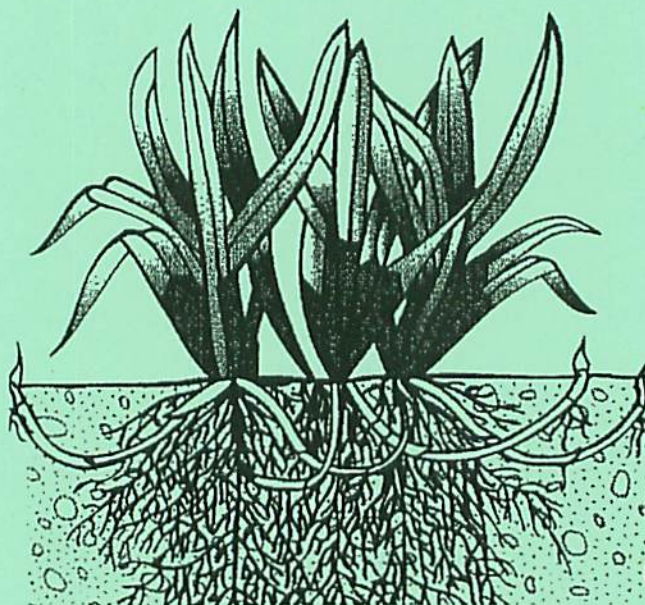




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2009 WSU/OSU TURFGRASS FIELD DAY

Tuesday, July 14, 2009



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Northwest Turfgrass Association

Facts about the Northwest Turfgrass Association (NTA) and the Turfgrass Universities Research Fund (T.U.R.F.)

- The NTA is a nonprofit 501c(3) organization of golf course superintendents and turfgrass professionals in OR, WA & ID. In 1997, the NTA formed the Turfgrass Universities Research Fund (T.U.R.F.) to provide funding for Education, Research, and Scholarship for the "Betterment of Golf." Since then, T.U.R.F. has contributed over \$775,000 to research and education projects that improve turf quality and the overall playing conditions of the game.
- Golf courses in the Pacific Northwest face many challenges, including environmental concerns regarding pesticide use, water issues, and wildlife habitat. The need for research on these issues, as well as many others, continues to grow in importance. The Northwest Turfgrass Association is committed to supporting turfgrass research programs in the Pacific Northwest.
- The NTA is dedicated to providing funding for research that benefits golf course superintendents and the entire golf course industry. We work with researchers to ensure that the topics being focused on are relevant to golf courses in the Pacific Northwest. Our research team is a highly respected group from the turfgrass programs at Oregon State University, Washington State University – Puyallup, and Washington State University – Pullman.
- The NTA also strives to provide NTA members with research results through our publications, website and annual conferences.
- The research projects that T.U.R.F. has supported have been diverse, including: grass seed selection, mowing heights, wear tolerance, annual bluegrass maintenance, earthworm casting studies, and weed and disease control, organic fertilizer trials & moss control.
- Current research being funded focuses on *Poa annua* fertility, organic fertilizer effects on turfgrass and soil systems, establishment of annual ryegrass, and cultivation and topdressing effects on bentgrass systems.
- T.U.R.F. also provides financial support for educational programs and projects. In 2009, beneficiaries include Walla Walla Community College, The First Green of Washington Program, Oregon State University's Turfgrass Professor Endowment Fund, and the WA State Golf Alliance (WA Golf Economic and Environmental Impact Study).

- T.U.R.F. depends upon contribution from individual, golf clubs, and other allied golf associations to support turfgrass research. The need for this support is more important now than ever, as universities cut funding to many programs, and the environmental community scrutinizes turf maintenance practices.
- Contributors to T.U.R.F. include golf associations, companies, golf clubs, and individuals. Sahalee Country Club is a leader among golf clubs that contribute to

To become a member of the NTA, or to make a tax-deductible contribution to T.U.R.F., please contact Paul Backman at:

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2203 Nut Tree Loop SE
Olympia, WA 98501
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Fax: 360-753-5928
Email: turfalliance@comcast.net

NTA Annual Conference at the Sunriver Resort -- October 4-6, 2009

The 63rd Annual NTA Conference will be held at the Sunriver Resort on October 4-6, 2009. The Dr. R.L. Goss Tournament will be a 12:00 p.m. shotgun start on Sunday, October 4th at Crosswater Golf Club and the Dr. Mike Hindahl Memorial Tournament will be held on the 5th at Bend Golf & Country Club. For additional information you can contact the NTA Office at the address listed above.

Contributors to WSU - Puyallup Turfgrass Research 2008- 09

There are many companies, organizations, and people from outside the university who support our efforts. We would like to express our gratitude to all who help make it possible for us to accomplish the things we do, including:

Agraquest, Inc.	Pierce County Parks and Rec./
Bayer-Purcell	Lake Spanaway GC
Canterwood Country Club	Pacific Northwest Golf Assn. (PNGA)
City of Sumner/	ProSource One
Sumner Meadows GC	Quali-Pro
Cooperative Turfgrass Breeders	Sahalee Country Club
Tests	Seattle Golf Club
D.A. Hogan and Associates	Seed Research of Oregon
DLF International Seeds	Simplot Partners
Dow AgroSciences	Syngenta
Dupont	Tam-O-Shanter G. and C.C.
Fircrest Golf Club	The Andersons
FMC	The Home Course
Glendale Country Club	TPC at Snoqualmie Ridge
Meadow Park Golf Course/	Turf-Seed
Metro Parks Tacoma	Valent
Monsanto	Walrath Trucking
National Turfgrass Federation	Washington State Dept. Agr.
NW Biosolids Management Assn.	Washington State Dept. of Ecology
Northwest Turfgrass Assn.	Washington State Golf Assn.
OGCSA	Western Canada Turfgrass Assn.
PNW Chapter, Sports Turf Mgrs.	Western Equipment
Assn.	Wilbur Ellis
Pickseed West	Wilco
Pierce Co. Environ. Services	Wolbert's/ Plant Essentials LLC
	WWGCSA

We apologize if there is anyone that we have overlooked.

STOP #1 Potential Chemical Combinations for *Poa annua* Suppression

M.W. Williams, C.T. Golob, W.J. Johnston, and C.A. Proctor
Washington State University
Pullman, WA

Annual bluegrass (*Poa annua* L.) control options have been studied for the better part of the last century; still no silver bullet for eradication. The varying, and sometimes contradictory levels of annual bluegrass control found on a per product basis may be attributable to the numerous biotypes of this species. With that in mind, two studies are currently being conducted at Palouse Ridge Golf Club that focus on the suppression or control of annual bluegrass.

The first study, located on the practice hole, was a fall fairway renovation in which glyphosate (Roundup Pro) was applied alone, or followed by mesotrione (Tenacity) (Table 1). Roundup Pro was applied 21 days before planting on September 12, 2008. All Tenacity treatments were applied with 0.25% v/v non-ionic surfactant (Activator 90). Renovation following Roundup Pro application was accomplished by first mowing (scalping), then vertical mowing the plot area in two directions, slice seeding in two directions and seeding perennial ryegrass at 10 lbs 1000 ft² using a drop spreader. Sand topdressing was applied following seeding. The study was a randomized complete block design with 4 replications.

Table 1. Fall renovation study treatments and application schedule at Palouse Ridge Golf Club, Pullman, WA. 2008-2009.

Trt#	Treatment	Rate	App date	App Sch
1	Roundup Pro	3 qt/A	1 [†]	21 DBP
2	Roundup Pro	3 qt/A	1	21 DBP
	Tenacity	175 GA/ha	2 [‡]	at planting
3	Roundup Pro +	3 qt/A	1	21 DBP
	Tenacity +	210 GA/ha	1	21 DBP
	Activator 90	0.25%	1	21 DBP
4	Roundup Pro +	3 qt/A	1	21 DBP
	Tenacity +	210 GA/ha	1	21 DBP
	Activator 90	0.25%	1	21 DBP
	Tenacity	175 GA/ha	2	at planting
	Tenacity +	175 GA/ha	3 [§]	28 DAP
	Activator 90	0.25%	3	28 DAP
5	Roundup Pro +	3 qt/A	1	21 DBP
	Tenacity	280 GA/ha	1	21 DBP
	Tenacity +	210 GA/ha	3	28 DAP
	Activator 90	0.25%	3	28 DAP
6	Check			

[†]Application date 1 = 12 Sept 2008; 21 Days before planting (DBP)

[‡]Application date 2 = 1 Oct 2008; at planting

[§]Application date 3 = 27 Oct 2008; 28 Days after planting (DAP)

At the most recent rating date for this study, May 26, 2009, it appears that treatments 4 and 5 are providing some level of *Poa annua* suppression, however statistical analysis has not yet been performed and annual bluegrass populations appear to be increasing. Early spring ratings

indicated that multiple applications of mesotrione were needed following glyphosate application to achieve annual bluegrass suppression in a fairway renovation.

