

creases depth and reach by two feet over the standard nine-foot model. The backhoe features 2" diameter chrome moly pivot pins that run on steel backed bronze/polymer replaceable wear bushings of 100-hour lubrication intervals.

Other options include: externally capped hydraulic cylinders with replaceable hardened steel wear bushings; SAE 100 R-2 hydraulic hose; o-ring ports; high strength alloy steel tapered section bucket.



Circle No. 201 on Reader Inquiry Card

### Watering tube also keeps out weeds

The Growth Ring Watering Tube can be used to fertigate young trees and

plants while at the same time keeping weeds out of tree basins.

The Growth Ring, says Caleb Industries, which manufactures it, "gives your plants the kind of irrigation that they like best—one that is not too wet to choke off oxygen from the roots and not so spasmodic as to put them in stress when you wait too long to water."

The ring, after being filled, can be covered with a light layer of mulch or soil to discourage vandalism.

Circle No. 202 on Reader Inquiry Card

### Computer system meant for the little guys

A personal computer system designed for smaller companies is new from Thornton Computer Management Systems. The IBM compatible Altos 500 system is configured specifically for companies with 1 to 3 person offices.

The system contains 2 megabytes of memory and a 40-megabyte hard disk, one monitor that can expand up to three, and a 24-pin dot matrix printer with letter quality.

Prices start at \$15,890, including hardware and SLICE Green Industry

software, telephone support and classroom instruction.

Circle No. 203 on Reader Inquiry Card

### Handle the rough stuff with Brouwer forklifts

New Brouwer rough terrain forklifts feature 5000-8000 lbs. capacities and 12-21 ft. masts.

The lifts are described as compact, light and rugged with tight turning radius for exceptional maneuverability.

Shuttle/torque converter features "on-the-move" shifting.

Circle No. 205 on Reader Inquiry Card

### Flowable Morestan gets EPA ahead

The Environmental Protection Agency has accepted for registration Mobay Corporation's new flowable formulation of Morestan 4 ornamental miticide, registered for use on flowers, shrubs and trees, and is free of harmful solvents.

Mobay sources add that the smaller particle size in the flowable product allows for more thorough distribution on the leaf surface, thus of-

# MIGHTIER.

NEW LIQUID FORMULATION!

In the battle for healthy ornamentals, only the strong emerge victorious. And the weak fall by the wayside.

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Circle No. 132 on Reader Inquiry Card

fering better coverage and better control. Visible residue is eliminated on practically all leaf surfaces.

Morestan 4 is available in quart sizes with "Caution" label. Not available in California.

Circle No. 206 on Reader Inquiry Card

## Seed Company expands growing supplies line

Ball Seed Company has expanded its complete line of growing supplies to include the full range of

high-quality Envy soluble powder fertilizers.

Envy fertilizers are made from the highest grade raw materials, and are uniformly consistent for quick, even absorption by plants. A soluble wetting agent assures reduced watering and faster, more uniform distribution of the nutrients.

The eight formulations include two general purpose blends, 20-20-20 and 20-10-20; 13-16-32 poinsettia finisher; 16-2-16 lily special; 20-2-20 low phosphorus blend; 15-16-17 peat-lite special; 20-5-30 potash special and

24-8-16 for tropical foliage.

Circle No. 207 on Reader Inquiry Card

## Natural herbicide controls moss, algae

Moss & Algae Eraser from Lesco, Inc. provides selective control in turfgrass and other areas.

A quick-acting, natural fatty acid herbicide, the product is registered for use on all turfgrasses.

It also works on roofs, sidewalks,



decks, trees, growing containers and other surfaces.

The liquid concentrate can be applied with any sprayer, and is packaged in 2-½ gallon containers.

