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Selecting the for the

Increasing consumption of water for use in home lawns and gardens, golf courses and athletic fields is creating quite a ruckus throughout much of Florida. Ordinances placing square footage restrictions on turfgrass are being drafted by county governments and local municipalities at a dizzying speed, causing great angst in the green industry. Similarly, water management districts are imposing water use restrictions in an attempt to curtail outdoor water usage.

Right Plant Right Place

Assessing Drought Response of Turfgrasses Using a Linear Gradient Irrigation System

By Dr. J. Bryan Unruh

The green industry also has seen companies with savvy marketing practices touting one turfgrass species over another by stating that one uses less water when compared to another. Couple these marketing practices with the incendiary newspaper headlines, such as “The Devil Grass: Water-Hungry St. Augustinegrass Sucking up Fresh Water” and “Thirsty Grass Has Evil Roots”. The end-user, whether they are a green industry professional or a gardening enthusiast, has become thoroughly confused about selecting the right plant for the right place.

Great confusion also exists around the terminology used to define a plant’s ability to handle drought conditions. For the purpose of clarity, “drought resistance” is the ability of a plant to survive prolonged drought stress through drought tolerance and drought avoidance mechanisms.

Drought tolerance occurs when plants either “escape” the drought through life cycle modifications such as entering dormancy sooner or producing seed for regeneration purposes. Plants may also tolerate the drought through cellular

level adjustments, making them hardier.

Drought avoidance occurs when plant factors are modified. For example, certain turfgrass species grow deeper roots or have enhanced root viability. Both of these factors influence soil water uptake. Turfgrasses with deeper roots can mine the water from greater soil depths. Additionally, certain plants have the ability to limit or reduce evapotranspiration (ET) allowing them to avoid drought stress. Factors such as shoot density, number of leaves per unit area, and leaf orientation all affect ET rates. Similarly, leaf width and leaf extension rate contribute to the total leaf area. A larger leaf area equates to a larger evaporative surface and generally equates to greater water usage. When a plant is able to maintain adequate tissue water content, they can avoid or postpone the stress.

Maybe a better phrase to use when talking about the influence of drought on turfgrass is “drought response”. Grasses undergo many changes in response to drought and many of these responses go unnoticed but have a profound effect on the plant’s ability to withstand drought. Some are often very difficult to quantify,



Fig. 1. Prior to the installation of the irrigation system, the topsoil was removed to a depth of 12" and stockpiled.

while others are readily observed and easily quantified. With this in mind, and the fact that little or no field research has documented which turfgrass actually performs best under drought conditions, we initiated a project to gain a better understanding of the drought response of the major turfgrass species and cultivars grown in Florida.

LGIS Construction

A Linear Gradient Irrigation System (LGIS) was constructed at the University

of Florida, West Florida Research and Education Center near Pensacola, FL. The system was modeled after a system designed and installed at Texas A&M University by Dr. Milt Engelke. The LGIS is designed as a triple row irrigation system with the central line having an irrigation headspacing equal to 33% of the throw of the irrigation heads.

This spacing allows for considerable overlapping from head to head and ensures uniform distribution of water perpendicular to the irrigation line. The outer two rows of irrigation heads were triangulated to the central head of the center trench. The LGIS measures 160' wide (80' on either side of the center irrigation line) and 750' in length. The irrigation lines were aligned according to prevailing winds to minimize cross winds that influence irrigation uniformity. During the research phase, the outer rows of heads are not used. The outer heads were used only during the establishment period to ensure uniform plot establishment.

Prior to the installation of the irrigation system, the topsoil was removed (12" depth) and stockpiled using heavy equipment (Fig. 1). The subgrade was laser-leveled and shaped to provide 5" drop from the outside inward to ensure



Fig. 2. The subgrade was laser-leveled and shaped to provide 5" drop from the outside inward to ensure all surface water flows to the center as evidenced during the rain event.

all surface water flows to the center (Fig. 2). After the subgrade was established, the topsoil was replaced, and the final grade was established using a laser-level.

Starting the week of September 9, 2008, twenty-seven commercially available turf cultivars were planted on 10' X 80' plots perpendicular to the line of the irrigation heads (Fig. 3). This allows for the comparative performance of each of the grasses under very high water application (center of the LGIS) to the outer edge which receives no supplemental irrigation. All of the sod and shipping costs were donated by sod producers from Florida, Alabama, Georgia, South Carolina and Texas. The mammoth logistics efforts of getting all the sod delivered in a timely manner was facilitated by Ms. Betsy McGill, Executive Director of the Florida Sod Growers Cooperative.

An additional thirty turfgrass breeding lines (African bermudagrass, zoysiagrass, carpetgrass, and centipedegrass) from Dr. Kevin Kenworthy's program were plugged on 18" centers (Fig. 4).

Drought conditions early this year afforded us the opportunity to start collecting some field data (Fig. 5). Because of seasonal and annual variations in climatic conditions, conclusive results from this research will not be available for several years.

For more information on this project or others conducted by Dr. J. Bryan Unruh, please contact him at jbu@ufl.edu.



Fig. 3. Twenty-seven commercially available turf cultivars were planted on 10' X 80' plots perpendicular to the line of the irrigation heads.



Fig. 4. Turfgrass breeding lines (African bermudagrass, zoysiagrass, carpetgrass, and centipedegrass) from Dr. Kevin Kenworthy's program were plugged on 18" centers on the LGIS.



Fig. 5. A dry period in June 2009 allowed for some initial data collection from the turfgrass cultivars planted on the LGIS.

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