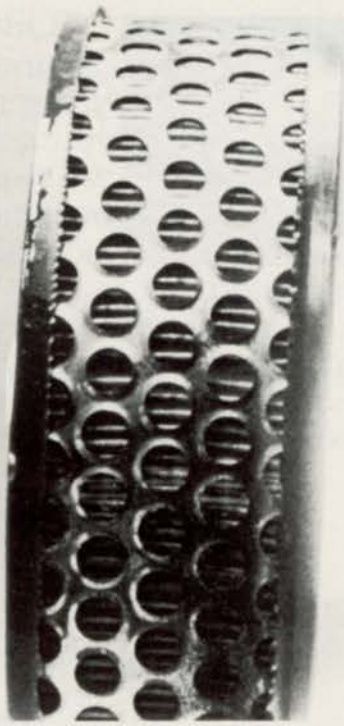
If you discover defects or troubles with the air cleaner, make sure that your preventive maintenance schedule includes a careful examination of the air cleaner in the future.

Now look down the carburetor throat. Again, check to see if somehow dirt had gotten past the air cleaner. Make a note of the deposits you find there.

This is the point at which you can finally steam clean the engine and begin actual teardown. Throughout the disassembly of the engine you should continue to make notes on the condition of the engine components as you find them. Everything should be examined for cracks, deposits, or other signs of damage that may have occurred and that may give you some clue to what has been happening inside your engine.

Your next step is to remove the carburetor and check the intake port for signs of dirt, poor seal, or perhaps a damaged gasket. When the cylinder head is off, examine it carefully, noting the amount of

Continues on page 43



Air cleaner is easily inspected by shining a light through the center.

Toro waters 52 of America's to

TORO's been around the greens for 60 years. And we've grown to become the leading name in golf course irrigation.

That can mean a lot; whether you're replacing a few heads or specifying a fully-automated pushbutton system. You'll be dealing with the company that irrigates the majority of U.S. courses. And that includes over half of *Golf Digest's* top-100 list.

Put in TORO automatic sprinklers and at the crack of the day's first drive you know your course is ready. Greens have been watered in their own special way. Fairways, tees and rough got customized sprinkling. Frost or dew has been syringed off the greens. Yet nobody has been near the course all night long.

But the newest thing about TORO

00 golf courses. Let that soak in.

automatic sprinkler systems is that the cost is less than ever. For example, our new hydraulically-controlled MPC system brings automatic within reach of just about everybody. Because we don't have to dig up your turf, you don't have to dig down into your pocket to afford the conversion.

And the solid-state VT 3 system we've just introduced bucks the rising tide of inflation with more control for less money. It's pushbutton irrigation nobody else can touch.

You don't have to be in Pebble Beach or Augusta to have a great golf course. Just call our Golf Course Marketing Manager John Skidgel today. His 24-hour number is 714-359-0701. It could be the biggest step you ever took toward *Golf Digest's* top 100 list. Did that soak in?

The TORO Company, Irrigation Division, P.O. Box 489, Riverside, CA 92502. International Telex: 676-490.

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TORO®

IRRIGATION DIVISION

RECLAMATION GRASS SELECTION DEPENDS ON COMBINATIONS, COST

The key to success in establishing grass cover in land reclamation is utilizing a mixture of hardy species according to research recently completed in a cooperative project between Lofts Pedigreed Seed Co. of Bound Brook, NJ, and Jacklin Seed Co., of Post Falls, ID.

The project, directed by Lofts Director of Research Richard Hurley, studied nearly 75 different species of grasses and legumes in order to select four mixtures for reclamation.

"Our research uncovered many desirable species which should be utilized in some reclamation situations, but because of limited or no commercially available seed sources, they were omitted from our final mixtures," Hurley said. "Although these species can be purchased, they are not widely utilized in reclamation mixtures because of high seed cost and/or difficulty in providing plant establishment.

