

Evaluation of low-maintenance turfgrass mixtures established from seed.

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The objective of this research project is to evaluate the performance of a two new low maintenance seed mixtures compared to a standard Kentucky bluegrass/fine fescue/perennial ryegrass seed mixture established from seed and maintained under low maintenance conditions.

Data collected includes emergence time (1st emergence and 50% emergence), speed of stand establishment, density, height and vigor, as well as shoot system growth rates. Weed infestation will be estimated visually and by point quadrat measurements.

MATERIALS/METHODS

The treatments (Table 1) consist of 3 seed mixtures and 3 mowing frequencies in a factorial design. Two experimental lawn seed mixtures and a standard lawn seed mixture were seeded June 26, 2009 at recommended rates. Each seed mixture is being mowed at three different frequencies – every 7-10 days, every 30 days, and once per season (at 6 weeks after seeding at establishment). Treatments were seeded into 1 x 2 m² plots, replicated 5 times in a randomized complete block design (Figure 1). Two days prior to seeding, the

plots were divided in half and one half of each plot treated with live steam (10 minutes of steam plus 10 minutes covered to maintain temperature) to sterilize the seed bed (Figure 2). Fertilizer (Andersons Nutri-DG 12-24-8; 2.5 g actual N m⁻²) was added with the seed. Seeded plots were irrigated regularly following seeding to maintain seedbed moisture.

Plots were observed and time of first emergence (days after seeding) noted. Following first emergence, the plots were rated regularly for emergence (visual rankings and canopy reflectance measurements), density, height, and vigor (visual rankings). Once full cover has developed, turf was rated for visual quality and color. Digital photographs of representative 1 m² area of each plot were taken regularly.

Shoot growth was noted by canopy height at mowing. Mowing height was 7.5 cm.

Weed infestation was observed by visual rankings.

All data were analyzed using general linear model ANOVA and means separations where appropriate.

Table 1. Treatments

Treatment	Seeding rate	Mowing frequency
1 Environturf (30% creeping red fescue, 25% sheep fescue, 25% hard fescue, 10% chewings fescue, 10% annual ryegrass)	350 kg ha ⁻¹	7-10 days
2 “No-mow” colonial bentgrass	50 kg ha ⁻¹	
3 Standard lawn seed mixture (60% Kentucky bluegrass, 15% creeping red fescue, 25% perennial ryegrass)	150 kg ha ⁻¹	
4 Environturf	350 kg ha ⁻¹	30 days
5 “No-mow” colonial bentgrass	50 kg ha ⁻¹	
6 Standard lawn seed mixture	150 kg ha ⁻¹	
7 Environturf	350 kg ha ⁻¹	Once (6 weeks after seeding)
8 “No-mow” colonial bentgrass	50 kg ha ⁻¹	
9 Standard lawn seed mixture	150 kg ha ⁻¹	



Figure 1. Plot area July 16, 2009 (20 days after seeding).



Figure 2. Sterilization of seedbed (half of each plot) with live steam. Plots were steamed for 10 minutes, then covered to retain heat for a further 10 minutes.

RESULTS

Germination and cover development.

Germination of seedlings was noted 7 days after seeding (July 3) in all plots, but there was no significant difference among the plots for germination ratings at this time (Table 2). Cover development was first apparent in an increase in canopy reflectance (normalized-difference vegetation index) on 6 DAS (Table 3), increasing in a typical logistic fashion to a maximum at about 50 DAS. The Enviro turf plots had slightly faster germination and cover development than the NoMow or standard lawn mix. The standard lawn mix had slightly faster development than

the NoMow in the early stages, but by the end of the season the NoMow was showing better cover and higher canopy reflectance values.

