Wear Tolerant Grasses for Use on Sports Fields in a Cold Climate

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Summary

This trial was initiated to examine the effects of traffic on various grasses for sports fields in a cold climate. The Calgary site was seeded June 30, 2003, and the Edmonton site was seeded September 3, 2003.

All grasses at Calgary site came through the winter of 2003-04 in good condition as weather conditions were generally mild. The grasses recovered quickly in the spring and continued to improve in quality over the summer. The perennial ryegrass cultivars were established well and received the highest scores for area cover, density and turf colour. The field was opened to athletic competitions in September 2004.

The plots at Edmonton over wintered as a dormant seed bed. In the spring, seed began to germinate but emergence was well below expectations leaving the stands of turf thin and patchy. The Perennial Ryegrass cultivars were best at establishing a stand of turf, while the Kentucky Bluegrass cultivars and the Poa supina plots were much poorer. A decision as to whether to continue the trial with the current stand of turf will be made after the spring evaluation in 2005.

Introduction

During the summer of 2001, the Prairie Turfgrass Research Centre conducted a site visit to the County of Strathcona (Sherwood Park, Alberta) to examine the condition of their sports fields and to assist in the development of a long-term plan for their improvement. Many of the high use fields were characterized by bare areas and thin turf that was a result of extremely high levels of traffic and was exacerbated by drought conditions that were prevalent throughout much of Alberta.

Sports participation, and in particular soccer, has increased dramatically in the last few years. These high participation levels have resulted in sports fields receiving far more traffic than the existing grasses are capable of withstanding. In addition, highly organized leagues in football, softball and baseball have also served to increase traffic on sports fields, particularly in urban areas.

Sports fields grasses in this climate are predominately Kentucky bluegrass and creeping red fescue. These grasses are considered to have only a moderate tolerance to traffic and wear (the effects of abrasive activity from foot traffic). These grasses are, however, quite cold tolerant and as a result survive Canadian Prairie winters quite well. In areas with a moderate climate i.e. the lower mainland of British Columbia, perennial ryegrass and tall fescue are frequently used in high traffic areas due to their good wear tolerance. However, in Alberta, their lack of cold tolerance has made them unsuitable for use on sports fields or other high traffic areas.

In recent years many new varieties of perennial ryegrass and tall fescue have been developed, but have never been tested for their cold tolerance. As there are often great differences in cold tolerance between varieties, some of these new wear tolerant perennial ryegrasses or tall fescues may have better cold tolerance. In addition, other grasses, such

as *Poa supina*, have been successfully used in sports fields in other parts of North America due to their good recovery from traffic but have not been adequately tested for their cold tolerance.

The objective of this trial is to develop additional information regarding wear and cold tolerant grasses that can be used on sports fields.

Specific Objectives of this Trial

- Screen new species and varieties of grasses for improved cold tolerance.
- Evaluate the most promising cold tolerant species and varieties for their wear tolerance and turfgrass quality in field conditions.
- Evaluate these cold tolerant grasses in different climate zones throughout the province.
- Evaluate mixtures of the best cold and wear tolerant grasses from the field study.

Methodology – Initial Screening

A preliminary screening of forty-eight grass cultivars for cold tolerance was conducted study to identify the most suitable cultivars for field-testing. Grasses were grown on in the greenhouse and then were subjected to a standard freeze test to determine their relative hardiness levels (table 1). Twenty-one grasses were chosen for the field study component of this trial. In addition, *Poa supina*, a *Poa supina* and Touchdown Kentucky bluegrass mix, and the City of Calgary standard sports field mix were added to the treatment list (Table1).

Table 1. List of grasses seeded at Calgary and Edmonton and their relative hardiness level.

Grass Species	Cultivar	Relative Hardiness (LT_{50} Values)
1. Kentucky Bluegrass	SR 2284	>-26°C
2. Kentucky Bluegrass	Showcase	>-26°C
3. Kentucky Bluegrass	Award	>-26°C
4. Kentucky Bluegrass	Total Eclipse	>-26°C
5. Kentucky Bluegrass	Tsunami	>-26°C
6. Kentucky Bluegrass	America	>-26°C
7. Kentucky Bluegrass	Langara	-26°C
8. Kentucky Bluegrass	Moon Shadow	-26°C
9. Kentucky Bluegrass	Touchdown	>-26°C
10. Kentucky Bluegrass	Rambo	>-26°C
11. Kentucky Bluegrass	Argyle	>-26°C
12. Perennial Ryegrass	Fiesta 3	-17°C
13. Perennial Ryegrass	Pennfine	-17°C
14. Perennial Ryegrass	Pick RC2	-17°C
15. Perennial Ryegrass	PR A-97	-16°C
16. Tall Fescue	Grande	>-22°C
17. Tall Fescue	SR 8600	>-22°C
18. Tall Fescue	Arid 3	>-22°C
19. Tall Fescue	Pixie	>-22°C
20. Tall Fescue	Mustang II	>-22°C
21. Tall Fescue	Watchdog	>-22°C
22. Poa supina	Sp.	Unknown
23. Turf Mix	10% Poa supina sp. 90% Touchdown (Kentucky Bluegrass)	Unknown >-26°C
24. City of Calgary Mix	25% Award (Kentucky Bluegrass) 25% Liberator (Kentucky Bluegrass) 25% Odyssey (Kentucky Bluegrass) 25% Champion (Perennial Ryegrass)	>-26°C Unknown >-26°C Unknown

