Turf Management Update

Grady L. Miller
North Carolina State University
Using Tall Fescue in North Carolina

• Even though tall fescue is the cool-season grass best adapted to the transition zone and the upper to mid-South, it is nonetheless a cool-season grass being used in the southernmost area of its adaptation. Its heat and drought tolerance are good for a cool-season grass, but still not as good as those of the warm-season grasses.
Alternatives to Tall Fescue in Charlotte Area

• Mixture: Tall fescue & Kentucky bluegrass.
• Bermudagrass
• Zoysiagrass
Cultivar Performance in North Carolina

<table>
<thead>
<tr>
<th>Very Good</th>
<th>Good</th>
<th>Fair</th>
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<tr>
<td>Adventure II**</td>
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<td>Lancer</td>
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<td>Marksman**</td>
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<td>Mini-Mustang</td>
<td>Finelawn</td>
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<td>Phoenix***</td>
<td>Finelawn 5GL</td>
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<td>Rebel 3 D</td>
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<td>Safari</td>
<td>Jaguar II ***</td>
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<td>Shenandoah***</td>
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<td>Southern Choice**</td>
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<td>Tarheel</td>
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<td>Taurus***</td>
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<td>Thoroughbred</td>
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<td>Tomahawk</td>
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**Indicate superior performance in the Mountain Region

*** Demonstrated good drought tolerance based on greenhouse studies
Objectives

- To evaluate new cultivars for improved drought tolerance.
- To evaluate drought recovery response.
- We already know how these grasses perform under well-watered conditions and how they response to disease pressure.
Set-up

• All cultivars were planted in the same rootzone material in the same container so each would have the same soil moisture.
• To evaluate drought recovery response, water was withheld.
• To test for recovery, containers were re-wet at day 24, 34, 41, 48, and 55 in summer ‘07 and 64, 88, 126, 137, and 158 in spring ‘08.
Day 25
Day 56

1 = 24
2 = 34
3 = 41
4 = 48
5 = 55
Day 80

1 = 24
2 = 34
3 = 41
4 = 48
5 = 55
**Tall Fescues Evaluated – run 1**

Recovery Ranking (does not consider quality)

<p>| | | |</p>
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<td>56</td>
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<td>Six point</td>
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<td>52</td>
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<td>Firebird</td>
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<td>53</td>
<td>4</td>
<td>Rembrandt</td>
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<td>46</td>
<td>5</td>
<td>ATM***</td>
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<td>PST-R5EP</td>
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<td>45</td>
<td>5</td>
<td>Avenger</td>
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<tr>
<td>48</td>
<td>5</td>
<td>Da Vinci</td>
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<tr>
<td>45</td>
<td>5</td>
<td>Scorpion II</td>
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<tr>
<td>45</td>
<td>5</td>
<td>Turbo</td>
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***removed for run 2***
Evaluation of ET-Based and Soil-Moisture Based Irrigation Control in Turf

Grabow, Bowman, Miller

- Treatments: schedule irrigation using two irrigation control technologies---based on ET or soil moisture sensor
- Tmt: Standard time-based irrigation schedule
- Tmt: irrigation frequency---1, 2, 7 days per wk
- Tmt: on-demand, 2-point soil moisture control

- Data: water applied and turf quality
Model CS3500 Water on Demand Irrigation Controller

Acclima
Closed Loop Irrigation Control

- Soil Moisture Sensors
- Manual Programs
- System Pause
- Event Pause
- Advanced Settings
- Set Date and Time
- Daily Restrictions
- Hourly Restrictions
- 2-Wire System Devices
- Add / Remove
- Master Valve
- Flow Control

Zone Configuration / Manual Watering

www.acclima.com
Summary

• In 2007, a dry year, frequency resulted in a difference in water amounts (1 day-less to daily-most).
• Two set-point soil moisture sensor produced high quality turf and maximized water efficiency.
• ET sensor followed weather trend and produced high-quality turf but applied more water than needed.
Best Irrigation Advice
--- Conservation Minded ---

• [www.turffiles.ncsu.edu/TIMS](http://www.turffiles.ncsu.edu/TIMS) for managing your irrigation