"Specially developed mixtures may be required for some areas of the U.S., especially the arid Midwest, West and portions of the Rocky Mountains, where varying elevations and slopes create thousands of small microclimates. Items in a seed mixture which should be considered are seed size or number of seeds per pound, seedling vigor and rate of establishment. Percent of seed included in a mixture may be misleading," Hurley warns.

When seeding any of the species available, they should not be seeded alone. As a general guideline, a minimum of three species should be included in any seed mixture."

As a result of this research, Lofts and Jacklin are now marketing four mixtures for reclamation under the name Pinto.

Below is a master list containing most of the desirable species of grasses and legumes used on reclamation and revegetation sites across the United States. When seeding any of these species, they should not be seeded alone. As a general guideline, a minimum of three species should be included in any seed mixture for revegetation purposes. "Many species which we would like to utilize from a standpoint of performance, are either too expensive on a cost per acre basis for most general recommendation situations, or are presently not in commercial production," says Hurley.

Dry Acid Mixture
- Tall Fescue
- "Oahe" Intermediate Wheatgrass
- Sheep Fescue
- "Reubens" Canada Bluegrass
- "Troy" Kentucky Bluegrass

Moist Acid Mixture
- Tall Fescue
- "Lynn" Perennial Ryegrass
- "Reubens" Canada Bluegrass
- "Troy" Kentucky Bluegrass
- "Sabre" Poa trivialis
- White Clover
- Alsike Clover

Dry Alkaline Mixture
- Tall Fescue
- Russian Wild Ryegrass
- Crested Wheatgrass
- Sheep Fescue
- "Lynn" Perennial Ryegrass
- "Lemmons" Alkali Grass

Moist Alkaline Mixture
- Tall Fescue
- Slender Wheatgrass
- "Lynn" Perennial Ryegrass
- "Lemmons" Alkali Grass
- "Sabre" Poa trivialis