Methodology – Field Study

The Calgary site was seeded June 30, 2003, and the Edmonton site was seeded September 3, 2003. Seeding rates were 0.5 kg/100m^2 for Kentucky bluegrass, and 3.2 kg/100m^2 for the tall fescue and perennial ryegrasses. Seed was broadcast onto the plots using a shaker bottle and lightly raked to ensure good seed to soil contact. Irrigation was provided at the Calgary site to ensure that the plots remained moist at all times, while the Edmonton site relied solely on natural precipitation.

Plots were replicated four times in a Randomized Complete Block Design (RCBD). The plots measured 1.5 by 2 metres. The plots were mowed initially at a mowing height of 62.5cm and were fertilized at a rate of 0.5kg N/100m^2 (1b N/1000ft^2) per growing month.

The sites were visually evaluated three times over the course of the 2004 growing season. Following National Turfgrass Evaluation Program (NTEP) protocols, three turf quality factors: area cover, turfgrass density and genetic colour were assessed. Colour was rated on a 1 to 9 basis where 1 indicated a brown dormant turf and 9 indicated a dark green turf coloration. Visual assessments were made when the turf was actively growing to assure that the turf colour was representative of its genetic potential and not as a result of an environmental stress on the turf. Density, which is a subjective rating of shoots per unit of area, was rated as 1 is poor density and 9 is superior density. The area cover rating is described as the area covered by the desired turfgrass and is rated by 1 indicates a complete lack of cover and 9 equals complete cover. Bare areas and/or weed encroachment reduced the rating values. Density and area cover were combined with colour to determine quality ratings.

Results and Discussion

Establishment of the Grasses

With no athletic events scheduled for either sport field until the fall of 2004, the first assessment of the grasses for wear tolerance will not occur until the 2005 season. This delay has allowed the grasses additional time to become better established. Presented in this interim report is the 2004 turf establishment data.

In general, the cultivars within each grass species tended to be very similar to each other during the establishment period. In all likelihood it won't be until the sports fields are exposed to increased wear and periods of cold that differences between the cultivars will become more significant (Table 2).

Table 2. Comparison of Perennial Ryegrass cultivars for Calgary and Edmonton, 2004.

Turf Area Cover	**Spring**		**Summer**		**Fall**	
	Clgy	**Edm**	**Clgy**	**Edm**	**Clgy**	**Edm**
Fiesta 3	6.8	4.8	6.3	5.3	5.8	5.3
Pennfine	7.0	4.3	6.5	5.5	4.8	5.8
Pick RC2	6.8	4.8	6.5	5.3	5.8	5.5
PR A-97	6.8	4.0	6.5	5.0	5.8	4.8
$LSD_{0.05}$ =	N/S	N/S	N/S	N/S	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Perennial Ryegrass 2004

Turf Density	**Spring**		**Summer**		**Fall**	
	Clgy	**Edm**	**Clgy**	**Edm**	**Clgy**	**Edm**
Fiesta 3	6.8	4.5	6.5	4.8	6.0	4.8
Pennfine	6.3	4.0	6.3	5.0	5.8	5.5
Pick RC2	6.8	4.3	6.5	4.8	6.0	4.8
PR A-97	6.5	3.5	6.5	4.3	6.3	4.5
$LSD_{0.05}$ =	N/S	N/S	N/S	N/S	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Perennial Ryegrass 2004

Turf Colour	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Fiesta 3	6.3	6.0A	6.5	6.5A	6.8AB	5.8A
Pennfine	5.5	5.3 B	6.0	4.8 B	5.8 C	4.8 B
Pick RC2	6.3	6.0A	6.5	6.0A	7.0A	5.3AB
PR A-97	6.5	6.0A	6.3	5.8A	6.3 BC	5.0 B
$LSD_{0.05}$ =	N/S	0.40	N/S	0.92	0.55	0.67

*Values followed by the same letter are not significantly different at p=0.05.