The other annual bluegrass control study, located on the ninth fairway at Palouse Ridge Golf Club, focuses on post-emergence applications of Tenacity alone, or in combination with, bispyribac-sodium (Velocity) or ethofumesate (Prograss) (Table 2). The fairway was seeded in fall 2007 with Kentucky bluegrass (*Poa pratensis* L.), and has a moderate infestation of annual bluegrass and meadow foxtail.

Table 2. Treatments included for post-emergence annual bluegrass control study at Palouse Ridge Golf Club, Pullman, WA. 2009.

Trt#	Treatment	Active Ingedient	Rate	App date
1	Tenacity 4FL + NIS	mesotrione	0.156 lb	5/18/2009
	Tenacity 4FL + NIS	mesotrione	0.156 lb	6/8/2009
	Tenacity 4FL + NIS	mesotrione	0.156 lb	6/29/2009
2	Tenacity 4FL + NIS and Velocity	mesotrione	0.156 lb	5/18/2009
		bispyribac sodium	15 g	
	Tenacity 4FL + NIS and Velocity	mesotrione	0.156 lb	6/8/2009
3	Velocity	bispyribac sodium	15 g	5/18/2009
	Velocity	bispyribac sodium	15 g	6/8/2009
	Velocity	bispyribac sodium	15 g	6/29/2009
4	Tenacity 4FL + NIS and Prograss	mesotrione	0.156 lb	5/18/2009
		ethofumesate	0.38 lb	
	Tenacity 4FL + NIS and Prograss	mesotrione	0.156 lb	6/8/2009
5	Prograss	ethofumesate	0.38 lb	5/18/2009
	Prograss	ethofumesate	0.38 lb	6/8/2009
	Prograss	ethofumesate	0.38 lb	6/29/2009
6	Check			

The final herbicide application of this study has been applied and preliminary results do not indicate high levels of annual bluegrass control or suppression, however, data will be taken through late fall 2009. Often times several months are needed to observe annual bluegrass suppression. All treatments with Velocity, although applied at a low label rate, caused phytotoxicity to the Kentucky bluegrass.

Studies in the future will continue to focus on annual bluegrass control and suppression. Check turf.wsu.edu in late 2009 for complete results from these, as well as other, studies.

STOP #2 Nitrogen Availability from Natural Organic and Synthetic Fertilizers

Eric Miltner and Randi Luchterhand

The popularity of organically-based fertilizer products has increased in recent years due to public interest in environmental stewardship. These products are perceived as being less likely to result in nutrient loss through either leaching or runoff. Products of this type are used widely by both homeowners and professional applicators. Most turfgrass professionals know what to expect with regards to nitrogen (N) release from synthetic slow-release fertilizers such as polymer coated sulfur coated urea (PCSCU), polymer coated urea (PCU) and methylene urea (MU). However, much less is known about N availability from natural organic products. This research was designed to characterize N availability from natural organic and synthetic fertilizer sources by measuring N uptake by perennial ryegrass over a four-year period.

METHODS:

Perennial ryegrass (*Lolium perenne* L.) turf grown in Puyallup fine sandy loam soil is fertilized with one of eight different fertilizers, plus a no-nitrogen control. There are five natural organic products, one synthetic organic slow-release product, and two synthetic inorganic products. Product details are provided in Table 1. The annual N application rate is 4 lb N per 1000 ft², applied in four equal applications of 1 lb N per 1000 ft² each in April, June, September, and November of each year. The first application was made in September 2006. One set of plots was established to measure plant N uptake, and a separate set to measure turfgrass color, quality, and weed encroachment. This report will focus on plant N uptake.

In order to determine N uptake, the plots are mowed only four times per year, immediately before a fertilizer application. For instance, following the first fertilization in September 2006, plots were not mowed until November. Shortly after cutting the grass, the November fertilizer application was made. This was repeated for each of the four fertilization/cutting cycles each year. At the time of cutting, all of the leaf tissue is collected, dried, and weighed, and a subsample is analyzed for percent N content. Total N uptake for each plot is then calculated (by multiplying N concentration by leaf tissue weight). By comparing tissue N uptake, differences in plant N availability between the various fertilizer products can be determined. Plant N uptake is converted to "Apparent Nitrogen Recovery" (ANR) by subtracting out the amount of N taken up by non-fertilized grass. This represents N taken up from soil pools, and therefore not a direct result of fertilizer application.

To date, we have quantified plant N uptake from September 2006 through November 2008, encompassing 9 total fertilizer applications. The study will continue through September 2010 (four years, encompassing 16 fertilizer applications).

RESULTS:

Table 2 shows ANR in clippings in response to each fertilizer product at each sampling date, and the cumulative N recovery for all sampling dates, expressed in lbs. N per 1000 ft². Calcium nitrate has consistently resulted in the highest ANR. Best Turf K ranks second, but is not statistically better than several of the natural organic products. Total N recovery from ammonium sulfate is similar to all of the natural organics. Uptake from Milorganite and Whitney Farms fertilizers was numerically the lowest, but not statistically different from the other natural organics. Averaged for the whole group, N uptake from natural organic fertilizers was 78% of

the uptake from calcium nitrate and Best Turf K. This is a useful comparison for turfgrass managers who may not be familiar with N release from natural organics. This difference in ANR indicates that fertilizer application rates may need to be increased when using natural organics to compensate for N that is in less available forms. We have a companion project addressing this question.

ANR values were also used to calculate fertilizer N uptake on a percentage basis, relative to the amount of fertilizer N applied. This was done on a cumulative basis. As an example, see the values for ammonium sulfate in Table 2. As of Nov 06, 0.21 lb N was recovered, and 1 lb N total had been applied, resulting in 21% recovery of fertilizer N $[(0.21 \div 1) \times 100]$. By April 07, total ANR was 0.62 lb $(0.21 + 0.41)$. A total of 2 lb N had been applied, resulting in 31% cumulative recovery of fertilizer N $[(0.62 \div 2) \times 100]$. This same calculation was made for every product for each date. The results appear in Figure 1. Note that for all fertilizer products, the percentage of N recovered by the plant increased for each subsequent harvest. This indicates that the N not taken up from previous fertilizer applications continues to be available to the plant, and is taken up over the long term. This is not surprising for either synthetic slow-release or natural organic fertilizers, but it also occurs for quick-release fertilizers (ammonium sulfate, calcium nitrate). Even these inorganic products are converted to slower-release forms in the soil through microbial cycling and plant uptake and turnover. As this study continues, we expect to see percent recovery from natural organic fertilizers continue to increase as more slowly available organic N is released, thereby allowing more complete use of fertilizer N by the plants.

Figure 1. Apparent Nitrogen Recovery (ANR) as a percentage of fertilizer N applied for each of the fertilizer products. Each bar in a series above a product name represents a sequential harvest date.

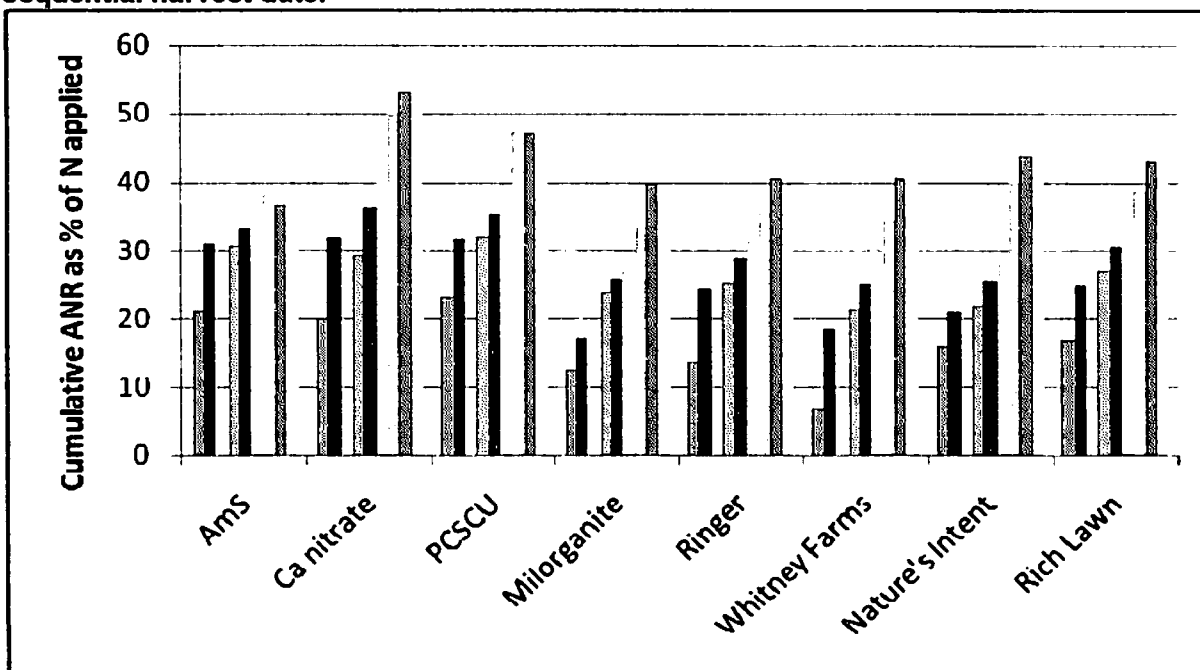


Table 1. Fertilizer products and manufacturers, nutrient analyses, and nutrient sources for organic and inorganic fertilizer products. All information comes from product labels.

