


Wetting Agent Research Update

Doug Karcher
Associate Professor
Department of Horticulture
University of Arkansas

karcher@uark.edu
turf.uark.edu

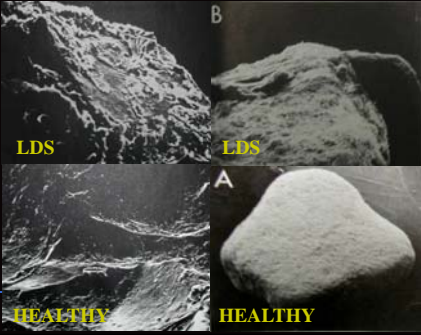
LDS on Sand Based Greens

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

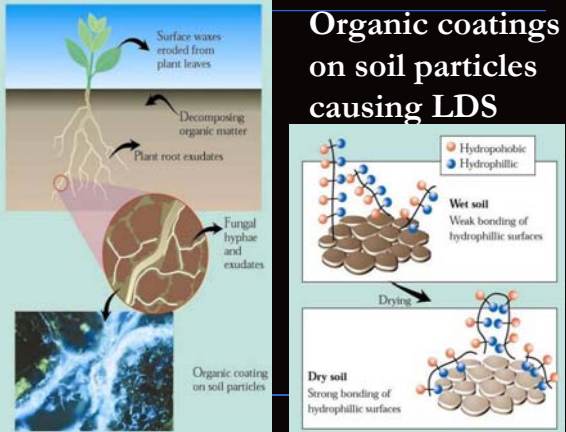



Cause of LDS

Organic coatings on sand grains

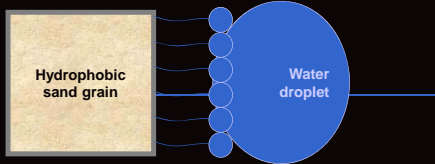



Organic coatings on soil particles causing LDS

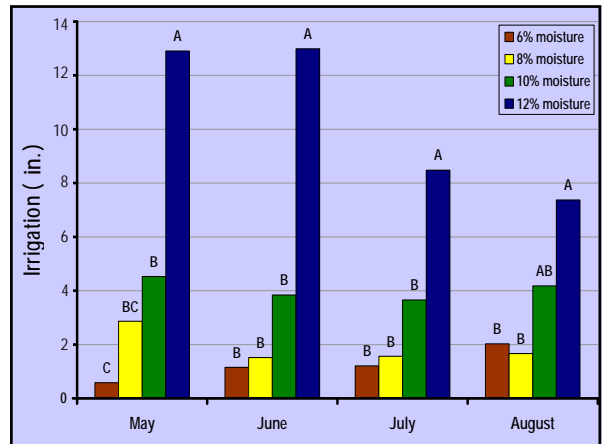


Wetting Agent Function

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

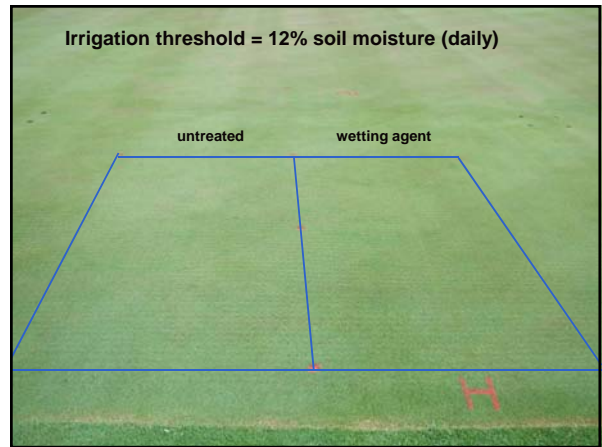


- Eventually leach or decomposed by microbes
- Sand remains hydrophobic: **TEMPORARY FIX**



