Sports Turf Manager
FOR BETTER, SAFER SPORTS TURF. SPRING 2015. VOL. 28. NO. 1.

Sports Field Benchmarking and Permitting Hours Verification Project

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Background

The Sports Field Benchmarking and Permitting Hours Verification Project 2013-2014 was initiated to attempt to verify the "Athletic Field Construction Manual" Table 3.1.2.1 "A guideline for the permitting hours of the five categories of athletic fields" (Table 1). The information in this table was developed with input from municipal sports turf managers based on their experiences from their respective municipalities. The goal of this project was to get two fields from each of the five categories as outlined in Table 2 in three municipalities for a total of 30 fields. Field performance characteristics (percent cover and surface hardness) data were to be collected three times throughout the field season in 2013 and 2014. Information on permitted hours of play and maintenance practices would also be obtained from all municipalities for all of the fields at the end of each field season and the field performance would be correlated with the permitted hours of play. In addition, at the end of each field season a group of experts would rate the overall conditions of each of the fields and these ratings would also be correlated with the permitted use to determine what the permitted use should be to maintain a soccer field with an acceptable or passable quality rating. This project could provide municipalities and user groups with information on the impact of the hours of permitted play on sports field conditions and enable them to make better decisions to optimize permitted hours without compromising field performance. The aim of this project was also to supply information to modify the guidelines of the permitting use of the different field categories if needed.

Objectives

1. To conduct a benchmarking study as a starting point or reference to determine the quality of municipal soccer fields.
2. To validate the use level (permitted hours per season) for the five categories of sports fields outlined in the "Athletic Field Construction Manual" and modify the permitted use hours per season accordingly.

Scope

Sports field managers in three municipalities were contacted in May 2013 and meetings were held to discuss possible fields for use in this project. Soil samples were taken from six to eight fields in each municipality and soil texture was determined. Samples were taken from the sidelines as these areas were less likely to have been

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President's Desk

BY TENNESSEE PROPEDO

As I write this column, looking through the window, the thaw of Spring 2015 has begun and numerous thoughts start popping into my head: Will sports fields and golf courses be subjected to the same damage as last year with February being the coldest month ever in Ontario? Was the snow cover sufficient to ward off the ice buildup on the top turf layer? We can only wait and see what will emerge from the snow.

L to R: Sports Turf Canada President Tennessee Propedo and Vice President Tab Buckner with WCTA President Trevor Smith. *Photo by Jerry Rousseau*

With the arrival of Spring, conference season has come to an end. Hopefully you were able to attend one of the sports turf educational symposia across the country. Thank you to our Ontario Turfgrass Symposium (OTS) conference sponsors, the University of Guelph's Office of Open Learning/conference manager, and Pam Charbonneau/program coordinator, on another successful event. This being Pam's last year, she was honoured with a gift and thank you from the OTS Executive Committee and the industry as a whole. We are pleased to publish in this issue the report of one of her final research projects, the *Sports Field Benchmarking and Permitting Hours Verification Project 2013 and 2014*. Mark Jiggens sat down with Pam upon her retirement; read the full interview in the March issue of *Turf & Recreation* magazine.

I had the opportunity to travel to the Western Canada Turfgrass Association conference in Victoria, BC participating in the educational sessions and bringing greetings from Sports Turf Canada. Congratulations to Trevor Smith and the organizing committee, Jerry Rousseau, Executive Director and all who contributed to this excellent educational and networking event. These educational initiatives, wherever they may be, are the result of a great deal of hard work for the benefit of us all.

Once again Sports Turf Canada held our annual general meeting of members during the OTS. Reports are posted in the Member's Only section of our website. Please plan to attend next year but if you are unable, then consider sending your vote by proxy. Participation by you in the business of your association is what gives us direction. At the AGM a new board of director's was established. I would like to welcome new director Dwayne McAllister, Supervisor of Sportsfields & IPM for the Town of Oakville, ON and say a heartfelt good bye and thank you to Bill Clausen who has stepped down after serving for numerous years on the board and representing us on many different committees. Bill hosted a number of events at the University of Guelph including association field days and workshops and authored and facilitated articles for the Sports Turf Manager magazine.

Watch for dates and locales as we schedule our 2015 educational courses and events. Upcoming things to be aware of include our four day Sports Turf Management & Maintenance Course on April 27 to 30 at the University of Guelph, ON, and the May 30 deadline for the Robert W. Sheard scholarship. Visit the Events Calendar at sportsturfcanada.com to link to all the details.

Thanks and have a great Spring!

Tennessee

New & Returning Members

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Cowichan Valley Regional District
Duncan, BC

Mark Beatty
City of Burnaby, BC

Jerry Sihota
Evergro Division
Crop Production Services Inc.
Delta, BC

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Town of Ajax, ON

Chris Clark
Town of Innisfil, ON

Chris Lecour
Evergro Division
Crop Production Services Inc.
Brantford, ON

Vicki Armitage
City of Brantford, ON

Event Calendar

Association Events are Highlighted in Green

April 27 to 30
Sports Turf Canada
Sports Turf Management & Maintenance Course
University of Guelph, Guelph, ON
www.sportsturfcanada.com/Events/EventCalendar

May 7
Sports Turf Canada
Optional Accreditation
Synthetic Sports Turf Field Safety & Maintenance Course
Toronto, ON
www.sportsturfcanada.com/Events/EventCalendar

May 30
Sports Turf Canada
Robert W. Sheard Scholarship Deadline
www.sportsturfcanada.com/Events/EventCalendar

August 24
Ontario Turfgrass Research Foundation
Fundraising Golf Tournament
Thornhill Golf & Country Club, ON
Registration opens April 1
www.otrf.ca

Sports Turf Manager

FOR BETTER, SAFER SPORTS TURF. SPRING 2015.

"The first day of Spring is one thing, and the first spring day is another. The difference between them is sometimes as great as a month" ~ Henry Van Dyke

March 20, 2015 – Sports Fields Across Canada

VICTORIA, BC
Photo by Murray Flower, District of Saanich

LANGLEY, BC
Photo by Dan Allen, Township of Langley

OAKVILLE, ON
Photo by Andrew Fairley, Town of Oakville

DARTMOUTH, NS
Photo by Rob Mullane, Halifax Regional Municipality

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Deadline for Summer 2015 Sports Turf Manager: May 22

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- Minutes of the annual meeting of members February 18, 2015

modified by topdressing compared to the goal mouths or centre circles. In addition, inventories of irrigation, sub-surface drainage and lights were also taken to categorize each of the fields. This information was combined to accurately categorize each of the fields and then choose fields in the category ranges of 1-5. Once this inventory was completed, it was clear that the three participating municipalities only had category 3-5 fields. Municipalities that participated in this project classified fields according to three classes – Class A, Class B and Class C. This system of classification seems to have more to do with overall facilities at the fields such as lighting, washrooms, fencing, etc. than the field itself, the rootzone and sub-surface drainage. The scope of the project was modified to focus on field categories 3-5 soccer and multi-use fields. Within each of the three municipalities, the goal then was to obtain two fields of each of the three categories. In total, twelve fields from three municipalities were included in this project. Table 3 shows the categories of all of the fields for 2013 and 2014. In 2013, two multi-use fields from Municipality B were included. In 2014, these were substituted with two soccer fields to be able to make more valid comparisons between fields and among municipalities.

Methodology

Field Performance Assessment

During the initial visit, 4 x 4 m plots were flagged in six

Table 1. A guideline for the permitting hours of the five categories of athletic fields*

Category	Permitted Days	Permitted hr/ day	Permitted hr/ season	Consecutive days of use
1	90	5	450	2
2	110	5	550	3
3	140	5	700	4
4	180	2.5	450	4
5	180	2.5	450	5

*Table 3.1.2.1. A guideline for the permitting hours of the five categories of athletic fields. From Sheard, 2012.

Table 2. A summary of the design requirements for the five field categories*

Design Requirements	Category 1	Category 2	Category 3	Category 4	Category 5
Soil (% silt plus clay)	<8.0	<25	25-35	36-45	All soils
Sub-surface drainage system	Yes	Yes	Yes	Yes	No
Irrigation	Yes	Yes	Optional	Optional	No
Lights	Yes	Yes	Optional	Optional	No

*Table 2.2.6 A summary of the design requirements for the five field categories. From Sheard, 2012.

Table 3. Field categories and classifications

Municipality	Park	Soil (% Silt + Clay)	Sub-surface Drainage	Lights	Irrigation	Field Category	Field Classification
A	1	34.5	Yes	No	No	3	A
	2	34.4	Yes	Yes	Yes	3	A
	3	56.7	No	No	No	5	B
	4	34.5	Yes	No	No	3	A
B	1 (2013 and 2014)	40.1	No	Yes	Yes	5	B
	2 (2013 only)	35	Yes	Yes	Yes	3	A
	3 (2013 only)	45.4	Yes	Yes	Yes	5	A
	4 (2013 and 2014)	33.5	Yes	Yes	Yes	3	A
	5 (2014 only)	41.5	Yes	Yes	Yes	4	A
	6 (2014 only)	47.4	Yes	Yes	Yes	5	A
C	1	36.6	Yes	Yes	Yes	4	A
	2	26.5	No	Yes	Yes	5	A
	3	44.9	Yes(partial)	Yes	Yes	5	B
	4	34.1	Yes	Yes	Yes	3	A

IN THE NEWS

Wood Bay Turf Technologies is pleased to announce the appointment of Paul Gillen as Ontario Regional Manager.

Paul has over 30 years' experience in the turfgrass industry and is immediate past president and board member of Sports Turf Canada; an association of professional, municipal, academic and industry personnel dedicated to the education and professional development of those involved in sports field management.

Paul is a member and proud supporter of the OGSA, WOGSA and GLAGS. He can be reached at 519-421-3742 or pcgillen1@gmail.com.

Wood Bay Turf Technologies established in 1987 and based in Edmonton, AB., designs and manufactures high quality maintenance equipment and parts for the golf course and sports turf industries. The current line-up includes the Greens Iron 3900, FDS dethatchers (now available in 3 sizes), and dynablade verticuting blades for both OEM and aftermarket applications. Visit the web site at woodbayturftech.com.

Wood Bay Turf Technologies
Nicole Sutton, Regional Sales and Service
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Integrated Pest Management for Turf is now available

Finally…..one comprehensive resource for turf IPM in Ontario, Integrated Pest Management for Turf, is now available.

Integrated Pest Management for Turf has been designed as a field handbook for golf courses, lawn care and the parks sector. It contains well over 100 colour photos of turf diseases and insects. It is recommended study material for the IPM accreditation exam for the Golf Course IPM Accreditation Program which is required under The Pesticides Act and Regulation 63/09 and is administered by the IPM Council of Canada. It contains extensive information on the diseases, insects, and weeds that are found in turf in Ontario, including a turf disease identification key, turf disease time profile, turf scouting calendar, turf insect injury key and an example of a pest scouting sheet. This publication, along with Protection Guide for Turfgrass provides a complete reference package on turf IPM for Ontario.

