SEED CROP *from page 8*

rocketed," Pepin says. The high demand and low supply forces seed prices up. "When the '87 crop comes in, hopefully it will be a better situation and mean lower prices."

Pepin's predictions include:

- limited availability of Kentucky bluegrass;
- fair availability of fine fescue;
- fair availability of perennial ryegrass;
- fair to good availability of turf-type tall fescue; and
- fair to poor availability of creeping bentgrass.

Although more creeping bent is being grown than in the past, the demand is much higher. "More golf courses are using creeping bent in their fairways and more Southern states are using it than ever before," Pepin says.

Pepin spoke at the Reinders Turf Conference in Milwaukee, Wisc.

TURF

Proper soil testing procedures are an art

Soil tests should be done at the same time each year, according to Dale Kinney of Harris Labs. That way, testing history can be charted for trends in the turf area.

Kinney says the size of the sample depends on the type of area that you are testing. Kinney says to avoid non-representative areas when picking a sample.

Soil tests are necessary to determine nutrient levels, soil characteristics and problems. Collect samples with a stainless steel probe in a plastic pail. Always remove the thatch layer.

- To sample greens, Kinney recommends taking 10 to 12 cores up to three inches deep.
- For fairways, send 10 to 15 cores up to three inches deep.
- For rights-of ways or park areas, send 15 to 30 cores up to six inches deep.
- For lawns, send 10 to 15 cores up to three inches deep.
- For shrub and hedge areas, send 10 to 15 cores up to six inches deep.

Kinney says to always know the laboratory procedures and methods being used.

Kinney spoke at the Reinders Turf Conference in Milwaukee, Wisc.

TREES

Nicks and salt are bane of urban trees

The way to keep trees healthy is to avoid extremes, but that's impossible in a city atmosphere. The Morton Arboretum in Chicago is researching ways to make trees more adaptable to urban settings.

George Ware, Ph.D., dendrologist at the arboretum, says trees need to be selected to tolerate urban stress. Beyond that, certain cultural practices can help.

Ware recommends relieving "people pressure" by placing barriers around the trees. Mulching helps by keeping lawn mowers away from the tree's trunk.

"One nick on a two-inch tree will be with the tree for life and will shorten its life," Ware says. "For a young tree a nick is a large part of the circumference."

Another major problem with urban trees is the salt spread on expressways which gets splashed on trees and soil. Salt-tolerant trees, such as the hackberry, must be chosen.

Trees should be inspected to make sure the trunk isn't being wasted under the soil. Roots need room to grow freely. "We suggest digging trenches to allow space for roots to grow," Ware says.

continued on page 14

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TURF TYPE TALL FESCUE

INDUSTRY NEWS *from page 12*

Imitating forest conditions helps urban trees. "Whoever heard of grass in a forest?" Ware asks. Most trees aren't used to living in turf.

Looking at the overall landscape situation should be a priority. Trees should be native to the region or to a part of the world with a similar climate.

Ware spoke at the Landscape Expo in Chicago, Ill.

ASSOCIATIONS

Breeders group formed to help seed growers

The Turfgrass Breeders Association has been formed to collect and distribute breeding data to educate growers and distributors on plant variety protection (PVP) laws. The group also intends to police PVP infractions.

"Our membership is the 'Who's Who' of the turfgrass breeding industry," says John Rutkai, association president. "With names like Dr. Jerry Pepin, Dr. Reed Funk and Dr. Bill Meyer, we have established credibility and clout.

"PVP laws were intended to protect and reward developers of improved turfgrass varieties," Rutkai adds. "Some sellers could be bypassing the certification and/or royalty programs."

For a better seed industry: left to right, Dr. Jerry Pepin, John Rutkai and Dr. Bill Meyer.

One of the first projects the association will be to investigate is variety-not-stated (VNS) perennial ryegrass trading. The association will act as a fact-finder, investigating suspect seed and presenting conclusions. It will be up to the individual breeder to prosecute infringements.

