Kentucky bluegrasses have a lower ET than tall fescues, with considerable variation in both species, but their root system is not as deep. When they are irrigated in arid or semi-arid regions they will often utilize less water and, if allowed to go dormant, often show better recovery.

The results of the National Turfgrass Evaluation Program should be used in deciding which variety is appropriate to use in low maintenance situations. Look for results under non-irrigated conditions in similar environments or local turf trials without irrigation. Among the varieties that have shown good performance in no irrigation sites in the current National Trial are Wabash, Asset, Julia, A-34, Mystic, Freedom, Monopoly, Georgetown and Joy. Additional varieties showed good performance in at least one site.

**ET rates are often not the primary determinant of drought tolerance in warm humid regions. The key determinant is actually acid soil tolerance.**

The fine-leaf fescues in general have low ET rates and methods of conserving water such as leaf rolling. As a result, they demonstrate a great deal of drought tolerance and have low water use. They do not root as deeply as some other species and will go dormant without irrigation during extensive droughts. You will often find fine fescues persisting on many old turf sites that have never been irrigated or fertilized.

In 1988, 11 midwestern universities established a Regional Alternate Species Trial to identify low maintenance grass species that can be used on large areas for cover. These trials received only broadleaf weed control and no fertilization or irrigation after establishment.

In the first two years of this trial, two fine fescues, sheep fescue and 'Durar' hard fescue, were two of the best performers. In addition, blue fescues are often found in turf sites that have received the lowest inputs and were not included in this trial. Improved hard fescues, especially those with endophytes, have shown the best performance at non-irrigated sites in the National Test. In both tall fescues and fine fescues, the presence of the endophyte appears to provide benefits under drought conditions by contributing to osmotic adjustment and better rooting.

The other species that performed well for two years in this Alternate Species Trial included ‘Alta’ tall fescue, ‘Exeter’ colonial bentgrass, and ‘Reton’ red top. The excellent performance of colonial bentgrass shows the common perception of it only as an appropriate species for the Pacific Northwest and New England is incorrect.

The USGA/GCSAA is currently supporting a colonial bentgrass breeding program utilizing breeding material from non-irrigated, low-input fairways of golf courses in hot, dry regions of New Zealand. The goal is to expand on the potential of this species under low maintenance conditions.

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Water Saving Grasses
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Further research needs to be done on the utilization of colonial bentgrass. Unfortunately, the primary testing sites are evaluating this material under standard fairway maintenance situations. It needs to be evaluated for low maintenance fairways, roughs and lawn situations. Red top and other native Agrostis species also need to be evaluated further.

There are many additional species of grasses that show potential or have been utilized for situations with low water availability. Canada bluegrass has shown excellent potential in some situations. The primary problem is its extreme stemminess in the spring. Texas bluegrass also has potential for many areas, and crosses of these, and other Poa species, with Kentucky bluegrass may provide varieties with lower water needs.

Considerable progress has been made in breeding and in understanding water use during the past decade.

Sweet vernalgrass (Anthoxanthum odoratum) is found extensively in pastures and low maintenance sites. Selections of this species for improved density and color may also make a pleasing low maintenance grass, with its sweet smell an added bonus.

Other native species that need to be examined more closely include species of Deschampsia, Muhlenbergia, and Festuca.

Turfgrass remains practical for probably every site where it is desired. Some sacrifices may have to be made at certain sites, including letting the grass go dormant during part of the year and accepting less density. In other areas, irrigation scheduling will have to be done carefully based on the ET rates of the grass in conjunction with the evaporative demands of the location.

Considerable progress has been made in breeding and in understanding water use during the past decade. The challenge of the next decade is to put the results of this research into widespread use.

Dr. Leah Brilman is research director for Seed Research of Oregon in Corvallis, OR.
TURF AND LANDSCAPE EXPO EXPANDS

Covering the entire 100,000 square feet of the Santa Clara Convention Center in Santa Clara, CA, the annual Northern California Turf and Landscape Exposition will be held January 29-30, 1992. The event is sponsored by the Northern California Turfgrass Council.

