

water-use turf species. These include some of the grama grasses (side oats, blackgrama, and bluegrama), some of the lovegrasses, and curly mesquitegrass (*Hilaria belangeri*). Turf-type selections of the latter are being evaluated to see if superior characteristics can be passed on to future generations through seed. This grass is adapted to Texas, New Mexico and Arizona.

2. New irrigation systems have been designed to irrigate turfs more precisely, with less waste. They also offer excellent record-keeping, thanks to micro-chip technology.

Compared to the mechanical clocks used in the past, solid state controllers offer greater versatility in start/stop features and irrigation scheduling options. Some even offer plug-in, plug-out storage chips, which record irrigation station run times for permanent water use records. Many of the new controllers can be hooked up to soil moisture sensors and rain or wind switches.

Weather station networks in many states can provide turfgrass growers with estimates of turfgrass water use based on local weather conditions. Weather stations can calculate a daily atmospheric demand for water, called a reference ET (Ref-ET).

Local researchers can mathematically adjust the Ref-ET value for turfgrass water use. That value can then be used to determine how much to irrigate.

Weather networks are available through the university system. Check with the Division of Cooperative Extension in your state to see if an "ET" program is available.

Irrigation companies now offer weather station and controller packages which calculate the Ref-ET from conditions on the golf course, and then apply irrigation based on the previous day's ET. Added features include flexibility in irrigation scheduling (days on/days off), irrigation amounts (relative to the Ref-ET), automatic data storage, and multiple start/stop cycles which can help prevent further runoff or puddling.

3. Using secondary water is becoming more popular because the use of potable water for landscape irrigation is becoming a sensitive issue—even in places where water supplies are plentiful. This makes a lot of sense since there are generally large amounts of effluent produced daily, and turf is an efficient filter of effluent.

Logistics of having large turf facilities next to water treatment stations need to be worked out to keep costs practical. Users need to be aware that the suitability of the

irrigation water can be determined by a water quality test.

4. Xeriscaping involves five or six principles using landscape plants and groundcovers for water conservation, energy savings, or both. Water catchments, tree and shrub placements for shading and protection, and the selective use of plant materials are part of the program.

Xeriscaping is being developed even in areas which receive large amounts of rainfall.

Original concepts in xeriscape programs called for eliminating turfed areas. But research should be conducted to determine if actual water use of trees in mesophytic or xeriphytic settings have a lower requirement (on a ground basis area) than turfs.

My guess is, some will and others will not.

Pesticides...

by Roch E. Gaussoin, Ph.D., University of Nebraska

■ Many successful landscape operations use pesticides as a necessary component of their programs.

With the 1990s being called "The Decade of the Environment," people in the industry are apprehensive about where pesticides will fit. Yet many indicators point toward a landscape industry which includes continued, though more conscientious, pesticide use.

One aspect of Federal Insecticide,

Fungicide and Rodenticide Act (FIFRA) amendments passed in 1988 is the re-registration of most pesticides. Manufacturers, in addition to new data acquisition, are required to pay a fee to the EPA for re-registration. So it is reasonable to expect that some of the "older" chemicals now available for turf and ornamentals might not survive the re-registration process. The end result will be fewer, but safer, pesticides.

Some future considerations and how they relate to pesticide use:

1. Signs cautioning consumers of a pesticide application are becoming a common sight all over the country. Posting treated lawns is law in eight states, with more possible in the not-too-distant future. It is here to stay; applicators may want to consider posting at their location *before* it becomes mandatory.

Although pre-notification of pesticide-sensitive individuals is law in only one state (Maryland), many states are considering such legislation. This legislation, if passed, would require the notification of individuals who claim to have had allergic reactions to pesticides.

2. Applicator training requirements will probably become more strict. Requirements to become a certified pesticide applicator may involve more frequent and rigorous testing and/or training. Individuals applying pesticides under the direct supervision of certified pesticide applicators may also be required to undergo documentable and verifiable training exercises.

3. Ground and surface water contami-



Monsanto markets a closed application system called Expedite, a backpack sprayer with pre-mixed pesticide containers.

nation and the environmental fate of pesticides will continue to be an important topic. Current research results indicate that application of pesticides to turf may not be detrimental, and—under certain circumstances—actually protect groundwater sources. The United States Golf Association (USGA) has committed over a million dollars for environmental fate research to be conducted in the early '90s.