Wetting Agent in Action

- Lower surface tension, less dew formation

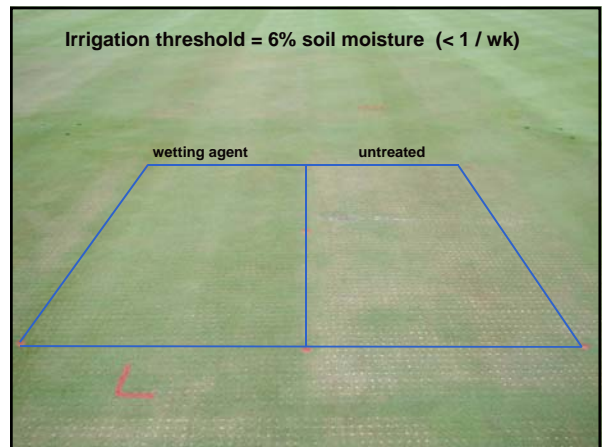


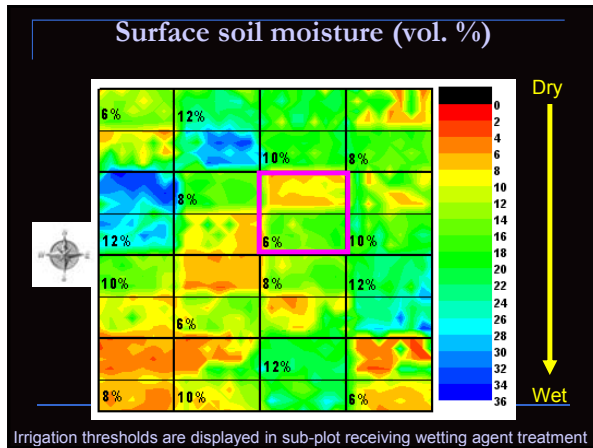
Wetting Agent Classification

Alkylphenol Ethoxylates (APE) Nonylphenol Ethoxylates (NPE) <ul style="list-style-type: none"> Effective wetters High potential phytotoxicity Residual potential Environmental concerns emerged 	Aquafin Cascade Hydroflex LeucoFlo Leucoflex Surfacto Ultraflo (UK) Wetbasil (Au)	Organosilicone "Super Spreading" Surfactants <ul style="list-style-type: none"> Excellent one-time wetting at very low rates High phytotoxicity potential No residual Restricted use as an spray adjuvant rather than to control repellency 	Break Thru (InfAxi, UK) Silwet
Anionic Linear Surfactants <ul style="list-style-type: none"> Moderate efficacy of wetting Poor residual effect Concern about long term soil effects 	Amway Adjuvant Basic H Powdered Wax	Block Copolymer and APG blends <ul style="list-style-type: none"> Chemically increases infiltration efficiency at very low application rates US and International patents issued on formulation and function 	Dispatch Bright Aid Gold
Yucca or Seaweed mixed with APE <ul style="list-style-type: none"> Poor wetting efficacy High phytotoxicity Limited use 	Centaur Nobufl	Organic Solvent and a Surfactant Complex <ul style="list-style-type: none"> Designed to remove accumulations of hydrophobic humic substances on soil surfaces Patented combination 	OARS
EO/PO Block Copolymers <ul style="list-style-type: none"> High phytotoxicity Good/best control of repellency Formulation and rate effects efficacy Some products result in very uniform soil moisture 	Aqueduct Aquafin Cascade Plus Duflor Hydroflo Primer Ego Respond Tri-Care	Methyl Capped Block Copolymer <ul style="list-style-type: none"> US and International patents pending Methyl capping branched to affect orientation on soil and influence water movement across soil particles Excellent control of repellency; acceptably consistent horizontal and vertical soil moisture 	Revelation

EO / PO = ethylene and propylene oxide
 APG = alkyl polyglycoside

(Moore et al., 2007)