Perennial Ryegrass 2004

Overall Quality	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Pick RC2	6.6	5.0	6.5	5.3	6.3A	5.2
Fiesta 3	6.6	5.1	6.4	5.5	6.2A	5.3
PR A-97	6.6	4.5	6.4	5.0	6.1A	4.8
Pennfine	6.3	4.5	6.3	5.1	5.4 B	5.4
$LSD_{0.05}$ =	N/S	N/S	N/S	N/S	0.50	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Tall Fescue 2004

Turf Area Cover	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Arid 3	5.8	2.5	6.0	3.5	4.8	4.3
Grande	5.0	2.5	5.8	3.5	4.5	4.5
Mustang II	5.5	2.5	5.8	3.5	4.8	4.3
Pixie	4.5	2.8	6.0	4.0	4.5	4.5
SR8600	5.3	3.0	6.0	3.5	4.5	4.3
Watchdog	4.3	4.3	5.5	4.8	4.5	5.3
$LSD_{0.05}$ =	N/S	N/S	N/S	N/S	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Tall Fescue 2004

Turf Density	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Arid 3	4.8	2.3 B	5.5	3.5	4.8	3.8
Grande	5.3	2.5 B	6.3	3.3	4.3	3.5
Mustang II	5.0	2.3 B	5.8	3.5	4.5	3.8
Pixie	4.5	2.8 B	5.5	3.8	4.5	4.3
SR8600	5.3	2.8 B	6.0	3.8	4.8	3.8
Watchdog	4.5	3.8A	5.8	4.3	4.5	4.3
$LSD_{0.05}$ =	N/S	0.98	N/S	N/S	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Tall Fescue 2004

Turf Colour	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Arid 3	5.0	5.3 B	6.3	6.5A	5.0	4.5
Grande	5.0	5.3 B	6.5	6.5A	5.3	5.0
Mustang II	5.5	5.8AB	6.3	6.5A	4.8	4.8
Pixie	4.8	5.5AB	6.3	6.0AB	5.3	5.0
SR8600	5.8	6.0A	7.0	6.3A	5.5	5.3
Watchdog	4.5	6.0A	6.5	5.3 B	5.0	4.8
$LSD_{0.05}$ =	N/S	0.52	N/S	0.88	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Tall Fescue 2004

Overall Quality	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Watchdog	4.4	4.7A	5.9	4.8	4.7	4.8
SR8600	5.4	3.9A	6.3	4.5	4.9	4.4
Pixie	4.6	3.7 B	5.9	4.6	4.8	4.6
Mustang II	5.4	3.5 B	5.9	4.5	4.7	4.3
Arid 3	5.2	3.4 B	5.9	4.5	4.8	4.2
Grande	5.1	3.4 B	6.2	4.4	4.7	4.3
$LSD_{0.05}$ =	N/S	0.87	N/S	N/S	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Kentucky Bluegrass 2004

Turf Area Cover	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
America	6.0AB	1.5	5.0 BCD	2.5	5.8	3.3
Argyle	6.3A	1.3	5.5AB	2.3	5.5	3.0
Award	6.0AB	1.0	6.3A	2.5	5.5	3.5
Langara	4.5 CD	1.0	5.8AB	2.0	5.8	2.5
Moon Shadow	5.3ABC	1.0	5.8AB	2.3	5.3	3.0
Rambo	3.8 D	1.0	4.3 D	2.3	4.8	3.5
Showcase	6.0AB	1.0	5.5AB	2.0	6.0	3.0
SR228	5.3ABC	1.3	5.5AB	1.8	4.8	2.8
Total Eclipse	5.3ABC	1.0	4.5 CD	2.3	4.8	2.8
Touchdown	5.5ABC	1.0	5.5AB	2.5	5.5	3.3
Tsunami	5.0 BC	1.0	5.3 BC	2.0	5.5	2.5
$LSD_{0.05}$ =	1.01	N/S	0.91	N/S	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Kentucky Bluegrass 2004

