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- Pre-emergence weed control

I.P.M.

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LANDSCAPE MANAGEMENT®



On the cover: Landscape pricing must be free of guesswork. Don't base your success on the toss of a coin.

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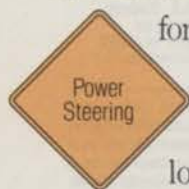




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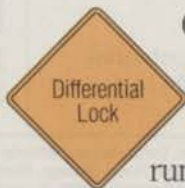
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Plan for profit in new season

Your mission, landscape contractors, is to show a 10 percent net profit in 1991.

Is that an impossible mission?

A panel discussion at the Green Industry Expo in Nashville featured three of our best—Ron Kujawa, Bruce Wilson and Dave Minor—in a discussion of ways to insure, maintain and improve profit.

Do you know what is and is not profit? You might be mistaken.

Kujawa, owner of KEI Industries in Cudahy, Wisc., believes company owners confuse the amount of money they take in wages and benefits as part of profits. "That is compensation," says Kujawa. "Profit is that which is left after the cost of your goods are sold, after all overhead, wages and general administration."

Setting reasonable profit goals depends on your company's mix of business. "We set a goal for each of our five profit centers," says Minor, president of Minor's, Inc., Ft Worth, Texas. "We analyze where our best chances are at getting the best return." As an example of knowing when to cut bait, Minor says he is considering eliminating maintenance service, due to competition from small maintenance-only companies that can be very competitive cutters.

If you let costs fall where they may, you're headed for trouble.

The destructive power of unmonitored labor costs cannot be denied. Tracking labor activity is difficult, so much so that some managers might just decide that it's a waste of time; what it becomes is a waste of money.

Kujawa says KEI now tracks "indirect labor costs," which is a mix of all the little interruptions associated with jobs: stopping off for a part, downtime, deliveries. "It's so important," insists Kujawa, "to know just how accurate time sheets are."

Bidding must therefore reflect time spent on the job and a percentage of indirect labor.

Other tips for profits this season:

- Watch parts costs. Insist that you see the estimates for repairs.
- Bid accurately, and only buy what you put in the bid, for the bid price.
- Get out of markets in which you can't compete profitably.
- Put the whammy on overtime; it's a reward for inefficiency. Wilson did, and found that, "somehow, the work gets done."
- Give what profits you can to the people who helped make it happen, and keep some to finance growth.

At a time when people on the outside are trying to keep you from doing your job, it's imperative that you control what you can on the inside.

Best wishes for a happy and prosperous 1991!

Terry McIver, managing editor

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LANDSCAPE MANAGEMENT

LAWN CARE

LCOs believe legislation will be obstacle in future

MARIETTA, Ga. — While public environmental concern is viewed as an "obstacle" to future growth, lawn care professionals believe more applicator certification and regulation will help emphasize the industry's environmental responsibility.

Slightly more than half of 342 respondents to a Professional Lawn Care Association of America poll said environmental concerns have cast a negative shadow on business. Nine in 10 indicated they believe it will be an obstacle in the future.

However, past PLCAA president Richard Steinau of Greenlon Inc. in Cincinnati, believes environmental awareness also could help business if communicated correctly.

"As people become more conscious of the environment, we expect they will better understand and appreciate the expertise of professional certified applicators," Steinau says. "This may open up new markets for skilled professionals."

In response to increased environmental sensitivity, lawn care applicators noted in the survey that they now conduct more employee and customer education programs, maintain better



records and strictly comply with product label instructions.

Nevertheless, members expect environmental concerns to stimulate regulatory changes, even though 64 percent believe the only action needed is enforcement of laws already in the books. One in four thinks no regulatory changes are necessary. (See chart for their expectations for regulatory change.)

In the poll, which was sponsored by Sandoz Crop Protection Corp., PLCAA members indicated they

feel product manufacturers should take the leadership role on environmental questions; nearly half (44 percent) said manufacturers have adequately responded. Specifically, they said manufacturers should provide more education and training programs (94 percent), and more printed materials on product safety and efficacy (96 percent) for distribution by applicators.

The poll was taken at the first Green Expo in Nashville, Tenn. last November. □

ENVIRONMENT

'Grasscycling' coming in April

MARIETTA, Ga. — National Grasscycling Week will be held April 21-27 as part of National Lawn Care Month.

The event, sponsored by the Professional Lawn Care Association of America (PLCAA), promotes disposal methods for grass clippings and other yard debris as a way to combat dwindling landfill space.

The PLCAA anticipates

lawn care companies, manufacturers, retailers, university extensions services and associations offering community events and educational programs to increase public awareness.

In marking the special week, the association offers

these grasscycling tips:

- Keep mower blades sharp.
- Mow at proper intervals so no more than one-third of lawn height is trimmed at each cutting.
- Maintain proper water and fertilization levels. □



RESEARCH

Thatch, weed cure: longhorns on lawn?

AUSTIN, Tex. — Eleven Texas longhorns have taken up residence at the National Wildflower Research Center to help researchers find the best method of restoring native prairie land. The cattle, which arrived last November, will be used at first to reduce the amount of thatch in the center's 15 vegetated acres, as well as to control bermudagrass.

"There is a major push to restore and maintain prairie land," says Alison Hill, Wildlife Center community ecologist. "Cattle have been a natural part of the tallgrass prairie in Texas. This long-term study is to discover the best way to rehabilitate the land from a monoculture to a greater diversity of plant species."

Wildflower Center researchers will study the effects of grazing as a tool to

control exotic grasses so native prairie grass species can be re-introduced and encouraged to grow.

In a non-related study, the research center has developed soil fungi experiments aimed at more successfully re-establishing nursery-grown native plants into landscapes.

Center personnel have found that plant seedlings grown in the soilless medium often used by nurseries grow better and don't require as much fertilizer when inoculated with mycorrhizae, fungi that help them absorb more nutrients and water. Once some plants have been inoculated, they remain so, benefiting from the fungi throughout their lives and requiring less water and fertilizer. The fungi are also re-introduced into the soil, where other plants may benefit from them. □

NEWS BRIEFS

THE SUBJECT WAS BENTGRASS...at the recent Wisconsin Golf Turf Symposium in Milwaukee. **Dr. Joe Duich** advised seed buyers to make careful note of seed lot numbers and retain all records "to insure they get what they pay for." **Kevin Dushane**, superintendent at the Bloomfield Hills Country Club in Union Lake, Mich., said that, "golfers—principally lower handicap players—would like to have a fairway lie where the ball sits up on the turf. Mowing at 1½-inch with a good stand of bentgrass can deliver that playing condition."

FLOWER GUIDE...A full-color 28-page booklet designed for the golf/landscape professional is being offered by the Professional Plant Growers Association. It contains valuable information on planning, planting and maintaining flowering annuals:

- a herbicide tolerance chart;
- a list of 63 popular flowering annuals with photos; and
- a chart describing each plant with regard to spacing, ease of maintenance, height, light, moisture and temperature requirements, degree of hardiness.

To order, send \$2 to: PPGA, P.O. Box 27517, Lansing, MI 48909.

IN THE WORKS...An "Envirotron" is in the works at the University of Florida in Gainesville. The structure, already approved by the Florida Turfgrass Research Foundation Board of Directors, is a field laboratory with components for rootzone, greenhouse and other controlled environment features. The complete Envirotron will consist of 3,172 sq. ft. of phytotron, head, house, storage, wet laboratory, rhizotron with automatic retractable rain shelter, and living quarters. Funding for the \$700,000 project is expected to be completed by April 1.

THE FUTURE IN VIDEO..."Growing Futures," a career video, is soon to be released by the Green Industry Council of Sutton, Mass. Careers in landscape architecture, design and construction; interior landscaping; turf management; arboriculture; and nursery and greenhouse management are among those highlighted in the 18-minute video. "There is definitely a positive future," says **Byron Gechtel** in the video. To order the videotape, send \$49.95 to: Green Industry Council, P.O. Box 171, Sutton, MA 01590 or call Phyllis Gillespie at (508) 476-3007. Along with the tape, you get a color poster and booklet on career opportunities and educational programs.

LAWN CARE

May take 3 years to integrate TruGreen and ServiceMaster

MIAMI BEACH, Fla. — Integrating Waste Management lawn care divisions into ServiceMaster operations could take up to three years, ServiceMaster president Carlos Cantu told members of the National Pest Control Association at its convention here late last year.

The decision came after ServiceMaster completed a deal last year acquiring the pest control and lawn care portions of Waste Management, said to be among the biggest transactions in both industries. ServiceMaster will be adding 270,000 of Waste Management's TruGreen lawn care customers through the deal.

"There is a lot of brand awareness in the marketplace for Waste Management, and for the names of the companies before Waste Management ac-

quired them," Cantu said during a press conference.

"The last thing we want to do is detract from that awareness, so we want to do it in such a way as to retain the names," he said, adding the Terminix pest control division could assume the Terminix name systemwide "in a subtle fashion."

TruGreen's 70 nationwide locations will continue as company branch operations while ServiceMaster's 165 lawn care franchises will operate under franchise arrangements as before, Cantu says.

"At this point, we don't anticipate any changes. The TruGreen (outlets) will continue as company-owned operations," says Cantu, while TruGreen branches will receive support from ServiceMaster franchises. Acquisition of



World Dealer

LINCOLNSHIRE, England — Gannon U.K. Ltd. was winner of Glenmac's World Dealer Award for 1990 for sales of the Harley Power Rake, used in golf, athletic fields, and landscaping. Photo shows, left to right: Guy Overton, Richard Overton and Derek Overton of Gannon accepting from Mac McPherson, president of Glenmac, Jamestown, N.D.

Waste Management's lawn care service is expected to net more than \$80 million in customer-level revenues while the pest control portion of Waste Management, also being folded into ServiceMaster operations, could add another \$90 million.

All ServiceMaster home and commercial services including lawn care, pest control and maid and cleaning services, also under franchise arrangements, may be reached through the central (800) 937-3783 network telephone number. □

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GOLF

Don't gamble a 'super' job for green speed

NOVI, Mich. — Getting the maximum ball speed from a putting green doesn't mean golf course superintendents have to run the risk of damaging the turf and losing their jobs.

Jacobsen product manager Bill Kinzer says that using a greens conditioning machine can provide good green speed and healthy turf without jeopardizing the super's livelihood.

"When superintendents were rolling the greens, drying them out, double-cutting, topdressing frequently, reducing nitrogen and dropping the height of cut below $\frac{1}{8}$ of an inch to increase ball speed, they were literally putting their jobs on the line," says Kinzer. "Now you can reduce or eliminate a lot of those practices by going with a greens conditioner."

Kinzer notes that, in addition to reducing the frequency of these potentially

Jake's
Bill
Kinzer



stressful turf practices, one of the main advantages of greens conditioners like Jacobsen's Turf Groomer is that they allow superintendents to go to a higher cut.

"I know a number of superintendents who are cutting at $\frac{3}{16}$ of an inch and have a good root system and the same ball speed they had when they were cutting below $\frac{1}{8}$ of an inch," Kinzer says. "Four or five years ago, everyone wanted to see how short they could mow their greens. The premise was: the shorter the grass, the faster the green. Everybody wanted the

thinnest bedknife possible on their greens mowers so they could get the lowest cut possible on their greens.

"Some supers lost their jobs over it, because when spring came around, there was no grass left on the green."

Kinzer says that the higher cut and the resulting increase in the amount of leaf surface on the plant means a healthier grass plant with deeper roots, and makes the turf more resistant to certain diseases.

Along with improving the turf, Kinzer says greens conditioners improve the putting surface by eliminating or reducing a number of undesirable aspects of plant growth.

"Number one, the grain is removed from the grass," he says. "That's what slows the ball down. You get a smoother surface. And number two, it helps control thatch, to a degree." □

LANDSCAPING

Newman pledges high standards

SACRAMENTO, Calif. — Lebo Newman, new president of the California Landscape Contractors Association, has formed an Environmental Committee to explore ways the landscaping industry can be gentler on the environment.

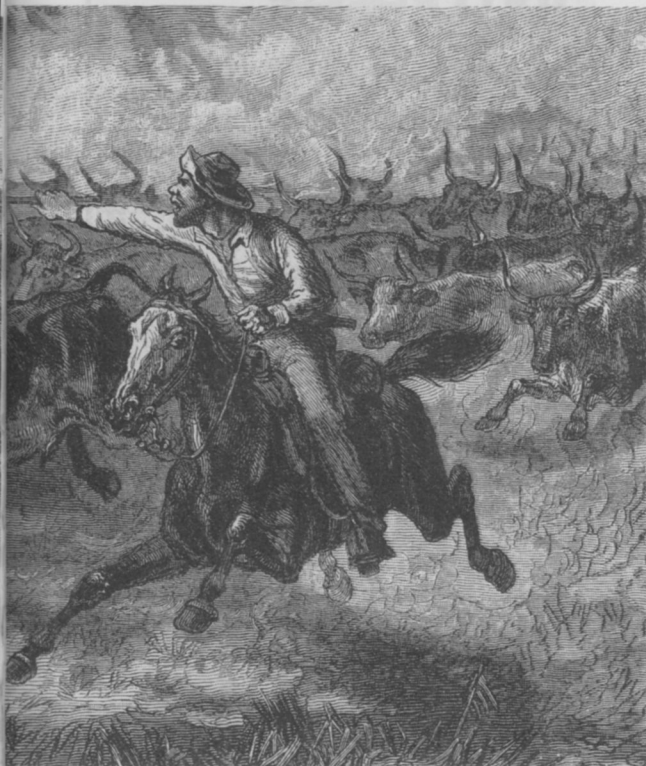
"We can educate people on better ways to apply (control products) or better ways to do our work without being a detriment," says Newman, who adds that the industry needs more ongoing management practices to prevent excessive application.

Newman, president of Redwood Landscaping in Santa Rosa, has been an active CLCA member since 1974.

"With passion, I pledge to maintaining CLCA's goals and to improve the image of the landscape industry,"

continued on page 14

under pressure.



Your high-value turf will never need to withstand the punishment of a cattle drive, but there's another kind of pressure your turfgrasses are facing right now: increased traffic. And it can make even the hardiest varieties more vulnerable to disease damage.

That's why more turf pros rely on CHIPCO® brand 26019 fungicide than any other disease control.

Even turf-killer diseases like Helminthosporium Leaf Spot and Melting Out, Dollar Spot, Brown Patch, Fusarium Blight, Red Thread, Pink and Gray Snow Mold and Fusarium Patch knuckle under to the power of CHIPCO® brand 26019.

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NEWMAN from page 13
Newman says. "We face challenging times: recession, drought, new regulations on employees, clean air, chemical use. I intend to position CLCA at the forefront of these issues."

Newman wants to see more industry support of bio control research.

"I think we can be fore-runners in assisting the colleges with looking into additional use of microbes and natural biotics to help promote natural activities in the soil," says Newman.

Chairman of CLCA's environmental committee is Francisco Peccorini of Landscape Management Services, San Rafael. □

New control products

'Barricade,' 'Sentinel' introduced by Sandoz

CHICAGO — Sandoz Crop Protection expects to introduce two new turf products in 1991, Barricade pre-emergence herbicide and Sentinel fungicide.

Both products have undergone extensive testing in the field.

"All in all, I had better results with Barricade than with my normal treatment program," says Tom Dale of Radnor Country Club, Philadelphia. Dale claimed longer residual control of goosegrass in his bent/poa fairways.

Other golf course superintendents satisfied with

Barricade:

● Ben Stagg (ryegrass fairways at Hog Neck Golf Course, Easton, Md.)

● Mike McNulty (ryegrass fairways, Ashborne Country Club, Cheltenham, Pa.)

● Fred Meda (bermudagrass fairways at Myrtle Beach (S.C.) National Golf Club)

"Barricade is the first herbicide that I'm aware of that lengthens the maximum residual control of the major problem grasses (crabgrass, goosegrass) up to a 12-month season," says Meda.

Sentinel is a new systemic fungicide that controls a broad spectrum of major turf diseases including dollar spot and brown patch. Meda, who tested it, claims it is "the product of the future" and Stagg, who used it on rye fairways and bent greens and tees, says he was "very impressed."

Sentinel has growth regulating properties that include turning the turf a darker green and thickening it, tests prove.

For more information on either product, contact Howard Heffron at Sandoz: (708) 390-3750. □

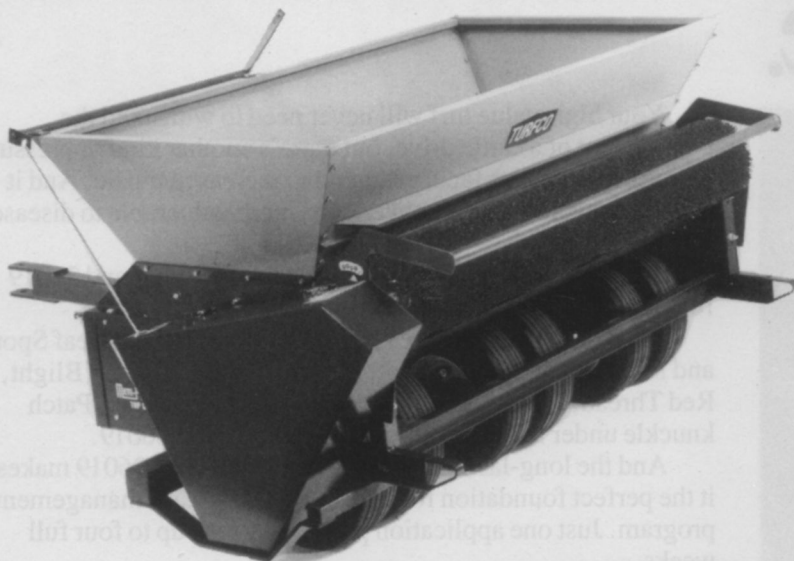
Hoechst-Roussel's 'Ignite,' 'Illoxan' due in '92

SOMERVILLE, N.J. — Hoechst-Roussel Agri-Vet Co. has announced the development of two control products designed for the

golf and landscape markets. They should be ready for the 1992 growing season.

Ignite herbicide, which currently boasts an EPA

Experimental Use Permit, is expected to get full registration later this year. The product is a non-selective
continued on page 18



Pioneers of top dressers since 1961

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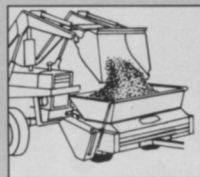
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With All The Abuse Your Turf Takes, Who Needs Root Pruning?



You know the story. The guys who swing an iron the way a lumberjack wields an ax are the same guys who yell the loudest when weeds give them a bad lie. So, with all the abuse your turf takes, the last thing you need is root-pruning from your herbicide. That's why you need CHIPCO® RONSTAR® brand G herbicide. University root pull studies show that CHIPCO® RONSTAR® G works without pruning turf roots. That means healthier roots and stronger, more durable turf. Best of all, just one pre-emergence application provides season-long

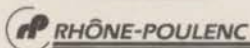
control of 25 tough broadleaf and grassy weeds—including goosegrass, crabgrass and Poa Annua.

You'll also appreciate the fact that CHIPCO® RONSTAR® G won't leach out or move laterally through the soil and is labeled for use on a wide variety of ornamentals, so you can keep more of your course weed-free with each application. CHIPCO® RONSTAR® brand G herbicide. It can't improve the quality of play on your course, just the quality of weed control.



Chipco® Ronstar® G

Brand Herbicide



Rhone-Poulenc Ag Company, 2 T.W. Alexander Drive, Research Triangle Park, NC 27709. For additional information, please call: 1-800-334-9745. As with any crop protection chemical, always read and follow instructions on the label. CHIPCO and RONSTAR are registered trademarks of Rhone-Poulenc. © 1990 Rhone-Poulenc Ag Company.

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THE REASON SOME MOWING CREWS DON'T GET MUCH DONE IN A DAY HAS NOTHING TO DO WITH TELLING JOKES, DRINKING COFFEE OR SMOKING CIGARETTES.

When you use ordinary bagging mowers, up to 38% of your employees' time is spent handling grass clippings.

The way we see it, that's just time going to waste.

Because with the new 48" Toro Recycler™ cutting deck, you don't have



The new 48" Toro Recycler deck.

to bag at all. Yet you'll still be giving your customers the kind of clean, well-groomed lawn you'd be proud to stake your reputation on.

Instead of bagging clippings, the Recycler deck cuts and re-cuts them into fine slivers. Then its tested airflow design



injects them below the surface of the grass. No other mower has this unique vertical discharge system. And, since it returns clippings back to the lawn, you won't have the hassle of taking care of clippings disposal.

The 48" Recycler deck is available on a variety of Toro commercial mowers. And our

Recycler technology is available throughout our mower line. So stop into your Toro ProLine dealer and ask how the Recycler deck can make your operation more productive.

And, as long as you're there, have a cup of coffee.



ProLine
The Professionals
that keep you cutting

A NEW WINNING COMBINATION.

Greenskeeper 20-4-10 with TEAM™

Get a jump on crabgrass and give turf a great start this spring with new Greenskeeper 20-4-10 Homogeneous Fertilizer with TEAM 1.15%. This two-in-one product contains 4.8 units WIN (40% Organic), providing predictable slow release nitrogen. Plus it's formulated with a premium crabgrass preventer to fight tough annual weeds. For dependable, reliable fertilization and crabgrass control, make your choice Greenskeeper 20-4-10 with TEAM. From your source for premium quality turf products.

Lebanon
TURF PRODUCTS

A division of Lebanon Chemical Corporation

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TEAM™ is the Registered Trademark of DowElanco's combination of benefin and trifluralin.

NEW CONTROL PRODUCTS from page 14

herbicide for use in orchards, vineyards and industrial areas. It can be tank-mixed with most residual herbicides used in non-crop areas. It will also be registered for use on grapes, palm fruits and tree nuts.

"Ignite has applications across the green industry where you don't have to worry about herbicide movement off-site," says Dr. Phil Robinson, product manager.

Illoxan herbicide, which has a 24C label in Florida, Georgia, Alabama and South Carolina, is expected to be registered some time in 1992. It is for control of goosegrass in bermudagrass turf—which is to say on golf courses. A 24C label is also pending in North Carolina and Texas.