Circle No. 208 on Reader Inquiry Card

## Emitter delivers water where and when needed

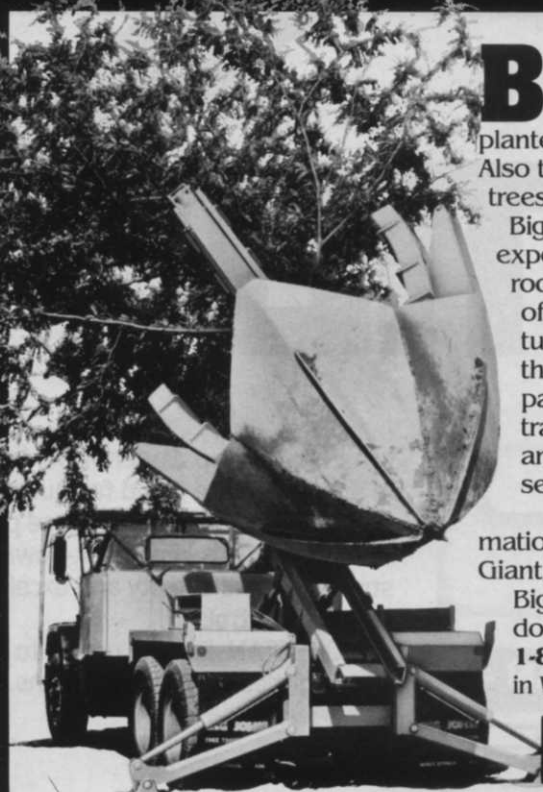
The Iso-Flo pressure compensating



emitter is designed by Agrifim to deliver a constant amount of required water at pressures of 10 to 40 psi.

The emitter is made of polypropyl-

# GENTLE GIANT



**B**ig John Model 90AA. The biggest transplanter you can buy. Also the kindest to trees.

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# BIG JOHN

The gentle giant



## BIG JOHN TREE TRANSPLANTER SALES

Circle No. 103 on Reader Inquiry Card



# Water is a Precious Resource!

## Hydro-Wet® Can Help Conserve Water. Maintain Quality Turf and Save Money Too!

### Hydro-Wet Makes Water Wetter

Hydro-Wet reduces both the surface tension and cohesive tension of water. It helps water move rapidly through thatch and soil into the root zone providing uniform wetting of soil.

Because Hydro-Wet reduces water loss from run-off and evaporation, watering can be reduced 30% to 50%.

### Hydro-Wet Boosts Soil Moisture

With Hydro-Wet you increase the soil moisture reserve even on slopes and compacted soils. And that's especially important when water is in short supply.

University trials show Hydro-Wet can significantly increase soil moisture and improve turf quality. The beneficial effects of Hydro-Wet remain for months.

Treatment	Soil Moisture (%)	
	1 month after applic	1 year after applic
Check	5.3%	5.4%
Hydro-Wet	8.3%	8.4%
Increased soil moisture	56%	55%

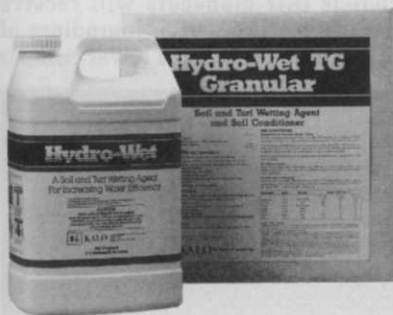
Treatment	Turfgrass Quality (1 = Best, 9 = Poor)	
	2 months after applic	1 year after applic
Check	4.6	5.2
Hydro-Wet	1.6	2.6

### Increased Soil Moisture Improves Turf Quality

A higher soil moisture content reduces drought stress. The results are greener, lusher turf. And noticeable dry spots are eliminated.

### Hydro-Wet Available As Liquid Or New Granular

Both the liquid concentrate and easy-to-spread granular can be broadcast or applied as a spot treatment. No special equipment or handling precautions are necessary.