In addition to increasing floor space to accommodate new and previous exhibitors, show organizers have tripled the number of free educational seminars. The traditional turf-related program, organized and presented by the University of California Cooperative Extension will be offered, as well as two concurrent sessions geared to the interests of landscape contractors, arborists, gardeners, golf course superintendents, landscape architects, irrigation consultants, and others.

For more information, contact NCTC, 425 Oak Street, Brentwood, CA 94513, (415) 516-0146. Fax (415) 516-1301.

PESTICIDE RULES TO TIGHTEN

Requirements for pesticide application and storage will be more stringent according to Art Williams, chief of the Environmental Protection Agency's Field Operations Division. Williams spoke at a recent environmental forum hosted by the Golf Course Superintendents Association of America.

Williams said that requirements for those who apply restricted-use pesticides, especially certified applicators, will be getting tougher.

The proposed recommendations are based on a 1985 task force report on the certification and training of RUP applicators. They address several areas of concern including groundwater protection, worker protection, endangered species protection, chronic toxicity of RUPs, and waste and container disposal.

Under the Federal Insecticide, Fungicide, and Rodenticide Act Section Three, any pesticide classified by the EPA for restricted use "shall be applied only by or under direct supervision of a certified applicator." FIFRA's Section Four gives each state an opportunity to implement its own pesticide applicator program, and most have established such programs.

The new rules will require certified applicators to keep records of site-specific training, as well as show competency of non-certified applicators applying RUPs. Recertification will be required at least every five years for all certified applicators.

Some states already have restrictions similar to these. The EPA's Williams said the final rule should be "on the streets" in 1992.

Dennis Howard of EPA's Environmental Effects and Fate Division said regulations concerning pesticide storage and mixing/loading are still under development and are not expected to be effective until 1993 and 1994, respectively. The storage requirements are not expected to affect most superintendents because they would apply only to facilities that store 11,000 pounds or more of pesticide.

Rinse pads will probably be mandatory in areas where concentrated pesticides are routinely transferred. This regulation would affect golf courses that do most of their mixing in the same location.

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WHITE JOINS LESCO

Charles B. (Bud) White has joined Lesco, Inc., based in Rocky River, OH, as director of golf development. In the newly created position, he will work with golf course owners, developers, builders, designers, and architects representing the company's products, equipment, and services.

White previously served as sales manager for Lesco's fertilizer/seed specialists. Prior to joining the company, he operated his own firm, Total Turf Services, Inc., which specialized in professional turfgrass consultation.

White is a long-time agronomist with the USGA Green Section and before founding his own firm he was director of golf and landscape operations at the Harbor Club in Greensboro, GA. He holds a bachelor's degree in plant and soil science from Tennessee Technological University and a master's degree in horticulture from Clemson University.

HAPP AWARDED SCHOLARSHIP

Best Sand Corporation of Chardon, OH has awarded its first turfgrass management scholarship to Keith Happ, an agronomy student at Ohio State University. The scholarship will cover the cost of tuition and books for the 1991-92 school year.

Happ is a certified golf course superintendent who returned to school full time in December 1990 and since then has consistently been named to the Dean's List. Previously he was the superintendent at Legend Lake Golf Club in Chardon for seven years and a crew member and assistant superintendent at Quail Hollow Inn and Golf Course in Painesville, OH for seven years.

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- Gandy/Engi & Mfg, Sheboygan, WI
- Floyd-McKay Aerator Co., Dunn, NC
- Great Plains Mfg, Inc., Assaria, KS
- Greenscare Intl., Huntington Beach, CA
- Harh Inc., Evansville, IN
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- Kalea Manufacturing, North Liberty, IA
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- Rain Jet Div Hardie, Laguna Niguel, CA
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- Covers, Traffic/Winter
- Edging
- Goals, Nets
- Golf Accessories
- Hydraulic Mulch
- Landscape Fabric
- Marking Flags
- Paint Stencils
- Paints, Marking Materials
- Pumps
- Sand/Soil Mixes
- Sharpening Compounds
- Signs
- Soil Amendments
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- Tines for Aerator
- Topdressing
- Track Surface
- Tree Root Barrier
- Windscreens

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- Aquatic Herbicides
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- Moisture Sensors
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- Pumping Systems
- Repair Parts
- Sprinkler Heads
- Travelling Sprinklers
- Valves