"Illoxan will make a ma-



Golf course super Mike McNulty observes disease on the 15th fairway at Ashborne Country Club. (See article on page 14.)

jor impact in the golf industry," Robinson notes. "We'll change the way people apply grass control herbicides." □

'Impact' gets EUP from EPA

RALEIGH, N.C. — An experimental use permit has been granted by the EPA to BASF Agricultural Chemical Group for an experimental turf herbicide to control broadleaf and annual grasses. The one-application herbicide will receive trials on more than 260 acres at sites across the country.

A full registration application is on file with the EPA for Impact, the herbicide which received testing last year on its control capabilities for crabgrass,

dandelions, clover and other weed species.

BASF specialty business manager Terry Hanson says that, after six years study, Impact will be tested under typical conditions and applications.

The firm also wants to determine the tolerant grass varieties for Impact. To date, bluegrass, ryegrass, tall fescue and bermudagrass have proved tolerant.

The product is formulated as a water soluble powder. □

'Snapshot' for ornamentals

INDIANAPOLIS, Ind. — Snapshot herbicide from DowElanco has received federal EPA registration for use on ornamental plants, groundcovers, non-fruit and nut-bearing crops, non-bearing vineyards and nursery stock.

Snapshot 80 DF (dry flowable) provides up to eight months control of 86 broadleaf and grassy weeds before they emerge. It can be applied directly over the top of established ornamentals and/or to wet foliage.

174 labeled species of ornamentals have excellent tolerance to it.

Snapshot 80 DF can be used alone or tank-mixed with other herbicides. Because it is a pre-emergent, applications should be made in the spring or fall before weeds emerge, preferably one to two weeks before weed germination. For best results, the herbicide must be activated by at least ½-inch of moisture within 21 days of application. □



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- 1987: #1 IN TRUCK CUSTOMER SATISFACTION
- 1988: #1 IN TRUCK CUSTOMER SATISFACTION
- 1989: MOST TROUBLE-FREE TRUCK LINE IN AMERICA
- 1990: #1 IN TRUCK CUSTOMER SATISFACTION
- 1990: MOST TROUBLE-FREE TRUCK LINE IN AMERICA

We've always believed that if we made good trucks, word would get around. And that's what's happening, if our rankings in recent J.D. Power and Associates surveys are any indication. This year, for the fourth time in the last five, our entire line of trucks ranked number one in customer satisfaction.*



SM

And Mazda received the award for most trouble-free compact truck line in America for the second straight year.** We think that's a pretty good indication of

what you, as a fleet operator, can expect from Mazda.

Choose from a complete range of models, 2- and 4-wheel drive, and a choice of engines to suit any purpose.

All with standard features like confidence-inspiring rear anti-lock brakes. And all backed by our 36-month/50,000 mile, no-deductible, "bumper-to-bumper" warranty—one of the best basic warranties† in the truck business.

To get the lowdown on the complete line of tough, reliable Mazda trucks, call our National Fleet Sales office at (714) 727-6453. As you'll quickly see, your business can benefit from choosing Mazda. Because only our reputation precedes us.

*J.D. Power and Associates 1986, 1987, 1988, 1990 Light Duty Truck Customer Satisfaction with Product Quality and Dealer Service. SM **J.D. Power and Associates 1989 and 1990 Compact Truck Initial Quality Survey. SM Based on owner reported problems during the first 90 days of ownership. †Contact the National Fleet Sales Office for limited-warranty details.

mazda
IT JUST FEELS RIGHT.®

Weed Control in the Environmental Age:

As turf management has become more sophisticated and environmentally significant, it has become absolutely essential for turf professionals to select a post-emergent herbicide that: • Has a broad enough spectrum to control virtually *all* problem weeds • Releases a minimum of active ingredients into the environment • Provides maximum safety to turf and adjacent trees and ornamentals • Reduces overall expenses (chemical *and* labor) to an absolute minimum. Read why only Trimec® Turf Herbicides can help you solve all of these problems.

Of course you know that herbicidal activity is influenced by temperature, weed species, state of growth, and type of turfgrass. So a herbicide that would be effective in taking hardened-off spurge out of bluegrass would be totally out of place for treating dollarweed in bermudagrass.

Indeed, in light of today's complex weed control problems, the one-size-

fits-all approach to herbicide selection has become totally obsolete.

As a matter of fact, in order to maximize the efficiency of weed control throughout the U.S.A., we have developed seven different Trimec Turf Herbicide formulations.

But even more important, we have developed a unique manufacturing process for each of these seven

formulations so that the acid components are reacted together to form a *Complex* of unified salt, thus assuring you that every Trimec Complex will always be dependable, time after time.

For a comprehensive explanation of how a Complex differs from a formulator tank mix — and why this difference is vital to you in coping with weed control problems today — we invite you to take a close look at the schematic diagrams on the opposite page, which were drawn up for us by one of the most prestigious university professors ever involved in ornamental turf.

Start the year right and early — with Trimec

Start early in the season with a broadcast treatment of Super Trimec any time when the temperature is above 40 degrees ... even in weather with intermittent rain or snow.

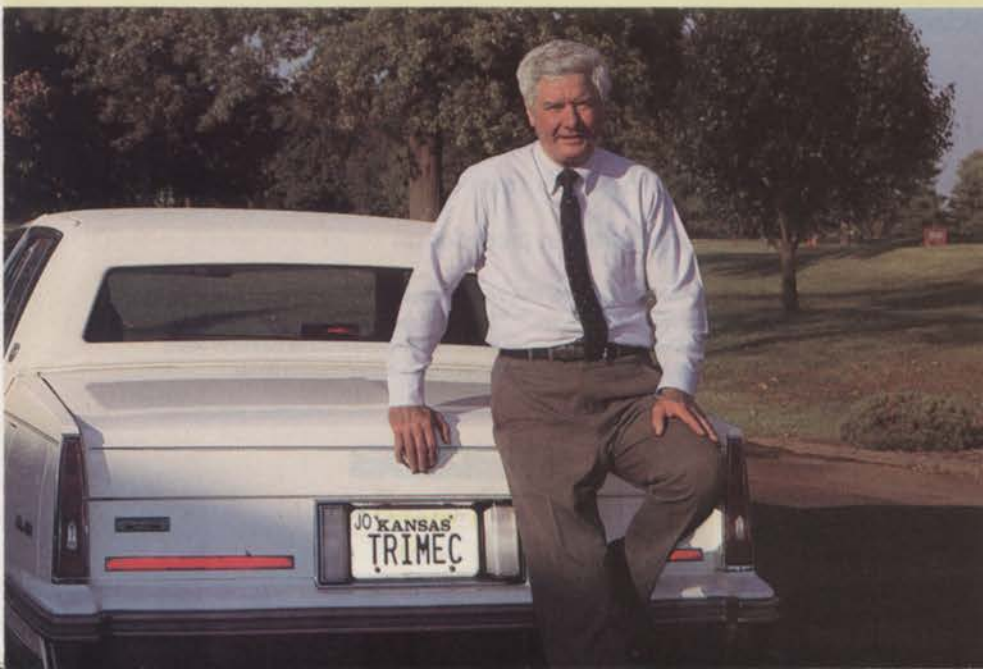
This not only enables you to get those over-wintering annuals at a time when you might otherwise have a void in your work schedule, but it also enables you to get them before their roots have a chance to compete with the turfgrass you are trying to thicken up ... and you get *all* the broadleaves because Super Trimec has the broadest spectrum of any post-emergent broadleaf herbicide.

Immaculate turf is more than cosmetic

... it is also friendly to the environment. It aids in the prevention of runoff, thus improving soil moisture retention; it helps to offset urban heat generated by pavement and buildings; it helps recycle auto emis-

sions into oxygen; it makes everybody feel better. I'm proud of the role Trimec plays in promoting weed-free turf.

Everett Mealman, President
PBI/Gordon Corporation



Increase your efficiency by selecting the right Trimec Complex for your specific weed control problems.

- ☐ **Super Trimec:** Unparalleled broadleaf control for cool-weather broadcasting and spot treatment of hardened-off summer annuals such as spurge, oxalis and ground ivy. One gallon covers 4 acres.
- ☐ **Trimec Classic:** Unmatched efficiency for controlling broadleaves when they are actively growing. One gallon covers 2½ acres.
- ☐ **Trimec Plus:** The ultimate post-emergent herbicide. Outstanding control of crabgrass and nutsedge, plus all the broadleaves controlled by Classic Trimec.
- ☐ **Trimec Southern:** Especially designed to control broadleaves in 2,4-D-sensitive southern grasses.
- ☐ **Trimec 992:** The applicator's formula. Especially designed for tank mixing with liquid fertilizer and other multiple tank-mix combinations.
- ☐ **Trimec Encore:** A Trimec Complex that contains no 2,4-D.
- ☐ **Trimec Bentgrass Formula:** Especially designed for use on bentgrass.



No matter how tough your weed problems, you can depend on a Trimec Complex for a specific solution.

Furthermore, Super Trimec is not only extremely economical in terms of cost per acre, but it is also very friendly to the environment in that one gallon covers four acres.

If, however, you are unable to apply your first broadcast until later in the season — when the temperature is up around 75° and the weeds are actively growing — don't fret about the lost time. Simply apply the one-and-only original Classic Trimec. You'll get the same excellent weed control, and your cost per acre will be slightly less (which will help you justify not getting out earlier with Super Trimec).

Depending on the season and the

condition of your turf, you may or may not need another application of Classic to treat summer annuals.

If crabgrass, goosegrass or dallisgrass become a problem, even in spite of your pre-emerge precaution, don't worry. Trimec Plus will take them out — usually with one application — without discoloring your Kentucky bluegrass or bermuda grass. And, of course, Trimec Plus will also control any broadleaves that are present.

Certainly Trimec Plus is the ultimate post-emergent herbicide... we have never introduced a new product that has met with such universal approval.

Why only a Complex is right for weed control in ornamental turf:

Historically, the chemicals used to control weeds in ornamental turf were developed for use in agriculture, where 80% weed control is considered acceptable.

And while Trimec was specifically developed for ornamental turf, it was originally formulated by tank-mixing ag-grade 2,4-D; ag-grade MCPP; and ag-grade Banvel® (dicamba).

Although the original Trimec immediately and dramatically improved weed control over that of any other herbicide, the tank-mixing procedure of ag-grade chemicals resulted in minute inconsistencies in the chemical composition of individual droplets, with consequent inconsistencies in weed control.

To eliminate these inconsistencies, we developed a technique of reacting the acid components of Trimec together to form a unified salt Complex in which every droplet of every production run would always be an exact mirror image of the total.

The manufacturing process involved in making a Trimec Complex is a trade secret, but the basic building block is known to all chemists. It is technical

dicamba (the active ingredient of Banvel) that triggers the synergistic activity and makes it chemically possible to react the acids into a Complex.

Of course, it is this same Banvel synergism that enables Trimec Complexes to be so effective with such a small amount of active ingredients... which in turn contributes to Trimec's unparalleled safety record, as demonstrated by the fact that more than 30 million acres of turfgrass have been treated with Trimec, and there has never been an instance in which damage to trees and ornamentals was proven to be the result of root absorption traced to Trimec when applied according to label directions.

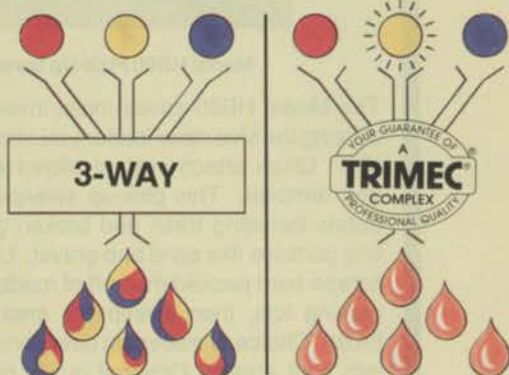
Technical Banvel acid is the key! And since PBI/Gordon has the exclusive turf use of technical Banvel acid in North America, only PBI/Gordon can make Trimec.

Do you have a weed problem?

One of our weed control specialists will gladly help you. Call toll-free, tell us your problems. No obligation. Ask for Sales Service.

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Ag-grade 2,4-D Ag-grade Banvel Ag-grade MCPP Tech. 2,4-D acid Tech. Banvel acid Tech. MCPP acid



Color code: Red, 2,4-D; Yellow, Banvel; Blue, MCPP; Amber, Complex acid. Note: Colors are for code only and do not in any way indicate the color of the product they are intended to identify.

Schematic drawings show the differences between a tank-mix and a Complex

These drawings indicate that, in a formulator's tank-mix (left), the molecules of 2,4-D, MCPP, and dicamba do not combine to form a new molecule. Accordingly, each droplet will contain its own unique amount of one or more of the ag chemicals, and control may vary from droplet to droplet.

In a Complex (right), the three acids are reacted together to form a salt Complex. When this is formulated with the other important ingredients, wetting agents, dispersants and sequestrants, as well as with continuous analytical monitoring that includes the use of a high-pressure liquid chromatograph, the unique product that is Trimec becomes a reality. Every droplet is an exact mirror image of the total, and thus precisely optimizes the intended synergistic activity.

The differences between a tank-mix and a Complex become major when the goal is cosmetic excellence.

Banvel® is a registered trademark of Sandoz.
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Model HB60 Pick-Up Sweeper

The Model HB60 saves initial investment costs by utilizing the skid steer loader you already have on the site. Quick attach system allows easy installation and removal. This pick-up sweeper collects bulky debris including trash and broken glass as well as fine particles like sand and gravel. Use the bucket to scrape hard packed mud off of roads, driveways and parking lots, then sweep the area clean with the brush. Choice of sweeping directions lets you sweep into tight areas. Optional gutter broom(s) can be mounted on the left, right or both sides of the hopper. Lift the loader arms and open the bucket to dump 15 cubic foot hopper into a truck or trash container.

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LAWN CARE

PLCAA members to get break on dues structure for 1991

MARIETTA, Ga. — The Professional Lawn Care Association of America (PLCAA) will use 1991 to make significant structural changes, judging by recent developments.

A new dues structure, proposed to the executive committee at a Jan. 29 meeting in Atlanta, will have the most immediate impact on current PLCAA members. A 1990 dues increase resulted in a number of member companies bolting from the association. Membership, once as high as 1400, now stands at less than 500.

Released by the board was deputy executive director Doug Moody, who joined the PLCAA in 1985. Moody had been involved with a number of member service programs, and was publications director and editor of the association

newsletter. Moody's responsibilities will be given to other staffers or contracted out as needed.

According to a memo from PLCAA president Neal DeAngelo, Moody's former post will remain vacant. DeAngelo says the education committee will be responsible for overseeing all of the association's educational needs.

"The committee will use the outside services of state university and extension people, associate members, our larger member firms and other outside resources," says DeAngelo, who adds that the education committee will also work through state chapters whenever possible.

Moody announced that he will continue to manage and advise associations and companies through his new

continued on page 26

Fall Fertilization

Use Par Ex® Turf Fertilizers containing IBDU® slow release nitrogen for superior quality turf this fall and earlier greening next spring.



Exclusive IBDU® slow release nitrogen is not dependent on microbial activity and it is formulated to meet your regional nutritional requirements.

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SUCCESS

Success. You strive for it every business day.

No matter how you define success, Special Products stands ready to support your efforts to meet (or exceed) your business objectives. You can rely on us for everything from a full line of quality, environmentally sound products to quick and accurate answers to your technical questions.

"Success in business." We want to work with you, because when you're successful, we're successful.

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Untreated Creeping Bentgrass

Want proof of the effectiveness of SCOTTS® TGR® Turf Enhancer 50 WP?

SCOTTS® TGR® Turf Enhancer 50 WP not only improves the color, density and playability of turf.

It also reduces clippings (by up to 50%).

TGR Turf Enhancer controls turf growth control for tees, fairways and greens, encouraging tightly knit turf stand. As turf

growth slows, clippings are reduced and water conserved—offering important economic and environmental advantages with regards to clipping disposal and water management.

When used with nitrogen fertilizers, TGR Turf Enhancer stimulates turf greening for

EVENTS

25-27: **Florida Golf Association**
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up to 12 weeks. And it is especially effective on perennial ryegrass turf.

Because Scott has been working with TGR technology for more than 10 years, our Tech Reps offer unsurpassed experience in managing growth regulator applications. Why settle for anything less?

Your Scott Tech Rep is ready to show you how TGR Turf Enhancer can improve the playability of your golf course as part of a total turfgrass program. For more information, contact him today. Or call 1-800-543-0006.



Growing better through technology.

PLCAA from page 22
company, Moody Management and Marketing Services.

DeAngelo says the PLCAA will refocus its public relations efforts to include a "much broader range of public relations programs internally." He cites the association's annual report as an example.

Government affairs will undergo little change, according to DeAngelo. □

EVENTS

FEBRUARY

7-8: Alaska Greenhouse & Nursery Conference, Anchorage, Alaska. Contact: Cathy Wright, SR Box 7440, Palmer, AK 99645; (907) 745-4119.

5-12: International Golf Course Conference, Las

Vegas (Nev.) Convention Center. Contact: GCSAA, 1617 St. Andrews Dr., Lawrence, KS 66047-7878; (913) 841-2240 or (800) 472-7878.

3: Associated Green Industries of Northeast Ohio Trade Show, Michaud's Town 'N' Country, Strongsville, Ohio. Contact: Associated Green Industries, 10812 Meadow Trail, Strongsville, OH 44136; (216) 572-2784.

14: Connecticut Turf and Landscape Conference, Hartford (Conn.) Civic Center. Contact: Elizabeth Maisano, P.O. Box 876, Bethel, CT 06801; (203) 791-8615.

17-20: ALCA Executive Forum, Radisson Palm Springs (Calif.) Resort and Convention Center. Contact: Associated Landscape Contractors of America, 405 N. Washington St., Falls Church, VA 22046; (703) 241-4004.

19-20: Cash Flow and Cash Flow Budgeting Seminar, Ontario (Calif.) Hilton on the 19th, Oakland (Calif.) Hilton on the 20th. Contact: Micheyl Barnett, California Landscape Contractors Assn., 2021 N St., Sacramento, CA 95814; (916) 448-2522.

21: Arborist Foreman Training Program, Park Hotel, Columbus, Ohio. Contact: Lana Ahlum, Ohio Chapter

ISA, P.O. Box 967, Hilliard, OH 43026.

21-22: Landscape Contractor's Association Winter Workshop, Holiday Inn Crowne Plaza, Rockville, Md. Contact: LCA, 9053 Shady Grove Ct., Gaithersburg, MD 20877; (301) 948-0810.

22-23: ALMA Expo, St. Petersburg, Fla. Contact: Barbara Ganz, (800) 992-2562.

27: New Jersey Landscape '91, The Meadowlands. Contact: Skip Powers, 630 Valley Court, Westwood, NJ 07675; (201) 664-6310.

MARCH

2: Long Island Tree Conference, SUNY Farmingdale. Contact: Long Island Arboricultural Assn., P.O. Box 69, Holtsville, NY 11742; (516) 698-3366.

2-3: Tampa Bay Horticultural Trade Show, Florida State Fairgrounds, Tampa. Contact: Trade Show, 6804-C Gunn Highway, Tampa, FL 33625; (813) 920-4393.

13-14: Reinders Brothers Turfgrass Conference, Waukesha (Wisc.) Expo Center. Contact: Ed Devinger, Reinders Brothers, 13400 Watertown Plank Rd., Elm Grove, WI 53122; (414) 786-3301. **LM**

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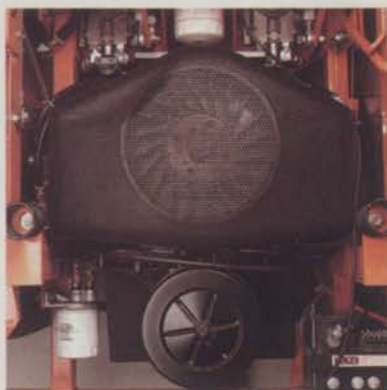
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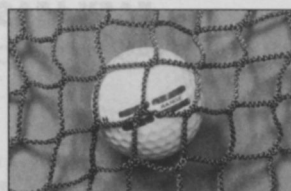
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PEOPLE

Solomon, Wetsel, Riordan honored by various groups

The Irrigation Association named **Dr. Kenneth H. Solomon** its 1990 Man of the Year. Solomon, the 31st recipient of this award, is director of the Center for Irrigation Technology in Fresno, Calif.

The IA also honored **Frank W. ("Pat") Murphy**, founder of the Murphy Manufacturer Co. in Mt. Carmel, Ind., with its Industry Achievement Award.

Bob Wetsel has been named Seedsman of the Year by the Atlantic Seedsmen's Association. Wetsel is senior vice president of Wetsel Seed Co., Harrisonburg, Va. He served as the group's president in 1982.

Seed Research of Oregon has selected the University of Nebraska's **Dr. Terry Riordan** winner of its "Excellence in Research" award. Riordan won for developing new cultivars of buffalograss, St. Augustinegrass and Kentucky bluegrass. The turf-type buffalograsses were developed for environmental reasons.

PGMS officers

New officers of the Professional Grounds Management Society are: **Thomas L. Smith** of Spring Grove Cemetery in Cincinnati, president; **John Abernethy Jr.** of the City of Lenoir, N.C., first vice president; **John Michalko** of Case Western Reserve University in Cleveland, second vice president; **Robert F. Rubel** of Rubel's Landscape Services in Fort Worth, Texas, treasurer. Regional directors most recently elected are **Earl Wilson**, **Charles Wilson** and **Teddi Davis**.

Other awards

Elin D. Miller has been made 1990 Honorary Member of the Western Agricultural Chemicals Associ-

ation (WACA). She recently resigned as WACA executive director, a position she held for 4½ years. At the same time, WACA chose **A.M. "Bo" Bolin** as 1990 Outstanding Member. Bolin is Western district sales manager for Dow-Elanco.

Cuyamaca College's **Dr. Brad Monroe** received the Edwin J. Hunter Conservation Award. The instructor and landscape designer in El Cajon, Calif., introduced the first horticulture program at the school and wrote the course curriculum.

Other movements

Michael G. Pruett has been promoted to vice president of Environmental Care of Livermore, Calif. He had been a branch manager. Pruett has been with Environmental since 1976, when he graduated from Cal Poly Pomona with a degree in park administration.

New president of the Mississippi Turfgrass Association is **Max Maxwell** of The Country Club of Jackson. Maxwell was the organization's Outstanding Turf Professional in 1987.