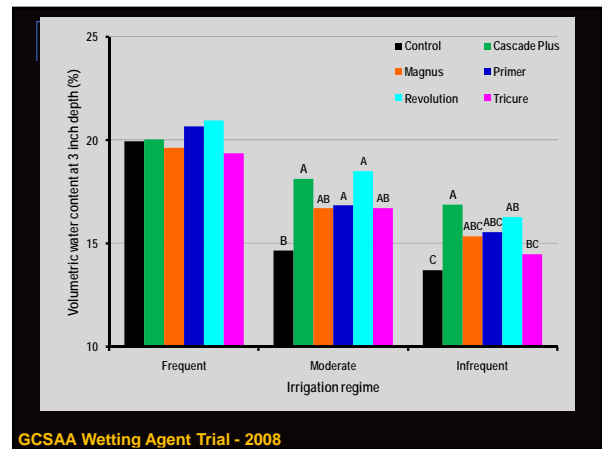
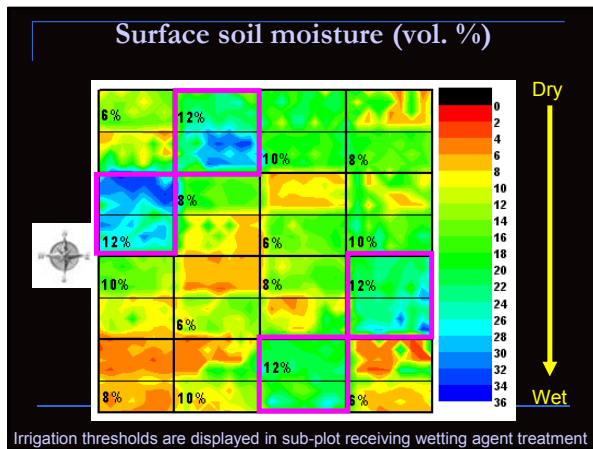
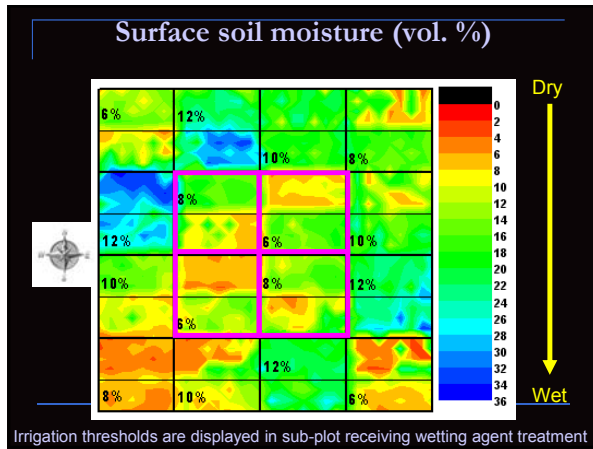


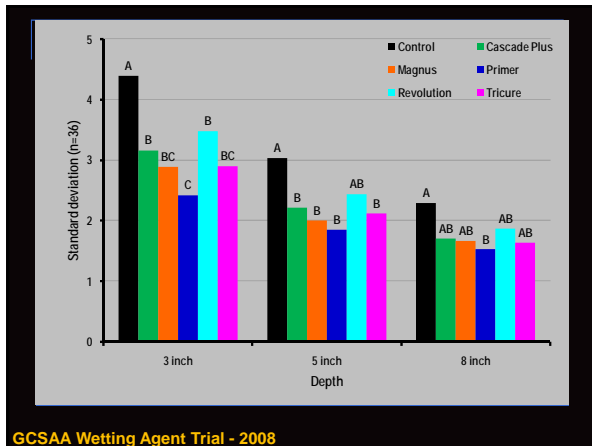
Wetting Agent Effects on Putting Green Moisture Distribution

GCSAA

- 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 (Pauisboro, NJ)
6. Primer Select	4 oz / 1000 ft ² monthly	Aquatrols, Inc (Pauisboro, NJ)



