

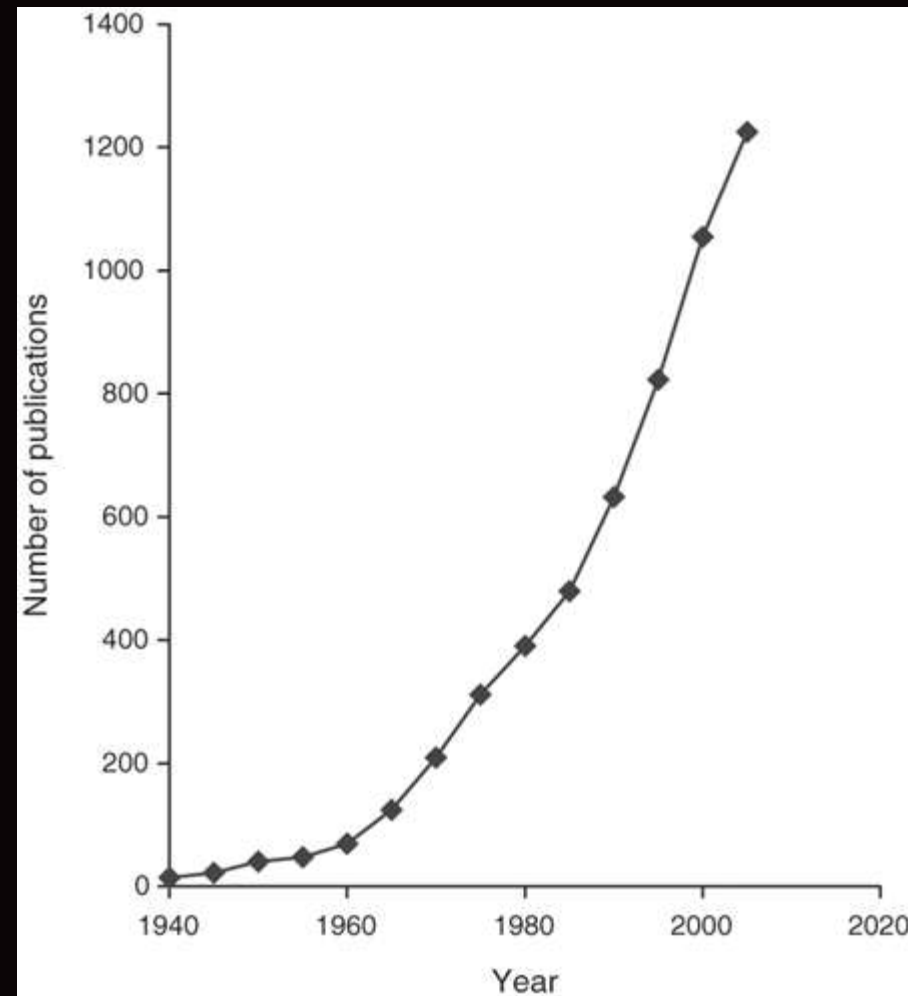
Wetting Agents and Moisture in Sand-Based Putting Greens

Doug Karcher
Associate Professor
Department of Horticulture
University of Arkansas

karcher@uark.edu
turf.uark.edu

Hydrophobic Rootzone Publications

- Since 1883, > 1200 publications
- Native sandy grasslands (CA, FL, and Australia)
- Currently, 200 pub's per 5 years. (Dekker et al.)
- Golf greens – 1964 (Dorman et al.)





**What Causes
Localized Dry
Spots?**

LDS on Sand-Based Greens

- Water repelled by “waxy” coatings on sand grains
- Water drop penetration time: 5s - >10m



Cause of LDS

Organic coatings on sand grains



Wetting Agent Efficacy - *Golf Course DePan, NL*

This golf course was established on native sandy soils. Which half of the fairway was treated with a wetting agent?

