

[z]Maintenance costs have been estimated on the basis of all expenditures, including labor, for medium-sized turf areas (100-10,000 m²). These figures are minimal costs, and can be increased by two to four times to include costs of edging, cleanup, routine spraying whether required or not, and managerial costs of supervision.

[y]Adapted from Busey and Myers (4). Growth rate is the relative fresh weight gain of a grass under ideal conditions. Values should be directly related to clippings produced, fertilizer and water requirements for replenishment of leaf tissue, and attendant energy costs.

[x]For most home lawns and especially in south Florida, the number of mowings may increase to about 25 per year.

[w]Maintenance costs of bahiagrass vary from less than $2 per thousand square feet per year (along Florida highways) to as high as the cost of maintaining St. Augustinegrass. Excessive costs for maintaining bahiagrass may result from failure to correct mole cricket infestation, excessive irrigation and fertilization, and close mowing.

[v]A fertilization rate is proposed here which is less than current Florida recommendations (12).


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When a turfman tries to skimp along with a narrow-spectrum herbicide on the theory that it will control the major eyesores like dandelions and chickweed, and will cost less per gallon than Trimec — he opens the door to an endless chain of problems and expenses.

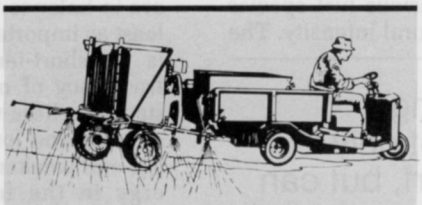
Perhaps the worst consequence is the emergence of some ugly weeds of the hard-to-kill variety that he once considered to be so rare that he didn't even think of them as a problem in his area. And, when these weeds come, they come as a crowd... out of nowhere.

Of course, you know where they came from and why they came. They're the natural consequence of using a narrow-spectrum herbicide in an area that is fertilized and watered.

The hardy weeds (which were not controlled by the narrow-spectrum herbicide) are nourished by the fertilizer and water, and fight with the grass to fill the vacancy left by the demise of the sensitive weeds. Some of them win, and weeds that were once obscure become prominent.

There's really only one efficient way to cope with the problem, and that is the Trimec way.

Trimec is the one turf herbicide with a broad enough spectrum to get those hard-to-kill weeds right along with the common, sensitive ones. How many species of broadleaf weeds will Trimec control? We are still looking for the economic broadleaf weed that Trimec will not control when applied at the right times and rate. If we ever do find such a weed, we will be very surprised. No other selective herbicide can match the broad spectrum of Trimec.



How many species of broadleaf weeds will Trimec control?

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In summary

The Trimec record speaks for itself. No other turf herbicide available today is the equal of Trimec, not only in providing superior broadleaf weed control, but also in terms of safety to grasses — and in total cost. No wonder an overwhelming majority of golf course superintendents agree: *Dollar for dollar and acre for acre of immaculate, weed-free turf, Trimec is the most efficient broadleaf herbicide on the market ... period.*

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that a manager with a budget of only $15 per year per one thousand square feet grow hybrid bermudagrass. Conversely, a turf manager with as much as $30/1000 ft²/year should not exclude the possibility of growing bahiagrass; perhaps a lower traffic tolerance would be adequate and the maintenance budget could be reduced by using a species such as bahiagrass.

For purposes of this analysis, we consider "utility" to be the usefulness of a turf in terms of traffic tolerance, coverage of the soil, and beauty (specifically, intensity of color and closeness of cut). We have applied rather arbitrary utility values to show examples of relationships of the usefulness of various turf species maintained at various levels of cultural intensity. The concept of "utility function" has been presented in management books (11)—the "utility function" is the relationship between costs and returns. When the utility function is presented graphically for a variety of circumstances (Fig. 1), a decision aid is thereby created for choosing the right grass and the right management strategy. This graph has been drawn as a series of curves, to represent a widespread economic observation of decreasing marginal returns at higher and higher levels of input (fertilizer, mowing, irrigation). Beyond a certain point, most species even do worse, and are beset by a number of pest problems. The real challenge coming to turf research is not the need to show that one management strategy provides greener grass than another, but to show how much an extra shade of green will cost the consumer and how much an extra pound of chemicals will affect the environment. A flexible concept such as the utility function should permit sound decisions in the reduction of energy and other turf costs, while at the same time provide an economical return in beauty and useability.

Too low mowing and long delayed mowing can not only damage and weaken turf, but can cause a later waste of energy.

Management Strategy

Turf maintenance primarily consists of mowing, fertilization and irrigation in order to keep the grass actively growing and continually replenished with new leaf tissue. Proper timing of these practices to satisfy plant requirements along with attention to pest problems is necessary in order to achieve a maximum possible utility at a given expenditure. In practice, the use of strict recommendations (Table 1) may not provide maximum return in quality on expenditures. When the average expected maintenance needs are programmed rigidly over a budgeting period, noticeable problems arise. For example, large amounts of water and fertilizer can be lost due to improper irrigation, as when programmed irrigation timers are used. A study of water application on urban landscapes showed that about 40% more water was used than the estimated requirement (5). Even with the adjustment of irrigation to correspond more closely with evapotranspiration, substantial N can be wasted through leaching. In studies performed on a sand soil in Fort Lauderdale, from 35% to 55% of the N from a water soluble source was lost due to leaching under conditions of high rainfall and/or excessive irrigation (14). The use of fertigation (frequent fertilizing of low rates through an irrigation system) was shown to provide a more uniform availability of N, and thereby to reduce losses due to leaching.

Considerable energy is spent to mow turf, and at first consideration this might appear to be a good opportunity to conserve energy. This kind of savings can be achieved provided that other conditions for the grass are in balance. However, regular mowing of turf is at least as important to insure freedom from weeds, as it is for short-term aesthetic reasons. Recommended frequency of mowing should not be reduced in instances where weed encroachment is active. Too low mowing and long delayed mowing can not only damage and weaken turf, but can cause a later waste of energy in the form of extra fertilizer to assist in reestablishment of bare areas.

The greatest savings of energy can be obtained through a management strategy including routine evaluation of past and present conditions. When problems arise, diagnosis of the cause for unhealthy turf is the first step, and should be followed by an analysis of available options. In the case of turf that is unsightly because of weed infestation, herbicides should not be used without considering the underlying problems (nematodes, improper irrigation, low fertility). If grass cannot be grown properly, it may be that the weeds achieve some utility in covering the soil, whereas drastic eradication of weeds without correcting the underlying conditions will only leave the manager with bare soil.

Finally, pesticides should in many cases be used primarily for curative treatments and spot treatments. A few chronic problems can be expected that virtually always require pesticide treatment—sod webworms in bermudagrass, for example. Even in these instances the pests are erratic in their behavior, and widespread use of pesticide can be replaced by prompt diagnosis and spot eradication. Few pest problems can be managed best through the use of preventive sprays. Although reliance on regularly timed preventive sprays cuts down the number of decisions required by the manager, it also cuts down on the opportunities for experimentation and greater familiarization with the turf ecosystem by the turf manager.

Low-Energy Grasses: Strategies for the Future

A breeding strategy has been presented that "places priority on genotypes requiring smaller inputs of energy, pesticides, water and fertilizer, in order to maintain an attractive and durable cover for urban areas" (2). Different adaptations among turfgrass species were related to different use characteristics. By extension of this concept to comparisons within turf species, one can conclude that there is no one "supergrass." Different turfgrass varieties are needed for different situations (3). How then can the development of new varieties be geared to reduce use of energy, pesticides, water, and fertilizer in Florida?

The goals of a breeding program might differ for each turfgrass species. An adequate consideration of various breeding strategies should consider not only

the economic value of a particular genetic improvement, but also the rapidity and certainty of its progress under selection. Some selection goals may have to be sacrificed, provided that an even greater success can be made towards other goals. As an example, one breeding strategy might be to make a high maintenance species cheaper to grow (and yet provide the same economic value) while another breeding strategy might be to make a low maintenance species more attractive to consumers at the same management cost. Both concepts are equally valid and probably both should be pursued as goals of a turfgrass breeding program.

Although rapid growth and early establishment of turfgrasses indicate good adaptation, longer term studies might also reveal that these characteristics are related to future thatch problems.

Although economic models for directing the goals of turfgrass breeding can be based on generalized functions (Fig. 1), there are discontinuities that may make such an approach difficult without specific attention to specific problems. For a particular species there may be erratic but devastating problems—chinchbugs in St. Augustinegrass, for example—that require special screening. Although rapid growth and early establishment indicate good adaptation, longer term studies might also reveal that these characteristics are related to future thatch problems. The need for long-term studies is not unusual in a perennial crop, but evaluation of the ornamental value of turf is difficult. The large number of selection criteria for new turf varieties require simplification.

The approach suggested to achieve low-energy grasses (2) was "establishment of minimal management plots for long-term adaptation studies." To date, this approach has been effective in identifying significant differences among energy-related traits (Table 2), but considerable additional experimentation is required. To substantiate the proposed energy savings it will be necessary to evaluate larger turf plantings than have been used in preliminary field trials. More representative evaluation can also be obtained by broadening the geographic range of testing environments. This, in turn, requires not only an expansion of activities in a breeding program, but a more careful assignment of priorities in order to breed and select the best plant materials in the fastest time possible.

The most thorough studies of variety research and development have been performed in field crops, and a number of statistical approaches have been suggested. LeClerg (10) suggested that "Since varieties usually interact with locations and seasons, the early phase of the selection program can be more efficient by sowing materials in one replicate per location and in as many locations as resources will permit." This is presently being considered in the Florida turfgrass breeding program. It is expected that although genotype comparisons over broad regions of Florida will appear to provide lower heritabilities and larger error variances, the net result will be a more useful prediction of energy costs and utility in the landscape.

There is at present no one option in breeding low-energy grasses, but a restricted number of goals for various species. Bahiagrass has an excellent potential for development and release of a variety with rapid coverage ability and high competition to weeds. Such a variety should have shorter stature and lower seedhead numbers than presently available types. It should also have improved density and darker green color, making it more acceptable to consumers wishing a lower energy landscape than obtainable from St. Augustinegrass. Priority should be placed on developing a lower maintenance St. Augustinegrass, similar to 'Floratam,' but with better color and finer texture and a better root system in order to withstand drought. At the same time, a St. Augustinegrass variety with improved appearance and rapid growth rate, but at an equal or higher maintenance cost, might serve as an alternative to bermudagrass for some sports areas. In the case of bermudagrass, lower maintenance types are already available that could probably be grown on fairways with lower inputs of fertilizer and pesticides. For zoysiagrass there is a strong potential for developing strains that would fill the place of higher maintenance bermudagrasses and for extension to high quality miniature landscapes. Finally, as for centipedegrass, there is a great need for more genetic diversity (2) before significant improvements can be made through

Continues on page 42

Table 2. Low-energy traits recognized in warm season turfgrasses, ARC-Fort Lauderdale, 1976-79.

Species	Trait	Rationale	Experimental basis
Bahiagrass	Fewer seedheads	Permits less frequent mowing	Replicated field trials
	Faster coverage	Prevents weed encroachment	Replicated field trials
	Shorter stature	Improves utility at a comparable energy input	Replicated field trials
St. Augustinegrass	Improved color and density	Improves acceptability to homeowners	Contemplated for evaluation
	Faster coverage	Prevents weed encroachment	Replicated field trials
	Tolerance to fertility stress	Permits less frequent fertilization	Hydroponic greenhouse expt.
	Gray leafspot resistance	Improves utility at the same energy input	Field and greenhouse comparisons
Bermudagrass	Survival under low maintenance	Permits less frequent mowing, fertilization and pesticide use	Replicated field trials
Zoysiagrass	Faster coverage	Cuts energy costs in production	Replicated field trials

breeding. In this species, a much greater need exists to develop sound management information, especially about the role of soil pH in susceptibility to disease and long term persistence.

Conclusions

Turf is likely to remain a dominant part of the Florida landscape, and to be a continuing drain in energy expenditures. Sizeable savings of energy may be obtained through the recommendation of lower maintenance species and the extension of available irrigation technology to turf managers. Examples of savings in energy through irrigation include the use of fertigation to provide more evenly available nitrogen, and moisture sensing devices to control water application according to plant requirements. Additional consideration should be given to making better economic use of turf, for example, the use of turfgrass clippings as a protein source for animal feeds (15), and the use of turf areas as a place to recycle urban wastes. Similarly, good turf provides erosion control, groundwater replenishment, and possibly reduced heat load in and around buildings. Improvements in the utility of grasses can be made through breeding, and preliminary field trials suggest that lower energy grasses can be developed. For example, in the case of bahiagrass mowing expenses should be reduced through genetically controlling seedhead production. In addition, improvements in the visual attractiveness of bahiagrass could be of great benefit, by permitting the extension of this low maintenance species to more areas of the urban landscape. Maintenance of established landscapes, although producing no exchangeable economic product (no "cashgate" value) is valued highly in Florida for aesthetic and recreational purposes. Adjusting the 1974 turf maintenance costs (7) for inflation would yield a 1979 expenditure in Florida in excess of $600 million. A wise management of turf is, in our opinion, critical in the proper use and conservation of water, energy, and other precious resources. **WTT**

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TURF PROGRAM ADVANTAGES OF SLOW-RELEASE FERTILIZERS

By John R. Hall, extension turf specialist, Virginia Tech, Blacksburg, VA.

Slow-release nitrogen sources have much to offer today's professional turfgrass manager. Even though they generally cost more per lb. of nitrogen than fast-release sources, they offer several advantages which contribute to their increasing popularity. When compared with fast-release sources, the slow-release sources of nitrogen provide the following advantages:

1. Reduced labor costs associated with fertilization, since the number of applications is generally reduced.
2. Reduced nitrogen leaching
3. Reduced risk of foliar burn or root plasmolysis
4. A more even supply of nitrogen is provided to the plant, avoiding the excess-deficiency syndrome associated with totally soluble nitrogen sources.

Today's professional turfgrass manager needs to be aware of the major factors which affect release rates of the more popular synthetic organic slow-release nitrogen sources: Isobutylidene Diurea (IBDU) Urea formaldehyde (UF), and sulfur-coated ureas (SCU).

IBDU

This product is available in several formulations providing a wide range of nitrogen release rates and N:P:K ratios. The basic slow-release nitrogen source is Isobutylidene Diurea (IBDU) which breaks down to isobutyraldehyde and urea in the soil. The isobutyraldehyde is of no value to the plant and is thought to volatilize. The urea eventually is converted to ammonium (NH_4^+) and with the help of microorganisms, finally changes to the most plant utilizable form -nitrate (NO_3^-). Particle size, soil moisture, soil pH and soil temperature affect the rate at which IBDU nitrogen is released to the plant.

Particle Size — IBDU is available in a coarse (.7 to 2.5 mm) and fine (.5 to 1.0 mm) particle size. The fine material releases nitrogen faster than the coarse. In a wet soil (50% moisture) at 80°F the fine material has been shown to release approximately 25% more nitrogen than the coarse material two months after application.

Soil Moisture — Water availability increases the breakdown rate of IBDU to urea. In experiments using fine IBDU and soils maintained at 80°F, wet soils (50% moisture) released approximately 56% more nitrogen in a 2 month period than dry soils (20% moisture).

Soil pH — IBDU's rate of nitrogen release will speed up in very acid soils (Ph $<$ 5.0) and slow up in alkaline soils (Ph $>$ 8.0). The availability of nitrogen from IBDU at alkaline pH's around 8.0 is somewhat depressed.

Soil Temperature — The temperature effect is minor when compared with other slow-release materials which depend upon microbial activity. However, in controlled studies fine IBDU applied on soil maintained at 80°F released approximately 37% more nitrogen in 2 months than fine IBDU applied to a soil maintained at 40°F. The soil in these studies was maintained at moderate soil moisture levels (35% moisture).

UF

Urea formaldehyde or ureaform (UF) is a generic name for several methylene urea formulations that are made from chemically condensing urea with formaldehyde. As the ratio of urea to formaldehyde increases the length of the methylene urea compounds formed, decrease. The shorter the methylene urea compound, the faster the urea is released for plant utilization. Nitroform is a common urea formaldehyde that has a urea: formaldehyde ratio of 1.3 to 1. It provides about 1/3 of its nitrogen as water soluble nitrogen and 2/3 as water insoluble nitrogen which becomes available to the plant predominantly as a function of microbiological activity. O. M. Scott utilizes urea formaldehyde solutions in the production of some of their products. These have a higher urea: to formaldehyde ratio and therefore are shorter chained methylene urea compounds that generally release a greater proportion of the applied nitrogen quicker than traditional urea formaldehyde materials. Because of this release pattern, they tend to provide less residual nitrogen than Nitroform when equally compared.

Since microbiological activity influences the rate of release of the urea formaldehyde products, any factor that increases microbiological activity will increase the release rate of the water insoluble nitrogen from UF. Therefore temperature, soil pH, aeration, soil texture and many other factors have been noted to affect UF release rates. Soil temperatures below 55°F generally decrease microbiological activity enough to significantly slow UF breakdown. Acid soil pH's and poor aeration will also slow breakdown of UF, through their negative effect upon microbiological activity.

SCU

Sulfur-coated urea (SCU) is a slow release nitrogen source made by coating hot (140°F) urea with molten (300°F) sulfur. The prill is then sealed with a polyethylene oil or a microcrystalline wax and conditioned with diatomaceous earth or some other suitable material. A 36% nitrogen SCU product will also contain 16% sulfur and about 5% conditioner + sealant. The nitrogen in these products is released through membrane rupture or diffusion of solutes through pores or imperfections in the coating. Solubility is varied by varying coating thickness or sealant weight. Nitrogen release rates in these products are characterized by determining the amount of nitrogen released in 7 days in water at 100°F. Therefore SCU-30 means the product releases 30% of its nitrogen under the conditions prescribed above. Therefore, an SCU-30 will theoretically release 1½ times as much nitrogen as an SCU-20 under the same conditions. These dissolution values are a measure of the relative number of imperfectly coated granules. Therefore, controlled release of nitrogen occurs from many granules providing nitrogen at different times rather than all granules slowly releasing nitrogen at the same time.