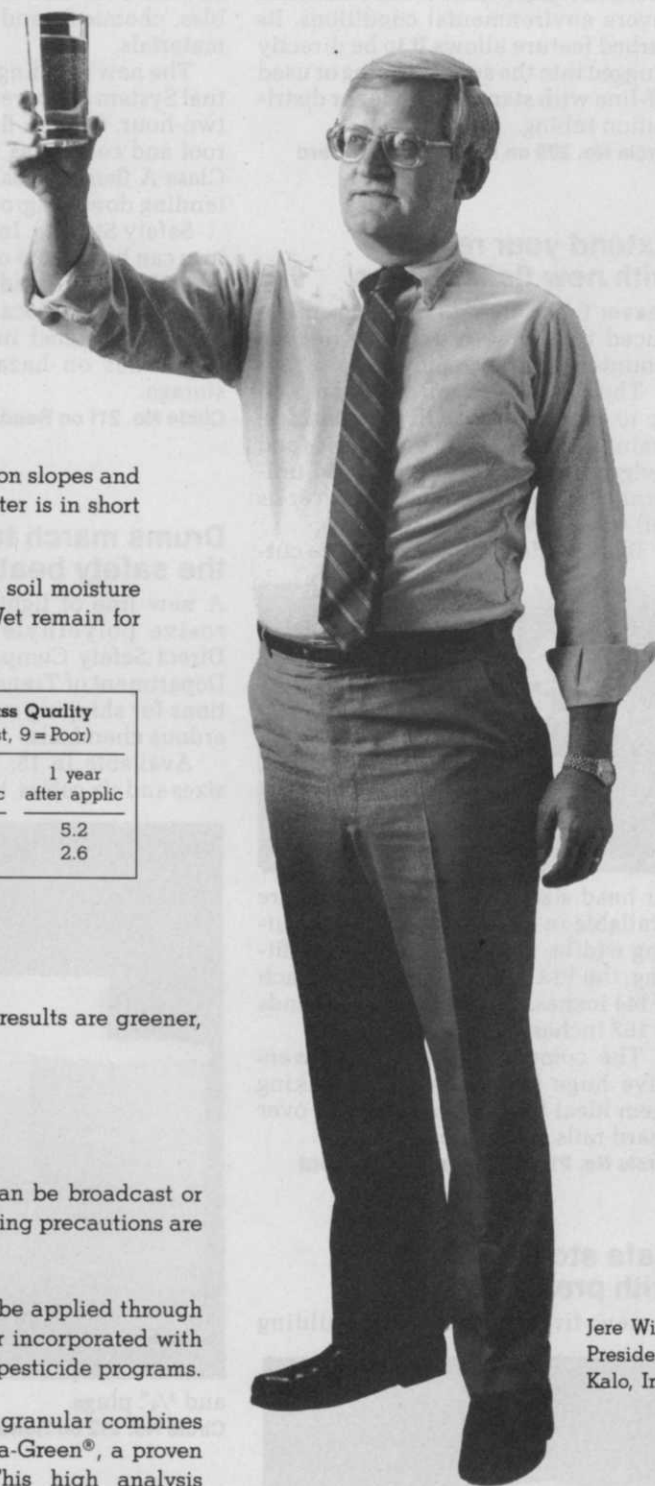
Hydro-Wet can also be applied through irrigation systems or incorporated with liquid fertilizer and pesticide programs.

New Hydro-Wet TG granular combines Hydro-Wet with Terra-Green®, a proven soil conditioner. This high analysis granule contains 22.5% Hydro-Wet, 50% more active ingredient than other granular agents, making it more economical.

### Call For Full Details

For the location of your nearest distributor and more information about Hydro-Wet, call us.

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Jere Wise  
President  
Kalo, Inc.



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Circle No. 122 on Reader Inquiry Card

ene, and Agrifim says it can withstand severe environmental conditions. Its barbed feature allows it to be directly plugged into the supply tubing or used off-line with standard feeder or distribution tubing.

**Circle No. 209 on Reader Inquiry Card**

### Extend your reach with new flail mowers

Beaver Equipment Limited has introduced two new three-point linkage mounted flail reach mowers.

The P12 and P15 can cut and mulch up to two years growth in roadsides, drainage ditches, field boundaries and hedges. Cuttings are discharged uniformly behind the cutter head over its full cutting width.