If the canopy reflectance readings are fitted to a typical sigmoidal growth curve, the differences among the treatments are more obvious than in the tabular data. Pooling the steamed and unsteamed halves and comparing the mixtures shows a significantly earlier time to 50% cover for the Enviro turf (Figure 3, Table 4). The Enviro turf plots were 4 to 5 days earlier to develop 50% cover than the other two mixtures. The maximum NDVI values, which reflect both cover development and genetic differences among

Table 2. Visual ratings of plots.

Treatment	Germination		Weed			
	07/03	Cover 07/30	07/03	07/30	08/31	09/18
Mix	07/03	07/30	07/03	07/30	08/31	09/18
Environturf	1.17	8.08 a	0.07	2.12 b	1.80 b	3.33 b
Lawn mix	1.07	5.90 c	0.08	2.57 ab	2.47 a	4.47 a
NoMow	1.10	6.83 b	0.08	2.72 a	2.27 ab	3.07 b
	NS	0.56	NS	0.46	0.47	0.70
Mowing						
monthly	1.13	6.83	0.06	2.22 b	1.93 b	3.47
one time	1.10	7.05	0.07	2.35 b	1.87 b	3.67
weekly	1.10	6.93	0.09	2.83 a	2.73 a	3.73
	NS	NS	NS	0.46	0.47	NS
Steamed						
no	1.20	7.17 a	0.11 a	3.63 a	3.18 a	4.40 a
yes	1.02	6.71 b	0.04 b	1.30 b	1.18 b	2.84 b
	NS	0.38	0.03	0.31	0.32	0.47

¹ Visual ratings, 0-10, 10 = full germination, 100% cover, or 100% weed cover. Mean of x 4 replicates; means within columns followed by the same letter are not significantly different (Tukey's HSD test, p=0.05)

Table 3. Canopy reflectance (normalized-difference vegetation index) in treated plots.

Treatment	Days after seeding									
	Mix	6	9	18	19	21	24	26	39	52
Environturf	-0.175 ¹ a	-0.152 a	-0.026 a	0.116 a	0.083 a	0.080 a	0.192 a	0.529 a	0.645 a	
Lawn mix	-0.180 b	-0.162 b	-0.088 b	0.033 b	-0.010 b	-0.029 b	0.066 c	0.442 b	0.611 c	
NoMow	-0.181 b	-0.163 b	-0.103 c	-0.003 c	-0.024 c	-0.020 b	0.088 b	0.442 b	0.618 b	
msd p=0.05	0.0016	0.0023	0.0063	0.0093	0.0093	0.0101	0.0129	0.0128	0.0056	
Mowing										
monthly	-0.179	-0.158	-0.085 c	0.039 b	0.001 c	-0.006 c	0.089 c	0.443 c	0.627 b	
one time	-0.179	-0.159	-0.073 b	0.039 b	0.011 b	0.005 b	0.115 b	0.477 b	0.640 a	
weekly	-0.179	-0.159	-0.058 a	0.067 a	0.036 a	0.031 a	0.141 a	0.494 a	0.608 c	
msd p=0.05	NS	NS	0.0063	0.0093	0.0093	0.0101	0.0129	0.0128	0.0056	
Steaming										
no	-0.177 a	-0.155 a	-0.069 a	0.053 a	0.021 a	0.019 a	0.121 a	0.484 a	0.617 b	
yes	-0.180 b	-0.162 b	-0.075 b	0.044 b	0.012 b	0.001 b	0.110 b	0.457 b	0.633 a	
msd p=0.05	0.0011	0.0015	0.0043	0.0063	0.0063	0.0069	0.0088	0.0087	0.0038	
Days 55-88										
Mix	55	59	63	66	68	75	83	88		
Environturf	0.629 a	0.626 a	0.616 a	0.650 a	0.599 a	0.605 a	0.616 a	0.605 a		
Lawn mix	0.588 c	0.584 c	0.561 b	0.605 b	0.537 c	0.539 b	0.541 c	0.544 b		
NoMow	0.620 b	0.614 b	0.615 a	0.652 a	0.591 b	0.603 a	0.607 b	0.604 a		
msd p=0.05	0.0048	0.0043	0.0053	0.0042	0.0053	0.0048	0.006	0.0067		
Mowing										
monthly	0.629 a	0.617 a	0.620 a	0.654 b	0.588 b	0.616 a	0.615 a	0.609 a		
one time	0.630 a	0.617 a	0.624 a	0.661 a	0.600 a	0.606 b	0.608 b	0.604 a		
weekly	0.580 b	0.589 b	0.548 b	0.590 c	0.538 c	0.525 c	0.540 c	0.539 b		
msd p=0.05	0.0048	0.0043	0.0053	0.0042	0.0053	0.0048	0.006	0.0067		
Steaming										
no	0.602 b	0.598 b	0.581 b	0.624 b	0.563 b	0.564 b	0.566 b	0.561 b		
yes	0.623 a	0.617 a	0.614 a	0.647 a	0.588 a	0.601 a	0.609 a	0.607 a		
msd p=0.05	0.0032	0.0029	0.0036	0.0029	0.0036	0.0033	0.0041	0.0046		