Or

• know your irrigation output rate, install a wafer-type rain shut-off device, and using extension publication AG-661, set your controller the first day of each month to irrigate at 60% of net irrigation requirement. Adjust up as needed.
<table>
<thead>
<tr>
<th>Month</th>
<th>Mean Temperature(°F)</th>
<th>Average Rainfall</th>
<th>ETP</th>
<th>Gross Irrigation Requirement</th>
<th>Net Irrigation Requirement</th>
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<tr>
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<td>3.72</td>
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<tr>
<td>Feb</td>
<td>44.3</td>
<td>3.65</td>
<td>0.82</td>
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<td>March</td>
<td>51.1</td>
<td>4.39</td>
<td>1.78</td>
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<td>April</td>
<td>60.4</td>
<td>3.19</td>
<td>3.40</td>
<td>1.81</td>
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<td>May</td>
<td>68.6</td>
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<td>June</td>
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<td>3.52</td>
<td>7.11</td>
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<td>July</td>
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<td>3.83</td>
<td>7.67</td>
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<td>3.80</td>
<td>6.92</td>
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<td>Sept</td>
<td>71.8</td>
<td>3.43</td>
<td>5.03</td>
<td>3.32</td>
<td>4.14</td>
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<tr>
<td>Oct</td>
<td>61.1</td>
<td>3.14</td>
<td>2.97</td>
<td>1.40</td>
<td>1.75</td>
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<td>Nov</td>
<td>51.4</td>
<td>3.05</td>
<td>1.40</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Dec</td>
<td>43.3</td>
<td>3.22</td>
<td>0.73</td>
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<td>Total</td>
<td>-</td>
<td>42.14</td>
<td>44.00</td>
<td>26.51</td>
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</table>

7.19 inches ÷ 4 = \( \frac{1.8 \text{ inches}}{\text{week}} \times 60\% = 1.07 \text{ inches per week} \)

\[
\frac{1.07 \text{ inches}}{1.5 \text{ inches/hr}} = 0.72 \text{ hour} \times \frac{60 \text{ min.}}{\text{hour}} = 43 \text{ min} \div 2 = 22 \text{ min. run time}
\]
Zoysiagrass Evaluations

1. Zoysiagrass fertility and mowing height study conducted in Raleigh.
2. Cultivars were established from sod in the summer of 2007.
3. Cultivars of both *Zoysia japonica* and *Zoysia matrella* were used.
Fertility Trial 2008

1. The *Zoysia japonica* cultivars included JaMur, Palisades, Empire, and Ultimate

2. Two different mowing heights were used, 1 inch and 2 inches

3. Mowing was done with a walk behind rotary mower
Fertility Trial 2008

1. The *Zoysia matrella* cultivars included Pristine, Zeon, Cavalier, and Diamond

2. Zorro was established in 2008 and will be included next year

3. Two different mowing heights were used, 0.25 inch and 0.5 inch

4. Mowing was done with a walk behind reel mower
Fertility Trial 2008

1. Fertility treatments were the same for all cultivars

2. The three rates used were 1.5, 3.5, and 5.5 lb N/1000 ft²/year

3. A complete fertilizer (16-4-8) was applied on 4/2/08 at 0.5 lb N/1000 ft² for all plots
JaMur Mowed at 2”
Turf Quality
Palisades Mowed at 2”
Turf Quality
Empire Mowed at 2”
Turf Quality
Ultimate Mowed at 2”
Turf Quality
Pristine Mowed at 0.5”
Turf Quality
Zeon Mowed at 0.5” Turf Quality
Cavalier Mowed at 0.5” Turf Quality
Diamond Mowed at 0.5”
Turf Quality
## Dollarspot