One goal of the association is to develop and implement a system to "fingerprint" turfgrass seeds so that a sample drawn from a suspect source will reveal the actual variety.

"The protection of improved varieties through the Plant Variety Protection Act was a giant step in turf breeding," Rutkai notes. "Now we want to put teeth into the law."

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COVER STORY

...TO THE LAST DROP

A diminishing water supply is forcing the green industry to take a hard look at conservation and alternative sources of water for irrigation.

by Jeff Sobul, assistant editor

Water. It is a resource we have long taken for granted. But like the Great Plains buffalo in the 19th century, it is one we can also drive to near-extinction.

Though 70 percent of this planet's surface is covered by water, only one percent of that water is fresh and usable.

Groundwater, our hidden resource, is a major contributor to our water supply. But humans syphon an average of 82 billion gallons of water each day from groundwater, only 61 billion of which is replaced through rainfall and runoff.

We put increasing demands on water resources as the United States modernized this century, and demands will continue to increase into the next.

STOPPING GLUTTONY

The most obvious way to avoid waste is through water management. Millions of gallons can be saved just by adjusting irrigation practices to maximize water efficiency without changing the landscape.

To begin with, stop watering sidewalks, driveways and parking lots by adjusting sprinkler heads.

A Landscape manager must know the water needs of the turf or plant material. Overwatering is common. "By far," says Suzanne Butterfield of the California Department of Water Resources, "landscape plants suffer more from overwatering than from underwatering."

Knowing evapotranspiration (ET) rates (the amount of moisture which is returned to the atmosphere via evaporation from the soil and transpiration through plant leaves) will give the precise amount of irrigation needed, expressed in inches.

The Water Conservation Office of the Denver Water Department, upon request, provides a simple device for converting inches of irrigation into time. Denver's Water Office also announces the ET rate daily. Check local papers or water department offices for ET rates in specific areas.

Increase water efficiency further by adjusting the time when irrigation is done. If it's sunny, 85 degrees with a breeze and the sprinkler system is on, as much water is probably evaporating as is reaching the roots of the turf. Irrigate when the chance of evaporation is at its lowest. "Water between midnight and 10 a.m.," instructs Mike Agnew, Ph.D., of Iowa State University.

"Because of past drought, we only run our water system between 4 p.m. and 10 a.m., with most starts between 10 p.m. and 12 a.m.," says Gary Tollison, highway landscape supervisor for District 7 in California. With less chance for evaporation at this time, more water reaches the plant root zone where it does the most good.

Agnew also recommends deep and infrequent watering. In heavier soil, though, he says "a gradual soaking in short periods is more effective."

Water management also includes finding and developing new sources of water for irrigation. Most of the country's aquifers and surface water supplies are already known. Therefore, developing new sources of water is becoming necessary.

The most promising new source is really an old one: effluent or reclaimed water. The water is recycled, filtered so it can be re-used. Applications so far are limited mostly to golf courses, though this will soon expand. Effluent use is only in its infancy, but a rapid maturation is in the offing.

Researchers say that certain cultural practices will help turf conserve water naturally. The key, says Virgina Tech's John Hall III, Ph.D., is to "maximize root development."

The deeper root system provides more water-drawing potential for the plant. Hall emphasizes using late fall fertalization. At this time, the plant's energies are focused more on root development than shoot development so the nitrogen will work more on that end of the plant. Higher potassium rates are also beneficial, he notes.

Mowing heights can also be adjusted for optimum root devlopment and water efficiency. A higher mowing height helps root devlopment, though height restrictions can come into play on golf courses. There is, of course, a trade-off. The longer leaf blades use more water. Hall says that to keep the use rate constant increase mowing frequency, for home lawns perhaps from once to twice a week.

Thatch is another area of concern. "Thatch is an inefficient water holder," Hall says. Spring aeration and coring prior to periods of limited rainfall, Hall notes, will maximize infiltration.