<u>Product name and manufacturer</u>	<u>Guaranteed minimum analysis (percent by weight)</u>	<u>Nutrients derived from</u>
Milorganite 6-2-0 Milwaukee Sewerage Commission Milwaukee, WI	6% N 0.5% WSN* 5.5% WIN** 2% P ₂ O ₅ 0% K ₂ O 4% Fe, 1.2% Ca	Biosolids
Nature's Intent 9-3-4 Pacific Calcium Tonasket, WA	9% N 9% WIN 3% P ₂ O ₅ 4% K ₂ O 3% Ca, 1% S	Feather meal, steamed bone meal, potassium sulfate, gypsum
Richlawn 5-3-2 Richlawn Turf Food Inc. Platteville, CO	5% N 1.25% WSN 3.75% WIN 3% P ₂ O ₅ 2% K ₂ O 4% Ca	Dried poultry manure
Ringer Lawn Restore 10-2-6 Woodstream Lititz, PA	10% N 2.4% WSN 7.6% WIN 2% P ₂ O ₅ 6% K ₂ O	Hydrolyzed poultry feather meal, nitrate of soda, potassium sulfate, bone meal, soybean meal
Whitney Farms 8-2-4 Rod McLellan Company Independence, OR	8% N 2% WSN 6% WIN 2% P ₂ O ₅ 4% K ₂ O 4% Ca	Blood meal, dried poultry waste, feather meal, bone meal, sulfate of potash magnesia
Best Turf K 24-3-10 JR Simplot Company Lathrop, CA	24% N 8% quickly available N 16% slowly available N 3% P ₂ O ₅ 10% K ₂ O 12% S 1.6% Fe, 0.25% Zn	Polymer coated sulfur coated urea, ammonium phosphate sulfate, potassium sulfate, iron and zinc oxides
Ammonium sulfate 21-0-0 Waupaca Northwoods LLC Waupaca, WI	21 % N 21% quickly available N	ammonium sulfate
Calcium nitrate Yara International Oslo, Norway	15.5 % N 15.5% quickly available N 19% Ca	calcium nitrate

* WSN = water soluble nitrogen, quickly available.

** WIN = water insoluble nitrogen, slowly available.

Table 2. Apparent Nitrogen Recovery (ANR) in grass clippings from five natural organic and three synthetic turfgrass fertilizers, following fertilizer applications from Sep 2006 through Sep 2008. Values are the mean of four replications.

<u>Treatment</u>	<u>Apparent Nitrogen Recovery (ANR)</u> <u>lbs. N per 1000 sq. ft.</u>									
	<u>Nov 06</u>	<u>Apr 07</u>	<u>Jun 07</u>	<u>Sep 07</u>	<u>Nov 07</u>	<u>Apr 08</u>	<u>Jun 08</u>	<u>Sep 08</u>	<u>Nov 08</u>	<u>Total</u>
Ammonium sulfate	0.21ab*	0.41	1.44 b	0.31	0.41 bc	0.40 b	0.56	0.27 c	0.23 de	4.24 bc
Calcium nitrate	0.20ab	0.44	1.95a	0.24	0.57a	0.56a	1.00	0.71a	0.50a	6.16a
Best Turf K	0.23a	0.40	1.51 b	0.33	0.45 b	0.57a	0.86	0.46 bc	0.34 bc	5.15 b
Milorganite	0.13 c	0.22	1.18 bc	0.37	0.32 c	0.41 b	0.56	0.79a	0.21 e	4.19 c
Ringer	0.14 c	0.35	1.32 bc	0.27	0.40 bc	0.42 b	0.56	0.72a	0.33 bcd	4.50 bc
Whitney Farms	0.07 d	0.30	0.96 c	0.28	0.36 bc	0.38 b	0.68	0.78a	0.37 b	4.18 c
Nature's Intent	0.16 bc	0.26	1.21 bc	0.24	0.37 bc	0.43 b	0.94	0.66ab	0.24 de	4.51 bc
Rich Lawn	0.17 bc	0.32	1.52 b	0.32	0.41 bc	0.50ab	0.60	0.69a	0.25 cde	4.78 bc
Isd (P = 0.05)	0.05	ns	0.40	ns	0.11	0.13	ns	0.23	0.10	0.94

Values within a column followed by the same letter are not significantly different according to Fisher's Protected Least Significant Difference (Isd). ns = not significant.

STOP #3 Transitioning to Natural Organic Fertilizers: Turfgrass Response and Potential Impacts on Soils

Eric Miltner and Randi Luchterhand

Natural organic fertilizers are becoming more widely used on golf courses and in other turf settings. The benefits of these materials include slow-release nitrogen and phosphorus, low burn potential, and low leaching potential compared to soluble inorganic sources. There are more natural organic fertilizer products available every year. The popularity of natural organics is due in part to the concept of resource reuse and recycling, as well as the desire of both the public and professional managers to increase the level of environmental stewardship.

Current research we are conducting indicates that N availability from natural organic sources ranges from 30% to 80% of N availability from a coated urea. The remaining N may become available in subsequent years, but this partial release during the first year means that the effective N rate will be relatively low. This project addresses fertilization programs during transition into a natural organic based management system, investigating ways to compensate for reduced N availability during the first year or two of natural organic fertilizer use.

Natural organic fertilizers have relatively low nutrient content, resulting in 85% or more of the material not being used nutritionally by the plant. Significant amounts of organic material might remain on the soil surface following application, with additional accumulations following repeated applications. It is known that organic amendments used in sand-based construction and organic inputs due to root turnover can affect soil physical properties. Could additions of natural organic fertilizers have a similar effect? Our research will measure water infiltration rates and surface soil organic matter content in order to quantify impacts on soil physical properties.

METHODS

Three sets of plots have been established for this study. One is in perennial ryegrass golf course fairway turf at The Home Course in DuPont, WA, in a sandy gravelly soil. The other two sets are at the WSU Puyallup R.L. Goss Research Farm: one on Puyallup fine sandy loam soil managed as lawn/rough; the other on a sand-based *Poa annua* turf maintained as fairway. Treatments include seven fertilization programs:

1. Synthetic organic (SO) product: (Proforma 20-5-10, 60% of N as polymer coated sulfur coated urea).
2. Natural organic (NO) product 1: (SoundGro 5-4-0, biosolids, 75% insoluble N).
3. Combination program 1 – NO1 + SO (portion of N from each source, see explanation below).
4. NO product 1, 1.5X rate.
5. NO product 2: (NatureSafe 8-3-5, feather, meat, blood, fish, poultry, and bone meals, 90% insoluble N).
6. Combination program 2 – NO2 + SO (portion of N from each source, see explanation below).
7. NO product 2, 1.5X rate.

Annual N application rate at The Home Course and Puyallup native soil sites is 3 lb N per 1000 sq ft per year. The annual rate at the Puyallup sand-based site is 5 lb N per 1000 sq ft per year. Programs 3, 4, 6, and 7 are designed to compensate for the expected lag in N release from the NO sources. Programs 3 and 6 address this by gradually transitioning to NO fertilizers. During the first year, 1/3 of the total N will come from NO fertilizer, and the remainder from SO fertilizer. In year 2, 2/3 of the N will come from NO, and in year 3 100% will come from NO. Programs 4 and 7 compensate by using a 1.5X rate of the NO fertilizers compared to programs 2 and 5.

For the Home Course and Puyallup native soil sites, the NO/SO combination programs were fertilized with NO products in July and August, respectively, and with SO product in October and April. For the Puyallup sand-based site, NO products were applied in August and the SO product on all other dates during the first year.

Infiltration rates were measured at both Goss Farm sites prior to fertilizer application in July 2008 to serve as baseline data. These will be repeated annually, but have not been conducted yet for 2009. The gravelly soil at the Home Course made it impossible to install the infiltration rings. Similarly, soil organic matter content is measured each year, but 2008 base line data only has been collected, so there is no basis for comparison yet.

Visual color and quality assessments are conducted monthly for all plots, as well as chlorophyll index ratings using a FieldScout CM1000 chlorophyll meter. A summary of color and quality ratings will be presented. Chlorophyll meter readings are more complex than can be presented in this summary format.

RESULTS

Fertilization programs have resulted in little to no difference in color and quality ratings for the native soil plots. All have had acceptable color and quality for lawn/rough turf (Table 1). This soil is high in organic matter and well-suited for turf growth, which makes visual differences hard to differentiate.

At the Home Course, NatureSafe resulted in higher color ratings and slightly higher quality ratings than SoundGro following the July application (Table 2). PCSCU was intermediate. Following fertilizer application in the cooler months of Oct and Apr, both NO/SO combination and NO 1.5X rate programs resulted in better color and quality than NO 1X rate programs. Recall that both combination programs were fertilized with PCSCU in these months.

