Playability with ET, Wetting Agents, and Slopes

Rodney V. Tocco Jr.
Michigan State University

MICHIGAN STATE UNIVERSITY

Research Objectives

- Plant Available Water (PAW)
- Water Conservation
- ET for an Irrigation Model
- Watering vs. Wetting Agent vs. Mowing 1x or 2x

MICHIGAN STATE UNIVERSITY
FOUNDED 1855

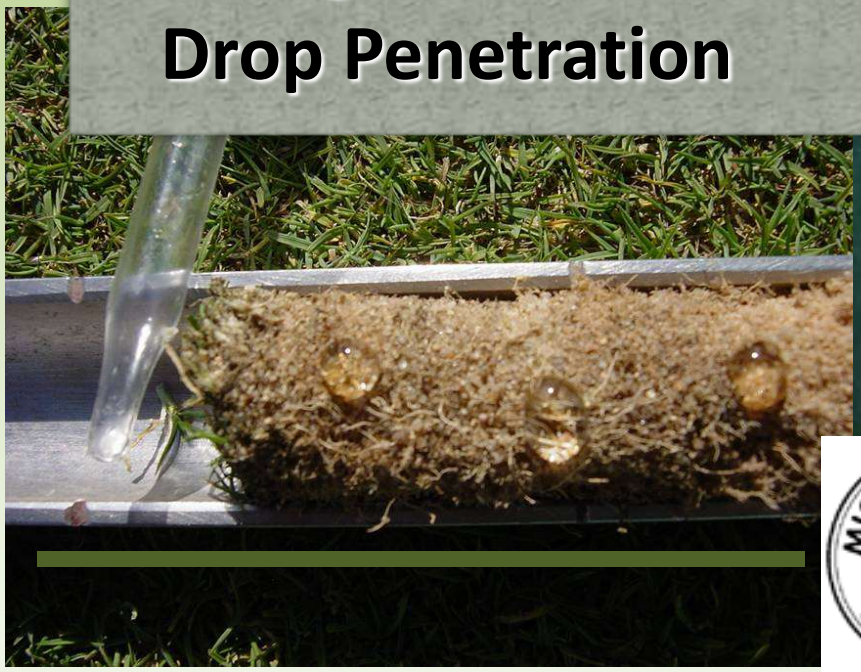
Experimental Set-up & Design

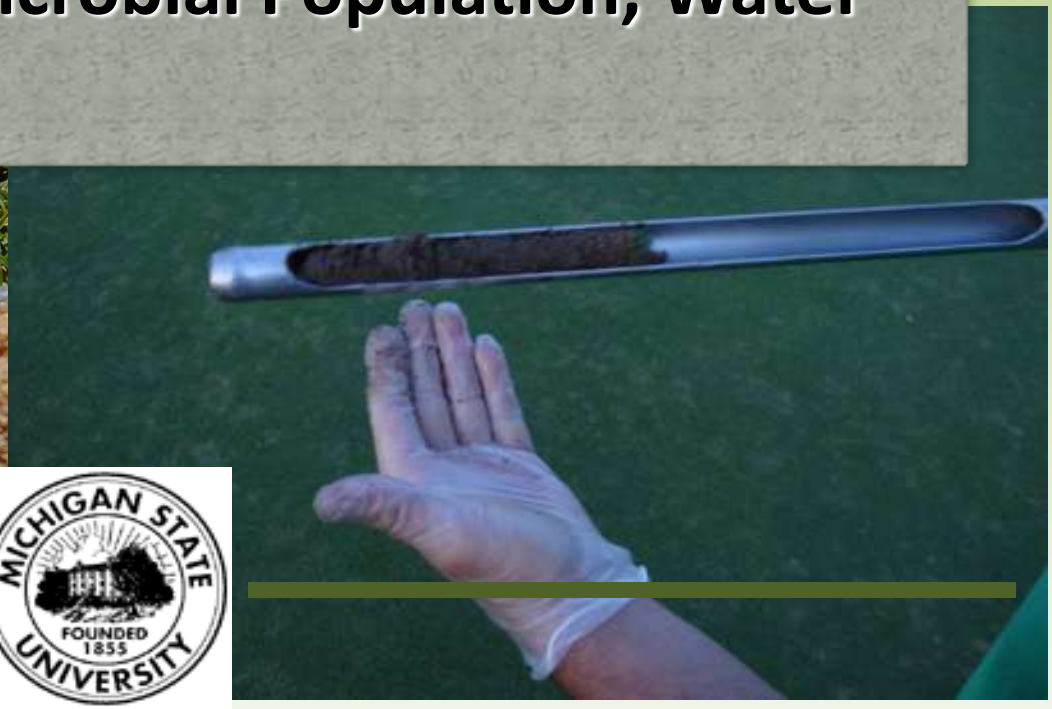
- Hancock Turfgrass Research Center (HTRC)
  East Lansing, MI
- 3 x 2 x 2 Factorial
  30, 60, 90% ET
  1X, 2X Mowing
  Wetting Agent vs. Untreated

- 'Crenshaw' Creeping Bentgrass (Native Soil)
  Mowed at 0.125" & Rolled (Daily at first then less)
- Nine plots of Hunter PGP's (0.8"/hr) within a block

Data Collection

- **Weekly (Same Day)**
  Visual Quality, TDR, Green Speeds
  LDS, Dollar Spot, etc. (If applicable)
- **Annually**
  % Organic Matter, Microbial Population, Water Drop Penetration





