

# Evaluation of Cutting Edge grass seed under low inputs and with two different mowing regimes

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Sponsor: Cutting Edge Grass Seed

The objective of this research is to evaluate and compare plots established with Cutting Edge Grass Seed to Ecolawn (or similar), Kentucky bluegrass blend and a three way lawn mix in a low input non-irrigated trial with two mowing regimes, weekly and seasonal.

Data collection will include, visual turfgrass quality, visual weed invasion, visual color ratings, normalized difference vegetative index (NDVI), canopy height (monthly), root growth at depth (July and August). Resistance to disease, insects, and drought will be evaluated if the stresses occur.

## MATERIALS/METHODS

Plots are located in turf research area at the Guelph Turfgrass Institute, Guelph, ON (Figure 1). Plots (1.5 x 1.5 m) of each grass type were established in the spring 2012. The

Table 1. Treatments

Treatment factor		Seeding rate (g m <sup>-2</sup> )
<i>Seed mix</i>		
1	Cutting edge Sun & Shade Mix 1	24.4
2	Cutting edge Sun & Shade Mix 2	24.4
3	Cutting edge Sunny Mix	24.4
4	Cutting edge 25:15 Mix	24.4
5	Eco-Lawn	24.2
6	Water Saver RTF	43.1
7	Pickseed Thickening	28.6
8	Turf Builder coated	25.0
<i>Mowing (split across mixtures)</i>		
1	Weekly	
2	Seasonal (2x, four weeks apart, spring and fall)	
<i>Salt (randomized within mix x mowing)</i>		
1	Salt added	Rate <i>ibid</i>
2	No salt	

experiment included 8 seed mixtures (Table 1 and Appendix 1). Mixes were seeded June 11, 2012 at the recommended rates (Table 1), and a starter fertilizer (5 g m<sup>-2</sup> N, 25-4-10) was



Figure 1. Plot area, June 18, 2012 (7 days after seeding).

incorporated at seeding. Plots were overseeded on August 14, using the same seeding rates but without fertilizer, to try to improve the cover establishment of all plots. Turf was maintained with typical post seeding irrigation to promote germination and establishment, but no fertility beyond the starter fertilizer. On July 12 a decision was made to apply 2 broadcast application of Fiesta to eliminate weeds: 200 ml m<sup>-2</sup> of 4% Fiesta solution was applied in two passes using a compressed air sprayer on July 12 and August 9. Plots were mowed weekly at 7 cm during the establishment phase. Once established (beginning in spring 2013) half of the plots will be mowed weekly and the others will be mowed twice in the fall and twice in the spring at 4-week intervals. Plots were irrigated regularly during the grow-in phase in 2012 to prevent turf loss; irrigation in 2013 will be more restricted, to assess drought tolerance and recovery.

The plots were rated visually for germination, establishment and cover development, and NDVI was recorded regularly. The established plots will be rated visually for turfgrass quality and color during 2013. Weed invasion and any other insect or disease pressure was rated visually monthly. Root mass at depth was not measured in 2012, because of the slow establishment of the plots. Root systems will be measured for root mass at different depths in 2013.

Weekly measurements of colour and NDVI will be made during drought and drought recovery in 2013.

In late winter/early spring 2013, plots will be split and treated with and without road salt to simulate roadside salts loads on half of each plot. The experiment will continue into the second year.

An anecdotal photographic record of the experiment is being kept.

All measurements are being analysed by appropriate statistical analyses (general linear models) and a full report will be prepared and

delivered to the sponsor by 90 days after the end of the experiment.

## RESULTS

*Germination, establishment, and cover development.* Germination was first noted in the plots 6 days after seeding (June 17). The germination and establishment phase was essentially complete by about 4 weeks after seeding (Tables 2 and 3, Figure 2). Beyond the germination phase, the grass mixtures were slow to fill in and cover the plots, primarily because of the hot, dry conditions. The plots were irrigated to encourage cover development, but were not fertilized beyond the starter fertilizer. At 9 weeks after seeding, the average grass cover as estimated by point-quadrat counts was about 59% of the plot area, and as estimated by digital image analysis (Figure 3), the average total green cover (non-dormant grass and weeds) was 67% of the plot area (Table 4).