For sand-based turf at the Goss Farm, both 1.5X NO programs enhanced color and quality following Aug application (Table 3). Following Oct fertilization, NO/SO combination programs (which received PCSCU), 1.5X rate NO programs, and PCSCU resulted in higher color and quality. In Nov, only PCSCU (including combination programs) resulted in enhanced color and quality, while 1.5X rate NO programs maintained higher quality than 1X NO programs. With Apr fertilizer application, 1.5X NO programs resulted in the highest color and quality ratings (except for quality with NatureSafe 1.5X).

In summary, NO products yielded the greatest benefit during warmer months. Application of either PCSCU or a 1.5X rate of either NO product during cooler months helped maintain turfgrass color and quality compared to a 1X rate of either NO fertilizer. When moving to a natural organic fertilizer management program, temperature and season need to be considered. During the first year, managers should apply either higher rates of NO products during fall and spring, or apply coated urea or other products that do not rely on soil temperature for N release.

Table 1. Color and quality ratings (1 = dead, 9 = ideal, 5 = acceptable) of perennial ryegrass on fine sandy loam soil at the R.L. Goss Research Farm in response to natural organic fertilizer transition programs. Values represent averages of all ratings collected from the specified fertilization date until the next fertilizer application.

<u>Fertilizer Program</u>	Color			Quality		
	Date of fertilizer application			Date of fertilizer application		
	<u>Aug 08</u>	<u>Oct 08</u>	<u>Apr 09</u>	<u>Aug 08</u>	<u>Oct 08</u>	<u>Apr 09</u>
SoundGro	6.8	6.4	5.8	5.9	5.9	5.7
SoundGro/PCSCU Combo	6.7	6.7	5.7	6.1	5.6	5.7
SoundGro 1.5X	6.8	6.5	5.8	6.0	5.8	5.7
NatureSafe	6.7	6.6	5.7	5.9	5.9	5.7
NatureSafe/PCSCU Combo	6.6	6.5	5.8	6.1	5.8	5.7
NatureSafe1.5X	6.7	6.5	6.0	5.9	5.8	5.7
PCSCU	6.4	6.6	5.6	5.8	5.6	5.7

Table 2. Color and quality ratings (1 = dead, 9 = ideal, 5 = acceptable) of perennial ryegrass on gravelly soil at The Home Course, DuPont, WA, in response to natural organic fertilizer transition programs. Values represent averages of all ratings collected from the specified fertilization date until the next fertilizer application.

<u>Fertilizer Program</u>	<u>Color</u>			<u>Quality</u>		
	<u>Date of fertilizer application</u>			<u>Date of fertilizer application</u>		
	<u>Jul 08</u>	<u>Oct 08</u>	<u>Apr 09</u>	<u>Jul 08</u>	<u>Oct 08</u>	<u>Apr 09</u>
SoundGro	5.1	6.0	4.8	4.8	4.9	5.0
SoundGro/PCSCU Combo	5.2	7.0	5.3	4.8	5.5	5.2
SoundGro 1.5X	5.1	6.7	5.6	4.9	5.6	5.4
NatureSafe	5.8	6.3	4.9	5.2	5.4	4.9
NatureSafe/PCSCU Combo	5.5	7.0	5.2	5.0	5.8	5.3
NatureSafe1.5X	6.0	7.3	5.1	5.4	6.0	5.1
PCSCU	5.3	6.9	5.0	5.0	5.6	5.0

Table 3. Color and quality ratings (1 = dead, 9 = ideal, 5 = acceptable) of perennial ryegrass on gravelly soil at The Home Course, DuPont, WA, in response to natural organic fertilizer transition programs. Values represent averages of all ratings collected from the specified fertilization date until the next fertilizer application.

<u>Fertilizer Program</u>	<u>Color</u>				<u>Quality</u>			
	<u>Date of fertilizer application</u>				<u>Date of fertilizer application</u>			
	<u>Aug 08</u>	<u>Oct 08</u>	<u>Nov 08</u>	<u>Apr 09</u>	<u>Aug 08</u>	<u>Oct 08</u>	<u>Nov 08</u>	<u>Apr 09</u>
SoundGro	6.0	7.0	5.7	4.4	4.8	5.8	5.2	4.4
SoundGro/PCSCU Combo	6.3	7.5	6.3	4.0	5.0	6.3	5.5	4.3
SoundGro 1.5X	6.8	7.8	6.0	5.4	5.7	6.6	5.4	5.0
NatureSafe	5.9	6.8	5.9	4.4	5.0	6.3	5.3	4.5
NatureSafe/PCSCU Combo	5.9	7.7	6.4	4.5	4.8	6.7	5.6	4.6
NatureSafe1.5X	6.8	8.0	6.0	4.8	5.8	6.9	5.7	4.6
PCSCU	5.5	7.8	6.3	4.4	4.6	6.5	5.6	4.1

Stop 4a: 2008 National Turfgrass Evaluation Fine Fescue Trial

The 2008 NTEP fine fescue trial was established on a 90% sand/5% axis/5% peat moss in early September of 2008. The trial was set up as a randomized complete block (RCBD) with 3 replications. Plot size is 4 ft. x 6 ft.

This is the first summer of establishment and we are watering to get the plots established and completely covered in the first year. During the second year of the trial, we are going to restrict water on the plots as see how low we can reduce the amount of irrigation added to the fine fescues. We are going to use a moisture meter to monitor the actual amount of moisture in the root zone. At present, there is not enough data collected to present on this new trial. However, the previous 2003 NTEP Fine Fescue Trial, which was established on a Puyallup sandy loam and seeded at 4.4 lbs./M, has its data listed in the Appendix.

Name	Species	Name	Species
Treasure II	Chewings	Garnet creeping red	
Boreal	strong creeping red	SR 5130	Chewings
Spartan II	hard	Shoreline	slender creeping
Intrigue 2	Chewings	SR 3150	hard
Zodiac	Chewings	SR 5250	strong creeping red
MVS-OS-1	strong creeping red	C08-CW-1	Chewings
Z6300	hard	C08-05-03	strong creeping red
MVS-FRC-101	Chewings		
TCD	Chewings		
PSG 50C3	Chewings		
NAB-HF1	hard		
Epic	strong creeping red		
Gotham	hard		
Lacrosse	Chewings		
IS-FRR-51	Chewings		
IS-FRR-62	strong creeping red		
IS-FRR-35	Chewings		
IS-FRC-33	Chewings		
Cascade	Chewings		
Aberdeen	strong creeping red		
PST-4CSD	Chewings		
PST-4HES	hard		
PST-4BU3	blue hard		
PST-48Y7	strong creeping red		
PSG-5RM	strong creeping red		

Stop 4b: Tall Fescue/Kentucky Bluegrass Seeding Mixtures for Athletic Field Use in the PNW

INTRODUCTION:

Use of water on athletic fields is a concern for every part of the country. In the Midwest, tall fescues have been interseeded with Kentucky bluegrasses successfully for drought tolerant, lower-use athletic fields. We have not been able to look at this possibility to date and would like to investigate the use of these grasses in combination for the PNW. The biggest factor of concern is use in the late and very early season when these grasses are not growing. We may have to use some intermediate ryegrass from our previously funded research project for protection of the plots in the early and late season.

METHODS OF RESEARCH:

Tall fescue/Kentucky bluegrass mixtures will be planted in August of 2008 on native soil at the WSU, Roy L. Goss farm. Details of the possible seeding mixes, ratings and maintenance are listed below.

Tall Fescue/Kentucky Bluegrass Seeding Mixtures

- Excellent choice for low to medium maintenance sports fields. Lower irrigation and fertility requirements than perennial ryegrass and KBG.
- Drought tolerance depends upon its ability to develop a deep extensive root system
- 85 to 95% Tall Fescue (Traffic tolerant turf-types)
- 5 to 15% Kentucky Bluegrasses that persists in western WA
- Seeding rate of this mix is 4 to 6 lbs. of seed per 1000 sq. ft.

Traffic Tolerance of Tall Fescue Cultivars

- Good tolerance – Elisa, Tar Heel, SR8550, Silverstar, Titan Ltd, Olympic Gold, Dominion, Tulsa II, Apache III, Jaguar 3, Masterpiece, Bingo and Endeavor
- Moderate tolerance – Black Watch, Finelawn Elite, 2nd Millennium, Millenium, Forte, Falcon IV, Bravo, Watchdog, Tar Heel II, Falcon II, Coyote, Barlexas, Padre and SR8600
- Fair tolerance – Scorpion, Tomahawk RT, Tempest, Focus, Rendition, Wyatt and Barlexas II
- Poor tolerance – Kentucky 31, Constitution, Kitty Hawk 2000, Daytona, DaVinci, Tuxedo, Plantation, Justice, Bonsai, Avenger and Pure Gold

Only those tall fescues that rated Good and Moderately Good should be used for sports fields that have wear on them. Tall fescues rated Fair and Poor had unacceptable performance when subjected to traffic and should not be used for sports turf. Irrigation of tall fescue sports fields is necessary under severe drought conditions to maintain green vigorous growth (Tall fescue without wear is capable of surviving drought for many weeks by going dormant.) Tall fescue turf grown on shallow or poor quality soils will have a limited root system and, therefore, less persistence under severe drought stress.