Continues on page 46

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Slow-Release *from page 43*

Many factors affect the release rate of nitrogen from sulfur-coated urea. Soil temperature, soil moisture, fertilizer placement and root action appear to be the most important.

Soil Temperature — Warm soils will accelerate release of N from SCU. Breakdown of the coating by microbial decomposition of the sealant or oxidation of the sulfur does speed up nitrogen release.

Soil Moisture — Soil moisture stress has been shown to *increase* the rate SCU breakdown. Dry soils (10% moisture) have been shown to release SCU nitrogen faster than moist (20% moisture) soils.

Fertilizer Placement — Surface applications have provided faster SCU dissolution than soil mixed applications. It is thought that the fluctuating soil temperature and moisture conditions on the surface of the soil increase dissolution.

Root activity — Root activity is thought to accelerate SCU dissolution. SCU release rates have been observed to be much slower on fallow soils than in soil containing actively growing plants.

There is evidence that from 5 to 30% of the applied nitrogen in SCU products may not dissolve during the season of application. Since membrane rupture significantly affects nitrogen release in this product, methods of application which crush granules could alter the release rate. Variable and somewhat unpredictable release rates on golf greens (close mowed turf) have led us to the position of currently not recommending coarse particle size SCU products on golf greens.

All three slow-release nitrogen products mentioned above have a place in turf management. It is important that the professional turf manager be aware of how these products might most effectively be used to enhance the quality of turf in his operation. **WTT**

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CITY OF MADISON COMPROMISES IN EMOTIONAL 2,4-D CONTROVERSY

By John A. Kerr, Associate Editor

In a decision that leaves a controversial issue still unanswered, the Madison (Wisconsin) City Council has reached a compromise decision on the use of the herbicide 2,4-D. It has restricted spraying from city parks and highway medians but allowed use to continue on most vegetation.

The issue has been argued hotly in Madison as well as in other parts of the U.S. and Canada in recent months. The sides are usually the same: townspeople who fear the use of chemicals and Vietnam Veterans Against the War against the agricultural/horticultural community and university and corporate scientists. Confrontations have peaked recently in Madison, the capital of Wisconsin, where many of the DDT hearings of the 1960's occurred and also where pesticides are used abundantly because of the many specialty crops produced.

Last October a member of the city's Parks Department was spraying 2,4-D and a child in a nearby home suffered a seizure. The child's parents, James and Mary Wachtendonk, felt the chemical triggered the seizure and called officials to stop the spraying. James Wachtendonk, 30, is a Vietnam veteran who was sprayed with Agent Orange at least three times and attributes his nervous system problems and the congenital problems of his son, Zachary, to the chemical. Parks Superintendent Daniel R. Stapay issued a moratorium on 2,4-D.

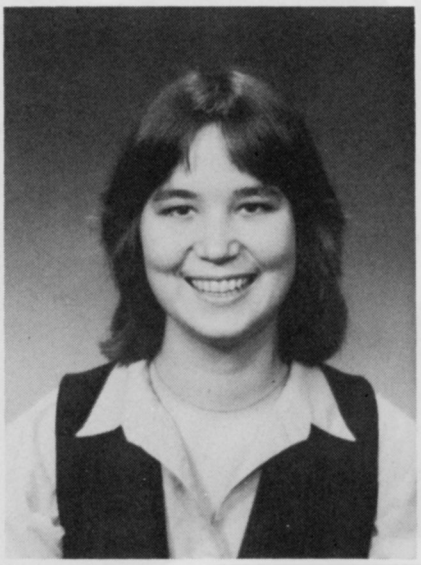
Since the moratorium, a member of the Dane County (Madison area) Board of Supervisors, Lynn Haanen, adopted a resolution to ban 2,4-D use in the city; the mayor issued the ban; and hearings were held before various city and county commissions. On January 27, the City Council met to issue a final ruling. A public hearing was held in conjunction with the meeting, at which a handful of University of Wisconsin professors along with Russ Weisensel, executive director of the Wisconsin Agri-Business Council, spoke against the ban. A much larger force of townspeople and Vietnam Veterans Against the War spoke in favor of the ban.

The total ban was defeated by an 11-10 vote. The final decision removes the use of 2,4-D in city parks and on highway median strips, and allows it on athletic fields, botanical gardens, farmlands, and for poison ivy and noxious weed control. This affects 50 to 60 percent of the herbicide's use in Madison. Also, a sign must be posted where 2,4-D is used for 48 hours after the application.

Weisensel says, "We (the agricultural and scientific communities) both won and lost." One vote the other way would have meant a total ban. "I hate to see a ban of any kind," says Weisensel. "It's not warranted by research." Yet he thinks they will never have a tougher group to face than the Madison City Council.

Weisensel does not consider losing 2,4-D in parks and highway medians an unmanageable loss. His major fear is that any ban will start a precedent that would give opponents impetus in battles with the county and state and that may eventually lead to a total ban on 2,4-D.

Weeds Trees & Turf spoke to leaders on both sides of the issue. Lynn Haanen of the County Board of Supervisors introduced a resolution before the city to ban 2,4-D after the incident with the child. R. Gordon Harvey, a professor of agronomy specializing in weed science at the University of Wisconsin-Madison, did his research thesis on 2,4-D and spoke at a couple of the public hearings against the ban.



Lynn Haanen

WTT: How are you involved in this issue?
Lynn Haanen: I'm on the County Board of Supervisors. I served on the City Council last fall for about a month in an interim appointment. During that month I introduced a resolution to the City Council and the County Board calling for a moratorium on use of 2,4-D in the parks. There was an incident — I'm sure Russ Wiesensel has told you about it — with a family that lived across the street from Warner Park. I had talked to people before that about specific use of herbicides. That incident quickened my action. I acted sooner than I had planned on.
WTT: What do you think of the 11-10 vote at the City Council meeting?
L H: I'm very satisfied with the compromise. It does what I think needs to be done, which is taking the heavy use of it out of the parks where there's no control over people walking in it and no way to block off the area where you're spraying it. It limits the use to the cemeteries, botanical gardens, golf courses, and the natural prairie areas. And the use in those areas, beside the golf courses, will be spot applications.
WTT: Russ Weisensel said it would cut use about 50 percent.
L H: Yes. One of the things I kept bringing up to people and bringing up to Russ was he has this theory that there will be a domino effect, that other places will stop using 2,4-D, and that fairly soon down the line agricultural use will be restricted. I don't think that's

what's going to happen at all. I'm not opposed to agricultural use of it. I think there's a big difference between the use of an herbicide in a rural area and its use in an urban area. If I were in agri-business, I would favor the restriction of its use in urban areas. The heavier it's used in urban areas the more people will object to it and the more chance people will demand it stop being used. Whereas if they use it correctly, in a rural area in agriculture where I think it belongs, people will not have a strong reaction to it because it won't be being sprayed across the street from them and in heavily populated areas. I don't have any objection for its use in agriculture; I just don't think it belongs in the city.

WTT: Did you follow the talks 10 to 15 years ago when they had the DDT hearings and after that 2,4,5-T? Isn't that what happened when banning started in small areas, spread to county and state levels, and then a total ban?

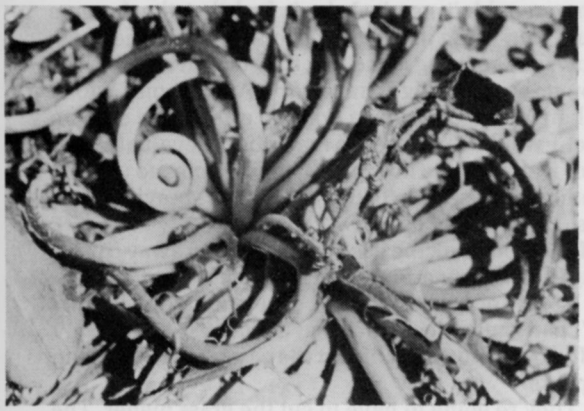
L H: The evidence against DDT and 2,4,5-T was much stronger at that point and it got much stronger. I think some chemical companies are still saying they're safe, but I think most people I've talked to agree that they're not safe and should not be used. In that case, there probably was a domino effect, but I think the reason that happened was that people recognized that those chemicals had serious flaws in them, and that even moderate use was not safe and in the long range effective to use them. I think with moderate, cautious use 2,4-D probably is safe. It probably can be continued to be used. I've seen contrary studies that say it's dangerous, it's very safe, and some say it's not all that dangerous and it's not all that safe. There's evidence on both sides and there's a lot of conflicting evidence. I really disagree with someone who will say it's perfectly safe. And I hear farmers say that they've been practically weaned on this stuff so it must be safe. I think that's the wrong attitude towards any chemical that you use.

WTT: You don't think it will affect the parks in any way or the highway medians by not using it?

L H: No, because the use that they're restricting in Madison is to kill the dandelions. I personally feel — and I've talked to a lot of people about this — that it's not important to have a perfectly green park. I personally consider it rather ugly. I think for its use to kill dandelions and thistles, we can either not kill them or remove the growth of thistles manually. I don't think it will affect the parks adversely.

WTT: So it's not allowed to be used in any area of the parks?

L H: It will not be allowed in the turf areas of the park. However, it does allow them to use 2,4-D in the Madison Park areas that are prairies. I think there are two areas where they're trying to preserve the natural



Selective effects of 2,4-D on dandelion while neighboring turf is unharmed. Higher mowing and physical removal are the park systems recommended alternatives to 2,4-D.

> "I personally feel that it's not important to have a perfectly green park."

prairie. I think in those areas they spot applicate to kill the black lotus and some of the European plants that are taking over. I feel more comfortable with that also because the people who are doing that are botanists who I think have a healthy respect for chemicals and who use them very judiciously.

WTT: Do you think this issue will go to the county?

L H: It will be going to the county but you have to remember that the county does not have home rule. So when we talk about limiting county use, we're talking about county governmental use, not use by private citizens in the county. What I anticipate will happen is that the county will establish criteria and restriction for its use. The county is a different situation than the city in that Dane County previously stopped using all chemicals, and since then has slowly added a few chemicals that they will use in very limited amounts. The county's use has been much less than the city's use in the past.

WTT: Doesn't the county do the work along the highways, too?

L H: Yes. The person who supervises that is very careful and they don't use it unless it's absolutely necessary. They also have the option of going in and doing the work manually. They don't have to use a chemical if they prefer not to. There's at least one area supervisor I know who prefers to do the work manually and not use a chemical. There's also a real big difference between using it along the county roadsides and along the city parks or even in the county parks.

WTT: Because of the population?

L H: Yes. There aren't as many people who will be walking along the roadsides. Use along the roadsides also blurs into the whole agricultural use because one of the main reasons we do that is so the noxious weeds don't spread into the fields right next to them. And so it's to assist the farmer because if we don't control the weeds and vines on the property we own, it spreads into their property.

WTT: The supporters heavily outnumbered the proponents to the ban at the City Council meeting. Who are the majority of supporters?

L H: They're just people. There's no organized group. Most of the people there I did not know. They heard about it and came themselves. They're people who live in the city and are concerned about it and want to see the use of 2,4-D cut back or stopped.

WTT: Isn't the Vietnam Veterans Against the War a big

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2,4-D *from page 49*

group against the use of 2,4-D?

L H: They are nationwide working to get people to reexamine their use of chemicals. I have worked with them in Madison, but they are by no means the overriding force and organizers behind it.

WTT: We have heard that one reason the Vietnam Veterans Against the War support the ban is that they have a lot of court cases, and if a ban would go through they'd have more success in those cases.

L H: I don't quite understand that rationale because 2,4,5-T is under very restricted use right now and that's one of the components of Agent Orange. And I think they already have quite a good case in terms of what dioxins can do. I've never heard anyone relate it to their court case. They're simply concerned because they feel they cannot afford to be exposed to any phenoxy herbicides anymore. And they feel that when they are exposed it hurts them. Some people might consider their reaction to be an overreaction but considering what they have gone through and the kind of treatment they've gotten from the government, I don't consider it to be an overreaction at all.

WTT: There seems to be no medical evidence that the seizure the child had was caused by the herbicide. Has there been anything more said about that?

L H: The doctor examined the child and wouldn't say conclusively what it was. However, the Department of Agriculture came out and tested the house, both inside and outside, for how much herbicide was in the air and on the surface. And it was pretty astounding how much they found. So the drift was quite large. It's a real hard issue, because Zak (the child) was doing fine until they started spraying that evening and he got progressively worse as they continued spraying the next morning. And I guess I tend to feel that since they found at least a half dozen children in the neighborhood also got sick when the park people were spraying, there's reason to believe that some people are sensitive to the chemical when exposed to it.

WTT: There was more than one child who got sick?

L H: Yes, there were other people in the neighborhood who have children that got sick. People are real hesitant to talk about it and real hesitant to go public with it because the reaction they get from some people is that you're overreacting and hysterical.

WTT: You don't think farmers should stop using 2,4-D?

L H: No, personally unless the EPA were to decide that farmers couldn't use it, I don't feel that the farmers should stop using it. My only concern is that they look at how they're using it and that they look at whether the amount they're using is necessary. At this point I don't think there's going to be a domino effect. The domino effect I would like to see is that cities reevaluate their use of it and decide how much they're going to use and whether it's necessary to use it if they're spraying it in a densely populated area.

WTT: Do you think the use it's being taken away from is going to have any effect on the park lands?

L H: No, the only harm might be more dandelions, but I don't particularly consider that a harm.

WTT: Do you think it will cost the city more to maintain the parks?

L H: They're going to have to cut the grass higher. The grass is not going to be as short as it has been in the past. There may be more labor time, but at this point the

Parks Department has not said this is going to be the case at all. They're not anticipating spending more on labor.

WTT: What is your involvement with the 2,4-D controversy in Madison?

Dr. R. Gordon Harvey: I did my research Ph.D. thesis on 2,4-D. I had to become familiar to an extensive degree on the literature relating to it. Since then, I've had a research student do a paper on it. I teach a weed control course at the university. I probably have as much familiarity with 2,4-D as anyone in the community. Thus when the Vietnam veterans seek to have it banned, I use my experience and familiarity to establish a degree of logic and scientific perspective on the controversy.

Testimony was limited to three minutes. The uninformed has time to cry and be emotional. A knowledgeable scientist must give his qualifications and describe a complicated issue in the same three minutes. The city does not seek contacts as does EPA.

WTT: How do you feel about the ruling by the City Council?

R G H: I have serious misgivings about the conduct of the City of Madison's decision-making process. When the controversy arose, the Department of Health had a hearing. They published its notice on the back page of the newspaper. Only those proponents of the ban who were informed could attend. I saw the notice and was the only one to attend against the ban. Unlike EPA who seeks contacts, the Department of Health in the city depends solely on hearings of people in the city. At the hearing on Tuesday (Jan. 27, when the final vote was given), the City Council questioned their own ability to make decisions regarding hiring of employees by the city. Yet no one questioned their ability to make decisions of a scientific nature regarding the use of a pesticide when their only information came from a public hearing. Testimony was limited to 3 minutes per person. A scientist working for years on a pesticide and familiar with the extensive literature available has to introduce himself, give his qualifications, and review the issue. It's almost impossible. The uninformed has time to cry and be emotional. I find the whole procedure inappropriate for governmental action. They must familiarize themselves with the scientific literature, not just listen in a hearing room, not just base their response on emotion alone.

The action taken has minimum impact in terms of a deliterious effect. I teach in my class that no herbicide or pesticide should be used needlessly. The City Parks Department insisted that they be allowed to continue use of 2,4-D in cemeteries, golf courses, and other areas considered from their experience. But in a general park area where children play, people walk around, they felt there was no reason they couldn't reduce the use there, modify use by changing cultural practices, such as mowing, fertilizing. They felt they

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2,4-D *from page 51*

could stop using it for a few years while it is being studied. Even if weed problems become severe, if bee stings become severe, they're locked into little flexibility in countering these problems. The principle of using it judiciously was good but the interpretation was probably a little too strong and reduced flexibility.

Also, the City Council requested that the park put up signs for 48 hours to indicate use. I don't think that's unreasonable; I think it's unnecessary. If people want to be informed so they don't come near it, Okay.

WTT: Are you afraid the ruling will have ramifications against use in the county and state?

R G H: A full moratorium could have. Any time decisions like this are made for political expediency rather than scientific review, other communities tend to follow this, thinking that there was a scientific background. There is always the fear that this could have fallout in other areas.

City and county governments are based upon aldermen and elected officials, positions which are part-time and outside their normal profession. They don't have the time to seek out officials on their own. They have a hearing process to get the story.

"Obviously, some home-owners relish nice green turf without yellow flowers."

WTT: What is 2,4-D used for in the parks?

R G H: Dandelions are the most obvious. Also, various species of thistle. It has less effect on chickweed and white clover. Since there is no scientific basis that to use it is hazardous and we have 35 or 36 years of safe use history, it's not logical to switch to MCPP or 2,4DP, which are also used. There's no reason to think they're any different. White clover is slicker, causes more falls, and stains more than bluegrass turf. A phenoxy complex can successfully control both. I don't want to encourage the widespread use of dicamba because of the possible greater hazard with drift and nearby shallow rooted shrubs. It is absorbed easily by roots.

Typical drift damage to deciduous tree more likely to occur with some substitute chemicals (above). Roadside use is still permitted to prevent weeds spreading to farm fields (right).

The noxious weed law in Wisconsin requires that Canadian thistle, leafy spurge, and field bindweed must be controlled. Phenoxies are not equally controlled. Unless the state law is amended, the city would be in violation of the law. It appears that 2,4-D was the best control.

WTT: Are there any alternatives?

R G H: The only alternatives — the law says they must be prevented from going to seed — are mowing, which is very costly, and dicamba, but if the weeds are by shrubs they could be damaged. It causes problably 10 times more drift damage than 2,4-D. Those are the only major alternatives.