Treatments

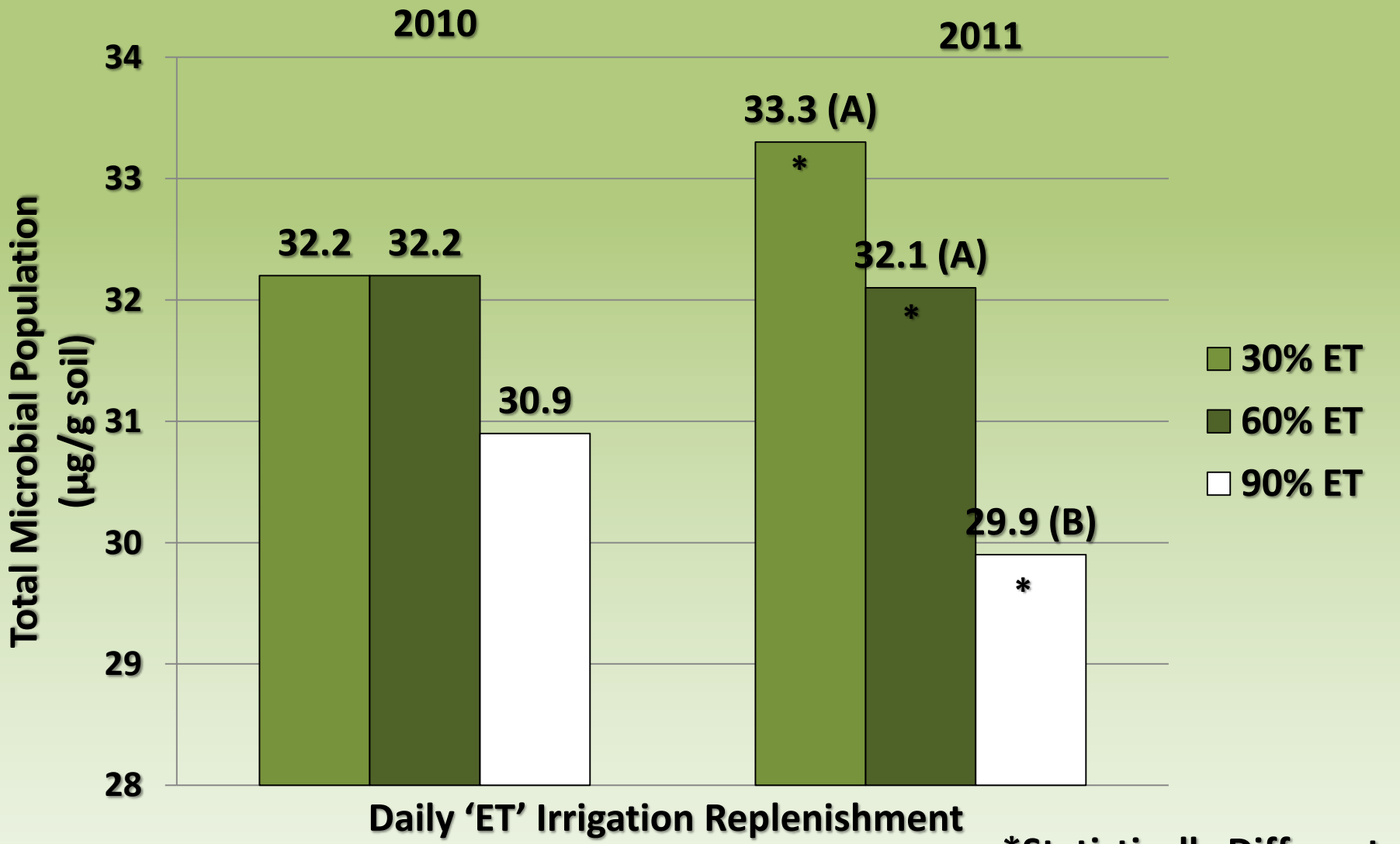
Treatments

Water Applied Stats

For 30%, 60%, & 90% ET respectively:

- **4.43, 8.91, & 13.35 Inches (June-Nov 2010)**
- **6.08, 12.06, & 18.13 Inches (May-Nov 2011)**

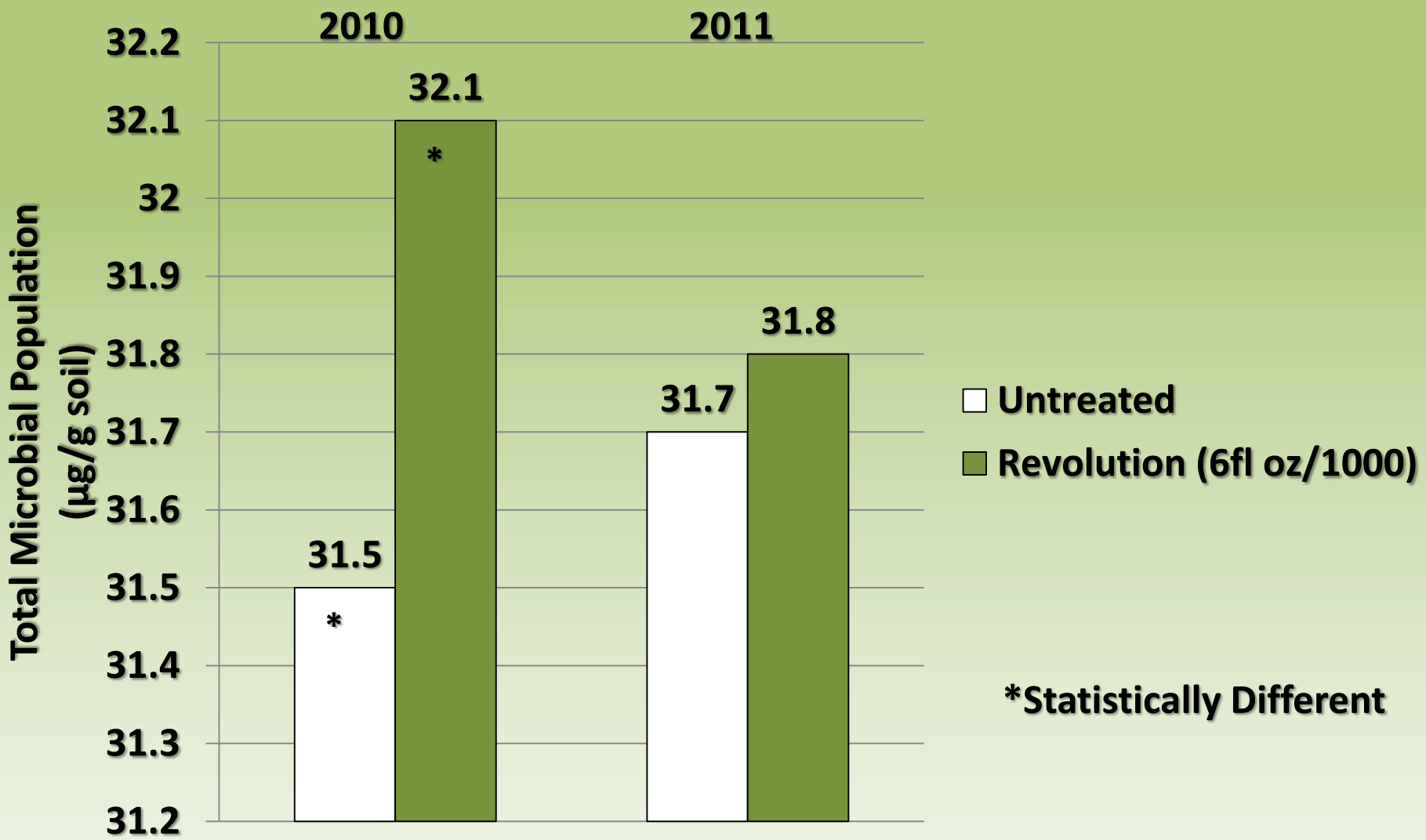
Total Microbial Population Results



*Statistically Different

Factorial AOV with LSD of 0.05 (Data analyzed with ARM version 8.3.4, 2012)