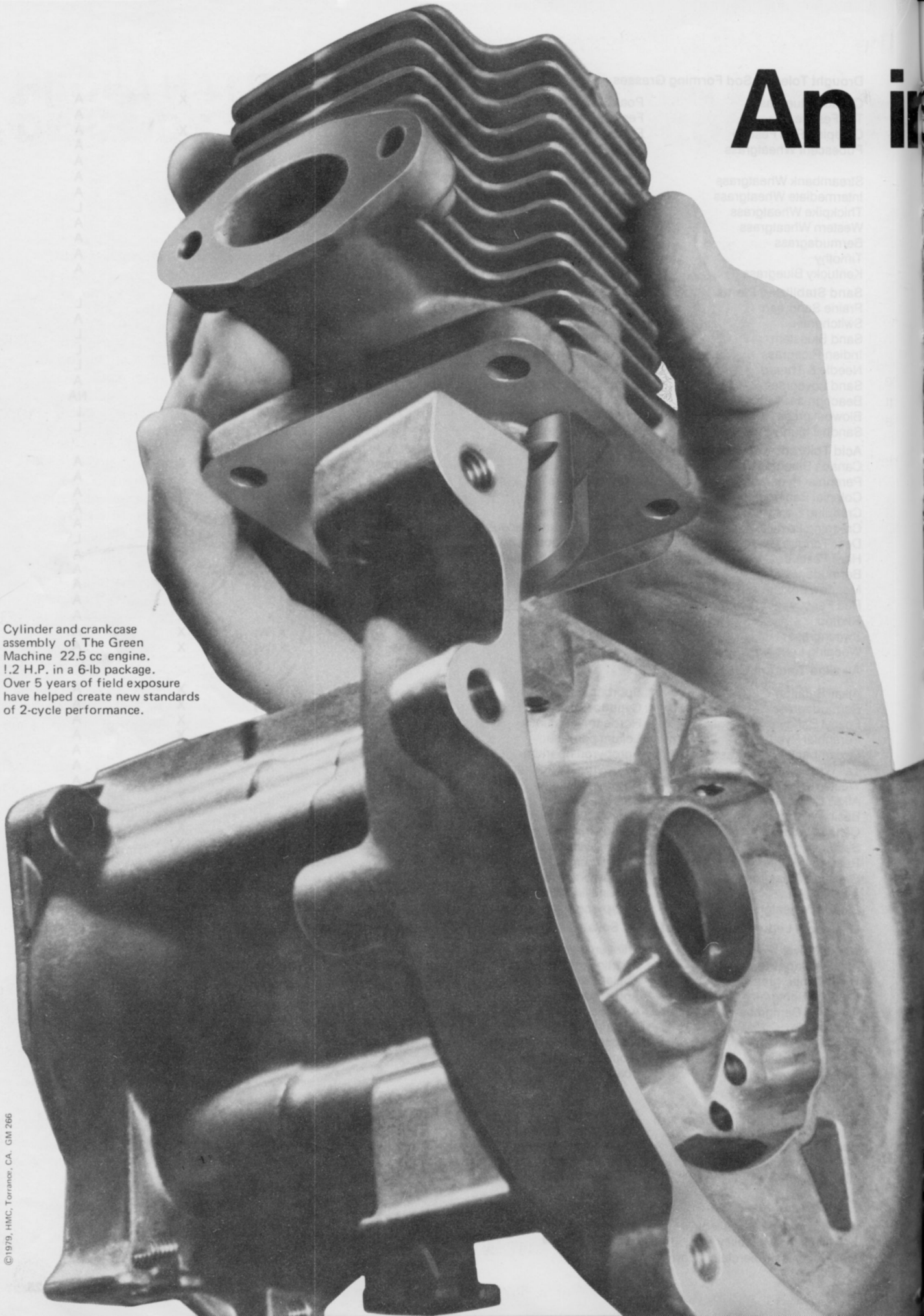
Species	Scientific Name	Variety	East to Midwest States	Midwest to Western States	Species Availability
Drought Tolerant Bunchgrass					
Beardless Wheatgrass	Agropyron inerme	"Whitmar"		X	*A
Big Bluegrass	Poa ampla	"Sherman"		X	A
Bluebunch Wheatgrass	Agropyron spicatum		X	X	L
Hard Fescue	Festuca ovina, var. duriuscula	"Durar"	X	X	A
Indian Ricegrass	Oryzopsis hymenoides			X	L
Needle and Thread	Stipa comata			X	L
Russian Wildrye	Elymus junceus	"Sawki"		X	A
Sand Dropseed	Sporobolus cryptandrus		X	X	L
Siberian Wheatgrass	Agropyron sibiricum			X	A
Slender Wheatgrass	Agropyron trachycaulum		X	X	A
Weeping Lovegrass	Eragrostis curvula		X (W)	X	A
Sheep Fescue	Festuca ovina		X	X	A