This publication combines the former Diseases and Insects of Turfgrass in Ontario and Turf IPM Manual. It contains information on turfgrass soil management and fertilizer use, turfgrass species and water management for turf. The Protection Guide for Turfgrass can be downloaded from the OMAFRA website: omfra.gov.on.ca/english/maps/hort/turf.html

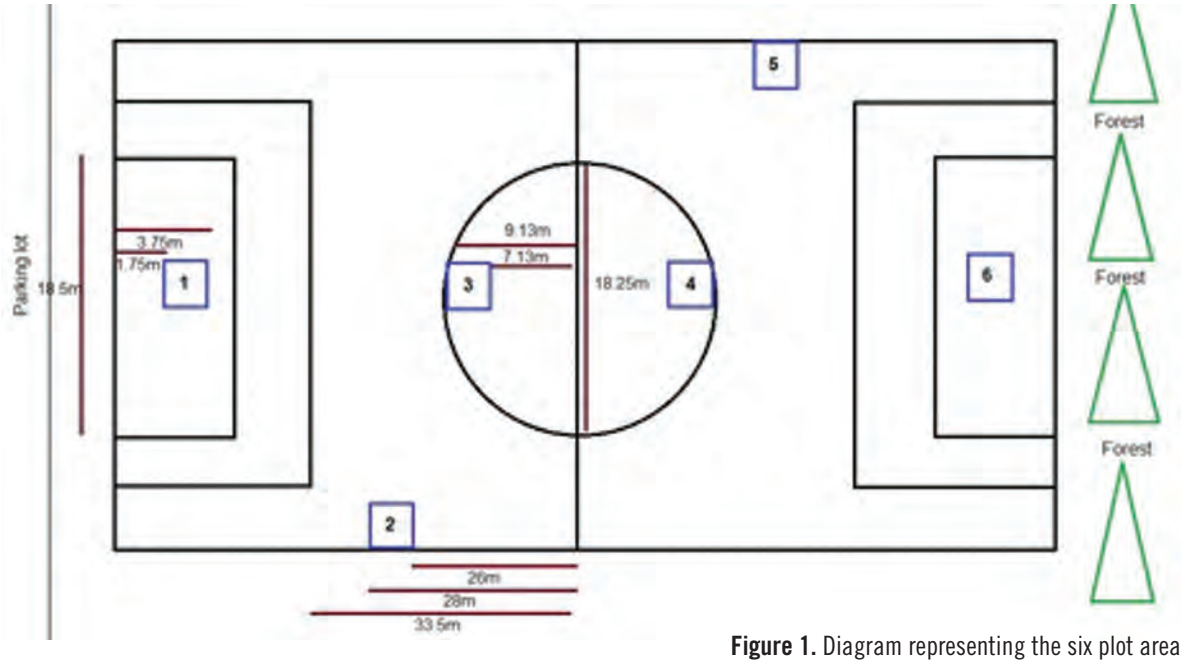


Figure 1. Diagram representing the six plot areas in study

areas of the soccer fields, two each in the goal mouths, centre circle and side lines (Bell and Holmes, 1988) as shown in Figure 1. At each visit percent species cover (individual turf species, individual weeds species and bare) was measured using four randomized point quadrat drops. The point quadrat measured 60 cm x 60 cm with 25 points in each quadrat (points 10 cm apart), (Figure 2) for a total of 100 points in each plot. Plots 1 and 6 represent the goal mouths which are the highest wear areas. Plots 3 and 4 were chosen at the edge of the centre circle and represent intermediate wear areas. Plots 2 and 5 represent areas with little wear and gave an indication of the weed infestation levels of each field. Percentages from plots 1 and 6 were averaged to give values for the goal mouths, plots 2 and 5 were averaged to give values for the sidelines and plots 3 and 4 were averaged to give values for the centre circle.

Surface hardness was also measured in each of these plots using a Clegg Impact tester (Figure 3). The Clegg hammer is used to obtain a measurement of the deceleration of a free falling mass (hammer) from a set height onto a surface under test to determine hardness. The impact of the hammer produces an electrical pulse, which is converted and displayed in units of gravities "G-max" or tens of gravities "CIT". The higher the number, the harder the surface. Our protocol was two drops and we recorded the peak (2nd drop only) with a 2.25 kg weight at the standard height and these are reported in CIT's. As with the percent cover data, the CIT's were averaged for plots 1 and 6 to give a value for the goal mouths, plots 2 and 5 were averaged to give a value for the side lines and plots 3 and 4 were averaged to give a value for the centre circle.

At each visit photos were taken of the six flagged plots to provide a visual record of the turf conditions.

The visits are listed in Table 4. In 2013, the field visits did not begin until mid-June and early August. This was because of the time it took to find cooperating municipalities, take soil samples and have them analysed. Site visits in 2014 began in late May and better reflect the field performance in early, mid and late season.

Figure 2. Point quadrat used to measure percent cover

Figure 3. Clegg hammer impact tester used to determine surface hardness

Turf Maintenance Records

Sports turf managers in each municipality were asked to supply information on the following for each of the fields in the project.

1. Fertility (Total N)
2. Cultivation frequency
3. Topdressing frequency
4. Overseeding (species and frequency)

Table 4. Dates of visits to municipal sports fields, 2013 and 2014

Municipality	Year	Early Season	Mid Season	Late Season
A	2013	June 19	July 17	August 14
A	2014	May 26	July 9	August 19
B	2013	June 24	July 22	August 30
B	2014	May 28	July 10	August 20
C	2013	July 8	August 8	September 12
C	2014	May 27	July 8	August 26

Field Use Records (permitted hours)

Permitting departments in each municipality were asked to supply information on the total permitted hours for each field for the season as part of this project.

Sports Field Rating

At the end of each season experts (four in 2013 and three in 2014) visited all of the fields and rated them using a scale of 1-9 where 1 is bare or dead and 9 is the equivalent to the quality of turf at a sod farm. A score of 6 and higher was considered a passing score and anything below 6 was a failing score. Goal mouths and the centre circle were rated separately and then the entire field was rated for uniformity and density. The uniformity rating was based on the amount of weedy grasses (mostly annual bluegrass) and broadleaf weeds in the field, with a lower score given to fields that had high weed infestation. The density rating was based on the thickness of the turf stand with a lower score given to fields with bare areas. The ratings for the goal mouths, centre circle, uniformity and density were averaged to give an overall score. It should be mentioned that the rating date for Municipality C in 2013 and 2014 occurred the week following a weekend long soccer tournament and the ratings reflect the heavy field use the previous weekend and do not necessarily reflect the conditions of the fields earlier in the season.

Results

Percent Cover

Percent cover was broken down by % broadleaf weeds (BLW), % Kentucky bluegrass (KB), % perennial ryegrass (PR), % bare and % annual bluegrass (AB). This data along with permitted use for each of the fields for 2013 is shown in Table 5. The first site visits in 2013 began in mid-June to early July and this "early season" data represents the condition of the fields well into the playing season. The 2014 data is shown in Table 6. It is a more accurate representation of percent cover from the beginning of the playing season until the end. It should be noted that in 2014, Field 2 in Municipality B centre circle and goal mouths were sodded just prior to the mid-season visit and the field was closed for play for one month. The data from that field in 2014 does not represent a field that has had the same conditions from the beginning of the season until the end of the season.

Goal Mouths 2013

Not surprising, the percent bare in the goal mouths increased over the season and was generally highest on the fields with the highest use. Figure 4 shows goal mouths of a category 3 field with moderate permitted hours (442) and Figure 5 shows a category 5 field with high permitted hours (1349). The exception was Municipality B, Field 2 which was a multi-use field with rugby and football during most of the summer. The wear patterns caused by these sports are different from the wear patterns caused by soccer. Municipality A had the highest number of booked hours and also had the highest percent bare in goal mouths with the two fields with the highest use in this study (1136 hours and 1349 hours) with 91.5 and 98% bare in the goal mouths by the end of the season. The soccer field in Municipality B with the highest use (B4) had 95% bare ground in the goal mouths by the end of the season. Conditions in the goal mouths were much better for Municipality C, but the hours of use were also one half to one third of Municipality A.

Figure 4. Goal mouth of category 3 field. Top: July 8, 2013 Middle: Aug. 8, 2013 Bottom: Sept. 12, 2013

Goal Mouths 2014

As mentioned, Municipality A, Field 2 was sodded in the middle of the summer so the goal mouth at the end of the season only had 40% bare and the hours of use were down because of the one month field closure. Field use for Municipality A, Field 1

Figure 5. Goal mouth of Category 5 field. **Top:** June 18, 2013 **Middle:** July 23, 2013 **Bottom:** Aug. 14, 2013

was up, probably because this field was in the same complex as Field 2 and games were probably increased on that field to compensate for the closure of Field 2. Even though the use hours were up for Field 1 the percent bare in the goal mouth was substantially better than the previous season. Municipality A, Field 4 had the most hours of use in 2014 again and had 100% bare ground by the end of the season.

Municipality B, Field 4 performed similarly from 2013 to 2014 and had 758.5 hours and 699 hours of use and 95% and 88.5% bare ground in the goal mouths. For the amount of use, Municipality B, Field 5 (500 hours and 42.5% bare) maintained turfgrass cover well. There were two fields with low numbers of booked hours, Field 1 and Field 6, which had the lowest percent bare (30 and 40.5%) at the end of the season.

Municipality C fields performed similarly in 2013 and 2014. Field 1 had more games but less bare in 2014. There was an increase in PR during the season suggesting that they had a successful overseeding program for their goal mouths on this field.

Side Lines 2013 and 2014

The data from the sidelines for each municipal field gives an indication of the species composition on the non-wear areas of the fields and the % BLW and % AB is an indication of the overall quality and uniformity of the fields (Table 5 and 6). Table 7 shows the major species of broadleaf weeds in each municipal field. There is no correlation with booked hours and percent BLW and there is probably more of a relationship between soil type and maintenance practices such as fertility and cultivation with the number of BLW.