Total Microbial Population Results

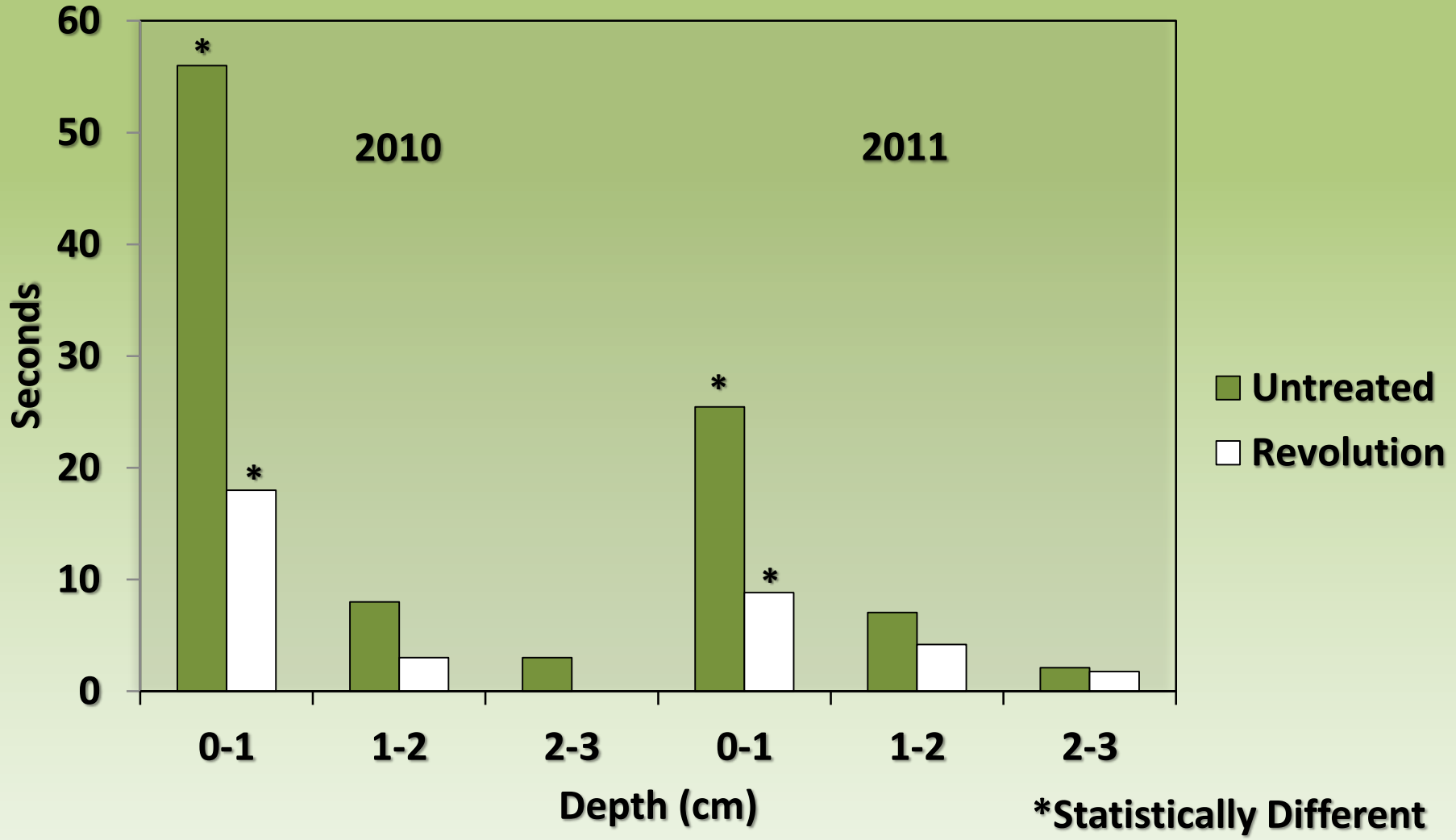


Factorial AOV with LSD of 0.05 (Data analyzed with ARM version 8.3.4, 2012)


Water Drop
Penetration Test


Faster penetration
leads to less run-off

Water Drop Penetration Test Results



Factorial AOV with LSD of 0.05 (Data analyzed with ARM version 8.3.4, 2012)

2011 Water Use & Playability

	Green Speeds (Inches)	TDR (%VWC)	Quality (1-10)
30% ET	-----	20.2* (B)	7.9
60% ET	-----	24.1* (A)	8.0
90% ET	-----	24.6* (A)	7.9

*Statistically Different

Factorial AOV with LSD of 0.05 (Data analyzed with ARM version 8.3.4, 2012)

2011 Water Use & Playability

	Green Speeds (Inches)	TDR (%VWC)	Quality (1-10)
Untreated	------	23.3	8.1
Revolution	- 1 inch	22.7 Flat surface native soil green	7.7