A SPLASH IN THE FACE

Effective water management will invariably have to go beyond simple adjustment of cultural and irrigation practices. One key will be public education, notes Gene Williamson, superintendent of parks for the North Jeffco Metropolitan Recreation and Park District Parks Department, Arvada, Colo.

Williamson's department has been meeting with citizens and homeowner associations to convince them that low-water landscapes such as xeriscapes (see story page 29) are beneficial. But, Williamson says, "they want nothing but bluegrass in the parks. And that's costing us money. We tell them the grass might not look quite as good, but it's just as healthy."

Waking up a doubting public to the present and future water situation in Denver's semi-arid climate has been difficult at best for the parks people. Williamson notes that when a park planning meeting with a homeowner group occurs, "we ask them what they want, we tell them what they need, and then we compromise."

For now, his district has reduced watering where it can, implemented isolated xeriscapes—low turf, water efficient landscapes—and experimented with more drought-resistant turfgrasses.

Extensive research is being con-

ducted to determine and breed more drought-tolerant and drought-avoidant turfgrass varieties.

"Drought avoidance is actually more important than drought tolerance," says Robert Shearman, Ph.D., of the University of Nebraska. "The plant just doesn't wilt. It avoids wilt symptoms."

Turfgrasses of this variety "maintain adequate water potential with low use rate or get water from the soil better," Shearman says. He adds that Adventure and Mustang tall fescues are the best examples of turf that combine both drought tolerance and wilt avoidance.

Plant breeder Terry Riordan, Ph.D., works with Shearman. He is trying to breed the most water-frugal and hearty plants. One grass variety Riordan is working with is buffalograss, a warm season variety native to the Great Plains. "This (buffalograss) is the area we're most optimistic about now," he notes. "It already has a lot of good characteristics."

Riordan's research project to find low water-use grasses is in the third year of a seven-year project funded by the USGA and GCSAA. Through his work, he has made some major improvements in the buffalo species. The biggest improvement has been in germination time. "A buffalograss burr (which holds the seed) normally requires a year to germinate. We've got that down to three days," he says.

Perhaps the biggest strike against buffalograss in cool-season climates is its dormancy. "Most people don't want the dormant tan color for five to six months of the year," notes Dorothy Borland of The Turf Expert, Denver.