The amount of AB at the side lines is an indication of over-watering and could also be an indication of compaction and low fertility. In 2013, the following irrigated fields had moderate AB

Table 5. Percent cover for all fields 2013

Area of the Field				Goal Mouth														
Season				Early Season					Mid-season					Late Season				
Municipality	Park	Class #	Booked Hours	BLW[1]	KB[2]	PR[3]	Bare	AB[4]	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB
A	1	3	820	0	20	3	70.5	6.5	0	14	0	80.5	5.5	0	11	2	87	0
A	2	3	1136	0	38	3	50	9	0	13	3	83	1	0	7	1.5	91.5	0
A	3	5	470	0	5	37.5	57.5	0	0	5.5	34	60.5	0	0	0	13	75	12
A	4	5	1349	0	14	0	82.5	0	0	3	2	95	0	0	1	1	98	0
B	1	5	198	0	22.5	36.5	27	14	0	15	32	42.5	10.5	0.5	12	39	48.5	0
B	2	3	579.5	27.5	5	54.5	10	3	43	19.5	20	7.5	10	31.5	5	40	23.5	0
B	3	5	611	2.5	4	11	81.5	1	1.5	0	0.5	95	3	6.5	0	0.5	93	0
B	4	3	758.5	0	6.5	30	53	10.5	0	20	0	71	8.5	0	4	1	95	0
C	1	4	462	0	2	52.5	45.5	0	0	3.5	30	66	0.5	0	5.5	20.5	74	0
C	2	5	683	0	17	0	83	0	0	24.5	0	75.5	0	0	17	0	83	0
C	3	5	322	0	7.5	34	39	19.5	0	3.5	29.5	51.5	15.5	0	8.5	32	57.5	2
C	4	3	442	5	18	31	25	21	5	17.5	32.5	40.5	4.5	7	22	37	30.5	3.5

1. BLW – broadleaf weeds, 2. KB -Kentucky bluegrass, 3. PR – perennial ryegrass, 4. AB – annual bluegrass.

Area of the Field				Centre Circle														
Season				Early Season					Mid-season					Late Season				
Municipality	Park	Class #	Booked Hours	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB
A	1	3	820	0	22.5	52.5	22.5	2.5	0	34.5	43.5	10.5	11.5	0	9.5	73.5	5	12
A	2	3	1136	0.5	25.5	42.5	31	0.5	0	25	36.5	29	9.5	0	6	66.5	18	9.5
A	3	5	470	1	25	48	2	24	2.5	17.5	61	7	12	1	24	64	1	10
A	4	5	1349	2.5	32.5	35	11	0	1	36	39.5	15	8.5	0	35.5	56.5	7	1
B	1	5	198	0	29.5	41.5	6.5	22.5	0	29.5	41.5	6.5	22.5	0	51	36.5	12.5	0
B	2	3	579.5	71	2.5	19.5	5.5	1.5	71	2.5	19.5	5.5	1.5	45.5	0	24.5	30	0
B	3	5	611	70	9	10.5	9	1.5	70	9	10.5	9	1.5	48	0.57	11.43	40	0
B	4	3	758.5	0	10.5	58.5	14.5	16.5	0	10.5	58.5	14.5	16.5	0	17.5	49.5	33	0
C	1	4	462	0	17.5	65	15.5	1.5	0	13.5	58.5	28	0	0	5.5	42.5	51.5	0.5
C	2	5	683	0	8	30.5	61.5	0	0	22	29	49	0	0	8	30.5	61.5	0
C	3	5	322	9	10	38.5	22	20.5	3.5	4.5	28	41	21.5	8	15.5	45	29.5	2
C	4	3	442	1	29	27.5	2.5	40	2	39.5	36	15	7.5	1	55.5	20.5	9	14

Area of the Field				Side Lines														
Season				Early Season					Mid-season					Late Season				
Municipality	Park	Class #	Booked Hours	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB
A	1	3	820	27.5	27.5	21.5	1.5	22	53.5	20.5	12.5	0	13.5	37.5	17.5	23	5	17
A	2	3	1136	19	31.5	23	2.5	24	25.5	25	35.5	0	14	23	12.5	44	0	20.5
A	3	5	470	7	47	35	1	10	10.5	41	43	0.5	5	11.5	47	34.5	0	7
A	4	5	1349	2	46.5	43	1	0	4	43.5	48.5	0.5	3.5	2	34.5	62.5	1	0
B	1	5	198	19.5	20.5	31.5	3.5	25	11.5	22.5	39.5	8.5	14	20.5	36.5	33	4	0
B	2	3	579.5	13.5	42.5	31.5	2.5	10	19	1.5	19.5	2	58	6.5	43	30	4	16.5
B	3	5	611	4	49	39.5	0	7.5	2.5	53	26.5	1.5	16.5	8	56.5	34.5	0.5	0.5
B	4	3	758.5	19.5	16	44	0	20.5	18	55.5	11	0.5	12	12.5	78	5	3.5	0
C	1	4	462	17.5	33.5	30	2	17	22.5	22	25	0	30.5	18	4.5	22.5	1.5	53.5
C	2	5	683	20.5	21	21.5	7	30	11	31.5	27.5	18	12	20.5	21	21.5	7	30
C	3	5	322	37.5	12.5	12.5	0.5	36	41	12	21.5	0	23.5	63	27	5.5	0	3
C	4	3	442	25.5	29.5	24	2	19	40.5	31.5	26.5	1	0.5	67	16	8	0.5	8.5

Table 6. Percent cover for all municipalities 2014

Area of the Field				Goal Mouth														
Season				Early Season					Mid-season					Late Season				
Municipality	Park	Class #	Booked Hours	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB
A	1	3	1191	0	0	8	90	2	0	1.5	25.5	73	0	0	56.5	0	43.5	0
A	2	3	878	0	0.5	41.5	57	1	0	100	0	0	0	0	13.5	47	40	0
A	3	5	501	0	10.5	0.5	88.5	0.5	0	10	4	86	0	0.5	14.5	0.5	84.5	0
A	4	5	1237	0	18	0	75.5	6.50	0	1	0	99	0	0	0	0	100	0
B	1	5	180	0.5	36.5	26.5	30.5	6	0	46.5	22	31.5	0	0	46.5	22	31.5	0
B	4	3	699	4.5	2.5	26	65.5	1.5	6	18.5	7.5	68	0	6	18.5	7.5	68	0
B	5	5	500	0	27	36.5	21.5	15	0	22.5	34.5	43	0	0	22.5	34.5	43	0
B	6	3	147	0	88	1	5.5	5.5	0	68.5	0.5	31	0	0	68.5	0.5	31	0
C	1	4	560.5	3	4.5	42.5	2.5	24	2	6.5	55	20.5	0.5	2.5	2.5	35.5	59.5	0
C	2	5	519	0	2.5	20	65	6.5	0	2	26	72	0	0	3.5	8	88.5	0
C	3	5	303	1.5	2.5	11.5	44	33	0	16	16.5	61.5	4	0	5	10	75	10
C	4	3	570	0.5	10	33	19	32	4.5	31.5	30	24	10	4	22	31	30.5	10

Area of the Field				Centre Circle														
Season				Early Season					Mid-season					Late Season				
Municipality	Park	Class #	Booked Hours	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB
A	1	3	1191	0.5	8.5	5.5	68	17.5	0	53	8	35.5	3.5	31	39	12.5	10	7.5
A	2	3	878	0	38.5	6	48.5	7	0	100	0	0	0	0	89.5	5.5	5	0
A	3	5	501	0	50.5	0	23.75	27	0	88.5	1.5	6	4	0	83	0.5	2	14.5
A	4	5	1237	0	51	1.5	17	30.5	0	74.5	14.5	10	1	71.5	9.5	19	0	71.5
B	1	5	180	0	60	18	3	19	0	78	13	9	0	0	79.75	13	1	7.5
B	4	3	699	0	35	43.5	6.5	15	0	31	53	16	0	0	14.5	60.5	23.5	1.5
B	5	5	500	0	47.5	29	7	16.5	0	64.5	29.5	5.5	0.5	0	62.5	31.5	1.5	4.5
B	6	3	147	0	41	10.5	19	29.5	0	55	12.5	15	17.5	0	63	15.5	14	7.5
C	1	4	560.5	0	4.5	21.5	2.5	29	0	12	76.5	0.5	3	0	20	51.5	23.5	5
C	2	5	519	0	5.5	32	20	36.5	0	25	56.5	14	4.5	0	35	46	18	1
C	3	5	303	15.5	9.5	11.5	15.5	46	4	39.5	29.5	19	7.5	7	43.5	26	12.5	11
C	4	3	570	6.5	35	12.5	1.5	35.5	3.5	55.5	15.5	0	25.5	0.5	59.5	21	2.5	16.5

Area of the Field				Side Lines														
Season				Early Season					Mid-season					Late Season				
Municipality	Park	Class #	Booked Hours	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB	BLW	KB	PR	Bare	AB
A	1	3	1191	3.5	9	11.5	10	66	32.5	34.5	18.5	1	13.5	5.5	60	7.5	1	26
A	2	3	878	26	58	9	1	6	6.5	37	7	0	49.5	41	20	16	18.5	4.5
A	3	5	501	6	67.5	3.5	0	23	22.5	62	14	1.5	0	16.5	70.5	7.5	1	4.5
A	4	5	1237	0.5	68	10	12.5	9	10	64	17.5	7.5	1	12.5	73	12	2	1
B	1	5	180	15	59	7.5	5	13.5	9	75	13.5	2.5	0	15	66.5	11	0.5	7
B	4	3	699	7.5	63.5	10.5	2.5	16	3	85.5	9.5	1.5	0.5	5.5	86.5	6.5	0	1.5
B	5	5	500	1.5	42	30.5	0	26	5	55.5	39.5	0	0	5.5	52	35.5	0	7
B	6	3	147	0	52.5	9	1	37.5	0.5	67	12.5	2	18	2	72.5	14	0	11.5
C	1	4	560.5	16	8	29.5	0	27	11	36.5	27.5	4.5	20.5	4.5	24	55	13	3.5
C	2	5	519	10.5	4	3	0.5	77	25.5	34	19	0	21.5	25	25	12	0	38
C	3	5	303	15.5	0.5	0	4	39	27	22	1.5	4.5	4.5	23	26.5	2	3	7
C	4	3	570	36.5	26.5	2.5	0.5	30.5	60.5	19	3	0	19.5	51.5	31	6	0	6

infestation: A1, A2, B2, C1 and C2. In 2014, there were fewer fields with AB, namely, A1, B4 and C2.

Centre Circle 2013 and 2014

Data from the centre circle represents a medium wear area on the soccer fields (Table 6 and 7). Municipality A has had success with their perennial ryegrass overseeding program as indicated by the increase in % PR in the centre circles of all of their fields from the beginning of the season to the end of the season in 2013. As indicated earlier, in 2014 Field 2 centre circle was sodded and the field was closed for one month. The PR overseeding program was less successful in 2014 in Municipality A. Municipality B, Field 4 also had a successful overseeding program, increasing the PR in the centre circle from 43.5 to 60.5 % over the season with 699 booked hours.

Municipality C had a successful PR overseeding program for Fields 1 and 2, but had less success in 2013 than 2014.

Surface Hardness

The Clegg impact tester results are not presented here. Figure 6 shows the general trend with the goal mouths surface measuring the hardest of the three areas (goal mouths, centre circle and side lines) and the hardness increases from the beginning of the season to the middle of the season and then decreases at the end of the season, but is harder than at the beginning of the season. The trend is similar for the centre circle, but with lower overall values and the sidelines do not change from early to mid to late season.