The germination data estimated by increase in canopy reflectance were fitted to sigmoidal curves to determine whether there were differences among mixtures. The fitted curves have the general form:

$$NDVI_{day\ t} = NDVI_0 + \frac{(NDVI_{max} - NDVI_0)}{1 + 10^{((days\ to\ 50\% - day\ t) - slope)}}$$

Fitted curves are shown in Figure 2. The curve parameters  $NDVI_{max}$  and  $days\ to\ 50\%$  (germination) were analysed by ANOVA, and are shown in Table 5 and Figure 4.

*Weed invasion.* There was significant weed pressure in the newly seeded plots, and irrigation to germinate the grass seed also stimulated weed growth. By two weeks after germination there was about 25% weed presence in the plots (Table 6). The Fiesta herbicide treatments at 31 and 59 DAS killed much of the broadleaf weed, though the point-quadrat count at 62 DAS still showed 25-30% cover (Table 4). The point-quadrat counts did not distinguish between live and dead weeds, however, so the total counts on that date are likely overestimates. By 112 DAS the weed presence had been reduced considerably.



Table 2. Canopy reflectance of plots during germination/establishment phase.

Seed mixture	7 DAS	8	9	10	11	14	15	16
Cutting edge 25:15 Mix	-0.173 <sup>1</sup>	-0.179 c	-0.168 bc	-0.150 ab	-0.151 c	-0.024 b	0.012 bc	0.022 c
Cutting edge Sun & Shade Mix 1	-0.172	-0.177 bc	-0.167 bc	-0.142 ab	-0.141 bc	-0.016 ab	0.032 abc	0.040 bc
Cutting edge Sun & Shade Mix 2	-0.169	-0.175 bc	-0.167 abc	-0.144 ab	-0.134 abc	-0.012 ab	0.028 bc	0.049 bc
Cutting edge Sunny Mix	-0.173	-0.177 bc	-0.168 bc	-0.152 b	-0.149 c	-0.034 b	0.002 c	0.009 c
Eco-Lawn	-0.171	-0.173 abc	-0.167 abc	-0.148 ab	-0.148 c	-0.037 b	0.001 c	0.018 c
Pickseed Thickening	-0.167	-0.167 a	-0.161 ab	-0.131 ab	-0.115 ab	0.028 a	0.082 a	0.106 a
Turf Builder coated	-0.172	-0.178 bc	-0.171 c	-0.149 ab	-0.151 c	-0.031 b	0.001 c	0.021 c
Water Saver RTF	-0.168	-0.170 ab	-0.157 a	-0.129 a	-0.103 a	0.021 a	0.064 ab	0.092 ab
msd p=0.05	NS	0.008	0.010	0.022	0.033	0.044	0.052	0.054

	17	18	19	21	22	23	25
Cutting edge 25:15 Mix	0.065 c	0.178 c	0.216 c	0.308 b	0.343 b	0.434	0.399
Cutting edge Sun & Shade Mix 1	0.095 c	0.212 bc	0.256 bc	0.341 ab	0.375 ab	0.464	0.431
Cutting edge Sun & Shade Mix 2	0.104 bc	0.223 abc	0.272 bc	0.354 ab	0.415 ab	0.480	0.465
Cutting edge Sunny Mix	0.051 c	0.173 c	0.214 c	0.308 b	0.366 ab	0.440	0.440
Eco-Lawn	0.054 c	0.176 c	0.207 c	0.295 b	0.348 ab	0.423	0.436
Pickseed Thickening	0.182 a	0.299 a	0.351 a	0.397 a	0.412 ab	0.475	0.452
Turf Builder coated	0.086 c	0.180 c	0.222 c	0.315 b	0.352 ab	0.428	0.426
Water Saver RTF	0.165 ab	0.277 ab	0.313 ab	0.394 a	0.446 a	0.482	0.480
msd p=0.05	0.068	0.084	0.080	0.074	0.101	NS	NS

<sup>1</sup>Normalized-difference vegetation index: mean of 4 replicates; means within columns followed by the same letter are not significantly different (Tukey's HSD test, p=0.05).

Table 3. Visual rating of germination, establishment and cover development.