Kentucky Bluegrasses

- Very wear tolerant grass
- Rhizomes grow and spread quickly to fill in damaged areas and stabilize the field
- Root system is not as deep as tall fescue root system
- Higher N requirement than tall fescue

Kentucky Bluegrasses Which Survived 5 Years in the NTEP Trials at Goss Farm

- | | | |
|-----------------|------------|--------|
| ▪ Champagne | Blackstone | Serene |
| ▪ Bariris | Washington | |
| ▪ Freedom II | Champlain | |
| ▪ Princeton 105 | Baritone | |
| ▪ Odyssey | Barzan | |

Sports Field Maintenance Practices and Timing:

- Sports fields should be renovated (aerified, seeded and fertilized after the last game in the fall if at all possible. If overseeding is done in spring, new seedlings will have to be watered in order to survive the summer.
- If we end up seeding the early spring with tall fescue, the field should not be used until fall play for best establishment results.
- Ideally, tall fescue/Kentucky bluegrass should be planted in late summer and establish over the winter and spring before being used
- When field is used, it should only be used for actual games and not practice, marching bands or other events that can be held on other areas
- Tall fescue is more drought tolerant, but can not take the wear of extra events, especially if it is maintained under low to no supplemental irrigation
- Fertility levels can vary from 1 to 4 lbs. of N/1000 sq. ft/year with clippings returned to the field.
- These rates would be on a native soil and the lowest N rate would not be enough for a football field.
- Use of TF/KBG would limit the amount of games on the field, as well as shorten the season the field can be used.
- This is not an ideal mix, but is a choice for limited use areas.

Soil temperature at a depth of 2" will be recorded with a thermocouple and data logger. Each week the grasses will be visually rated for percent cover until the total area is covered. Quality ratings will be taken after 100% cover was achieved. Traffic will be imposed beginning spring and fall of 2009.

OBJECTIVES:

Wear will be applied in the spring and fall of 2009 for evaluation of stability and recovery. This data is important to see if this seeding mix effectively in western Washington for lower use sports turf areas to conserve water while still maintaining the integrity of the sports turf area. Some overseeding with an intermediate ryegrass may have to be used to protect the sports turf area in the cooler portions of the year when the tall fescue and Kentucky bluegrass have gone semi-dormant. This will also need to be researched as the project is underway.

PROGRESS:

The 3200 ft² area is on a Puyallup sandy silt loam and was stripped, tilled, leveled and allowed to settle for several weeks. Results from a soil test showed that calcium was low, so Calpril was applied at 22.4kg /ha (20lbs/A) on 4/11/08. The Calpril was rototilled into the soil to a depth of 5cm (2"), and hand rolled to firm the surface. Ranger Pro (Glyphosate) was applied on 6/6/08 for weed control.

The seed bed preparation began on 9/2/08 using an Einboeck tine harrow to loosen the top 2.5cm (1") of the soil. The plot area was fertilized with 19-25-5 on Sept 3, 2008 at 4.15gN/m² (0.85lbsN/M), with a second application of 19-25-5 on Sept 25th at 1.8gN/m² (0.3lbsN/M).

The plot area was divided into 4 main plots, each measuring 12.2m by 6.1m (20ft x 40ft). Individual plots were seeded on 9/04/08 using a Scotts drop spreader. The four plots were:

- 1) Touché' Kentucky bluegrass (*Poa pratensis* L.) at 6.1g /m² (3lbs/M) plus 'SR 8650' tall fescue (*Festuca arundinacea* schreb L.) at 22g /m² (8lbs/M);
- 2) Touché Kentucky bluegrass at 6.1g /m² (3lbs/M) plus 'Mustang IV' tall fescue at 22g /m² (8lbs /M);
- 3) 'Champagne' Kentucky bluegrass at 3.1g / m² (1.5lbs/ M) plus 'SR 8650' tall fescue at 22g / m² (8lbs /M); and
- 4) 'Champagne' Kentucky bluegrass at 3.1g /m² (1.5lbs /M) plus 'Mustang IV' tall fescue at 22g /m² (8lbs /M).

Seed was hand-raked, hand-rolled and irrigated with the equivalent of 0.65cm (0.25") rain. Irrigation was applied 3 times per day to keep the area moist until germination was complete. After germination, irrigation was applied as needed to prevent wilting of the plants. Plots were hand-weeded on 9/17 and 10/1/08. The first mowing of the plots was on 10/7/08 and then on a weekly schedule for the rest of the fall.

The four main plots were further divided into 2 fertility levels, (0.5 lbs. N/M ft² and 0.75 lbs. N/M ft²), as well as wear and non-wear plots within each fertility treatment.

The 8 week wear study began in late May of 2009, with an approximately 8 week recovery period. The recovery period began in early July and the next 8 week wear period coinciding with football traffic in the fall will begin about Labor Day, with an 8 week recovery period in late fall.

STOP #5 2008-2009 Evaluation of Preventative Fungicide Applications for Control of Gray Snow Mold on Annual Bluegrass/Kentucky Bluegrass Fairways in Central Oregon

Oregon State University

**Rob Golembiewski, Assistant Professor
Brian McDonald, Research Assistant**

Final Report

June 30, 2009

OBJECTIVE

The purpose of these trials was to evaluate a single preventative application of various fungicides for the control of gray snow mold on golf course fairways.

MATERIALS AND METHODS

Two trials were initiated on October 29th and 30th (after the last mowing) on fairway turf at two golf courses - the Sun River Meadows Golf Course (4,160 feet elevation) located in Sun River, Oregon, 15 miles south of Bend, and Glaze Meadows Course located at Black Butte Ranch (3,350 feet elevation), a resort located 8 miles north of Sisters, Oregon. The Black Butte Resort site abuts the Cascade Mountain range and is surrounded by pine trees and accompanying shade. The Sun River site is more exposed with few trees and higher winds. The Sun River Resort is about 45 miles south of the Black Butte Resort.

The Sun River Meadows site consisted of primarily Kentucky bluegrass and the Glaze Meadow site consisted of primarily annual bluegrass. The individual plots measured 30 square feet (6' x 5') with a one foot buffer between plots. The products were applied at 30 psi producing a total spray volume of two gallons per 1,000 square feet.

Permanent snow cover did not occur until 6 weeks after the treatments were applied which may have impacted the effectiveness of some of the fungicides most specifically PCNB applied as Penstar FLO. The length of snow cover for the Sun River site lasted from mid-December until March 20th, and the length of snow cover for the Glaze Meadow site lasted from mid-December until the first week of April or approximately 2 weeks longer.

Percent disease and turf quality ratings were taken on March 26th and April 10th or about one week after snow melt, respectively. Percent disease data was normalized using the arcsine(y) transformation. Data was subjected to analysis of variance using a randomized complete block design with 4 replications. Differences between means were determined by Fisher's Protected LSD at the 5% level.

The treatments applied are listed below:

Trt #	Product	Rate	Units
1	Untreated	na	na
2	Interface 2.27 SC*	4.00	oz/M
	+ Triton FLO 3.0 SC	0.85	oz/M
3	Interface 2.27 SC*	5.00	oz/M
	+ Triton FLO 3.0 SC	0.85	oz/M
4	Interface 2.27 SC*	6.00	oz/M
	+ Triton FLO 3.0 SC	0.85	oz/M
5	Triton FLO 3.0 SC	0.85	oz/M
	+ Compass 50WG	0.25	WT oz/M
	+ Daconil Ultrex 82.5 WDG	5.00	WT oz/M
6	Reserve 4.8 SC**	5.40	oz/M
	+ Compass 50WG	0.25	WT oz/M
7	Tartan 2.4 SC	2.00	oz/M
	+ Daconil Ultrex 82.5 WDG	5.00	WT oz/M
8	Triton FLO 3.0 SC	1.10	oz/M
	+ Compass 50WG	0.20	WT oz/M
	+ Daconil Ultrex 82.5 WDG	5.00	WT oz/M
9	Instrata 3.6SE	9.30	oz/M
10	Disarm 480 SC	0.36	oz/M
11	Disarm G 0.25% G	4.50	WT lbs/M
12	Disarm C 4.25 SC	3.00	oz/M
	+ Banner Maxx 1.3ME	3.00	oz/M
13	Penstar FLO 4F	12.00	oz/M
14	Penstar FLO 4F	8.00	oz/M
	+26 GT 2SC	4.00	oz/M
	+Daconil Ultrex 82.5 WDG	5.00	WT oz/M
15	Banner Maxx 1.3ME	4.00	oz/M
16	Headway 1.39EC	3.00	oz/M
17	Concert 4.3 SE	8.50	oz/M

* 2.14 lbs 26GT and 0.13 lbs of Compass per gallon

** Reserve is Triton FLO + chlorothalanil + StressGard™

RESULTS

Most of the treatments in these trials had acceptable turf quality which we arbitrarily set at a 5.0 rating or higher. Instrata and Headway rated slightly below this level for both trials on average but one of the trials rated above and one rated below 5.0.