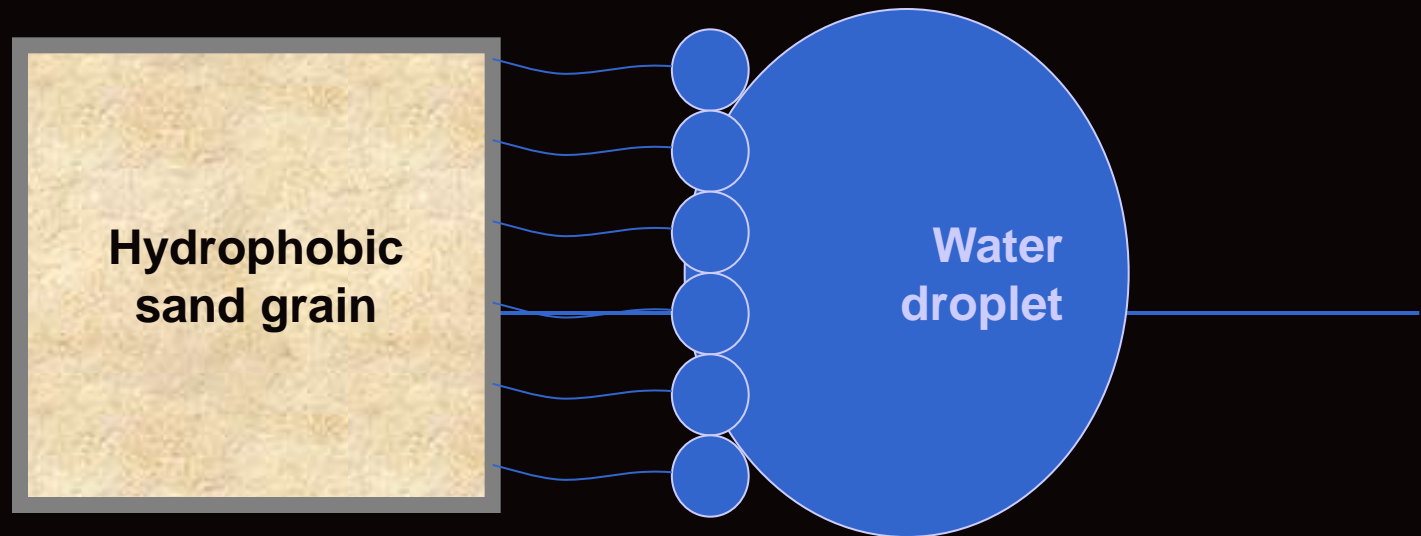


Courtesy of Coen Ritsema, Alterra, Wageningen, NL

How Do Wetting Agents Work?

Wetting Agent Function

- Acts as a **bridge** between waxy sand coatings and water droplet



- Eventually leach or decomposed by microbes
- Sand remains hydrophobic: **TEMPORARY FIX**

Wetting Agent in Action

- Lower surface tension, less dew formation



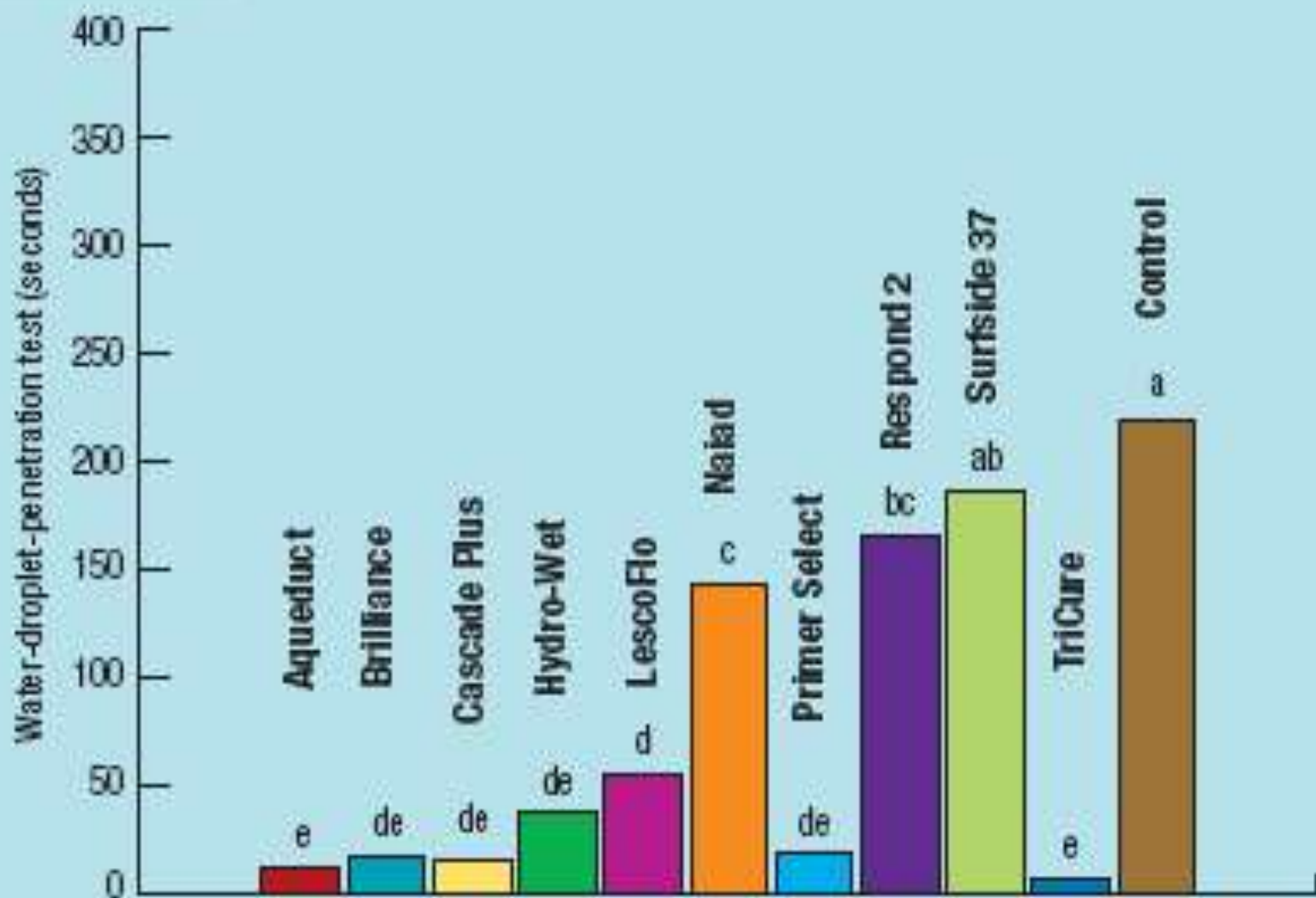


Figure 8. WDPT in seconds averaged over depths of 0.5, 1.5 and 2.5 centimeters (0.2, 0.6 and 1 inch) and over all sampling dates for 2004. Different letters indicate significant differences among wetting agents.