Drought Tolerant Sod Forming Grasses					
Canada Bluegrass	Poa Compressa	"Rubens"	X	X	A
Tall Fescue	Festuca arundinacea		X		A
Creeping Red Fescue	Festuca rubra			X	A
Pubescent Wheatgrass	Agropyron trichophorum	"Greenleaf" or		X	A
		"Topar"	X	X	A
Streambank Wheatgrass	Agropyron riparium	"Sodar"		X	A
Intermediate Wheatgrass	Agropyron intermedium	"Oahe"		X	A
Thickpike Wheatgrass	Agropyron dasystachyum			X	L
Western Wheatgrass	Agropyron smithii		X	X	A
Bermudagrass	Cynodon dactylon		X (W)	X	A
Timothy	Phleum pratense		X	X	A
Kentucky Bluegrass	Poa pratensis		X	X	A
Sand Stabilizing Plants					
Prairie Sandreed	Calamovilfa longifolia			X	L
Switchgrass	Panicum virgatum		X	X	A
Sand Bluestem	Andropogon hallii			X	L
Indian Ricegrass	Oryzopsis hymenoides			X	L
Needle & Thread	Stipa comata			X	L
Sand Lovegrass	Eragrostis trichodes			X	A
Beachgrass	Ammophila spp.		X		NA
Blowout grass	Redfieldia flexuosa		(W)	X	L
Sandhill Muhly	Muhlenbergia pungens		(W)	X	L
Acid Tolerant Grasses					
Canada Bluegrass	Poa Compressa	"Rubens"	X	X	A
Perennial Ryegrass	Lolium perenne		X	X	A
Colonial Bentgrass	Agrostis tenuis	"Highland"	X	X	A
Creeping Bentgrass	Agrostis palustris		X	X	A
Creeping Foxtail	Alopecurus arundinaceus	"Garrison"	X	X	A
Deer Tongue Grass	Panicum clandestinum	"Tioga"	X		L
Hard Fescue	Festuca ovina, var. duriuscula	"Durar"	X	X	A
Bermudagrass	Cynodon dactylon		X (W)	X	A
Meadow Foxtail	Alopecurus pratensis		X	X	A
Red Fescue	Festuca rubra		X	X	A
Redtop	Agrostis alba		X	X	A
Switchgrass	Panicum virgatum		X (W)	X	A
Weeping Lovegrass	Eragrostis curvula		X (W)	X	A
Alkaline Tolerant Grasses					
Alkali Sacaton	Sporobolus airoides			X	A
Bermudagrass	Cynodon dactylon		X (W)	X	A
Foxtail Barley	Hordeum jubatum		X	X	A
Perennial Ryegrass	Lolium perenne		X	X	A
Streambank Wheatgrass	Agropyron riparium	"Sodar"	X	X	A
Tall Wheatgrass	Agropyron elongatum	"Alkar"	X	X	A
Western Wheatgrass	Agropyron smithii		X	X	A
Alkali Cordgrass	Spartina gracilis			X	NA
Basin Wildrye	Elymus Cinereus			X	NA
Canada Wildrye	Elymus canadensis		X	X	NA
Saltgrass	Distichlis stricta		(W)	X	NA
Russian Wildrye	Elymus junceus	"Sawki"		X	A
Crested Wheatgrass	Agropyron desertorum			X	A
Alkali Grass	Puccinellia lemmoni	"Lemmons"		X	A
Slender Wheatgrass	Agropyron trachycaulum				
Grasses & Legumes Tolerant of Moist Soils					
Alsike Clover	Trifolium hybridum		X	X	A
Alkali Cordgrass	Spartina gracilis			X	A
Reed Canarygrass	Phalaris arundinacea		X	X	A
Colonial Bentgrass	Agrostis tenuis	"Highland"	X	X	A
Creeping Bentgrass	Agrostis palustris		X	X	A
Poa trivialis	Poa trivialis	"Sabre"	X		A
Creeping Foxtail	Alopecurus arundinaceus	"Garrison"	X	X	A
Meadow Foxtail	Alopecurus pratensis		X	X	A
Perennial Ryegrass	Lolium perenne		X	X	A
Legumes					
Crown Vetch	Coronilla varia	"Penngift"	X	X	A
Birdfoot Treefoil	Lotus corniculatus	"Empire"	X	X	A
Sericea Lespedeza	Lespedeza cuneata		X	X	A
White Clover	Trifolium repens		X	X	A
Alsike Clover	Trifolium hybridum				

A — commercially available
L — limited availability
NA — not commercially available

W — warm season grass best adapted to the southern states or similar climate

An in



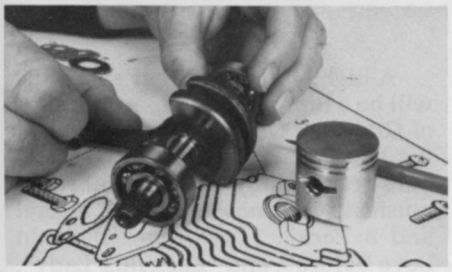
Cylinder and crankcase assembly of The Green Machine 22.5 cc engine. !.2 H.P. in a 6-lb package. Over 5 years of field exposure have helped create new standards of 2-cycle performance.