The Sun River plots had turf quality ratings that were a point higher than the Glaze Meadow plots. The cause of this difference may have come from the different turf species (Kentucky bluegrass vs. annual bluegrass), two weeks less of snow cover, or some other environmental, soil, or fertility factor. However, if you are choosing a fungicide program for your site, you may want to weight the results slightly in favor of the turf species that matches your golf course. In

other words, if you have primarily annual bluegrass, you may want to place more emphasis on the results from the Glaze Meadow site, whereas, if you have primarily Kentucky bluegrass, you may want to place more emphasis on the results from Sun River.

Overall, the treatments that performed the best were those that contained a mix of Interface + Triton FLO, Reserve + Compass, Tartan + Daconil Ultrex or Triton FLO + Compass + Daconil Ultrex.

The standard treatment of PCNB (Penstar FLO), 26GT, and Daconil Ultrex performed well on the Sun River site, but only marginally on the Glaze Meadow site. As mentioned above, the 6 week lag time between application and permanent snow cover may have impacted the effectiveness of PCNB or other fungicides in this trial.

Since the Interface + Triton FLO mix did well in these trials, it is useful to try to determine the "best" rate. Of course, "best" to some may mean least expensive and to others, least disease or best turf quality with much less consideration of cost.

Unfortunately, when comparing the three rates of Interface in the Interface + Triton FLO mix, it is difficult to make sense of the results in these trials. On the Glaze Meadow site, surprisingly, the low rate of Interface performed the best and the high rate performed the worst, although the differences were not statistically significant. On the Sun River site, the high rate performed the best and there was a statistical difference in turf quality between the high rate and low rate. All we can say at this point is that one year's worth of data is not enough to make any recommendations on this particular issue other than the low rate provided more than acceptable turf quality and the disease ratings averaged 6.3 and 1.3 percent with the worst plot having 20% disease.

Table 1: Turf Quality Comparison Black Butte vs. Sun River

Trt #	Product	Rate (oz/M)	Black Butte Turf Quality*	Sun River Turf Quality*	Avg
3	Interface** + Triton FLO	5 + 0.85	6.0	7.3	6.6
4	Interface** + Triton FLO	6 + 0.85	5.5	7.8	6.6
6	Reserve 4.8 SC + Compass	5.4 +.25	6.8	6.3	6.5
2	Interface** + Triton FLO	4 + 0.85	6.3	6.5	6.4
7	Tartan + Daconil Ultrex	2.0 + 5.0	5.5	7.3	6.4
8	Triton FLO + Compass + Daconil Ultrex	1.1+0.20+5.0	5.6	6.5	6.1
5	Triton FLO + Compass + Dac Ultrex	0.85+0.25+5.0	5.0	7.0	6.0
14	Penstar FLO+ 26 GT + Dac Ultrex	8.0+4.0+5.0	4.8	7.3	6.0
10	Disarm 480 SC	0.36	5.3	5.0	5.1
12	Disarm C + Banner Maxx	3 + 3	4.5	5.8	5.1
17	Concert	8.5	5.3	4.8	5.0
9	Instrata	9.3	5.4	4.3	4.8
16	Headway	3.0	4.5	5.0	4.8
15	Banner Maxx	4.0	2.8	4.3	3.5
13	Penstar FLO	12.0	3.5	3.3	3.4
11	Disarm G	72.0	3.5	1.5	2.5
1	Untreated	na	2.8	1.5	2.1
	LSD @ .05		1.0	1.8	

*Turf Quality (1-9; 9 = highest quality)

** 26GT + Compass

Table 2: Percent Disease Comparison Black Butte vs. Sun River

Trt #	Product	Rate (oz/M)	Black Butte % Disease*	Sun River % Disease*	Avg
4	Interface** + Triton FLO	6 + 0.85	6.0	1.3	3.7
2	Interface** + Triton FLO	4 + 0.85	1.3	6.3	3.8
6	Reserve 4.8 SC + Compass	5.4 +.25	1.3	6.3	3.8
3	Interface** + Triton FLO	5 + 0.85	1.9	8.8	5.4
7	Tartan + Daconil Ultrex	2.0 + 5.0	5.8	6.3	6.1
8	Triton FLO + Compass + Dac Ultrex	1.1+0.2+5.0	3.3	10.0	6.7
14	Penstar FLO+ 26 GT + Dac Ultrex	8+4+5	8.8	5.0	6.9
10	Disarm 480 SC	0.36	6.5	12.5	9.5
12	Disarm C + Banner Maxx	3 + 3	11.3	10.0	10.7
5	Triton FLO + Compass + Dac Ultrex	0.85+0.25+5.0	18.3	3.8	11.1
17	Concert	8.5	9.3	15.1	12.2
16	Headway	3.0	10.8	15.1	13.0
9	Instrata	9.3	4.3	22.4	13.4
15	Banner Maxx	4.0	32.1	24.0	28.1
13	Penstar FLO	12.0	28.7	38.8	33.8
11	Disarm G	72	20.3	85.9	53.1
1	Untreated	na	50.4	83.3	66.9
	LSD @ .05		13.8	15.8	

* Percent disease numbers have been normalized using the arcsine(y) transformation.

** 26GT + Compass

Note: The Black Butte site was primarily annual bluegrass; the Sun River site was primarily Kentucky bluegrass.

STOP #6 Biosolid Fertilizer Use in Cool Season Turfgrass

Jeff Rutan, Eric Miltner, and Randi Luchterhand

The Chambers Creek Regional Wastewater Treatment Plant (WWTP) recently began producing a biosolid fertilizer, SoundGro™. This nutrient-rich material is the result of physical and biological treatment processes of residential and commercial wastewater. Classified as an 'Exceptional Quality' Class A product, this dry granular fertilizer does not need a permit for application, intended for use on golf courses, parks, and home lawns. This study was conducted to understand the nitrogen release and plant response to this product, and develop application and seasonal use guidelines.

MATERIALS AND METHODS

Field plots were established to determine how application date and fertilizer source would affect nitrogen uptake and turfgrass response due to nitrogen fertilization. This study was conducted on two sites: sand-based golf course fairway turf maintained at 0.5 inches (fine fescue / colonial bentgrass mixture), and perennial ryegrass grown on a Puyallup fine sandy loam maintained at 2 inches. Fertilizer treatments (Table 1) included SoundGro (biosolid; Pierce County, WA), Milorganite (biosolid; Milwaukee Metropolitan Sewerage District), ammonium sulfate [(AmS) quickly available inorganic N source], polymer coated sulfur coated urea [(PCSCU) controlled release N source], and an unfertilized control. Treatments were applied to plots measuring 4 ft x 6 ft arranged in a split-plot, randomized complete block design with four replications of each fertilizer x month treatment combination applied at the rate of 1 lb N per 1000 sq. ft. Treatments were applied at five different times (March, May, July, September, and November) as single monthly applications to separate plots. This method allowed the effectiveness of each fertilizer to be evaluated according to its month of application. Phosphorus and potassium rates were equalized among treatments. Treatments began in July of 2006. In July 2007, the treatment rate was increased to 1.5 lb N per 1000 sq. ft. for perennial ryegrass plots. Clippings were collected at 4, 8, 12, and 16 weeks after treatment (WAT). Clippings were dried (55 C), weighed, and ground for analysis of tissue N content. Total N uptake was calculated as (clipping dry weight x % N). Plots were visually rated for color and quality (9=ideal, 1=dead, 5=acceptable) prior to collection. Using a handheld reflectance meter, chlorophyll index readings were taken before collection every two weeks from 2 to 16 weeks post fertilizer application and correlated to visual color ratings. SoundGro was evaluated relative to other quick and slow release N sources to determine seasonally appropriate use.

RESULTS

Information will only be provided for fairway turf plots. Timing of fertilizer application resulted in various impacts on turfgrass response. Biosolid organic N is relatively non available to plants at application and released through soil microbial activity (mineralization). Cool and dry soils have been shown to decrease microbial activity resulting in less mineralization. March fertilization resulted in lower % leaf tissue N (Table 2) presumably due to this affect. However, warming air temperatures during this time of year caused an increase in top growth (yield; Table 3). May applications produced the best results. Warming air and soil temperatures combined with adequate soil moisture probably increased soil N mineralization. Clipping yields and leaf tissue N were generally highest during this time indicating a great period to maximize fertilizer use efficiency. July fertilizer applications produced results intermediate to March and May applications. Warmer air temperatures during this time of year reduced plant growth. As a result leaf tissue N and clipping yield were also reduced.

September was found effective for fertilizer application. Air temperatures in the Pacific Northwest are typically decreasing while soil temperatures remain warm. Applications resulted in leaf tissue N levels similar to May, indicating nitrogen mineralization and assimilation. 2007 applications produced clipping yields (Table 3) greater than July applications. November fertilization was found to be less effective for all fertilizer treatments. Cool air and soil temperatures reduced clipping yields to quantities similar to July applications. Plant uptake of nitrogen was decreased, but still higher than unfertilized check plots indicating N mineralization was still taking place.