¹ Normalized- difference vegetation index: mean of ~230 readings x 4 replicates (mixtures and mowing schedules) or ~350 x 4 replicates (steaming) ; means within columns followed by the same letter are not significantly different (Tukey's HSD test, p=0.05).

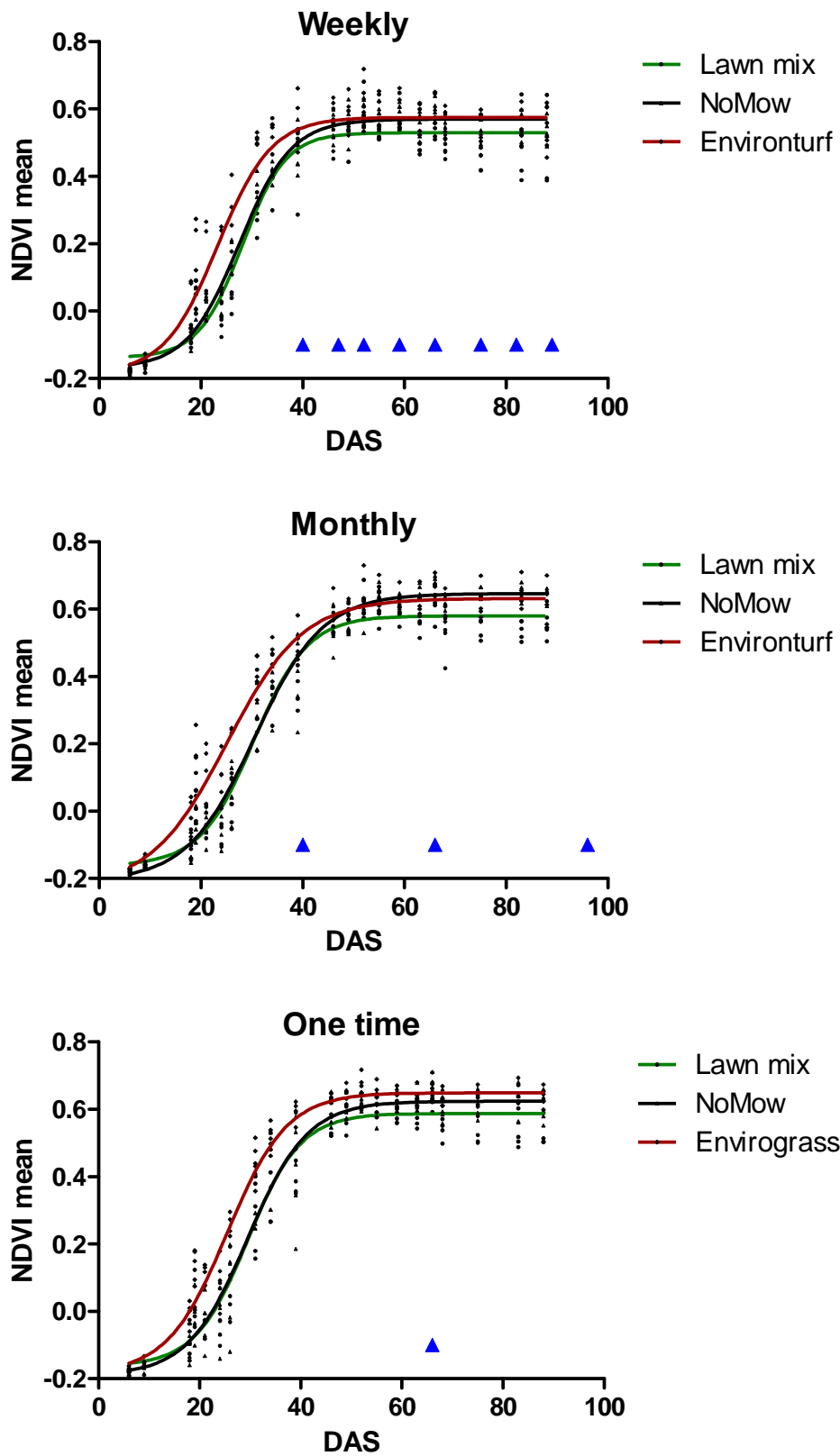


Figure 3. Germination and cover development as assessed by increase in canopy reflectance (NDVI). Plot means (pooled across steamed and unsteamed plots) are shown fitted to variable slope sigmoidal growth curves. The statistics for the curves are shown in Table 4. Blue arrowheads indicate mowing dates.



Table 4. Cover development estimated by sigmoidal non-linear curve fit (variable slope) of NDVI plot means.

Best-fit values	weekly	once	monthly	unsteamed	steamed
			Environturf		
Minimum	-0.1857	-0.1835	-0.2272	-0.1985	-0.1821
Maximum	0.5752	0.6495	0.6317	0.6092	0.6414
Days to 50% of maximum	23.32 ¹	25.46	25.1	24.84	26.74
Std. Error					
Minimum	0.03568	0.02404	0.03882	0.02072	0.01752
Maximum	0.01048	0.00752	0.01005	0.005918	0.00625
Days to 50% of maximum	0.7508	0.5214	0.8956	0.4643	0.4106