**Can Wetting Agents
Reduce Irrigation
Requirements?**

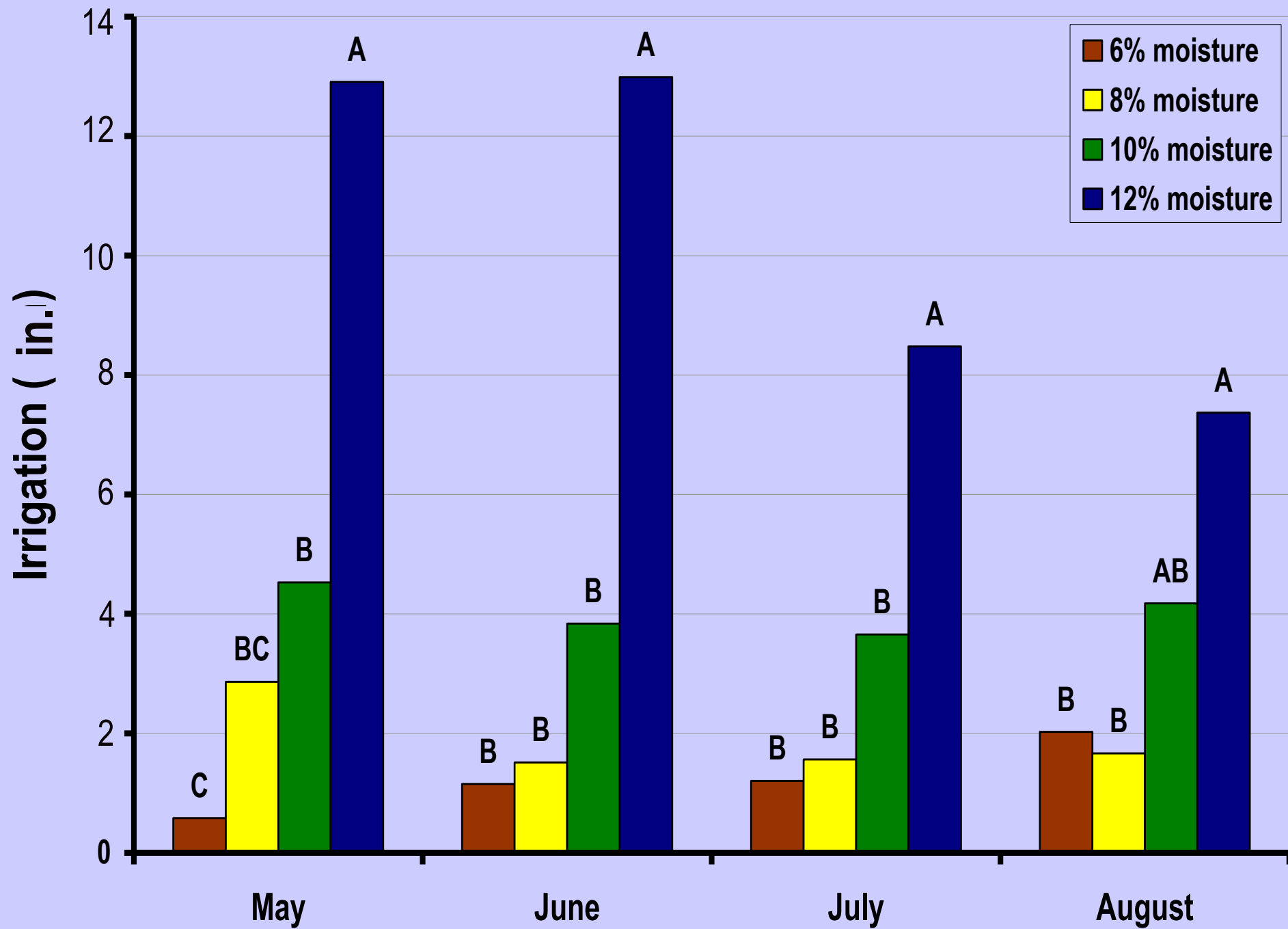
Irrigation Frequency & Wetting Agent Effects on LDS and Moisture Distribution



Treatment Structure

- Irrigation threshold (vol. soil moisture)
 1. 12% (~ daily)
 2. 10% (~ 2-3 x / week)
 3. 8% (~ 1-2 / week)
 4. 6% (~ extreme drought stress)

- Wetting agent (Revolution)
 1. untreated control
 2. label rate (6 oz / 1000 ft² / per month)



Irrigation threshold = 12% soil moisture (daily)

untreated

wetting agent



Irrigation threshold = 10% soil moisture (2-3x per wk)

untreated

wetting agent



MH

Irrigation threshold = 8% soil moisture (1-2 x per wk)

untreated

wetting agent



ML

Irrigation threshold = 6% soil moisture (< 1 / wk)