Dr. Tim Bowyer has been nominated to serve on the Golf and Landscape Operations Industry Advisory Committee for Lake City (Fla.) Community College. Dr. Bowyer is president of Southern Turf Nurseries.

Professor of ornamental horticulture and landscape design **Dr. Donald B. Williams** of the University of Tennessee at Knoxville was named 1990 Outstanding Undergraduate Educator by The American Society of Hort Science.

Lex Dalton, former president and general manager of The Daltons of Indiana has joined Lawn Rangers of Warsaw, Ind. He'll direct marketing and right-of-way maintenance. **LM**



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PRICING FOR PROFIT: AN INTRODUCTION

Are you charging the 'right' price for landscaping services?
In part one of this two-part in-depth article, various practical approaches to pricing are examined.

by Travis Phillips, Ph.D., Mississippi State University

Landscape managers have always had a problem of arriving at the most accurate price to charge for services. In spite of understanding actual incurred costs better, the problem of discovering this "proper" price has tended to become more evasive. The main reason is that businesses have tended to offer customers larger and much more diverse services.

Any person who has ever had to worry about pricing a service knows the answer to the question of "what price?" is simple. You charge a price that covers all costs, plus an acceptable level of profit. But the culprit in applying this simple principle is figuring out how to allocate the proper amount of overhead cost and profit to each unit of service.

Even if you've established a price that provides an acceptable level of

profit, further consideration should be given before making the quote. Either a higher price may be possible, or the desired price may be unobtainable.

Approaches to pricing

1. Adjustment of previous price.

A common pricing method is merely to use the previous price or bid with a more-or-less arbitrary adjustment. Since this earlier price was not objectively determined, neither is the new one. Profits for the business as a whole may have been acceptable; however, some products may have been priced "too high," while others were "too low."

2. Budgeted price.

A second method is based on budgeted costs plus a profit. While more precise than percentage adjustments from the past, there are problems in

applying this concept.

Suppose we want to know what to charge per hour for a machine and operator. The machine costs \$16,000 and is expected to have a \$4,000 salvage value after 10 years.

The machine is expected to be used for 400 hours per year. Over its life, repairs for the machine are expected to be 60 percent of its initial costs. Repairs, fuel and lubrication are estimated at \$5.45/hour. Average annual fixed costs (depreciation, interest on investment, insurance and taxes) are estimated at \$3,020. Dividing total annual fixed cost by the 400 hours of use, the hourly cost is \$7.55. Adding variable costs to fixed, we are at a \$13/hour cost.

Next we add an operator for the machine. Suppose this cost is \$7/hour, including payroll taxes directly attributable to having the person em-

ployed. We are now up to \$20 (\$13 + \$7)/hour. The above cost includes a 15 percent charge for interest on the investment cost.

This does not mean that we can hire out this machine and operator at \$20 per hour and make a 15 percent return on the investment. The business has a \$100,000 overhead, and an interest charge was not made for the

True profit is the combined payment for the owner's labor and management and for his investment or equity.

operating funds associated with the variable cost of the machine and its operator. None of this is included in the \$20. How much of the overhead per hour should be added?

Since the business consists of numerous activities, there is no logical method of assigning to equipment and operator their share of the overhead. So—even though we know the cost involved—simple budgeting does not tell us how to price out the equipment.

The budgeting procedure, however, is better in the end than just adjusting a previous price; it identifies variable and fixed costs associated directly with the machine.

3. Targeted return on investment.

A more positive approach, one that provides a means for allocating overhead, is based on beginning with pricing to meet a targeted return on investment (ROI).

This procedure provides an estimate that covers all costs, including overhead, plus the pre-selected return on equity. The procedure has been widely presented by the Association of Landscape Contractors of America (ALCA). Broader and more varied applications are presented by Spencer A. Tucker in his book "Pricing for Higher Profits" (McGraw-Hill, 1966). Although the procedure is no cure-all, it does provide a framework for using already available accounting data.

Defining profit

In the usual accounting procedures, expenses are payments you must make for using your various resources. Profits are the payments received for those not specifically identified as expenses.

continued on page 34

Table 1.

Past year's income statement, by departments

Item	Department			Total
	Contract	Service	Merchandise	
Sales	\$292,011	\$90,849	\$175,702	\$558,562
Beginning inventory	\$32,273		32,608	64,881
Purchases	95,841	5,691	91,142	192,674
Ending inventory	36,250		31,034	67,284
cost of goods	91,861	5,691	92,716	190,271
Gross profit	200,147	85,158	82,986	368,291
Expenses				
Contracting supplies	5,757			5,757
Vehicles	14,227	14,227	1,000	29,454
Equipment rental	2,303			2,303
Salaries	109,605	51,054	46,610	207,269
Advertising	1,964		4,583	6,547
Repairs	1,341	1,340		2,681
Rent	7,174	1,000	4,026	12,200
Taxes-payroll	9,126	4,250	3,464	16,840
-property	1,332	184	743	2,259
Depreciation	10,355	7,141	357	17,853
Utilities	4,384	877	12,274	17,535
Dues and subscription	474		475	949
Buying expenses	85		85	170
Credit card discounts	262		786	1,048
Professional fees	5,444	158	286	5,888
Insurance	8,264	3,849	3,138	15,251
Office supplies	2,587	892	1,706	5,185
Net interest	3,051	1,052	2,012	6,115
Miscellaneous	554	191	364	1,109
Total expenses	188,289	86,215	76,909	351,413
Net profit	11,858	(1,057)	6,077	16,878

Table 2.

CONTRACTING DEPARTMENT: Income statement for past year by classified costs

Item	Direct Cost	Overhead Costs		Total
		Variable	Fixed	
Sales				\$292,011
Beginning inventory				32,273
Purchases				95,841
Ending inventory				36,250
Cost of goods				91,864
Gross profit				200,147
Expenses				
Contracting supplies		\$ 5,757		\$ 5,757
Vehicles	\$11,327		\$ 2,900	14,227
Equipment rental	2,303			2,303
Salaries	79,605		30,000	109,605
Advertising		1,964		1,964
Repairs		1,341		1,341
Rent			7,174	7,174
Taxes-payroll	6,426		2,700	9,126
-property			1,332	1,332
Depreciation			10,355	10,355
Utilities			4,384	4,384
Dues & subscriptions			474	474
Buying expenses		85		85
Credit card discounts		262		262
Professional fees		0	5,444	5,444
Insurance		4,524	3,740	8,264
Office supplies		2,587		2,587
Net interest			3,051	3,051
Miscellaneous		554		554
Total expenses	99,661	17,074	71,554	188,289
Net profit				11,858

Table 3.

**CONTRACTING DEPARTMENT:
Income statement
for past year**

Item	Dollars	Percent of Sales
Sales	292,001	100.00
Direct costs		
Cost of goods (materials)	91,864	
Vehicles	11,327	
Equipment rental	2,303	
Labor	79,605	
Labor burden	6,426	
Total direct	191,525	65.59
Overhead costs		
Variable		
Contracting supplies	5,757	
Advertising	1,964	
Repairs	1,341	
Buying expense	85	
Credit card discounts	262	
Insurance	4,524	
Office supplies	2,587	
Miscellaneous	554	
Total variable	17,074	5.85
Fixed		
Vehicle insurance	2,900	
Administrative salaries	30,000	
Salary burden	2,700	
Rent	7,174	
Property taxes	1,332	
Depreciation	10,355	
Utilities	4,384	
Dues and subscriptions	474	
Professional fees	5,444	
Insurance	3,740	
Interest	3,051	
Total fixed	71,554	24.50
Total overhead	88,628	30.35
Net profit	11,858	4.06

Table 4.

**CONTRACTING DEPARTMENT:
Projected income statement
for next year by classified costs**

Item	Dollars	Percent Sales Exposure	
Sales	343,627	100.00	
Direct costs			
Cost of goods (materials)	108,105		
Vehicles	13,329		
Equipment rental	2,710		
Labor	93,679		
Labor burden	7,562		
Total direct	225,385	65.59	100.00
Overhead costs			
Variable			
Contracting supplies	6,778		
Advertising	2,312		
Repairs	1,579		
Buying expenses	100		
Credit card discounts	309		
Insurance	5,326		
Office supplies	3,046		
Miscellaneous	652		
Total variable	20,102	5.85	8.92
Fixed			
Vehicle insurance	3,248		
Administrative salaries	33,600		
Salary burden	3,024		
Rent	8,035		
Property taxes	1,492		
Depreciation	11,597		
Utilities	4,910		
Dues and subscriptions	531		
Professional fees	6,097		
Insurance	4,189		
Interest	3,417		
Total fixed	80,140	23.32	35.56
Total overhead	100,242	29.17	44.48
Net profit	18,000	5.24	

PROFITS from page 33

For example, in an *unincorporated* business, the owner/manager cannot pay himself and consider it an expense. A return on the investment in the owner's equity cannot be considered an expense. Therefore, the true profit is the combined payment for the owner's labor and management and for his investment or equity.

In order to separate profit into the two components, we must value one resource and subtract it from the profit in order to estimate the value of the other. Typically, economists place a value on the labor and management resource and subtract this value from profit to have the return on equity.

How are labor and management valued? This owner/manager has a value as an employee performing a similar function in another business. So the value of the person's best alternative employment is subtracted from profit to leave a residual we call return on equity, or return on investment.

How is the situation changed if the

business is *incorporated*?

Since the owner/manager becomes an employee of the corporation, his or her salary is included as an expense. If he/she has paid him/herself at the alternative rate, profit now reflects ROI. This will be assumed from now on in this explanation of pricing for profit.

Valuing assets

Accounting creates yet another problem for economists who want to treat alternative investments comparably.

Assets are valued at book value (their purchase price less depreciation, if applicable). Assets acquired some years ago may have a current market value considerably above book value. The rapid recovery system allowed by recent tax laws have also allowed write-off much faster than the actual decline in value.

Therefore, assets should be evaluated at current market value rather than at book value. If an alternative investment would yield 12 percent, a

true ROI should be calculated as if existing assets were cashed out and invested at 12 percent.

Next month: Get out your calculators!—Pricing by target return on investment. LM



Dr. Phillips is a professor/economist in the Department of Agricultural Economics at Mississippi State University. He has written numerous articles on the economics of crop and horticulture production, and has developed and presented marketing programs for Mississippi landscape maintenance firms.

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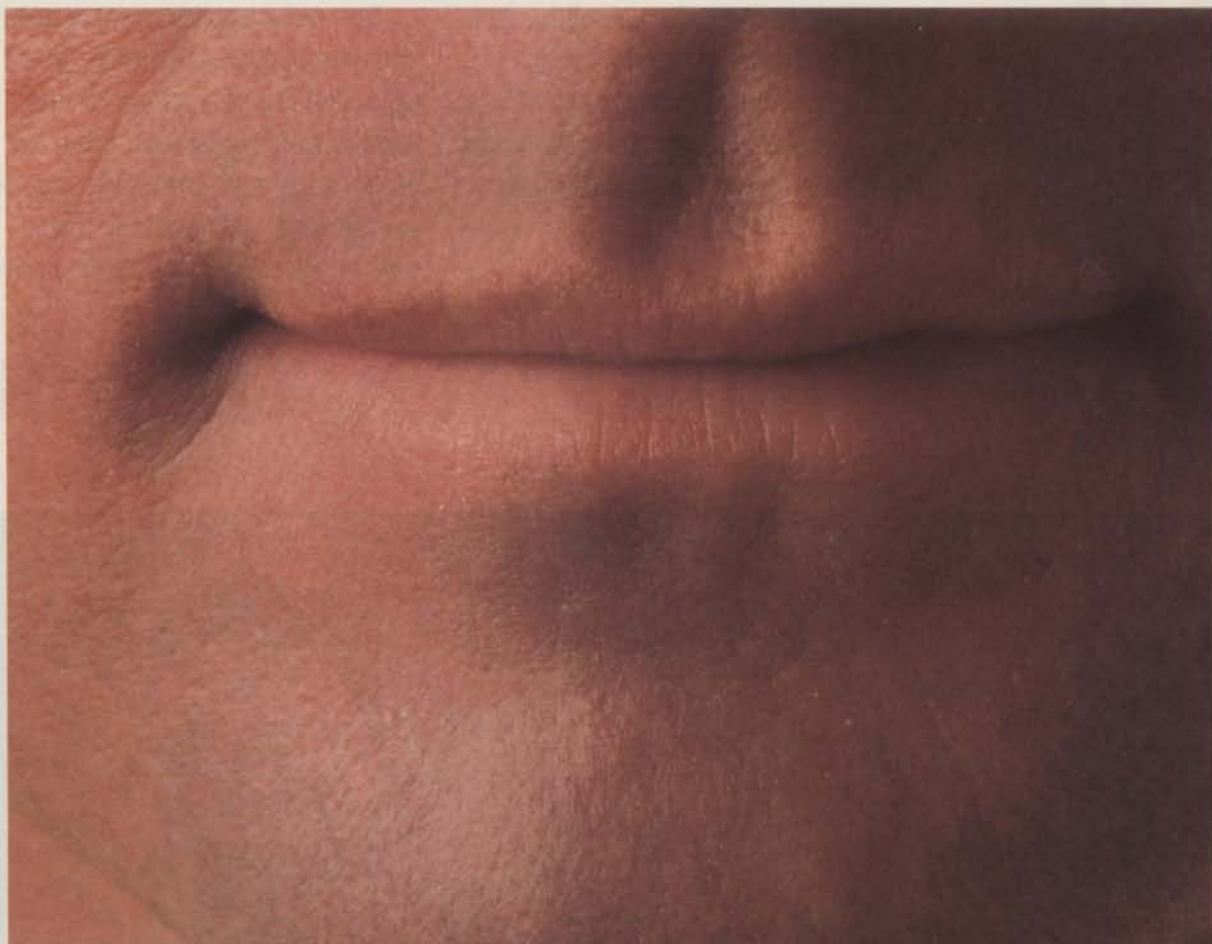
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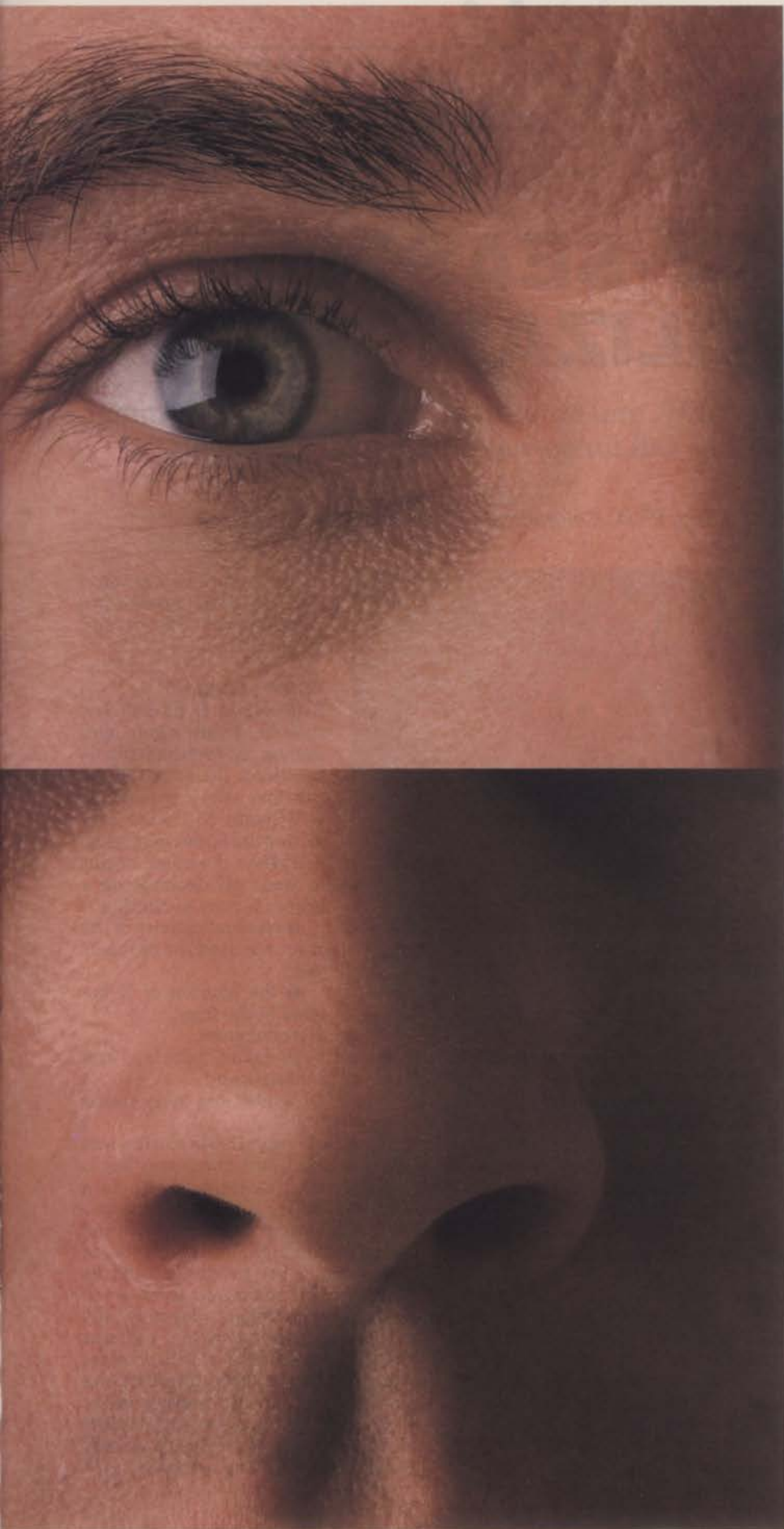


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EARLY-SEASON FERTILIZATION

Depending on desired turf quality, and amount of spring and early summer activity, many situations call for spring nitrogen fertilization.

by Anthony J. Koski, Ph.D., Colorado State University

Spring time brings daffodils, crocuses, and—hopefully—the greening of grass. Along with the wide acceptance of late-season fertilization, many turf managers seemed to have developed a fear of fertilizing in the spring.

While it is true that improper nitrogen use in the spring can bring about a host of problems, adopting a late-season fertilization philosophy generally does not allow you to eliminate spring nitrogen (N) applications.

Not to excess

Stimulating shoot growth during the spring can detrimentally affect the depth and number of roots. Since this is the time of year when most of the roots for cool-season turfgrass species are being formed (Fig. 1), it is important that root formation not be discouraged.

Large applications (greater than one pound of N/1000 sq. ft.), especially of quickly-available N sources, can substantially reduce root growth of cool-season species. Excessive spring shoot growth shifts carbohydrate use from the roots to the shoots, thus reducing the number and health of new roots. The root and shoot growth patterns of warm-season grasses are different, and spring N applications are less apt to negatively affect root formation (Fig. 2).

Overuse of nitrogen during spring, resulting in high shoot growth, necessitates frequent mowing.



Pink patch and red thread can become severe during the spring on N-deficient turf.

Diseases may increase

The incidence and severity of some diseases may be increased by over-fertilization in the spring. The leafspot (*Helminthosporium*) diseases, patch diseases, and high- and low-temperature pythiums are favored by excessive N applications. Recovery from damage caused by these diseases is more difficult, since exhaustion of carbohydrate reserves is a consequence of N overuse.

Reduced stress tolerance: The zealous use of N in spring may reduce summer drought resistance and heat tolerance. This is partly attributable to effects on the roots, but also because of lowered carbohydrate levels and the formation of excessively hydrated leaves.

Effects on lateral growth: High N rates can diminish the number and vigor of lateral stems (stolons and rhizomes). The ability for a trafficked or divoted turf to recuperate from injury

is lowered. Low carbohydrates and hydrated leaves may effect sod strength.

When spring N?

Late-season N doesn't last forever. Even when late-season N fertilization is practiced, the effects of the previous year's application will begin to "wear off" during the following spring. Just when the effect begins to wear off depends on a host of factors, including:

- residual activity of the N source used the previous year,
- the amount of N applied at the time,
- the species of grass,
- soil type (sand vs. clay, and leaching potential), and
- level of winter and early spring precipitation.

If a quickly-available source was used in the fall, the effect may begin to dissipate during early to late May, especially if the turf is growing on a sandy soil and winter/spring rain is high. If higher rates of slowly-available products such as IBDU or sulfur-coated urea were used, the residual activity may persist longer into the spring, perhaps into early summer. In either case, some N should be applied in the spring, either to maintain quality during the spring, or to provide an N source that would release slowly during the following summer.

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new customer during the winter, it is probably unwise to depend on the client's memory of "what kind, how much and when" fertilizer was applied the previous season.

You are in the business of growing green grass, and those new customers give you their business because, in many cases, they were unhappy with the last company. A spring N application will insure that the lawn is green and growing in the spring. Don't bet on the possibility that what the other company applied last season will be enough to provide a high quality turf this spring.

Mite, winter damage

Winter-damaged turf may require supplemental spring N to promote recovery, even if late-season applications were made. Where foliage has been killed by desiccation or snow mold (but crowns and roots are still living), fertilization may hasten recuperation. Of course, nitrogen will not resuscitate dead turf, so make sure it is still alive before fertilizing.

In some areas of the country, various species of mites cause turf damage. Quite often the turf is dead by the time the cause has been determined, but in some cases only the foliage has been damaged and a bit of nitrogen can hasten recovery and promote growth that will outpace the injury being caused by the mites. Remind clients that fertilizer applications cannot be expected to "kick in" unless sufficient precipitation occurs, or irrigation is provided, following fertilization.

Athletic applications

Football fields are often used for practice or games late in the fall, long after temperatures have cooled to the point that recuperation is possible. These same fields are often used early the following year for spring games and drills, resulting in even greater damage.

On these fields, spring fertilization

is necessary to promote growth and recovery of the damaged turf. Similarly, spring baseball can be devastating to slow-growing fields, especially if the same field is used for both practice and games.

Other high-use athletic areas, such as soccer fields and multi-use fields in city parks, can also benefit from springtime fertilization. On such heavy-use fields it is not unusual to fertilize with as much as 8 to 10 lbs. N/1000 sq. ft. over the course of a growing season.

Averting diseases

Certain disease problems can be averted, or at least be decreased in severity, by wise spring N applications. Turf damaged by snow mold may recover more quickly with spring fertilization, especially if little or no N had been applied the previous fall.

