Stop #3: Evaluation of Natural and Hybrid Turf for Water Conservation

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Project Overview:

This study was designed to evaluate CoverLawn hybrid turf for potential water savings and other turf quality characteristics such as winter color retention. CoverLawn is produced by EZ Hybrid Turf, and consists of a netted polyester and latex material with a polyethylene artificial turf pile. This design allows natural turf to grow up through spaces in the material, blending with the synthetic turf. Coverlawn avoids the use of infill material, which is often involved in synthetic turf use. Additionally, runoff can be avoided as water infiltrates the soil and follows the natural water cycle. Here we also evaluate different installation strategies and material types.

Study Design:

This study evaluated the use of CoverLawn with both tall fescue 'New Millennia' and bermudagrass 'Princess-77' turf, and their performance under reduced levels of irrigation. Plots were established in August-September 2014, turf was either left as is (control without CoverLawn), scalped or completely removed and seeded before installation. Tall fescue was seeded at a rate of 5 lbs/M, while bermudagrass was seeded at 1 lb/M. Tall fescue is maintained at 2.5 inches weekly, while bermudagrass is maintained at 0.5 inches 3 time/wk. Two CoverLawn materials were evaluated for tall fescue: CL6003 (2.1-inch pile height; 1-inch hole size) and CL2003 (0.78-inch pile height; 1.18-inch hole size), and one for bermudagrass: CM2003 (same dimensions as CL2003, but different color). Each treatment consisted of a 6' x 60' strip of fabric overlain on turf or bare soil. Installation was completed on 3 September 2014.

Beginning 5/13/2015, each lane was split into 3 sections and subjected to varying degrees of ET_o replacement representing minimal irrigation and further reductions of 20 and 40% ET_o to evaluate performance under extreme water deficits. Minimal irrigation for tall fescue was equal to 100% ET_o replacement, and 80% ET_o replacement for bermudagrass. Due to heavy rain events, low temperatures, and subsequent delay of green-up of bermudagrass, deficit irrigation was delayed until 6/30/2015 when all turf reached acceptable quality. Bi-weekly measurements were taken beginning 7/09/2015 including: cover; surface canopy temperature; drought stress; visual quality; Digital Image Analysis (DIA); Normalized Difference Vegetation Index (NDVI) as measured by a Green Seeker instrument; and soil volumetric water content (SVWC). At the end of the growing season, winter color retention will be measured. In addition, clipping yield was collected on a monthly basis beginning 7/14/2015 through the end of the growing season on the tall fescue portion of the study. Our hypothesis was that the reduced density of living turf resulting from presence of CoverLawn could reduce irrigation requirements while maintaining acceptable turf quality.

Results

Tall Fescue:

- Clipping yield results from 7/14/2015 and 8/06/2014 show reduced clipping yield in those plots established on bare ground with CL2003 or CL6003 installed (Fig.1). These reductions in clipping yield did not lead to reduction in visual quality. In general, turf established from seed on bare ground produced fewer clippings compared to scalped turf or the control.
- All CoverLawn treatments except CL2003 applied to scalped turf outperformed control plots in visual quality as drought stress increased on the rating date 8/06/2015 (Fig.2).
- NDVI results showed that CL2003 installed on bare soil and CL6003 installed on scalped turf outperformed control plots on 7/24/2015, as well as CL2003 on scalped turf (data not shown). On 8/06/2015, all CoverLawn treatments outperformed the control plots except for CL2003 on scalped turf, which is comparable to visual quality measurements.
- On 7/24/2015, canopy temperature was reduced on plots established on bare soil with either CL2003 or CL6003 (data not shown).
- Percent green cover assessed with DIA increased on CoverLawn plots on 8/06/2015. Results matched those of visual quality, with only plots established on scalped turf with CL2003 having comparable cover to control plots (Fig.3).
- Differences in soil water content were detected on 7/09/2015 only. Control plots and those treated with CL2003 on scalped turf had the highest water content, while scalped control plots and CL2003 installed on bare, seeded soil had the lowest.
- Dark Green Color Index (DGCI) measured by DIA showed no differences among CoverLawn and control plots, except for on the rating date 8/06/2015, when CL2003 installed on bare soil showed decreased color quality.
- Tall fescue with CoverLawn product CL6003, which has more synthetic turf material, led to increases in DGCI as assessed by DIA when compared to those plots with CL2003 installed, though these results were transient.
- Interaction between ET_o replacement and treatment was never significant. However, ET_o replacement had an effect on all measurements, with 100% ET_o replacement resulting in the highest (most desirable) values.