<table>
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<tr>
<th></th>
<th>1.5 lb N/M</th>
<th>3.5 lb N/M</th>
<th>5.5 lb N/M</th>
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<tr>
<td></td>
<td>Short</td>
<td>Tall</td>
<td>Short</td>
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<tr>
<td>JaMur</td>
<td>0.1 bc</td>
<td>0.1 c</td>
<td>0 b</td>
</tr>
<tr>
<td>Palisades</td>
<td>4.9 bc</td>
<td>5.5 b</td>
<td>1.4 b</td>
</tr>
<tr>
<td>Empire</td>
<td>0.1 bc</td>
<td>0 c</td>
<td>0 b</td>
</tr>
<tr>
<td>Ultimate</td>
<td>0.3 bc</td>
<td>0.4 c</td>
<td>0 b</td>
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<tr>
<td>Pristine</td>
<td>6.7 b</td>
<td>4.9 b</td>
<td>3.2 ab</td>
</tr>
<tr>
<td>Zeon</td>
<td>0 c</td>
<td>0 c</td>
<td>0 b</td>
</tr>
<tr>
<td>Cavalier</td>
<td>3.1 bc</td>
<td>2.3 bc</td>
<td>0.7 b</td>
</tr>
<tr>
<td>Diamond</td>
<td>18.3 a</td>
<td>21.3 a</td>
<td>6.2 a</td>
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Cold Tolerance
1st Run

The temperature treatments were nontreated (3°C), -6, -8, -10, -12, -14°C (21, 18, 14, 10, 7 °F)
Zoysia japonica cultivars
5 weeks
Zoysia matrella cultivars
5 weeks
Pristine (l) and Zeon (r)
March 20, 2008
Sprigging Trial 2008

Percent Cover - Week 10
Organic Fertilizers vs. Inorganics

Release Mechanisms

Organics

• Microorganisms breakdown the fertilizer elements into more basic compounds.
• Soil temperature affects the activity levels of microorganisms
  – Cold temperatures = less activity and less breakdown
  – Warmer temperatures = more activity and breakdown
• Microbial activity also influenced by water, oxygen, pH

Inorganics

• Osmosis – moves across membrane due to concentration gradient, e.g., coated fertilizers
• Hydrolysis – interacts with water, e.g., Urea, IBDU
Premise of Organic Study

golf course study on cool-season grass

• 3-year study comparing programmatic approach of from Novozymes, Helena, Plant Food, Nutramax, Griggs Brothers, Emerald Isle, Sustane, and Floratine to 3.5#N, 1.5#P, 3#K, 2#Fe on G-2 Bentgrass with daily traffic.
Summary of Study

• Performance of most of these products is not consistently or substantially different from traditional fertilizer applications.
• A few products offer nitrogen use reductions, but not consistent.
• Some resulted in increased disease incidence.
• Traditional programs always provide acceptable green turf (organic products did not).
• In some cases there were benefits to programs that had a mixture of organic + inorganic products.
Comparison of Fertilizer Equivalents based on 5 pounds of N per year or 215 pounds per acre per year and the “per application” rates

<table>
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<tr>
<th>Equivalent</th>
<th>Urea</th>
<th>Amm sulfate</th>
<th>16-4-8</th>
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<td>Lbs fertilizer per 1000 sq ft</td>
<td>11</td>
<td>24</td>
<td>31</td>
<td>83</td>
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<tr>
<td>Pounds fertilizer per acre</td>
<td>470</td>
<td>1,050</td>
<td>1,361</td>
<td>3,630</td>
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<td>Bags needed for one soccer field per year</td>
<td>20</td>
<td>42</td>
<td>56</td>
<td>146</td>
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<td>Pounds of fertilizer per field per application</td>
<td>188</td>
<td>420</td>
<td>544</td>
<td>1,450</td>
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<tr>
<td>Number of bags per application for field</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>29</td>
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Fertilization Products

• Most N for the $$$
• Slow release if your budget can afford it or if required.
• Quick release N sources most effective way to promote recovery (e.g. ammonium sulfate, ammonium nitrate, urea, calcium nitrate), but should be applied at lower rates.
Information on Weed Management in Issues in Home Lawns provided by Fred Yelverton, PhD
New Herbicides

- Sulfentrazone (Dismiss)
- Dismiss + Prodiamine (Echelon)
- Sulfentrazone + Imazethapyr (Dismiss South)
- Sulfentrazone + Quinclorac (Solitaire)
New Herbicides

- Quinclorac (Drive XLR8)
- Mesotrione (Tenacity)
- Oxadiazon (Ronstar Flowable)
- Quinclorac + MCPP + Dicamba (OneTime)
On 8-10-06, EPA proposed a ban on all current uses of organic arsenicals. Driven by EPA’s finding of:
- Limited benefits and adequate alternatives.
- Potential exposure to inorganic arsenic in drinking water and food.
MSMA update