Red thread and pink patch can be especially severe during a cool, moist spring on N-deficient turf. The severity of zoysia patch disease, most common on intensively-managed zoysia in the transition zone, may be reduced by spring and summer nitrogen applications.

Amount and frequency

The goal of any spring fertilization program should be to promote green-up and a pre-determined growth level, without producing a fast-growing, succulent turfgrass plant. This can be difficult for a number of reasons, the main one being that shoot growth is naturally rapid at this time of year. A complicating factor is the unpredictability of spring weather, most importantly temperature and precipitation. Since release of N from all fertilizer sources more or less depends on moisture, with some also being quite temperature dependent, the choice of a fertilizer (and determination of how much to apply) for spring use can be difficult.

Ideally, one would use a quickly-available fertilizer to apply small amounts of N ($\frac{1}{8}$ to $\frac{1}{4}$ lb./1000 sq. ft.) on a frequent basis, perhaps every 7 to 14 days. The amount and frequency could be varied, depending on turf response. Quickly-available nitrogen sources can always be counted on to provide a predictable response, but unless they can be applied at lower rates and more frequently than the slowly-available fertilizers, their use might result in an undesirable rate of shoot growth.

With the exception of some golf course superintendents and a few sports turf managers, there are a few situations where this type of program can be practically implemented. This "spoon-feeding" approach can be approximated, however, via the use of slowly-available nitrogen fertilizers.

This generally works well, but remember: you are depending on Mother Nature to provide conditions conducive to release of N for the turfgrass plant.

Slowly-available nitrogen sources that do not work well (or predictably) during early spring would be ideal for late spring or summer use, since you can count on warmer and moister conditions to prevail at those times. Some natural organic fertilizers and those with a high percentage of their N as longer-chain ureaformaldehyde polymers (Nitroform) must be applied at relatively high rates (1.5 to 2 lbs. N/100 sq. ft.) in order to elicit a noticeable short term response from the turf, even under conditions favoring the release of their nitrogen.

If you are able to make light, frequent spring N applications, using a quickly-available N source (urea, ammonium sulfate) would be ideal. If you are locked into making one or two applications during the spring, consider using a $\frac{1}{2}$ or $\frac{3}{4}$ rate of a quickly-available source early, and a more slowly-available N source (1 lb. N or

FIGURE 1

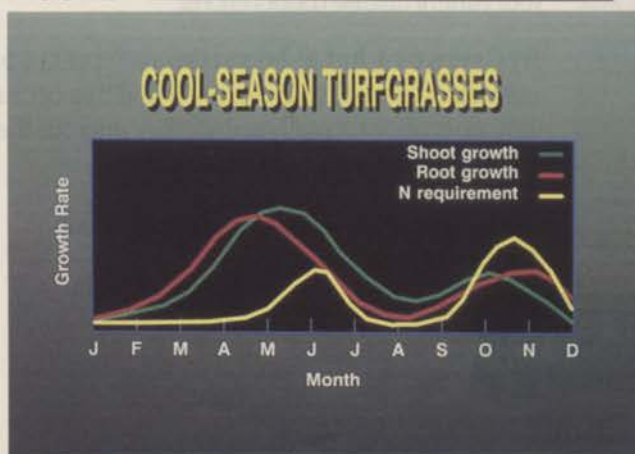
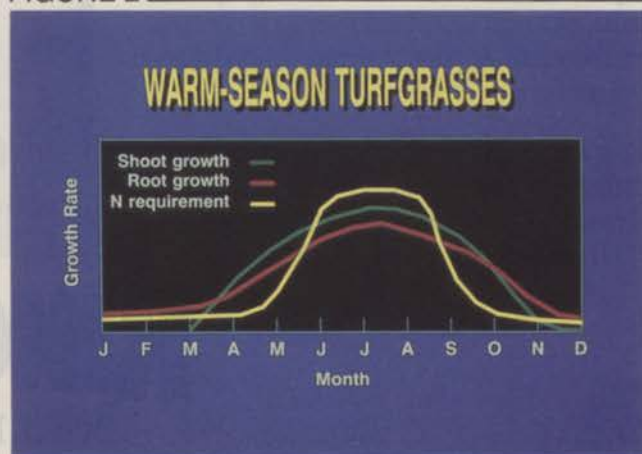


FIGURE 2



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Slow and quick release fertilizers

Quickly-available sources: These are water-soluble and not dependent on temperature to release their nitrogen.

Some, such as potassium nitrate, contain N in the form of nitrate (NO_3). Others, such as urea, ammonium sulfate, mono- and diammonium phosphate, have nitrogen in the form of ammonium (NH_4).

Ammonium nitrate contains both forms of nitrogen. Urea is an important N source, since it forms the basis for nearly all of the slowly-available nitrogen fertilizers, with the exception of the natural organic fertilizers.

The quickly-available nitrogen sources are ideal for "spoon feeding" and for use under cold conditions, when many many slowly-available sources do not perform adequately. They are relatively inexpensive, but may result in higher labor costs if they are applied frequently. The potential for "burn" is also greater with the quickly-available sources, mainly due to their higher salt indexes.

Slowly-available sources: It is more difficult to keep up with the types of fertilizers in this category, since changing technologies continue to result in new fertilizers. Within this category are *slow-release* (or *controlled release*) fertilizers that encapsulate a quickly-available fertilizer (usually urea) with a sulfur or plastic coating that degrades over time, slowly releasing the enclosed nitrogen source. Examples include the sulfur-coated and resin-coated fertilizers. These types of fertilizers generally contain enough free urea, or other soluble N source, to provide adequate short-term response, while providing the benefits of long-term, slow-release fertilization. Sulfur-coated urea has a history of performing well in lawn care and many golf course applications.

A new product from Grace-Sierra, with the trade name Once, can be applied once during the year to provide season-long feeding. In two years of testing at Colorado State University this resin-coated product has performed very well. These coated products require

adequate soil moisture to aid in breakdown of the coating, as well as to allow for solubilization of the enclosed N source and its subsequent movement into the root-zone. They will not perform well under dry conditions. On heavily-trafficked turf (especially if compacted and with little thatch), the coated products are subject to mechanical breakage, thus negating the slow-release characteristics of the fertilizer. On very close-cut turfs, such as tees or putting greens, the particles may be damaged (or picked up) during mowing.

Slowly-soluble: This category would include such fertilizers as IBDU and ureaformaldehyde. The N in these fertilizers is released via the action of hydrolysis (water) and/or microbial activity. Both types are quite moisture dependent. The UF fertilizers are also temperature-dependent, since the level of microbial activity is governed by soil temperature, in addition to the presence of adequate moisture. Thus, IBDU should work effectively under cool, moist conditions, while long-chain UF types will not perform nearly as well. Fertilizers containing UF are better-suited to summer use.

Natural organics popular

Natural organic fertilizers have become quite popular in recent years. Derived from plant or animal by-products, they include products like activated sewage sludge (Milorganite), dehydrated poultry waste (Richlawn products, Sustane), and dried blood, bone and seed meals (the Ringer products). These fertilizers depend on microbial activity to release much of the nitrogen contained in them. Interestingly, the Ringer and Richlawn products have performed very well under cool conditions in Colorado testing, probably because blood meal will release N quite quickly. These products require good levels of soil moisture to work well, and may not perform up to expectations under dry conditions (even if temperatures are warm).

—Dr. Koski □

Characteristics of Nitrogen Fertilizers

Fertilizer Source	N Percentage	N Source	Moisture Dependence	Temperature Dependence	Residual Activity	Burn Potential
QUICKLY-AVAILABLE N						
Ammonium nitrate	33	ammonium nitrate	low	low	short	high
Ammonium phosphates	11-21	mono/di-ammon. phos.	low	low	short	high
Ammonium sulfate	21	ammonium sulfate	low	low	short	high
Urea	46	urea	low	low	short	high
SLOWLY-AVAILABLE N						
Slow-Release Sources						
Sulfur-coated	14-38	urea, ammoniacal N	moderate	moderate	long	low
Resin-coated (ONCE™)	24-35	ammoniacal N, urea, nitrate	moderate	moderate	long	low
Slowly-Soluble Sources						
IBDU	31	IBDU	high	low	long	low
Ureaform Products						
Nitroform	38	ureaformaldehyde	high	high	long	low
FLUF	18	ureaformaldehyde/urea	moderate	moderate	medium	low
Nutralene	40	methylene urea polymers	moderate	low	medium-long	low
Scotts methylene urea	39	methylene urea polymers	moderate	moderate	medium-long	low
CoRoN	28	methylene urea/urea	low	low	medium	low
Formolene Plus	30	methylene urea/urea	low	low	medium	low
N-Sure	28	triazine/urea	low	low	medium	low
Natural Organic Products						
Ringer fertilizers	6-10	blood, bone, seed meals	high	high	long	low
Sustane	6	composted turkey waste	high	high	long	low
Richlawn fertilizers	6-14	DPW, blood & bone meal	high	high	long	low
Milorganite	6	activated sewage sludge	high	high	long	low

Source: The author

more, depending on the source) later in the spring when it becomes warmer. Alternatively, use a mixture of slowly- and quickly- available N when you cannot make frequent spring applications (see sidebar).

Other nutrients

Most often, other nutrients are applied with (or in addition to) regular nitrogen applications. Potassium (K) applications, even when soil tests say

levels are adequate, have been touted in recent years as providing an added degree of drought resistance and/or heat tolerance.

Many turf managers believe that they see this effect in the field, although

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In cases of mite damaged turf, recovery can sometimes occur with adequate spring fertilization and watering.

research on the subject has not proven conclusively that supplemental K provides such benefits.

Less has been said about phospho-

rus (P) in this regard, but many turf managers provide regular supplements of potassium in their programs. It is unlikely that these higher levels

of K or P can cause any harm, but one should consider whether any benefit is gained by using high levels of either, especially when one considers the extra cost involved. Routine use of both is encouraged, however, on those sites where grass clippings are regularly removed.

Iron applications can enhance turf color without stimulating excess shoot production. Iron in the spring can be advantageous if it allows you to reduce the amount of N applied. Research by Wehner and Haley at the University of Illinois found that iron can be substituted for a portion of some N fertilizers (urea and Formolene), while still attaining a response equivalent than that obtained from a full rate of nitrogen.

In certain parts of the country where iron chlorosis is prevalent (high pH soils), it may be necessary to apply iron at least once per year. Nitrogen applications to a chlorotic (yellow), iron-deficient turf will worsen the chlorotic condition.

Iron is most effective when applied as a foliar spray. **LM**

Dr. Koski is an assistant professor and extension turfgrass specialist at Colorado State University.

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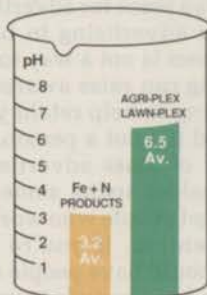
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SURVIVING IN A TROUBLED ECONOMY II

by Rudd McGary, Ph.D., AGMA, Inc.

Perhaps the most important key to being a strong company in the coming years is marketing: standard practices of past years aren't going to take a company through the '90s. Much of what used to be standard will become old-fashioned and—worse—ineffective. Here are some ideas about the ways in which you need to market to survive in the '90s.

Attract and retain

Most green industry companies have emphasized attracting customers. This is apparent by strong efforts in direct mail and—with larger companies—in television and radio advertising. The idea was to keep on finding new customers year after year, with the supposition that there was a never-ending supply of them.

Unfortunately for companies which thought this way, the supply is just about used up. By that I mean that there aren't likely to be many potential customers in major metro markets who are just now finding out about companies for lawn and landscape care, as well as construction and design. Particularly lawn care, since advertising for this service has been done for at least a decade. This customer base knows that the services are available and generally has an idea about their costs.

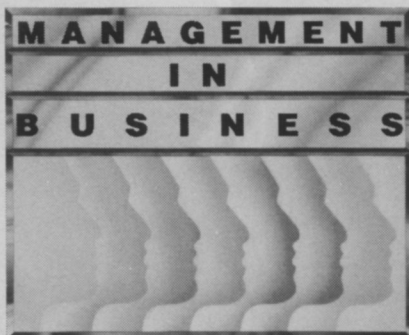
What does this mean for survival? Simply that you had better look at retaining your customers and making sure that your growth is predicated on a strong customer base rather than by trying to replace your customers (or at least a large part of them) each year.

Retention vs. attraction

Retention is a good marketing strategy, not only for survival, but for any company looking for strong growth.

One reason is that it costs less than attraction. Depending on your budget for advertising, and on how much you budget for retention efforts, attracting a new customer generally will cost three to six times as much as retaining one. Reason enough here to focus on retention.

But the true survival part of this strategy is linked to the fact that if a satisfied customer tells a potential



customer about your services, you're likely to get the business. If you're focusing on retention—making sure that the customer is satisfied—then you're likely to have a strong base of referrals, and growth is likely. Trying the opposite, to attract and not retain, is a sure way to perish.

The personal touch

A second major part of survival strategy deals with how you treat the customer. If you're interested in keeping customers, you need to make sure that you work on keeping in personal touch. That means several things from a marketing standpoint:

Advertising can be useful, but if you focus on retention and the personal touch, you should shift your emphasis to more personal sales. (This doesn't mean you should go more toward telephone sales. That's not a personal sale, it's a phone call.) You should go more toward a trained sales staff that knows how to explain your services to a consumer in a way that will help that consumer make a decision to buy your company's offerings.

There is a place for advertising, but relying on advertising to bring you new business is not a way to survive. Advertising can raise awareness, but it's not going to help retain your customers and it's not a personal touch.

Instead of mass advertising, you might consider using some of your budget to get people who work on customer retention. If you're in lawn care, you could have people call after the first and last rounds to make sure that the customer is satisfied, with both the results of the service and the way in which he or she was treated. If

you're in landscaping, you should call after your jobs to make sure that the client was serviced in such a way that he or she is likely to refer you to a new customer.

In addition, you might take some money out of your advertising budget and spend it on the office staff. They're the people who will make the first impression on the public, and also the ones who will deal with problems first as incoming calls occur. By finding ways to compensate the office staff for helping to retain your customers, you can help the entire company focus on retention.

At the same time, making sure that you look for a personal touch rather than mass advertising is likely to give you a group of customers who will help you grow through referral and word of mouth—the two most important ways to grow any type of green industry company.

In short, to survive:

1) Stop thinking about attracting new customers. Simply going after new customers each year isn't a good strategy, particularly in times when the word "survival" is being used. By worrying about how you're going to keep customers (and this includes work quality), consumers become the focus of everything the company does.

In a survival mode, the retaining customers becomes more and more important.

2) Use less mass media and more personal touch. The days of mailing out large amounts of direct mail pieces and getting a decent return are becoming history. You need to have a good sales force and a good retention force, people that can work with the consumers, in order to survive.

For most companies, taking care of the customer was the way to start and grow. In a survival mode, you should look at what the customer wants and make sure to deliver the service so that customers will want to come back or at the very least, give us a good recommendation. People can choose a lot of different companies for their green services. Those companies that give the personal touch are the ones that will survive and prosper. **LM**

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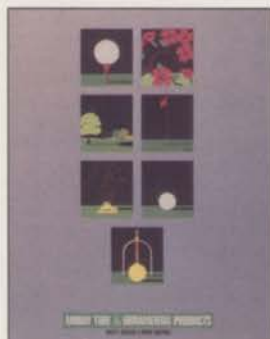
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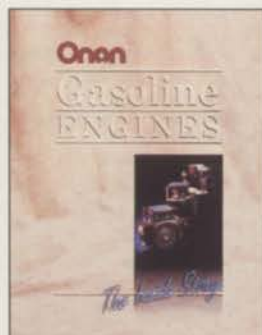
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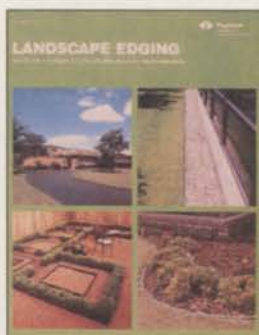
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PRE-EMERGENCE WEED CONTROL

WARM-SEASON GRASSES

The degree and duration of herbicide effectiveness will vary according to the herbicide characteristics and seasonal weather conditions.

by W.M. Lewis, Ph.D., North Carolina State Univ.

Goosegrass and smooth crabgrass (shown above) are two of the most common weeds found in warm-season turfgrasses. Specific management practices lead to aesthetically appealing turfgrasses.

The first step in a weed management program is to produce a healthy vigorous turf, one competitive with weeds. This may be done by matching proper warm-season turfgrass species or cultivars with their intended use—whether a home lawn, athletic field, commercial landscape or golf course fairway.

Grass selection may also be related to its intended level of management

(amount and frequency of fertilization, needed irrigation and mowing height and frequency).

Insect and disease problems should also be reduced.

Once these practices have been put into action, the turf manager is ready to consider the need for pre-emergence herbicides.

Frequently, the need should be determined by observations made on

the site the previous season. Applying pre-emergence herbicides year after year without any consideration to the existing weed problems is not good management. Carefully selecting specific management practices leads to an aesthetically appealing and serviceable warm-season turfgrass.

Available herbicides

Pre-emergence herbicides are the

backbone of a weed management program. They are primarily used for the control of smooth and large crabgrass and goosegrass, though many will control certain other summer annual weedy grasses. Also, they provide pre-emergence control of annual bluegrass when applied in the fall.

A number of herbicides or herbicide combinations are registered for pre-emergence use in established warm-season turfgrasses (Table 1). This listing contains examples of common and trade names of pre-emergence products.

Many herbicides are also formulated on fertilizer carriers. Certain herbicides are limited to use by professional turf managers which can be determined by reading the label.

Oxadiazon (Ronstar) is not registered for use on home lawns. Two additional herbicides, dithiopyr (Dimension 1EC) and prodiamine (Barricade 65 WDG) may be registered for use in the 1991 season.

The emphasis is on application to established turfgrass because none of the herbicides are registered for application at time of sprigging, sodding or seeding warm-season turfgrasses. There is one exception, however: siduron may be used when sprigging zoysiagrass.

Herbicide selection

When selecting a herbicide, first consider turfgrass tolerance (Table 2) and the grassy weeds present on the site. Then consider the effectiveness of the herbicides on those weeds (Table 3). The method or ease of application may also influence the choice in addition to safety and cost.

Perhaps one overlooked factor is the tolerance of trees and ornamentals in the landscape. Most labels list tolerant ornamental species. This

Table 1.

Examples of Common and Trade Names of Pre-emergence Herbicides for Warm-Season Turfgrasses

Common Name	Company	Trade Name and Formulation
Atrazine	Ciba-Geigy	AAtrex 80W, 4L, 90DG
Benefin	Security	Purge II 2L
	Dow/Elanco	Balan 2.5G, 60DF
	Lescro	2.5 Benefin Granular
Benefin + oryzalin	Dow/Elanco	XL 2G
Benefin + trifluralin	Dow/Elanco	Team 2G
Bensulide	ICI	Betasan 4E LF, 3.6G, 7G, 12.5G
	Lescro	Lescosan 4E, 7G
	PBI/Gordon	Bensumex 4LF
Bensulide + oxadiazon	Scotts	Goosegrass/Crabgrass Control 6.5G
DCPA	Fermenta	Dacthal 75W, 6F
Napropamide	ICI	Devrinol 50WP, 2G, 5G
	Lescro	Devrinol 5G Ornamental
Oryzalin	Dow/Elanco	Surflan 4AS
Oxadiazon	Rhone-Poulenc	Ronstar 2G, 50WP
Pendimethalin	Lescro	Pre-M 60 DG
	Scotts	Halts 1.71G
		Southern Weedgrass Control 2.45G
		Turf Weedgrass Control 1.71G
		Weedgrass Control 60WDG
Simazine	Ciba-Geigy	Princep 80W, 4L, 90DG, 4G

opens up another possibility of selecting a single herbicide for pre-emergence grassy weed control in the turf as well as the ornamental plant beds.

With the exception of atrazine, simazine and oxadiazon, the effects of the pre-emergence herbicides are associated with inhibiting root growth in the germinating weed seeds. Root inhibition has also been observed in desired turfgrasses; for example, in the growth of new roots along the stolons of bermudagrass and centipedegrass.

The degree and duration of the effects will vary according to the herbicide characteristics and seasonal weather conditions. For this reason, it may be wise to alternate herbicides from year to year or—maybe even more important—to be very cautious in determining the need for a pre-

emergence herbicide in any year.

In heavily-trafficked areas having thin open stands, a pre-emergence herbicide may interfere with the stand filling in and the stolons rooting properly. Post-emergence control would be the best approach for this situation.

Frequent light applications of MSMA may be used in bermudagrass in an effort to control recently germinated crabgrass and goosegrass. In centipedegrass, sethoxydim (Poast) applied as a post-emergence provides control to crabgrass and goosegrass. The other alternative in these situations is to delay pre-emergence application until a dense stand is established and in the meantime to concentrate on starting the proper management practices to encourage that dense stand.

Table 2.

Tolerance of Established Warm-Season Turfgrasses to Pre-emergence Herbicides for Control of Annual Weedy Grasses

Herbicide	Bahiagrass	Bermudagrass	Centipedegrass	St. Augustinegrass	Zoysiagrass
Atrazine	NR	T	T	T	T
Benefin	T	T	T	T	T
Benefin + oryzalin	T	T	T	T	T
Benefin + trifluralin	T	T	T	T	T
Bensulide	T	T	T	T	T
Bensulide + oxadiazon	NR	T	NR	NR	T
DCPA	T	T	T	T	T
Napropamide	T	T	T	T	NR
Oryzalin	T	T	T	T	T
Oxadiazon	NR	T	NR	T	T
Pendimethalin	T	T	T	T	T
Siduron	NR	NR	NR	NR	T
Simazine	NR	T	T	T	T

T = tolerant when used properly according to the label; NR = not registered for use on this turfgrass.

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Application timing

Pre-emergence herbicides are best applied at least two weeks before expected weed seed germination. In areas where there is a crabgrass history, pre-emergence herbicides are applied in the spring when soil temperatures approach 53°F. Goosegrass germination is usually two weeks later than crabgrass.

Crabgrass and goosegrass germinate first in thin open stands of warm-season turfgrasses. Germination is delayed and/or reduced in dense stands, which is another reason for considering all cultural practices as part of a total weed management program. Moving from the southern to the northern portion of the warm-season zone, crabgrass may germinate from late January to early April.