Beaver offers a choice of three cut-



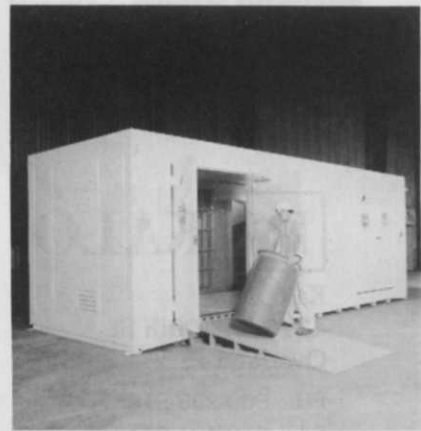
ter head sizes. Flail cutter heads are available in 40-, 48-, and 60-inch cutting widths. With the cutter head fitting, the P12 offers a horizontal reach of 144 inches. The P15's reach extends to 187 inches.

The company says both mowers have huge fence clearance, making them ideal for highway mowing over guard rails and fences.

**Circle No. 210 on Reader Inquiry Card**

### Safe storage easy with prefab building

A new fire-rated storage building



from Safety Storage, Inc. is designed to provide a prefabricated, relocatable

structure for safe storage of flammables, chemicals and other hazardous materials.

The new buildings are Factory Mutual System approved and incorporate two-hour, Class A flame spread rated roof and ceiling, as well as two-hour Class A flame spread rated walls extending down to ground level.

Safety Storage, Inc. says the buildings can be located on any flat surface adjacent to or inside existing buildings, subject to local regulations and conditions stated in Factory Mutual guidelines on hazardous materials storage.

**Circle No. 211 on Reader Inquiry Card**

### Drums march to the safety beat

A new line of lightweight, non-corrosive polyethylene drums from Direct Safety Company comply with Department of Transportation regulations for shipping and storage of hazardous chemicals.

Available in 15-, 30- and 55-gallon sizes and six colors, the drums have 2"



and 3/4" plugs.

**Circle No. 212 on Reader Inquiry Card**

### Repair fitting is convenient, economical

Slip-Fix, an in-line PVC repair fitting from AMS Plastics is designed for quick and easy installation of valves, repair of broken water lines and the addition of laterals and risers.

When combined with a male adapter, Slip-Fix can be installed with a valve on either the pressure or non-pressure side, for fast and convenient in-line service.

Slip-Fix is available in 1/2 to 4-inch sizes, with a 1500 PSI rated O-ring and pressure ratings to Schedule 40 tolerances. A patented O-ring relief helps maintain the O-ring's shape and mobility, ensuring leakproof operation.

**Circle No. 213 on Reader Inquiry Card**

### One-piece fitting for easy assembly

A new Unitized Swing Joint from Lasco Fittings is a one-piece molded swing arm with no welded joints. The



standard 12-inch lay length can be increased by adding a top-out nipple. A choice of inlets is provided to fit the system and various outlets may be specified to fit sprinkler heads.

The new swing joint is available in 1", 1 1/4" and 1 1/2" diameters, all pressure rated at 200 PSI/73° Fahrenheit. It features leak-proof O-rings seated in sealing grooves free of parting lines.

The Unitized Swing Joint carries a three-year performance warranty.

**Circle No. 214 on Reader Inquiry Card**

### Pellets spot treat the dry turf areas

Aquatrols has reformulated its Aqua-Gro soil wetting agent into pellets. The Advantage Pellets are applied through a hose-end unit, for treatment of localized dry spots. Aquatrols predicts turf managers will receive about twice the active ingredient of competitive pellets at a lower cost per



pellet. Each pellet treats up to one acre of turf.

The Advantage Applicator features a hose quick couple and comes complete with fittings for a one inch hose and an adapter for a 3/4 inch hose.

**Circle No. 215 on Reader Inquiry Card**



# THERE ISN'T A GOLF COURSE ON EARTH OUR MULE CAN'T MASTER.



If you've got a tough course to care for, we've got a Pro to help you do it. The Kawasaki Mule.™

The Mule's got 4-wheel independent suspension, automatic transmission, and a reliable 18 horsepower, liquid-cooled engine for plenty of putt. And a Dual-Mode Differential for maximum drive.