**Weather Station**
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**Seed**
- Bentgrass
- Common Bermudagrass
- Fine Fescue
- Hard Fescue
- Kentucky Bluegrass
- Overseeding Blends
- Perennial Ryegrass
- Seed Coating
- Tall Fescue
- Wildflowers

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**Company Listings**

- Bell Turf Equip., San Jose, CA
- Foley United, Minneapolis, MN
- I.G. & Co., Gahanna, OH
- Mowing Machine Grinders & Reels, Andalusia, AL
- Yeager Ford Tractor, Hillsboro, OR

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SNAPPER POWER EQUIPMENT, MC DONOUGH, GA
SOLO INC., NEWPORT NEWS, VA
STIHL INC., VIRGINIA BEACH, VA
TANAKA (USA) CO LTD., BOTHELL, WA
TORO COMPANY, MINNEAPOLIS, MN
VANDERMOLEN CORP., LIVINGSTON, NJ
WESTHIEFLE CORP., LAWRENCE, KS

TURF VEHICLES
CHI INDUSTRIES, BENTON HARBOR, MI
CHIKUSUI/TIT EQM., GLENDALE, CA
CLB CAR, AUGUSTA, GA
CUSHMAN/RANSOMES, LINCOLN, NE
DAIBATSU AMERICA INC, MONTMONTA, CO
E-Z-GO, AUGUSTA, GA
HAHN INC, EVANSVILLE, IN
HAUL MASTER., MENDOTA, IL
KAWASAKI MOTOR CORP., SANTA ANA, CA
KROMER CO., MOUNT, MN
MITSUBISHI MOTORSAmerica, CYPRESS, CA
SALSCO, CHE什IRE, CT
SMITCO INC, WAYNE, PA
TAYLOR-DUNN, ANAHEIM, CA
TERRAIN VEHICLES, ADDISON, IL
TORO COMPANY, MINNEAPOLIS, MN
TRIDENT MACHINES, COLUMBUS, OH
YAMAHA MOTOR CORP, BUENA PARK, CA

WATER REMOVAL MACHINES
KURANDA USA, ANNAPOLIS, MD
PARTAC FEAT CORP, GREAT MEADOWS, NJ
WATER HOG INC., WOBURN, MA

CHEMICALS
AQUATIC DYES
AQASHADE INC., ELDRED, NY
DOLVE/Rochester MIDLAND, ROCHESTER, NY
PRECISION LABORATORIES, NORTHBOURG, IL

AQUATIC HERBICIDES
APPLIED BIOCHEMISTS INC, MEQUON, WI
CIBA-GEIGY CORP., GREENSBORO, NC
DOWELANCIO PRODUCTS, INDIANAPOLIS, IN
GREAT LAKES BIOCHEMICAL, MILWAUKEE, WI
LESCO, ROCKY RIVER, OH
MONSANTO CHEMICAL CO., ST. LOUIS, MO
PNWELL CORP., PHILADELPHIA, PA
UNIRoyal CHEMICAL, MIDDLEBURY, CT
VALENT USA CORP, WALNUT CREEK, CA

BIOSTIMULANTS
AGRI-MART, INC., HUSTON, FL
BIO-TURF, HILTON HEAD, SC
EMERALD ISLE LTD., ANN ARBOR, MI
RINGE MFG. CORPORATION, MILWAUKEE, WI
ROOTS, INC., NEW HAVEN, CT
SOIL TECHNOLOGIES CORP, FAIRFIELD, IA

FERTILIZERS
C P CHEMICALS CORP., GREAT MEADOWS, NJ
DOW CHEMICAL USA CORP., JACKSONVILLE, FL
EMCOORD., LANCASTER, PA
JWP TURF, ELLICOTT, NY

TARP ROLLER
TARP MACHINE, CHADRON, OH

TRACTORS
ALLIS CHALMERS, MILWAUKEE, WI
ARIENS, BRILLION, WI
BOLENS CORP., PT. WASHINGTON, WI
BUNTON MFG CO, LOUISVILLE, KY
CATERPILLAR, PEORIA, IL
FORD NEW HOLLAND INC., NEW HOLLAND, PA
GRAVELY INTL. SYSTEM, CLEMMONS, NC
INGERSOLL EQUIPMENT CO., WINNEMUCA, NV
I & I CASE COMPANY, MILWAUKEE, WI
JACOBSON/TEXTRON, RACINE, WI
JOHN DEERE IND. EQUIP CO, MOLINE, IL
KIOTI TRACTOR CO., PORTLAND, OR
KUBOTA, COMPTON, CA