WTT: Are there any other reasons why 2,4-D should be used?

R G H: Aesthetic aspects as well. Obviously some homeowners relish nice green turf without yellow flowers. If growing uncontrolled in city parks, homeowners will have more problems controlling them. A small percentage were treated annually as it was. Even noxious weeds were not always controlled. Poison ivy and ragweed could increase without the use of herbicides. They can be controlled by mowing and hand pulling, but I'd like to use as many alternatives as possible.

WTT: Do you think there's reason to fear the use of 2,4-D?

R G H: There is no evidence at the present time that would suggest the least hazard presented to the public for using this material. We've used it for 36 years — farmers, foresters, and city employees around the country. Close to 2 billion pounds have been used. It's one of the most widely used pesticides ever and there has been no demonstration of adverse effects from it. To my knowledge, seven cases come to mind in which there's been nervous disorder to someone. They frequently were using other materials and other factors were involved — diseases, contaminants, and psychosomatic conditions. Because of these seven cases though, the EPA did tests on nervous systems. EPA last April had indicated no reason to take any action to stop 2,4-D's use, but because the herbicide was developed so long ago, some of the research did not meet some of the currently accepted laboratory practices. They asked manufacturers to do studies on carcinogenicity, reproductive problems, and other disorders. A number of studies had been done on carcinogenicity and these did not show any problems, but because of insufficiency in the technology they wanted them re-

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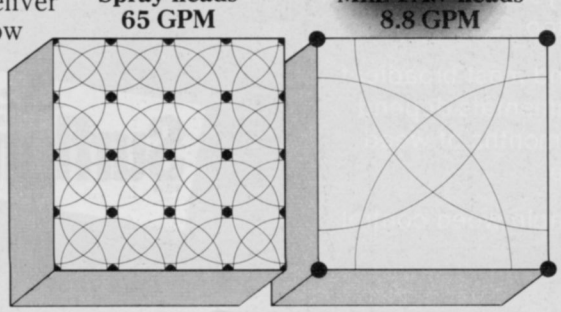

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KENTUCKY RESEARCH REVEALS GREENBUG TURFGRASS PREFERENCES

By D.W. Jackson, K.J. Vessels, and D.A. Potter, department of Entomology, University of Kentucky, Lexington, KY.

The greenbug, *Schizaphis graminum* (Rondani), has become an important problem of the turf industry within the last 10 years (1). Although this aphid is well studied as a pest of sorghum and small grains, little is known about its biology or habits on turfgrass. Many important questions concerning the aphid's overwintering site, its feeding preferences, and its reasons for attacking only certain lawns remain unanswered.

Damage

Greenbug feeding injury on turfgrass foliage shows up as yellow or rust-colored spots with necrotic centers, caused by toxic secretions injected into the plant tissue and from withdrawal of chlorophyll at the feeding sites. Translocation of the aphid's salivary toxins within the plant may also weaken the root system. Heavily infested turf may harbor 5,000 or more aphids per square foot, and will develop a characteristic rust color and finally turn brown (2). Greenbug damage nearly always begins around the base of trees, but often spreads into sunny areas as well. Our observations indicate that injury on home lawns is most severe in areas that are under moisture stress, while low-lying areas are less likely to be affected.

Research

In research at the University of Kentucky, we studied the feeding preferences, survival, and reproductive rate of greenbugs on nine common cool and warm season turfgrasses. We also tested the aphid's ability to survive on nine frequently encountered lawn and roadside weed species. Results showed that 'Kenblue,' 'Vantage,' and 'Adelphi,' the three Kentucky bluegrass cultivars tested, were all highly suitable hosts for the greenbug. Since these cultivars differ widely with respect to both their genetic and morphological characteristics, it is doubtful that existing Kentucky bluegrass cultivars with appreciable levels of resistance will be found. Although previous reports of greenbug activities on turf suggest that the aphid will feed and reproduce only on Kentucky bluegrass, we found that both 'Ky 31' tall fescue and 'Jamestown' chewings fescue will support rapid aphid buildups in the greenhouse. Aphids did not survive or reproduce on ryegrass, bentgrass, zoysiagrass, or bermudagrass.

The following weed species were screened as potential alternative hosts for the greenbug:

Common dandelion	*Taraxacum officinale* (Weber)
Broadleaf plantain	*Plantago major* L.
Buckthorn plantain	*P. lanceolata* L.
Ground ivy	*Galeochoma hederacea* L.
Pigweed	*Amaranthus* sp.
Wild strawberry	*Duchesnea indica* (Andr.) Focke
Large crabgrass	*Digitaria sanguinalis* L.
Violet	*Viola* sp.
Yellow wood sorrel	*Oxalis stricta* L.

In our studies, greenbugs failed to survive or reproduce on any of the nine grassy or broad-leaved weeds tested, suggesting that these plants do not serve as reservoirs from which greenbugs could reinfest a lawn.

Future Research

The recent alarming increase in greenbug outbreaks on home lawns suggests that this insect may have developed a new association with turfgrasses. Although it is possible that a new greenbug biotype or strain has evolved which prefers turfgrass over other hosts, there is evidence that certain high maintenance practices, such as overuse of insecticides and fertilizers, may be changing the physiology of the turfgrass habitat so as to make it more suitable for the greenbug. Observations during the 1979-1980 seasons indicate that greenbug outbreaks nearly always occur on well maintained, intensively managed lawns. It is apparent that additional research pertaining to the effects of lawn chemicals and high maintenance programs on greenbug popula-

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Although greenbug injury generally appears first in shaded areas under trees, heavy infestations may severely damage an entire lawn.

Patches of healthy grass in greenbug infested bluegrass lawns indicate the potential for resistant turfgrass species.

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Greenburg *from page 55*

tions will provide important information for the turf industry. Discovery of the greenbug's overwintering site may reveal a weak link in the aphid's life cycle that is vulnerable to control. The possibility that greenbug damage can be minimized by cultural practices such as timely irrigation, seeding with resistant lawngrasses, or use of a bagging mower should also be investigated.

Literature Cited

(1) Niemczyk, H. 1980. New evidence indicates greenbug overwinters in north. Weeds, Trees and Turf 19(6):64.
(2) Street, J. R., R. Randell, and G. Clayton. 1978. Greenbug damage found on Kentucky bluegrass. Weeds, Trees and Turf 17(10):26.

Weed Control *from page 21*

bined to provide a broader spectrum of control plus this combination has the advantage of using dicamba at a lower rate than when it is used alone. This combination should be applied at the rate of 1.0 pound ai/A, 2,4-D + 0.5 pound ai/A MCPP + 0.10 pound ai/A dicamba. Fall and spring are the best times for control with early fall being preferred especially when turf stands are contaminated with later germinating summer annuals (particularly spurges and *Oxalis).*

Some broadleaf weeds require more specific treatment. Creeping speedwell *(Veronica filliformis)* can be controlled with DCPA 75 W applied in May at 12 pounds ai/A. The granular formulation is not effective. Control using the 75 W often takes as long as three to four weeks to occur. Once the chemical begins to work, the level of control should be nearly 100 percent. DCPA 75 W is not currently recommended for control of any other speedwells.

Oxalis and wild violet are also difficult to control since silvex cannot be used. The combination of 2,4-D and 2,4-DP at 1.0 pound of ai/A from each has provided good control of *Oxalis.* Wild violet control from this combination is not as good as for *Oxalis.* Spring application is the best time of the year for wild violet control.

Regardless of the broadleaf weed control approach being used, treatments should be made only when soil moisture is adequate to support vigorous weed growth. Avoid spray drift onto sensitive plants, clean equipment properly after application, and dispose of empty pesticide containers in an approved manner. **WTT**

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PREVENTION OF TREE DISEASES INCLUDES ROOT GRAFT BARRIERS

Preventative measures remain the dominant control method for many diseases of trees and ornamentals. Selecting resistant varieties, removing diseased individuals, and planting many varieties in low proportions at safe distances apart are a few of the preventative measures used today.

Another preventative measure, not quite as common but equally important, is blocking transmission of disease by root grafts. This can be an effective measure where susceptible species are planted within root range of each other, generally within 35 to 50 feet. A mechanical or chemical barrier must be created between infected and healthy trees.

Dr. Jay Stipes, a plant pathologist at Virginia Tech maintains the best way to control Dutch elm disease is to prevent it. Stipes has served as a DED consultant to the U.S. Department of the Interior and state forest services across the country. "Severing root grafts is not always the answer, but on campuses, city blocks, golf courses, anywhere elms are planted in rows within close proximity, it cannot be overlooked," Stipes says.

Good sanitation, radical tree surgery, and timely applications of foliar insecticides also must be used to control DED, he says.

"When Dutch elm disease is transmitted above ground by bark beetles, radical tree surgery can often save the tree from further destruction," Stipes explains. "It's like cancer with a human being—you may have to remove a breast or a limb to save the person's life. It's the same way with trees.

"If a tree contracts Dutch elm disease by a natural root graft, however, there's no way to stop it. That's why it's so important to prevent the disease from spreading to other healthy trees."

Removing an infected tree will not eliminate the danger, he says. A mechanical or chemical barrier must be established to protect healthy trees as soon as a diseased tree shows signs of infection. "The strategy should be to sever the root grafts first, and then remove the diseased tree about two weeks later," he says.

Groundskeepers have two options available for severing root grafts mechanically. A trench 30 inches deep can be dug midway between diseased and healthy trees.

"The mechanical approach is probably the surest way to get the job done," Stipes says, "but not always the easiest. There are many instances when a fumigant may be preferred."

Groundskeepers electing to fumigate should have a pesticide applicator's license, Stipes says. Otherwise a professional arborist should be hired.

To stop DED with the fumigant Vapam, Stipes says groundskeepers must first drill 3/4-inch holes about 15 inches into the ground and six inches apart. This may be done with a soil auger, power drill or other suitable tool. The line should be at least 10 feet from the healthy tree, and extend well beyond the infected tree's drip line.

Because some apparently healthy trees may already be infected, it's usually a good idea to make a second fumigation line beyond the second tree, Stipes says.

A solution of one part Vapam and three parts water should then be poured slowly into each hole to within two inches of the soil surface. The hole should be sealed with dirt to trap the vapors and minimize grass kill.

Dr. Stipes stands where a diseased elm was recently removed and points at a healthy elm. A soil fumigant was used as a barrier to root graft transmission two weeks prior to removal of the diseased tree.

The fumigant soaks into the soil and kills tree roots in the immediate area. Thus, the underground root graft is broken and disease-causing sap cannot spread to healthy trees. Stipes cautions that Vapam will kill turf growing along the fumigation line, but this can be reseeded or sodded two weeks after the treatment.

Diseased trees should be removed two weeks after fumigating. A disease-resistant tree may then be planted in its place. Groundskeepers should consult their cooperative extension office for local tree planting recommendations, Stipes says. Always follow instructions on the pesticide label. **WTT**


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CAUSES OF LATE WINTER-EARLY SPRING TURFGRASS DAMAGE

By J.R. Watson, Vice President, The Toro Company

During late winter-early spring, fluctuating temperatures and waterlogged, partially frozen soil produce conditions that cause the loss of turf. This loss may be the direct or indirect result of one or more of these phenomena. Direct damage or kill of the permanent grass may occur at any point of the freeze — frozen — thaw cycle so characteristic of this season. Indirect injury may result from attacks by disease-producing organisms (mostly snowmold and other low temperature fungi) and by traffic on frozen and partially frozen turfgrass areas.

Turfgrass may be destroyed — at the time it freezes, during the time it's frozen, during the time it's thawing, or after it's thawed and growth has begun. Some killing probably occurs during each of these periods. This cycle of freezing, frozen, thawing may be repeated several times during each winter and early spring. When associated with intermittent growth in late winter-early spring, damage may be severe. Death as the plant freezes happens most often in the late fall-early winter, but may occur after a period of growth (particularly rapid growth) in the spring when a sudden drop in temperature occurs. This is most damaging when the grass plants are in non-hardened condition. Ice crystals form within the cells and this disruption of the protoplasm may cause death. Too, repeated cycles in the spring will exhaust food reserves upon which the plants must draw to initiate growth. For this reason, *Poa annua* is especially vulnerable.

Death during the time the plant is frozen is unlikely to occur unless it is subjected to traffic. This will seldom occur if a good snow cover exists, which is the case most often during the winter months. However, play during the time period under discussion may cause mechanical damage either by attrition or from pressure which forces the ice crystals through the cells, thereby puncturing them and causing death. Play during time the grass is covered with frost has the same effect.

Death at the time of thawing depends on the amount and the state of the "bound" water within the cell (intra-cellular water). Unless adequate bound water is present in the protoplasm, death may result if thawing is rapid or if inter-cellular water re-enters the cell too rapidly. In the latter case, the cell wall is permeable but the protoplasm is unable to absorb the water. Prolonged cold may be conducive to death because it contributes to brittleness of the protoplasm and, if contact (from traffic) is made, the plant is highly susceptible to damage.

Causes Relating to Traffic

Grass will initiate growth during the warmer periods of late winter-early spring. If the season is characterized by widely fluctuating temperatures, the grass is vulnerable to the freeze-frozen-thaw growth cycle with its attendent problems. Too, the environment produced is highly conducive to disease development. Thus, this may be the most critical phase of the turf management program facing the golf course superintendent. And, he often finds his turf management programs (and, therefore, himself) in direct conflict with the golfing membership, especially those desirous of playing a few early rounds.

Mechanical injury by traffic on partially frozen or wet soil may be immediately evident (visible) or delayed (invisible). Visible injuries (soil displacement) are the footprints and ruts caused by foot and vehicular traffic — sliding and slipping, walking or rolling — on partially frozen or saturated soil. Invisible injury stems from soil compaction.

Although this type of mechanical damage is not confined to the winter months, soil compaction may be far more damaging during this period than generally recognized. Traffic on partially frozen or wet soil, without the protection of living grass, will exert greater pressure (hence, more compacting force) than during the normal growing season. This results, subsequently, in poor growth and may explain "problem areas" which show up in spring and summer for no apparent reason. Cupping areas are particularly vulnerable in this respect.

Traffic on frosted turf causes the frost crystals to puncture leaf cells and kill the grass. Removal of frost, or preventing play when the grass is frosted, is essential.

Control of traffic during vulnerable periods does not always contribute to harmony between early golfing members and the less enthusiastic golfing and nongolfing members. The responsibility for control rests with the club officials — president, green chairman, superintendent and golf professional.

Causes Relating to Ice Sheets and Ponded Water

Turfgrasses, although essentially dormant during the winter months, nevertheless, carry on metabolic (growth) activity, particularly respiration. During late winter-early spring, as growth activity increases, the grass may suffocate (a) if difussion of atmospheric and soil gases is reduced or stopped; (b) if excess carbon dioxide accumulates, or (c) if oxygen supplies are reduced to a minimum. Such conditions exist under ice sheets in poorly drained areas where the soil remains saturated for extended periods and, under flooded conditions when ponded or standing water persists. The higher the temperature, the shorter the period of time that the grass can survive these adverse conditions.

Under limited (and rare) conditions, ice sheets and ponded water may act as a lens. When this happens, the sun's rays are magnified to the point where the excessive heat produced may cause a burning or scalding of the turfgrass.

Causes Related to Reduced Water Intake

Desiccation is a "wilting" phenomenon. Like wilt, which occurs during the normal growing season, desiccation occurs when evapotranspiration exceeds

Continues on page 63

water intake. This inability of the roots to absorb water, or for the plant to transport it to or through its system, may result from a shallow, poorly branched root system; diseased vascular system, or, from a reduced or restricted soil water supply. Limited soil moisture may be the result of a "dry" soil (not enough water) or of a frozen or partially frozen soil (water unavailable to the root because of its physical state). Thus, the roots simply cannot take in enough water to offset that being lost by the plant and it "desiccates" or dries up — it wilts. Although more serious during periods when the soil is "on the dry side" or partially frozen, desiccation on high windswept sites may occur at any time. The increased air movement causes excessive transpiration and under limited or reduced soil moisture conditions, the plants may die unless protected.

In late winter-early spring, before the irrigation system has been activated, damage from desiccation may be severe. Water hauled in spray tanks or by other means and applied to critical sites will preclude or minimize loss.

Protective Measures

Techniques and procedures that protect, avoid and correct the damage that occurs in late winter-early spring are well known to and understood by the golf course superintendent. For the most part, protective measures relate to production of a healthy, vigorous grass and to the control, to the extent possible, of the soil- plant environment. When these factors are adversely impacted by anomalous conditions of weather, poor construction, or inadequate equipment and supplies, the responsibility for loss of turfgrass must be shared. **WTT**

Herbicides *from page 19*

is higher than that suggested for use in new grass seedings. DCPA and bromoxynil will be tested more completely next season. We should then know more about their effectiveness for spurge control and safety to various turfgrasses.

Remember

Although herbicides will control weeds, new weeds may appear in turf from seed in the soil. If turf is neglected, retreatment may be necessary after a year or so. If a dense, vigorously growing stand of grass is maintained, weeds should not be a major problem. Remember, weeds are the result of poor turf rather than the cause. A successful program combines good management with the use of herbicides.

The pesticides listed in this article may be classified "for restricted use only" in accordance with regulations. It is unlawful to use any pesticide for other than the registered use. *Read and follow the label.* The trade names used in this article are for identification purposes and no product endorsement is implied, nor is discrimination intended against similar materials. The information in this article was presented at the New Jersey Turfgrass Expo '80. **WTT**

VEGETATION MANAGEMENT

By Roger Funk, Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *Is rolling the best method of leveling earthworm casts?*

A: Drag matting, brushing the turf or shallow vertical mowing are much more advisable than rolling, particularly if the soil is wet or contains a high percentage of clay.

Q: *My foreman talks constantly about soil amelioration. What does he mean?*

A: Soil amelioration simply means improving the soil. The term is sometimes used in connection with soil aeration.

Q: *What is a calcifuge plant?*

A: A calcifuge plant is a plant which cannot tolerate calcerous (high calcium) soils.