Turf Density	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
America	5.0 BC	1.3	5.3 BCD	2.5	5.8	3.0
Argyle	5.8AB	1.3	5.5ABC	2.3	5.5	3.0
Award	6.0A	1.0	6.0AB	2.3	5.5	3.0
Langara	4.5 CD	1.0	5.8AB	2.0	5.8	2.5
Moon Shadow	5.3ABC	1.0	5.8AB	2.0	5.3	2.5
Rambo	3.8 D	1.0	4.5 D	2.3	4.8	3.0
Showcase	5.8AB	1.0	6.3A	2.0	6.0	2.8
SR228	4.8 C	1.3	5.3 BCD	1.8	4.8	2.8
Total Eclipse	5.0 BC	1.0	4.8 CD	2.0	4.8	2.5
Touchdown	6.0A	1.0	5.3 BCD	2.3	5.5	2.8
Tsunami	4.8 C	1.0	6.0AB	2.0	5.5	2.3
$LSD_{0.05}$ =	0.98	N/S	0.86	N/S	N/S	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Kentucky Bluegrass 2004

Turf Colour	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
America	5.8AB	4.3	5.8	5.5 B	6.0 B	4.3
Argyle	5.8AB	4.3	6.0	6.0A	5.8 B	4.3
Award	6.3A	4.3	6.3	6.3A	6.0 B	4.8
Langara	5.3 BC	4.3	6.0	5.5 B	6.3AB	4.0
Moon Shadow	5.3 BC	4.0	6.8	6.0A	6.0 B	5.0
Showcase	6.3A	4.0	6.8	6.0A	6.8A	4.3
SR228	5.3 BC	4.5	6.0	6.0A	5.0 C	4.0
Total Eclipse	5.3 BC	4.0	6.0	6.0A	5.8 B	4.8
Touchdown	5.5AB	4.3	6.0	6.0A	6.0 B	4.8
Tsunami	5.3 BC	4.0	6.5	6.0A	6.0 B	4.3
Rambo	4.5 C	4.0	5.0	6.0A	4.8 C	4.8
$LSD_{0.05}$ =	0.92	N/S	N/S	0.42	0.59	N/S

*Values followed by the same letter are not significantly different at p=0.05.

Kentucky Bluegrass 2004

Overall Quality	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Award	6.1A	2.1	6.2A	3.7	5.7A	3.8
Showcase	6.0AB	2.0	6.2A	3.3	6.0A	3.4
Argyle	5.9ABC	2.3	5.7ABC	3.5	5.4AB	3.4
Touchdown	5.7ABCD	2.1	5.6ABC	3.6	5.5AB	3.6
America	5.6ABCD	2.4	5.4 BC	3.5	5.7A	3.5
Moon Shadow	5.3BCDE	2.0	6.1AB	3.4	5.4AB	3.5
Tsunami	4.9 DE	2.0	5.9AB	3.3	5.4AB	3.0
Langara	4.7 EF	2.1	5.9ABC	3.2	5.8A	3.0
Total Eclipse	5.2 CDE	2.0	5.1 CD	3.4	5.0 BC	3.3
SR228	5.1 DE	2.3	5.1 CD	3.2	4.7 C	3.2
Rambo	4.0 F	2.0	4.6 D	3.5	4.9 BC	3.7
$LSD_{0.05}$ =	0.77	N/S	0.78	N/S	0.59	N/S

*Values followed by the same letter are not significantly different at p=0.05.

It was not the intended purpose of this trial to make comparisons between the different turf species. Each species has attributes and weaknesses which the turf manager must consider when selecting the best combination of grasses for each specific application. However with little else to report at this juncture, a discussion comparing the effectiveness of each of the grass species to establish an acceptable stand of turf may prove interesting (Table 3).

Table 3. Comparison of the various grass species in Edmonton and Calgary, 2004.

Turf Area Cover	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Perennial Ryegrass	7.0A	4.5A	6.8A	5.3A	5.3	5.5A
Tall Fescue	5.0 C	3.3 B	6.0 B	4.0 B	4.8	4.5 B
Calgary Sports Mix	5.8 BC	2.0 C	5.5 BC	3.3 C	4.8	4.0 B
Poa supina	6.3AB	1.0 D	6.8A	2.0 D	5.0	2.8 C
10% Poa supina Mix	5.8 BC	1.0 D	5.8 BC	2.3 D	5.0	2.8 C
Kentucky Bluegrass	5.5 BC	1.0 D	5.3 C	2.3 D	5.0	3.0 C
$LSD_{0.05}$ =	1.11	0.81	0.74	0.64	N/S	0.92

*Values followed by the same letter are not significantly different at p=0.05.

Turf Density	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Perennial Ryegrass	6.8A	4.3A	6.8A	4.8A	6.3A	5.0A
Calgary Sports Mix	6.0AB	2.0 B	6.0 B	3.3 B	5.5 B	4.0 B
Tall Fescue	5.0 B	2.8 B	5.8 B	3.8 B	4.5 C	4.0 B
Poa supina	6.0AB	1.0 C	6.0 B	2.0 C	5.3 B	2.8 C
10% Poa supina Mix	5.8AB	1.0 C	6.0 B	2.0 C	5.5 B	2.5 C
Kentucky Bluegrass	5.0 B	1.0 C	5.5 B	2.3 C	5.3 B	3.0 C
$LSD_{0.05}$ =	1.14	0.79	0.57	0.78	0.57	0.74

*Values followed by the same letter are not significantly different at p=0.05.