4. New technology has or is being developed to make pesticide applications safer for humans and the environment. Most chemical companies have divisions or sections solely to target the turf and ornamental market, resulting in products becoming available for use much faster.

Pesticide formulation and packaging has resulted in products which are safer to handle and apply. Many companies package pesticides in pre-measured water soluble packages which dissolve in the spray tank. Not only does this eliminate measurement errors and exposure to the undiluted pesticide, but it solves the problem of pesticide container disposal.

Dry flowable and water dispersible granule (WDG) formulations are also becoming more prevalent. Dry formulations do not contain organic solvents, which can reduce phytotoxicity and odor problems as well as eliminate a potential fire hazard.

Pesticides are also being developed which are less toxic and can be used at lower rates than their predecessors. The net benefit for both the applicator and the environment is obvious.

Other developments which should prove beneficial to the continued use of pesticides include closed delivery systems and returnable pesticide containers. Monsanto markets a closed application system called Expedite, a backpack sprayer with pre-mixed pesticide containers. Applicator exposure is minimized and calibration is simplified. DowElanco has small volume returnable containers (SVRs) which can be returned to the distributor to be refilled. This approach could help alleviate part of the solid waste disposal problem.

5. Integrated Pest Management (IPM) will become more refined in the future, with pesticides.



David Kopec (left), Roch Gaussoin (center) and John Doyle during the Nebraska Turfgrass Conference, at which they gave the speeches these articles are taken from.

Though pesticides, either biological or chemical, will continue to be an integral component in most landscape systems, some changes in how business will be done is inevitable.

Steps landscape managers must consider taking to respond to the market are:

- Stay informed about pesticide risks and benefits and convey this information to clients and other appropriate audiences. Seriously consider joining community associations or non-extremist environmental groups, and become involved in the political process.

- Because product availability, due to the re-registration process, may be questionable, be well trained and informed about industry developments. This will require joining regional and national organizations and attendance at university conferences and field days and industry trade shows.

The outlook for continued pesticide availability is good. It becomes the responsibility of the landscape manager to adhere to federal and state regulations, apply pesticides correctly and judiciously, and be conscious of the environment.

Fertilizers...

by John M. Doyle, Ringer Corp.

■ Glancing into the crystal ball at the future of turfgrass fertilizers is not easy. Who would have predicted 10 years ago that environmental issues would play a significant role in shaping management practices?

However, here are issues to consider:

1. Public perception concerning fertilizers and the environment is being shaped

by information such as the EPA drinking water survey.

The results of the study revealed nitrate contamination in 52.1 percent of community water systems and 57 percent of rural domestic wells. Even though the EPA has not yet determined how much nitrate contamination can be traced to fertilizer use, this information still raises concern among the general public about turf fertilizers.

Issues concerning pesticides have spilled over as concern about exposure to fertilizers. Other issues gain-

ing in public awareness are the closing of landfills or the restriction of materials that can be dumped.

Natural resources like water are no longer generally looked at as "renewable," so modifications in water use will have an effect on the nutritional management of turf.

2. Changes in product technology and management systems are imminent as understanding of plant growth systems increases. Turf managers will become more reliant on data concerning the turf growing environment. Turf management will become more of a science and less of an art.

For instance, in the last 20 years, fertilizer sources have changed from ammonium nitrate and urea to slow-release sources such as various coated ureas and urea formaldehyde reaction products.

3. Synthetic organic fertilizers engineered with turf management practices in mind will continually be developed. For example, recently-released materials provide a season's entire nutritional program in one spring application. Also, fertilizers will have release characteristics specifically based on the growth and development demands of turf. The release patterns of these materials will be more predictable.

With all the environmental pressures the industry is dealing with, public perception still holds that "organic" is safe. This will definitely have an impact on the market, especially the homeowner, as to what types of products are in demand.

Familiarity of materials listed as nutrient sources on packaging (bone meal, blood meal, etc.) also offers relief to consumers about the safe handling of materials.

As a nitrogen source, natural proteins provide slow-release, non-burning nutrition to turf. There exist numerous materi-