VERTICUTTERS, THATCHERS
BLUEBIRD INT, ENGLEWOOD, CO
BRIDGWATER TURF LTD, OTTAWA, ON, CANADA
CUSHMAN/RANSOMES, LINCOLN, NE
DANZI MFG. CO., CHICO, CA
HANIN ING, EVANSVILLE, IN
HAko INTERNATIONAL, VIRGINIA BEACH, VA
JACOBSON/TEXTRON, RACINE, WI
JOHN DEERE IND. EQUIP CO, MOLINE, IL
LELY PACIFIC, ALBANY, OR
LESSCO, ROCKY RIVER, OH
MOLDUS T SYSTEMS, OTTAWA, ON, CANADA
NATIONAL MOWER CO., ST PAUL, MN
OLATHE MFG CO, INDUST AIRPORT, KS
PARKER SWEEPER, SPRINGFIELD, OH
RANSOMES INC, ELM GROVE, WI
ROSEMANN MOWER, GLENVIEW, IL
SALSCO, CHE什IRE, CT
SNAPPER POWER EQUIPMENT, MC DONOUGH, GA
TORO COMPANY, MINNEAPOLIS, MN

Turf Source Book
DRIP, TRICKLE, LOW-FLOW

AGRI FIRM IRRIGATION PROD. INC., FRESNO, CA
EFCO INC., NORTH HOLLYWOOD, CA
ENTEK CORP., GRAPEVINE, TX
MOISTURE SYSTEMS, ORLANDO, FL
PEFCO EXTRUDED PRODUCTS, FRESNO, CA
RAIN BIRD (GOLF DIV.), GLENDALE, CA
SALCO PRODUCTS INC., HAWTHORNE, CA
SENNINGER IRRIGATION INC., ORLANDO, FL
THAYER IND INC., DUNDEE, FL
UNDERGROUND IRRIGATION SYSTEM INC., OVERLAND PARK, KS

FILTERS

AMID USA, VAN VUIJS, CA
ANGEWAL CORP., PENNSAUKEN, NJ
CHEMIGATION SYSTEMS, MONTEGO, WA
INJECT-O-METER, CLOVIS, NM
PERFECTION SPRINKLER CO., ANNA ABOR, MI
PUMPING SYSTEMS, INC., DANVILLE, TX
SYNCHROFL, ICN., NORCROSS, GA
VU FLOW FILTERS, SATELLITE BEACH, FL

INJECTION PROPORTIONERS

AMID USA, VAN VUIJS, CA
AQUATROPS CORP., PENNSAUKEN, NJ
CHEMIGATION SYSTEMS, MONTEGO, WA
INJECT-O-METER, CLOVIS, NM
J. FEDELMAN COMPANY, LEWISVILLE, TX
KALT, INC., OVERLAND PARK, KS
KASTEN TURF CORP., PHOENIX, AZ
LESKO, ROCKY RIVER, OH
M & MEER INJECTOR CORP., BAKERSFIELD, CA
NATIONAL TURF SYSTEMS INC., STAFFORD, TX
OASIS WAY, SANTON, WA
OPTI-GRO, DALLAS, TX
PUMPING SYSTEMS, INC., DALLAS, TX
S&S WEST MFG. CO., RICHLAND, WA
TFS SYSTEMS, SANTAN, CA
TRICKLE SOAK SYSTEMS, SANTAN, CA