*Statistically Different

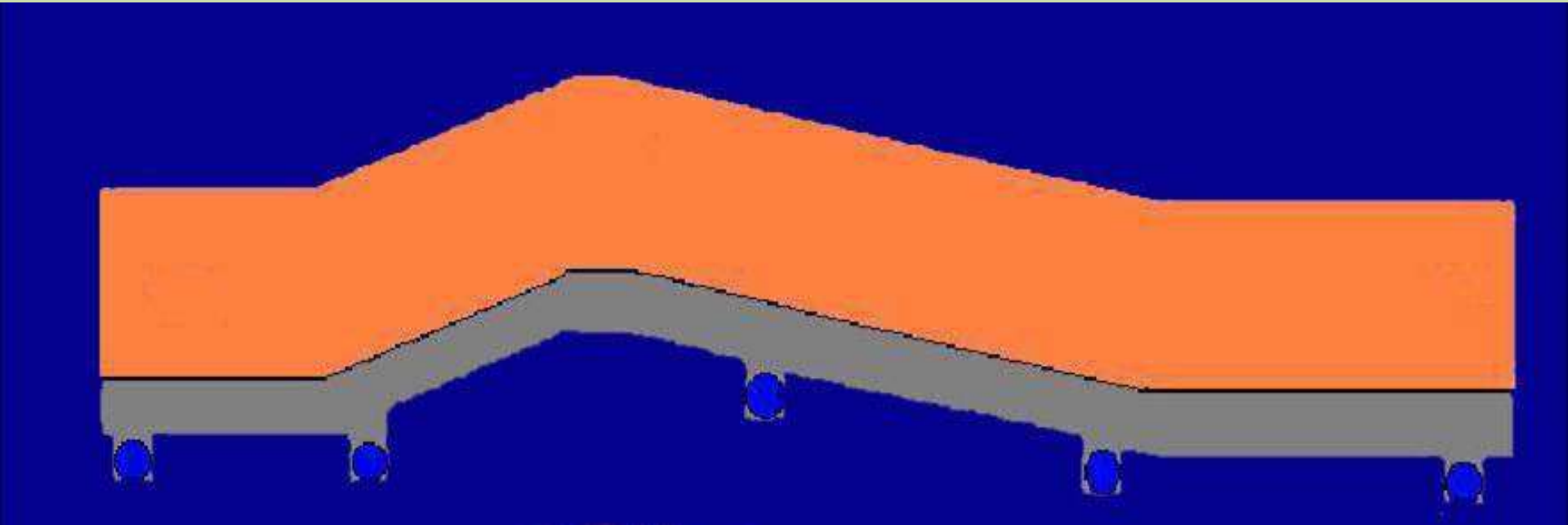
Factorial AOV with LSD of 0.05 (Data analyzed with ARM version 8.3.4, 2012)

Watering, Mowing, and Wetting Agents Study Summary

2010 & 2011

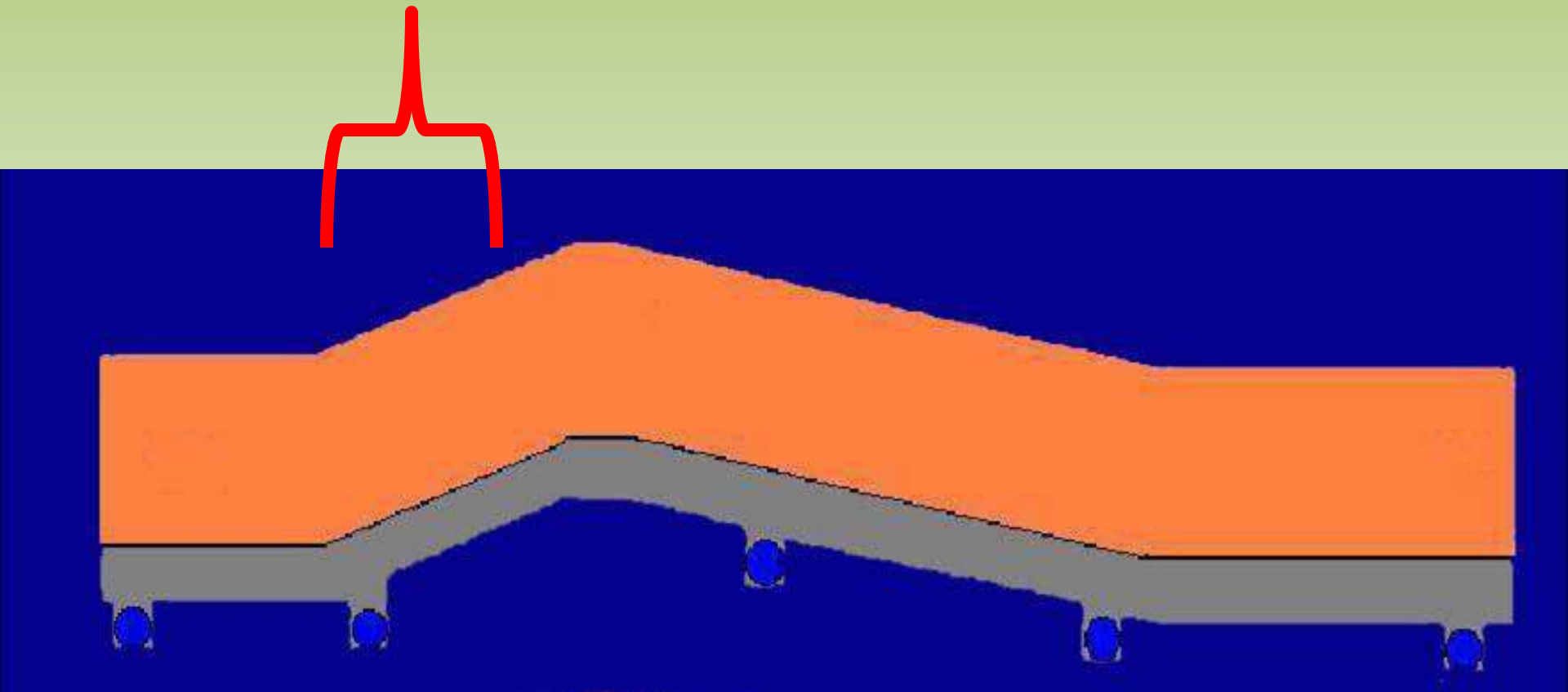
- **Green Speeds Higher w/ 2X Mow**
- **Dollar Spot Lower w/2X Mow**
- **Green Speeds and Quality no different with 'ET' watering replenishment or wetting agents**