Bermudagrass:

- Differences in turfgrass quality were detected on 7/09/2015 and 7/24/2015. On 7/04/2015, CM2003 installed on seeded bare ground and bare control plots demonstrated lower visual quality. On 7/24/2015, CM2003 had the highest visual quality, though not significantly different from control plots. CM2003 installed on seeded bare ground had the lowest quality (Fig.4).
- NDVI results showed differences on 7/09/2015 and 7/24/2015 based on treatment. On both dates bare controls and CM2003 on bare, seeded ground showed the lowest values (data not shown).

- No differences in canopy temperature were detected among treatments.
- Percent cover measured with DIA showed treatment effect on 8/20/2015. Bare ground controls and CM2003 installed on bare seeded ground resulted in increased cover (Fig. 5).
- Control plots had the highest soil water content, which was not significantly different from CM2003 on scalped turf. Scalped controls and CM2003 installed on seeded bare ground had the lowest water content (Fig. 6).
- Turf color as measured by DIA showed no differences based on treatment.
- Interaction between ET_o replacement and treatment was never significant. However, ET_o replacement had an effect on all measurements, with 80% ET_o replacement resulting in the highest values.

Summary:

At this point, there is no strong evidence to indicate improved performance of drought stressed turf when CoverLawn is installed. Improvements to visual quality were inconsistent, but indicate that the CoverLawn product may improve visual appearance of turf under stress. It appears that installing on bare seeded ground is the most effective use of the product, especially on tall fescue. In addition, both turfgrass species established equally well from seed that was sown underneath the CoverLawn fabric despite super optimal air and soil temperatures for germination.

Tall Fescue Plot (Northern) Plan and Treatment List

(North)

Trt	ET Replacement		
1	60% ET_o	80% ET_o	100% ET_o
2			
3			
4			
5			
4	80% ET_o	60% ET_o	100% ET_o
2			
1			
3			
5			
4	100% ET_o	80% ET_o	60% ET_o
1			
2			
3			
5			

1	Coverlawn CL6003 Bare ground
2	Coverlawn CL2003 Bare ground
3	Coverlawn CL6003 Scalped
4	Coverlawn CL2003 Scalped
5	Tall fescue Control

Bermudagrass Plot Plan and Treatment List

(North)

Trt	ET Replacement		
1	40% ET_o	60% ET_o	80% ET_o
2			
3			
4			
5			
4	60% ET_o	80% ET_o	40% ET_o
2			
1			
3			
5			
4	80% ET_o	40% ET_o	60% ET_o
1			
2			
3			
5			

1	Coverlawn CM2003 Bare ground
2	Coverlawn CM2003 Scalped
3	Bermudagrass Bare ground
4	Bermudagrass Scalped
5	Bermudagrass Control