Goodness of Fit					
Degrees of Freedom	101	101	101	285	277
R ²	0.9215	0.9704	0.9553	0.9464	0.9518
			NoMow		
Minimum	-0.1694	-0.1904	-0.2071	-0.1617	-0.1967
Maximum	0.5697	0.6245	0.6468	0.5968	0.6342
Days to 50% of maximum	27.56	29.52	30.59	29.05	29.35
Std. Error					
Minimum	0.01778	0.02708	0.02315	0.01228	0.01267
Maximum	0.006826	0.01084	0.009471	0.005739	0.004878
Days to 50% of maximum	0.4512	0.6968	0.6101	0.3363	0.3386
Goodness of Fit					
Degrees of Freedom	101	101	101	275	287
R ²	0.9725	0.9529	0.9709	0.9583	0.9741
			Lawn mix		
Minimum	-0.1382	-0.1625	-0.1616	-0.1552	-0.1656
Maximum	0.5296	0.5881	0.5807	0.5615	0.5814
Days to 50% of maximum	28.12	29.54	30.39	29.28	29
Std. Error					
Minimum	0.02437	0.02429	0.02164	0.01468	0.01477
Maximum	0.01045	0.01024	0.009542	0.006208	0.006273
Days to 50% of maximum	0.6725	0.6595	0.6144	0.4453	0.4227
Goodness of Fit					
Degrees of Freedom	101	101	101	283	279
R ²	0.9267	0.9488	0.9568	0.943	0.947

¹The number of days to 50% of maximum NDVI is a good estimate of cover development. Full cover developed in most plots at around 50 days after seeding.