2007-08 Sloping Green & Wetting Agents



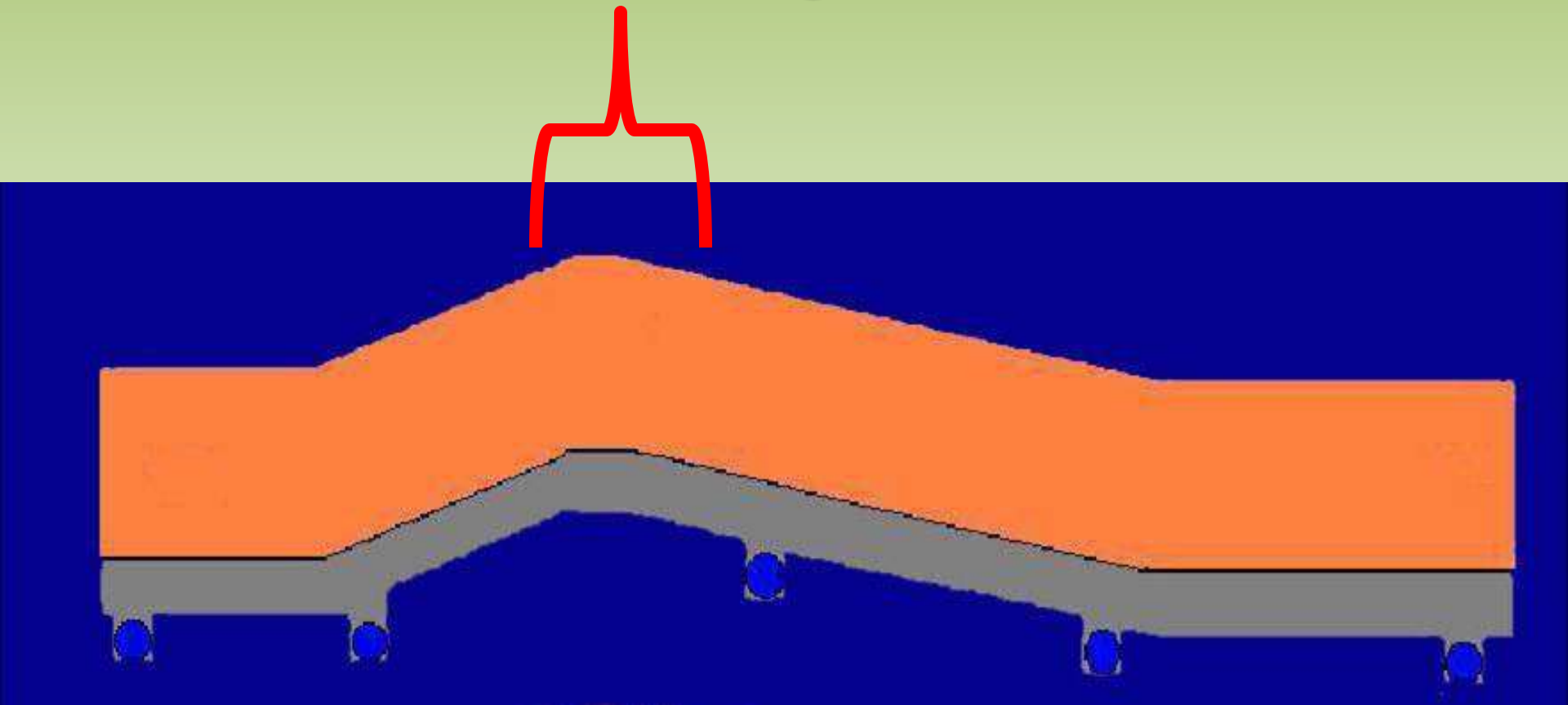
2007-08 Sloping Green & Wetting Agents

North slope ~ 15’ long (a 7% incline)