- January 16 2009: MAA research task force signed agreement with EPA
  - Permits continued use of MSMA in turf
    - Golf courses, sod farms, highway rights of way
    - Newly imposed restrictions
  - Use may continue through 2013 under current agreement
MSMA update

- During 2012, EPA will evaluate scientific information available pertaining to risks posed by inorganic arsenic.
  - Use beyond 2013 may be granted if EPA concludes there is no health concern.
  - EPA will also take into account benefits conferred by MSMA.
The following use sites deleted year-end 2010:

- Residential turf
- Forestry
- Non-bearing fruit and nut
- Bearing- and non-bearing citrus
- Drainage ditch, railroad, pipeline, utility rights of way, fencerows, storage yards, other noncrop areas
MSMA deleted use sites

- The following use sites deleted year-end 2013:
  - Bluegrass, fescue and ryegrass grown for seed

- MSMA (as well as DSMA, CAMA, and DMA) use in Florida will cease year-end 2010 for all uses excluding cotton
Negative interaction with Echelon and urea on ‘Confederate’ tall fescue

Applied 4-25-08. Echelon (0.75 lb ai/a), 46-0-0 (0.5 lb N), 3-way herbicide (3.5 pt), Fe (4-4-5 w/ 6% Fe) 2 oz/M.
Negative interaction with Echelon and urea on ‘Confederate’ tall fescue

14 Days After Treatment

Applied 4-25-08. Echelon (0.75 lb ai/a), 46-0-0 (0.5 lb N), 3-way herbicide (3.5 pt), Fe (4-4-5 w/ 6% Fe) 2 oz/M.
Echelon (0.75 lb ai/a) applied 4-25-08

3 DAT

5 DAT

14 DAT
Echelon (0.75 lb ai) + urea (0.5 lb N/M) + Trimec Classic (3.5 pt) + 6% Fe (2 oz/M) applied 4-25-08
Effect of Mowing Height on Large Crabgrass Incidence

• 3.5 lbs Crabgrass/1000ft$^2$ on March 7, 2007

• Mowing Heights initiated when soil temperatures reached 55°F – Mowed every 4 days thereafter
Effect of Mowing Height on Large Crabgrass Incidence

- Bermudagrass mowing heights
  - 0.5”, 1”, 1.5”, 2.0”

- Tall fescue mowing heights
  - 1”, 2”, 3”, 4”
Effect of Tall Fescue Mowing Height on Crabgrass Incidence

Data Collected: 09-13-07, LSD (P=0.05), Sandhills Research Station, Sodman 90/10 (mixture w/ bluegrass)
Effect of Bermudagrass Mowing Height on Incidence of Crabgrass

Data Collected: 09-13-07, LSD (P=0.05), Lake Wheeler Field Labs
Smooth Crabgrass Control in Tall Fescue

Evaluations collected 09-06-05, 186 DAIT. Treatments applied: Mar 04 and April 28

LSD=30 (P=0.05)
Smooth Crabgrass Control in Bermudagrass

Evaluations collected 09-06-05, 191 DAIT. Treatments applied: Mar 04 and April 28

LSD=16 (P=0.05)
Spraying Glyphosate on Partially (15%) Greened- Up ‘Tifway’ Bermudagrass

Glyphosate sprayed at 33gpa on 3-29-99 with XR11003 nozzles
Spraying Glyphosate on Partially (15%) Greened-Up ‘Tifway’ Bermudagrass

% green-up

49 DAT
LSD 6.7

57 DAT
LSD 5.5

Roundup Pro 8oz
Roundup Pro 12 oz
Roundup Pro 16 oz
Roundup Pro 24 oz
Roundup Pro 32 oz
Nontreated

Glyphosate sprayed at 33gpa on 3-29-99 with XR11003 nozzles
Apr 25, 2007

Roundup on “dormant zoysiagrass”
Dallisgrass Control Using Roundup ProMax 4.5SL in Late Summer / Early Fall

2007-08: Hidden Valley Golf Club

% Control

19-Jun

Check
Common Bermudagrass Effects from Roundup ProMax 4.5SL in Late Summer / Early Fall

2007-08: Hidden Valley Golf Club

Check influenced by PASDI infestation
Non treated          Roundup ProMax
                      10.7 fl oz/A
                      Applied Oct 16
                      Photo Nov 6
Information on Fungicide Programs for Cool- and Warm-Season Landscapes provided by:

Lane Tredway
Associate Professor & Extension Specialist
Department of Plant Pathology
North Carolina State University
Each Turf Species Has Unique Problems

- Tall Fescue
  - brown patch, gray leaf spot, Pythium blight
- Kentucky bluegrass
  - dollar spot, summer patch, Pythium blight, rust, powdery mildew
Each Turf Species Has Unique Problems

- **Centipedegrass**
  - large patch

- **Bermudagrass**
  - spring dead spot, dollar spot

- **Zoysiagrass**
  - large patch, dollar spot, spring dead spot

- **St. Augustinegrass**
  - large patch, gray leaf spot
Diseases are stress induced when they are stressed and growing slowly.
Diseases are stress induced turfgrasses need protection when they are stressed and growing slowly
Rhizoctonia diseases are the most common and destructive in landscapes.

brown patch of tall fescue caused by *Rhizoctonia solani*

large patch of zoysiagrass caused by *Rhizoctonia solani*
## Fungicides Programs for Brown Patch Control

<table>
<thead>
<tr>
<th>Product</th>
<th>Recommended Rate (/1000 ft²)</th>
<th>Recommended Interval (days)</th>
<th>$/acre/day</th>
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<tr>
<td>Disarm</td>
<td>0.18 fl oz</td>
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<tr>
<td>Heritage 50WG</td>
<td>0.2 oz</td>
<td>28</td>
<td>$7</td>
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<td>Heritage TL</td>
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<td>28</td>
<td>$7</td>
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<td>Compass</td>
<td>0.2 oz</td>
<td>21</td>
<td>$10</td>
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<tr>
<td>Insignia</td>
<td>0.7 oz</td>
<td>28</td>
<td>$10</td>
</tr>
<tr>
<td>ProStar</td>
<td>2.2 oz</td>
<td>28</td>
<td>$10</td>
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Combination Products for Landscape Turf

- **Headway**
  - azoxystrobin + propiconazole (Heritage + Banner)
- **Armada**
  - trifloxystrobin + triadimefon (Compass + Bayleton)
- **SysStar**
  - thiophanate-methyl + flutolanil (3336 + ProStar)
Keys to Successful Brown Patch Control

- initiate applications when night temperatures consistently exceed 60°F
- spray in at least 2 gallons H₂O per 1000 ft² for best results
- minimize nitrogen fertilization during summer
- avoid extended periods of leaf wetness
- mow regularly at 3” to 3.5”
Turf Disease Diagnosis Services

- NC State Turf Diagnostics Lab
  - (ncstateturfdiagnostics.com)
- Turffiles Disease ID Utility
  - (www.turffiles.ncsu.edu)
Large Patch Control with Fungicides

- preventative timing is crucial
- initiate in fall when soil temperatures dip below 70°F
- number of applications needed determined by threshold and pressure
  - high pressure/low threshold
    - 2 in fall, 1 in spring
  - low pressure/high threshold
    - 1 or 2 apps in fall
Large patch control in zoysiagrass

Lawrence, KS
Treatments applied Oct 8
Data collected Apr 24
Large patch control in zoysiagrass

![Bar Chart]

- Untreated
- Compass (0.25 oz)
- 3336 (4 oz)
- Bayleton (1 oz)
- Heritage (0.4 oz)

Lawrence, KS
Treatments applied Sept 24
Data collected Apr 23
Resources for Fungicide Program Development

TurfFiles - Turfgrass Information for North Carolina

Welcome

2009 North Carolina Turfgrass Conference & Show
Location: North Raleigh Hilton, Raleigh NC
Dates: January 26 - 29, 2009

- Golf Topics & Speakers
- Sports & Athletic Turf
- Lawncare/Landscaping
- Drought and water management
- NCDA Pesticide and GCSAA Credits available

SAVE MONEY!! STAY LOCAL.

Disease Identification
Many diseases occur on the turfgrasses that are used throughout North Carolina. Most of the diseases included here are caused by fungi. Some problems that resemble diseases are caused by environmental or management factors such as cold, heat, drought, high soluble salts, soil compaction, or chemical damage. Careful identification of the cause of a problem is important for the selection of proper control methods.
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