Seed mixture	7 DAS	8	11	15	112
	Germination/establishment				Cover
Cutting edge 25:15 Mix	1.9 ab <sup>1</sup>	2.0 bc	2.8 c	2.5 cd	7.3 abc
Cutting edge Sun & Shade Mix 1	2.0 ab	2.8 ab	3.0 bc	3.0 bc	7.4 abc
Cutting edge Sun & Shade Mix 2	2.1 ab	2.8 ab	3.4 abc	3.1 abc	7.5 ab
Cutting edge Sunny Mix	2.1 ab	1.1 c	2.0 c	1.5 d	6.0 c
Eco-Lawn	1.4 b	1.9 bc	2.9 c	2.4 cd	7.1 bc
Pickseed Thickening	3.1 a	3.5 a	4.5 ab	4.3 ab	8.6 a
Turf Builder coated	1.4 b	1.6 bc	2.4 c	2.0 cd	6.8 bc
Water Saver RTF	2.6 ab	3.9 a	4.8 a	4.4 a	7.8 ab
msd p=0.05	1.3	1.3	1.5	1.3	1.4

<sup>1</sup> Visual rating 0 – 10, 10 = complete cover. Means of four replicates; means within columns followed by the same letter are not significantly different (Tukey's HSD test, p=0.05).

There were no significant patterns among the mixtures in the visual weed ratings, but the point-quadrat counts showed weed infestation falling into three groups: low (Pickseed and RTF), medium (3 Cutting Edge mixtures and the Scotts Turf Builder) and high (Eco-Lawn and the Cutting Edge Sunny Mix). This grouping is similar to the pattern seen in speed of germination and establishment, both in the visual ratings and the canopy reflectance data.

*Canopy reflectance in established turf.* The overall values in canopy reflectance (NDVI)

fluctuated between the end of the establishment and the end of the season (Table 7), which is largely a function of moisture status. The patterns among the seed mixture treatments were not strong and consistent, but tended to follow the groupings seen in germination/establishment and weed pressure.

There was a significant association of canopy reflectance with percent cover as estimated either with image analysis (Figure 5) or point quadrat estimation (Figure 6) during the post-establishment growth period.

