Search Intensifies For Water Saving Grasses

By Leah A. Brilman, Ph.D.

In the past decade, the need for learning about water saving grasses has not changed, only intensified. The circumstances that have generated a growing interest in turfgrass water use include: droughts in many areas, increasing demands on a limited available supply, the increasing cost of available water, and a desire for lower maintenance ground covers.

In the past few months I have seen the following water-related news in turf industry publications:

1) A map of the U.S.A. showing areas of moderate to severe droughts covering much of the United States.

2) An article on Las Vegas showing a tripling of population with the same water rights on the Colorado River.

3) A discussion of the cost of utilizing storm run off or effluent on golf courses in California.

4) Numerous articles on buffalograss, zoysia, wildflowers and other species with lower maintenance demands.

The most important development in recent research is that turf water use can be reduced not only by changing the species of grass planted, but by changing the management and the perception of how the turf should look. Much of the water usage of grass is not due to the needs of the grass but due to people.

Superintendents and sports turf managers need to analyze each turfgrass situation to determine how the grass will be used, time of year it will be utilized, turf density necessary, irrigation to be practiced, necessary appearance and environmental conditions before selecting a species and variety of grass to be planted. Many species that have reduced water requirements and/or drought avoidance have winter or summer dormancy periods which may make them unacceptable for some uses. Others may not form the density of turf necessary for heavy use areas but be very acceptable for roughs or other low use sites.

In order for any grass to save water turf managers must modify their irrigation practices and water to the needs of the grass and not by the clock.

Warm-season grasses typically have lower water needs than other species. Although use of many of these species is limited to the extreme southern United States, certain varieties of buffalograss, zoysiagrass and bermudagrass have better cold tolerance and can be used in many other areas of the United States.

Eight-year-old plots in Beltsville, MD, show difference between straight zoysia (R) and a mixture of zoysia and tall fescue (L).

These grasses will go dormant during the winter and have to be overseeded, or established with a companion cool-season grass, if year-long green is necessary or desired.

New, vegetatively propagated varieties of buffalograsses and zoysias have improved quality, establishment and/or reduced maintenance when compared to older material. In addition, improved seeded varieties of all three species are currently being developed or marketed. These will increase the options available for people wanting to use these species.

The National Turfgrass Evaluation Program has just initiated tests of these species to determine the best growing area for each species and variety as well as their maintenance demands. Other species of warm-season grasses are currently under evaluation as potential turfgrasses with reduced water requirements. Many of these are species native to arid or semi-arid areas of the United States.

The USGA/GCSAA Turfgrass Research Program is supporting much of this research with the aim of reducing water use and maintenance costs at golf courses. Dr. Charles Mancino and Andrew Ralowicz are evaluating the potential of curly mesquitegrass (*Hilaria belangeri)* as a desert turfgrass. Drs. Robin L. Cuany and Anthony Koski are developing material of three western adapted species, one of which is a warm season grass, blue grama (*Bouteloua gracilis*). The other two species are native, cool-season grasses, alkaligrass (*Puccinellia* spp.) and fairway crested wheatgrass (*Agropyron cristatum*). The primary research areas on these species, before they can be used as low maintenance turf at many sites, is improvement of seed production, density, color and, in some cases, leaf texture.

Alkaligrass is not very drought resistant and is dormant during hot weather. However, it is salt-tolerant, which may be very important as turf managers use poorer quality water.

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In evaluating cool-season grasses for reduced water use, the climate of the region and pattern of water demand must be considered. In certain areas of the country, water is also used to cool these grasses during summer, so it is not just the water use rate that must be considered.

Tall fescues are known as drought resistant turfgrasses but actually utilize more water (have a higher evapotranspiration or ET rate) than many other cool-season grasses. Their major advantage is their deep root system that allows them to extract water from a much larger soil profile and thus avoid drought. Eventually that soil profile has to be refilled by water through rainfall or irrigation or the plants will go dormant.

In the Pacific Northwest and other areas with only short periods without rainfall and extensive rainfall during other times, tall fescue will stay green all year with no irrigation. Many of the dwarfer types of tall fescue have roots as deep as standard types with reduced rates of top growth and lower clipping yields. Some have shallower roots. These types may be useful in reducing maintenance at some sites and areas of the country.

Sweet vernalgrass next to perennial ryegrass (foreground) at the University of Rhode Island.

Dr. Robert Carrow of the University of Georgia recently noted that in warm humid regions, ET rates are often not the primary determinant of drought tolerance, since most species show low ET rates in these areas.

The key determinant of drought tolerance is actually acid soil tolerance since many of these areas have a very acid subsoil. This subsoil prevents deep root penetration of grass varieties and species without acid tolerance and thus limits their water supply.

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.

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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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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.

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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.

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