Sports Field Rating

As mentioned, the rating scheme was 1-9 with 1 the worst and 9 the best and a passing score for any area of the fields was 6 and higher. Table 8 shows the average ratings vs. booked hours of the four experts in 2013 and Table 9 shows average ratings vs. booked hours of the three experts in 2014.

In 2013, only one field from Municipality A had a passing score and it was the field with the least amount of booked hours (Field A4 with 470 booked hours). The same was true for Municipality B and the only one with a passing score was Field B1 with 198 booked hours. Municipality C had no passing scores, but as mentioned earlier, the rating took place after a weekend long soccer tournament was held on all of the fields in this project.

In 2014, Municipality A had one passing field and it was the field that was sodded in the middle of the season and closed for play for one month. Municipality B had three fields with passing scores. Fields 1 and 6 had low booked hours (180 and 147) and Field 5 had 500 booked hours. Municipality C had one field with a passing score in 2014, Field C4 which had 570 booked hours in 2014.

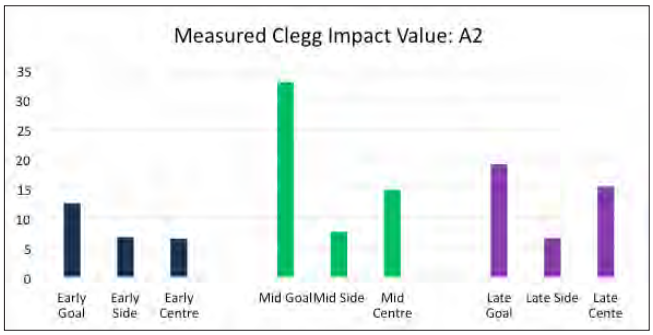
General Comments

As mentioned, municipal classification of sports fields is influenced by factors such as facilities at the fields, lighting, washrooms, fencing, etc. rather than the rootzone texture and sub-surface drainage. The municipal classifications in this project do not match "Athletic Field Construction Manual" categories. Most municipalities are not aware of the particle size distribution of the rootzones of their

Table 7. Major weed species

Municipality	Field	Main Weed Species
A	1	Clover
A	2	Clover
A	3	Clover
A	4	Clover
B	1	Clover
B	2	Clover/prostrate knotweed
B	3	Clover/prostrate knotweed
B	4	Dandelion/clover
B	5	Clover
B	6	Clover
C	1	Clover
C	2	Clover
C	3	Dandelion/clover/broadleaf plantain/ creeping bentgrass
C	4	Dandelion/clover/broadleaf plantain

Figure 6. Typical Clegg impact values for a category 3 field, 2013



fields. They may know that it was a modified rootzone, but they usually don't have a record of the texture analysis. Municipal sports fields would benefit if municipalities conducted textural analysis of all of their rootzones and kept inventories of this information to help them determine what category of fields they have and schedule play and maintenance accordingly. Often it was difficult to determine if fields had sub-surface drainage. This may be due to staff turnover and recordkeeping.

Due to the different systems of field classifications many municipality Class A fields are actually Category 5 fields. The amount of play that is scheduled on these fields in particular is far above what should be scheduled for that category of field.

Overall, there were very few weeds in most of the fields that were part of this project in spite of the Cosmetic Pesticides Ban. Most of the weeds were in the lower wear areas and by far clover was the most prominent weed. In a few of the goal mouths, those with heavy use, there was invasion of prostrate knotweed. In general, Municipality C had the most broadleaf weeds.

There were high percentages of AB in many fields

Table 8. Average field ratings vs. booked hours for all fields, 2013

Municipality	Park	Class #	Booked hrs	Goal Mouth	Centre Circle	Uniformity	Density	Average
A	1	3	820	3.87	**6.75***	**6.12**	**7.12**	5.97
A	2	3	1136	2.75	3.5	**6.37**	**6.62**	4.81
A	3	5	470	4	**7**	**6.5**	**7.37**	**6.22**
A	4	5	1349	2.25	**6**	**6.5**	**6.37**	5.28
B	1	5	198	**6**	**7.62**	**6.37**	**6.87**	**6.72**
B	2	3	579.5	5.25	2.87	4.37	4.37	4.22
B	3	5	611	1.75	2	3.87	3.25	2.72
B	4	3	758.5	3.5	4	4.5	5.12	4.28
C	1	4	462	3.62	4	5.25	5	4.47
C	2	5	683	3.62	4	5.12	5.12	4.47
C	3	5	322	2.5	5.37	3.87	4.12	3.97
C	4	3	442	5.12	**6.75**	5.125	**6**	5.75

*bolded numbers with dark green shading indicate a passing score

Table 9. Average field ratings vs. booked hours for all fields, 2014

Municipality	Park	Class #	Booked hrs	Goal Mouth	Centre Circle	Uniformity	Density	Average
A	1	3	1191	2.83	5.5	**6.33**	5.67	5.08
A	2	3	878	**6.33***	**7.17**	**7.17**	**7.5**	**7.04**
A	3	5	501	2.33	**6.66**	**6.83**	**7.17**	5.75
A	4	5	1237	1.83	4.66	5	5.5	4.25
B	1	5	180	**6.33**	**7.67**	**7.17**	**7**	**7.04**
B	4	3	699	2	2.67	5.33	6	4
B	5	4	500	5.83	**8.17**	**7.67**	**7.83**	**7.37**
B	6	5	147	5.75	**6**	**6.5**	**6.33**	**6.15**
C	1	4	560.5	4	**6.17**	**6.5**	**6.33**	5.75
C	2	5	519	3.67	5	**6.33**	**6**	5.25
C	3	5	303	2.83	5	4.67	4.67	4.29
C	4	3	570	5.5	**7.33**	**6.5**	**6**	**6.33**

*bolded numbers with dark green shading indicate a passing score

Table 10. Recommendations for modification of permitted hours for Category 3-5 soccer fields

Category	Booked hours of fields with a passing score				Avg. Booked Hours	Uniformity
3	**442**	570	570		**527**	**450-600**
4	**500**				500	**450**
5	**470**	198	180	147	**230**	**200-450**

indicating that those fields received too much irrigation. At many of the site visits there was standing water on some of the fields. It would be prudent to perform irrigation audits on those fields to improve the overall quality of the turfgrass.

Sodding of goal mouths with Kentucky bluegrass sod was common at the end of the playing season on heavily worn goal mouths. By the mid-season visit and especially by the end of the playing season, most of the Kentucky bluegrass sod was worn leaving the majority of the goal mouth areas bare. This is clearly a band-aid solution that only provides turfgrass cover for a short period into the playing season.

Recommendations

Based on this two year project, it is recommended that the guidelines for permitting hours of the three categories of athletic fields be modified. It is also more realistic to have a range of hours than one number.

Category 3, 4 and 5 fields that had passing scores in 2013 and 2014 with their respective hours of permitted use are shown in Table 10 with the exception of Field A2 which was sodded mid-season. Based on this, it is suggested that the permitted hours be modified as in Table 10 to 450 – 600 hours for category 3 fields. For category 4 fields, there is only one data point so there is not sufficient information on which to change this category and it should remain at 450 until there is more information available. Category 5 fields are the poorest quality fields and play should be limited to 200-450 hours per season to provide fields that have a passing standard of quality. •

References

Bell, M.J. and Holmes, G , 1988. The playing quality of association football pitches, *Journal of the Sports Turf Research Institute*, **64**, 19-47.

Sheard, R.W, 2012. *Athletic Field Construction Manual*. Guelph, ON Canada: Sports Turf Association of Canada.

Acknowledgements

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project. I learned an enormous amount and I hope the information is helpful for municipal sports turfmanagers. I would also like to thank all participating municipalities whose names have been changed to protect the innocent and their very helpful staff that provided background information, field permitting records and maintenance records, as well as the experts:

- Ken Pavely, Lawn Life
- Ben Tymchyshyn, MMM Group
- Paul Turner, G.C. Duke Equipment
- Bob Kennedy, Niagara College
- David Smith, DSC Agronomics
- Gord Dol, Dol Turf Restoration

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Turfgrass Seed Sources in Ontario

Advertising Supplement to the Sports Turf Manager, Spring 2015

Sports Turf Canada strongly recommends to athletic field managers that they use only improved cultivars that have been tested and found superior under local conditions.

SPECIES	SUPPLIER							
	Evergro Division Crop Production Services Inc.		Graham Turf Seeds Ltd.		Lawn Life	Master's Turf Supply Ltd.		
Kentucky bluegrass	Appalachian Armada Blue Velvet Crest	Evora Mercury SR2100	Award Baron Bluechip Corsair Dauntless Everest Full Moon Impact Jumpstart	NuDestiny NuGlade Rugby II Rush Skye SR 2100 SR 2284 Sudden Impact	Mallard Monte Carlo Oasis Ridgeline Wildhorse	Award Baron Barrister Bedazzled Bonaire Brooklawn	Diva Everest Jumpstart Midnight Shamrock Wildhorse
Texas/Kentucky bluegrass hybrid	Bandera	Spitfire				Bandera	
Poa compressa	Canon	Reubens	Reubens			Canada Blue	
Poa supina	Supernova		Supranova				
Poa trivialis	Darkhorse		Maximum	Sabre III		Cypress	
Fine fescue: Blue	Azay Blue		SR 3200				
Fine fescue: Chewings	Silhouette	Windward	J-5 Jamestown IV King James	SR 5100 SR 5130	7 Seas Survivor	Ambassador Bridgeport II	Culumbra II Shadow II
Fine fescue: Creeping Red	Boreal Garnet	Maxima 1 SeaLink	Audobon Boreal Crossbow	SR 5210 SR 5250 Trapeze	Lustrous Penn ASC 295 Razor	Aberdeen Boreal	Miser Seabreeze
Fine Fescue: Hard	Ridu	Spartan II	Bighorn GT Ecostar Soil Guard	SR 3100 SR 3150	Predator	Oxford Reliant IV Reliant V	Soil Guard Stonehenge
Fine Fescue: Sheeps	Azay		Marco Polo	Quatro		Marco Polo	
Tall fescue	Mustang 4	Team Jr Blend	Darlington Grande II	Talladega	RK4	Bighorn GT Coronado Gold Fury	Lexington Titan
Tall fescue: Spreading/ Rhizomatous	Blade Runner II	Team Blend	Speedway		Marauder	Falcon IV	Titan Ultra
Perennial ryegrass	Cutter II Dasher 3 GLSR Double 4N	Sunshine II Transist 2600 Intermediate TXR Annual	Accent Arctic Caddyshack Calypso III Champion Extreme	Harrier SR 4220 SR 4420 SR 4500 SR 4600 Top Gun	Applaud II IG2 Integra Shining Star	Affirmed Charismatic II Dominator Doubletime IQ	Manhattan 5 Passport Plateau Trifecta Wind Dance 2
Perennial ryegrass: Creeping/Regenerating	Blazer 4	Fiesta 4	CSI		Allante Natural Knit	Baralpha	
Weeping alkali	Fults II		Fults	Salty		Fults	
Contact Information	**Evergro Division Crop Production Services Inc.** 10 Craig Street Brantford, ON N3R 7J1 Chris Lecour P:519.421.6593 F:519.757.0800		**Graham Turf Seeds Ltd.** 1702 Elm Tree Road, RR 1 Lindsay, ON K9V 4R1 P:795.878.8822 F:705.878.1978 graham@grahamturf.com www.grahamturf.com		**Lawn Life** 935023 Airport Road Mono, ON L9W 6C6 kpavely.lawnlife@xplornet.ca lawnlifenaturalturfproducts.com	**Master's Turf Supply Ltd.** P.O. Box 629 80 William Street West Harriston, ON N0G 1Z0 P: 519.510.8873 F: 519.510.8875 mastersturf@wightman.ca	

Turfgrass Seed Sources in Ontario

Turf Seeding Rates are available in Table 7—2 Turfgrass Species Characteristics and Uses in OMAFRA publication 845, *Integrated Pest Management for Turf*, available for download at www.omafra.gov.on.ca/english/crops/pub845/p845order.htm.