Frequently, application timing is correlated with a biological indicator. For example, in North Carolina, pre-emergence crabgrass herbicides should be applied by the time dogwoods are in full bloom.

Research at North Carolina State University has shown that split applications generally out-perform a single pre-emergence application. An example of a split rate may be 1.5 pounds in early spring and 1.5 pounds eight weeks later, if the usual single spring application rate is 3 pounds active per acre. Split applications of benefin + trifluralin, oryzalin and pendimethalin have given acceptable goosegrass control.

Some turf managers apply one pre-emergence herbicide early in the spring and a second herbicide eight weeks later in an attempt to increase safety to the turf. We have not observed any adverse effects on ryegrass mixtures overseeded in bermudagrass in September or October following a March-to-May pre-emergence herbicide application, though we have observed a reduction in stand density of fall overseeded ryegrass from spring applications of oryzalin and benefin + oryzalin.

Our tests have also shown that applications can begin six to eight weeks before expected crabgrass germination with favorable control, because under cool soil temperatures little if any herbicide degradation occurs during this period. This would not hold true farther south in the warm-season turfgrass area. In fact, in some areas crabgrass can germinate year-round under favorable conditions.

Applications of herbicides for pre-emergence control of annual bluegrass and certain winter annual broadleaf weeds may be from late August to early November, depending on

TABLE 3.

Annual Grassy Weed Control Ratings for Pre-emergence Herbicides

Herbicide	Crabgrass	Goosegrass	Annual Bluegrass
Atrazine	P	P	E
Benfen	G	F	G
Benfen + oryzalin	G	F-G	G
Benfen + trifluralin	G	F	G
Bensulide	G	P	G
Bensulide + oxadiazon	G	G	G
DCPA	G	F	G
Napropamide	G	G	G
Oryzalin	G-E	G	G
Oxadiazon	G	G	G
Pendimethalin	G-E	F-G	G
Siduron	G	F	NR
Simazine	P	P	E

Weed control effectiveness: E = excellent (90-100%), G = good (80-90%), F = fair (70-80%), P = poor (<70%), NR = not registered.

geographical location. Annual bluegrass germination is influenced by adequate moisture and cool temperatures. Time of emergence can be quite variable from year to year.

Herbicide effectiveness

Herbicide characteristics, weeds to be controlled, and weather conditions influence the effectiveness and longevity of pre-emergence herbicides. The persistence of herbicides in the

Pre-emergence herbicides are best applied at least two weeks before expected weed seed germination.

soil differs. Benfen does not persist as long as oryzalin or pendimethalin, for example. Split or repeat herbicide applications help to maintain threshold levels for season-long grassy weed control.

As indicated in Table 3, with the exception of atrazine and simazine, pre-emergence herbicides provide good to excellent control of crabgrass. However, the ability to control goosegrass varies. For effective goosegrass control, a herbicide rated "good" should be applied. Single applications of oxadiazon and bensulide + oxadiazon have provided favorable goosegrass control in North Carolina tests.

If a pre-emergence herbicide is to be effective, it must be applied prior to weed seed germination. Applications

following weed emergence will fail. If applied too early, the herbicide may dissipate or degrade before weed seed germination.

Pre-emergence applications need rainfall or irrigation to move them off the turf foliage into the upper soil layers where the weed seeds germinate. If at least one-half inch of rain doesn't fall within a week following application, irrigation is advisable. On the other hand, excessive seasonal rainfall usually reduces the length of effective control.

Mowings of warm-season turfgrasses should be delayed until the herbicide has been washed off the turfgrass foliage, especially if grass clippings are to be removed.

It has been a common belief that cultivation following pre-emergence applications disrupts the herbicide barrier in the soil and then stimulates weed germination. However, according to test results, coreing (aerification) following pre-emergence herbicide application does not affect herbicide performance, providing the soil cores are returned.

Metolachlor (Pennant 7.8E) has been registered for pre-emergence yellow nutsedge control on golf fairways, sod farms and commercial lawns, but not on residential turf. It may be applied to bahiagrass, bermudagrass, centipedegrass and St. Augustinegrass.

Choosing the appropriate pre-emergence herbicide requires knowing the tolerance of the warm-season turfgrass to the herbicide. This must be matched with the weeds. **LM**

Dr. Lewis is a professor of crop science at North Carolina State University



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PRE-EMERGENCE WEED CONTROL

COOL-SEASON GRASSES

Annual weed control requires a sound knowledge of the grasses and weeds in question, and discriminating cultural practices.

by Nick Christians, Ph.D., Iowa State University

Many of the annual weeds we encounter in cool-season turf species are actually warm-season grasses.

Unlike the cool-season turfgrasses that thrive in spring and fall, warm-season grasses such as crabgrass, goosegrass and foxtail thrive during the summer.

Warm-season annuals die early in the fall with the first cool weather. Cool-season grasses thrive in the fall and early spring. Fertilizer applications at this time will help thicken cool-season lawns and make them more resistant to annual weed encroachment in the late spring. Fertilizer applications during mid-June to mid-August to lawns with some annual grasses and broadleaf weeds don't encourage the lawn grasses but do benefit the warm-season weeds.

High-phosphorus diet

The proper fertilizer can also help discourage annual weeds.

When the lawn is established, "starter" fertilizers high in phosphorus (P) are used, such as a 13-25-6 or a 10-20-10. Once the grass plant matures and forms an extensive root system, however, it is able to remove phos-

phorus from the surrounding soil; then fertilizers with analysis much lower in P are generally sufficient (i.e., 20-3-15 or 18-5-9).

Application timing

Fertilizing mature lawns with high phosphorus fertilizers does little to benefit the turf, unless the area is shown by a soil test to be low in that element. Germinating annual weeds thrive on high P fertilizers just as do germinating perennial grass seedlings.

Although turf deficient in P may benefit from "winterizing" treatments, most lawns have sufficient phosphorus in the soil. So more will not improve the turf's winter survival; however, the resulting high P levels on the soil surface will help germinating weed seeds in the spring.

Importance of mowing

Mowing itself can serve as a weed control. Many of the serious agricultural weeds are of no consequence in turf areas because they cannot tolerate continuous mowing. Excessively low mowing heights, however, will reduce the turf's competitive advantage and allow annual weeds to

become established regardless of whether herbicides are used, as observed at Iowa State University in late summer studies. (Kentucky bluegrass mowed below 1½ inch will often become infested with crabgrass, regardless of the presence of pre-emergence herbicides.)

A good dense stand of turf is one of the best weed controls, and mowing to meet the turf's requirements is one of the best ways to assure a dense stand.

Cultural practices

Cultivation techniques such as core aeration can work both ways on weed infestation.

Compacted soils have a detrimental effect on the turf and often become infested with annual weeds. Using herbicides on compacted areas makes little sense, unless the compaction problem is dealt with first. Aeration reduces compaction and favors the turf, thereby helping to control weeds.

Improperly timed cultivation can potentially aid weed infestation. Any practice that opens the turf and brings annual weed seed to the surface during the peak weed germination period is likely to benefit the weeds more

than it does the turf.

Recent research has shown that spring aerification following pre-emergence herbicide application does not disrupt the barrier established by the herbicide as much as once believed. It makes good sense, though, to avoid this time if possible. Late summer to early fall is still the best time to aerify cool-season lawns.

Irrigation strategies

A sound knowledge of grass species and weeds can also be used to design an irrigation strategy that will help prevent weeds.

In an established, well-rooted lawn it makes little sense to irrigate to keep the surface continuously moist during the germination of annual weeds. Some surface drying will generally have no detrimental effect on perennial lawn grasses, but will have an impact on newly-germinated weed seed that are struggling to survive.

Turf infested with fungal patch diseases may benefit from light, frequent watering before and during disease activity. Proper use and timing of light, frequent watering programs is recommended on lawns where patch diseases have been a problem. On lawns where patch diseases have not historically been a problem, deep, infrequent watering is still the best practice.

Proper irrigation at other times can also help prevent weed problems. Kentucky bluegrass lawns can survive extended drought periods by going into summer dormancy. But spurge and oxalis often infest these lawns in late summer resulting in callbacks and the need for more herbicides. Using irrigation water to keep the lawn growing can help insure against these weed problems.

Watering cool-season lawns during dry fall conditions can also be a sound management practice.

Dry autumns have been a problem in the Midwest during three of the last four years. This is one of the best times for cool-season grasses to become re-established in the absence of competing annual weeds. This time of year is particularly important on lawns damaged by summer drought.

Proper fall fertilization and watering can help make the lawn more resistant to weed infestation in the spring.

Easy on perennials

Using cultural techniques can help prevent a weed problem. However, cultural controls are rarely 100 percent effective.

Insect and disease damage, adverse weather conditions, physical damage to the lawn, and a variety of other

factors can injure even the best managed turf and open it to weed establishment. For these situations, herbicides can prevent weed infestation if properly used.

Table 1 lists a variety of pre-emergence herbicides that can be used on cool-season lawns to help prevent annual weeds. The activity of these materials is such that they do little, if any, damage to the perennial grasses in the turf, but are deadly to the germinating annuals.

(For a detailed discussion of these herbicides, see, "Cool-season weed control poses special challenge," *Lawn Care Industry* magazine, Feb., 1990.)

Some of the materials in this group have unique characteristics.

Siduron, for instance, is the only material in the group that can control annual weeds selectively at the time of lawn establishment. This material is particularly useful for spring seedings.

Isoxaben is marketed under the trade name Gallery. It is particularly effective against knotweed, spurge, oxalis and other annual broadleaf weeds. Isoxaben has limited activity at labeled rates against annual grasses and will generally fit into the lawn care program as a supplement to standard pre-emergence herbicides. Where annual broadleaves have been a problem in the past, this material provides a new tool that can be used effectively if properly timed.

Widening the window

Much of the research on annual weed

control in the 1980s was aimed at "widening the window" of application (Figure 1).

The pre-emergence herbicides in Table 1 will control annual weeds if applied before weed germination, but most provide little if any post-emergence activity on weeds that have already germinated. These materials are very useful in situations where they can be properly timed before weeds germinate.

A breakthrough

In the early 1980s, MSMA (monosodium methanearsonate) and DSMA (disodium methanearsonate) were the only materials available for post-emergence control of summer annual weeds in turf. The weed control from these materials was quite inconsistent in much of the Northern region and often resulted in phytotoxicity to the turf. Pre-emergence applications were far preferable during this time, and these post-emergence materials were used only as a last resort.

Fenoxaprop-ethyl, marketed under the trade name Acclaim, was released in the mid-1980s. It was the first really effective post-emergence herbicide for controlling annual grasses in cool-season lawns.

This material broadens the window of application by allowing lawn care specialists to effectively treat germinated crabgrass in its early stages. Customers whose lawns could not be treated before crabgrass germination and customers who signed up for the service after the time of pre-emergence application no longer had to go

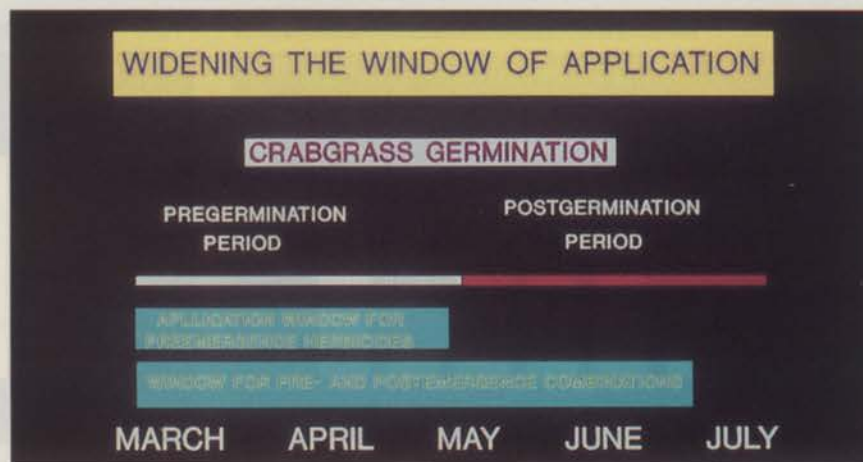
TABLE 1

Pre-emergence herbicides currently in use in cool-season turf

COMMON NAME	TRADE NAME	COMMON NAME	TRADE NAME
DCPA	DACTHAL	OXADIAZON	RONSTAR
BENEFIN	BALAN	PENDIMETHALIN	PRE-M, WEED GRASS CONTROL
BENSULIDE	BETAMEC-4, PRE-SAN,	TRIFLURALIN/BENEFIN	TEAM
	BETASAN	SIDURON	TUPERSAN
ISOXABEN	GALLERY		

Source: The author

FIGURE 1



through the entire season with a lawn filled with warm-season annuals.

Fenoxaprop-ethyl has had some limitations. It is incompatible with many broadleaf herbicides such as 2,4-D. It has no pre-emergence activity, and it is not very effective following drought stress of the target species. But it has still been widely used in the cool-season region. **LM**

Dr. Christians is a professor of horticulture at Iowa State University.



New pre-emergence herbicides are becoming available which "widen the window" of time for effective applications.

New control products

DIMENSION: Dithiopyr is a new material that will be marketed on a limited basis in selected states in 1991 under the name Dimension. Research on this product has been under way at various state universities since the mid-1980s under the experimental name MON 15100.

Dithiopyr is a very effective pre-emergence herbicide that provides reasonably good post-emergence control of germinated crabgrass. The extent of the post-emergence activity varies with location, but I have found it to provide excellent post-emergence control in most years at the Iowa State University turfgrass research area.

Dithiopyr has two important advantages over older products:

- it can provide both pre- and post-emergence activity, and
- it does so at a lower rate of application than most herbicides. The recommended application rate will be 0.5 lbs. AI/acre as compared to 1.5 to as high as 10 lbs. AI/acre with earlier materials.

QUINCLORAC: Quinclorac, an experimental product that has been given the potential trade name Impact is another of the new products that may possibly widen the window of application.

This material provides excellent post-emergence control of crabgrass in its early stages and provides excellent control of some broadleaf weeds, particularly white clover. Quinclorac, with little pre-emergence activity, would have to be combined with a pre-emergence material if it is applied at a time when crabgrass is still germinating.

Quinclorac has been found in recent experimental work to provide very good activity in the granular form and may well find a place in the future.

Similar problems during drought

Research at Iowa State University on both dithiopyr and

quinclorac indicate that these products are likely to experience problems controlling crabgrass that has been subjected to drought periods. Fenoxaprop-ethyl has similar problems.

Figures 2 and 3 show the results of post-emergence weed control studies following an extended drought period (Fig. 2) and following a period in which no drought stress was observed (Fig. 3). Crabgrass subjected to dry conditions before treatment was much harder to control than the crabgrass that experienced no drought conditions. More work will be needed to understand this reduced control, but this should be considered whenever post-emergence crabgrass control is needed.

Changing standards

With the new tools being developed, the potential exists for a change in the standard lawn care program.

In the past, a standard program included a pre-emergence application in the first round, often followed by an additional application in the second round to assure complete control through the season. With the new post-emergence materials being developed, the possibility exists that the early pre-emergence application could be eliminated and replaced with a single application in the second round that would control annuals both before and after emergence.

The new products will have to prove themselves in the market place, but if this type of program can be used effectively, it could potentially reduce the amount of herbicides that the industry now applies to lawns and could reduce cost. These possibilities will be worth investigating in future seasons as new herbicides reach the market.

—Dr. Christians □

FIGURE 2

POSTEMERGENCE CRABGRASS CONTROL WITH DIMENSION AND IMPACT FOLLOWING DROUGHT CONDITIONS

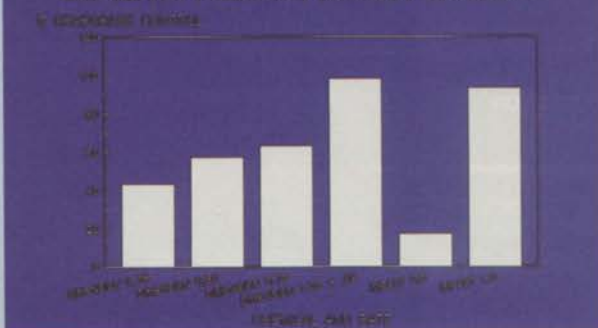
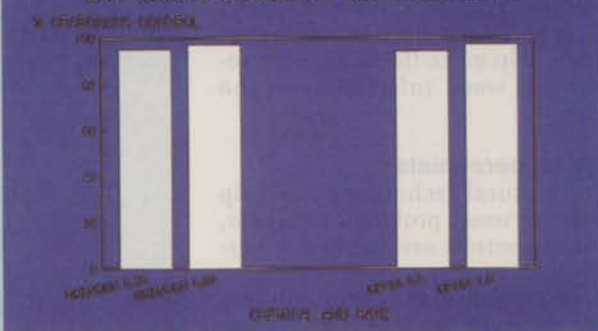
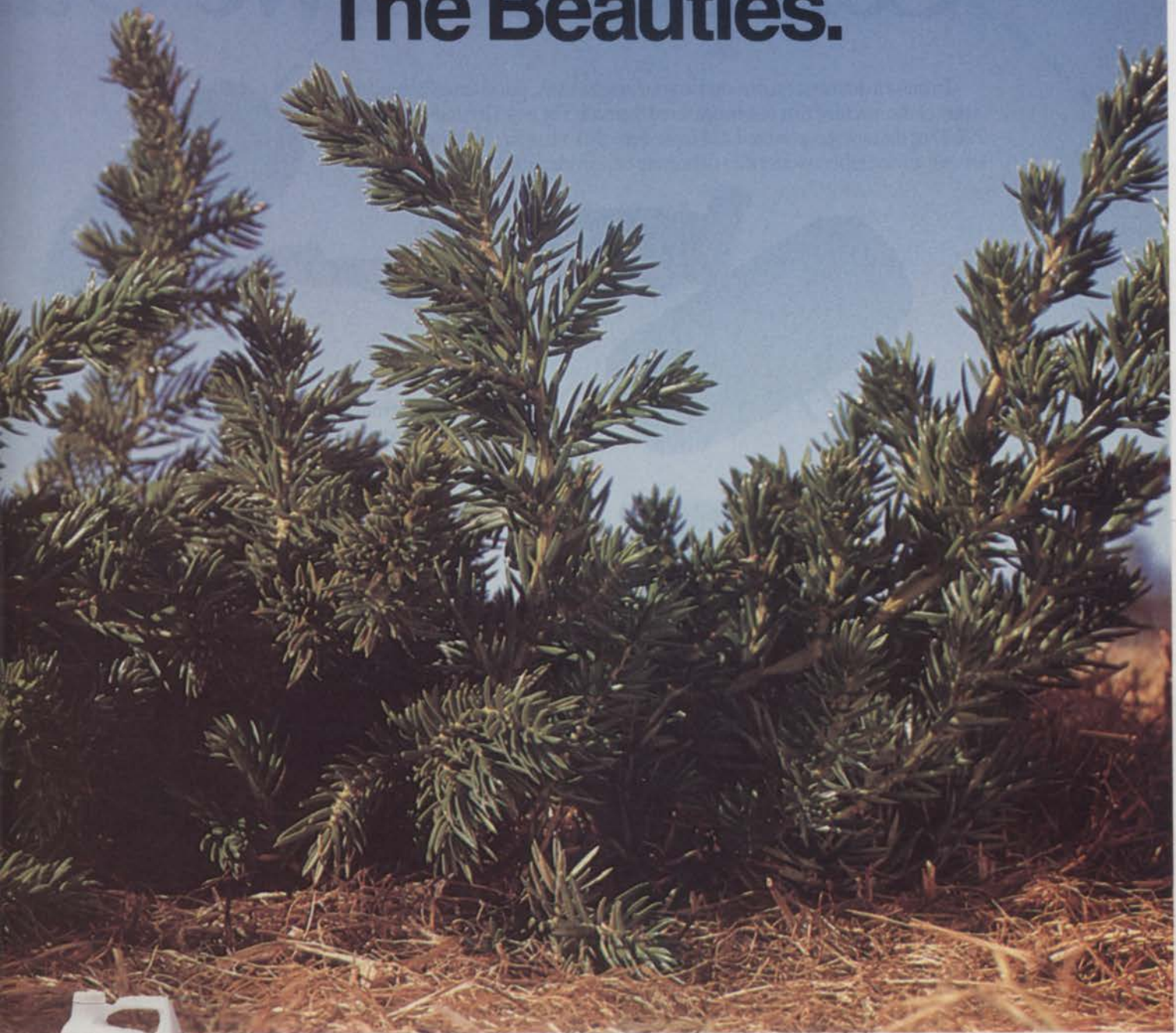


FIGURE 3

POSTEMERGENCE CRABGRASS CONTROL WITH DIMENSION AND IMPACT FOLLOWING WET CONDITIONS



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PGRs: LESS TIME, FEWER CLIPPINGS

Yard waste restrictions and busy mowing schedules persuade companies to add plant growth regulators to their arsenals.

by Doug Oberman, PBI/Gordon, Kansas City, Mo.

Proof of the way science benefits industry can be found in the renewed interest in plant growth regulators (PGRs) for reducing yard waste and mowing time.

Using PGRs on fine turf runs contrary to the conservative attitude of the turfgrass professional: that quality turf depends on how rapidly and vigorously the grass grows. But the reality of landfill depletion has changed many attitudes.

"As clipping management and yard waste becomes a bigger problem, we see a larger opportunity for PGRs, especially when they are used to complement controlled release nitrogen (N) feedings," says Dr. Milt Kageyama, director of product development at O.M. Scott & Sons. Scott's regulator product, TGR Poa Annua Control, is described as a controlled-release fertilizer-based product, designed to halt the growth of poa and encourage the growth of desirable species.

Stay on schedule

Like other technological developments

in the turf industry, it has taken several years for PGRs to get up to speed with the turf manager's needs. While manufacturers were striving for seven or eight weeks of growth suppression, with reduced mowings, the maintenance contractor simply wanted a temporary

Clippings and other yard debris make up an estimated 17 to 20 percent of waste going into U.S. landfills...for now.

solution to the peak growth during April or May. PGRs' benefits continue beyond spring, and help keep crews on schedule during peak growth seasons.