It's small and maneuverable and easy on your turf. But plenty big enough to haul two guys and pack an additional 500 pounds in the tiltable, diamond-plate steel cargo bed. Total payload is a full half ton, like most of the bulky pickups you're probably using now. And with the optional trailer hitch, you can tow up to 1,000 more.

Plus you can add options like a hydraulic lift kit, turf tires, sideboards and more.

The bottom line? A Mule is high on performance and reliability and low on maintenance and operating costs. Which is par for the course, since it's a Kawasaki.

For your nearest dealer, call 1-800-543-MULE.

## Kawasaki

Let the good times roll.

© 1989 Kawasaki Motors Corp., U.S.A. Always wear protective equipment appropriate for the use of the vehicle. See the Owner's Manual for more information. Never operate under the influence of drugs or alcohol. Protect the environment. Obey laws and regulations that control the use of your vehicle. The Kawasaki Mule is an off-highway vehicle only, and is not designed, equipped, or manufactured for use on public streets, roads, or highways. Specifications subject to change without notice. Availability may be limited.

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50,125	COMMUNICATIONS NEWS
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Circulation	Magazine
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47,767	LANDSCAPE MANAGEMENT
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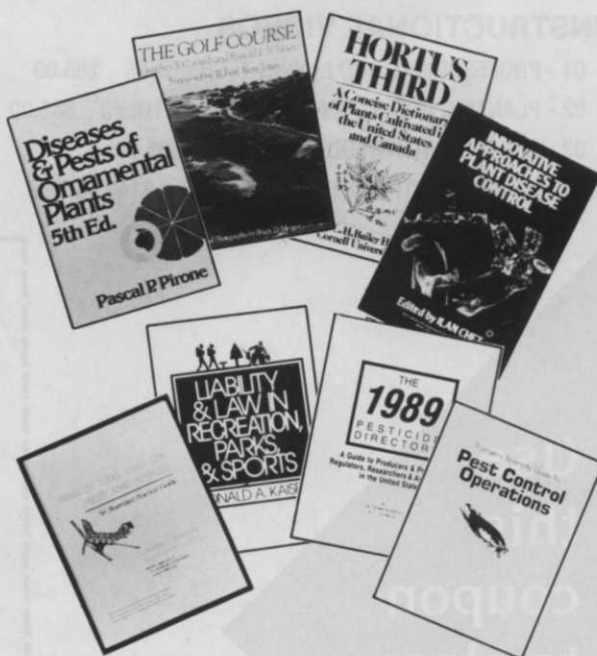
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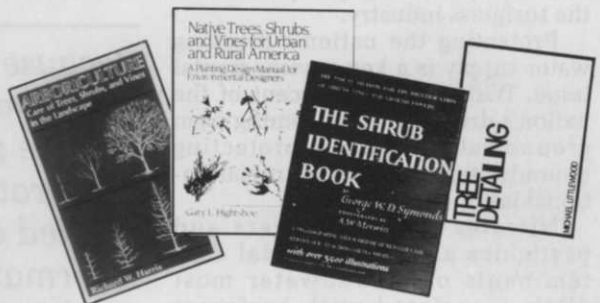
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## Studies to protect groundwater quality

by Martin A. Petrovic, Ph.D., Cornell University

The national concern over chemicals in the environment has seldom been higher.

The recent episodes of Alar in apples and cyanide in grapes are cases in point. A segment of chemical users receiving even more pressure are non-food-producing groups such as the turfgrass industry.

Protecting the nation's drinking water supply is a key environmental issue. With about 50 percent of the nation's drinking water coming from groundwater supplies, protecting groundwater quality is a crucial national issue.

Nitrates from fertilizers and pesticides are two potential contaminants of groundwater most often associated with turfgrass culture.