SUPPLIER								
Ontario Seed Company	Pickseed Canada Inc.		Quality Seeds			Speare Seeds	
Award Beyond Blitz Freedom III Midnight Star NuGlade Perfection	America Appalachian Armada Blue Velvet Crest Evora Explorer	Granite Langara Mercury Quantum Leap SR2100 Touchdown Touche	Abbey Argyle Aviator Barduke Barimpala Barinque Bariris Baron Baroness Barrister	Barvette BlackJack Blue Angel Blue Coat Blue Note Blue Sapphire Cadet Corsair Courtyard Dauntless	Everglade Gaelic Hampton HGT Midnight Midnight II Prosperity Raven Right Rubicon Rubix	Appalachian Award Baron Barrister Bedazzled Bonaire Brooklawn Diva	Everest Guiness Jumpstart Midnight Rockstar Shamrock Wildhorse
	Bandera	Spitfire	Farenheit 90	SPF 30		Bandera	
Canada Blue Reubens	Canon	Reubens	Reubens			Canada Blue	
	Supernova		Supranova				
Havana	Colt Darkhorse	Racehorse	Laser Sabre IV	Sun-Up		Bartalon	
	Azay Blue		Little Big Horn	MX 86			
J-5 LS-3000	Silhouette Windward		Fairmont Jamestown IV	Longfellow II Shadow II		Ambassador Bridgeport II	Culumbra II Shadow II
Aruba Audubon	Boreal Garnet Jasper II	Maxima 1 Mystic SeaLink	Boreal Crossbow Kent	LiFine Navigator II Trapeze		Aberdeen Boreal	Miser Seabreeze
Ecostar	Bornito Eureka	Ridu Spartan II	Chariot Firefly Heron	Rhino Ridu Sword		Oxford Reliant IV	Soil Guard Stonehenge
Marco Polo	Azay		Big Horn GT	Quatro		Marco Polo	
Arid III Inferno	Cayenne Crossfire 3	Mustang 4	Darlington Lexington Sitka	Tahoe II Talladega		Bighorn GT Coronado Gold	Fury Lexington
	Blade Runner II	Team Blend	RTF Rhizomatous			Falcon IV	Titan Ultra
Evolution Revenge	Cutter II Dasher 3 GLSR Double 4N Edge II Express III Fiesta 3	Mighty Nightsky Quebec Transist 2600 Intermediate TXR Annual	Amazing GS Apple GL Ecological Home Run Palace	Pillar Premium Presidio Primary Prominent		Affirmed Charismatic II Dominator Doubletime Elegana	IQ Manhattan 5 Passport Plateau Wind Dance 2
CSI	Blazer 4 Fiesta 4 GLSR	Karma Sideways	RPR Regenerating			Baralpha	
Fults	Fults II	Salty	Fults II			Fults	
Ontario Seed Company 77 Wellington Street South Kitchener, ON N2G 2E6 P:519.886.0557 F:519.886.0605 dave@oscseeds.com www.oscturf.com	**Pickseed Canada Inc.** 1 Greenfield Road Lindsay, ON K9V 4S3 P:705.878.9240 F:705.878.9249 pstevens@pickseed.com www.pickseed.com		**Quality Seeds** 8400 Huntington Road Vaughan, ON L4L 1A5 P:905.856.7333 support@qualityseeds.ca www.qualityseeds.ca			**Speare Seeds** 99 John Street Harriston, ON N0G 1Z0 P: 519.338.3840 F: 519.338.2510 info@speareseeds.ca	

IN THE NEWS

Sports Turf Canada Elects 2015/2016 Directors

Members of Sports Turf Canada elected the 2015/2016 directors at the annual meeting held recently at the University of Guelph during the Ontario Turfgrass Symposium.

Joining the board is new director Dwayne McAllister of the Town of Oakville. Returning for a new term are directors John D'Ovidio/City of Mississauga ON, Gord Horsman/ City of Moncton NB, Jason Inwood/Town of Innisfil ON, Ben Tymchyshyn/MMM Group Limited AB, and Dave Warden/City of Mississauga ON.

Continuing into the second year of their term are directors Tennessee Propedo/City of Hamilton ON, Tab Buckner/Township of Langley BC, Paul Gillen, Gord Dol/Dol Turf Restoration Ltd. ON, Terry Henderson/City of Guelph ON, Roger Macklin/City of Toronto ON, Ken Pavely/Lawn Life ON, and Paul Turner/G.C. Duke Equipment Ltd. ON.

At the subsequent meeting of the new board of directors Tennessee Propedo was appointed president, Tab Buckner/ vice president, Jason Inwood/secretary and Ben Tymchyshyn/ treasurer of Sports Turf Canada. Paul Gillen continues as immediate past president.

We express our appreciation to departing director Bill Clausen/ University of Guelph ON who has served the association as a director since 2007.

Pros and Cons of Using Tall Fescue Cultivars for Sports Fields

Row of plots of old cultivars tall fescue on the left and row of improved turf type tall fescues on right, Freehold, NJ

Trent Tate, Brad Park, S.A. Bonos and William A. Meyer
Graduate Assistant, Laboratory Researcher II, Principle Laboratory Technician, Field Researcher IV, Associate Professor, and Research Professor, respectively, New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State University of New Jersey, New Brunswick, NJ

Tall fescue [*Lolium arundinacea* (Schreb.) Darbyshire], a cool season grass, native to Europe and some parts of Africa (Bucker et al., 1979), was introduced into the United States in the 1800s as a forage grass (Hoveland, 2009). Tall fescue gained popularity after the release of the first commercial cultivar 'KY-31' in 1940, which enhanced forage production in the United States. The utility of tall fescue extended to turfgrass after the release of the first turf type tall fescue cultivar 'Rebel' in 1979 (Funk et al., 1981). Since that time, tall fescue has become one of the major cool season turf species in the United States because of its winter hardiness, persistence, adaptability to wider range of soils, and tolerance to shade and drought. Tall fescue has a deep root system that enhances drought tolerance and allows the plant to stay green longer in dry conditions. Tall fescue also has among the best heat tolerance of the cool-season grasses. These qualities have increased the use of tall fescue in North America to 200 million pounds (90 million kilograms) per year in home lawns, sports fields, golf course roughs, recreational fields, sod farms, and roadsides.

The Rutgers tall fescue breeding program has focused on turf quality (darker leaf colour, lower growth habit, finer leaf texture, and denser turf canopy) and the presence of endophytes that convey resistance to insects that feed above ground. Endophytic fungi live symbiotically inside the stem and leaf tissues (intercellular areas) and produce alkaloids that enhance tolerance to above ground insect feeding (Funk et al., 1993). The incorporation of endophytic fungi in tall fescue has been a major breeding objective for many years. Tall fescues require a soil temperature of 8°F (-13°C) for germination. This requirement demands that tall fescue must be planted in late August or early September for optimum establishment of new seedings. It also is slower to develop a mature turf than perennial ryegrass.

One of the major limitations of tall fescue is susceptibility to brown patch, caused by the fungus *Rhizoctonia solani*, in warm and humid regions. Brown patch, a soil borne disease of both cool season and warm season turfgrasses, causes blighted, circular to irregularly-shaped patches to form in the turf which quickly fade to light brown. Breeding for disease resistance is one of the main objectives of the Rutgers breeding program. The demand for disease resistant cultivars, with concurrent higher turf quality and superior performance, is high among consumers. Turf managers can improve the resistance of turf to brown patch by using mixtures of 10-15% Kentucky bluegrass with tall fescue.

The Rutgers turfgrass breeding program has continued to develop improved tall fescue cultivars. Presently, thousands of germplasm sources have gone through numerous cycles of selection and hybridization to improve turf quality, disease resistance, billbug resistance, and wear and drought tolerance. To achieve these objectives, collected germplasm has also been incorporated in the breeding program to introduce beneficial genes into the populations.

Procedures

Field Establishment and Maintenance

Four tall fescue trials were established at the Rutgers Plant Biology and Pathology Research and Extension Farm at Adelphia, NJ between 2010 and 2012 (all tables are available in their entirety turf.rutgers.edu/research/reports/2013/175.pdf). All tests were established in September by hand sowing 0.88 oz (25 g) of seed per 3 x 5 ft (0.9 x 1.5 m) plot (3.7 lb/1000 ft^2 (1.8 kg/100 m^2)). All tests were arranged in randomized complete block design with three replications, and each plot had a 6-inch (15.2 cm) unseeded border to limit contamination. Broadleaf weeds were controlled with spring or fall applications of 2, 4-D, dicamba (Banvel), and MCPP. Dithiopyr (Dimension)

was applied in spring to control annual grassy weeds. In July, metalaxyl (Subdue) was applied when required to prevent Pythium blight disease. Single applications of fertilizer did not exceed 1.0 lb nitrogen (N) /1000 ft^2 (0.5 kg/100 m^2). The amount and timing of N applied to the turf varied to encourage disease and other stresses (Table 5). The trials established in 2012 had an application of 10-10-10 fertilizer at the rate of 1.0 lb /1000 ft^2 (0.5 kg/100 m^2) at establishment. Field trials were mowed regularly (approximately 1 to 2 times per week) with reel mowers to maintain a 1.5 inch (3.8 cm) height of cut. The annual rate of N applied as well as mowing height for each test is presented in Table 5. Based on soil test results, lime was applied as needed to maintain a pH of 6.0 to 6.5. Irrigation was applied to each test as needed to avoid wilting. The 2010 test (Table 1) was managed under a low maintenance regimen beginning in 2012, which consisted of a higher mowing height of 2.5 inches (6.4 cm) as well as reduced fertilization input at 0.8 lb (0.4 kg) of nitrogen for the year (Table 5).