While the majority of N in biosolids is slowly available and requires mineralization, the AmS treatment was a quickly available, soluble N source. Research has shown that only $37 \pm 5\%$ of total biosolids N becomes available within the first year of application. All fertilizer treatments contained a portion of quickly available N. This soluble portion of N was probably responsible for elevated quality ratings (Table 4) at 4 and 8 WAT. Highest quality ratings were found with the AmS treatment. Both biosolid and PCSCU treatments were similar and improved turf quality over the unfertilized check. By 12 WAT all fertilizer treatments were similar in quality and maintained acceptable levels (>5) through 16 WAT.

Biosolid fertilization resulted in lower N recovery than with AmS or PCSCU (Table 5). Natural organic fertilizers, including biosolids, contain some portion of N that is very slow to release, resulting in a lower effective N application rate. Similar to quality ratings, the highest N recoveries were found at 4 and 8 WAT, presumably due to the soluble N component of all fertilizer treatments. All fertilizer treatments resulted in higher N recoveries than the unfertilized check.

CONCLUSIONS

Application timing was found to affect turfgrass response to fertilizer treatments. Differences existing between months of application were attributed to soil and air temperatures presumably effecting plant growth and mineralization. Fertilizer applications were most effective when applied in May, while November applications were least effective. March, July, and September produced positive intermediate results. Though all fertilizer treatments increased % leaf tissue N, quality, and plant nitrogen uptake, biosolid treatments were less effective due to limited availability of complex N forms. Milorganite and SoundGro were also less effective in November. PCSCU and AmS would be better choices for late fall fertilization.

Table 1. Product Analyses

	Short-Kut 16 with TriKote	Anderson's Turf Fertilizer	SoundGro™	Milorganite® 6-2-0 Classic
Nitrogen (N) %	16% 6.4% ammoniacal N 0.6% water soluble organic N 9.0% coated slow release N	13% 13.0% ammoniacal nitrogen	5% 3.5% water insoluble nitrogen 1.5% water soluble nitrogen	6% 5.25% water insoluble nitrogen 0.75% water soluble nitrogen
Phosphorus (P) %	0.88	0.88	1.76	0.88
Potassium (K) %	13.28	10.79	0	0
N: P: K ratio	1 : 0.06 : 0.8	1 : 0.07 : 0.8	1 : 0.40 : 0	1 : 0.15 : 0
Other nutrients	13.5% Sulfur (S), 3.8% Iron (Fe)	18.42% S, 2% Fe, 0.10% Cu, 0.10% Mn, 0.10% Zn	3.0% Ca, 0.90% Mg, 0.55% Fe, 0.05% Zn, 0.0010% Mo	4.0% Fe, 1.2% Ca, 1.0% Cl,
Source materials	polymer coated sulfur coated urea, ammonium phosphate sulfate, potassium sulfate, and ferrous oxides	ammonium phosphate, ammonium sulfate, potassium sulfate, ferric oxide, ferrous sulfate, cupric oxide, cupric sulfate, manganous oxide, manganese sulfate, zinc oxide, and zinc sulfate	Activated sewage sludge	Activated sewage sludge
Manufacturer	J.R. Simplot Company, Lathrop, CA	The Anderson's Lawn Fertilizer Division, Maumee, OH	Pierce County, WA Public Works and Utilities, University Place, WA	Milwaukee Metropolitan Sewerage District, Milwaukee, WI

Table 2. 2007 + 2008 turfgrass % leaf tissue N following application of fertilizer treatments to a fine fescue / colonial bentgrass mixture grown on sand maintained under fairway conditions arranged in monthly applications by fertilizer treatments.

		2007				2008			
		Weeks after treatment							
		4	8	12	16	4	8	12	16
Check	Mar	2.27	2.32	2.78	2.91	3.19	3.08	3.03	2.55
	May	2.99	3.10	3.52	2.65	3.09	2.99	3.35	2.97
	Jul	2.98	2.04	2.89	2.50	2.85	3.05	4.51	3.13
	Sep	3.16	2.61	2.30	2.01	3.41	3.43	.	2.72
	Nov	2.31	2.28	1.92	2.12	.	2.66	2.38	2.35
	Isd ‡	0.61	ns†	0.44	0.53	ns	ns	1.16	0.23
AmS	Mar	3.35	2.85	2.91	3.14	4.19	3.80	3.46	2.82
	May	4.01	3.47	3.75	3.23	4.00	3.02	3.09	3.19
	Jul	3.85	3.19	3.31	2.72	3.69	3.27	4.28	3.27
	Sep	4.60	3.55	2.94	2.54	4.28	3.78	.	3.27
	Nov	2.75	2.87	2.81	2.98	.	3.80	3.20	3.15
	Isd	0.51	0.50	0.58	ns	ns	0.60	0.76	ns
PCSCU	Mar	3.41	2.96	2.96	3.19	4.25	3.73	3.31	2.83
	May	3.96	3.51	3.77	3.31	4.04	3.19	3.25	3.42
	Jul	3.79	2.94	2.98	2.54	3.42	2.99	4.09	3.02
	Sep	4.57	3.60	2.98	2.55	4.15	3.78	.	3.30
	Nov	3.47	2.92	2.91	3.13	.	4.03	3.33	3.24
	Isd	0.50	0.46	0.59	0.59	0.68	0.52	0.74	ns
Milorganite	Mar	2.67	2.82	3.15	3.21	3.76	3.59	3.47	2.98
	May	3.72	3.55	3.83	3.38	3.67	3.21	3.33	3.31
	Jul	3.71	3.11	3.39	2.78	3.35	3.24	4.15	3.08
	Sep	3.80	3.19	2.71	2.42	3.63	3.56	.	3.18
	Nov	2.63	2.65	2.36	2.46	.	3.38	2.85	2.72
	Isd	0.58	0.41	0.59	0.56	ns	ns	0.70	ns
SoundGro	Mar	2.88	2.77	3.18	3.25	3.75	3.49	3.41	2.99
	May	3.61	3.44	3.77	3.27	3.69	3.03	3.14	3.16
	Jul	3.24	2.79	3.01	2.45	3.05	2.96	3.99	3.02
	Sep	3.96	3.19	2.76	2.43	3.90	3.80	.	3.32
	Nov	2.81	2.74	2.44	2.52	.	3.45	2.85	2.69
	Isd	0.73	0.59	0.55	0.57	0.60	0.65	0.69	ns

†ns=not significant

‡Fisher's protected Least Significant Difference (P=0.05).

Table 3. 2007 + 2008 clipping yield lb dry matter per 1000 sq. ft. following application of fertilizer treatments to a fine fescue / colonial bentgrass mixture grown on sand maintained under fairway conditions arranged by month of application.

	2007				2008			
	Weeks after first treatment							
	4	8	12	Total	4	8	12	Total
Mar	2.6	.	2.5	5.1
May	.	3.4	.	3.4	3.3	2.6	2.2	8.1
Jul	1.3	2.1	1.3	4.7	2.9	0.8	1.5	5.1
Sep	2.1	3.4	1.9	7.4	2.2	1.8	.	4.0
Nov	2.1	0.5	1.8	4.4	.	1.4	0.8	2.2
lsd ±	ns	0.8	ns	1.5	ns	0.4	0.5	1.0

†ns=not significant

‡Fisher's protected Least Significant Difference (P=0.05)

Table 4. 2007 + 2008 turfgrass quality ratings following application of fertilizer treatments to a fine fescue / colonial bentgrass mixture grown on sand maintained under fairway conditions arranged by fertilizer treatments.

	2007				2008			
	Weeks after first treatment							
	4	8	12	16	4	8	12	16
Check	4.8*	4.8	4.9	4.4	5.0	4.6	5.1	4.4
AmS	7.1	6.8	6.0	5.6	6.7	6.2	6.1	5.0
PCSCU	6.6	7.0	5.9	5.3	6.1	5.7	5.8	4.9
Milorganite	5.7	6.1	5.6	5.1	5.9	5.4	5.8	5.2
SoundGro	6.2	6.6	5.7	5.0	6.2	5.6	5.8	4.8
lsd ‡	0.4	0.5	0.5	0.5	0.5	0.4	0.6	0.5

*Rating scale: 1-9; with 9 indicating best quality, and 5 acceptable quality.

‡Fisher's protected Least Significant Difference (P=0.05).

Table 5. 2007 + 2008 tissue nitrogen recovery lb per 1000 sq. ft. following application of fertilizer treatments to a fine fescue / colonial bentgrass mixture grown on sand maintained under fairway conditions arranged by fertilizer treatments.

	2007				2008			
	Weeks after first treatment							
	4	8	12	Total	4	8	12	Total
Check	0.03	0.03	0.03	0.08	0.05	0.04	0.07	0.13
AmS	0.08	0.11	0.06	0.21	0.16	0.07	0.07	0.24
PCSCU	0.08	0.10	0.05	0.19	0.13	0.06	0.06	0.20
Milorganite	0.06	0.08	0.05	0.16	0.08	0.05	0.06	0.15
SoundGro	0.09	0.06	0.05	0.16	0.09	0.06	0.05	0.16
lsd ‡	0.03	0.03	ns	0.05	0.03	0.02	ns	0.05

†ns=not significant

‡Fisher's protected Least Significant Difference (P=0.05).