The Green Machine trimmer-pruner-cutter.

side look at a classic.

In 1972, The Green Machine introduced a gas-powered string trimmer employing a new concept —extreme light weight combined with amazing torque. It proved the ideal tool for high production weed and grass trimming, as well as brush cutting and tree pruning. From the start, Green Machines set new industry standards for quality—and new records for time-saving and money-making. The reasons are basic: ingenious design and a fanatic devotion to excellence.

For instance, The Green Machine



model 3000 engines have been dynomometer tested—at full throttle and full load—for 200 hours. That's equal to 600 hours of field operation. Actual field operation of 1000 to 1500 hours is common-place.

Chrome and hone

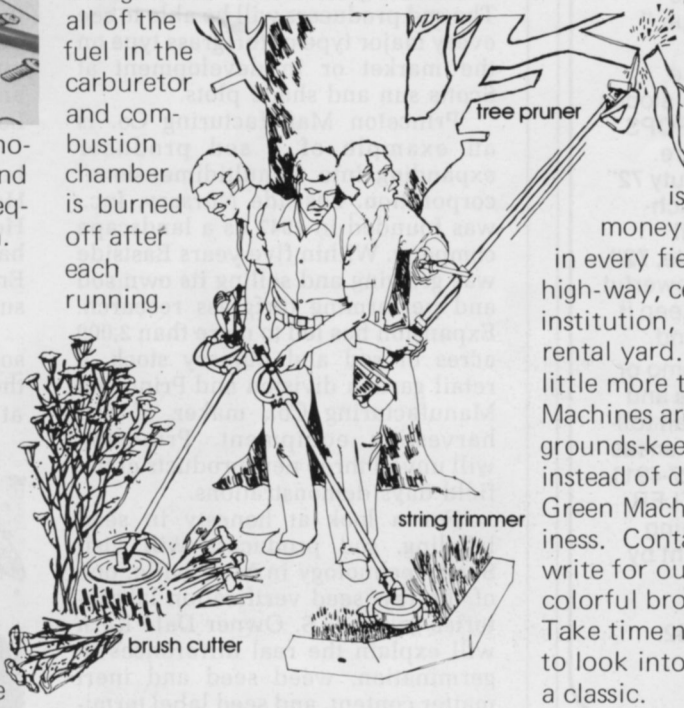
To understand what's behind Green Machine performance, just take a look inside a model 3000 engine.

You'll see a precision die-cast cylinder with polished chrome-plated bore—plus such refinements as piston-port fuel timing and almost five square inches of scavenge porting. Running inside that chrome-protected cylinder, you'll see a precision die-cast aluminum piston, micro-honed and fitted with double, positively-located rings.

You'll also see a crankshaft and rod assembly of high-carbon steel, precision-machined, and aligned to ±.001 -inch tolerances, running with high-speed ball-type main bearings and needle-type rod journal bearings.

Easy starting with P.F.S.

Long engine life is a recognized Green Machine virtue. So is easy starting. Thanks to a proven, reliable fuel pump and carburetor design. Plus an important Green Machine exclusive: Positive Fuel Shut-off. Engine "kill" is accomplished by stopping the fuel supply to the engine, rather than by cutting the ignition. This means that all of the fuel in the carburetor and combustion chamber is burned off after each running.



Fresh fuel is used for each start. Conventional "ignition kill" allows the fuel and oil mixture to remain in the chamber and carburetor where it can become stale and even, with time, create a residue that prevents starting.