### The nitrogen question

In the past decade a wealth of knowledge has been generated on the fate of nitrogen applied to turfgrass. Considerable information exists on nitrate leaching from sandy sites, but little or none exists from finer textured soils. A study was initiated for this purpose in 1987 at the Cornell University Long Island Horticultural Research Station, Riverhead, N.Y.

The study, supported by member companies of The Fertilizer Institute, evaluated the leaching potential of 9 different nitrogen sources (ureaform, methylene urea, two sulfur-coated ureas, urea, calcium nitrate, two polymer-coated ureas and Milorganite) applied as a "typical lawn" program.

Preliminary results indicate that the amount of fertilizer nitrogen leaching past the rootzone ranged from 0 to 5 percent, with most at 1 percent or less.

The amount of fertilizer nitrogen removed in the clippings of Kentucky bluegrass was found to range between 3 and 21 percent of fertilizer applied.

This study will continue until the spring of 1990 and provide additional information needed to develop a model to describe the fate of nitrogen applied to turfgrass.

### Options available

The options available to manage nitrate leaching are: nitrogen source selection and rate of application, sea-

son of application, irrigation management and possibly amendments of sandy soil.

Amending sand for putting green or high-use athletic field construction may prove to be a valuable means of reducing nitrate leaching. Sand, by nature, does not absorb nutrients (low

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*Because leaching data is not needed in order to receive pesticide registration, there is a limited amount of information available on the subject.*

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cation exchange capacity), especially the inorganic forms of nitrogen (ammonium and nitrate) as well as potassium.

Most sources of nitrogen fertilizers generally go through a conversion from ammonium to nitrate (nitrification). Ammonium, being a cation (+ charge), is held in soils having a high cation exchange capacity (not sand). Nitrate, on the other hand, is an anion (- charge) and is not held in soil, so it is easily leached if water is passing through the soil.

The ideal amendment would stop nitrogen from leaching, but still allow the green to have the physical properties of good drainage and aeration, and to resist compaction.

Clay has good cation holding properties but would destroy the physical properties of the green.

### Natural zeolite

One material potentially meets both criteria—natural zeolite. One natural zeolite, called clinoptilolite, is a secondary mineral with a high silica content formed from volcanic rock. Major deposits of clinoptilolite are found in the western U.S.

Clinoptilolite can be crushed and screened to sand-sized particles with good physical properties and a cation exchange capacity like clay. Initial studies have shown that the physical properties of sand mixtures containing 5 percent clinoptilolite are maintained at the same

time that the clinoptilolite protects the ammonium from being converted to nitrate.

Large scale field testing is now under way to determine to what extent clinoptilolite-amended sand will resist nitrate leaching. Organic amendments will also be evaluated.

There is limited information on the leaching potential of pesticides applied to turfgrass. Generally, this is a result of the fact that even though leaching data is needed for pesticide registration, little has been done related to turfgrass. Furthermore, the information available on pesticide leaching may not be applicable for the turfgrass ecosystem for the following reasons:

- The turfgrass sward has a very high surface canopy compared to row crops. This could relate to greater interception of the pesticide, resulting in the potential for more plant uptake, photodegradation and volatilization.

- The turfgrass ecosystem often has a thatch layer associated with it. The thatch can absorb some of the pesticide and provide conditions that favor both more volatilization and enhanced microbial degradation.

- Under turfgrass conditions, the surface soil contains substantially more roots than most other cropping systems. This could relate to more root uptake or other aspects that could tie up more pesticide.

### Establishing models

Numerous pesticide leaching models can predict the leaching potential of a given pesticide. Work being done this year at Cornell University will examine the usefulness of four pesticide leaching models in predicting the leaching from turf of at least two pesticides (Sevin and Daconil 2787).

The study at the A.R.E.S.T.S. facility will involve three soil types (sandy, sandy loam and slit loam) and two irrigation approaches (light, frequent versus heavy, infrequent).

Protecting our nations resources, such as groundwater, should be a concern of every landscape manager. Research of this nature can provide the information necessary to protect the environment while allowing turfgrasses to have the quality desired.

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