wetting agent

untreated

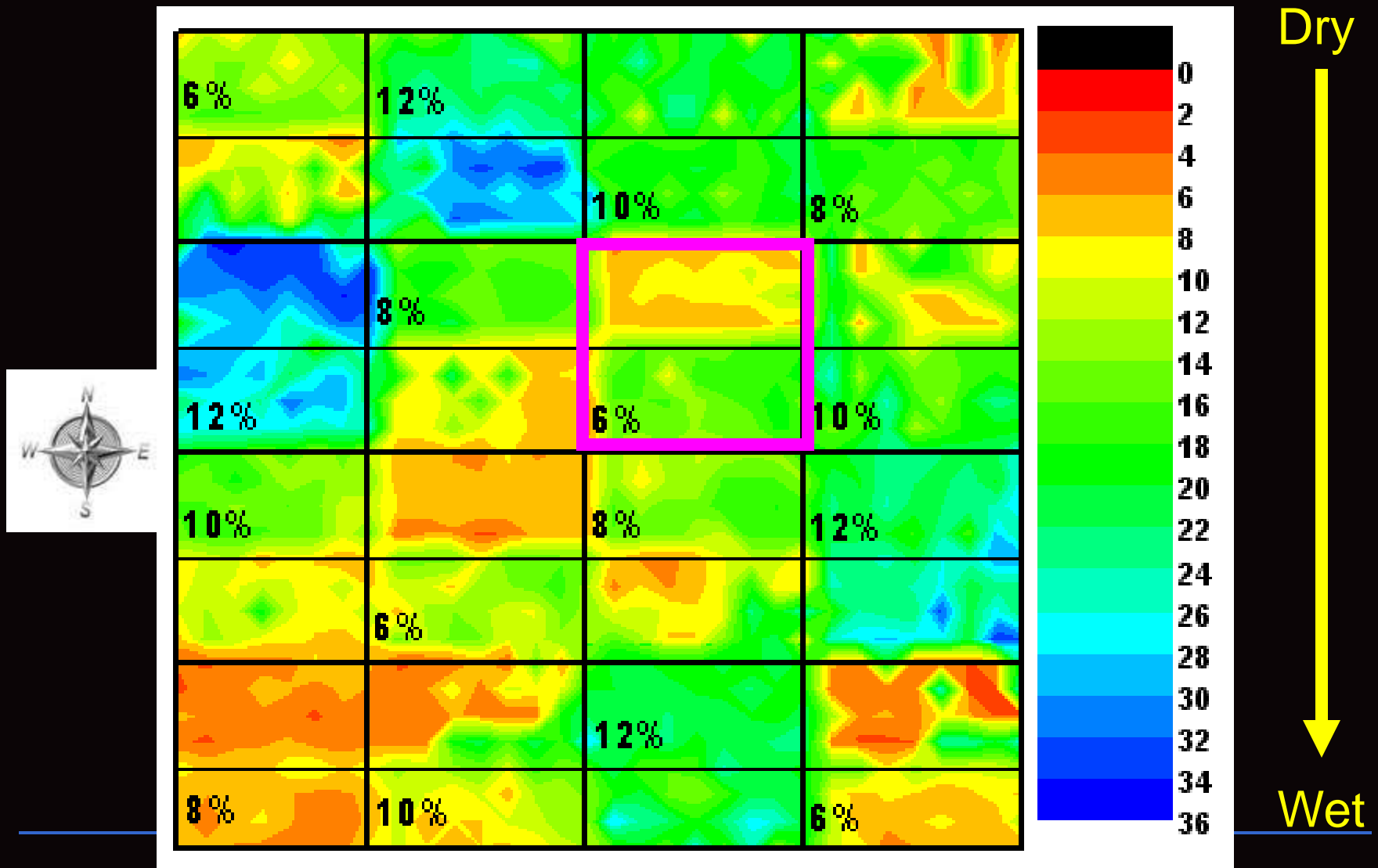


Surface Soil Moisture

- Weekly measurements on a 1 x 1 ft. grid
- Average moisture values
- Moisture variability within plots