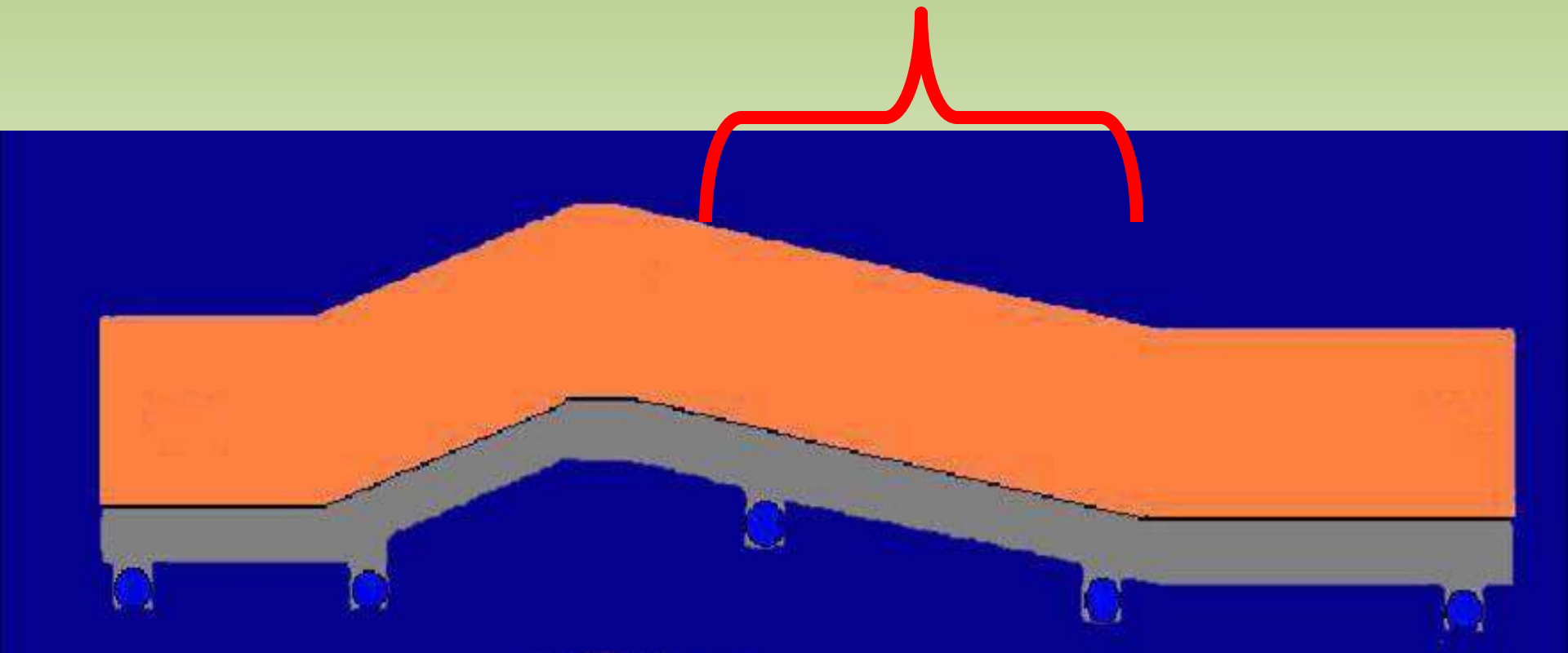
2007-08 Sloping Green & Wetting Agents

Crown ~ 6’ long



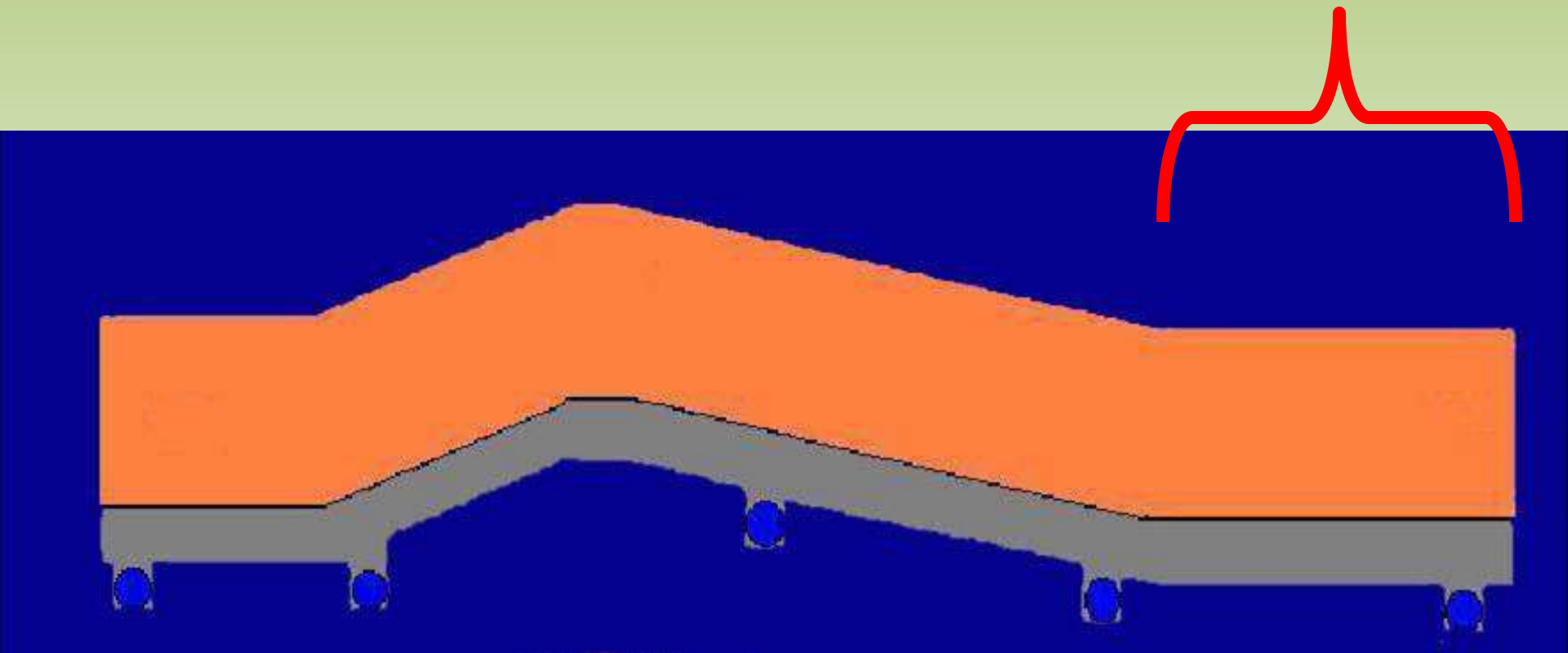
2007-08 Sloping Green & Wetting Agents

Mid-slope ~ 40’ long (a 3% incline)



2007-08 Sloping Green & Wetting Agents

South flat~14’ long (0% incline)



2007-08 Sloping Green & Wetting Agents

- Data collection:
  LDS ratings from 4-locations
- Ratings:
  - 1 = excellent
  - 2 = very good
  - 3 = good
  - 4 = fair
  - 5 = poor

Localized dry-spot ratings

10 total for the season

	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	10%	100%	50%	-----
90:10 sand soil	10%	100%	40%	-----
ACA 2787	10%	50%	10%	-----
Revolution	10%	50%	10%	-----
Check				

Localized dry-spot ratings

10 total for the season

	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	10%	100%	50%	-----
90:10 sand soil	10%	100%	40%	-----
ACA 2787	10%	50%	10%	-----
Revolution	10%	50%	10%	-----
Check				

Localized dry-spot ratings

10 total for the season

	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	10%	100%	50%	-----
90:10 sand soil	10%	100%	40%	-----
ACA 2787	10%	50%	10%	-----
Revolution	10%	50%	10%	-----
Check				