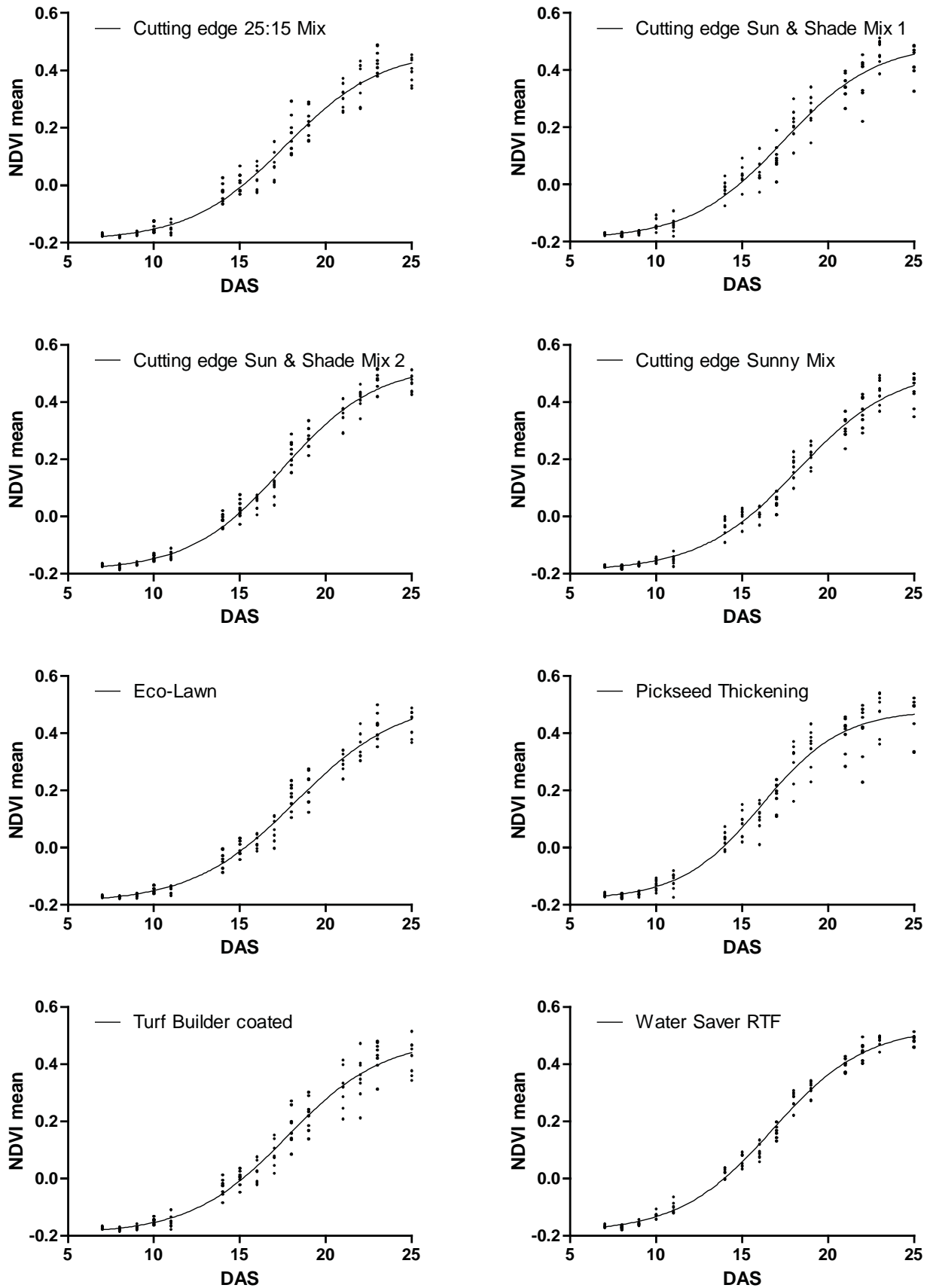


Figure 2. Curves fitted to canopy reflectance (NDVI) data from plots during germination/establishment. Points are plot means by date (8 plots per date).



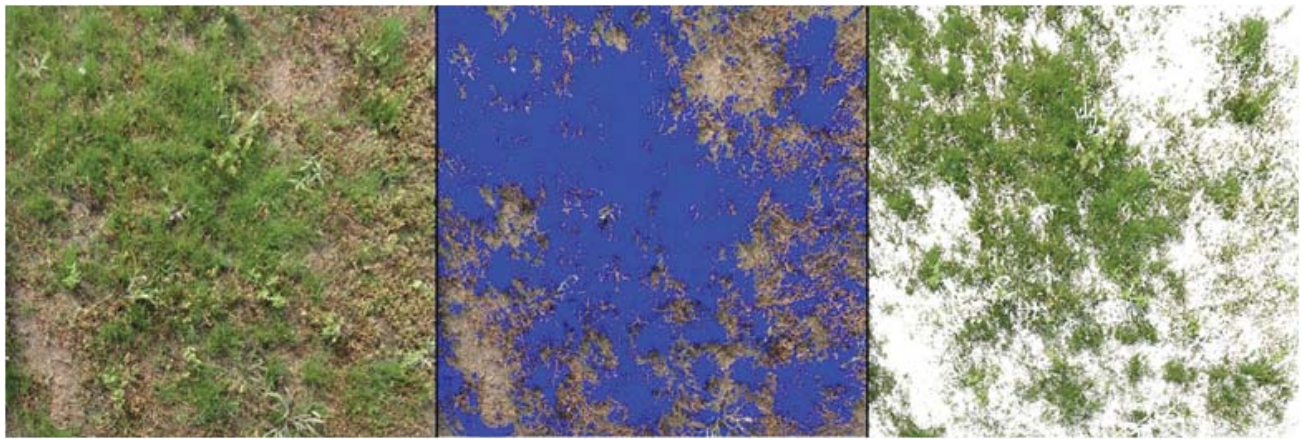


Figure 3. Representative image processing for digital image data (Table 4). The left image is the original photo of the 1.5 x 1.5 m plot. The center image is the mask (blue) applied by Sigmascan to the portion of the image whose pixels fall within the color threshold, and the right image is the same image with the (white) mask applied to the “non-green) portions of the plot. The percent area of green vegetation in the image shown is 49%.