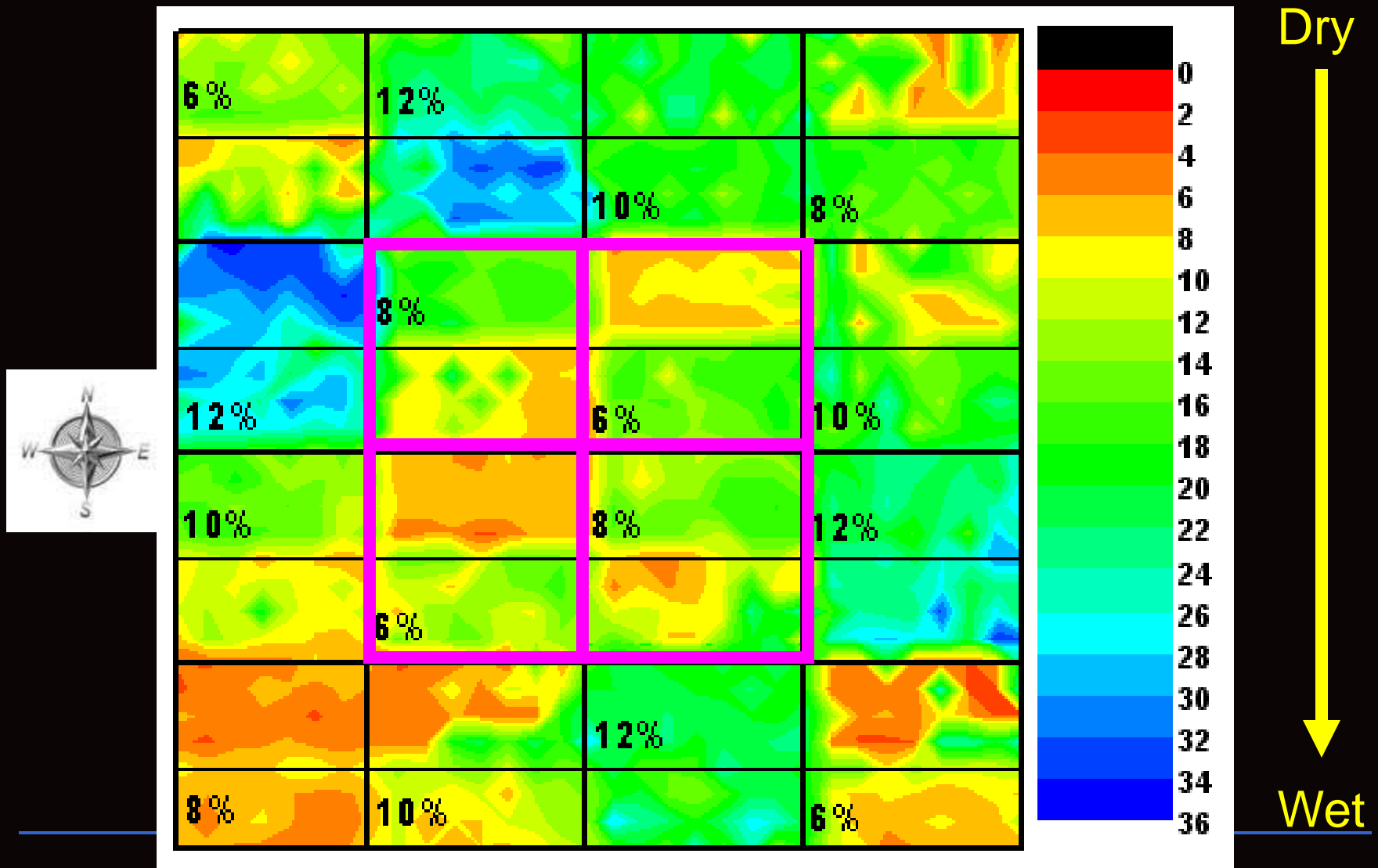


Surface soil moisture (vol. %)



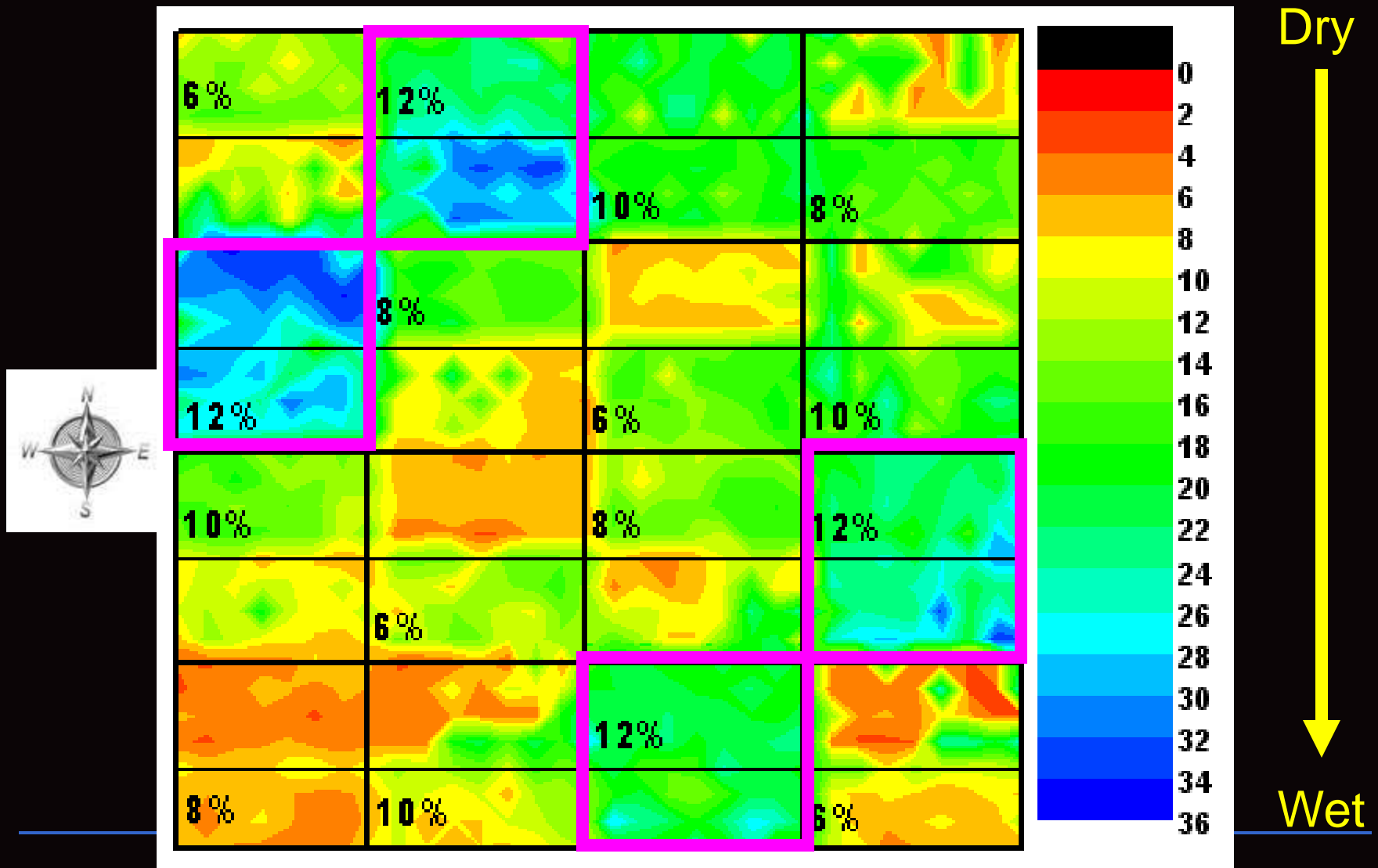
Irrigation thresholds are displayed in sub-plot receiving wetting agent treatment

Surface soil moisture (vol. %)



Irrigation thresholds are displayed in sub-plot receiving wetting agent treatment

Surface soil moisture (vol. %)



Irrigation thresholds are displayed in sub-plot receiving wetting agent treatment