Figure 1: Tall fescue clipping yield during study period

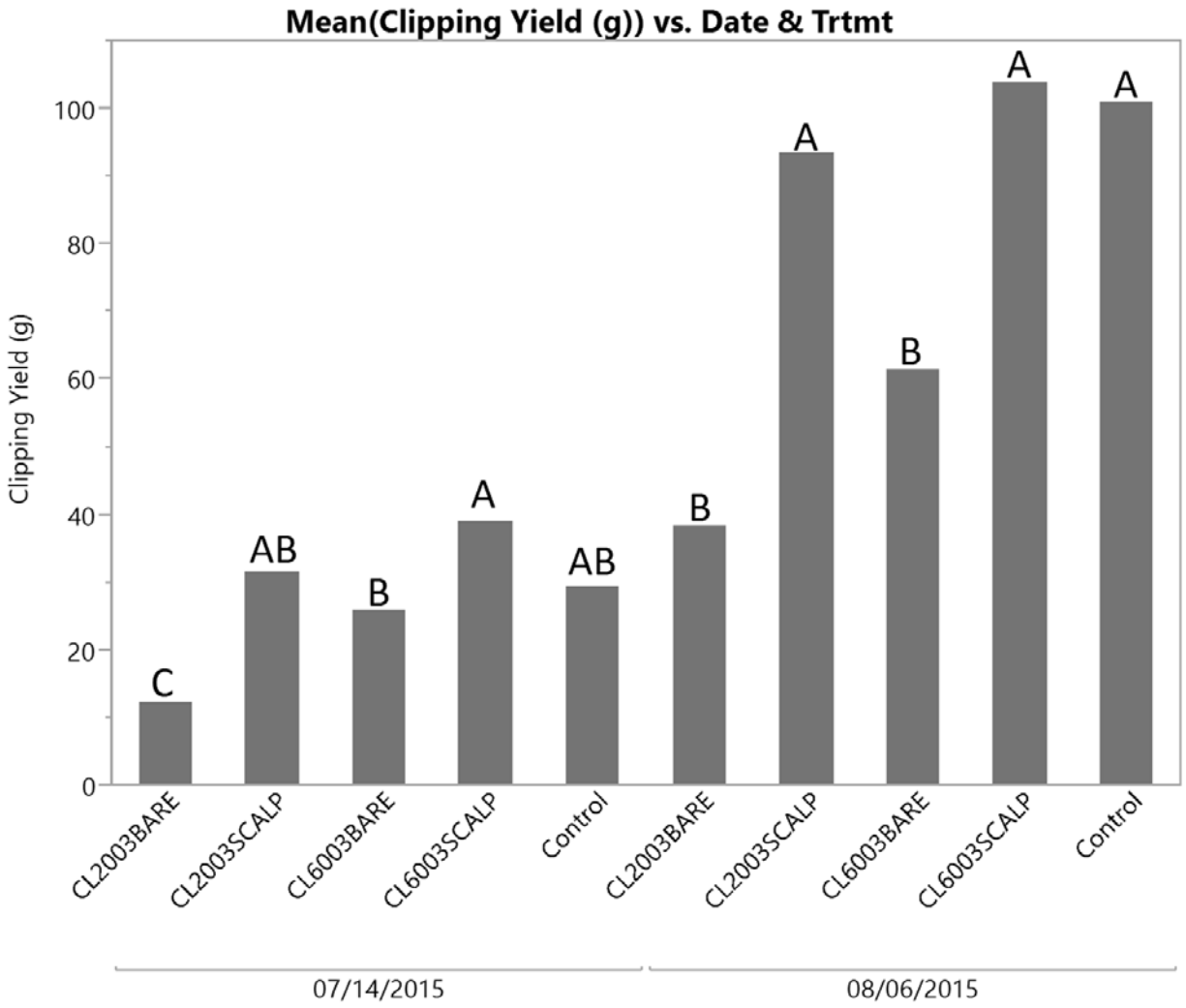

Figure 2: Tall fescue visual quality