Localized dry-spot ratings

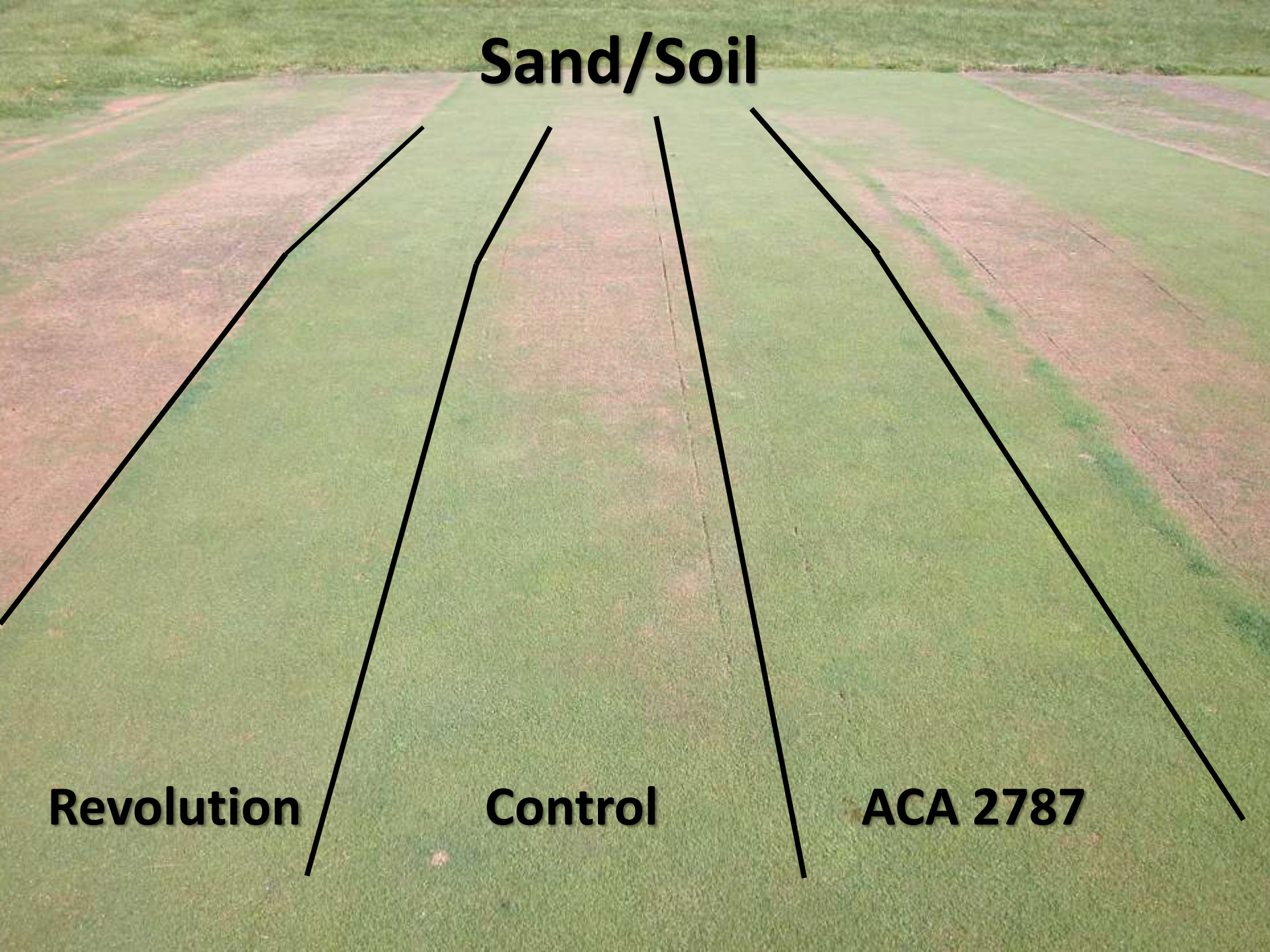
10 total for the season

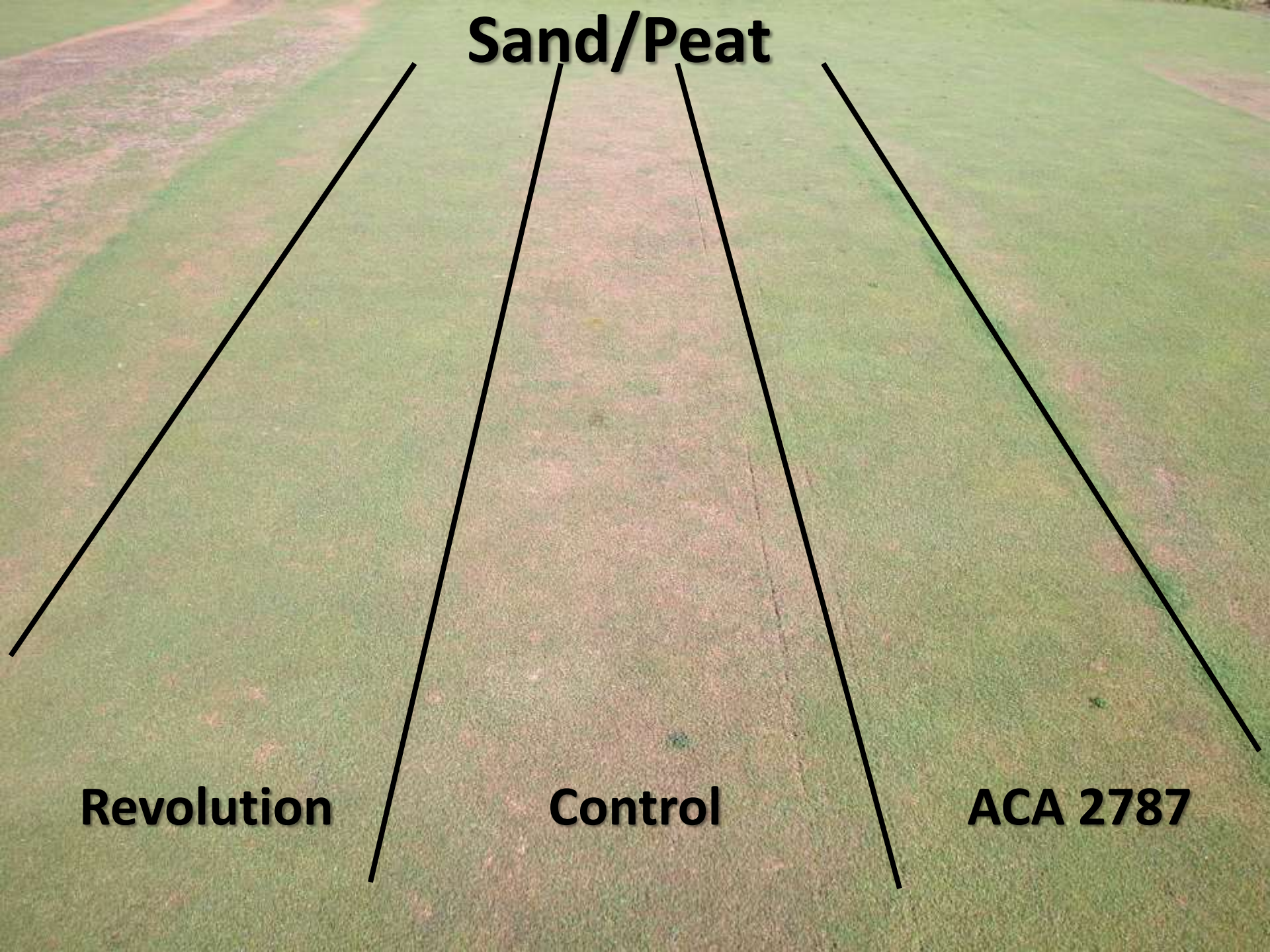
	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	10%	100%	50%	-----
90:10 sand soil	10%	100%	40%	-----
ACA 2787	10%	50%	10%	-----
Revolution	10%	50%	10%	-----
Check				

Localized dry-spot ratings

10 total for the season

	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	10%	100%	50%	-----
90:10 sand soil	10%	100%	40%	-----
ACA 2787	10%	50%	10%	-----
Revolution	10%	50%	10%	-----
Check				


Sand/Soil
Revolution
Control
ACA 2787


Sand/Peat
Revolution
Control
ACA 2787

Moisture = The Crucial Element

Playability

Golf Ball Acceptance


100% = 100% sand
SS = 90% sand 10% soil
SP = 90% sand 10% peat
100%
SS
SP
SP
100%
SS
SS
SP
100%
SP
SS
100%

Spectrum Technologies, Inc.

