



### Parched Earth: Effects of the Historic Texas Drought

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### Outline



- I. 2011 Texas Drought
- II. Effect on Turfgrass/Golf Industry
- III. Unique Environment West TX
- IV. University Research





### 2011 Drought - Texas



- Most severe one-year drought on record
- July 2011 was the warmest month ever
- Billions of dollars in agronomic damages
- 3500 square miles lost from wild fires





### 2011 Drought - Texas

### **2011 Precipitation (Jan. – Sept.)**

- Lubbock 1.1 "
- El Paso 0.1 "
- Amarillo 1.1 "
- Midland 0.1 "
- Pecos 0 "
- San Angelo 2.9 "

- (Normal 7.1 ")
  - (Normal 2.4 ")
  - (Normal 9.4 ")
  - (Normal 5.6 ")
  - (Normal 4.2 ")
- 2.9 " (Normal 10.2 ")





### 2011 Drought - Texas



### <u>July – Record Temperatures</u>

- Amarillo 111 F
- Childress 117 F
- Lubbock 112 F
- Midland 111 F
- San Angelo 108 F
- Wichita Falls 111 F
- San Antonio 104 F
- Dallas 104 F

(14 days above 100)

(18 days above 100)
(20 days above 100)
(24 days above 100)
(26 days above 100)
(7 days above 100)
(7 days above 100)



**Empty stock tank at a ranch in Manor, TX** 





**Ranchers forced to sell starving cattle at auction – Fredericksburg, TX** 



#### 175-Acre Dry-land Cotton Farm in Garfield, TX



#### Hundreds of acres of corn destroyed in Round Rock, TX



#### Every county in TX had a ban burn in effect at one point



**Over 3500 square miles were burned by wild fires** 





**Boat docks are unusable at Lake Travis** 



#### **Cypress Creek arm of Lake Travis**







### **Drought Associated Damage**

- Turfgrass death/reduction in aesthetics
- Shrinking and swelling of clay

   Pipe breaks, misaligned heads, cart path cracks
- Bird and burrowing animal damage
- Loss of ornamental plantings
- Spending next years budget this year
- Increase in course fees













### Managing Turf During Drought

- Syringing greens and tees
  - Use of wetting agents
- Provide just enough water to keep turf in fairways and roughs alive
- Use water bags for trees
- Manage salt issues through gypsum applications and flushing
- Significant golf cart restrictions







### **Transition Zone**







### West Texas

- Unique Environment
  - Hot summers
  - Cold winters
  - Low humidity
  - High soil pH
  - Low annual rainfall
  - Salinity
  - Gusting winds













### **Utilized Turf Species**

- Cool-season grasses

   Tall Fescue
   Hybrid Bluegrass

   Warm-season grasses

   Bermudagrass
  - (common and hybrids)
  - Zoysiagrass
  - Buffalograss







### Seashore Paspalum (Paspalum vaginatum)

- Medium to fine textured rhizomatous and stoloniferous warm-season grass
- Good heat, drought, and salt tolerance
- Limitations:
  - Cold tolerance,
     disease pressure





### **Seashore Paspalum Collection**

- October 2010 trip to Guana Island – BVI
- Tropical Dry Forest

   15 inches/year
- Presence of Seashore Paspalum documented in 1960s
- 15 accessions taken from 3 regions of the island

















### **Buffalograss Breeding**

- Stoloniferous warmseason grass
- Good heat, drought, and cold tolerance
- Low fertility requirement
- Limitations:
  - Shade tolerance and recuperative capacity



### Tall fescue

- Primary cool-season grass used in the transition zone
- Good heat, drought, and salt tolerance
- Collaboration with Dr. Bill Meyer, RU
- Evaluation of new germplasm for increased drought, heat, and salt tolerance



# Establishment



### Bermudagrass Establishment

- Common bermuda establishment from plugs
- Fertilizer + soil amendments





### **Root and Shoot Weight 4 MAP**





### Bermudagrass Establishment

- Common bermuda establishment from seed
- Fertilizer + soil amendments





### **Root and Shoot Weight 2 MAP**



### **Common Barley – 1 MAT**

Henry et al. 2012. Crop Sci. Soc. of Am.