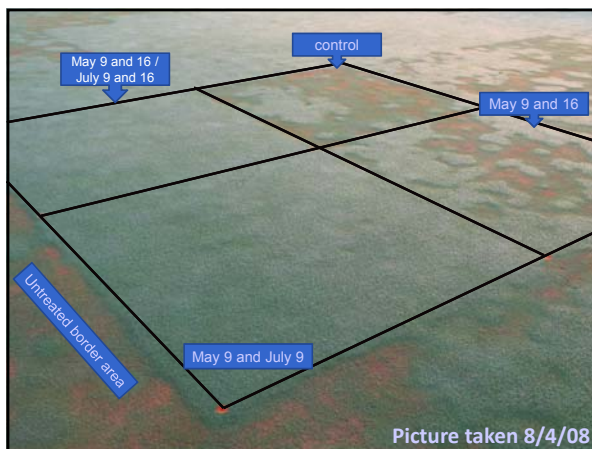


Long Term Control of LDS

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

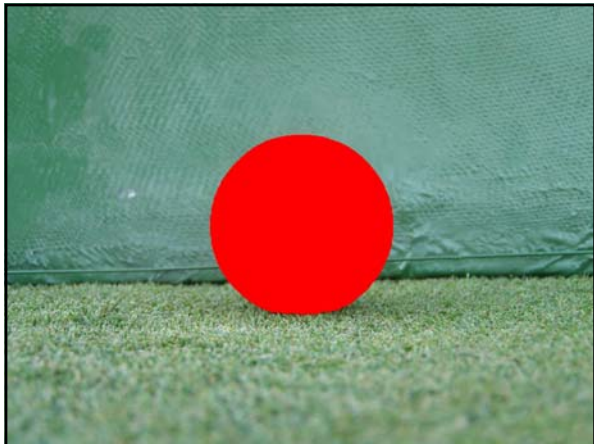
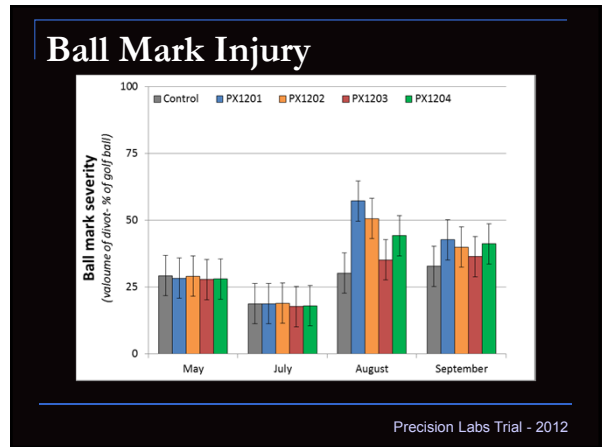
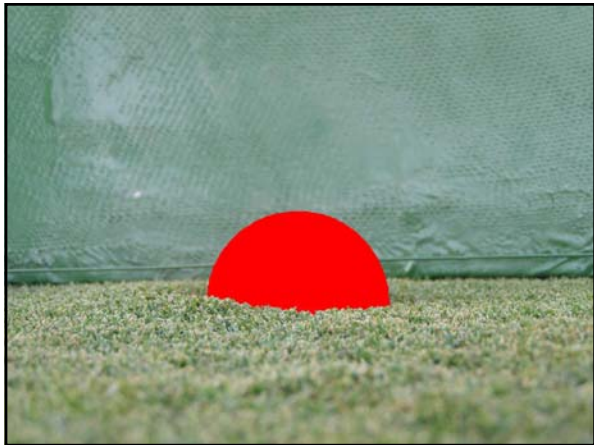
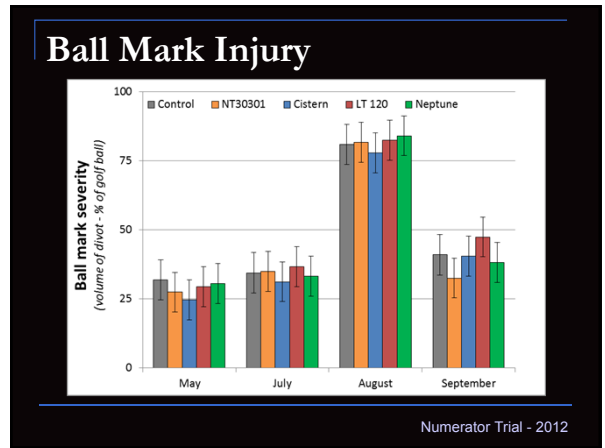
Treatment ID	Description
1 Control	Untreated control
2 7 DAIT	Cascade Plus May 9 and May 16
3 60 DAIT	Cascade Plus May 9 and July 9
4 7, 60, 90, and 120 DAIT	Cascade Plus May 9 and 16, July 9, Aug. 9, and Sept. 9