Visual Assessment

All tests were rated throughout the growing season for visual turf quality (i.e., overall appearance, turf colour, uniformity, density, mowing quality, reduced vertical growth rate, leaf texture, and damage due to insects and diseases). Other ratings such as spring green-up, wear tolerance, density, and damage due to specific diseases were documented when significant differences were evident. All ratings were based on a 1 to 9 scale, where 9 represented the best results. Plots were evaluated

Table 4. Performance of tall fescue cultivars and selections in the National Turf Test established in September 2012 at Adelphia, NJ.

		Turf Quality[1] Avg 2013	Establishment[2] Oct 2012	Net Blotch[3] May 2013	Brown Patch[3] Sept 2013	Leaf Texture[4] Oct 2013	Color[5] Oct 2013
1	Regenerate	6.6	5.0	5.3	6.3	7.7	7.3
2	B23	6.5	6.0	5.3	7.0	7.3	7.0
3	IS-TF 285	6.4	6.3	6.7	5.7	7.3	7.3
4	Firecracker SLS	6.4	6.3	6.3	6.7	7.3	7.7
5	IS-TF 291	6.3	5.7	6.3	5.3	7.7	8.0
6	TD1	6.3	6.0	7.3	5.7	6.3	8.3
7	IS-TF 269 SEL	6.2	4.7	6.7	4.3	7.7	7.7
8	4th Millenium	6.2	5.3	4.7	7.0	7.0	7.0
9	Traverse 2	6.2	5.3	6.0	7.7	7.7	7.3
10	PPG-TF-157	6.1	5.3	6.7	6.3	6.7	8.3
11	PPG-TF-152	6.1	5.7	6.3	6.3	7.3	7.7
12	Rambler II	6.1	5.7	7.0	5.7	6.0	6.0
13	RAD-TF-88	6.0	5.7	5.7	5.3	8.0	8.7
14	Rowdy	6.0	6.7	6.3	5.3	8.0	6.3
15	Rockwell	6.0	4.7	5.3	7.3	6.7	6.0
16	IS-TF 289	6.0	6.0	7.0	5.0	6.7	7.7
17	PPG-TF-170	6.0	7.7	5.3	6.3	8.3	6.7
18	Pick-W43	5.9	6.3	5.3	5.7	7.7	5.3
19	Bullseye	5.9	6.0	6.0	4.7	7.3	7.3
20	Raptor III	5.8	5.3	5.7	7.0	7.7	6.0
21	IS-TF 310 SEL	5.8	4.7	6.0	5.7	8.0	6.7
22	CCR2	5.8	5.3	5.3	7.0	7.7	6.7
23	DB1	5.8	5.0	6.3	4.3	7.3	8.3
24	PPG-TF-150	5.8	5.3	6.3	5.7	8.0	6.7
25	Slate	5.8	6.7	4.0	5.7	7.7	5.7
26	IS-TF 330	5.8	4.7	6.7	5.7	7.0	9.0
27	Fesnova	5.7	6.0	5.7	6.0	6.3	6.7
28	Firebird 2	5.7	5.0	6.3	6.0	7.3	6.7
29	DZ1	5.7	5.0	6.0	4.3	7.3	7.7
30	RAD-TF-89	5.7	6.3	5.3	5.7	8.3	9.0
31	K12-05	5.7	5.3	6.0	4.3	7.0	8.7
32	PPG-TF-151	5.7	5.0	5.0	5.0	7.3	6.7
33	RAD-TF-92	5.6	6.0	5.3	5.0	8.0	7.7
34	IS-TF 284 M2	5.6	3.7	6.3	4.7	7.0	8.0
35	PPG-TF-148	5.6	5.3	4.3	6.7	6.3	5.7
36	IS-TF 282 M2	5.5	5.7	6.0	3.3	6.7	8.3
37	Reflection	5.5	4.7	5.3	6.0	7.7	6.3
38	Faith	5.5	5.0	4.3	6.0	6.7	7.3
39	PPG-TF-156	5.5	6.0	4.7	6.3	7.3	6.7
40	PPG-TF-139	5.5	4.3	6.0	5.0	8.3	7.3
41	IS-TF 311	5.5	3.7	5.3	5.3	7.0	6.0
42	RAD-TF-83	5.5	5.3	5.3	4.7	7.7	9.0
43	Terrano	5.5	6.0	5.7	4.3	6.0	6.7
44	MET-3	5.5	5.0	5.0	6.3	7.3	7.0
45	PSG-P01	5.4	5.0	4.3	5.7	7.0	6.3
46	ATF 1612	5.4	5.7	4.0	5.7	6.7	5.7
47	RZ2	5.4	6.0	5.3	6.7	7.3	5.3
48	Hot Rod	5.4	5.0	5.7	6.3	7.0	6.7
49	Burl TF-69	5.4	5.3	5.0	5.0	7.3	8.0
50	TF-287	5.4	5.7	5.7	5.0	7.3	7.7
51	IS-TF 276 M2	5.3	5.3	5.3	4.0	6.7	7.3
52	GTO	5.3	6.0	4.7	5.7	7.3	7.0
53	T31	5.3	6.0	4.0	5.3	6.7	5.0
54	PSG-WE1	5.3	5.0	5.7	5.0	7.7	6.7
55	PPG-TF-172	5.3	5.3	5.3	5.7	6.7	6.7
56	Michelangelo	5.3	5.3	4.3	5.7	6.0	5.7
57	PPG-TF-115	5.3	5.7	6.7	3.7	5.7	7.3
58	Leonardo	5.2	6.3	5.3	4.7	5.7	5.7
59	Hemi	5.2	5.7	5.0	5.7	7.7	5.7
60	PPG-TF-137	5.2	5.0	4.3	6.0	7.3	5.7

by a number of turfgrass specialists to reduce the impact of personal bias for particular characteristics. All data were summarized and subjected to an analysis of variance. Means were separated using Fisher's protected least significant difference (LSD) means separation test.

Results And Discussion

Results of tall fescue tests are published in the 2013 Rutgers Turfgrass Proceedings (turf.rutgers.edu). All tests are ranked by overall (multi-year) turf quality average. A high quality average is generally indicative of better disease resistance, a darker green colour, greater turf density and uniformity, finer leaf texture, lower growth habit, improved mowing quality, and less damage due to insects.

Turf Quality

Higher turf quality increases the utility of tall fescue in athletic fields, school grounds, sod farms, lawns, and parks. Turf quality characteristics include canopy density, uniformity, lower growth habit, finer leaf texture, dark green colour, and tolerance to disease or environmental stress. The selections and cultivars that performed well in the 2012 NTEP test were Regenerate, B23, IS-TF 285, and Firecracker SLS (Table 4). The best performing cultivars and selections in the 2012 test were W43, Regenerate, and B23 (Table 3). In the 2011 test the best performing cultivars and selections were PPG-TF 141, B23, and PPG-TF 105 (Table 2). For the 2010 test the best performing cultivars and selections were WE2, Regenerate, RZI, and CCR2 (Table 1).

		Turf Quality[1] Avg 2013	Establishment[2] Oct 2012	Net Blotch[3] May 2013	Brown Patch[3] Sept 2013	Leaf Texture[4] Oct 2013	Color[5] Oct 2013
61	JS 916	5.2	4.7	5.0	5.3	7.3	7.3
62	OR-21	5.2	6.7	5.7	4.3	6.0	9.0
63	TY 10	5.2	5.7	4.7	3.7	6.3	8.7
64	JS 818	5.1	5.3	6.7	3.7	5.3	8.0
65	PST-5EV2	5.1	4.7	4.3	6.0	7.0	5.3
66	W41	5.1	5.0	5.0	5.0	7.7	7.0
67	IS-TF 305 SEL	5.1	5.0	5.7	5.0	6.0	8.0
68	PPG-TF-138	5.1	5.3	5.7	4.7	7.7	6.7
69	PST-5BRK	5.1	5.3	5.0	5.3	7.0	5.0
70	Bizem	5.1	4.3	4.3	5.3	6.7	6.0
71	F711	5.0	5.3	5.0	5.7	7.0	7.3
72	ATF 1754	5.0	5.0	3.7	4.7	6.7	4.7
73	Falcon V	5.0	6.0	3.3	5.7	7.7	6.3
74	IS-TF 308 SEL	5.0	3.3	5.3	4.7	7.7	7.0
75	Cochise V	5.0	5.3	4.3	5.3	7.0	6.0
76	JS 819	5.0	5.3	6.0	4.0	6.3	6.7
77	Exp TF-09	5.0	5.7	6.0	3.7	6.0	8.0
78	PST-5GRB	5.0	4.3	4.7	5.3	7.7	5.3
79	ATF 1736	4.9	5.3	3.7	4.3	7.0	5.7
80	PST-5MVD	4.9	5.0	4.0	5.3	6.3	5.3
81	MET 6 SEL	4.9	4.0	4.3	6.3	7.0	5.0
82	PPG-TF-169	4.9	6.7	3.3	5.7	6.7	6.0
83	PST-5DZP	4.9	4.3	6.0	3.3	6.3	6.7
84	GO-DFR	4.9	4.0	5.7	4.0	6.3	7.0
85	K12-MCD	4.9	6.0	6.0	4.0	6.7	5.3
86	PPG-TF-145	4.8	4.0	6.3	4.0	6.7	8.0
87	PPG-TF-142	4.8	4.0	5.7	4.7	7.3	7.3
88	Grande 3	4.8	5.7	3.0	5.0	7.3	6.0
89	ATF 1704	4.7	5.3	3.3	5.7	6.7	5.3
90	Saltillo	4.7	4.7	5.7	4.3	5.7	6.0
91	Comp. Res. SST	4.7	5.7	5.3	3.3	8.0	5.7
92	IS-TF 307 SEL	4.7	3.7	6.0	4.7	7.0	8.0
93	IS-TF 272	4.7	3.3	5.3	5.0	7.3	8.3
94	JS 809	4.7	5.3	6.0	4.0	6.7	7.0
95	PSG-GSD	4.6	5.7	4.7	4.3	7.0	4.7
96	Catalyst	4.6	6.0	2.7	5.7	7.3	4.3
97	BAR Fa 121095	4.6	4.3	5.7	4.3	6.7	7.0
98	Falcon IV	4.6	6.0	5.0	3.7	5.7	6.0
99	PST-5R05	4.5	6.3	4.3	3.0	7.7	5.7
100	PSG-8BP2	4.5	4.0	5.3	3.3	6.0	6.7
101	K12-13	4.4	4.3	5.7	3.0	8.0	6.3
102	JS 825	4.3	5.0	5.7	3.7	4.0	7.3
103	Marauder	4.2	5.3	5.3	2.7	8.0	5.7
104	Annihilator	4.2	6.3	4.3	2.3	7.3	7.3
105	BAR Fa 121089	4.2	4.7	5.0	4.7	5.7	6.7
106	PSG-TT4	4.2	4.7	3.7	3.7	6.7	5.3
107	Inspiration	4.1	4.7	5.0	3.7	3.3	5.3
108	204 Res. Blk 4	4.1	4.7	4.0	3.0	8.3	4.3
109	Rain Dance	4.1	4.7	2.7	4.3	5.7	5.7
110	Warhawk	4.0	4.7	4.3	2.3	6.7	6.3
111	PST-5BP0	4.0	4.0	3.7	4.3	5.3	5.0
112	Aquaduct	3.8	4.0	3.0	3.0	5.0	5.3
113	PST-5EX2	3.5	5.3	3.3	5.7	6.3	3.7
114	BAR Fa 121091	3.0	3.0	4.0	2.3	2.7	8.0
115	BAR Fa 120878	2.6	7.0	3.0	2.7	2.3	3.7
116	Ky-31	1.3	7.7	1.0	3.7	1.0	1.0
	LSD at 5%=	0.8	1.0	1.3	1.8	1.5	1.4

[1] 9 = best turf quality [2] 9 = best turf establishment [3] 9 = least disease [4] 9 = finest leaf texture [5] 9 = darkest genetic colour

Leaf Texture

Turfgrass texture is a rating based on the estimated leaf width. The rating is based on a 1-9 scale with 1 being coarse texture and 9 being fine texture. The 2012 NTEP was rated for leaf texture and the selections with the finest texture were PPG-TF-170, RAD-TF-89, PPG-TF-139, and 204 Res. Blk 4, while the most coarse textured cultivar was Ky-31 (Table 4).