**Are There Differences
Among Wetting
Agents?**

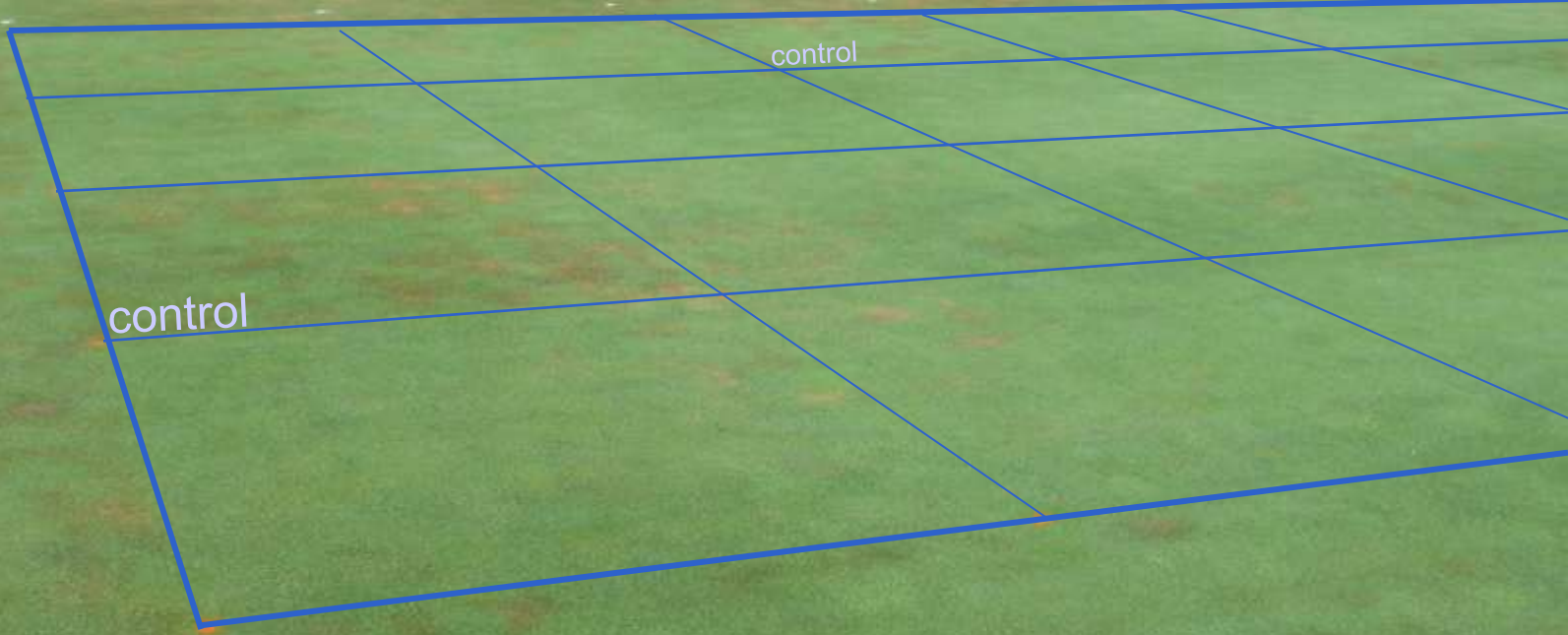
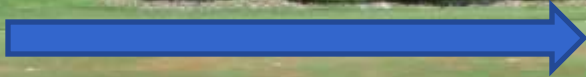
Wetting Agent Effects on Putting Green Moisture Distribution



- Commonly-used products tested within the same trial
- Tested during frequent, moderate, and infrequent irrigation frequencies
- Evaluated LDS and soil moisture at 3 depths

Treatment	Description	Manufacturer
1. Control	Untreated control	
2. Cascade Plus	2 app's @ 8oz/ 1000 ft ² (7 days apart)	Precision Labs, Inc. (Waukegan, IL)
3. Magnus	4 oz/ 1000 ft ² monthly	Precision Labs, Inc. (Waukegan, IL)
4. TriCure AD	6 oz / 1000 ft ² monthly	Mitchell Products (Millville, NJ)
5. Revolution	6 oz / 1000 ft ² monthly	Aquatrols, Inc (Paulsboro, NJ)
6. Primer Select	4 oz / 1000 ft ² monthly	Aquatrols, Inc (Paulsboro, NJ)