Nine heads and blades

Green Machine introduced the first professional-quality Tap-For-Cord automatic string-feed head. A total of five different string trimmer heads are now offered as well as four quick-change blades.

A string trimmer... and more

The Green Machine is a great string trimmer—and a great brush cutter, and tree pruner. With accessory metal blades, one man can clear up to an acre of brush a day, cutting easily through vines up to ¾-inch thick. Tree branches up to three inches thick can be sliced through easily— in a single stroke.

See what's in it for you

The Green Machine is saving time and making money for thousands of users in every field: park and municipal, high-way, cemetary, estate, golf course, institution, landscape, farm, school, rental yard. Crews equipped with little more than mowers and Green Machines are completing massive grounds-keeping chores in hours, instead of days. See what The Green Machine can do for your business. Contact your dealer or write for our new, colorful brochures. Take time now to look into a classic.

HMC, 22133 S. Vermont, Torrance, CA 90502

The Green Machine®

A yard-care classic.

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SOD FIELD DAYS INCLUDE VISIT TO SCOTTS, PRINCETON

Members of the American Sod Producers Association will visit two of their largest suppliers during the 13th Annual Summer Convention and Field Days at Columbus, Ohio this month.

Both O.M. Scott & Sons and Princeton Manufacturing (part of Eastside Nursery) have played major roles in the development of the sod industry.

These tours are an expansion of the field days last summer in Washington and Idaho where the sod producers saw first-hand seed production at Jacklin Seed Co.

O.M. Scotts has a very large research center in Marysville, OH, fifteen miles from Columbus. Sod producers will see acres of test plots for improved turf seed and the labs where Scotts develops new turfgrass varieties, fertilizers, insecticides, fungicides, and herbicides. The sod producers will be able to see every major type of turfgrass type on the market or in development at Scotts sun and shade plots.

Princeton Manufacturing Co. is an example of a sod producer expanding into a multidimensional corporation. Eastside Nursery, Inc., was founded in 1947 as a landscape company. Within five years Eastside was growing and selling its own sod and performing turfgrass research. Expansion has led to more than 2,000 acres of sod and nursery stock, a retail garden division and Princeton Manufacturing Co., maker of sod harvesting equipment. Princeton will unveil three new products at the field days demonstrations.

For a look at honesty in seed labeling, sod producers will visit Seed Technology in Marysville, one of the few seed verification laboratories in the U.S. Owner Dale Kern will explain the real differences in germination, weed seed and inert matter content, and seed label terminology. Kern will soon announce a proposal to improve the reliability of seed labels as verified by seed testing laboratories.

A highlight of this year's meeting will be a dinner theatre performance of Guys and Dolls. ASPA has bought the house for the night so that members can enjoy this memorable musical with songs such as "Bushel and a Peck", "I've Never Been in Love Before", and "Luck Be a Lady".

A special ladies program has been arranged featuring a tour of Heisey Glass Museum, Davidson House, and Granville Inn. Antiques, handmade glass, and dining in an old English atmosphere will take the summer heat off the ladies.

Of course, all major suppliers of sod equipment will demonstrate their latest machinery and products at the field days. **WTT**

German Village where ladies can shop for antiques (top). Research Center at O. M. Scott & Sons in Marysville (right).

Northrup King turf gets trampled, torn, squashed, and scuffed and it still looks great.

But that's not news to you.

The days when turf just laid around looking pretty are long gone. Now your turf has to be pretty—and pretty tough, too. Tough enough to take all kinds of wear and still go on looking terrific.

That's just why so many pros like you specify turf seed from Northrup King. For years, Northrup King has given pros all they need—low maintenance varieties, winter hardy blends, special mixes for specific geographic problems, and expert help in selecting the right one.

And no matter what Northrup King turf seed the pros use, they get turf that's good looking and hard working.

Find out more about quality turf seed from Northrup King. Talk to your Northrup King representative or distributor.

Or talk to someone with great looking turf.