Q: *What is the latest on fusarium blight? We have heard so many ways to solve this problem but what is your view?*

A: There is still a lot of controversy regarding fusarium blight including whether, in fact, Fusarium species are always involved in causing the blight symptoms on turf. Some researchers feel that other organisms may be causal agents and that perhaps the blight is misnamed.

Regardless of the dominant fungal organism involved, the evidence to date supports the philosophy that fusarium blight occurs primarily on turfgrasses which have been stressed by adverse environmental conditions or cultural practices.

Most of the fusarium blight symptoms which have been reported to our diagnostic lab occurred on exposed slopes and other sunny areas which accumulate heat. Also, the most severe symptoms were on sodded lawns, suggesting that the sod-soil interface may be a factor in increasing the susceptibility of turfgrasses to fusarium blight. We have noted poor rooting in the underlying soil when peat sod is laid directly on clay without proper soil preparation. Local dry spots are another problem area.

At the present time we are recommending a slightly higher mowing height (2½"-3") and proper watering to minimize summer stress. Aerification will help correct both sod-soil interfaces and local dry spots allowing better penetration of air, water, nutrients and pesticides. The latter is particularly important when treating fusarium blight with benzimidazole fungicides which must be drenched into the root zone.

Q: *I read about a new material called Amdro for fire ant control. Is it effective and, if so, where can it be purchased? (Florida)*

A: Amdro is effective if used within three days after opening the bag. Soybean oil is used as bait and it quickly becomes rancid. Amdro also degrades rapidly in sunlight and should be applied only when ants are actively foraging. Because Amdro contains a slow-acting poison, results may not be evident for several weeks.

The distributor of Amdro in your area is Asgrow Seed Company.

Q: *The horticulturist at the local arboreteum is telling my clients not to have their trees fertilized after midsummer. What is your opinion? (Indiana)*

A: The roots of many trees continue growing throughout the fall until the soil temperature approaches freezing. Fertilizer available during this period will help stimulate root growth even though trees with determinate growth have completed their shoot development for the season.

The possibility exists that certain trees, such as southern pines, with indeterminate growth might be stimulated with fertilizer to produce new shoot growth just prior to freezing weather. This has been demonstrated with small trees in containerized and greenhouse culture. However, I am not aware of any reported incidence with established trees in the landscape. In any case, the use of slow-release fertilizers will minimize the potential for growth flushes.

Q: *How can you tell if nematodes are causing a problem in turf? (Pennsylvania)*

A: Unfortunately it is difficult to decide if nematodes are causing, or are likely to cause, injury to turfgrasses.

Most plant nematodes affect root functions and, therefore, most symptoms associated with them are the result of inadequate water supply or mineral nutrition to the turfgrass shoots. Aboveground symptoms include chlorosis (yellowing), stunted top growth, poor fertilizer response, "melting out" or gradual decline, invasion by weeds, a tendency to wilt more quickly than healthy plants, and slower recovery from wilting. Belowground symptoms include short roots often in a bushy arrangement near the root tip, slight swellings, and distortion of root growth.

Identification of the nematodes to determine whether or not they are parasitic and present in sufficient numbers to warrant treatment will require a laboratory nematode assay.

Contact your local cooperative extension service for the proper procedures in the collection and handling of soil samples for nematode analysis. Many county extension offices have a nematode sample kit available.

Turf managers often identify the presence of nematode injury by applying nematicides to several small plots within the suspect area and comparing turf response to untreated plots.

Send your questions or comments to: Vegetation Management c/o WEEDS TREES & TURF, 757 Third Avenue, New York, NY 10017. Leave at least two months for Roger Funk's response in this column.

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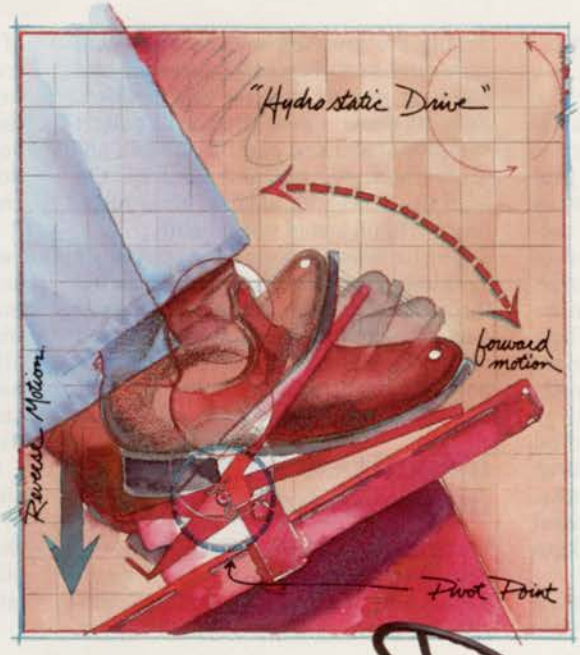

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SOD PRODUCER NEWS

Turfgrass association plans soil tests

The New York State Turfgrass Association is planning a research project to develop a turfgrass fertilization program based on soil testing results. It will then make specific fertilizer recommendations to help turf managers of golf courses, athletic fields, sod farms, and residential grounds determine their fertilizer needs accurately. Thus, they will be able to eliminate nutrient deficiencies and also avoid the costly waste of over-fertilization.

Numerous sites will be selected across New York State for soil testing, including eight regional golf courses, two athletic fields, five residential areas, three sod farms, and one lime belt located on a general turf area.

The researchers will take turfgrass quality ratings at monthly intervals during the growing season. They will note disease and insect occurrence and changes in turf species composition. Several times a year, they will collect samples of soil and plant tissue and analyze them for nutrient content. On high use recreational sites, wear resistance will be tested periodically.

The turfgrass association is currently seeking funding for the project throughout the state. The study is expected to run for three to five years, and each cooperator will receive yearly reports.

Insecticide kills ducks on turfgrass

Ward Stone, wildlife pathologist of the New York State Department of Environmental Conservation, has expressed grave concern about the death of ducks and geese on turfgrass areas treated with Diazinon and other organophosphate insecticides. Although half the cases he reported involved illegal or improper use, he advocates discontinuation of these chemicals.

Dr. Haruo Tashiro of the Geneva Experiment Station in Geneva, New York, says, "Turfgrass managers should make every effort to prevent further bird kill by proper and judicious use of all pesticides, so that cancellation of needed products will not result, if it occurs at all, until safer and more effective substitutes are registered."

Oftanol is likely to replace Diazinon and Dursban for grub control according to Tashiro. However, Diazinon and Dursban are basic to elimination of all other turfgrass insects and their cancellation would create hardships.

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The Land Reclamation Report

Roberts Construction gets $16.4 contract

The Water and Power Resources Service has awarded a $16.4 million contract to Roberts Construction Company of Denver to build four pumping plants between Pueblo and Colorado Springs, Colorado. This represents the largest contract ever awarded to a minority-owned firm by the Interior Department.

The four pumping plants are part of the Fountain Valley Conduit System, which will carry water from Pueblo Reservoir to the Colorado Springs area. Other communities to be served by the conduit area are Stratmoor Hills, Security, Widefield, and Fountain. The plants are expected to be completed in November 1982, and water from the conduit is scheduled to be delivered early in 1983.

The Fountain Valley Conduit is part of the Fryingpan-Arkansas Project, which provides water for irrigation, recreation, power generation, and fish and wildlife, in addition to municipal and industrial purposes.

Environmental impact statement issued

The Water and Power Resources Service has filed with the Environmental Protection Agency a draft environmental impact statement on the administration of the acreage limitation provisions of reclamation law.

The draft statement briefly describes the legislative history of the Reclamation Act of 1902, which established a policy of Federal assistance through irrigation development for farming on land in the arid West. The statement examines the effectiveness of present administrative practices and three alternative methods of administering the law. It also examines two options that would allow individual districts to pay the full cost of the Federally developed water in exchange for program deregulation.

Individual copies of the draft statement are available at regional offices of the Water and Power Resources Service or: Director, Office of Environmental Affairs, Room 7622, Water and Power Resources Service, 18th and E Streets, NW, Washington, DC 20240, 202/343-4991.

Wyoming to regulate mining on Federal land

Wyoming's Governor Ed Herschler and former Secretary of the Interior Cecil D. Andrus signed a cooperative agreement to regulate surface coal mining on Federal lands within the state's boundaries.

This agreement is in accordance with the permanent regulatory program prescribed by the Surface Mining Control and Reclamation Act of 1977. It means that the state assumes primary responsibility for regulation and reclamation of surface mining on Federal, privately owned, and other lands, and the Interior's Office of Surface Mining will function only in an oversight capacity within Wyoming.

"The new agreement eliminates duplication of regulatory control and allows for uniform application of the permanent regulatory program throughout the state," Andrus said.

The Secretary also approved the Kansas regulatory program for surface coal mining and reclamation. The state has agreed to make changes to correct several minor problems as a condition of the approval.

Peer review amendment added to FIFRA

Congress passed the 1980 amendments to the FIFRA bill (H.R. 7018) in December.

The bill itself extended the funding authority for EPA to operate pesticide control programs through September 30, 1981. An amendment directs EPA to set up formal procedures for "peer review" by independent scientists on major scientific studies which are used as the basis of EPA regulatory actions.

Other provisions of the bill are authority for a two-house Congressional veto of future EPA regulations dealing with pesticides, and authority for expedited judicial review of any future attempt to challenge the constitutionality of the Congressional veto provision.

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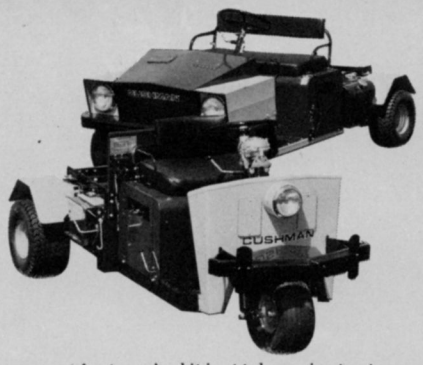

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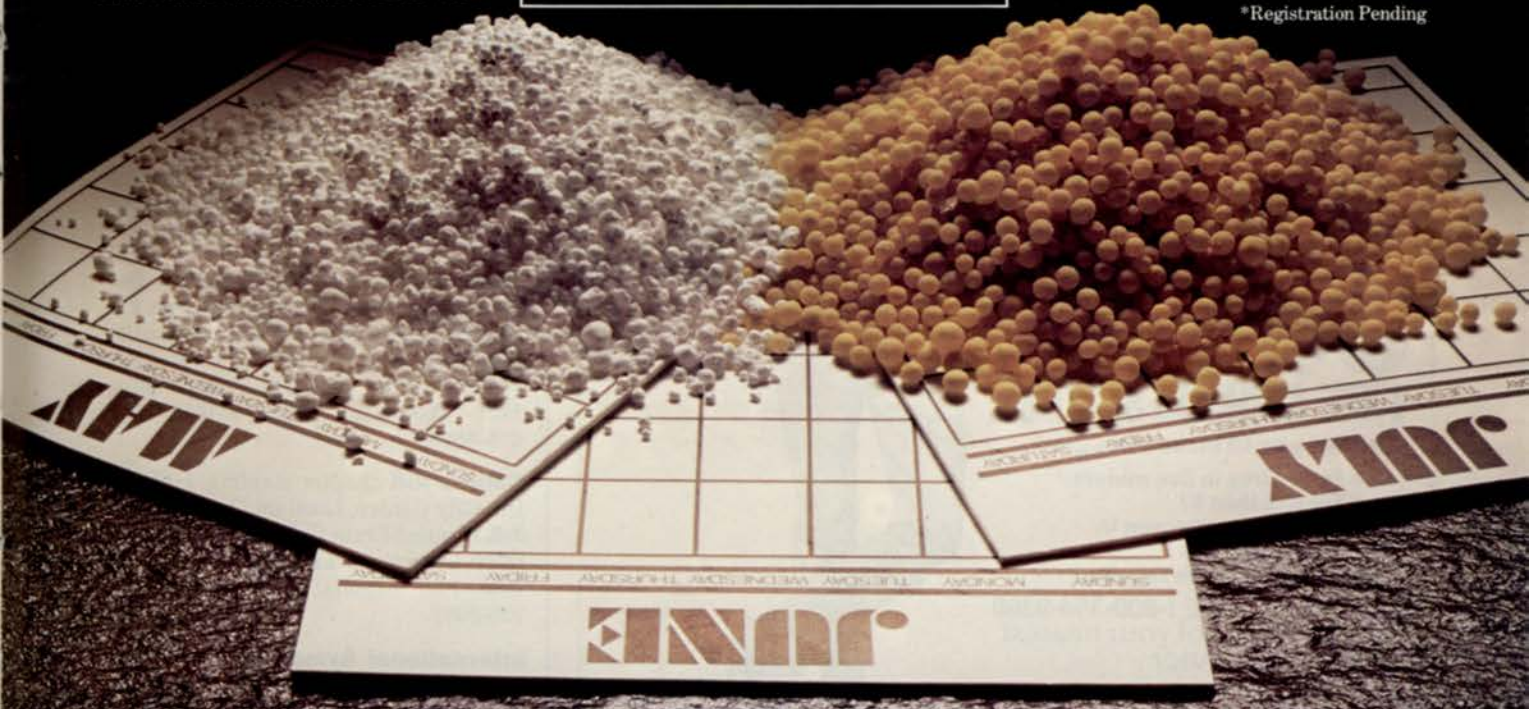

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EVENTS

The current issue of WEEDS TREES & TURF carries meeting dates beginning with the following month. To insure that your event is included, please forward it, 90 days in advance, to: WEEDS TREES & TURF Events, 757 Third Ave., New York, NY 10017.

Southeast Region Parks and Recreation Maintenance Operations workshop, Unicoi State Park, **Mar. 8-13.** Contact Charles Gregory, Recreation Advisor, Recreation Services Section, Georgia Dept. of Natural Resources, 270 Washington Street, S.W., Room 704, Atlanta, GA 30334.

The Irrigation Association Short Course, Lansing, MI, **Mar. 10-11.** Contact The Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906, 301/871-1200.

Northeastern Pennsylvania Turf & Grounds Maintenance School, Master Host Motel, Wilkes-Barre, PA, **Mar. 10-11.** Contact E.V. Chadwick, Luzerne County Cooperative Extension Service, Court House Annex, 5 Water Street, Wilkes-Barre, PA 18702, 717/822-1109.

Residential Landscape Design Short Course IV, Fisher Auditorium, Ohio Agricultural Research and Development Center, Wooster, OH, **Mar. 16-17.** Contact Fred Buscher, Area Extension Agent-Landscape Horticulture, Administration Building, OARDC, Wooster, OH 44691, 216/262-8176.

Hazardous Waste Management Conference, Stouffer's National Center, Arlington, VA, **Mar. 16-17.** Contact Robert W. Nash, executive director, The Energy Bureau Inc., 41 East 42nd Street, New York, NY 10017, 212/687-3178.

Energy Bureau Conference, Stouffer's National Center, Arlington, VA, **March 16-17.** Contact Robert W. Nash, Executive Director, The Energy Bureau, Inc., 41 East 42 Street, New York, NY, 212/687-3178.

Second Annual Professional Grounds Management Society Workshop, Catonsville Community College, Baltimore, MD, **Mar. 17-18.** Contact Mark D. Raab, 11011 McCormick Road, Hunt Valley, MD 21031, 301/667-7741.

Maine Turf Conference, South Portland, ME, **Mar. 18-19.** Contact Vaughn Holyoke, University of Maine, Deering Hall, Orono, ME 04401, 207/581-2111.

5th Turf Conference of Reinders Brothers, Inc., Waukesha Expo Center, Waukesha, WI, **Mar. 18-19.** Contact Ed Devinger, Reinders Brothers, Inc., 13400 Watertown Plank Road, Elm Grove, WI 53122, 414/786-3300.

Irrigation Association's Institute for Agricultural Irrigation, University of California-Riverside, **Mar. 23-Apr. 3.** Contact the IA, 13975 Connecticut Ave., Silver Spring, MD 20906.

The California Landscape Contractors Associations' second annual Landscape Industry Show, Convention Center, Long Beach, CA, **Mar. 26-27.** Contact Michael Leeson, CLCA, 1419 21st St., Sacramento, CA 95814, 916/448-2522.

Pest Control Operator's Conference, Earle Brown Continuing Education Center, St. Paul Campus, University of Minnesota, St. Paul, MN. **Mar. 30-April 1.** Contact Sherry Brothen, Office of Special Programs, Agricultural Extension Service, University of Minnesota, St. Paul, MN 55108, 612/373-0725.

University of Florida Turfgrass Research Field Day, Fort Lauderdale, FL, **Apr. 1.** Contact Dr. Bruce J. Augustin, University of Florida, Agricultural Research Center, 3205 SW 70th Avenue, Fort Lauderdale, FL 33314, 305/475-8890.

Canada ISA chapter meeting, Holiday Inn City Centre, London, Ontario, **Apr. 1-3.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

International Symposium on Phytophthora, Riverside, CA, **Apr. 1-4.** Contact Donald C. Erwin, University of California, Dept. of Plant Pathology, Riverside, CA.