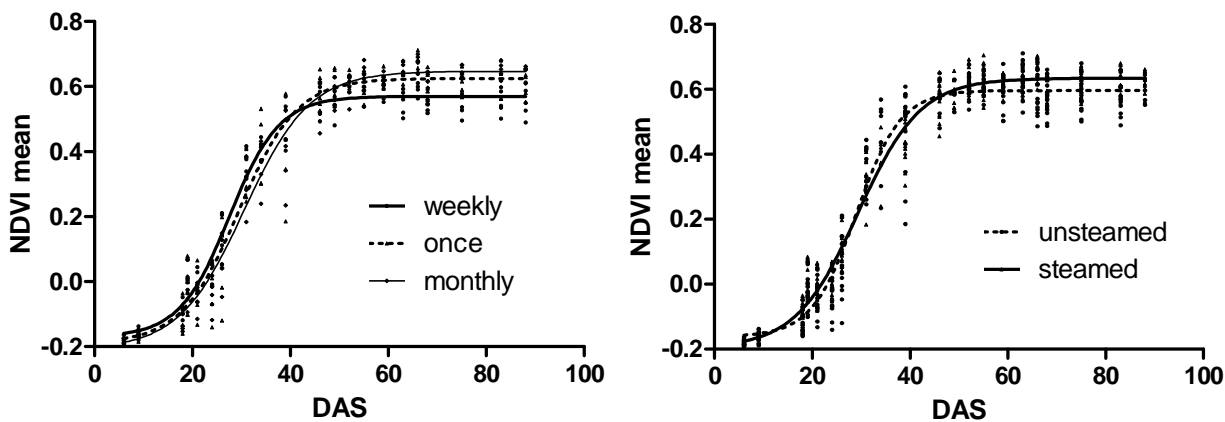


Figure 4. Effect of mowing schedule and steaming on germination and cover development in NoMow plots as assessed by increase in canopy reflectance (NDVI). Plot means (pooled across steamed and unsteamed plots) are shown fitted to variable slope sigmoidal growth curves.

the mixtures, were higher for the Enviro turf and NoMow mixtures. Mowing, which only began near the end of the cover development phase, slightly increased the speed of development and reduced the NDVI maximum values in the plots mowed weekly, but steaming had less effect (Figure 4, NoMow plot data are presented as representative – the other two mixtures had very similar patterns). The fit of the growth curves to

the data was very good (>90%) in all cases.

Broadleaf weed pressure. There were significant differences among the treatments in weed pressure: seed mixture, mowing schedule, and steaming all had effects on different dates (Table 2). The steaming process reduced the weed pressure significantly (Figure 5) on all dates. Weekly mowing resulted in increased weed early in the season, but the effect had disappeared by the end of the season. The Enviro turf had slightly less weed early in the trial, but by the end of the season it and the NoMow plots had significantly less weed than the standard lawn mix.



Figure 5. Typical weed pressure in steamed (right) and unsteamed (left) halves of each plot. Photo is of monthly mowed plots Aug. 18 (53 days after seeding.)

DISCUSSION AND CONCLUSIONS

There was no difference among any of the treatments in time to first emergence of seedlings (6 days after seeding). There was a 4-5 day difference between the turf seed mixture that established cover most quickly (Enviro turf), and the NoMow and standard lawn mixture. More frequent mowing tended to speed up the establishment by a day or two, but steam treatment of the rootzone had little effect. The NoMow mixture and Enviro turf were approximately equivalent in final cover as estimated by canopy reflectance, which the standard lawn mix had slightly poorer values. Steam treatment of the rootzone reduced weed pressure significantly, but there were still unacceptable amounts of broadleaf weed in all plots.

Sponsor: Clarke Snedden (NomowGrass.ca)