during study period

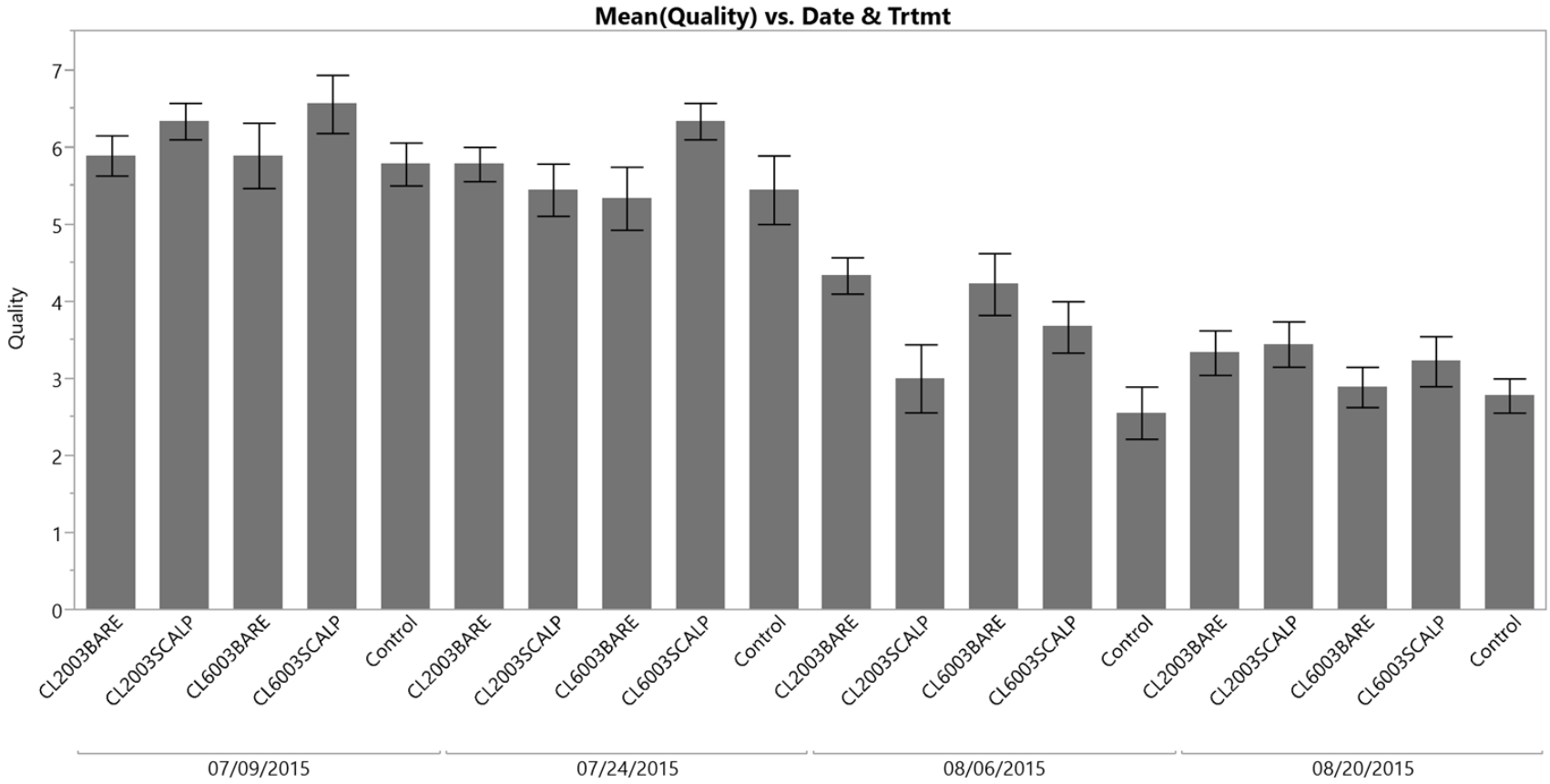

Figure 3: Tall fescue cover during study period