Continues on page 74

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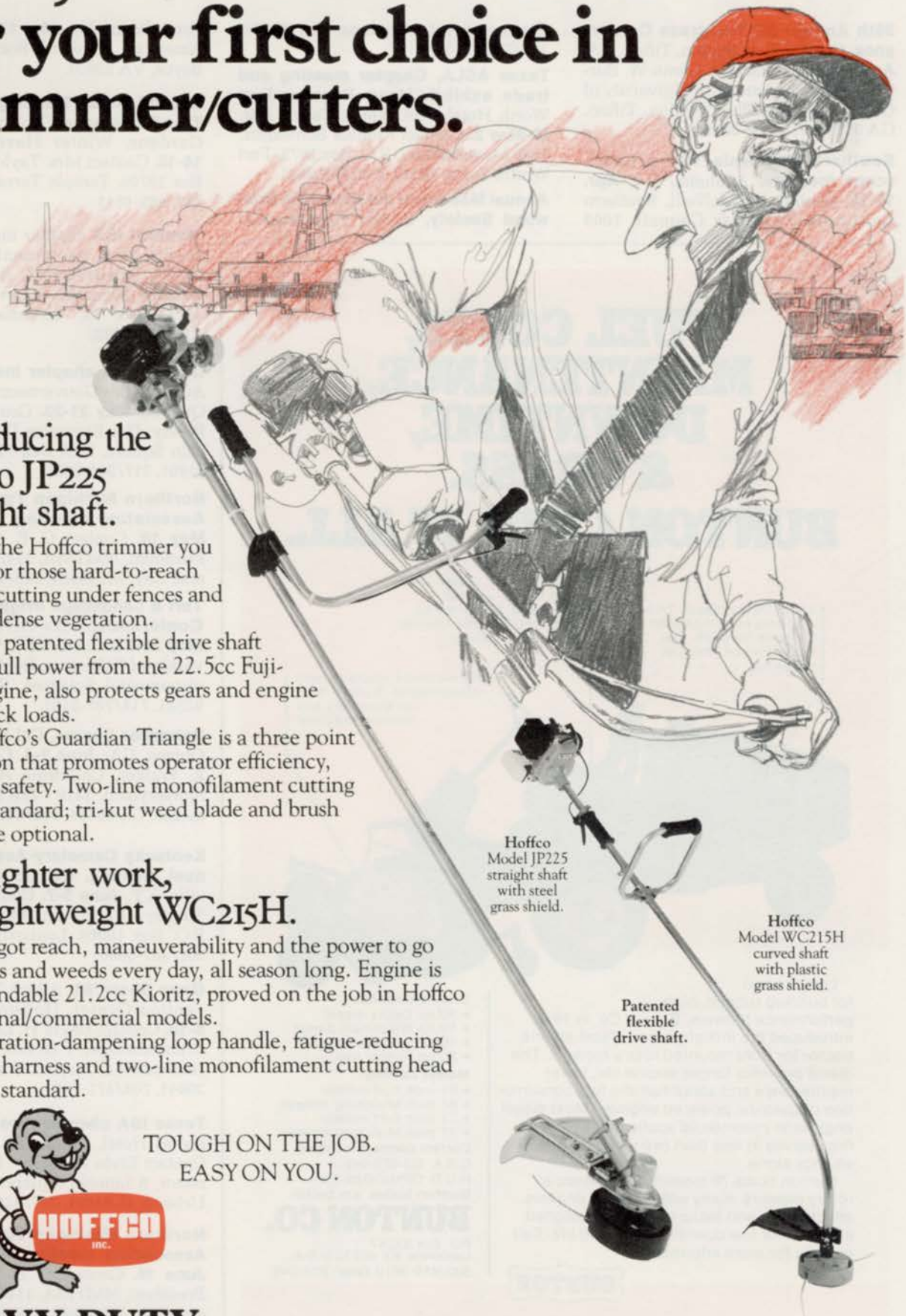

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35th Annual SE Turfgrass Conference, Coastal Plain Station, Tifton, GA, **Apr. 13-14.** Contact Dr. Glenn W. Burton, Research Geneticist, University of Georgia, Coastal Plain Station, Tifton, GA 31793, 912/386-3353.

Southern California Turf & Landscape Institute, Anaheim, CA, **Apr. 14-15.** Contact Ed McNeill, Southern California Turfgrass Council, 1000 Concha Street, Altadena, CA 91001, 213/798-1715.

Texas ASLA, Chapter meeting and trade exhibit, Hyatt Regency-Fort Worth Hotel, Fort Worth, Texas, **Apr. 29-May 2.** Contact Monica Schwanitz, 1100 Macon Street, P.O. Box 2973, Fort Worth, Texas 76113, 817/333-2611.

Annual Meeting of the American Boxwood Society, Blandy Experimental Farm, Boyce, VA, **May 13.** Contact The American Boxwood Society, Box 85, Boyce, VA 22620.

Second Annual Menninger Flowering Tree Conference, Quality Inn, Cypress Gardens, Winter Haven, FL, **May 14-15.** Contact Mrs. Taylor Burris, P.O. Box 16796, Temple Terrace, FL 33687, 813/985-8511.

Western ISA chapter meeting, Sacramento Inn, Sacramento, CA, **May 17-20.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2832.

Quebec ISA chapter meeting, Hotel Auberge des Gouverneurs, Sherbrook, Quebec, **May 21-23.** Contact Ervin C. Bundy, ISA Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

Northern Michigan Turf Managers Association meeting, Leland, MI, **May 19.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Turf & Landscape Irrigation Institute Conference, Lake Arrowhead, CA, **May 29-31.** Contact J. L. Meyer, University of California, Dept. of Soil & Environmental Sciences, Riverside, CA 92521, 714/787-5101.

Refresher Course, Cal Poly, San Luis Obispo, CA, **June 2-4.** Contact Lanny E. Walker, California Association of Nurserymen, 1419 - 21st Street, Sacramento, CA 95814, 916/448-2881.

Kentucky Cemetary Association annual meeting, Executive Inn, Louisville, KY, **June 5-7.** Contact Lewis C. Tingley, Resthaven Memorial Park, P.O. Box 18068, Louisville, KY 40218, 502/491-5950.

Grow Show '81, Albert Thomas Convention Center, Houston, TX, **June 8-10.** Contact David H. Lindsay, Exposition Manager, P.O. Box 17413, Dulles International Airport, Washington, DC 20041, 703/471-5761.

Texas ISA chapter meeting, Dunfey Dallas Hotel, Dallas, TX, **June 11-13.** Contact Ervin C. Bundy, Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

Northern Michigan Turf Managers Association meeting, Cadillac, MI, **June 16.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Continues on page 76

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(714) 821-9020
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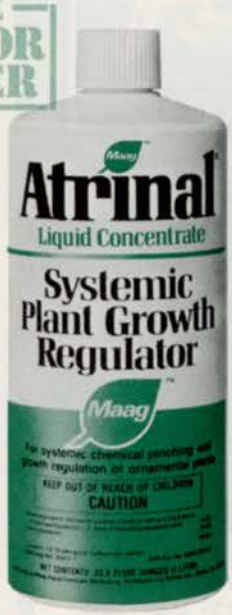

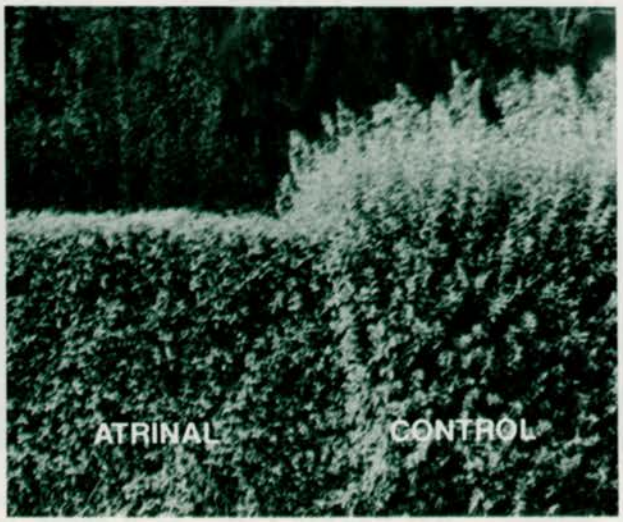

RCD 6012

Events *from page 74*

Seventh Annual Turf Field Day, University of Massachusetts, South Deerfield Research Station, **June 24.** Contact Dr. Joseph Troll, University of Massachusetts, Dept. of Plant and Soil Science, Stockbridge Hall, Amherst, MA 01003, 413/545-2353.

Better Lawn & Turf Institute Annual Meeting, Atlanta, GA, **June 30.** Contact Robert W. Schery, Director, BLTI, 991 W. 5th Street, Marysville, OH 43040, 513/642-1777.

Northern Michigan Turf Managers Association meeting, Cadillac, MI, **July 7.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

New York State Nurseryman's Association Convention and Trade Show, Onondaga County War Memorial Convention Center, Syracuse, NY, **July 7-10.** Contact Margaret Herbst, 230 Park Ave., New York, NY 10017, 212/685-4579.

American Sod Producers Association Summer Convention & Field Days, Hershey Motor Lodge & Convention Center, Hershey, PA, **July 15-17.** Contact ASPA, Bob Garey, Executive Director 9th & Minnesota, Hastings, NE 68901, 402/463-4683.

International Society of Arboriculture Annual Meeting, **Aug. 9-13,** Boyne Mountain Resort, Boyne Falls, Michigan. Contact E.C. Bundy, 5 Lincoln Square, P.O. Box 71, Urbana, IL, 61801, 217/328-2832.

Sixth Nebraska Turfgrass Field Day and Equipment Show, Aug. 4. Contact Dr. Robert Shearman, University of Nebraska, 377 Plant Science Bldg., Lincoln, NE 68583, 402/472-2550.

International Garden Centre Congress, Disneyland Hotel, Anaheim, CA, **Aug. 24-30.** Contact Pat Redding, GCA, 230 Southern Bldg., Washington, DC 20005.

University of Rhode Island Turfgrass Field Day, Kingston, RI, **Aug. 26.** Contact C.R. Skogley, University of Rhode Island, Dept. of Plant Science, Woodward Hall, Kingston, RI, 02881, 401/792-2570.

Northern Michigan Turf Managers Association meeting, Gaylord, MI, **Aug. 26.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Ornamentals Northwest Seminars, Oregon State University, Portland Memorial Coliseum Portland, OR, **Aug. 28-29.** Contact Dr. James L. Green, Oregon State University, Dept. of Horticulture, Corvallis, Oregon 97331, 503/754-3464.

Garden Industry of America Conference & Trade Show, Pittsburgh Convention/Exposition Center, Pittsburgh, PA, **Sept. 10-12.** Contact GIA, Box 1092, Minneapolis, MN 55440.

Northern Michigan Turf Managers Association meeting, Acme, MI, **Sept. 15.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Pacific Horticultural Trade Show, Long Beach Convention Center, Long Beach, CA, **Sept. 23-25.** Contact Lanny E. Walker, California Association of Nurserymen, 1419 - 21st Street, Sacramento, CA 95814, 916/448-2881.

Continues on page 80

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Clay-coated, paper-fiber Spra-Mulch® bonds firmly and makes things easy for you.

Spra-Mulch clings tenaciously to steep slopes and uneven areas because each shred of paper is coated with kaolin clay. And this, along with the paper's ground wood fibers, makes it highly resistant to wind and erosion. But, that's only part of the story. Spra-Mulch makes things easy and productive every step of the way.

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An innovative man fell over an impact sprinkler head on a riser. As he massaged his throbbing ankle, he exclaimed, "Someone needs to make these darn things safer!" And thus, Safe-T-Lawn was born. And our fumbling friend developed one of the first spring-loaded pop-up heads in the industry...for Safe-T's sake.

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Events *from page 76*

Northwest Turfgrass Conference, Olympia, WA, **Sept. 28-Oct. 1.** Contact Dr. Roy L. Goss, Northwest Turfgrass Association, Western Washington Research and Extension Center, Puyallup, WA 98371, 206/593-8513.

Central Coast Turf Day, California Polytechnic State University, San Luis Obispo, CA, **Oct. 1.** Contact Ronald D. Regan, Head, Ornamental Horticulture Department, CPSU, San Luis Obispo, CA 93407, 805/546-0111.

Northern Michigan Turf Managers Association meeting, Pinconning, MI, **Oct. 6.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Southern California Turfgrass/ Landscape Equipment & Material Educational Exposition, Costa Mesa, CA, **Oct. 14-15.** Contact Ed McNeill, Southern California Turfgrass Council, 1000 Concha Street, Altadena, CA 91001, 213/798-1715.

Southwest Turfgrass Association Annual Conference, Albuquerque, NM, **Oct. 15-16.** Contact Arden Baltensperger, Southwest Turfgrass Association, New Mexico State University, Agronomy Dept., Box 3-Q, Las Cruces, NM 88003, 505/646-3138.

Florida Turf-Grass Association 29th Annual Conference and Show, Orlando, FL, **Oct. 18-22.** Contact Beth Eyman, FTGA, 1520 Edgewater Drive, Suite E, Orlando, FL 32804.

C.A.N. Convention, Ventura Holiday Inn, Ventura, CA, **Oct. 20-22.** Contact Lanny E. Walker, California Association of Nurserymen, 1419 - 21st Street, Sacramento, CA 95814, 916/448-2881.

Interior Plantscape Association Annual Meeting, Radisson St. Paul Hotel, St. Paul, MN, **Oct. 28-30.** Contact IPA, 11800 Sunrise Valley Drive, Reston, VA 22091, 703/476-8550.

National Institute on Park & Management meeting, Appleton, WI, **Nov. 1-6.** Contact NIPM, Box 1936, Appleton, WI 54913, 414/733-2301.

The Irrigation Association Annual Convention, Honolulu, HI, **Nov. 9-13.** Contact Tom Schiltz, Director Technical Services, The Irrigation Association, 13975 Connecticut Avenue, Silver Spring, MD 20906, 301/871-1200.

New York State Turfgrass Association Conference & Trade Show, Albany, NY, **Nov. 16-19.** Contact Ann Reilly, NYSTA, 210 Cartwright Blvd., Massapequa Park, NY 11762, 516/541-6902.

12th Annual GCSA/University of Georgia Turfgrass Short Course, Athens, GA, **Nov. 23-24.** Contact George M. Kozelnicky, University of Georgia, c/o Dept. of Plant Pathology & Plant Genetics, Athens, Georgia 30601.

Ohio Turfgrass Conference and Show, Columbus, OH, **Dec. 2-4.** Contact David P. Martin, Ohio Turfgrass Foundation, Ohio State University, 1827 Neil Avenue, Columbus, OH 43210, 614/422-2591.

Texas Turfgrass Conference, College Station, TX, **Dec. 7-9.** Contact Dr. Richard L. Duble, TTC, Soil & Crop Sciences Dept., Texas A & M University, College Station, TX 77843, 713/845-4826.

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New, big machine performance in a compact size, low price.

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News *from page 14*

75 percent green-goods display. The association has agreed to pay the present 25 stockholders $60,000 plus a booth credit in the show for the next four years.

FNGA's executive vice president, Charles W. Dunn, said that the exposition will offer the association's foliage division a vehicle to promote its Florida product further. "The production of some of the world's finest foliage is based in Florida," he said. "These growers need to expand markets and seize every opportunity to develop new ones."

RESEARCH

Study on California's use of pesticides

California, the nation's leading agricultural state, is also its leading user of pesticides, reports Security Pacific National Bank in a study, "California Agriculture." The study shows that in 1979 the state used an estimated 139 million pounds of pesticides, which included more than 118 million pounds used for agricultural purposes.

Vernon M. Crowder, assistant vice president of the bank's research department, says, "California has regulated pesticide usage for more than 40 years." He emphasizes that many of these pesticides are nontoxic, and that the last recorded death from pesticide usage involving an agricultural worker occurred in 1972.

California growers, says Crowder, also use a variety of "natural" means of control, such as weather, irrigation, crop rotation, natural predators, selection of resistant plant varieties, sex attractants, and the introduction of sterile male pests.

New regulations governing the use of pesticide will increase the costs of the state's agricultural industry. "Ultimately," says Crowder, "the added financial burden would fall on the consumer—either at the checkout stand in the market or on the tax bill." He reports that California growers also are concerned that freedom to use pesticides when needed is essential to the production of reasonably priced, high quality food products.

CONFERENCE

Annual weed control conference held

The North Central Weed Control Conference elected new officers recently at its 35th annual gathering in Omaha, Nebraska. James D. DiVall of Stauffer Chemical Co. was elected second vice president; James W. Herron, University of Kentucky, agronomy department, was named president; and Robert L. Benson, Monsanto Co., became first vice president.

The conference's two keynote speakers lauded the accomplishments of weed scientists during the past decade, but said they need to be more active in public affairs in order to meet the challenges of the '80s.

Will D. Carpenter, president of the Weed Science Society of America, urged his audience "to work toward responsible regulations—not no regulations. If you choose not to become involved, you can be assured that others will," he warned. He said that although research and development professionals have little control over inflation, the declining food supply, the decreasing availability of resources, and the political environment, they need to be active in public issues which affect agriculture.

G.F. Warren, professor emeritus of Ohio State University, reviewed developments in herbicides and biological weed control during the '70s. Reduced tillage to conserve moisture and reduce soil erosion has grown popular, he said. But finding ways to control resistant weed species continues to be a problem.

The speakers mentioned two new trends in weed science personnel: many noted scientists who began their careers in the World War II era will retire in the 1980s, and more women are choosing careers in weed science than a decade ago.

CONFERENCE

Turfgrass meeting draws huge crowd

The Ohio Turfgrass Conference and Show, held December 2-4 at the Ohio Center in Columbus, drew a record number of 1,745 people from 34 states.

Some 85 show exhibitors, representing fertilizer, seed, and equipment companies, chemical firms, irrigation specialists, and even a computer company, filled all 180 booth spaces.

The keynote speaker at the opening session, Dr. Roger Blackwell, professor of marketing at Ohio State University, spoke on "Changing Consumer Lifestyles: Implications for the Turfgrass Industry." The educational program was split into concurrent sessions on golf courses and on professional lawn

Continues on page 86

AT HOLY CROSS, FULL-TIME TRIMMING IS BECOMING A PART-TIME JOB.

Larry Farrell
Superintendent
Holy Cross Cemetery
Milwaukee, WI

Maybe you can't see the difference. But since Holy Cross Cemetery added EMBARK plant growth regulator to its seasonal work force, they're doing 50 percent less trimming.

What started as a test is now a full fledged turf maintenance tool for Larry Farrell, superintendent of this 160-acre cemetery.

"By spraying EMBARK PGR on fast-growing grass around raised monuments, crews only trim 4 or 5 times a season," says Larry. "That's down from the usual 8 or 10 trips."