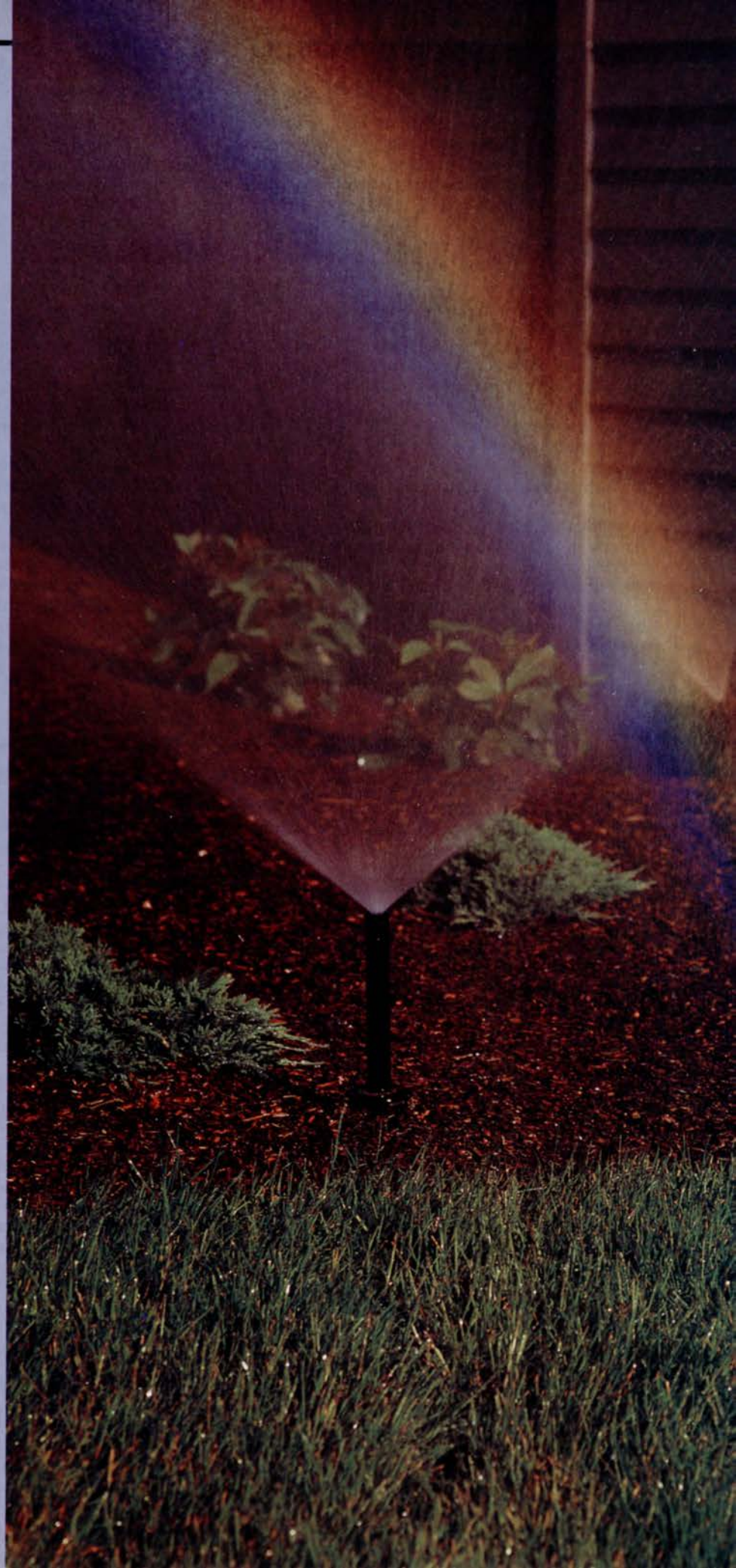
But Riordan sees buffalograss being used in golf course roughs, industrial sites, roadsides and even home lawns. He notes that a couple of lower budget golf courses in Nebraska are actually using buffalograss on fairways.

Another problem with buffalograss is that it is "not very competitive with cool-season grasses" like blue or rye, Riordan explains. However, he says, "applications of simazine at normal rates keep cool-season grasses at bay so buffalograss can propagate."

Riordan believes buffalograss will be able to adapt to the heavier soils of the Southwest, though Florida soils could be a problem because they are rather sandy. In all, he concludes, "I think we've made significant progress."

Further benefit can be gained by implementing native shrubs and trees into the landscape instead of import-

continued on page 20



. . . TO THE LAST DROP *from page 19*

ing less adaptive breeds. Natives tend to require less water after establishment and grow well in local soils. "Natives are emphasized in xeriscaping," notes Cyrus McKell, Ph.D., of Native Plants, Inc., a plant biotechnology firm. He recommends also selecting plants with greater stress tolerance.

According to LANDSCAPE MANAGEMENT research, nearly 52 percent of the magazine's readers are engaged in some form of irrigation. In 1986, readers spent over $101 million on irrigation equipment, $59 million on sprinklers alone.

Expenditures on electronic irrigation controls increased more than $5 million from 1984 figures, to $20.8 million.

"Irrigation will become more computerized and automatic," comments Steve Bock, an assistant golf course superintendent in Papillion, Neb.

"One (advancement) would probably be a control box that could be placed in the office," adds Gregg Wilson, co-owner of Southern Turf, a landscaping/lawn maintenance firm in Goldsboro, N.C. "With it, all systems could be programmed or controlled. This would discontinue any hustling to a site in case of rain during the time set for irrigating."

CHANGING TIMES

"The computer is really the thing that's going to change the irrigation industry," says Vince Nolletti of Buckner, Inc. Adds Tom Fermanian, Ph.D. of the University of Illinois, "Over the next 20 years they will be widely accepted in the industry."