Northrup King Co., P.O. Box 959, Minneapolis, MN 55440.

NK
NORTHRUP KING
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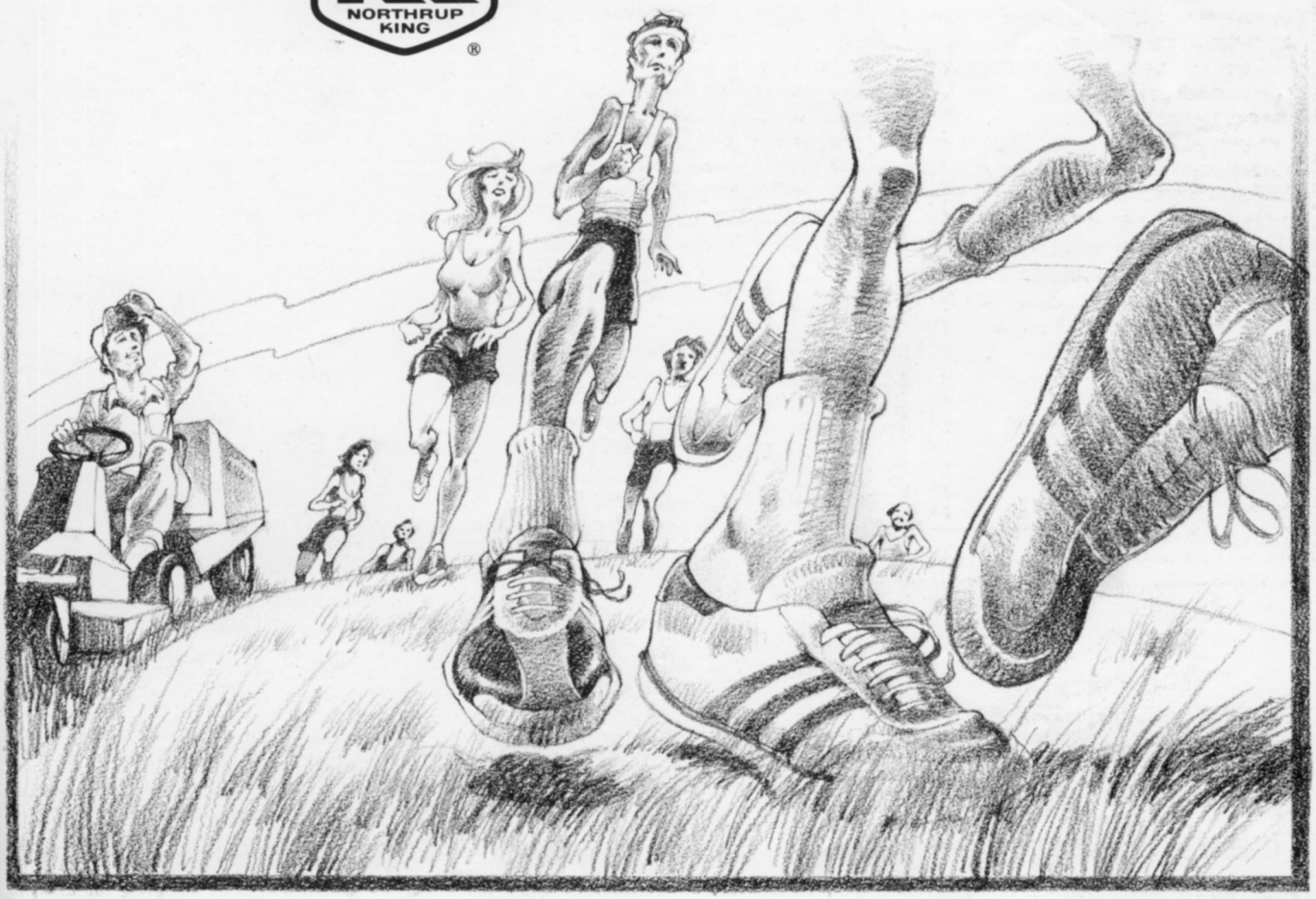

Northrup King
turf seed
trampled turf,
squashed
and scuffed
and it still
looks great.