For Holy Cross a 50 percent drop in trimming means better use of part-time labor. Because if crews aren't cutting around markers, they're busy mowing or doing other cemetery maintenance jobs.

With EMBARK PGR, you spray whenever grass is actively growing. Spring, summer or fall.

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3M

2,4-D *from page 52*

peated. Reproductive studies were done intensively and an EPA advisory report said that it could show no effective levels that are higher than human exposure. These are justifiable things. It's impossible to prove a negative, that 2,4-D is not harmful. Studies can't always define every situation. You have to study the benefits of continued use to see if they outweigh any contradictory evidence. I'd rather see any contradictory evidence. I'd rather see if they outweigh any contradictory evidence. I'd rather see the old experience that is proven more than something newer, not as well tested. The city parks department has been using 2,4-D for 25 years without complaint.

WTT: Do you think medical evidence may show that the child (Zachary) was affected by the spraying of 2,4-D?

R G H: There's no reason to believe this. It is generally accepted that the applicator is the most likely person to be the most exposed. No correlation has been observed previously of this type of symptom. Nothing in scientific literature lends credibility to the father's claim. The doctor claimed the child had a history of these types of seizures. A neurologist testified at the hearings that there was no correlation between the child's history and 2,4-D. It occurred in an uncontrolled situation; there is no way to control the circumstances. The family hasn't given medical evidence to confirm or deny the accusations. All you have to go by is the parent's opinion that this seizure had to do with the use across the street at the park.

WTT: What do you think will happen to this issue in the future?

R G H: I have no idea. In this city because of liberal politics, the tendency for an emotional reaction that's traditionally taken place — anything is possible. The health director wanted stoppage of the use of all herbicides. This wasn't based on any data, but on his own emotional concerns. He didn't talk to anyone about herbicide chemistry.

Nationwide, many people and organizations are trying to stop the use of any type of pesticides. They wish to go back to organic farming, and are anti-technology. Many are very well meaning. It is their privilege to have these beliefs. Based on these feelings, their basic philosophy is to raise the 2,4-D question in every town hall, county commission, and school hall — to get the word "herbicide" in the press as much as possible to raise the excitement of the public.

I believe logic will prevail; decisions will be made on scientific review and analysis. I sure hope this is the case. Otherwise, the future of the country is in trouble. There's no guarantee that there won't be some discovery of a hazard with 2,4-D or anything. Who knows what will come along? I hope whatever happens is based on scientific review, not on emotional, unscientific data. **WTT**

Toro creates the ultimate low pressure, large radius Pop-Up.

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The Super 600 is also so remarkably compact, it's a breeze to install.

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service and grounds maintenance. Among the speakers were Dr. Roy Goss of Washington State University, who talked about "Fertility Programs and Other Methods of Annual Bluegrass Management," and Dr. Win Hock of Pennsylvania State University, who discussed "Pesticide Spills." On the last morning, there was a third session—a disease and insect identification workshop.

At a business meeting, Mark Yoder was elected president and Dick Warner became president-elect. Tom Baker was elected vice president, and Gary Rasor is the new treasurer.

The Banquet Guest Speaker was Wayne Woodrow "Woody" Hayes, who served for 28 years as head football coach at Ohio State University. Hayes reviewed the history of Ohio State football, which he related to political history, concluding "That's the way the ball bounces."

The "Man of the Year" Award for Professional Excellence was presented to Wilbur Waters. He recently retired as superintendent of Inverness Golf Club in Sylvania, Ohio, and had been associated with the golf course business for 54 years.

CONFERENCE

Maryland turf group meets in Baltimore

Some 600 people attended the Maryland Turfgrass Council's Educational Conference & Trade Show at the new Baltimore Convention Center in Baltimore, Maryland, on January 5-7.

Several out-of-state speakers delivered talks, including Dr. Harry Niemczyk of the Ohio Agricultural Research and Development Center, whose subject was the absorption of insecticides by thatch. He told how to control chinch bugs and billbugs with one application of insecticides during the spring.

Two speakers discussed the severe drought and practical ways to conserve water. Dr. Jack Butler of Colorado State University talked about managing water with limited quantity and quality. Dr. Al Dudeck of the University of Florida spoke on water management problems and related research in Florida.

Dr. Tom Watschke of Pennsylvania State University covered the subject of growth regulators for turfgrass, including their current use and the potential for in-depth research at the university.

Mr. J. M. Jalone of J. M. Malone & Sons talked about aquatic vegetation and control with a hybrid white amur. This fish, a type of carp developed by breeding, controls weeds and cannot reproduce. Thus, it does not stifle native species, and efforts are being made to legalize its use.

PARKS

Park Service halts use of 2,4-D

The National Park Service is suspending the use of the herbicide 2,4-D in its 325 parks and recreation areas.

A park spokesman said that the action stems from pressure from environmental groups, which claim adverse reaction to the weed killer. Dow Chemical, a major manufacturer of 2,4-D, says that in 30 years of marketing there has been "absolutely no problem associated with the chemical." EPA in its study of the chemical has said the evidence of adverse health effects is inconclusive and they have no plans to ban it.

LEGISLATION

Congress extends mower deadline

Congress has granted mower manufacturers a six-month extension to comply with the Consumer Product Safety Commission safety standard for walk-behinds. The action delays the effective date to June 30, 1982.

The extension is part of the CPSC appropriations measure, which is part of a larger bill including the Department of Housing & Urban Development. It was proposed by Rep. Lawrence Coughlin (R-Pa.), ranking minority member of the House appropriations subcommittee, and strongly supported by Sen. William Proxmire (D-Wisc.), chairman of the Senate subcommittee.

PUBLICATION

Free copies available of restoration news

Free copies of the first issue of Restora-

Continues on page 90

THE GRASS IS GREENER ON THE ENKAMAT® SIDE.

The Rose Bowl

Enkamat® webbing is a 3-dimensional nylon turf reinforcer. Placed just below the surface, it will keep turfgrass and/or appropriate vegetation in place, protect it against tearing, and in most cases prolong the playing season.

The Rose Bowl installed 20,000 square feet in March 1980, and reported excellent results, even after an extensive soccer season. The Wellington Landing Strip and numerous high schools also installed Enkamat webbing with great success.

Enkamat helps scarred turfgrass heal itself by protecting against compaction and divoting, promoting a strong root system.

Because Enkamat provides a more resilient footing than both unprotected grass and topical synthetic matting, it tends to reduce the types of injuries suffered on artificial turf.

Enkamat works. In the stadiums of the Orange Bowl and New Mexico State. On the tees and greens and cartpaths of this country's more prestigious golf courses. On athletic fields, polo grounds, parks and soccer fields.

You'll call it the greening of America. But the real name is Enkamat.

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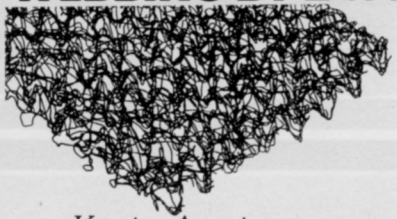

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Just what the Industrial Vegetation Control Specialists ordered.

Economy. Efficacy. Environmentally sound. That's what these industrial vegetation control specialists said they wanted in brush and broadleaf weed control herbicides. So we offered them a complete line of Banvel industrial products. Here's what they had to say...

Robert J. Gates, chief of field operations, Southwest Florida Water Management District.

Robert Gates and the Water Management District have been using Banvel Industrial Herbicides for over five years: "Alligator weed and pennywort are real problems in navigation work. we control 'em with Banvel 720. We also maintain our recharge areas, and it works beautifully there, too. Banvel 720 works on hardwoods and softwoods, where 2,4-D would only be effective on one species. The favorable ecological impact is another important reason for using Banvel 720. Without the Banvel, we would have some serious problems."

John (Jack) Bogle, President of the R. H. Bogle Company, Alexandria, Virginia.

The R. H. Bogle Company has been a pioneer in the control of brush along railroads: "We've been using Banvel products for the last six or seven years. Today, we're using Banvel 720 as a general brush killer. Also to spot treat woody plants, such as pines. Banvel 720 also has an aquatic label in eleven southern states. So it gives us the flexibility to spray along ditches. And it's at least as good, if not a little better on price with other herbicides. For mixed brush control, Banvel 720 is highly efficient."

M. L. Bugh, landscape architect, Indiana State Highway Commission, maintenance division.

M. L. Bugh has worked closely with Purdue University to develop a strong, affordable weed control program for Indiana highways. He's been specifying Banvel 720 and Banvel 4-W.S. since 1975: "Economy is a major factor when we consider a weed control program. But we look as much at performance as at cost. Banvel 720 combines the best of both. Two applications of Banvel look like four of 2,4-D. And, applied the right way, Banvel is as safe to the environment as any other chemical we've used."

These industrial vegetation control specialists get all they ask for with the Banvel line of products. Shouldn't you? Contact your Velsicol salesman and see how Banvel industrial herbicides can work for you.

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News *from page 86*

tion and Management Notes, a new publication from the University of Wisconsin-Madison Arboretum, will be available to interested persons on request.

The publication, to be made up mostly of short notices dealing with the techniques and principles of restoring and managing communities of native plants and animals, is intended to encourage communication between researchers, managers, naturalists, landowners, and others involved in the active conservation of natural and semi-natural areas.

To obtain a copy, contact WR Jordan, III, The University of Wisconsin-Madison Arboretum, 1207 Seminole Highway, Madison, WI 53711, 608/263-7888.

PLANTS

Perlite Institute offers plant guide

The Perlite Institute has announced publication of a two-page plant guide for the use of lime on plants susceptible to fluoride.

The guide, prepared by Dr. Raymond Sheldrake, states that when limestone is added to a soil mix, the amount of fluoride in the plant leaves and soil solution decreases. Copies of Perlite Plant Guide Number 1 may be obtained from Perlite Institute, Inc., 45 West 45 Street, New York, NY 10036.

Golf Show *from page 8*

Kurtz, and plant selection for the golf course by Dow Garden horticulturist Douglas Chapman. The United States Golf Association program on the final day discussed balancing quality with economy on the golf course.

One of the highlights of the research session was Dr. Noel Jackson's tracking of the turf disease Ophiobolus patch in the East. More cases are being reported in that area, especially with Penncross bentgrass. Bluegrass and ryegrass tend to move in where bentgrass has been weakened by the disease. The disease causes patches up to five feet in diameter after a few years of no control. Jackson said pH and moisture control and use of another bentgrass can help curb the spread of the disease. The disease was first noticed in turf in the Pacific Northwest where it is commonly found on cereal crops.

Dr. Houston Couch compared the phytotoxic conditions of the various systemic fungicides for turf. Couch warned that these compounds can accumulate in the soil and reach harmful levels. Common bluegrass and ryegrass are least sensitive to damage by systemic fungicides. Bentgrasses and Merion Kentucky bluegrass have exhibited higher susceptibility to damage.

Dr. Bob Kneebone from the University of Arizona provided a comprehensive study of turf water needs. Although subirrigation reduces evaporative loss it does not provide the necessary leaching out of salts required in many dry areas. Kneebone said evaporation rates can be reduced by changes in cutting height and texture, increasing infiltration rates of the soil, and se-

Continues on page 92

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Golf Show *from page 90*

lection of drought tolerant cultivars. Subirrigation uses the same amount of water as surface irrigation Kneebone pointed out. He also said use of moisture sensors in the soil can save up to 50% of water used for irrigation.

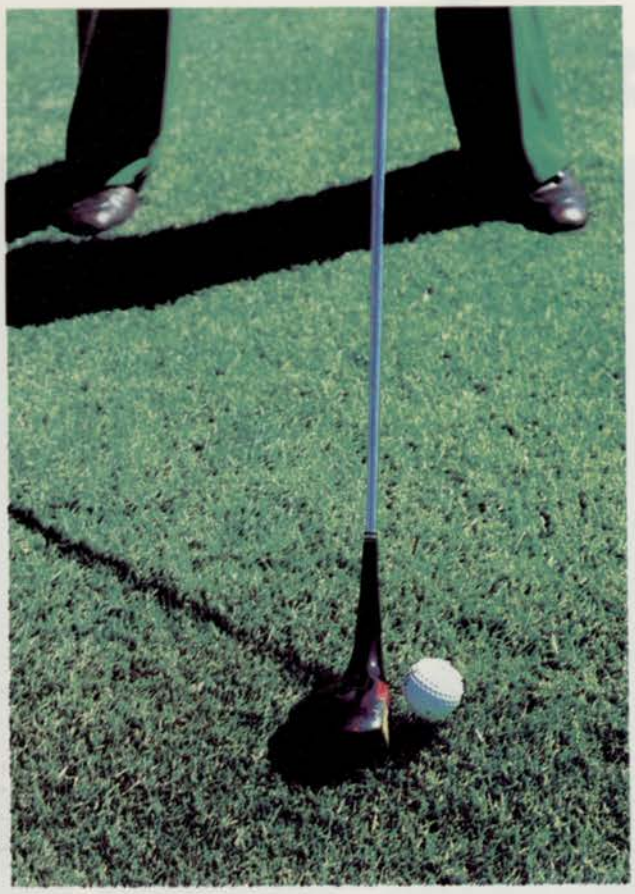
Dr. Bob Shearman of the University of Nebraska said heat stress in turfgrass can be reduced by increasing the cutting height, air movement over the turf, syringing, control of thatch accumulation, and less fertilization. By cutting the grass an inch higher surface temperatures are reduced four or more degrees.

Dr. James Beard of Texas A&M University told delegates that wind speed has a greater effect on ball roll than any management practice. Beard disputed whether double cutting greens increases roll. He recommended topdressing after coring, removal of dew on greens, selection of fast turfgrasses, and alternate mowing.

Dr. John Madison, professor emeritus of the University of California outlined the pro's and con's of sand topdressing. This procedure helps control thatch; provides a truer, faster putting surface; and allows for deeper rooting. The drawbacks include application rates for chemicals must be carefully adjusted, handling of large volumes of sand, interface problems between soil and sand layers, and localized dry spots. Madison recommended frequent light applications of sand over fewer heavy applications. He said up to 50 applications per year may be necessary in some locations. The size of the sand particle is also critical.

Dr. Roy Goss of the Western Washington Extension Center showed delegates that material from the explosion of Mount St. Helens is very similar to present soils, lacking primarily organic matter. Goss said one cubic mile of material now coats more than 600,000 acres of land in the area. Trials have indicated that bentgrasses, fescues and ryegrasses will succeed on the ash with less success with bluegrasses.

Dr. Paul Rieke of Michigan State University compared wetting agents available to turf managers. He recommended irrigation prior and following application of wetting agents. **WTT**



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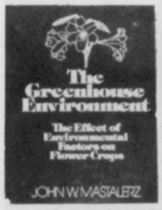

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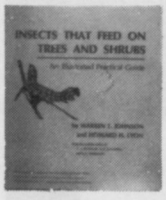

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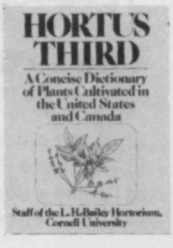

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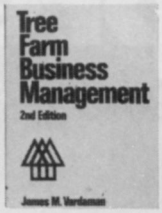

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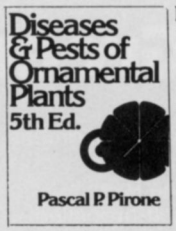

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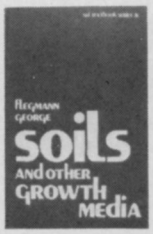

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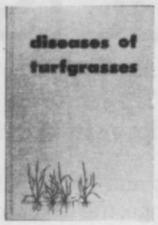

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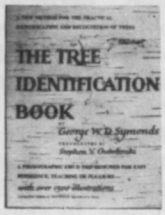

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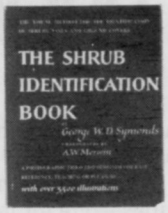

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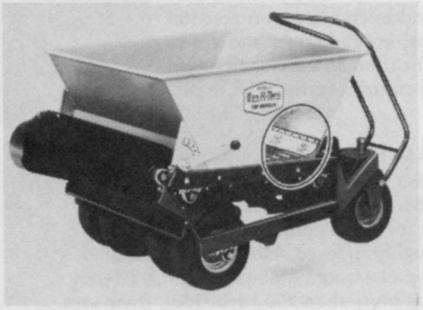

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A system of nozzles and nozzle tubes, the Erocon super nozzle system from EROCON-Pacific uses the laminar flow principle to improve movement when applying water, or water-based slurries, for hydraulic-seeding and fire-fighting. The system changes violent turbulence created in the centrifugal pump to straight-line stream flow. It reduces friction further with the smooth inside of its nozzle parts.

There are six nozzles and two nozzle tubes—one for long range, the other for mid range. Brass threads on the tubes eliminate potential nozzle blowout due to high pressures in the hydraulic-seeding process.

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A one-man operated herbicide sprayer called the Swinglok applies bareground herbicides under guardrails, signs, and on shoulders; treats right-of-ways; and laces foliage with soil active herbicides to control brush. The Cibolo Manufacturing product attaches to the front bumper of the vehicle and uses various booms. Its spray swath consists of four 9-foot sections which allows for selective spraying up to 36 feet in the ROW.

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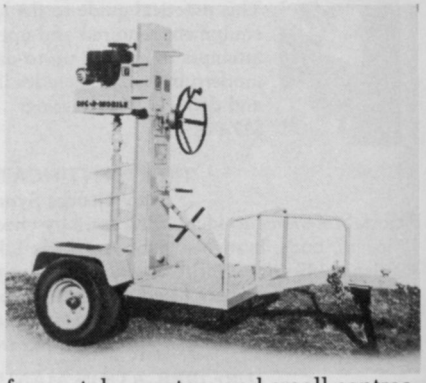

for rental operators and small contractors. It accepts augers 12 inches in diameter.

For long wear and reliability, the 350 contains a 5-horsepower Briggs & Stratton engine, Pengo boreheads, industrial hex drive, full-flighted augers and auger extensions, and heavy-duty construction. General Equipment Co. manufactures it.