Turf Colour	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Perennial Ryegrass	6.0	6.0A	6.5AB	6.0A	6.8A	5.3A
Tall Fescue	5.3	5.8A	6.8A	6.3A	5.8 C	4.8AB
Calgary Sports Mix	5.8	5.0 B	6.5AB	5.8AB	6.0 BC	4.5AB
Kentucky Bluegrass	5.5	4.3 C	6.0 BC	6.0A	6.0 B	4.8AB
10% Poa supina Mix	5.8	4.5 BC	5.5 C	5.0 BC	6.3 B	4.3AB
Poa supina	5.0	4.0 C	4.5 D	4.8 C	5.0 D	3.8 B
$LSD_{0.05}$ =	N/S	0.67	0.74	0.96	0.47	1.07

*Values followed by the same letter are not significantly different at p=0.05.

Overall Quality	Spring		Summer		Fall	
	Clgy	Edm	Clgy	Edm	Clgy	Edm
Perennial Ryegrass	6.5A	5.0A	6.4A	5.5A	5.9A	5.3A
Tall Fescue	5.0 B	4.0 B	6.0 BC	4.5 B	4.8 C	4.5AB
Calgary Sports Mix	5.8AB	3.0 C	6.0 BC	4.0 B	5.4 B	4.3 B
10% Poa supina Mix	5.8AB	2.3 D	5.8 BCD	2.8 C	5.6 B	3.0 C
Poa supina	5.8AB	2.0 D	5.7 CD	2.8 C	5.4 B	3.0 C
Kentucky Bluegrass	5.3 B	2.0 D	5.6 D	3.3 C	5.4 B	3.3 C
$LSD_{0.05}$ =	0.85	0.63	0.27	0.65	0.38	0.88

*Values followed by the same letter are not significantly different at p=0.05.

At the Calgary site the plots were well established by the fall of 2003. During the winter of 2003-04 the conditions were generally mild and a snow cover was present which protected the turf from any exposure to extreme cold. As a result, the turf plots came through the winter in excellent condition.

The perennial ryegrass cultivars were strongly established and received the highest scores for area cover, density and turf colour when rated in 2004 (Table 3). The tall fescue cultivars were initially slower to establish than the perennial ryegrass but by the summer the quality of the stands of tall fescue had significantly improved (Table 3). The City of Calgary standard sports field mix also performed well in the trial and it received high scores for area cover, density and turf colour (Table 3). The *Poa supina* and *Poa supina*/Touchdown Kentucky bluegrass mix performed well and scored well for turf quality. There was one significant difference observed; the inherent turf colour displayed by the *Poa supina* was consistently different than the other grasses. Its light green colour was very distinct and scored lower than the other darker green turfgrasses (Table 3). The Kentucky Bluegrass cultivars were the slowest to establish. Area cover did improve over the season and was continually rated lower than the other grasses. The cultivars scored very well for their inherent darker green colour (Table 3).

Over the summer all of grasses improved in overall turf quality and in September the field was opened to athletic competitions.

Meanwhile at the Edmonton site, as a result of the later seeding date, the plots over wintered as a dormant seed bed. It was not until the spring of 2004 that the seed began to

germinate. The spring evaluation quickly revealed that the seedling emergence was well below expectations.

The perennial ryegrasses were the quickest to establish a ground cover and over the course of the summer the overall quality of perennial ryegrass plots continued to improve (Table3). The tall fescue cultivars were slower to germinate than the perennial ryegrass. By the fall rating the stands of tall fescue had also improved (Table 3). The germination of the Kentucky Bluegrass cultivars and the *Poa supina* was extremely poor. Area cover did improve slightly over the season, but was continually rated lower than the other grasses (Table 3).

As for the City of Calgary standard sports field mix, consisting of 75% Kentucky bluegrass and 25% perennial ryegrass, it performed better than the plots consisting of only the Kentucky bluegrass cultivars but did not perform as well as the plots containing the perennial ryegrass cultivars (Table 3).

Over the course of 2004 season most of the grasses did not establish a good groundcover, and the entire site remained thin and patchy. A decision as to whether to continue the trial with the current stand of turf will be made after the spring evaluation in 2005.

Financial support and maintenance of the trial site was provided by the City of Calgary and the City of Edmonton parks departments.