Colour

The 2012 NTEP test was also rated for colour in October of 2013. The rating for colour is based on a 1-9 scale with 1 being light green and 9 being dark green. The darkest selections for that test were Diablo, RAD-TF-89, RAD-TF-83, and OR-21, while the lightest coloured cultivar was Ky-31 (Table 4).

Disease Resistance

Brown patch, a major disease of tall fescue, causes significant damage during humid and warm weather conditions. Improved cultivars are available but there are no cultivars that are completely resistant to this disease. In the 2012 NTEP test, the selections Traverse 2 and Rockwell showed the greatest resistance, while Annihilator, Warhawk, and BAR Fa 121091 showed the least resistance (Table 4). For the 2012 test, the most resistant cultivars and selections were W43, Regenerate, and Traverse 2, with the least resistant cultivars and selections being LB07-6-11, Penn ATF 1258, Titan Rx, Greystone, and Arid 3 (Table 3). The most resistant cultivars for the 2011 test were PPG-TF 141, Firecracker SLS, Rowdy, PPG-TF 106, and PPG-TF 123 with the least resistant PSG 8RSTR3 Grande 3, 3311 Bulk, Inspiration, PSG 8GF4, PSG 8GF6, Prospect, Greystone, and PSG 8GF1 (Table 2). For the 2010 test, SCTF 3, Falcon V, 1-10 Fa Bulk, and Mustang 4 were most resistant while the least resistant was RAD-TF75 (Table 1).

Net blotch is a leaf spot disease of tall fescue caused by the fungus *Drechslera dictyoides*. The symptoms occur as tiny brown spots on the leaves which expand and become oval or square and then coalesce to form a net like pattern on the leaf. The diseased turf appears thinned with a yellow or brown colour. This disease occurs during cool, wet, and cloudy periods in the spring and early summer. Resistance to net blotch can vary greatly by cultivar. Both tall fescue tests that were established in 2012 were rated for net blotch disease in May of 2013. The most disease resistant cultivars and selections in the 2012 test were LB08-5-12, PS-Fa-09-7-11, and PPG-TF 145 with the least resistant being Greystone (Table 3). For the 2012 NTEP test the most resistant cultivars and selections were TD1, RAMBLER 2, and IS-TF 289, with the least resistant being Ky-31 (Table 4).

Overall performance of new tall fescue cultivars in New Jersey in wear and non wear trials the past 8 years (some of the best examples): Regenerate, Rowdy, Firewall, Titanium 2LS, Hot Rod, Rambler 2, 3rd and 4th Millennium, Traverse 2, Raptor II and III, Avenger II, Rockwell, Cochise IV, Wolfpack II, Bullseye, Hemi, Mustang 4, Padre, LS 1200, Shenadoah III and Elite, Falcon V, Faith, Bizem, PennRK-4, Sidewinder, Meridian, Temple and Monet.

SUMMARY

At Rutgers, turfgrass breeders are continuing to make progress in improving tall fescue to extend its acceptance in the turfgrass industry and among consumers. Resistance to brown patch, rapid establishment, and higher turf quality are among the primary goals of tall fescue breeding programs. Ongoing evaluation of the cultivars and germplasm help to identify superior lines that can be used by breeders to develop new cultivars. Efforts to collect germplasm and incorporate endophytes in tall fescue may lead to increased persistence

and tolerance to above ground insect feeding and diseases. Therefore, the efforts to improve tall fescue would extend its utility to the areas where it has not been used before and would be suitable to different regions in the United States. •

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IN THE NEWS

DLF Pickseed is pleased to announce the hiring of Craig McCutcheon as Pickseed's Professional Turf Salesman

Craig will be responsible for supporting distribution partners and customers in KEY market segments including Landscape, Municipal, Sod and Independent Garden Centres in South Western Ontario and the greater Toronto area. Craig brings 24 years of experience from the turf industry, most recently working with Direct Solutions as a Technical Sales Representative. Craig's experience also includes the sales and support of seed products along with participation in various related seed industry educational programs.

Paul Stevens, Professional Turf Manager stated, "This position is significant to DLF Pickseed as we look to develop and grow long-term relationships with existing and new customers, as well as with related associations in the South Western Ontario region".

IN THE NEWS

$250,000 of Turfgrass Research

The Board of Directors of the Ontario Turfgrass Research Foundation (OTRF) is pleased to announce the 2015 distribution of $140,000 in grants awarded to turfgrass research. By collaborating with industry partners and funding agencies such as the Canadian Growing Forward 2 program, the OTRF will be granting valuable industry seed money to researchers who will use these funds to conduct $250,000 of research this year. There are several important projects funded by the OTRF with outcomes of significant value to sports turf managers, golf superintendents and homeowners alike. For additional information on the following OTRF sponsored research projects, please visit the foundation website otrf.ca.

- Biological control of dandelion weed in turfgrass using beneficial microbes, Dr. Manish Raizada, University of Guelph
- Turf disease and stress resistance defense activators: Field work, Dr. Tom Hsiang/ Dr. Paul Goodwin, University of Guelph
- Guideline for sustainable turfgrass using low-input cultivars and low-risk management practices, Dr. Michael Brownbridge, Vineland Research Center
- Biological control of dollar spot disease in creeping bentgrass using beneficial microbes, Dr. Manish Raizada, University of Guelph
- Evaluation of compost topdressing and compost tea applications on sports field turfgrass swards, Katie Dodson, Olds College

Sports Turf Canada supports turfgrass research with our annual donation to the Ontario Turfgrass Research Foundation, a member of the Canadian Allied Turfgrass Research funding group. Sports Turf Canada Vice President Tab Buckner (L) presents our 2015 contribution to OTRF President Dave Smith at the recent Ontario Turfgrass Symposium.

tgif turfgrass information file

250,000 Pieces of Information

The Turfgrass Information Center is ecstatic to announce its latest milestone: the Turfgrass Information File database now contains 250,000 unique records! This achievement solidifies the TGIF database as the premiere online, comprehensive source of turfgrass information for researchers, practitioners, individuals, and students all around the world.

Although record creation in the database has been ongoing since 1984, creation has increased enormously over the last five years, averaging roughly 15,000-20,000 records per year between 2011 and 2014. Since that very first record over 30 years ago in September of 1984, the Turfgrass Information Center has continually worked to improve its operations and the integrity of the database, and hopes to continue this work for many years to come.

Sports Turf Canada members have complete subscriber access via the Michael J. Bladon Educational Link in the Members Only section of our website. Log-in and start searching today!

IN THE NEWS

XGD Systems Names Mark Hughes Technical Representative for Canadian Operations

XGD Systems, Canada, designs and installs drainage systems as well as providing renovation services to golf courses and sports fields, has named Mark Hughes as its new Technical Representative for Canadian Operations.

Mr. Hughes, who had been Senior Project Manager at TDI Golf (Canadian & US operations), will be in charge of managing and increasing XGD Systems Canadian operations. XGD Systems is considered North America's leader in golf course drainage with a resume including: Merion Golf Club (PA), Oakmont Golf Club (PA), Toronto Golf Club (ON), Bel-Air Country Club (CA), Trump International Golf Club (FL) to name a few.

XGD Systems has always had a Canadian presence having a shared office in Guelph, ON with owner, Geoff Corlett. Currently, XGD Systems is expanding its Canadian Operations to better service their Canadian clientele, with Mr. Hughes spearheading this campaign.

Mr. Hughes has an Associate Diploma in Agriculture from University of Guelph. He and his wife, Deborah live in Kitchener, ON with their three children.

For more information on XGD System please visit greensdrainage.com
or give Mark a call at (226) 808-0386.

UNCOVERING THE BENEFITS OF TURFGRASS AS A GROUND COVER

Jim Novak, Public Relations Manager, Turfgrass Producers International

When it comes to the benefits of turfgrass most people don't give it much thought. If the average homeowner does give it any thought, it's usually limited to their front lawn, their backyard, maybe the neighborhood park, or perhaps that sports field at the local high school. The truth is, most people focus more on the cosmetic appearance of their lawns than ponder the question – why is turfgrass such a great ground cover?

The environmental benefits of turfgrass seldom come up in the conversation and I suspect a good number of people would be hard pressed if they were asked the question, "What has your lawn done for you lately?"

Truth be known, turfgrass which includes lawns, playing fields, golf courses, parks and many other outdoor areas provides tremendous environmental benefits that are seldom considered.

In fact, turfgrass is among the foremost protectors of the environment, providing many functional, recreational aesthetic benefits. That was the conclusion of a scientific study "The Role of Turfgrasses in Environmental Protection and Their Benefits to Humans" published in the Journal of Environmental Quality by two prominent turf experts, Dr. James B. Beard and Dr. Robert L. Green. They emphasized that "the complexity and comprehensiveness of the environmental benefits of turfgrass that improve our quality of life are just now being quantitatively documented through research."

The environmental benefits of turfgrass scientifically documented in the article include:

- Soil erosion control and dust stabilization
- Groundwater recharge and surface water quality
- Organic chemical decomposition
- Soil improvement and restoration
- Heat dissipation-temperature moderation
- Noise abatement and glare reduction
- Decrease of noxious pests, reduced allergy-related pollens and human disease exposure
- Security for vital installations and lower fire hazard

The researchers also reported that scientific support for recreational and aesthetic benefits included improved mental health, social harmony and improved productivity.