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The super nozzle system developed by Erocon-Pacific Corp. uses the laminar flow principle of movement to provide a significant improvement in the application of water-based slurries used for hydraulic seeding and fire fighting. This system modifies violent turbulence, created in the centrifugal pump, to straight-line stream flow as it leaves the nozzle tip.

It consists of two nozzle tubes and six different nozzles. The chemical resistant tubes are designed, one for long range and the other for mid range. Brass threads on the tubes eliminate potential nozzle blow-out due to the high pressures used in the hydraulic seeding process. Different combinations of nozzles and tubes provide smoother application of water slurries at different distances. System is available for new equipment or as replacement for present nozzles.

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A componentized power train is featured on JCB 3C and 3D backhoe loaders. Designed for easy access to major drive train components, the new

Continues on page 100

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A four-pound flowable Maneb formulation provides control of most diseases of vegetables, ornamentals, turf, and grasses. Stoller's Maneb produces micron-size particles. It protects emerging seedlings from fungal blights, and also prevents rot and decay of stems and foliage. Low rates give effective control under severe disease conditions. The product mixes readily with water and is compatible with most insecticides, including spray oils. When applied according to label instructions, it is safe to use.

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Stoller Chemical has just received EPA clearance for a 4-pound flowable Maneb formulation. Label recommendations include control of most diseases of ornamentals, turf, and grasses. Low rates give effective control under severe disease conditions. It mixes readily and is compatible with most insecticides, including spray oils.

Other advantages of Maneb include activity against a wide range of fungal organisms, protection of emerging seedlings from fungal blights, and prevention of rot and decay of stems and foliage.

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Continues on page 102

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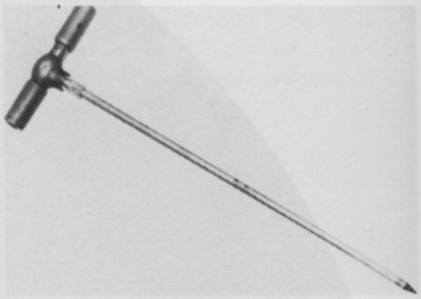
Glade is your guarantee of physically pure, genetically true seeds. Get the big "G" — Glade Kentucky bluegrass at your local wholesale seed distributor.

Products *from page 100*

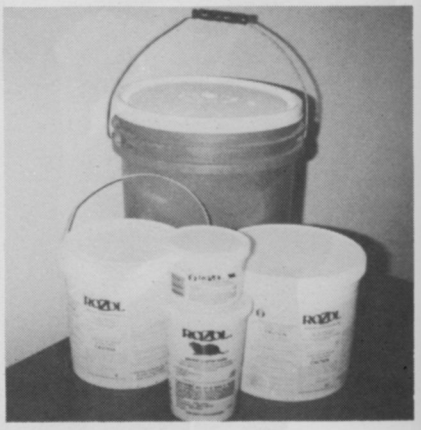
A worm-gear flow control on this invigorator makes for easy, one-hand regulation of liquid fertilizer. The worm-gear control prevents "water hammer" damage to the hose caused by



sudden shut-off. The removable, all-steel feeder rod penetrates to 31 inches. The rod is 7/16 inch inside diameter and is easily cleaned or replaced. The 7 pound, 4 ounce invigorator is heavy enough for fast penetration and light enough to avoid unnecessary fatigue. Bar-Spray, a division of Bar-Way Manufacturing Co., makes it.

Write No. 711 on reader service card

Baits for ground squirrels and pocket gophers are manufactured by Chempar Chemical Company. RoZol®



(chlorophacinone) ground squirrel bait is a paraffinized pellet formulation for use in nurseries, on picnic grounds, and around homes. It has a California label for special applications. The pocket gopher bait is in coarse grain form and meant for farms, water districts, playgrounds, and backyards where gopher holes can be hazardous. This bait is placed in gopher tunnels with probes.

Write No. 712 on reader service card

Ten outdoor power equipment models introduced as Yard-Man's "Mustang" Series include two 3-hp, 20-inch

Continues on page 106

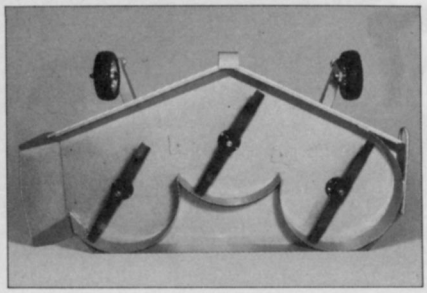
Now, the Cushman Front Line offers a choice of decks. And a diesel.

We've taken a proven performer and made it work even harder. You already know the Front Line™ as an exceptional rotary turf mower. With the kind of common-sense engineering and durability you expect from Cushman.

Durability that comes from features like an 18 hp, air-cooled OMC gasoline engine. Single, rear-wheel steering and split, front-wheel traction assist pedals. Variable cutting heights. Hydraulic deck lift. Foot and parking brakes. Large-capacity fuel tank. Wheel-type steering, and more.

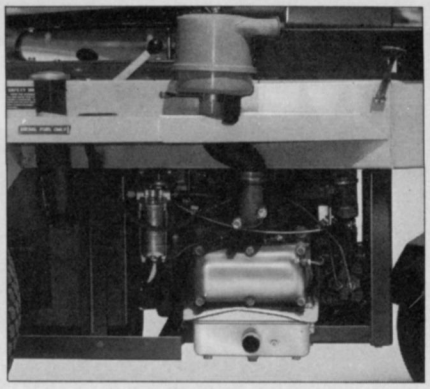
And now, optional decks, diesel power and specialized accessories make it even more productive.

In addition to the 72" mower deck, we now offer a 60" deck for smaller jobs. Both feature 12-gauge carbon steel construction, and are offset for close-up trimming.



For even greater economy and durability, the Front Line is now available with an optional water-cooled 4-cycle, 2-cylinder diesel engine.

And for year-round versatility, we've added hard-working optional accessories for the gas tractor. Like the new 60" chain-driven rotary broom. The roll-over protection structure and weatherproof cab set (also available for diesel). And the



new 48" snow thrower that can move up to 5,000 lbs. of snow per minute.

The Front Line. Tough enough to be a Cushman. Now versatile enough to pay off full time.

Call your Cushman dealer now for a demonstration. 81-CUT-3R

CUSHMAN®

3032 Cushman, P.O. Box 82409
Lincoln, NE 68501
Call: 402/435-7208

Front Line™

Moving forests?

When you've been building tree spades as long as Vermeer, you've moved several forests. Moved 'em. Packaged 'em. Replanted 'em. And, that's the way it should be. After all, Vermeer invented automated tree-moving and packaging nearly 15 years ago.

Today, it's the No. 1 selling tree spade in the world. With your choice of five different models, mounted on trailers, tractors or trucks. Plus, you've got all the extras you'll ever need. Serrated spades. Cone or flat-bottom spades. Self-locking rear assemblies. Tap root extensions. You can even outfit them as complete landscaping machines with optional trencher, plow, backhoe, loader and dozer attachments. But, best of all, it's a one man machine. One man can do it all — from shrubs to giant 8-in. diameter trees. Hydraulically. In minutes. Instant shade. Instant beauty. See your local Vermeer dealer today.

VERMEER TS-44A TREE SPADE: Digs tree ball 44 inches in diameter, 40 inches deep. Hydraulic controls. Optional serrated spades. Hydraulic self-locking rear assembly. Spade extensions for tap roots. **FOR COMPLETE INFORMATION:** Call Toll-free (800) 247-2347. In Iowa call collect at (515) 628-3333.

Write **176** on reader service card

Get a taste of
Vermeer Quality

THE DIGGIN' DUTCHMAN

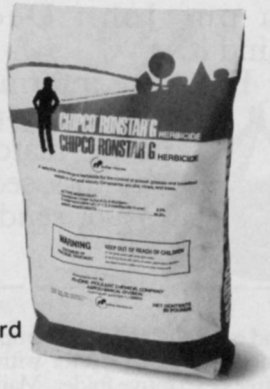
8803 New Sharon Road • Pella, Iowa 50219

IN 4 YEARS OF TESTING, NOTHING EVEN CAME CLOSE TO CHIPCO® RONSTAR® G FOR GOOSEGRASS CONTROL.*

INTERVAL	CHIPCO® RONSTAR® G	BALAN	DACTHAL	BETASAN
101-150 days	94%	61%	45%	37%

The only turf care professionals who still think goosegrass is hard to control are the ones who haven't tried Chipco Ronstar G herbicide yet. The ones who have tried it will tell you it does a great job, even 200 days after application. And that it's effective against crabgrass and poa annua, too.

Got a goosegrass problem? Get the most effective, longest lasting pre-emergent goosegrass herbicide there is: Chipco Ronstar G. Rhône Poulenc Chemical Company Agro-chemical Division, Rhône Poulenc Inc. Monmouth Junction, New Jersey 08852.



RHÔNE·POULENC

Write **156** on reader service card

Please read label carefully, and use only as directed.

*In field trials conducted from 1973 to 1977. • Balan is a registered trademark of Elanco Products Company • Dacthal is a registered trademark of Diamond Shamrock • Betasan is a registered trademark of Stauffer Chemical Co.

Products *from page 102*

cut side-discharge rotary mowers; a 3.5-hp, 20-inch cut mulch-mow rotary mower; a 5-hp, 22-inch cut high wheel rotary mower; a 5-hp, 26-inch cut rear engine riding mower; an 11-hp, 38-inch cut lawn tractor; two 16-hp transaxle garden tractors complete with 44-inch side- or rear-discharge cutting decks; a 3-hp, 18-inch tilling width compact rotary tiller; and a 2-hp, all-steel edger. A full complement of accessories is available.

Write No. 713 on reader service card

A lawn sprinkler line, Time-A-Matic, features models with built-in timers that allow a specific amount of water to

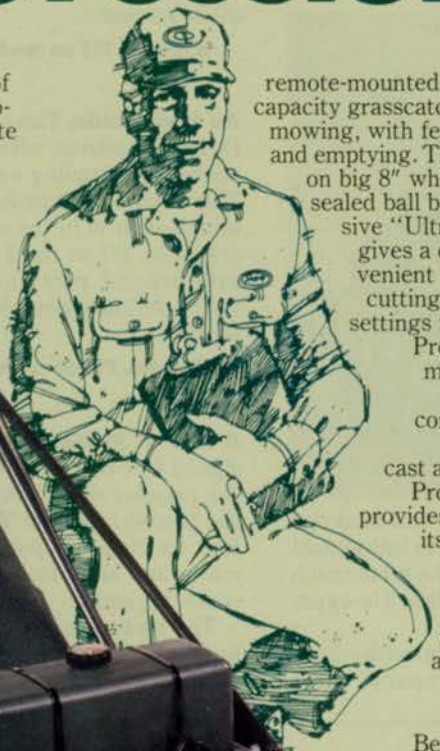
be dispersed, then shut off automatically. This conserves time, because the user does not have to watch his sprinkler, waiting to shut it off; it conserves money preventing overwatering, with tremendous savings on water bills; and it conserves the precious resource of water. Melnor Industries created these sprinklers.

Write No. 714 on reader service card

Continues on page 108

For day-in, day-out dependability...

Hire a Professional!



Because there's no time for down-time in the world of professional grounds and turf care, dependable equipment is a necessity. That's why MTD makes Lawnflite Professionals to last through years of continuous hard use...with minimum time out for maintenance.

Strength and durability are built into Lawnflite Professional mowers and tillers with heavy-duty components: handles that won't twist, throttles that don't bind, steel wheels with thick-wall tires, muscular industrial engines with Stellite exhaust valves and double-protection air cleaners.

Performance and convenient operation are part of all Lawnflite Professionals by design. Chain reduction drive gives the tillers quick response and gets the most out of every horsepower. All tiller controls are within arm's reach on or below the handles.

Lawnflite Professional mowers are equipped with extra-large, remote-mounted gas tanks and large-capacity grasscatchers that keep them mowing, with fewer stops for fill-ups and emptying. The mowers roll easily on big 8" wheels with heavy-duty sealed ball bearings, while exclusive "Ultra-Lift" blade design gives a clean, even cut. Convenient levers quickly adjust cutting height to any of five settings from ¾" to 3½". The Professional Model 618 mower offers all these features, plus the combined strength and light weight of a cast aluminum alloy deck. Professional Model 638 provides a wide 22" cut, and its true rear-discharge design means extra maneuverability and close-trim mowing next to trees, fences, and other obstacles... on both sides of the mower!

Behind every Lawnflite Professional are a full-year limited warranty and, even more importantly, the MTD heritage: 50 years of design and manufacturing excellence.

MTD

638
Model 111-638
22" Cut/Rear Discharge
Rotary Mower

LAWNFLITE Professionals

618
Model 111-618
20" Cut/Side Discharge
Rotary Mower

398
Model 211-398
5 HP/Chain Drive
Rotary Tiller

418
Model 211-418
8 HP/Rear Tine/Chain Drive
Rotary Tiller

Write today for color brochure with full specifications

MTD PRODUCTS INC P.O. Box 36900 Cleveland, Ohio 44136

Write **121** on reader service card

High-pressure hot water washer cleans hard-to-reach areas of grease, caked mud, or sludge. The portable

unit has an oil burner for fast heat rise of wash solution. Tap water introduced into the heating coil can be set to reach 100°F to 200°F, and it exits at 3 to 4 gpm up to 1500 psi.

The washer, manufactured by Specialty Equipment Company, uses downstream chemical injection to keep pump and coils clean. A 12-gallon oil tank supplies the burner with #1 fuel oil or kerosene.

Write No. 715 on reader service card

An insecticide, Dexa-Klor Dust from Dexol Industries, offers long residual control of crawling and flying insects. This chlordane substitute is fast-acting, odorless, low in toxicity, and biodegradable. When used as directed, it is safe around pets and children and won't damage household surfaces or fabrics.

Write No. 716 on reader service card

A line of hydraulic sweepers is designed by Sweepster, Inc., for use with the popular diesel and gas tractors in the 25 to 40 hp range. They handle such jobs as cleaning parking lots, access roads, and sites; sweeping leaves; and removing snow.

The sweepers are equipped with a hydraulic brush drive that eliminates most moving parts, resulting in low

maintenance costs. The sectional-type brush comes in either all-polypropylene or ½ wire-½ poly bristle material. Hydraulic components for operating the run, swing, and lift are located at the operator's seat for handiness.

Write No. 717 on reader service card

Susie's Bloomers are self-contained plant seed modules that are easy for consumers to use and choose. Consumers can select numerous types of outstanding and unusual plant varieties

Continues on page 112

Send us this page.

We'll send you this book.

Elanco has re-written the book on vegetation management.

Vegetation management is a tough job. You know it, and we at Elanco know it. We also know that one of the toughest, and most important, parts of the job is keeping up-to-date on new practices, programs, and products.

That's why we put together this Vegetation Management Guide. It contains lots of helpful information about what's happening right now in the vegetation management field.

In Elanco's Vegetation Management Guide you'll read about new ways to save money on vegetation management. New ways to control problem species. New ways to get local help when you need it. And more.

Another nice feature of this guide is its price. It costs you nothing. Just fill out the information below, tear out the page, and send it to: Elanco Vegetation Management Guide, Elanco Products Company, Dept. E-455, Indianapolis, IN 46285, U.S.A.

Name_____ Title_____ Company_____

Address_____ City_____ State_____ Zip_____

Vegetation Management responsibilities: _____ acres and/or _____ miles right-of-way.

Products *from page 108*

that grow without constant attention. Pellets expand in minutes after adding water to them in a self-contained planter. They sprout in days and are ready to transplant in four to six weeks.

Write No. 718 on reader service card

Electronic indicator helps determine moisture levels for stored goods. The Beckman Humi-Chek II features a

built-in calibration adjustment for quick measurements that are accurate to within ±2% in the 20% to 90% relative humidity span. Because the instrument has built-in calibration adjustment, it does not require additional preparations, calculations, or graphs.

Write No. 719 on reader service card

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BOX NUMBER REPLIES: Mail Box number replies to: WEEDS, TREES & TURF, Classified Ad Department, 120 W. 2nd St., Duluth, MN 55802. Please include box number in address.

HELP WANTED

WANTED: Firewood Distributors for energy conservations company. Inventory investment range — $2000 to $10,000 — depending on location. Serious replies to: HOME FIREWOOD, P.O. Box 141 Sta. B., Hamilton, Ontario L8L 7O7 Canada.

IRRIGATION SUPERVISOR for established Connecticut irrigation contractor. Previous experience in installation and supervision of irrigation crews essential. Excellent opportunity to join a rapidly expanding company. Excellent salary and future for qualified person. Send complete resume and salary history to Mark Sosnowitz, Sprinklescape, P.O. Box 175, Glenville Station, Greenwich, Conn. 06830 (203) 869-4149.

Chemical Lawn & Tree Care Company needs General Manager with at least three years experience with a national or regional lawn care company. Experience must include sales, and customer and employee relations. Salary open! (214) 690-1051. Layson, Inc., P.O. Box 30121, Dallas, Texas 75230.

YOU ARE experienced in all phases of tree care and transplanting, possess communication skills that are well developed, honest, hard working, quality oriented, and searching for the opportunity to realize your full potential.

WE ARE an established commercial landscape contractor, based in Houston, Texas. This is a top-level position with authority and responsibility, you will be responsible for building and managing the tree division of our company. Salary and benefits will exceed your expectations.

Send resume to WTT Box 263.

HORTICULTURIST to plan and supervise lawn, garden and tree maintenance. B.S. in plant science and three years practical experience required. Send resume to Director, Blithewold Gardens and Arboretum. Ferry Road, Bristol, Rhode Island 02809.

HORTICULTURIST/MANAGER: Responsible for organizing, planning and supervising day to day activities in conjunction with Assistant Superintendent of Grounds. Prefer MS degree in horticulture or related field. Excellent starting salary and fringe benefits. Send resume including education and work history to: Personnel Manager, Brookfield Zoo, Brookfield, Illinois 60513.