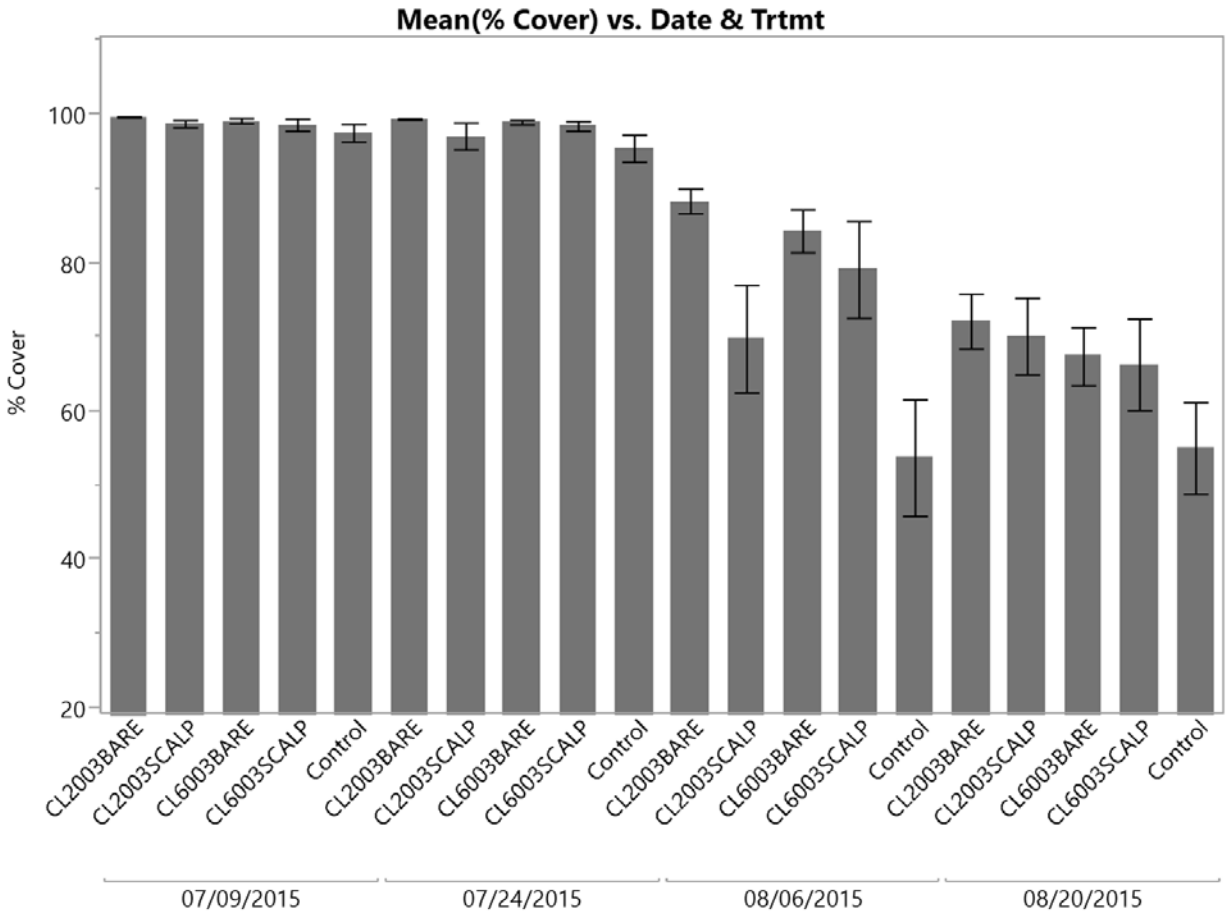

Figure 4: Bermudagrass quality during study period

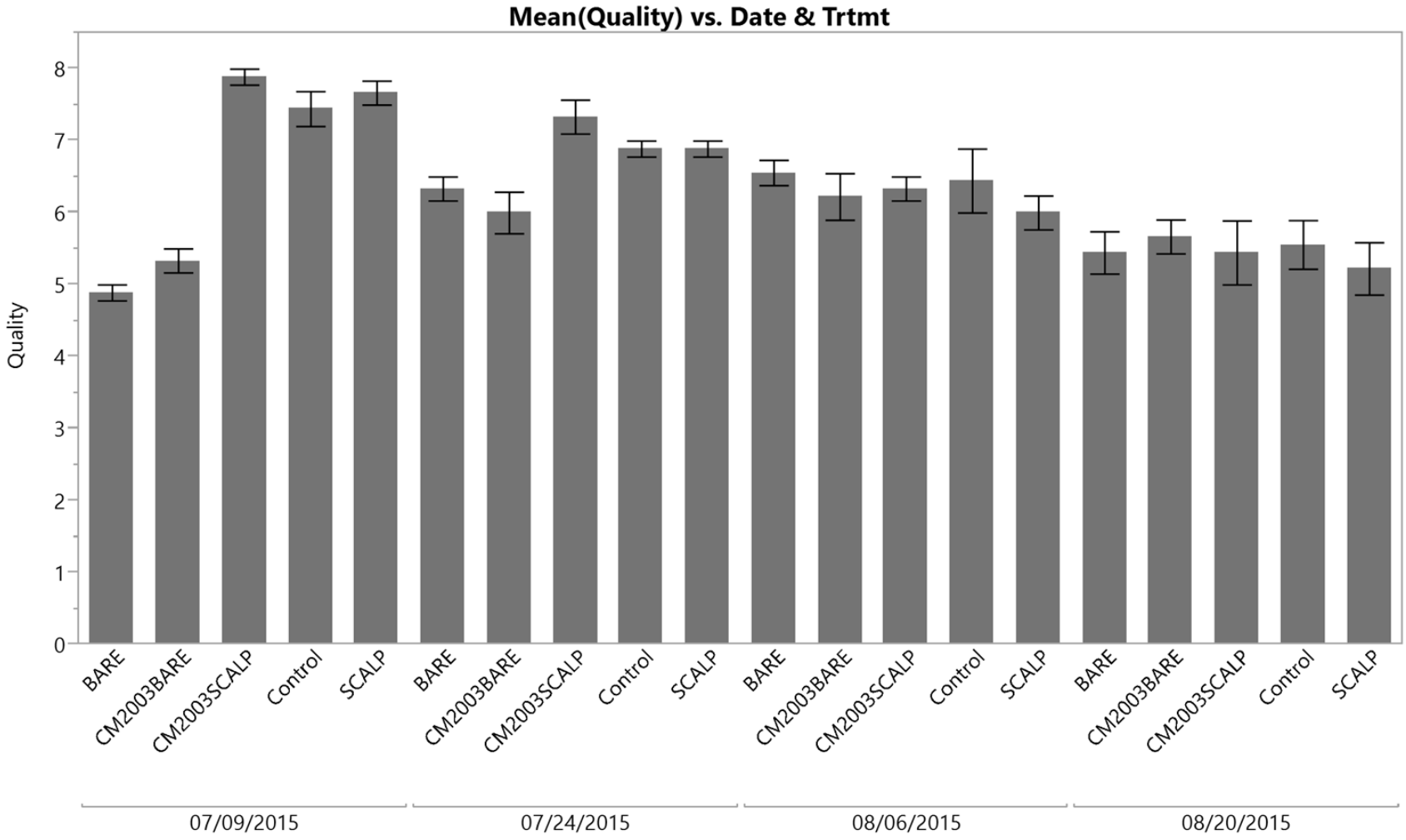