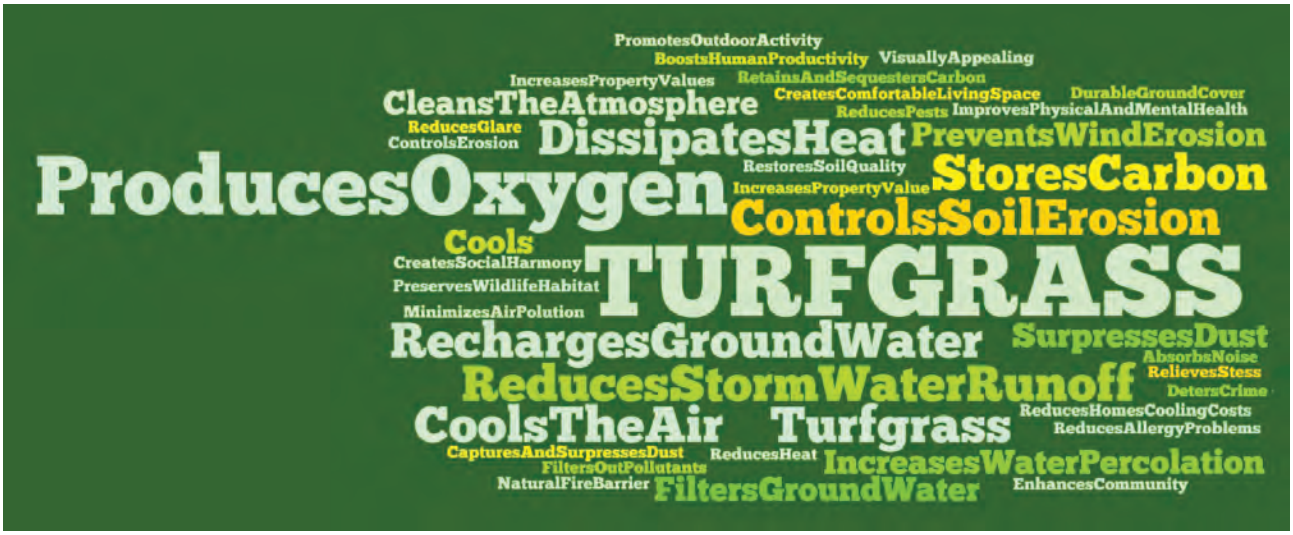
Addressing concerns about turf water use, the researchers reported that "there is no valid scientific basis for water conservation strategies or legislation requiring extensive use of trees and shrubs in lieu of turfgrasses. The main cause for excessive landscape water use in most situations is the human factor."

Turfgrass controls soil erosion and stabilizes dust by trapping and holding particles in place. It also recharges groundwater and improves surface water quality by filtering runoff. In addition, it dissipates heat through its natural cooling process, reducing temperatures in turf area by as much as five to seven degrees as compared to hard-surface areas.

Turfgrass controls air pollution by taking carbon dioxide and other pollutants from the atmosphere and returning oxygen. Just a small 25-foot by 25-foot (7.5 m x 7.5 m) plot of lawn traps enough carbon dioxide from the atm osphere to return oxygen to an entire family of four to breathe!

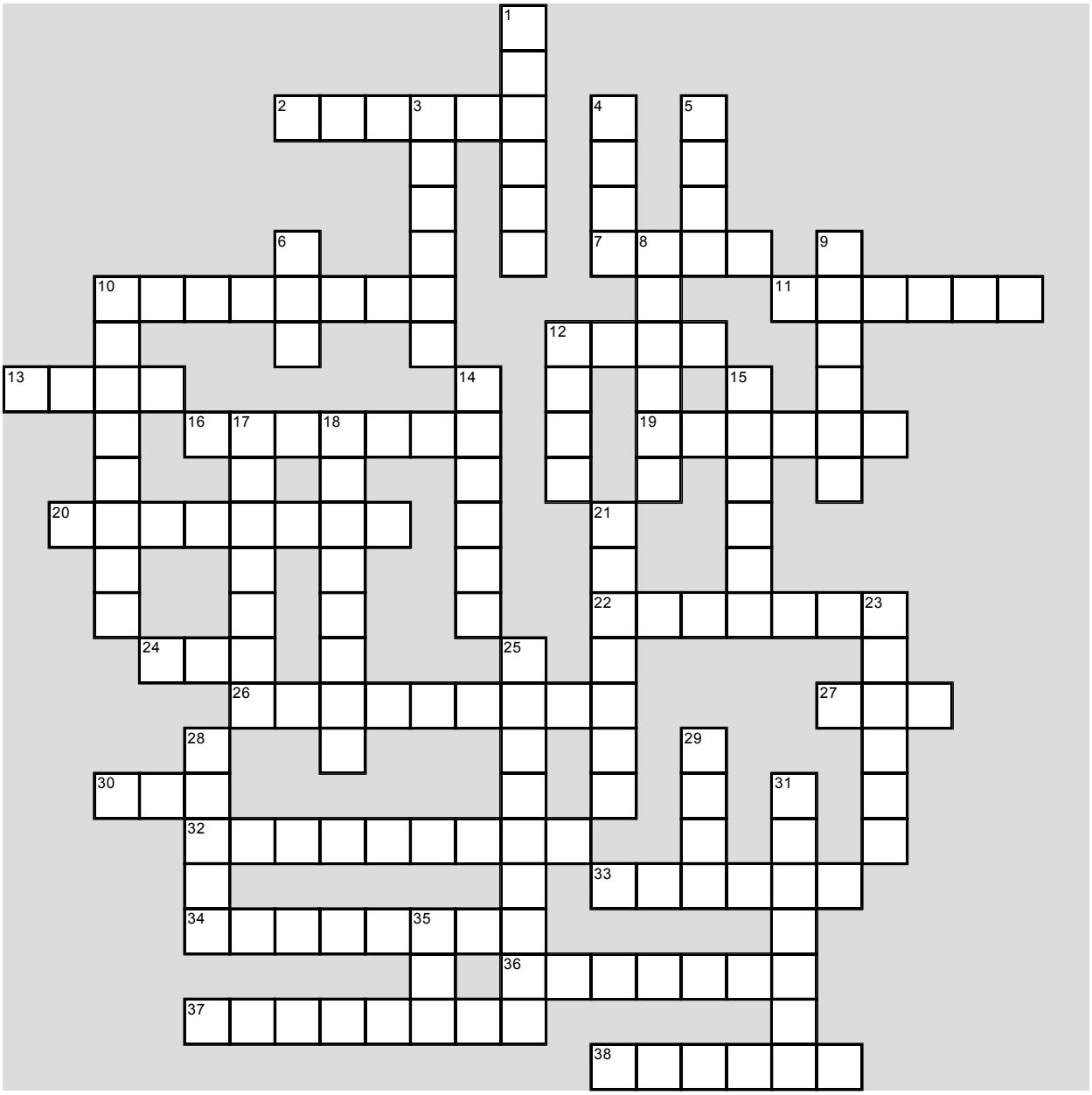
So, in the event you're ever asked the question, "What has your lawn done for you lately?" You might respond – more than you could ever imagine!

For more benefits of turfgrass go to: www.landcarenetwork.org/legislative/ResearchSummary.pdf



Sports Turf Mind Bender

Author: Mike Bladon



ACROSS

2 Lower wear tolerant turf
7 Plant portion
10 Virus
11 Organic component of turf
12 Soil component
13 The "T" in STC
16 Unit of botanical classification
19 Genetically identical plants
20 Capable of being mixed
22 Organic catalysts
24 Charged atom
26 Where the keeper typically is
27 To plant
30 Average
32 Oxygen deficient
33 Cultivation
34 Atmospheric gas and granular fertilizer
36 Pattern of travel
37 Plant death
38 Roots and ....

DOWN

1 He wrote the STC Bible on turf
3 Beer or ring around the moon
4 New turf for MLB's Toronto team
5 Field marking
6 Transplant
8 Undecomposed plant matter
9 Sprout or stalk
10 Influences percolation
12 Hollow stem
14 Barometric line
15 Mower type
17 Water to seed
18 Species selection
21 STC Executive Manager
23 Horizontal stem
25 Essential to plants
28 Draw off liquid
29 Traffic that affects turfgrass
31 One cotelydon
35 Vapour

Be one of the first 10 to email (info@sportsturfcanada.com) or fax (519-766-1704) your correct puzzle solution for Sports Turf Mind Bender bragging rights. Go ahead! We dare you! Solution will be published in the Summer issue of the magazine.

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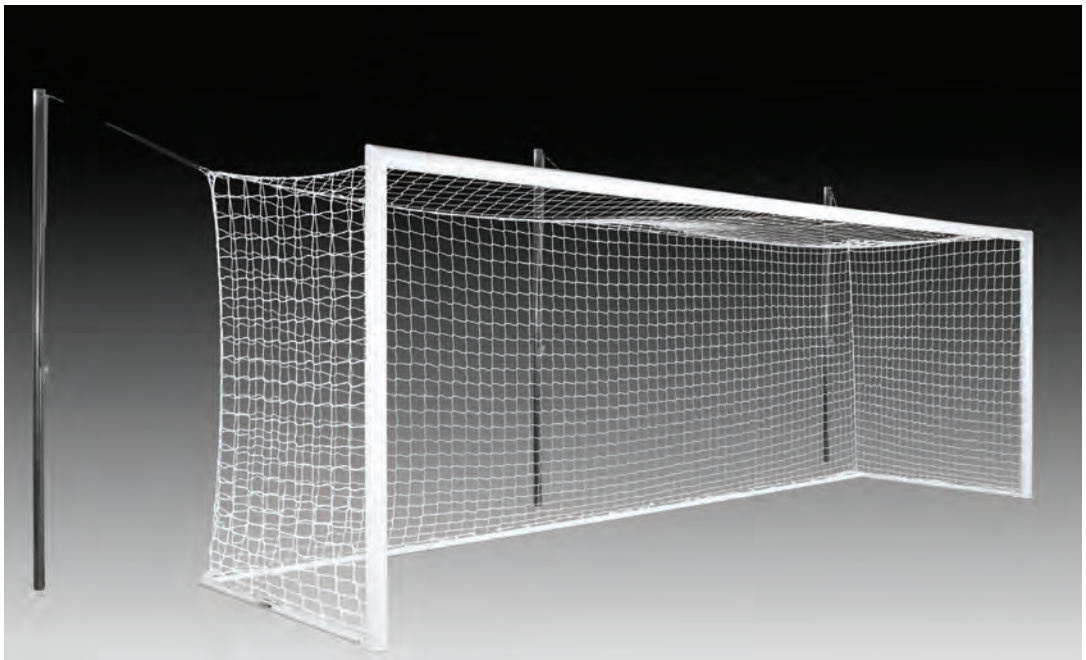

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