Experienced people needed in landscape maintenance sales and as foremen for our crews. These individuals must be self-starters, knowledgeable in landscape maintenance, and be able to communicate their knowledge effectively to our clients and prospects. Interested candidates should send qualifications and resume to: Maintain Incorporated, P.O. Box 42062, Houston, TX 77042 Atten: Jerry Vontress, Manager.

HELP WANTED: MANAGER for landscape maintenance department. We have been in business 52 years and do exterior and interior landscaping and maintenance in Pa., N.J., Md., and Del. We need an aggressive and knowledgeable individual to hire, train, and supervise people; have a sound horticultural background, be familiar with equipment, do estimating and who loves to sell. Minimum 4 years college, 4 years experience. Salary, commission, benefits, company car. Send resume to Heyser Landscaping, Inc., 400 North Park Avenue, Norristown, Pennsylvania 19403.

HELP WANTED: "Super" Superintendent. Check your attitude. If you have your heart totally committed to success in the landscape field and are looking for a company that feels the same way, contact us immediately. We've been doing quality work in the Denver market since 1948, and 1981 will be our best year ever. You must be experienced, knowledgeable and completely dedicated in all areas of installation and ground maintenance supervision. Opportunities are unlimited for the sharp, aggressive individual. Send resume and salary requirements today or call (303) 936-3493 and ask for Wally Sabell. Share in our 30 year reputation for excellence. Sabell's, Inc., 5555 W. Ohio Ave., Lakewood, CO 80226.

GARDEN CENTER & NURSERY MANAGER. A Person to expand our Garden Center. Looking for person with marketing or horticultural degree, or equivalent experience. Someone to take full charge of garden center operation. The right person has the opportunity to build his own future. Permanent year round position with a well established firm (thirty years) for a real self-starter, take charge person. Salary, benefits, etc. commensurate with experience and ability to produce. Send resume, etc. to: Box 45101, Westlake, Ohio 44145.

USED EQUIPMENT

FOR SALE: 78 inch Big John tree mover, serial 32 in good condition, original owner. Trees, Inc. (517) 627-9155.

Spyder fork lift: New engine, tires and paint. Edgewood Turf, 5402 Edgewood Road, Crystal Lake, IL 60014. (815) 459-3358.

Rebuilt, like new cat pumps, model 1010 Leopard series $350.00 each (208) 362-4440.

AERIAL BUCKETS, call Aerial Hydraulic Equipment, Essex, Conn. (203) 767-1636 — For brush chippers, Vermeer stumpers, sprayers, Hydro-Ax's, log loaders available for immediate sale, call P.C. Gould Sales Company, Plains Road, Essex, Conn. 06426. (203) 767-1636.

1977 Chevy C-60 lawn spray truck, excellent condition, 1,200 gallon steel tank mounted on 14 foot platform. 2 Hanney electric hose reels with 500 feet of hose on each. Bean 20-20 pump mechanical and jet agitation. $11,500. Call or write, Rusin Landscaping, Inc., 340 North Drive, Lorain, Ohio 44053. Phone (216) 233-8217.

HI-RANGERS AERIAL BASKETS 65', 57', and 53'. Skyworkers aerial baskets 65', 50', 40'. Vermeer stump cutter 1560, 6. Vermeer tree spade 66, TS 44. Asplundh bucket and brush chippers. Bean sprayer, 9 ton trailer. Parkway Tree Service, 12026 W. Cherry, Wauwatosa, Wisc. 53226. (414) 257-1555.

1977 Princeton Self-Propelled Sod Harvester with Diesel Engine. Must Sell. (402) 624-6385.

FOR SALE: 5 Aerial Bucket Trucks and 6 Brush Chippers. Call (603) 497-2614.

Reinco Hydroseeder, 1,000 gallon on trailer. Excellent condition. $7,500. George. (317) 873-5937 or (317) 873-5231.

NICE: Ryan 12"-18" and 24" sod cutters. Also have field automatic sod pickup and loading conveyer. All in A-1 shape. 1-513-424-2052.

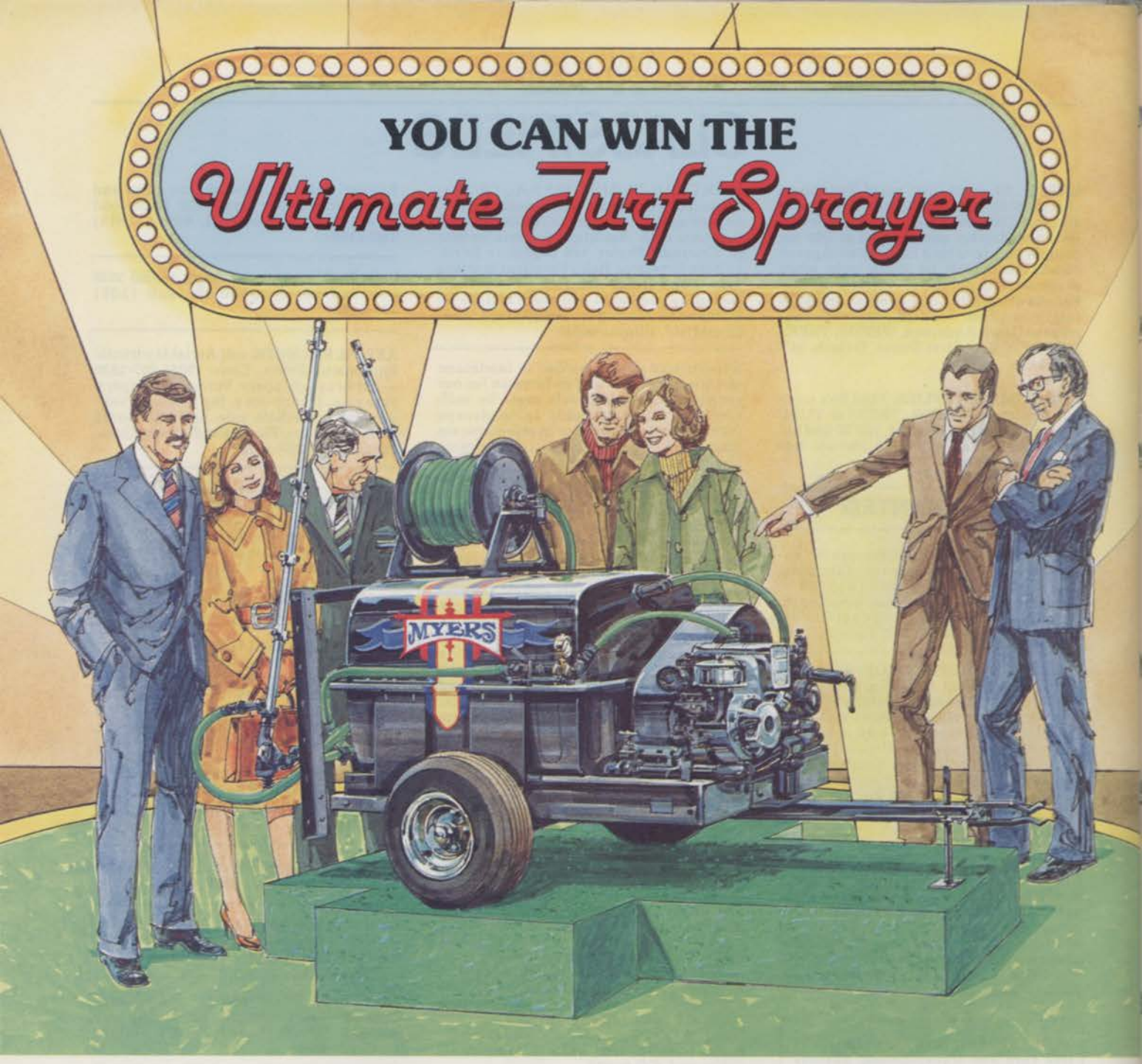
1967-1600 International pump truck $2,500.00, vermeer model 10 stump cutter $2,500.00. Lowell Mooney, Mt. Liberty, OH (614) 625-5951.

SALE: 65' Arlo Crane with Ladders on 1972 GMC Truck, 18' Bed, Front and Rear Outriggers, Air brakes, very nice — $9800.00, also, 50' Strato-Tower, 2-man Aerial Bucket — Factory rebuilt on 69' Ford Truck with Motor Overhaul and New Paint — $11,500.00. Eastcoast Crane, Inc. (201) 922-9393.

A-1 Finn 900 gal spray tank and flat bed, includes all hardware to fit on your own truck cab. Handles both granular and liquid. Two Hahn electric reels with 325' of hose on each, with spray guns. Only used 2 seasons, PTO driven. $5295.00 or best offer. Now sells for $11,000. Send inquiries to WTT Box 262.

Continues on page 115

YOU CAN WIN THE *Ultimate Turf Sprayer*



This one-of-a-kind, special edition Myers Power Sprayer can be yours.

Myers will award this specially prepared sprayer to some lucky Turf Professional free of charge. The drawing will be held June 15, 1981. To enter, just fill in the coupon and send to Myers.

The outstanding Myers Sprayer being offered is model no. VTL10ESG. It features a deluxe custom paint job; beautifully chromed accent parts; 100 gallon fiberglass tank; 10 GPM, 500 PSI Myers Du-All piston pump; 7 HP air cooled engine; 15 ft. stainless steel boom with dripless nozzles; mounted hose reel and spray gun. It **is** the Ultimate Turf Sprayer. Don't delay, send your coupon today!

Yes. Please enter my name in the Myers Turf Sprayer Sweepstakes.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Entries must be postmarked before March 31, 1981.

Myers®

Send Coupon to: F. E. Myers, Att: Advertising Dept., 400 Orange St., Ashland, Ohio 44805.

Write **147** on reader service card

FOR SALE

COLORADO NURSERY, established 8 years, year-round business with snow plowing. Building and land also available. Sales ½ million. Terms available. Call (303) 476-3047 weekdays.

MONSANTO KRILIUM soil conditioner several 200# drums for sale .85 per pound MITCHELL SEED AND GRAIN, BX 279, Roswell, NM 88201.

LAWN SEED. Wholesale. Full line of top quality grasses. Improved bluegrass varieties, fine fescues and fine bladed ryegrasses. We specialize in custom mixing. Oliger Seed Company, 2705 Wingate Avenue, Akron, Ohio 44314. Call collect (216) 753-2259.

LIQUI-SYSTEM DEMONSTRATOR ON 1975 DODGE 300. 24,000 MILES. CONDITION EXCELLENT. SALE $16,000.00. LEASE $551.11, 36 MONTHS PLUS $1000.00. LIQUI-MATIC™ DEMONSTRATOR ON 1979 DODGE 300. 5000 MILES. CONDITION NEW. SALE $17,400.00. LEASE $478.50, 48 MONTHS PLUS $1000.00. LIQUI-SYSTEM®, P.O. BOX 1043 VICTORIA, TX 77901 (512) 575-5882.

FOR SALE 30,000 sq.'-50' L&B steel frame clear span houses. Double top vents. 23 48" fans. Automatic sidewall vent. 32 1" solenoid watering valves. Steam piping. Redwood bars. 20" glass available or use fiberglass, poly. Guaranteed complete w/assembly instructions. Packaged F.O.B. Denver. (303) 245-6115 collect or Peterson Development, PO 3725, Grand Junction, Colorado 81502.

STUMP CUTTER, Vermeer model 630A, $4100. Good condition, one owner, S & S Tree Service. (919) 425-3685.

Nunes Sod Harvester, low hours. Rolling or folding, with or without tractor. Eve. (914) 651-7071.

65 factory built wire baskets for 44 tree spade in good condition. $5.50 ea. Will ship COD. Ed White, 6033 N. Foster Dr., Baton Rouge, LA., 70805. (504) 355-0528.

MISCELLANEOUS

Prepare now to increase next year's profits. "Garden Tips" the monthly customer newsletter with your company name/phone. Proven response . . . cements customer relations, gets them to spend more, opens new doors expertly in new expansion areas. Low cost, effective profit building. Call today (516) 538-6444, we'll send complete information or write: Garden Tips, Box 117, Garden City, NY 11530.

START YOUR LANDSCAPING CAREER NOW! Write: School of Landscape Design and Sales, Lake City Community College, Rt. 7, Box 42, Lake City, FL 32055. Fully accredited and V.A. approved.

LANDSCAPE DESIGN KIT, 37 rubber symbol stamps, ink pad, $38.50 postpaid. California add $2.16 tax. Stamp kit brochures available. T-Gordon's, Box 741, Dept. WT, Reseda, California 91335. (213) 881-2808.

WANTED TO BUY

WANTED TO BUY — USED BIG ROLL SOD CUTTER Write to WTT Box 259.

Wanted Used Sod Harvester. Prefer roll style. State age and price. Write WTT Box 265.

BUSINESS OPPORTUNITIES

WANT TO BUY OR SELL a golf course? Exclusively golf course transactions and appraisals. Ask for our catalog. McKay Golf and Country Club Properties, 15553 N. East Street, Lansing, Michigan 48906. Phone (517) 484-7726.

Tree Service — 25 years in business, prominent clientele, Crane truck, bucket truck with chip box, chip truck, two chippers, stump machine, pick-up truck, spray truck with 600 gallon spray tank, Business located in lg. N.W. Ohio city. Write WTT Box 264.

send a message...
...write here

1. Number of insertions: (circle) 1 2 3 6 12
2. Start with (month)_____issue (Copy must be in by 1st of month preceding)
3. Amount enclosed: $_____.

PAYMENT MUST ACCOMPANY ORDER. WE'LL BILL RATED FIRMS.

NAME _____

COMPANY _____

STREET _____

CITY _____ STATE_____ ZIP_____

MAIL AD COPY TO: DAWN ANDERSON, WEEDS, TREES & TURF, 1 EAST FIRST STREET, DULUTH, MN 55802

RATES: 70 cents per word (minimum charge, $15). Bold face words or words in all capital letters charged at 80 cents per word. Boxed or display ads charged at $60 per column inch (one inch minimum). For ads using blind box number, add $5 to total cost of ad.

Any turfgrass seed works

RUGBY KENTUCKY BLUEGRASS IS DESIGNED TO WORK IN THE REAL WORLD.

well with constant attention.

RUGBY KENTUCKY BLUEGRASS.
IT DOESN'T NEED CODDLING TO LOOK GREAT.

As a turf professional, you know all the tricks to making grass look terrific. You lavish water and fertilizer on it, overseed, apply herbicides, and take great care in mowing.

But times are changing. Increasingly you're finding yourself pinched by escalating costs for materials and labor. And there's a growing movement among environmentalists to lessen dependence on fertilizers.

Rugby Kentucky Bluegrass answers these problems.

YEARS OF TESTING.

Rugby is a new Kentucky bluegrass. But it's not unproven. Before it was ready to be introduced to you, years of extensive testing were performed under a broad range of climatic and soil conditions. Test sites were located not only in the United States, but Canada as well.

The results? Our testing has shown Rugby to be unique. It's a truly *different* variety from anything else on the market, with superior performance.

How is it superior? Read on.

A TRUE LOW-MAINTENANCE TURF.

The most singular advantage of Rugby is its ability to provide high-quality dark green turf when maintained at *low* nitrogen fertility and restricted moisture levels.

Most improved Kentucky bluegrass varieties are *not* low-fertility types. You may be told they performed well in turf trials. Unfortunately, you're *not* told that those trials are often conducted using *optimum* nitrogen levels. So it's no wonder you have to fertilize the heck out of these varieties to get good results.

Not so with Rugby. *You can actually get better results with Rugby than with other Kentucky bluegrass varieties while using less nitrogen fertilizer.*

And you'll also save on the *labor* it would take to apply that extra fertilizer and to do the extra mowing.

A HIGH-QUALITY TURF.

But no matter how much we tell you about the low-maintenance aspects of Rugby, ultimately you look for — and demand — *superior turf.* Your professional standards wouldn't settle for anything less. And we wouldn't want it any other way.

Rugby has a rapid spring green-up rate and excellent fall color. And it also displays *sustained growth during the mid-summer heat stress period,* even under low nitrogen fertility and restricted moisture.

Moreover, Rugby possesses a high level of resistance to most of the common and current turfgrass diseases. This is another factor which may well result in significant savings in turf management costs.

THE ENVIRONMENTALIST'S GRASS.

Using less water and fertilizer means potential dollar savings for you, of course. But you can also take satisfaction in the fact you'll be using *fewer natural resources.*

By now you're well aware of the increasing social consciousness among the population in this regard. And by making available a Kentucky bluegrass that fits the world of the '80's, we believe we're fulfilling an important need.

For more information on Rugby, write Rugby Kentucky Bluegrass, P.O. Box 923, Minneapolis, MN 55440.

Rugby
KENTUCKY BLUEGRASS
For low-maintenance turf.

"Our Roll'n Grow lawn mat concept is new but we use the best known bluegrass. We use baron"

Carl Suding, Vice President and General Manager
Roll'n Grow Lawns,T.M. Pleasantville, Iowa

"This new concept, Roll'n Grow, promises a beautiful lawn in just 30 days. That's quite a promise to keep so you've got to start with the best. Let me explain the concept very simply. We take super clean wheat straw, chop it up and add an organic bonding agent to form a mat. Then we add the seed. A large percentage of the seed we use is Kentucky Bluegrass. And that bluegrass is Baron. And for some very good reasons :

"When it comes to quality, Baron can give us quick germination, disease resistance, very good color and winter hardiness. And all of this with only average maintenance. That's important too because sometimes you need a seed that can thrive on neglect.

"Secondly, we knew Baron would be available when we wanted it. Since Baron is the largest selling proprietary bluegrass in the world, we knew we could rely on a sufficient supply.

"We're offering a quality product and want only quality grasses in our Roll'n Grow lawn mats. We believe we have it with Baron."

For more information on Roll'n Grow lawns, call Carl Suding at (515) 848-3627 or write Roll'n Grow, Box U, Pleasantville, IA 50225.

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