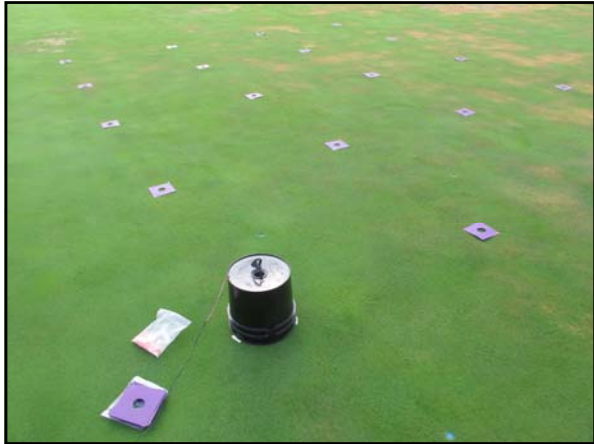
How Do Wetting Agents Affect the Putting Surface?



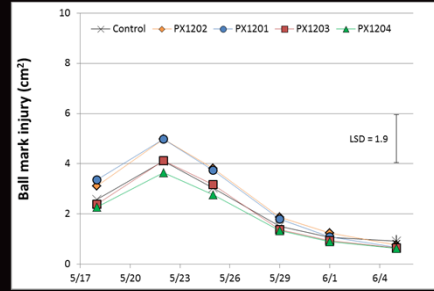
2012 Research at the UofA

- Green speed (ball roll distance)
- Surface hardness and moisture
- Ball mark injury
- Ball mark recovery
- LDS severity
 - Products were, again, very effective