IRRIGATION, OTHER

3M ELECTRICAL PRODUCTS, ST. PAUL, MN
AGRICULTURAL PRODUCTS INC, SUN VALLEY, CA
AMERICAN MARKING CORP., OHAM, NE
AMETEK, SHEBOYGAN, WI
BARON Controls, CLEVELAND, CA
BATROW, SHORT BEACH, CT
BRIAN R. WHITE, UANKIA, CA
CARNON INDUSTRIES, LA VERNE, CA
CROS BROTHERS, COMMERCE, CA
DATA INDUSTRIAL, POCATELLA, UT
GEORGE FISHER SIGNET, TUSTIN, CA
GRISWOLD CONTROLS, IRVINE, CA
HIT PRODUCTS CORP., LISBY, ND
I P S WILD-ON, CLEVENCIA, CA
PEREGRINE INDUSTRIES, SBURG, WI
PERFECT SPRINKLER CO., ANN ARBOR, MI
PUMPING SYSTEMS, INC., DALLAS, TX
SPINX CORP., BAKERSFIELD, CA
SYNCHROFL, ICN., NORCROSS, GA
VU FLOW FILTERS, SATELLITE BEACH, FL

MOISTURE SENSORS

AQUATERRR INSTRUMENTS, FREMONT, CA
CAI.SENSE CORP., CARLSBAD, CA
CONSULTATION TECHNOLOGIES, WESTERVILLE, OH
CNP CORP., MARTINEZ, CA
GLEN HILTON PRODUCTS INC., RICHBORO, VA
GRISWOLD CONTROLS, IRVINE, CA
IRRMETER CO., RIVERSIDE, CA
KASTEN TURF CORP., PHOENIX, AZ
SYSTEMIC IRRIGATION, COSTA MESA, CA
TURF-TEC INTEGRATION, OAKLAND PARK, FL
WATER CONTROL SYSTEMS, CLAREMONT, CA

PIPE & FITTINGS

AGRICULTURAL PRODUCTS INC, SUN VALLEY, CA
AMERICAN PUMP CO., PHOENIX, AZ
BROWNLIN EN PIPES, INDUSTRY, CA
CAMSCO FOUNDRY/LAWLIFE, AZUSA, CA
CANS-TEX INDUSTRIES, MINNEAPOLIS, MN
DURA PLASTIC PRODUCTS, BEAUMONT, CA
INTERLOCK/PINNICK ENR, CLOVIS, CA
KING BROS INDUSTRIES, VALENCE, CA
LASCO INDUSTRIES, ANAHEIM, CA
MOISTURE SYSTEMS, GLASTONBURY, CT
NIBCO, ILHART, MI
NORTHCO T & ASSOC., SAN CLEMENTA, CA
P.E. SALES, GRAND RAPIDS, MI
PEFCO EXTRUDED PRODUCTS, FRESNO, CA
RAIN BIRD (GOLF DIV.), GLENDALE, CA
SPEARS MFG. CO., SYLMA, FL
SUBMATIC IRRIGATION SYSTEM, LUBBOCK, TX
TOKO IRRIGATION (GOLF), RIVERSIDE, CA
WEATHER-MATIC/TELSCO, DALLAS, TX

PUMPING SYSTEMS

AGAUTURF INC., JACKSONVILLE, FL
BERKELEY PUMPS, DELAVAN, WI
BEST EQUIPMENT, ADDISON, TX
CARR ILLI PUMPS, HOUSTON, TX
COM. PUMP SERVICE, SWANTON, OH
CORNELL PUMP CO., PORTLAND, OR
HYPRO INC., NEW BRIGHTON, MN
PUMPING SYSTEMS, DALLAS, TX
SYNCHROFL, ICN., NORCROSS, GA
WATERTEC, GROVE, WI
WESTERN PUMPING SYSTEMS, CHANDLER, AZ

REPAIR PARTS

AMERICAN IRRIGATION REPAIR, FREMONT, CA
ARCO PARTS, PLEASONTON, CA
RAINBOW IRRIG. CONTROLS, HOLLY HILL, FL

SPRINKLER HEADS

AMERICAN IRRIGATION REPAIR, FREMONT, CA
CAMSCO FOUNDRY/LAWLIFE, AZUSA, CA
CHAMPION SPRINKLER EQUIP., LOS ANGELES, CA
EFCO INC., NORTH HOLLYWOOD, CA
HARDIE IRRIGATION, LAGUNA NIGUEL, CA
HUNTER INDUSTRIES, OAKLAND, CA
IN TRAL UNDERGROUND SPRINKLER CO., LENEXA, KS
IRRIDELCO DRIP DIV, FRESNO, CA
J & R NELSON CORP., PERRIS, CA
LAWNLIFE BY CERES, AZUSA, CA
RAIN BIRD (GOLF DIV.), GLENDALE, CA
RAINMASTER, SIMI VALLEY, CA
RICHDEL/GARDENAMERICA, CARSON CITY, NV
SENNINGER IRRIGATION INC., ORLANDO, FL
TOYO CONTROLS, VALENCE, CA
THOMPSON MFG CO., CHINO, CA
VALCON IRRIGATION, S FLA, MONTE, CA
WEATHER-MATIC/TELSCO, DALLAS, TX
WILKINS REGULATOR DIV., PASO ROBLES, CA