Using PGRs on highly-managed turf allows the grass to be put "on hold," in its best condition. This is a

new realization, since prior marketing strategies had targeted less maintained, lower quality turf. Discoloration was a down-side risk that had to be overcome before PGRs could be accepted in well-maintained lawns. But by reducing the dose of active ingredients, "spoon-feeding," or sequential applications, a tank mix of two different active ingredients, and proper timing can minimize or eliminate off-color. Liquid iron-nitrogen product may also provide this added benefit.

Points to consider

Growth regulators should be used in low-traffic areas (not to be mistaken with "no-traffic"). More diligence is also needed when scouting for turf insects or diseases.

These pests may not be noticed in untreated grass, but may cause more pronounced symptoms if left uncorrected in PGR-treated grass because the turf may not be able to grow past these problems. Also, sprinkler volume may need to be reduced, so that





Dan Rosen, president of Paragon Lawns in suburban Minneapolis and his wife/partner Jill, use an Embark-Limit combination at industrial parks. The product delivers five weeks of regulated growth.

slower-growing grass isn't over-watered.

Inhibiting the stem and seedhead development can be an important benefit. Timely treatment is required: generally, no later than the second or third mowing in the spring, or seed-head formation will have already begun in Kentucky bluegrass or tall fescue.

Turf quality tends to decline once the grass starts throwing seedheads, which the plant continues to do for some weeks, even when they are repeatedly mowed off.

Some lawn care companies and maintenance contractors are offering

PGRs to condo/homeowner associations and homeowners with low-traffic ornamental lawns. Turf maintenance bills are lower, and contractors can offer lower bids when a PGR is part of the program.

Reports from the field

Gator Lawns of Baton Rouge, La., sprayed PGR treatments on a number of residential St. Augustinegrass lawns last season.

"We used a pint of Embark 2S plus 2.75 gallons of amine compatible liquid iron per acre and got around seven or eight weeks slowdown in grass growth," says mana-

ger Mike Spalding.

"Two to four cuttings were enough to keep the PGR-treated lawns looking as good as neighboring lawns mowed seven or eight times."

Removing more than $\frac{1}{3}$ to $\frac{1}{2}$ of the grass blade can be stressful to grass plants.

"Whacking off four to six inches of grass in one cutting just isn't treating the lawn or your customer right, no matter what your excuse may be," says Dan Rosen of Paragon Lawns, a total-care landscape maintenance contractor in Edina, Minn. Rosen manages office parks and industrial plant lawns with a light rate of mefluidide and a tank-mix of mefluidide and amidichlor.

Rosen feels the mefluidide alone, costing under \$20 per acre and providing three to four weeks of growth suppression, can be used to "tame" the peak season growth, when the client wants weekly mowing.

He says the tank-mix gives up to six weeks duration of slowed growth, and allows Paragon to cut mowing in half.

Renovation aid

PGRs can be used during turf renovations, when the new grass is slit-seeded into existing turf. You can use a PGR to put the existing grass on hold, followed within a few days by overseeding. The absence of significant competition from existing grass allows the new seedlings to better compete for nutrients, moisture and light for several weeks, and reduces mowing damage. The original lawn returns to normal within five to six weeks.

In southern climes, golf greens can be sprayed with a PGR to suppress

TABLE 1

Fine Turf Plant Growth Regulators

	PRODUCT	MODE OF ACTION	PURPOSE/EFFECT
TYPE I GROWTH REGULATORS Suppress or inhibit growth and development	<ul style="list-style-type: none"> Amidochlor: LIMIT* (PBI/Gordon Corporation) Mefluidide: EMBARK* (PBI/Gordon Corporation) 	Suppresses growth and development by interrupting cell division and cell elongation at the crown. For control of tiller and seedhead formation. LIMIT - Root absorbed EMBARK - Leaf absorbed	Effective for controlling growth, tillering and seed-head formation. Post suppression greening occurs.
TYPE II GROWTH REGULATORS Suppress growth only	<ul style="list-style-type: none"> Flurprimidol: CUTLESS* (DowElanco) Paclobutrazol: Scott's TGR* (O.M. Scott and Sons Co.) 	Often referred to as anti-gibberellins which reduces growth by suppressing internode elongation. Tiller development and growth continues, but new plants are dwarfed. Both-Root absorbed	Used to control growth, enhanced greening, by concentrating chlorophyll, and turf thickening. Reduces competition of <i>Poa annua</i> .

Table adapted from materials published by Dr. John Kaufmann, Monsanto Ag Co.

WHAT'S OUT THERE: TWO TYPES OF GROWTH REGULATORS

Type I regulators: slower growth, seedhead suppression

If applied to emerging seedheads in spring, Type I growth regulators suppress turf growth and inhibit seedhead development. Applying PGRs before nutrient flow kicks in spares the root system from energy and mass depletion.

"The turf topgrowth is suppressed (not stopped), and the roots remain viable when using most PGRs," says Dr. Bruce Branham of Michigan State University's department of crops and soil science.

According to Branham, since the foliage is only slowed, photosynthesis remains active. The energy produced is stored in the roots and stem bases. Therefore, Branham explains, when the regulator wears off, a deeper green color occurs, due to the release of pent-up energy.

Embark Lite, a newly-approved, Type I mefluidide label from PBI/Gordon, adapted for fine turf uses by reducing the active ingredient, can also be used alone as a "mowing aid."

Duration of control is rate-related, but is generally targeted for three to four weeks of growth suppression. This application can make a significant difference in mowing ease and reduced clippings, especially if the application is timed to periods when grass growth and mowing pressure are the greatest. PBI/Gordon says the product can be used with good results in spring and fall, in most areas.

Of all the PGRs, mefluidide is probably the favorite product for tank-mixing with other growth regulators. It provides seedhead suppression at low rates, which is often a shortcoming of other PGRs.

A newly-developed tank mix recommendation for fine turf combines Embark Lite with amidochlor (Limit), the fine turf regulator developed by Monsanto and recently acquired by PBI/Gordon. Tank-mix directions reduce the label rates of each product, which provides a substantial margin of safety. There is generally no phyto or browning even when overlaps or over-applications occur.

Type II: density, color for poa control

Golf course superintendents favor regulators which enhance turf color and density. Of these, DowElanco's Cutless and Scott's TGR Poa Annua Control are technically referred to as anti-gibberlins. Initially meant for bentgrass greens and fairways, these PGRs are now noted for their contributions to density, color, playability and clippings reductions.

The growth reduction action of Type II PGRs has been referred to as a "miniturization" of the above-ground parts of the grass plant.

Scott's TGR (paclobutrazol, or PP333), has been well-received by the golf industry. More than 3,000 courses have used the product, says Jim Fetter, O.M. Scotts & Sons' vice president of professional products.

In addition to its fertilizer-based TGR Poa Annua Control, Scotts has a new, 50-WP sprayable formulation, TGR Turf Enhancer.

DowElanco's Cutless (flurprimidol) is used by superintendents for increased green-up, improved surface density and reduced clippings, says Mike Shaw, DowElanco's product development manager. With Cutless, sequential application is recommended.

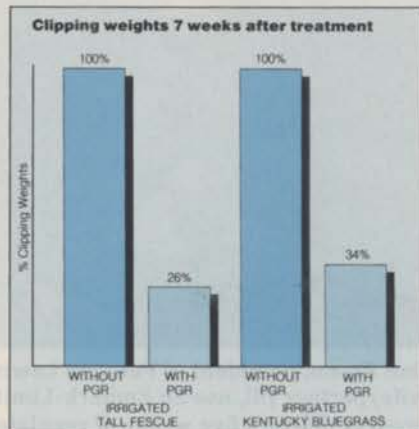
"Instead of applying Cutless all in one blow, spreading out the applications delivers the product to the plant as it needs it," says Shaw. Besides the added turf quality, Shaw says the use of Cutless in greens and fairways increases bentgrass populations.

Doug Obermann □

existing warm-season bermudagrass, followed by overseeding with ryegrass, *Poa trivialis* or other winter grasses. In spring, winter putting surfaces can be suppressed to help "release" the growth of dormant bermudagrass.

One of many tools

The benefits of PGR use for profes-



sional turf management increase as the problems facing the turf manager increase.

Says one manager: "We need something that can keep the turf growing slower, maintain green color, and not cost an arm and a leg."

"There is no one panacea, but what can help is a program for improved mowing equipment, fertility (via slow-release N), efficient watering and plant growth regulation. These are the tools which will help our industry survive." **LM**



Doug Obermann is product sales specialist for plant growth regulators at PBI/Gordon Corp. He received his Master of Science degree in agronomy from Iowa State University.

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IPM: ON THE VERGE OF ACCEPTANCE?

Integrated pest management is gaining ground in some circles as the industry realizes it's not meant to 'do away' with anything.

by Jack Simonds, contributing editor

Run the Integrated Pest Management (IPM) issue up the flagpole and see how it flies.

The IPM banner has been flapping heartily in the winds as researchers, industry watchers and green industry practitioners alike enjoy a robust debate over IPM: its mission, its benefits, even its definition.

To hear Dr. Gerard Ferrentino tell it, IPM methods have not simply carved a niche in the landscaping industry. IPM is on the verge of a full arrival.

"There is no doubt that pesticides work and are an important tool," Ferrentino says. But, the ornamentals IPM coordinator at Cornell University also notes: "In an IPM program, our main focus is how to use pesticides better and maximize their use. *IPM does not mean do away with chemicals.* I think we'll see its use grow tremendously in the next couple of years."

The proving ground

The test area for Ferrentino's conclusions came from just outside his office window: the 310-acre Cornell University itself.

Working with the university's ground maintenance crews, the turfgrass science program sought to reduce pesticide use employing IPM methods which include soap and oil applications, pruning, plant selection, vacuuming, turf removal and other alternatives.

The pest maintenance program was employed campus-wide on 79 acres of trees, 20 miles of walkways, 12 to 15 miles of roads and about 114 acres of parking lot space; a good mix of land uses in a concentrated space.

"(Alternative) methods work and when applied at the right time are safe to use," Ferrentino asserts.

IPM, if not on the verge of full and widespread use, is certainly a popular commodity on the conference circuit. Scarcely a conference in the green industry convenes without IPM figuring prominently on the agenda.

IPM is hot stuff, to be sure, but for the "mom-and-pop" landscape manager, the question remains: Is IPM a passing fancy or are today's murmurings a foreshadowing of things to come?

What's in the way?

Dr. James Wilkinson, chief operating officer with Lawnmark of Hudson, Ohio, says "practical obstacles" still exist for widespread IPM use.

Wilkinson believes that some

stumbling blocks remain:

- **Customer expectation.** In some cases, Wilkinson argues, homeowners finding the lone dandelion or single grub will insist on a new, lawnwide spraying, which "flies in the face" of the intent of IPM.

- **Employee training.** With the inherent high turnover in the lawn care industry, keeping a "true practitioner" of IPM on staff can be difficult.

- **Follow-up monitoring.** Here, Wilkinson notes that with many landscaping firms basing profits on number of lawns or square feet serviced in a season or simply the amount of billing dollars per season, field applicators and technicians simply "don't have the time to get down on their hands and knees to do monitoring or diagnosis."

Follow-up monitoring, all connected with IPM agree, is a cornerstone to its success.

Nonetheless, Wilkinson and Dr. David Sheltar, entomologist with Ohio State University's Cooperative Extension Service, agree that IPM has a place in the industry and time may allow its foothold to become firmer.

"We need to consider all the control options. All too easily we reach for the container of pesticide and take a whiz at it and hope that will take care of the problem," Sheltar says.

Localized tracking

Sheltar agrees that the industry needs to focus on finding "efficient ways of monitoring pest activity."

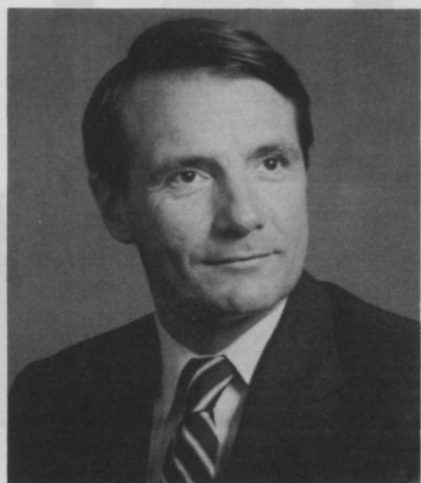
Sheltar advances the notion of monitoring by neighborhood, charting pest, weed and disease infestations which may occur commonly to a localized area and perhaps employing billbags, pitfall traps or other non-chemical techniques as dictated by common sense.

Sheltar laments about the "hose jockey" or "nozzle head" characterization of the green industry; IPM makes sense, he says, when one considers that "no one single control will succeed."

continued on page 70



Dr. Gerard Ferrentino: IPM will grow "tremendously."



Dr. James Wilkinson: Customer demands often run counter to IPM.



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IPM from page 68

"(IPM) is not an organic (or) biological program. It can contain both those elements. It is also not a 'no-pesticides' program," Shetlar observes.

The "no pesticides" aspect of IPM surfaces time and again as specialists gather to air out where the practice is and where it is headed.

Ferrentino, for example, pens an "IPM Corner" in a department newsletter, "Cornell University Turfgrass Times." In the fall issue, he highlighted IPM's overall definition as a preventive practice and its techniques for success which include monitoring and record-keeping, not dodging the common complaint that these elements often receive resistance because of perceptions they lower productivity.

"IPM practitioners," wrote Ferrentino, "follow fundamental pest management principles to develop strategies that integrate chemical, biological, cultural and mechanical methods to prevent or control pests."

A good working definition and one likely not to cause much consternation, it is true.

But as IPM continues as a hit on the convention circuit, it still apparently isn't playing well in Peoria. **LM**

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Everett Mealman, President
PBI/Gordon Corporation

The Embark PGR programs for growth regulation of fine turf are surely the most important developments to date in landscape management. They can dramatically increase the productivity of turf managers ... and productivity, of course, is the ultimate generator of profits.

The recommendation for maximum growth suppression of cool-season

fine-turf species is a tank mix of Embark Lite and Limit.

Embark Lite (Mefluidide) is specially formulated and labeled for use on fine turf. And Limit is amidochlor, the root-absorbed turf growth regulator developed by Monsanto and recently acquired by PBI/Gordon.

This easy-to-handle tank mix, when applied to cool-season grasses prior to

the major growth period, will reduce the number of mowings up to 50% for five to six weeks at a cost of approximately \$45.00 per acre — the average cost of one mowing.

But that's only part of the good news: Turf discoloration is avoided with this combination, when used as directed. At the end of the six-week cycle when untreated turf tends to fade, the release of pent-up energies in the Embark Lite/Limit-treated turf results in a rich, vibrant green color.

And, notice, we haven't even mentioned the environmental bonus of reduced clippings.

On the other end of the Embark programs, an application of just Embark Lite will by itself slow down the growth for three to four weeks to such a degree that the mowers will virtually float over the turf ... clippings will be significantly reduced ... you'll be able to stay on schedule even during the peak growing season ... and the cost will be only \$18.00 per acre.

What users say

Paragon Lawn of Edina, Minnesota is typical of the many turf management professionals throughout the country who are using Embark. Paragon is a total landscape management company owned and operated by the husband-wife partnership team of Dan and Jill Rosen.

The business is oriented toward high-visibility commercial properties in the Minneapolis suburbs, where immaculate turf is a vital part of the image the property owners want to project to the public.

A typical area where Jill and Dan Rosen, of Paragon Lawn, use Embark Lite. For approximately \$18.00 per acre they can literally take the fight out of cool-season grass, so that even in the peak growing period they not only can stay on schedule but the mowed premises will maintain their freshly cut appearance longer.



On several properties, Paragon has total responsibility for designing and executing the complete program on an annual bid basis. "Such property owners don't really care what we do or when we do it," says Rosen. "The issue is that a constant image of quality and neatness be maintained."

In such instances the Rosens factor into their bid an Embark Lite/Limit tank mix treatment twice a year. Once in the spring, ahead of seedhead emergence, and a repeat prior to the fall growth season.

"It reduces our mowing costs by more than 50%, at a cost of less than \$45 per acre, while actually improving the appearance of the grass..." states Rosen.

On the other hand, Paragon has many customers who are on a regular mowing schedule. "We get paid a flat fee per mow," says Rosen, "and at the peak of the growing season it can be a real back breaker to stay on schedule and maintain a manicured appearance."

"This is where Embark Lite is ideal. During the peak growing season, we can definitely put money in the bank by spending \$18 per acre out of our own pocket for a treatment of Embark Lite that lasts three to four weeks. It eliminates double mowing... it makes clipping clean-up a breeze... it takes pressure off men handling the mowers... and, best of all, it keeps us on schedule."

Interestingly, the Rosens were hesitant about getting started with Embark, and actually had a gallon in their machine shop for a year before they opened it. Like so many turfgrass professionals, the concept of suppressing growth made them uncomfortable in light of the fact that they had always measured turf quality and health on the basis of how vigorously it was growing.

Consequently, the Rosens started out very cautiously and tested both the Embark Lite/Limit tank mix and the Embark Lite mowing aid program in low-profile areas and expanded the total commitment as the evidence became overwhelming.



The Beauty of Embark Lite/Limit Tank Mix

Above: John Van Haften, director of research and development for PBI/Gordon, demonstrates the dramatic effectiveness of an Embark Lite/Limit tank mix. This test plot of bluegrass and ryegrass in suburban Kansas City was treated on April 25, 1990. It was mowed once, on May 1 after the PGR kicked in, and never touched again until this photo was taken on May 25. This dramatic reduction in growth occurred in spite of abundant rainfall and excellent growing temperatures.

Embark is the original, undisputed leader of all PGRs for use on turfgrass. It is foliarly absorbed and translocated to the growing points of a plant, and redirects the energy to the roots, thus preventing seedhead development and stem elongation.

For almost ten years, Embark has been virtually unchallenged for use on low-maintenance turf such as roadsides and hard-to-reach areas.

But use of Embark on highly visible fine turf was not recommended until 1986, when PBI/Gordon researchers, as well as several universities, had proven that tank mixes of Embark and Ferromec® AC Liquid Iron could eliminate the problems of turf discoloration.

Limit, on the other hand, is root absorbed and has been recognized from its inception as the PGR for maximum growth suppression on fine turf without problems of discoloration. The major drawback was its cost.

Happily, a tank mix consisting of reduced rates of both Embark Lite and Limit has proven to be the perfect marriage. It results in growth control for five to six weeks; control of seedheads and stem elongation; reduction of clipping volumes; strengthening of the roots... and all of this for only \$45 per acre.

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Circle No. 130 on Reader Inquiry Card

MANAGE SALT, MANAGE STRESS

An understanding of the potential salt effect of the various fertilizer materials can help the turf manager prevent fertilizer burn.

by William Knoop, Ph.D., Texas A&M

A crucial element of fertilizer selection is knowing that plant availability of essential elements is influenced by a fertilizer's salt index.

Fertilizer burn, certainly, is the extreme end result of adverse osmotic pressure in the soil solution. But high salt index fertilizers cause other plant problems that do not show up as dramatically as turf burn. Factors other than salt index should be understood by those serious about managing turfgrass against damage and stress.

A turf manager usually chooses a fertilizer based on such factors as cost, availability and—perhaps—its physical characteristics. But another characteristic associated with each of the nutrient-containing chemicals should be considered before selecting a fertilizer. This characteristic concerns the method through which nutrients become available to the plant.

Nutrients enter the plant through its roots as it draws water from the soil (from what is technically called the soil solution). So nutrients must first become part of the soil solution, regardless of whether they were applied as a liquid or a solid. That is, the nutrients must sooner or later become a part of the soil solution in order for them to be used by the plant. But even once the nutrients are part of the soil solution, they won't necessarily move into the plant through its roots. The determining factor is osmotic pressure.

Osmotic pressure

What is osmotic pressure and what does it have to do with the movement of nutrients? Osmotic pressure, in a sense, is a measure of how tightly molecules of water are held together in a solution, the very solution in which turf nutrients have dissolved.

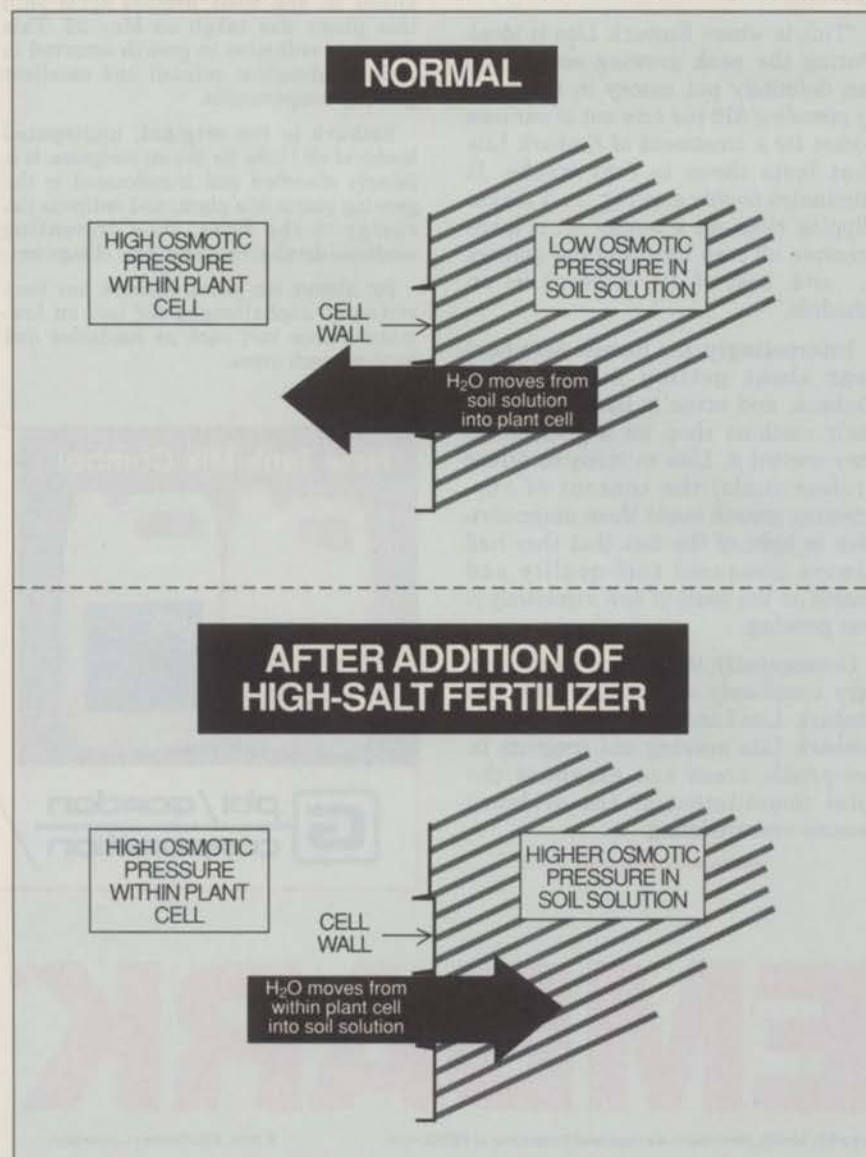
The nutrient-containing chemicals in fertilizers are salts. As salts, they can change the osmotic pressure of a solution, and therein lies at least a potential concern. In order for roots to

take up water, it must pass through a cell membrane. This process is only possible when the osmotic pressure of the cell sap is higher than the osmotic pressure of the soil solution outside the cell (Figure 1).