Much of the technology needed for efficient systems exists already, and some of it is not new at all. Computers already run irrigation systems.

Computers can make use of the latest technology that reads the environment. Golf courses can now have weather stations installed as part of irrigation systems. Weather stations monitor atmospheric and ground moisture conditions to determine the evapotranspiration (ET) rate and adjust irrigation rates and timing accordingly (see sidebar below).

Included in weather stations are tensiometers, instruments measuring soil moisture content. Palm Springs, Calif., recently experimented with tensiometers. According to Ronald L. Baetz of the Desert Water Agency, the city took a 6½-acre park served from two irrigation meters, divided it in half and installed tensiometers in one half. For the two-year life of the project, water use was cut by 54 percent on the fitted half, translating into a savings of $11,000, just for that one small area. Not surprisingly, "the city is following a program to retro-fit most of its landscaping with tensiometers," Baetz says.

Edward Hunter of Hunter Industries sees low-cost plastic rotors replacing the fixed heads used today. To use tensiometers effectively, sprinklers must "apply evenly and at an acceptable rate. Most apply too fast for absorption," Hunter says, about 1½ to 2 inches per hour.

These new heads are likely to oper-

continued on page 22

More 'eyes' for turf managers

New irrigation equipment can help turf managers save water, a resource that is becoming increasingly valuable. However, further technical evolution is needed; landscape managers can never have enough "eyes" to help them monitor water usage.

Irrigation manufacturers are taking a hint from these signs of the times by trying to develop sophisticated yet easy-to-use equipment. Not often in irrigation industry have manufacturers generally agreed on marketing plans, but in this instance they do.

Rain Bird Sales of Glendora, Calif., has devised a complete irrigation system which can include weather stations that can calculate probable daily evapotranspiration loss and automatically set the controller so that the correct amount of water can be put back into the turf. The system is called the Maxi ET.

But just because it's almost fully automated, the Maxi ET does not waste the landscape manager's expertise.

"He is the expert," notes Rene Evelyn-Veere of Rain Bird. "The Maxi first draws on his experience because the superintendent or landscape manager can modify the weather station data for specific weather conditions. Then, once the turf manager gets 'tuned into' the system, he can slowly, more precisely replace the water."

The weather station, placed centrally on a golf course for instance, senses temperature, solar radiation, relative humidity and wind speed to calculate the water lost to evapotranspiration over 24 hours. It then subtracts rainfall during the period and, through an IBM PC computer, adjusts irrigation to replace the lost water.

"The user defines ET upload time," notes Evelyn-Veere, "and the system then automatically adjusts the irrigation."

Adds Ed Shoemaker of Rain Bird Golf Sales: "We're finding very few superintendents who have any problem with this concept." If there is a problem, it is trying to get golf course superintendents to think in terms of *inches* of water rather than amount of *time* the system is switched on.

A handy secondary function of the system is that it can switch lights, open gates, operate fountains—virtually anything that has an on-off switch.

Toro's entry is the Network 8000. Its user chooses one of the four ET measurement methods, and that method is used to drive the system, determining each day what amount of water must be dispersed to replace the water lost to ET. The four choices are based on:

(1) Temperature: every Network 8000 satellite has a built-in ability to measure temperature, and ET can be calculated from an equation based on the high and low daily temperature and the area's latitude and longitude;

(2) Solar radiation and other data available from an attached weather station (temperature, wind speed, relative humidity);

(3) Historical ET data: ET data for the last 30 years is available, and if monthly values are assigned, a projection can be made automatically of how much water to apply at a specific time of the year;

(4) CIMIS, California Irrigation Management Information System: a network of 60-plus weather stations around California that daily collect data and feed it to the University of California at Davis, where phone modem access is provided to anyone who wants to use the data for a specific locale.

The Network 8000 is fully automatic, but a key requirement is that all nozzle data be entered into the system's IBM personal computer. With

continued on page 22