But grass
not news to
you.

The French Market offers a wide variety of shops (top). Headquarters of Princeton Mfg. Co. (above).

WETTING AGENTS AND THEIR ROLE IN WATER CONSERVATION TODAY

By Robert A. Moore, President, Aquatrols Corp. of America, New Jersey

Robert Moore is a chemical engineer who, 25 years ago, developed a product to improve the penetration of water into all types of soils. Moore received his degree from Cornell University and previously worked for Mobil Corp.

A few years ago, we were all shocked, and made well aware of our dependency on oil — particularly foreign oil — and we have been talking about "An Energy Crisis" ever since. It is my firm belief that our next national crisis will be "A Water Crisis." As an example, at the Oklahoma Turf Conference, in December 1978, Dr. Huffine recalled a comment by Marv Ferguson, that if this nation ever has another Civil War, it will be fought over water.

I don't believe we'll run out of water! But I do believe we must stop wasting water. We must learn to use water efficiently. Some areas of our country are now very aware of the necessity to conserve water, and have started various programs. Most of these programs require registering and reporting the quantity of water used, either monthly, quarterly or yearly. Very few areas are actually restricting water use except in cases of extreme drought or water shortages. We have all read about these checks — and in some years, have experienced such regulation.

The present requirements for registration and monitoring of water-use, provide the mechanism for future planning, and future restrictions, if and when they are needed. Take note of how many conferences in recent years are placing an increasing emphasis on water. When our company started twenty-five years ago, very few conference programs considered water at all. Today's increased awareness of potential limited water resources is sharpening our senses on ways to more economically use water — ways to make water more efficient.

One enormously useful tool to make water more efficient, that has gained recognition in the last few years, is the use of soil wetting agents. Before we discuss their place in water conservation and improved plant growth, let's take a quick look at the vital role of water in plant growth and turf maintenance; and at some of the characteristics of water that can lead to problems. Bob Kneebone, has pointed out that water is essential for every function within the plant — for photosynthesis, for cooling, for growth, for turgor and for root development. It is used as a solvent, as a reagent, and as a nutrient — in fact the largest nutrient used by a plant. Water is also involved in every maintenance practice in your operations — fertilizing, pesticide treatments, mowing, aerifying — it even affects the quality of playing conditions — sometimes to the point of eliminating play.

Most properties of water are beneficial, but two in particular, surface tension and the moisture tension in the soil, can be obstacles leading to inefficient water use, and turf losses. If we investigate the relationship between these moisture-tensions, turf losses and water uses, we see a definite pattern. Plain water has a lot of tension and hang-ups that can cause soil-water problems, one obvious example is low infiltration rates and puddling.

Puddling leads to run-off, and evaporative loss of water. One U.S.D.A. survey in the plains states, indicated that less than 20% of the natural rainfall actually becomes root-zone moisture — the water being lost by run-off and evaporation. Without water in the root-zone plants can't function. Plain water with its high tensions, moves slowly in fine textured soils. Though not always a loss of water, this is another inefficient use, since turf can't utilize water from a saturated soil with poor aeration. Diseases such as root rots, pythium, and other water molds, as well as algaes increase under these conditions, weaken the turf, add to the inefficient use of water, and many times result in turf losses.

On the other hand, in the coarse texture soils, which have been enjoying great popularity for the past few years, the high tensions of plain water create different problems. Water tends to channel and not wet the soil profile uniformly. These soils can be droughty requiring greater amounts of water. In addition, the sandy type soils have been shown to produce a hard-to-wet condition referred to as localized dry-spots. These areas literally

Poa annua deeply rooted in the middle of summer because of treatment with wetting agent.