WEATHER STATION

AQUA ENGINEERING CO., PORT COLLINS, CO
CHAMPION SPRINKLER EQUIP., PHOENIX, AZ
RAIN BIRD (GOLF DIV.), GLENDALE, CA
SPECTRUM TECH. INC., PLAINTFIELD, IL
TMI INC., LAKE OSWEGO, OR
TOKO IRRIGATION (GOLF), RIVERSIDE, CA

Materials and Supplies

ABSORBENTS/SOIL

AGLUKO AGR PRODUCTS, CONOES, NY
ARCO CORP., PHOENIX, AZ
AMCOR, DEERFIELD, IL
AMERICAN COLLID, ARLINGTON HTS., IL
ANDERSONS, MAUMEE, OH
BROADLEAF CAPS, INC., SAN DIEGO, CA
CHEMEDAL, PALATINE, IL
EXCEL MINERAL CO., INC., GOLETA, CA
HYdrop RESOURCES SOUTHWEST, MESA, AZ
INDUSTRIAL SERVICES, INC., BRADENTON, FL
INTERNATIONAL ABSORPTION PROD., SMITHTER, VA
ISOTIE/INNOVA CORP., WESTMINSTER, CO
RM CHEMICAL, CLEVELAND, OH
OIL-DRI CAPS, INC., FORT WALTON, FL
PIONEER MFG. CO., CLEVELAND, OH
SPORTSFIELDS INC., BLUE ISLAND, IL
STOCKHAUSEN, INC., GREENSBORO, NC
TURF-TEC INTEGRATION, OAKLAND PARK, FL
WESTERN POLYACRYLAMIDE, INC., CASTLE ROCK, CO

ARTIFICIAL TURF SURFACES

ALL PRO ATHLETIC SURFACES, DALLAS, TX
ASTROTURF IRONICS, INC., ST. LOUIS, MO AND DALTON, GA
BALSAM AMERICA SPORTS FACILITIES, ST. LOUIS, MO

FRANK D. SMITH & ASSOC., PALATINE, IL
KIFCO/AG RAIN, HAVANA, IL
LARCHMONT ENGINEERING, LEBRON, MA
LESIO, ROCKY RIVER, OH
PIONEER MFG. CO., CLEVELAND, OH
RAIN FOR RENT, BAKERSFIELD, CA
VALMONT INDUSTRIES, VALLEY, NE

VALVES

BERMAID, ANAHEM, CA
BUCKNER, FRESNO, CA
CHAMPION SPRINKLER EQUIP., LOS ANGELES, CA
GRISWOLD CONTROLS, IRVINE, CA
HARDIE IRRIGATION, LAGUNA NIGUEL, CA
HERSEY PRODUCTS, PHOENIX, AZ
HIT PRODUCTS CORP., LINDSDAY, KS
IMPERIAL UNDERGROUND SPRINKLER, LENEXA, KS
LAWNLIFE BY CERES, AZUSA, CA
QUICK RAIN, MIAMI, FL
RAIN BIRD (GOLF DIV.), GLENDALE, CA
RAINMASTER, SIMI VALLEY, CA
RICHDEL/GARDENAMERICA, CARSON CITY, NV
SENNINGER IRRIGATION INC., ORLANDO, FL
SUPERIOR CONTROLS, VALENCE, CA
THOMPSON MFG CO., CHINO, CA
TOKO IRRIGATION (GOLF), RIVERSIDE, CA
VALCON IRRIGATION, S FLA, MONTE, CA
WEATHER-MATIC/TELSCO, DALLAS, TX
WILKINS REGULATOR DIV., PASO ROBLES, CA

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