Water moves out of a solution that has a low osmotic pressure (like the soil solution) and into a solution that has a higher pressure (like plant root cells).

For water to move into plant root cells, the osmotic pressure within the roots must be higher than the osmotic pressure of the soil solution. On the

Influences on pressure



other hand, if a fertilizer causes an increase in the osmotic pressure of the soil solution above that of the cell sap, water is withheld and may actually be withdrawn from the plant. The result is called "fertilizer burn."

Virtually every fertilizing chemical—organic or inorganic—can cause some increase in the soil solution's osmotic pressure, with effects ranging from minimal to serious. Of course, the rate at which any material is applied has a profound effect on the osmotic pressure. The term "salt index" has been devised to help evaluate a given material's potential to change osmotic pressure.

Watering in a fertilizer helps move soil moisture and dissolved nutrients into root cells.

The salt index of sodium nitrate is given the value of 100 (see Tables 1 and 2) and all other materials are compared to the effect of an equal amount of sodium nitrate. The higher the salt index, the greater that material's potential to increase the soil solution's osmotic pressure and thus burn potential. As indicated in Tables 1 and 2, there are wide difference in the salt indices for commonly-used turf fertilizers.

Note that Table 1 also lists the salt indices of selected nitrogen fertilizers in terms of single units of nitrogen (based on application on a unit basis, lbs./1000 sq.ft.). Although a material such as ammonium sulfate (21 percent nitrogen) has a lower salt index than urea, the salt effect of applied urea is lower because it contains a higher percentage of nitrogen (45 percent).

Consideration should also be given when selecting a potassium source. Note that the salt index of potassium sulfate (0.9) is less than half that of potassium chloride (1.9). Additionally, potassium sulfate is a source of sulfur, a nutrient that turfgrass generally requires at levels similar to those of phosphorus.

Other factors

Burn potential is not totally dependent on the fertilizer's salt index. Moisture status of the soil and the turfgrass plant is also important. If the soil is not very moist, a fertilizer will have a proportionally increased effect on elevating soil solu-

Table 1

Nitrate Salt Index

Material	Approx. % N	Availability	Salt Index	Salt Index per unit of N
Sodium Nitrate	16	Fast	100	6.3
Ammonium Nitrate	33	Fast	105	3.2
Ammonium Sulfate	21	Fast	69	3.3
Potassium Nitrate	14	Fast	74	5.3
Calcium Nitrate	12	Fast	53	4.4
Urea	45	Fast	75	1.7
IBDU	31	Slow	5	0.2
Ureaformaldehyde	38	Slow	10	0.3
Sulfur Coated Urea	38	Slow		*
Natural Organic	5	Slow	4	0.8

*The salt index for sulfur coated urea is the same as urea on a material unit basis, but the salt index is moderated for SCU over a longer time period.

Table 2

Salt Index Values for Other Fertilizers

Material	Approx. % N	Salt Index	Salt Index per unit of N
Superphosphate	20% P ₂ O ₅	8	0.4
Muriate of Potash	60% K ₂ O	114	1.9
Sulfate of Potash	50% K ₂ O	46	0.9
Dolomite	30% CaO	1	—
	20% MgO		
Gypsum	33% CaO	8	0.2
Epsom Salts	16% MgO	44	2.7

tion's osmotic pressure

Watering in a fertilizer increases the volume of the soil solution. This beneficially reduces the osmotic pressure of the soil solution and helps move soil moisture and dissolved nutrients into root cells.

In well-drained soils, however, heavy water applications may also harm the plant by leaching nutrients past the root system. Different nutrient sources also have different rates of potential for leaching. For example, research in Florida has shown that fertilizer applications are exposed to stresses from any of several outside factors such as drought, heat or disease.

Sulfate of potash (SOP) leaches from the rootzone at about one-half the rate of potassium chloride.

Both air temperature and humidity influence a plant's water status and water requirements. That is, as air temperature increases, the plant requires more water. And as humidity decreases, the plant requires more water.

As the osmotic pressure of the soil solution increases, less water is avail-

able to the plant. Watering in a fertilizer may increase the water available to the root system by decreasing the osmotic pressure of the soil solution; but it may have the unintended effect of reducing the plant's water requirements by cooling the plant and increasing the humidity of the plant's micro-environment.

Application rates

Soluble fertilizer materials may be used at any time of year with minimal risk of damage to turf, if the factors that contribute to burn are understood. The salt index of a fertilizer material is extremely important, especially when the fertilizer is highly soluble. The rates of application must be lower when a fertilizer with a high salt index is used.

Fertilizers with a low salt index should be used when soil test results indicate that the soil already contains excessive levels of soluble salts or when turfgrass stands receiving a fertilizer application are exposed to stresses from any of several outside factors such as drought, heat or disease.

LM

QUICKIE-QUIZ

Pre-emergence weed control in lawns

ED. NOTE: Answers to all questions can be found in this month's Pre-emergence Weed Control Guides.

1. Cool-season grasses thrive in the:
a) spring and summer
b) spring and fall
c) summer and fall
2. When first established, cool-season lawns should be given plenty of extra:
a) nitrogen
b) phosphorus
c) potassium
d) all of the above
3. To avoid weed establishment, you should not:
a) apply pre-emergence herbicides
b) mow too low
c) fertilize
d) none of the above
4. Spring aerification should be avoided because:
a) it brings weed seeds to the surface
b) the grass is too wet
c) the turf hasn't yet re-established itself
d) none of the above
5. Which is the only herbicide that can control annual weeds in cool-season grasses at the time of lawn establishment?
a) isoxaben
b) benefin
c) siduron
6. The first really effective post-emergence herbicide for controlling annual grasses in cool-season lawns was:
a) ethofumesate
b) oxadiazon
c) pendamethalin
d) fenoxypop-ethyl
7. A major problem in the Midwest three of the last four years has been:
a) dry autumns
b) wet summers
c) wet autumns
8. MSMA and DSMA are effective pre-emergence herbicides.
a) true
b) false
9. The need for pre-emergence herbicides should be based on:
a) observed weeds which have emerged
b) observations on site the previous season
c) making an educated guess
d) none of the above
10. The only warm-season pre-emergence herbicide registered for application at sprigging, sodding or sodding is:
a) oxadiazon
b) prodiamine
c) siduron
d) none of the above
11. It is possible to use a single herbicide for controlling weeds in both turf and ornamentals.
a) true
b) false
12. Pre-emergence herbicides in warm season areas are best applied:
a) at least two weeks before expected weed germination
b) when the dogwoods bloom
c) immediately after the first spring rain
d) the first week in March
13. Crabgrass and goosegrass germinate first in warm-season areas:
a) the last two weeks in February
b) in moist areas
c) in dry areas
d) in thin, open stands of grass
14. Applications of pre-emergence herbicides for control of annual bluegrass and certain winter annual broadleaf weeds in warm-season areas may be:
a) mid-December
b) late August to early November
c) January and February
d) none of the above
15. Pre-emergence herbicides need at least:
a) one inch of water within three days of application
b) one inch of water within one week of application
c) one-half inch of water immediately following application
d) one-half inch of water within one week of application
16. If your lawn care or landscaping company does not apply pre-emergence herbicides correctly, you will be subject to:
a) callbacks
b) dismissal
c) legal action
d) execution
e) all of the above

ANSWERS: 1.b; 2.b; 3.b; 4.a; 5.c; 6.d; 7.a; 8.b; 9.b; 10.c; 11.a; 12.a; 13.d; 14.b; 15.d; 16.a (but in some cases, e!)

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Circle No. 280 on Reader Inquiry Card

Keeping residential landscapes weed-free

by Evert Burt, Wayne Currey and John Burt

The most desirable features of weed control programs in landscape sites are all the practices and procedures that have a positive impact on plant growth in the landscape and a negative impact on weeds.

The encroachment of weeds into a turf is usually the result of a poor turf rather than the basic cause. Weeds commonly establish where the turf is thin and weak. Thin turf usually results from poor species selection for the specific site and improper maintenance practices.

Consider the level of maintenance that will be provided. Although bermudagrasses are considered the most attractive in Florida, they require the highest level of maintenance to look their best. If not properly maintained, bermudagrass will not provide as attractive a turf as St. Augustinegrass. In other words, a well-maintained St. Augustine lawn will provide a better and more attractive turf than will a poorly-maintained bermudagrass.

When selecting a turfgrass, consider the following factors:

- **Shade.** Some turfgrasses, such as St. Augustine, will grow well under moderate shade conditions, while others such as bermudagrass, will not.

- **Soil Conditions.** Turfgrasses vary in their ability to grow in different soils. St. Augustinegrass tolerates high salt; bahiagrass doesn't. Some turfgrasses grow little or not at all on poor, acid soils while others grow much better under the same conditions.

Other environmental factors such as soil texture, the presence of a hardpan, and the degree of slope may influence the selection of turf species.

- **Climate.** Temperature, degree of shade, and air drainage can greatly influence turfgrass growth. Tolerance to these various influences should be considered in the selection process.

Proper cultivar selection

Choosing cultivars not adapted to the particular site usually results in weak, thin turf that is soon followed by the appearance of weeds. Use high quality seed, sod, plugs or sprigs from the outset.

Seed or vegetative material should be planted in soil that is free of perennial weeds. If such weeds are present, consider using a total vegetation con-



A lawn that is cut too short will eventually thin out and require adjustments in fertilization practices.

trol such as glyphosate or fumigate the site prior to planting.

Determine the level of maintenance. One cannot achieve putting green quality at a roadside maintenance level. An important consideration in turfgrass selection is the turf manager's ability and willingness to supply the appropriate maintenance

thin and weedy. Correcting the basic problems of unhealthy turf is a vital part of a sound weed control program that will help prevent future weed problems. Healthy turf is more tolerant of herbicides than is a weak turf. At the same time, healthy weeds are easier to kill.

The common cause

Lack of proper maintenance is the most common cause of weedy turf. Mowing is the most basic and universal practice for maintaining a healthy, vigorous and attractive turf, but it is frequently done improperly.

It is important to realize that all the primary cultural practices—mowing, irrigation and fertilization—are inter-related. If one of the cultural practices is done incorrectly, it will affect the others.

For example, by mowing the turf too short, the grass develops a shallow root system, which will require more irrigation. A lawn cut too short will eventually thin out and require adjustments in fertilization practices. Before changing cultural practices, consider what effects the action will have on total maintenance. **LM**

Mowing is the most basic and universal practice for maintaining a healthy, vigorous and attractive turf.

to keep the grass in a healthy condition. A dense, healthy stand of grass can be maintained best by adhering to good horticultural practices of mowing, watering, fertilization and pest control.

Reacting to weeds by applying a herbicide usually does not solve the problem. A wiser, more practical approach is to determine why the turf is

Evert Burt, Wayne Currey and John Burt are ornamental horticulture consultants based in Ft. Lauderdale, Fla.

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JOB TALK

Supers find conservation, efficiency in PGRs

In the never-ending challenge to maintain healthy, good-looking turf, many golf course superintendents are searching for new and more efficient ways to promote and maintain quality turf while conserving water and using labor more efficiently.

Brae Burn C.C.

Dennis Flynn, superintendent at Brae Burn Country Club in Purchase, N.Y., recently began using Elanco's Cutless 50W plant growth regulator.

Flynn first tried Cutless on his 10th fairway, which was thick with *Poa annua* and needed much watering. After several years' use, he now estimates that water use has been reduced by about 10 percent. The turf transpires less, he says, which reduces turfgrass water use so irrigation frequency can be reduced.

Middle Bay C.C.

Growth regulators can also reduce mowing frequency.

"With Cutless, we probably reduced our clippings by about 50 percent during the four to five weeks of growth suppression in the spring," says Flynn. "We were able to ease off our regular seven-day mowing sched-

ule and only cut three times a week." Flynn has also lowered the mowing height from $\frac{3}{4}$ - to $\frac{1}{2}$ -inch because of the increased amount of bentgrass on the fairways. As a result, equipment use and labor have been reduced, especially in the spring, when workers are better employed cleaning up the course, working on bunkers and getting the course ready for play.

Conserving water

New projects at the Middle Bay Country Club in Oceanside, N.Y. have included application of growth regulators on bentgrass fairways. Superintendent John Carlone selected two fairways to treat because of their contrasting locations. "One was inland and the other was along the ocean," Carlone explains. "The links portion of our course gets a lot of sea breeze and has a sandy soil profile. I applied Cutless on both areas to see if there was any difference in its activity. I haven't seen any significant differences in its effectiveness or growth reduction capabilities in either area. It seems to work well under all the conditions here."

Both Carlone and Flynn mention reduced watering as a great benefit of

using Cutless. Carlone has been able to use less water every time he irrigates treated fairways. He says that before using a growth regulator, it was not uncommon for him to water each fairway 20 to 25 minutes per night. That time has been reduced to 12 to 15 minutes. Areas adjacent to the ocean still require more due to drying effects.

Bentgrass thrives

Flynn says his fairways contain more bentgrass now than before he used Cutless. He estimates a 50 percent increase in bentgrass population, and a shorter, denser turf in fairways.

By using Cutless in conjunction with lightweight mowing, proper aerification, overseeding and verticutting, Carlone says he has improved the bentgrass/*Poa* ratio to about 60/40 on the ninth fairway and 70/30 on the 16th fairway. Four years ago, he was looking at a mere 10 percent bentgrass population.

Carlone and Flynn report a slight yellowing of the turf immediately after treating it with Cutless. This is a temporary side-effect, as the growth regulator soon takes effect and the bentgrass gradually becomes denser. **LM**

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0045 ☐ Condominiums/apartments/housing
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0060 ☐ Military installations & prisons

0065 ☐ Airports

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30 ☐ GOVERNMENT OFFICIAL—Government commissioner, agent, other government official

40 ☐ SPECIALIST—Arborist, forester, architect, consultant, agronomist, pilot, instructor,
researcher, horticulturalist, certified specialist

50 ☐ OTHER TITLED AND NON-TITLED PERSONNEL (specify) _____

PRODUCTS

New fertilizer more organically based

Humax Corporation has developed an organically-based line of fertilizers for lawns, gardens, golf courses, parks and other settings.

Humax, based in Salt Lake City, Utah, uses a patented colloidal process that efficiently uses nitrogen, phosphate and potassium and combines these nutrients with organic material present in the soil.

The firm says nutrient leaching is

lessened and a reactor process breaks down organic waste within a matter of minutes into humic acid. The company says plant root systems' feeding capacity is increased through use of the fertilizer.

Circle No. 190 on Reader Inquiry Card.

Spreader carrier simplifies portal to portal transport

External Spreader Carriers of Little

Rock, Ark., has designed a spreader carrier to fit most common broadcast type equipment.

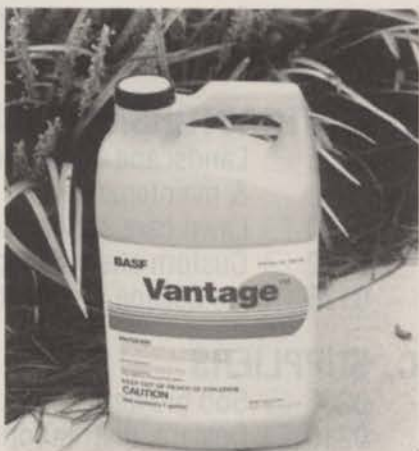
The carrier, developed to avoid interior fertilizer spills from spreaders while in transport, comes with two adapters to accommodate LESCO, Spyker and Ev-N-Spred models and other popular designs. The device is affixed to the rear bumper of the service vehicle. It is easily installed and more than 200 pounds. The unit weighs 21 pounds.



Circle 191 on Reader Inquiry Card

Ornamental herbicide controls grass growth

BASF Corporation announced registration with the EPA of Vantage, a new herbicide for control of annual and perennial grasses in nurseries, ornamentals, ground covers, Christmas trees and general indoor and outdoor sites.



Vantage can be used on control of seedling johnsongrass, smooth crabgrass, seedling tall fescue and goosegrass as well as perennials as bermudagrass, rhizome johnsongrass and quackgrass.

A California label for Vantage is pending.

Vantage enters the grass through foilage. Growth slows and stops

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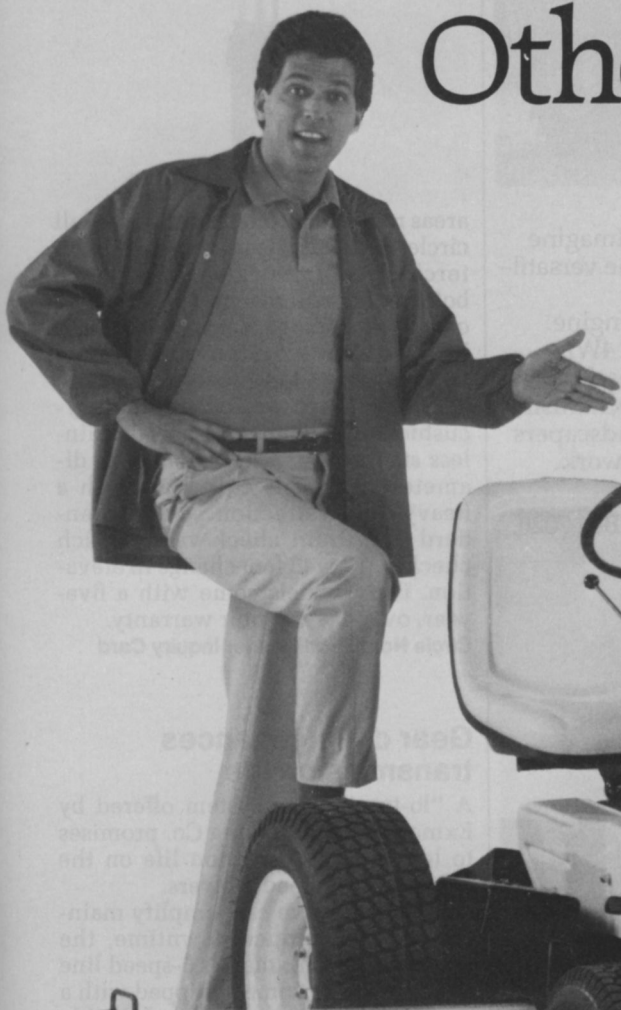
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within two days, the company says, and the plant reddens, its leaf tips burn and burn back of the foliage follows.

Circle No. 192 on Reader Inquiry Card

Adjustable arc sprinkler to cover lots of space

The I-40-ADS arc sprinkler by Hunter Industries is now available in two models.

The units may be set between 40 and 360 degrees while water is on or off. Model I-40-36S is also available for



areas requiring a fixed 360 degree full circle. Both models come with five interchangeable nozzles which vary both radius and discharge rates. Discharge rates range from 7 to 25.3 gallons per minute and the radius may be varied from 45 to 67 feet.

Other features include safety-cushioned rubber covers and stainless steel risers. A 1 5/8 exposed diameter surface is equipped with a heavy-duty retraction spring. Standard is a drain check valve which checks up to a 15 foot change in elevation. Both models come with a five-year, over-the-counter warranty.

Circle No. 193 on Reader Inquiry Card

Gear drive enhances transmission life

A "lo-torq" drive system offered by Exmark Manufacturing Co. promises to lengthen transmission life on the company's 5-speed mowers.

The gear drive can simplify maintenance and reduce downtime, the company says. Exmark's 5-speed line of mowers also come equipped with a posi-track pulley system and double idlers on wheel drive belts.

Exmark says these features provide for maximum maneuverability and prevent downhill runaway.

Circle No. 194 on Reader Inquiry Card

Safety feature offered for Ransomes middles

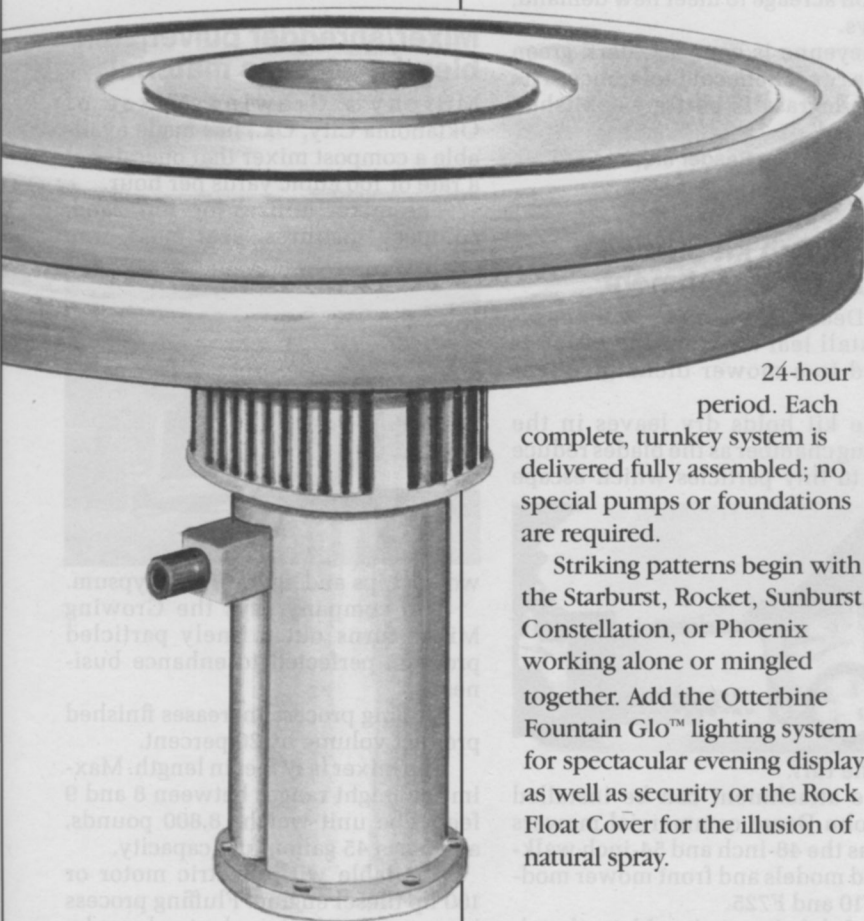
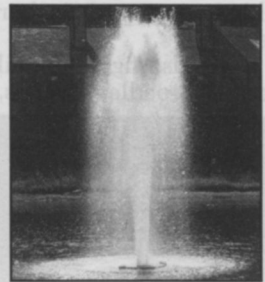
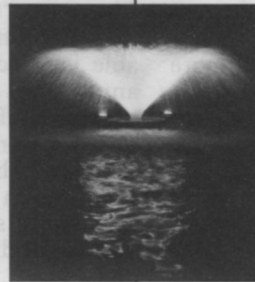
Ransomes Inc. announced recently that all Bob-Cat mid-size mowers

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manufactured before 1989 may be equipped with operator present controls.