Table 5. Parameters of curves fitted to NDVI data during establishment phase.

Seed mixture	NDVI <sub>max</sub>	Days to 50% NDVI <sub>max</sub>
Cutting edge 25:15 Mix	0.4717 <sup>1</sup>	16.85 a <sup>1</sup>
Cutting edge Sun & Shade Mix 1	0.4951	16.60 ab
Cutting edge Sun & Shade Mix 2	0.5292	16.48 ab
Cutting edge Sunny Mix	0.5209	16.87 a
Eco-Lawn	0.5167	16.94 a
Pickseed Thickening	0.4807	15.52 c
Turf Builder coated	0.4871	16.69 a
Water Saver RTF	0.5294	15.80 bc

<sup>1</sup> There were no significant differences among the treatments for NDVI<sub>max</sub>. Estimates of 50% germination followed by the same letter are not significantly different (One way ANOVA, Tukeys test of means comparisons, p=0.05).

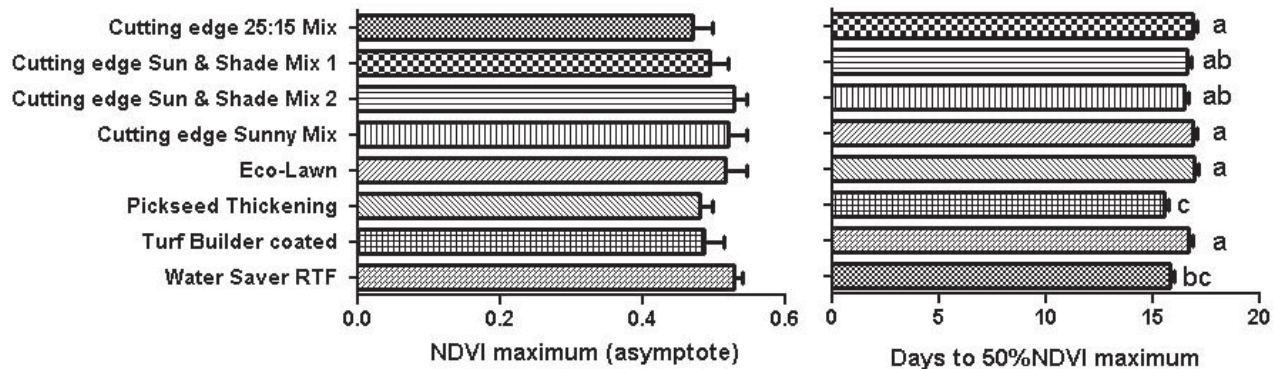


Figure 4. Estimated parameters of fitted curves (see Table 5).

Table 6. Visual weed rating.

Seed mixture	15 DAS	112
Cutting edge 25:15 Mix	2.8 <sup>1</sup>	0.6
Cutting edge Sun & Shade Mix 1	2.8	0.8
Cutting edge Sun & Shade Mix 2	2.8	0.5
Cutting edge Sunny Mix	2.5	0.6
Eco-Lawn	2.4	0.9
Pickseed Thickening	3.0	0.3
Turf Builder coated	2.4	0.5
Water Saver RTF	3.0	0.1
msd p=0.05	NS	NS

<sup>1</sup> Visual rating of weed pressure 0 – 10, 0 = no weed, 10 = solid weed. Means of four replicates; means within columns followed by the same letter are not significantly different (Tukey’s HSD test, p=0.05).

Table 7. Canopy reflectance of plots following establishment phase.