2007-08 TDR readings (1.5”)

14 total for the season

	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	21%	50%	21%	----
90:10 sand soil	14%	43%	7%	----
ACA 2787	----	28%	14%	----
Revolution	----	36%	14%	7%
Check				

2007-08 TDR readings (1.5”)

14 total for the season

	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	21%	50%	21%	----
90:10 sand soil	14%	43%	7%	----
ACA 2787	----	28%	14%	----
Revolution	----	36%	14%	7%
Check				

2007-08 TDR readings (1.5”)

14 total for the season

	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	21%	50%	21%	----
90:10 sand soil	14%	43%	7%	----
ACA 2787	----	28%	14%	----
Revolution	----	36%	14%	7%
Check				

2007-08 TDR readings (1.5”)

14 total for the season

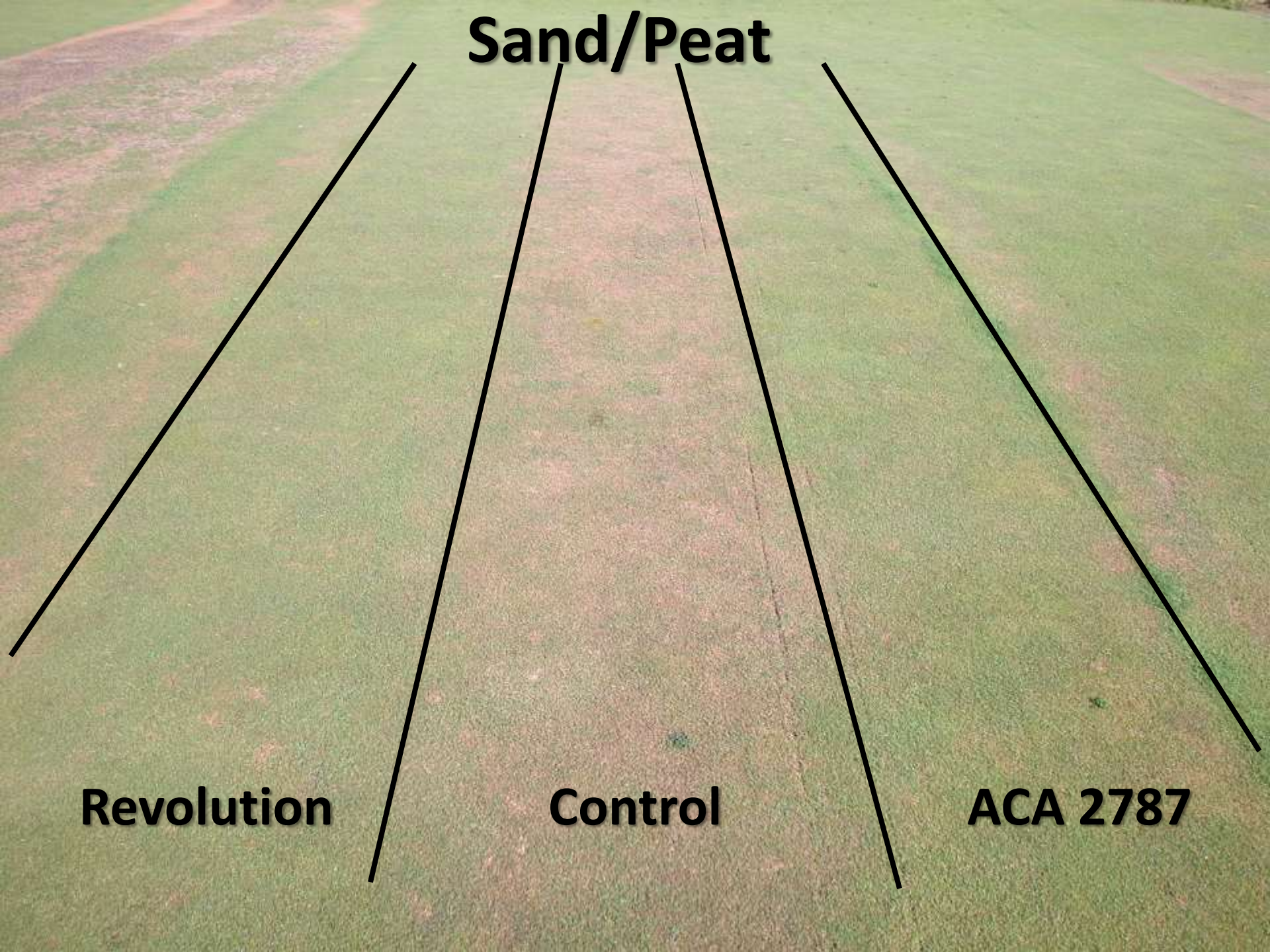
	North slope	Crown	Mid-slope	South flat
100% sand				
90:10 sand peat	21%	50%	21%	----
90:10 sand soil	14%	43%	7%	----
ACA 2787	----	28%	14%	----
Revolution	----	36%	14%	7%
Check				

2007-08 Sloping Green & Wetting Agents Conclusions

- Straight sand had the most LDS
- Sand/peat retained more moisture than our sand soil mix

2007-08 Sloping Green & Wetting Agents Conclusions

- Wetting agents decreased localized dry spot on the high spots of the green after several applications
- Wetting agents increased soil moisture retention especially on high spots and slopes.


Sand/Peat
Revolution
Control
ACA 2787

Acknowledgements

Committee

- Dr. Thom Nikolai
- Dr. Kevin Frank
- Dr. Kurt Steinke
- Dr. Joseph Vargas
- Dr. Bernard Zandstra

HTRC Staff

- Frank Roggenbuck
- Mark Collins
- Aaron Hathaway
- Jeff Dunne
- Undergrad Employees

Thank you for your time.

Questions?

Citations

- Throssel, Clark. 1981. Management factors affecting putting green speed. Masters thesis. Pennsylvania State University.
- Throssel, Clark. 1985. Management practices affecting bentgrass putting green speed. CPTF Newsletter (March/April):2-3).
- "Generally Accepted Agricultural and Management Practices for Irrigation Water Use". Michigan Department of Agriculture. January 2010. http://www.michigan.gov/documents/MDA_Irrigation_GAAMP_129710_7.pdf
- "Water Withdrawals for Golf Course Irrigation in Michigan, by County". Michigan Department of Environmental Quality. 2004. http://www.deq.state.mi.us/documents/deq-wd-wurp-Golf2004.pdf
- "Enviro-weather Automated Weather Station Network" formerly Michigan Automated Weather Network (MAWN). 2010-Present. http://www.agweather.geo.msu.edu/mawn/mawn.html
- "The Water Industry in Michigan". Michigan DEQ Water Withdrawal Reports. 2006. http://ref.michiganadvantage.org/cm/attach/c82f14ed-bb41-41ee-8951-3814e4d2390f/Water%20Industry%20in%20Michigan.pdf
- "Ball Mark Repair" image – Dave Martin / Getty Images http://0.tqn.com/d/golf/1/5/2/2/1/ballmarkrepair.jpg
- "Putt" image – Unknown Author http://004eeb5.netsolhost.com/nsnational/wp-content/uploads/2010/09/putt.jpg