Untreated
border
areas



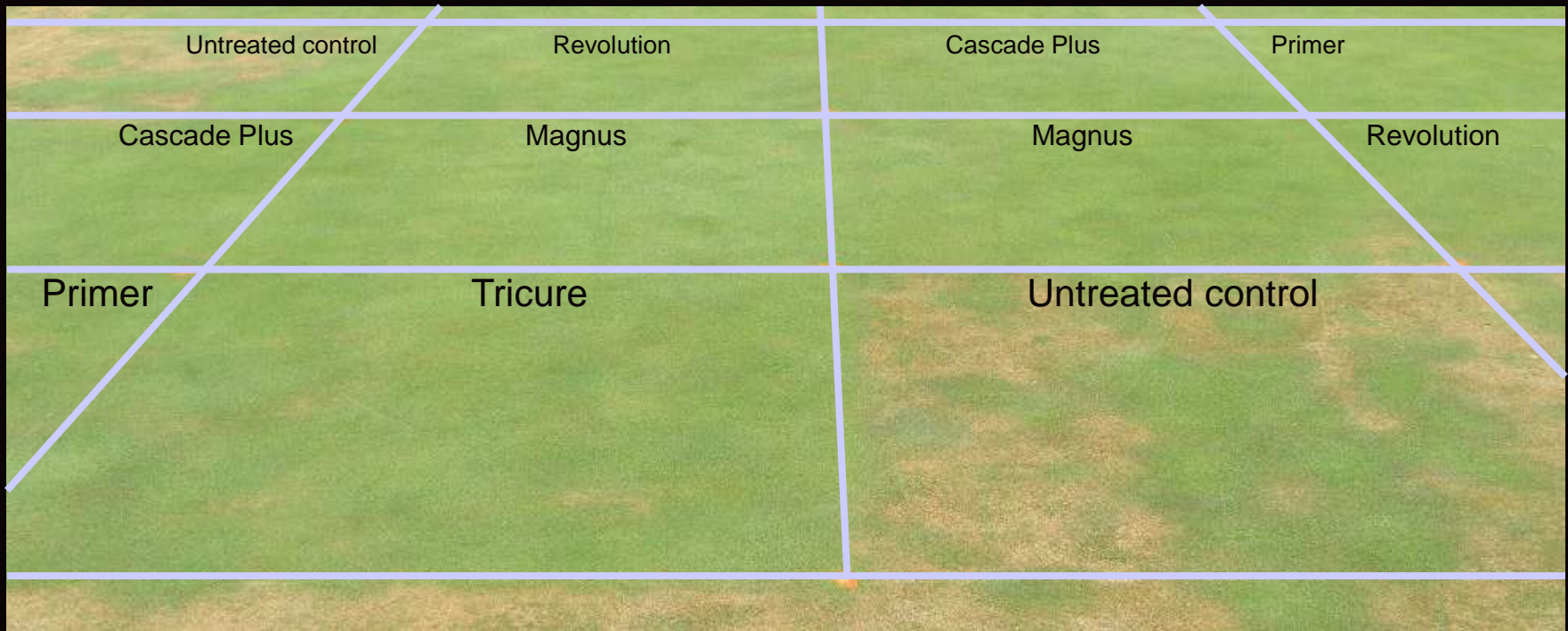
GCSAA Wetting Agent Trial

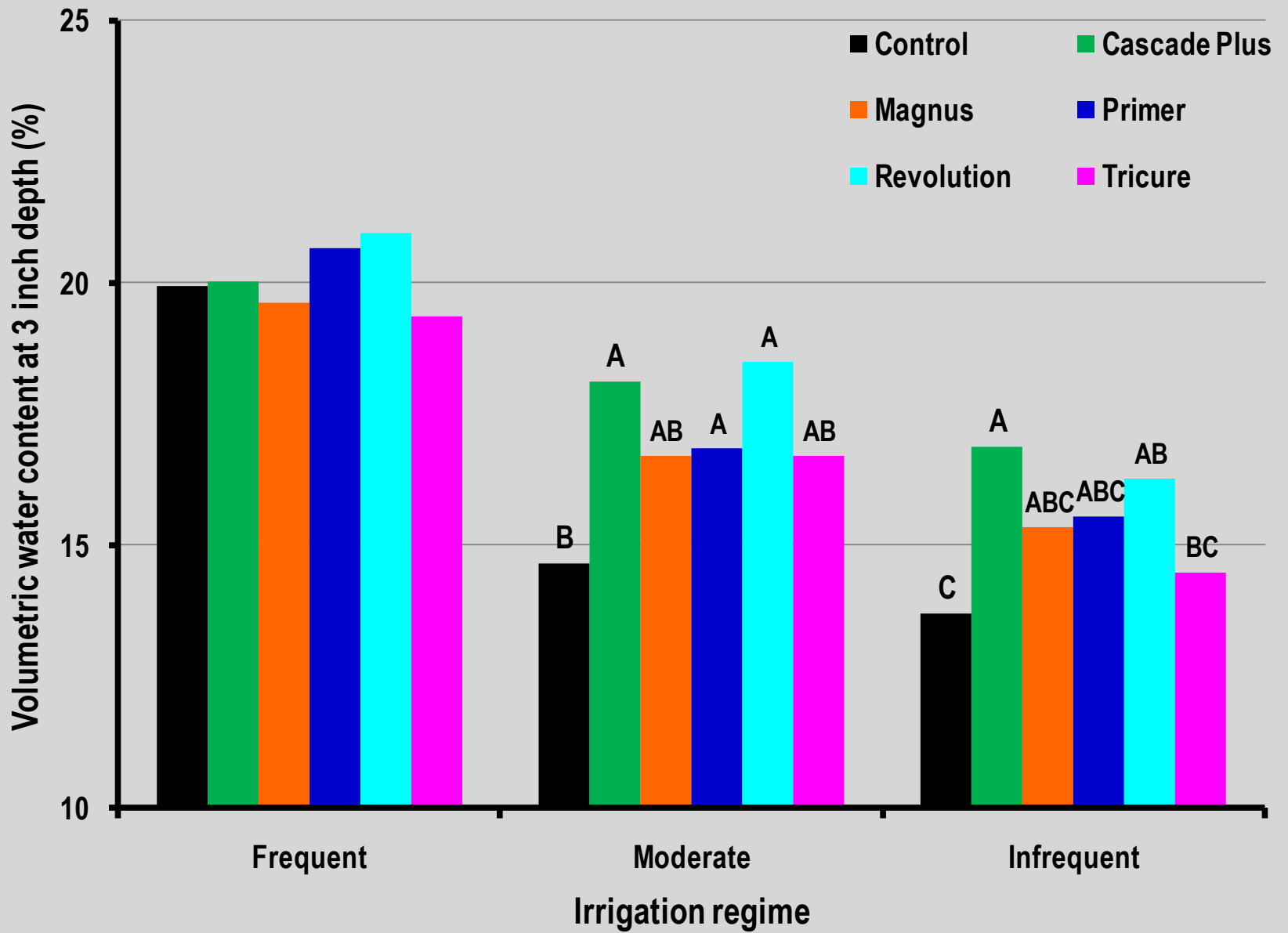
University of Arkansas
Fayetteville, AR

Picture taken 08/04/08

GCSAA Wetting Agent Trial

LDS – August 26, 2009

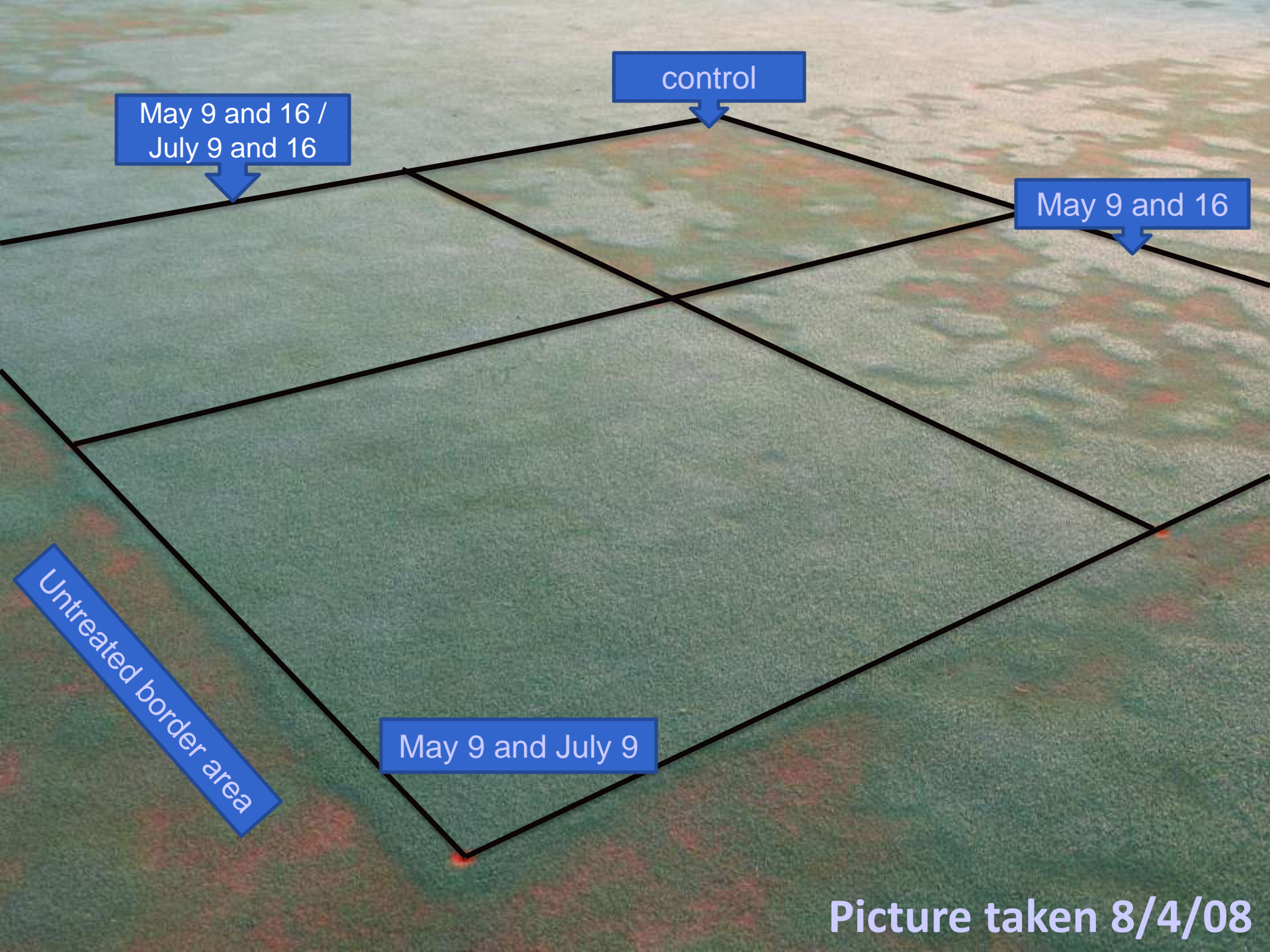




Effect of Cascade Plus Timing on Season-Long Control of Localized Dry Spot

- Label: 2 applications 7 d
 - Has not provided season long control in previous studies
- Experimental timing treatments:

Treatment ID	Description
1. Control	Untreated control
2. 7 DAIT	Cascade Plus May 9 and May 16
3. 60 DAIT	Cascade Plus May 9 and July 9
4. 7, 60, 90, and 120 DAIT	Cascade Plus May 9 and 16, July 9, Aug. 9, and Sept. 9



May 9 and 16 /
July 9 and 16

control

May 9 and 16

Untreated border area

May 9 and July 9

Picture taken 8/4/08

Other Wetting Agents Warrant Consideration



Amega Sciences Trial



Helena Trial

Summary Points

- Most wetting agent products tested reduced LDS and improved moisture uniformity w/o adversely affecting moisture content
- Many wetting agent products available
 - Find product resulting in uniform and desirable moisture content (get a moisture probe!)
 - Univ. of Arkansas will continue WA research
- Make wetting agents more effective!
 - Couple w/ reduced irrigation frequency to:
 - ↓ summer stress decline
 - ↓ surface organic matter content
 - ↓ summer disease
 - ↓ moss and algae
 - ↓ water budget

Acknowledgments

GCSAA 

**Environmental
Institute for Golf**



UofA

UNIVERSITY OF ARKANSAS

DIVISION OF AGRICULTURE

Wetting Agents and Moisture in Sand-Based Putting Greens

Doug Karcher
Associate Professor
Department of Horticulture
University of Arkansas

karcher@uark.edu
turf.uark.edu