### **Mulching Media**

- 1 million tons of cotton gin trash produced yearly
- High temps. and gusting winds complicate establishment from seed



**Buffalograss establishment from seed** 

Henry et al. 2009. Crop Sci. Soc. of Am. Cooper et al. 2011. Southern Weed Sci. Soc.



#### **Buffalograss – No Mulch**

#### **Buffalograss – Wheat Straw**



#### **Buffalograss – Gin Trash**



#### **Buffalograss – Hydro-mulch**



# Turfgrass Water Consumption

### **Importance of Water-use Efficiency**

#### • Water restrictions

- Imposed (County or City)
  - When, how much, source, cultivar or species, etc.
- Drought
  - Short-term or long-term
- Limited water supply
  - Sources decreasing in size and availability
- Water quality
  - Salinity, contaminants, etc.







### **Materials and Methods**

- Location: Quaker Research Farm, Lubbock, TX
- Soil Type: Brownfield Sandy Clay Loam
- Experimental Design: Split plot
  - Irrigation main plot
  - Mixes/blends subplots
  - 3 replications



Henry et al. 2010. Crop Sci. Soc. of Am. 55:72-1

### **Materials and Methods**





# 2 MAIT



# Pest Management

### Spring Dead Spot (SDS)

- Casual agents: – Ophiosphaerella spp.
  These fungi grow most actively in spring and fall
- Infect roots, rhizomes, and stolons





### Spring Dead Spot (SDS)

- Infections reduce bermudagrass tolerance to freezing temperatures
- Severe pressure in the transition zone
- SDS is typically enhanced by high soil pH



### **SDS Chemical Control - 2009**

- Initial applications on 9/11/2008
- Sequential applications on 10/10/2008
- Fungicide Treatments:
  - Rubigan fb Cleary's 3336 4 fb 4 fl oz/1000 ft<sup>2</sup>
  - Rubigan + Cleary's 3336 x2 4 + 4 fl oz/1000 ft<sup>2</sup>
  - Rubigan + Cleary's 3336 x2 4 + 6 fl oz/1000 ft<sup>2</sup>
  - Rubigan + Cleary's 3336 x2 2 + 6 fl oz/1000 ft<sup>2</sup>

### **SDS Chemical Control - 2009**

4/28/2009



# **SDS Chemical**

**Control - TTU** 



### **SDS Chemical Control - 2010**

- Initial applications on 9/15/2009
- Sequential applications on 10/13/2009
- Fungicide Treatments:
  - Rubigan fb Cleary's 3336 4 fb 4 fl oz/1000 ft<sup>2</sup>
  - Rubigan + Cleary's 3336 x2 4 + 4 fl oz/1000 ft<sup>2</sup>
  - Rubigan + Cleary's 3336 x2 4 + 6 fl oz/1000 ft<sup>2</sup>
  - Rubigan + Cleary's 3336 x2 2 + 4 fl oz/1000 ft<sup>2</sup>
- All treatments applied with Grounded at 1.5 GPA

### **SDS Chemical Control - 2010**

#### 4/23/2010



Beck et al. 2010. Crop Sci. Soc. of Am.

### Rubigan + Cleary's 3336 $-4 + 6 \text{ fl oz}/1000 \text{ ft}^2 \text{ x2}$

+ Grounded

### 4/23/2010

# SDS Chemical + Cultural Control



### **Cultivation + Fungicides**

- Cultivation Treatments
  - Aeration
  - Verticutting
  - Aeration + Verticutting
  - No Cultivation
- Fungicide Treatments

   Torque 0.6 fl oz/1000 x2
   Rubigan 4 fl oz/1000 x2
   Applied Aug. fb Sept.





### **SDS Control – Fungicides + Cultivation**



Beck et al. 2011. Crop Sci. Soc. of Am.

## **Cultivation + Fungicides Trial 2011**



#### **Predicted Drought of 2022**

# **Questions?**