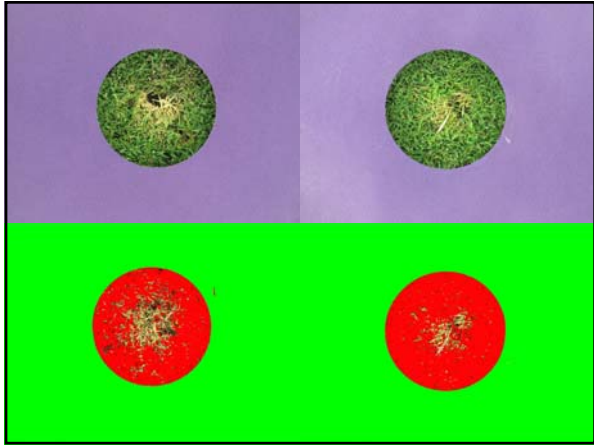




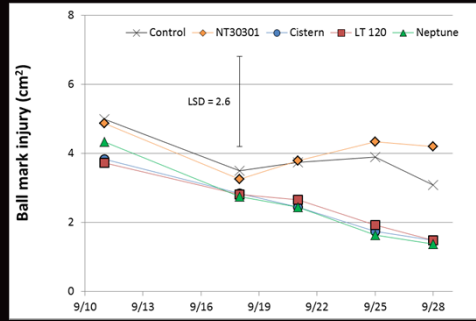
Ball Mark Recovery - June



Precision Labs Trial - 2012

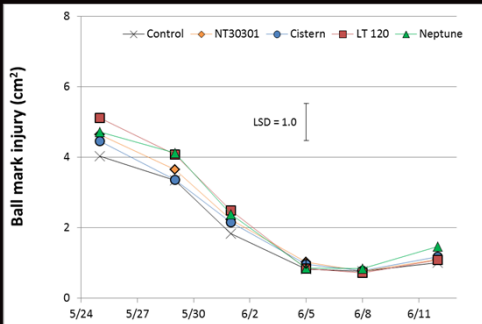


Ball Mark Recovery - September



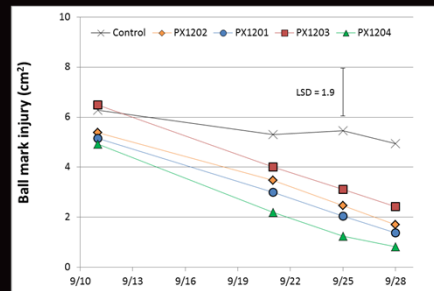
Numerator Trial - 2012

Ball Mark Recovery - June



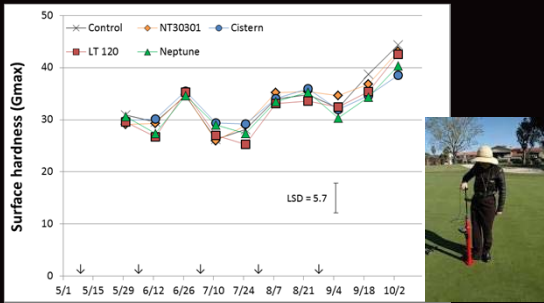
Numerator Trial - 2012

Ball Mark Recovery - September



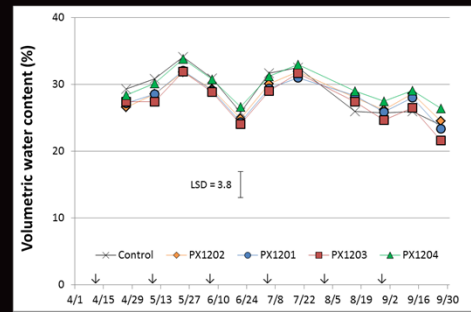
Precision Labs Trial - 2012

Surface hardness



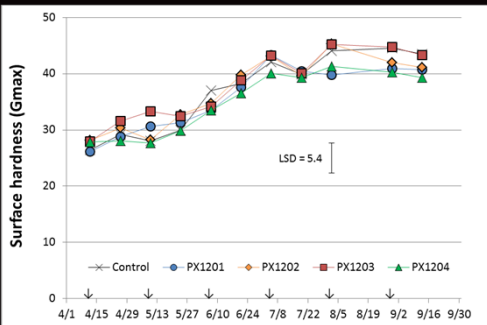
Numerator Trial - 2012

Surface moisture – 1.5 inch rods



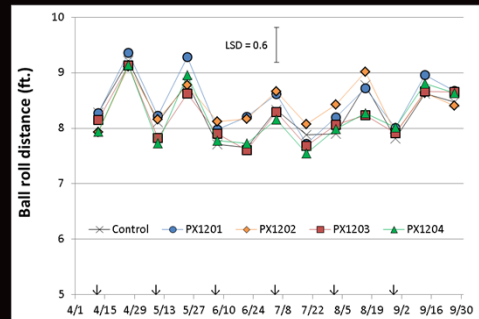
Precision Labs Trial - 2012

Surface hardness



Precision Labs Trial - 2012

Green Speed



Precision Labs Trial - 2012



Summary Points

- Most wetting products tested reduced LDS and improved moisture uniformity w/o adversely affecting moisture content
 - & appear to have little effect on putting surface performance

Summary Points

- Most wetting products tested reduced LDS and improved moisture uniformity w/o adversely affecting moisture content
 - *& appear to have little effect on putting surface performance*
- Many wetting agent products available
 - Find product resulting in uniform and desirable moisture content (get a moisture probe!)
 - Consult peers, distributors, company tech. rep's
 - Univ. of Arkansas will continue WA research



Summary Points

- Most wetting products tested reduced LDS and improved moisture uniformity w/o adversely affecting moisture content
 - *& appear to have little effect on putting surface performance*
- Many wetting agent products available
 - Find product resulting in uniform and desirable moisture content (get a moisture probe!)
 - Consult peers, distributors, company tech. rep's
 - 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



Environmental
Institute for Golf