Seed mixture	35 DAS	38	46	52	63	65	74	86	109
Cutting edge 25:15 Mix	0.259 ab <sup>1</sup>	0.279 ab	0.341 abc	0.378 abc	0.310	0.340 ab	0.394 ab	0.410 a	0.478 b
Cutting edge Sun & Shade Mix 1	0.287 ab	0.301 ab	0.358 ab	0.403 a	0.335	0.366 a	0.404 a	0.402 a	0.472 b
Cutting edge Sun & Shade Mix 2	0.281 ab	0.289 ab	0.346 abc	0.382 abc	0.312	0.334 ab	0.384 ab	0.397 a	0.475 b
Cutting edge Sunny Mix	0.234 b	0.242 b	0.305 c	0.341 bc	0.263	0.272 b	0.356 ab	0.386 a	0.467 b
Eco-Lawn	0.236 b	0.248 b	0.305 c	0.339 c	0.292	0.315 ab	0.369 ab	0.396 a	0.526 a
Pickseed Thickening	0.312 a	0.322 a	0.374 a	0.399 ab	0.310	0.348 a	0.362 ab	0.321 b	0.392 c
Turf Builder coated	0.230 b	0.245 b	0.312 bc	0.357 abc	0.287	0.314 ab	0.373 ab	0.391 a	0.486 ab
Water Saver RTF	0.290 ab	0.291 ab	0.349 abc	0.386 abc	0.268	0.306 ab	0.343 b	0.408 a	0.470 b
msd p=0.05	0.065	0.067	0.052	0.059	NS	0.070	0.053	0.043	0.041

<sup>1</sup>Normalized-difference vegetation index: mean of 4 replicates; means within columns followed by the same letter are not significantly different (Tukey’s HSD test, p=0.05).

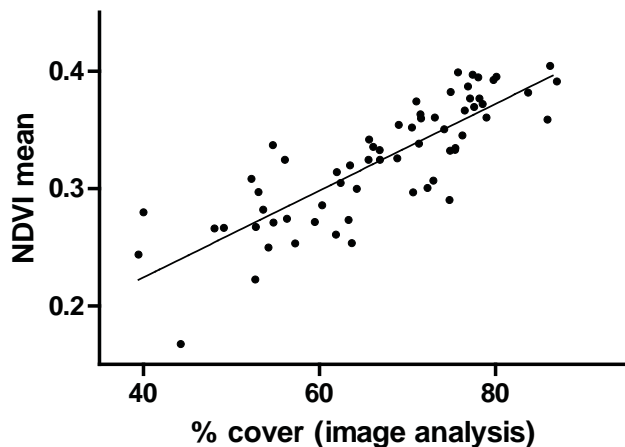


Figure 5. Association between mean NDVI and percent green cover from digital image analysis, August 15 (65 DAS).

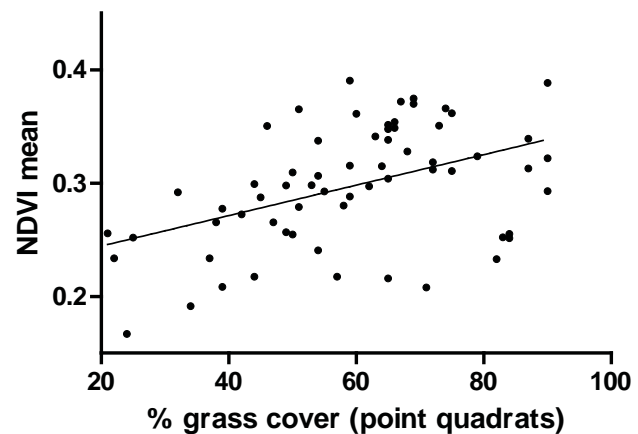


Figure 6. Association between mean NDVI and percent grass cover from point quadrat counts, August 12 (62 DAS).

## DISCUSSION AND CONCLUSIONS

The plots were seeded and established during a very challenging part of the season in 2013. The summer was very hot and dry, and weed pressure was significant. Nevertheless, there was reasonably good cover on most plots by the

end of the season, and it will be possible to assess the performance of the mixtures in response to the salt, mowing, and drought stresses in 2013.

There was a consistent pattern in the performance of the mixtures during the



germination and establishment phase which saw them fall roughly into three groups. The mixtures that germinated slightly more quickly and consequently had less weed and better cover and canopy reflectance values were the Pickseed Thickening and Watersaver RTF; just slightly behind were the Cutting edge Sun & Shade Mix 1,

Cutting edge Sun & Shade Mix 2, Cutting edge 25:15 Mix, and the Scotts Turf Builder. The Cutting edge Sunny Mix and Eco-Lawn mixtures were slightly slower to germinate and fill in, with more weed and lower cover values at the end of the season.