The control stops the engine if the mower's blade has been engaged and the operator releases grip on the handle.

Installation of the control is offered at a special price to Bob-Cat owners. Details on conversions are available at authorized Ransomes/Bob-Cat dealers.

Circle No. 195 on Reader Inquiry Card

New herbicide controls bahiagrass as it sprouts

O.M. Scott & Sons Co. has released DMC Weed Control to combat bahiagrass growth in bermudagrass areas.

DMC also fights foxtail and more than 25 broadleaf weeds, including



chickweed, henbit, dandelion, wild garlic, white clover and plantain.

The granular herbicide is applied as a foliar spray and the company can provide application timing a rate flexibility.

Circle No. 196 on Reader Inquiry Card

Three patents granted for plant disease detection

Agri-Diagnostics Associates has been granted three patents for monoclonal antibodies that detect plant diseases.

The inventions can detect Pythiaceae, including several phytophthora and pythium diseases, *Sclerotinia homoeocarpa*, related to dollar spot disease and *rhizoctonia*, causative agent of diseases on turf and other crops.

The antibodies are being used to develop rapid and low cost tests for

diseases in soil and plant tissues. The firm has already marketed REVEAL tissue testings kits used in fungal diseases in turf. Also a soil test for Phytophthora root rot in soybeans is available. In development are soil and tissue Phytophthora tests for apples, peaches, tomatoes, peppers, citrus, avocado and berry crops. Phytophthora, pythium and rhizoctonia development tests are underway in nursery and greenhouse crops and rhizoctonia in rice and cotton.

Circle No. 197 on Reader Inquiry Card

Bermudagrass seed is available in spring

Cheyenne "turf type" Bermudagrass from Pennington Seed will be available in good quantity, the company announced. Production fields at Pennington's affiliate Cactus Seed Company near Roll, Arizona, has delivered the seed as expected. But Pennington vice president Ronnie Stapp says supplies could be somewhat tight due to an expected strong demand.

The firm expects to increase production acreage to meet new demand, he says.

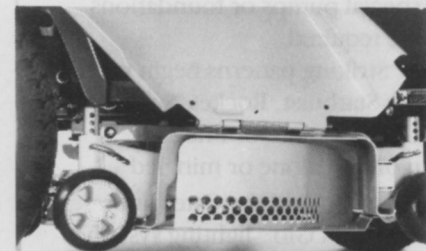
Cheyenne is compact, dark green and has excellent cold tolerance. The Bermudagrass is easily established from seed.

Circle No. 198 on Reader Inquiry Card

Leaf mulch kit offered as mower attachment

John Deere Co. is offering an easy-to-install leaf mulcher kit which is affixed to a mower discharge opening.

The kit holds dry leaves in the mowing chamber as the blades reduce them to tiny particles which escape



into the turf.

The attachment can be installed into John Deere commercial mowers such as the 48-inch and 54-inch walk-behind models and front mower models F710 and F725.

Leaf debris won't add to thatch build up, according to the company, because leaves are chopped into fine

pieces and break down quickly in the soil.

Circle No. 199 on Reader Inquiry Card

Hydraulic four-wheeler new in Jacobsen line

The Jacobsen Division of Textron's latest addition to Turfcat is the hydraulic four-wheel drive Turfcat T422D.



Each Turfcat can be equipped with a variety of attachments including front-mounted rotary mowing decks, or with fine-cut flail that eliminates grass clipping collection. Snow throwing, straight blade, rotary brush and blower attachments are also available.

Circle No. 200 on Reader Inquiry Card

Mixer/shredder pulverizes, blends, screens material

Murphy's Growing Mixer of Oklahoma City, Ok., has made available a compost mixer that operates at a rate of 100 cubic yards per hour.

The mixer utilizes top soil, sand, compost, manures, peat moss, fine



wood chips and agricultural gypsum.

The company says the Growing Mixer turns out a finely particled product, perfected to enhance business.

Fluffing process increases finished product volume by 20 percent.

The mixer is 17 feet in length. Maximum height ranges between 8 and 9 feet. The unit weighs 8,800 pounds, and has a 45 gallon fuel capacity.

Available with electric motor or 100 hp diesel engine. Fluffing process increases finished product volume by 20 percent.

Circle No. 201 on Reader Inquiry Card

BOOKSTORE

410 - DISEASES & PESTS OF ORNAMENTAL PLANTS

by Pascal Pirone

This standard reference discusses diagnosis and treatment of diseases and organisms affecting nearly 500 varieties of ornamental plants grown outdoors, under glass or in the home. Easy to understand explanations of when and how to use the most effective fungicides, insecticides and other control methods. **\$39.95**

430 - DISEASES OF TREES AND SHRUBS

By Wayne Sinclair, Howard Lyon and Warren Johnson

A comprehensive pictorial survey of the diseases of, as well as the environmental damage to, forest and shade trees and woody ornamental plants in the United States and Canada. Reflects the most important developments in fungal biology and taxonomy, plant bacteriology, virology, and environmentally induced stress in plants. Summarizes information about newly discovered diseases and provides up-to-date accounts of old ones. **\$52.50**

800 - THE GOLF COURSE

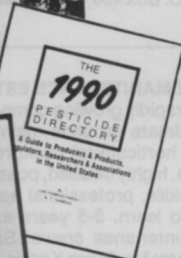
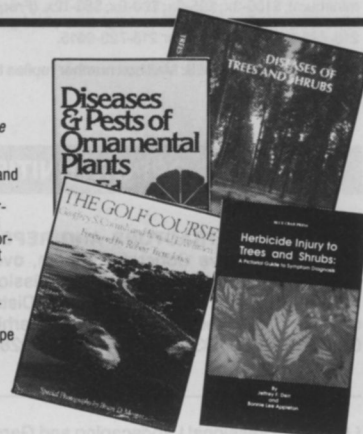
by Cornish and Whitten

The first book ever to give the art of golf course design its due, and golf course architects the credit and recognition they deserve. 320 pages and 150 color and black and white photographs. Traces the history and evolution of the golf course, analyzes the great courses, shows how they were designed and constructed. **\$35.00**

420 - HERBICIDE INJURY TO TREES AND SHRUBS

By Jeffrey F. Derr and Bonnie Lee Appleton

Describes how to diagnose herbicide damage to nursery crops and landscape ornamentals. Injury symptoms resulting from the herbicides used today are described and compared to other plant disorders to assist in diagnosing plant problems. Tables list common names, trade names, major uses and injury symptoms for the herbicides currently used in agronomic, horticultural, landscape and noncrop areas. **\$24.95**



510 - HORTUS THIRD

from Cornell University

A 1,300 page concise dictionary of plants cultivated in the United States and Canada. A reference which every horticulture professional should have. **\$135.00**

415 - INNOVATIVE APPROACHES TO PLANT DISEASE CONTROL

by Ian Chet

Brings together alternative approaches and methods that have potential to control diseases caused by fungi, bacteria and viruses. Major concepts of disease control discussed include biological control systems, their possible mechanisms, potential application and genetic improvement. **\$54.95**

690 - INSECTS THAT FEED ON TREES AND SHRUBS

by Johnson and Lyon
Essential information for identifying more than 650 insect pests and the injuries they cause. More than 200 color illustrations. **\$49.95**

500 - THE 1990 PESTICIDE DIRECTORY

by Lori Thomson Harvey and W.T. Thomson

A Guide to Producers and Products, Regulators, Researchers and Associations in the United States. For the person who needs to know anything in the United States pesticide industry. **\$75.00**
Available in March 1990

665 - ARBORICULTURE: THE CARE OF TREES, SHRUBS AND VINES IN THE LANDSCAPE

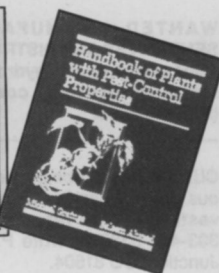
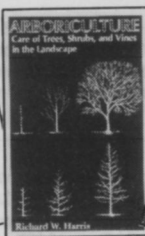
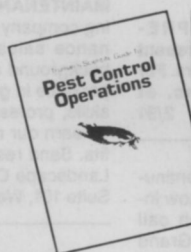
by Richard W. Harris

Provides comprehensive coverage of complete planting, site analysis, preparation and special planting methods, fully detailed coverage of fertilization, irrigation and pruning guidelines on preventative maintenance, repair and chemical control, how-tos of diagnosing plant problems, practical data on non-infectious disorders, diseases, insects and related pests and pest management. **\$63.00**

450 - HANDBOOK OF PLANTS WITH PEST-CONTROL PROPERTIES

By Michael Grange and Saleem Ahmed

Provides information on approximately 2,400 plant species having pest-control properties in addition to the plant's specific common and family names, coded information is provided on such plant characteristics as life cycle, classification, and the ecological conditions suited for growth. Also lists 1,000 plants that are potential candidates for screening pest-control activity due to their poisonous nature or their ability to control human and animal diseases. **\$49.95**



125 - SCIENTIFIC GUIDE TO PEST CONTROL OPERATIONS

by G.W. Bennett, J.M. Owens, R.M. Corrigan

Fourth Edition. New chapters on fumigation, urban wildlife, special facilities, plus updated, improved chapters on pesticides, cockroaches, birds, termites, equipment, sanitation, stored product pests and more. Don't be without this updated edition. **\$49.95 Domestic All Others \$60.00**

400 - NATIVE TREES, SHRUBS, AND VINES FOR URBAN AND RURAL AMERICA

by Gary L. Hightshoe

This award-winning reference to native U.S. plants has now been expanded to include shrubs and vines. Over 250 major species are characterized by form, branching pattern, foliage, flower, fruits, habitat, soil, hardiness, susceptibility, urban tolerance and associate species. Includes unique color-coded keys that classify plant species by visual characteristics, cultural requirements and ecological relationships. **\$86.00**

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by George Symonds

Pictorial key to identify shrubs. Contains more than 3,500 illustrations to check specimens. Popular and botanical names are given for each shrub and handy index tabs for quick reference. **\$17.95 paperback**

750 - TREE IDENTIFICATION

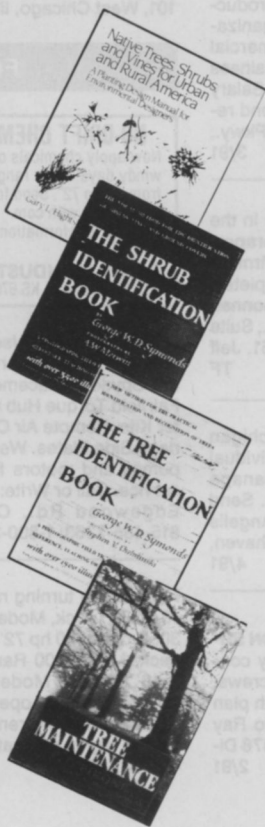
by George Symonds

Pictorial reference to identifying trees by checking leaves, buds, branches, fruit and bark. Like its sister publication, SHRUB IDENTIFICATION, popular and botanical names are listed with index tabs for easy reference. **\$17.95 paperback**

760 - TREE MAINTENANCE

by Pascal Pirone

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2/91

LANDSCAPE MAINTENANCE PRODUCTION MANAGER: Rapidly growing Central Florida Landscape firm seeking an experienced production manager with strong people and organizational skills. Experience with large commercial accounts and a sincere desire to build a business based on customer service a must. Strong Salary and Benefits. Must relocate to Orlando. Send resume to: Mr. Khalsa, 1174 Florida Central Pkwy., Longwood, Florida 32750.

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LANDSCAPE MAINTENANCE PRODUCTION SUPERVISOR: Responsibilities include quality control, productivity and customer service for 5 crews. 4 years experience and hort. degree. Health plan with dental. Profit-sharing. Send resume to Ray Knoll, Western DuPage Landscaping, 31W478 Diehl Rd., Naperville, IL 60563.

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LAWN CARE MANAGER: Seeking individual to coordinate lawn care operations. Responsibilities include all aspects of marketing, sales and production of all lawn care related services. 4 years experience and hort. degree. Health plan with dental. Profit-sharing. Send resume to Ray Knoll, Western DuPage Landscaping, 31W478 Diehl Rd., Naperville, IL 60563.

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LANDSCAPE MANAGEMENT ACCOUNT REP: Large Northeast Ohio firm needs Account Rep for existing and new accounts. Horticulture and Agronomics background helpful. Be a part of a fast growing, diverse company. Send resume to Ed Gallagher, P.O. Box 438, Painesville, OH 44077.

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LANDSCAPE MAINTENANCE ESTIMATOR: Well established, rapidly growing company needs individual to estimate grounds maintenance. Must have strong horticultural background, be good with numbers, highly detailed, possess good communication skills, professional appearance, and willingness to learn. 3-5 years experience with grounds maintenance crews. Salary/benefits. Send resume to: Mr. Glenn Kedzie, Tandem Landscape Company, 33W480 Fabyan Parkway, Suite 101, West Chicago, Illinois 60185.

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LANDSCAPE MAINTENANCE PRODUCTION SUPERINTENDENT: Well established, rapidly growing company needs individual capable of running multiple crews. Must be good with people, have a strong horticultural background, good communication skills, a professional appearance, be highly organized, and eager to learn. 5-7 years experience with grounds maintenance. Salary/benefits. Send resume to: Mr. Glenn Kedzie, Tandem Landscape Company, 33W480 Fabyan Parkway, Suite 101, West Chicago, Illinois 60185.

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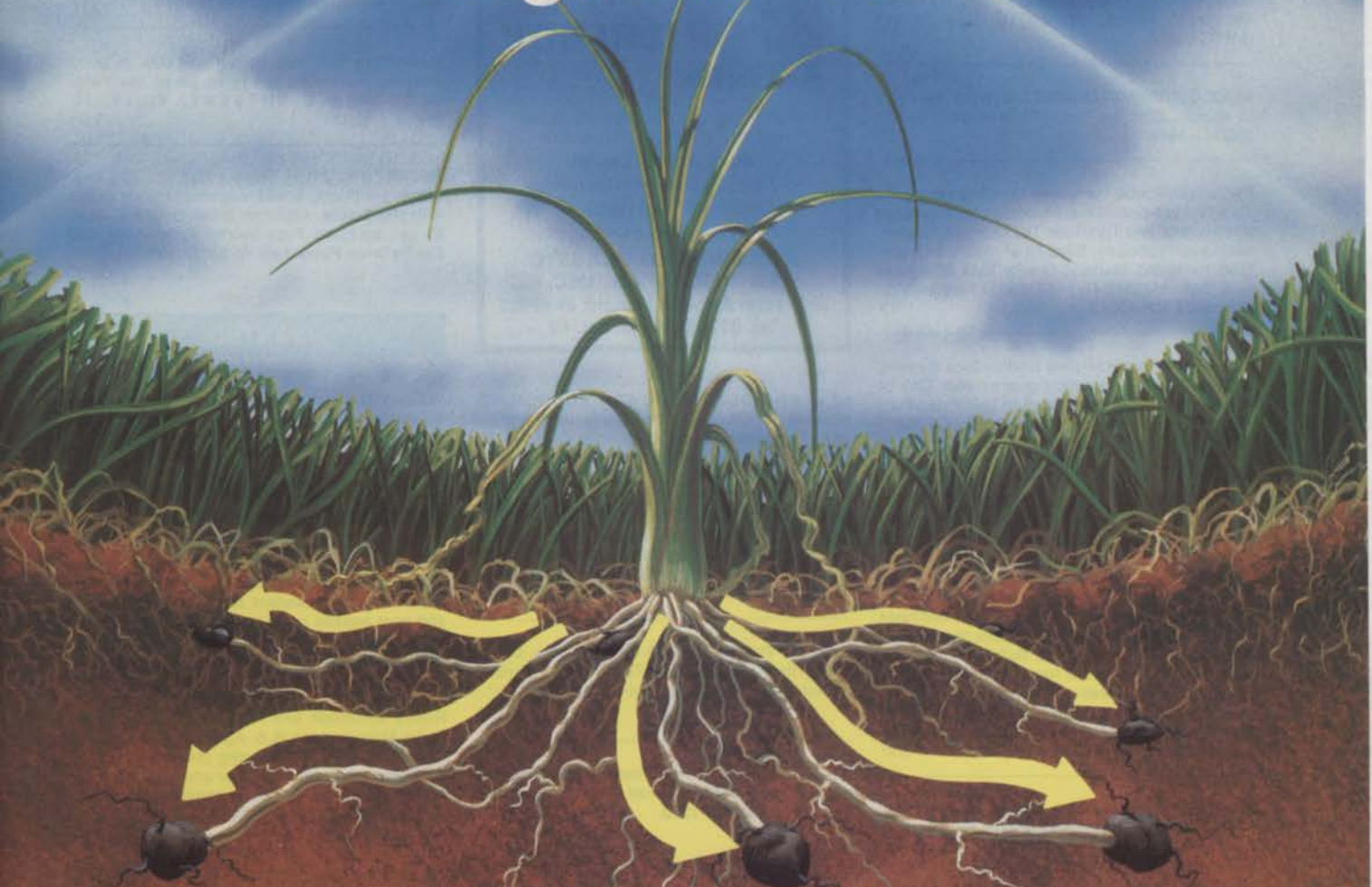
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PROBLEM MANAGEMENT

Diagnosing pin oak disease

Problem: Every year we see severe leaf spot type of disease on pin oaks. Any idea what causes this? How can it be managed? (Missouri)

Solution: Without examining the affected leaves, it is difficult to diagnose accurately. Oaks in your area as well as many parts of the country get several late season leaf diseases.

Actinopelte leaf spot is one of the most common late season leaf spot diseases caused by the fungus. Although most oaks are susceptible, pin oak is frequently the most commonly affected. This disease apparently is common in pin oaks suffering from iron deficiency and showing iron chlorosis symptoms. Symptoms of actinopelte leaf spot begin to appear in middle to late summer. The disease generally doesn't get severe until August. The fungus produces small, circular to angular reddish-brown spots which are 2 to 15 mm in diameter. The spots will coalesce and become larger, irregular areas of necrotic leaf tissue.

If the disease is severe it can cause the leaves to defoliate prematurely. The fungal agent is a weak pathogen which establishes on leaves damaged mechanically or by other diseases or iron chlorosis. Chemical control is not warranted since the infection occurred late in the growing season; the plant had a chance to produce normal sugar for the year; and damage to the tree is minimal.

Info on zoysiagrass?

Problem: Where can I find detailed literature available on zoysiagrasses? Lawn and turf books usually cover the zoysia japonicagrass very lightly and in insufficient detail. Also, what type of scarification program should be maintained on zoysiagrass? At present, there is a thick build-up of thatch, and during the dormant period, the turf has a dark black background which is rotting cuttings and roots. These are over 30 years old and well implanted. We've been cutting the lawns to ground zero in the fall which I feel is wrong. (Italy).

Solution: We are not aware of authoritative works on zoysiagrass. References to zoysiagrass are typically brief sections of turf books and reprints of articles. Perhaps one of our readers will be aware of a source of information. Close mowing is sometimes practiced just prior to growth in the spring to help minimize the potential for thatch and allow sunlight to warm the soil, and encourage a rapid turfgrass recovery. I am not aware of any advantages of close mowing in the fall.

For thatch maintenance, consider aerification or dethatching in the spring. Aerification is effective in maintaining the proper thatch depth but may not be effective in reducing excessive levels. Core aerification removes a small plug of soil which is deposited on the surface. Scattering the core will provide "top-dressing" which aids in microbial breakdown of thatch. Mechanical dethatching literally tears the

thatch out of the lawn and in the process, injures the turfgrass.

On warm-season grasses such as zoysia, this procedure should be practiced only in the spring to allow for the maximum recovery period. Considerable debris is loosened which should be raked and discarded. If thatch is too thick to be adequately reduced by dethatching, the lawn should be renovated and then properly maintained to prevent thatch accumulation.

Preventing pine cones

Problem: The campus at the University of Waterloo, Waterloo, Ontario is approximately 1000 acres in size. Intensive landscaping practices are required on 200 acres and maintenance is carried out as efficiently as possible. One of the problems we have with our maintenance program is with the cones from a large number of Austrian or black pines. Throughout the spring and early summer, cones cover the ground causing litter problems, particularly when mowed. Perhaps you can advise us as to the availability of some type of solution or spray which can be used to prevent the development of cones. As the trees are landscape trees, it is important that they are not damaged. It would also be desirable if the solution did not harm bees. (Canada)

Solution: At the present time, there aren't any materials registered for the removal of cones on pines. Reports from preliminary work suggest that Chipco Florel pro brand plant growth regulator manufactured by Rhone-Poulenc is showing some promising results. However, currently it is not on the Florel label. Possibly it can be used in the near future if the label is expanded. Your best approach now would be to hand or mechanically rake the cones or prune the cone bearing branches.



Balakrishna Rao is Manager of Technical Resources for the Davey Tree Co., Kent, Ohio.

Questions should be mailed to Problem Management, LANDSCAPE MANAGEMENT, 7500 Old Oak Boulevard, Cleveland, OH 44130. Please allow 2-3 months for an answer to appear in the magazine.

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