Figure 5: Bermudagrass cover during study period

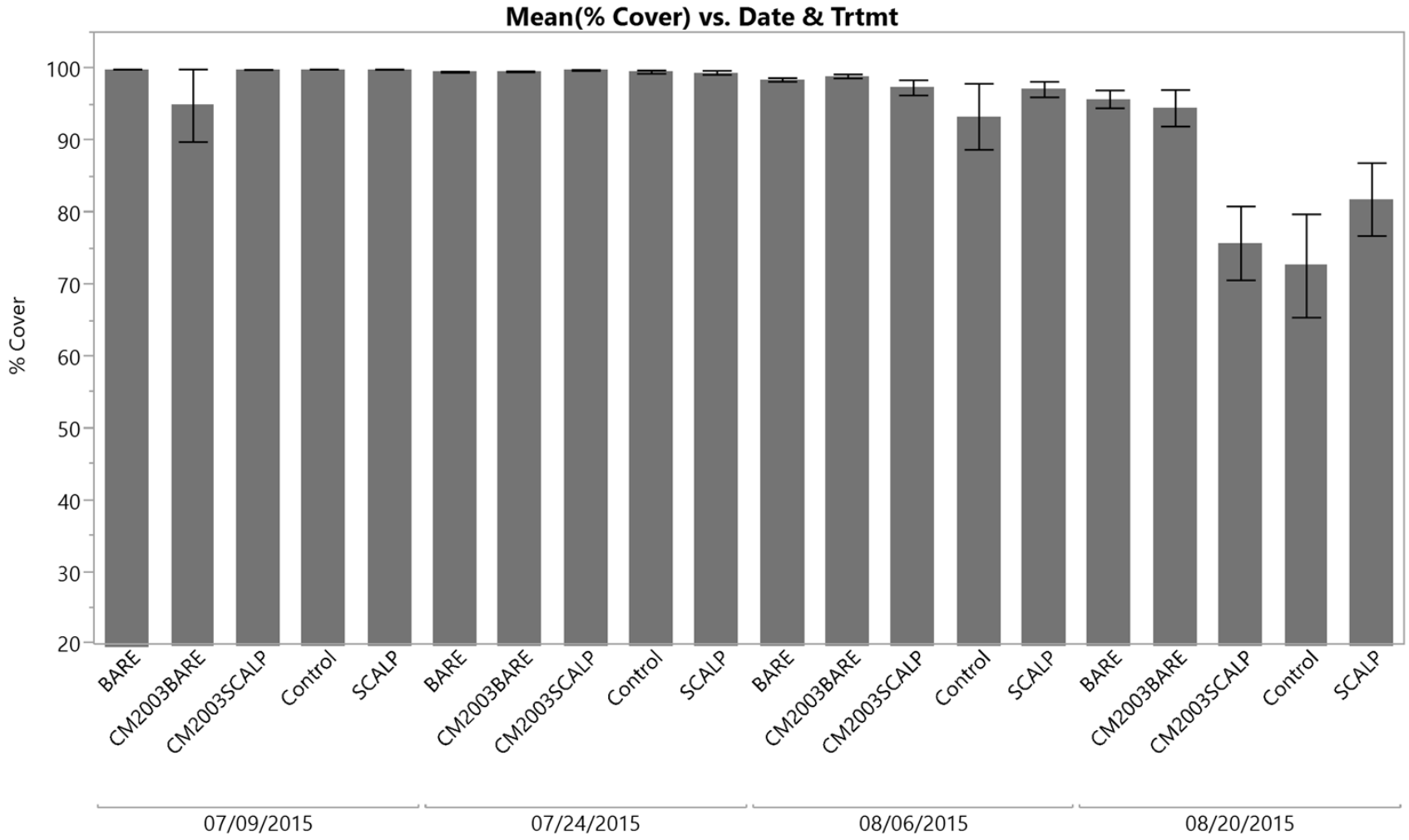

Figure 6: Bermudagrass soil water content during study period