STOP #7 2008 Evaluation of Proxy, Primo, & Trimmit Growth Regulators Applied to 'Providence' Creeping Bentgrass Putting Green for Phytotoxicity and Turf Quality

Oregon State University

**Rob Golembiewski, Assistant Professor
Tom Cook, Professor Emeritus
Brian McDonald, Research Assistant**

Final Report

June 29, 2009

OBJECTIVE

The primary objective of this trial was to determine whether repeated applications (2, 3, or 4) of Proxy (ethephon) or Proxy + Primo (trinexpac-ethyl) caused phytotoxicity to 'Providence' creeping bentgrass maintained at putting green height. A secondary objective was to evaluate turf quality of putting green turf treated with Proxy, Proxy + Primo, or Trimmit (paclobutrazol) growth regulators.

MATERIALS AND METHODS

The trial was initiated on March 21, 2008 at the Lewis-Brown Horticulture Farm in Corvallis, Oregon. The site was a 'Providence' creeping bentgrass putting green which was built in the mid 1990's on a 12 inch sand/compost mix. Annual bluegrass has been removed by cutting out plants with a pocket knife every spring. Soil tests are done every spring and the pH has hovered around 6.0.

The green was mowed at 0.145 inches at the start of the trial and lowered slowly to 0.115 inches by the first part of June. After the first week of June, the mowing height was then raised to 0.125 inches for the rest of the trial. The putting green was cored on June 24th with 5/8 inch tines.

The treatments were applied with a CO₂-powered plot sprayer with a 5 foot boom using TeeJet 80015 nozzles sprayed at 30 psi. The Proxy and Proxy + Primo treatments were applied at 1 gallon of total spray solution per 1,000 square feet. The Trimmit treatments were applied at 2 gallons of total spray solution per 1,000 square feet. Irrigation was applied (0.125 inches) with a watering can to the plots treated with Trimmit.

The trial was designed to evaluate 2, 3, and 4 applications. However, because of the severe injury from the Proxy treatments, the fourth application was not made.

The trial was set up as a randomized complete block design with 3 replications. Plot size was 25 square feet (5' X 5'). Visual turf quality and injury ratings were made on April 18th, May 2nd, May 17th, May 30th, and June 13th. The data for each rating date were subjected to analysis of variance (ANOVA) and the differences between means were determined by LSD at the 5 % level.

The treatments applied were as follows:

Trt #	Treatments	Rate	Apps
1	Proxy (ethephon)	5.0	2
2	Proxy	5.0	3
3	Proxy	5.0	4*
4	Proxy + Primo (trinexpac-ethyl)	5.0 + .125	2
5	Proxy + Primo	5.0 + .125	3
6	Proxy + Primo	5.0 + .125	4*
7	Trimmit + Irrigation** (paclobutrazol)	0.125	4*
8	Trimmit + Irrigation**	0.25	4*
9	Trimmit + Irrigation** + 0.25 lbs N	0.125	4*
10	Trimmit + Irrigation** + 0.25 lbs N	0.25	4*
11	Untreated Check	Na	na

* The 4th application was not made because of severe injury to plots treated with proxy.

** Irrigation was applied at 0.125 inches of water.

The applications were made on the following dates:

- 3/21 - All treatments
- 4/11 - Primo only on treatments 4, 5, & 6
- 4/25 - All treatments (5 weeks after first application)
- 5/02 - Primo only on treatments 4, 5, & 6
- 5/23 - All treatments (4 weeks after second application)

RESULTS

Proxy caused significant phytotoxicity to the bentgrass putting green after two applications. The injury was first noticeable 7 days after the second application and became obvious 2 weeks after second application (See Table 2). From this trial, it is not discernable whether the injury was caused directly by the Proxy applications or as a result of scalping. There were no obvious mower scalping lines but the turf quality did improve slightly when the mowing height was raised.

When Primo was added to the Proxy, the injury was not as severe but the turf quality still suffered.

There was no turf injury from any of the Trimmit applications. However, Trimmit did darken the turf and also caused the leaf blades to become coarser over time (this effect became more prominent after 3 applications). The coarser leaf blades did decrease the turf quality slightly.

Table 1: Turf Color & Quality 1 – 9; 9 = best

Trt #	Treatments	Rate oz/M	Apps	Turf Color 4/18	Turf Quality 5/2	Turf Quality 5/17	Turf Quality 5/30	Turf Quality 6/13
1	Proxy	5.0	2.0	7.0	6.5	5.5	4.7	5.0
2	Proxy	5.0	3.0	7.0	6.5	5.3	2.7	4.2
3	Proxy	5.0	3.0	7.0	6.5	5.0	2.7	3.5
4	Proxy + Primo	5.0 + .125	2.0	7.5	7.3	5.8	5.2	5.8
5	Proxy + Primo	5.0 + .125	3.0	7.3	7.2	6.0	4.0	5.0
6	Proxy + Primo	5.0 + .125	3.0	7.3	7.5	6.2	3.7	5.2
7	Trimmit + Irrigation	0.125	3.0	8.0	7.8	8.0	7.0	7.0
8	Trimmit + Irrigation	0.250	3.0	8.2	8.0	8.0	7.5	7.3
9	Trimmit + Irrig + 0.25 lbs N	0.125	3.0	8.0	8.5	8.2	8.2	7.3
10	N	0.250	3.0	8.5	8.8	8.7	8.5	7.5
11	Untreated Check	na	na	8.0	7.8	7.7	7.2	7.2
LSD @ .05				0.3	0.4	0.6	0.7	0.5

Table 2: Turf Injury 1 – 9; 9 = most injury

Trt #	Treatments	Rate oz/M	Apps	Turf Injury 5/2	Turf Injury 5/17	Turf Injury 5/30	Turf Injury 6/13
1	Proxy	5.0	2.0	1.7	3.0	3.8	3.0*
2	Proxy	5.0	3.0	1.4	3.2	6.5	4.7*
3	Proxy	5.0	3.0	1.7	3.8	6.7	5.0*
4	Proxy + Primo	5.0 + .125	2.0	1.2	2.7	3.2	2.2*
5	Proxy + Primo	5.0 + .125	3.0	1.3	2.5	4.7	3.0*
6	Proxy + Primo	5.0 + .125	3.0	1.2	2.2	5.2	3.2*
7	Trimmit + Irrigation	0.125	3.0	1.0	1.0	1.3	1.0
8	Trimmit + Irrigation	0.250	3.0	1.0	1.0	1.3	1.2
9	Trimmit + Irrig + 0.25 lbs N	0.125	3.0	1.0	1.0	1.0	1.0
10	N	0.250	3.0	1.0	1.0	1.0	1.0
11	Untreated Check	na	na	1.0	1.0	1.0	1.0
LSD @ .05				0.3	0.7	0.9	0.6

* Note: The mowing height was raised from 0.115" to 0.125" and the green was fertilized after the first week of June. These changes improved turf quality.

STOP #8 2009 Annual Bluegrass Seedhead Suppression Timing for the PNW

Dr. Gwen K. Stahnke and Richard Bembenek, WSU-Puyallup

Soil Temperature

Research on seedhead suppression began on 3/5/08 with the installation of 4 Hobo data loggers. All dataloggers were installed at a 2-inch depth. One datalogger was installed in the middle of the first fairway at the TPC at Snoqualmie Ridge; 2 dataloggers were installed on two separate greens on the South course at Sahalee Country Club and the last datalogger was installed on a sand-based *Poa* green at the WSU Goss Facility. Dataloggers are set to record every hour. Data has been downloaded monthly from each site and compiled on an Excel spreadsheet for analysis over the duration of the study. In order to develop a growing degree-day model (GDD), it requires at least one full year and preferably two years of data. This project was developed to relate the GDD model to soil temperatures instead of air temperatures given in the model. We have received previous air temperature data directly from Rich Taylor at Sahalee and Ryan Gordon at TPC Snoqualmie and are working with our current information from dataloggers on these courses to correlate seedhead formation into a GDD model.



Hobo being placed on 2 South green at Sahalee



Downloading data with shuttle onsite

There are still a few holes in our soil data collection, as we have lost several dataloggers due to inclement weather and inopportune mishaps. These are minor setbacks and have simply increased our time and money expended for data collection with extra trips to the golf courses and replaced dataloggers. We are also using weather underground and NOAA weather data to compare and supplement with the data that we are collecting for use at each site.

Previous application timing parameters studies have been based on GDD50 where timing of treatments are based on 50 deg F base growing degree day and when cumulative value reached between 61 and 90 for timing the first spray for seed head suppression. The formula $[(T_{max} + T_{min}) / 2] - T_{base}$ where T_{max} and T_{min} are daily maximum and minimum air

temperature and Tbase is the base temperature. However, from our preliminary data, using the GDD50 model for the Pacific Northwest would push application date into late April early May which is much too late for adequate control.

We are using the soil temperature to directly relate them to *Poa* seedhead development. The GDD will be designed to fit with the actual soil/air temperature data we collected and we will extrapolate this into an appropriate GDD model and correlate to each site.

Seedhead emergence was observed at Snoqualmie's nursery green eight days after installation of Hobo on March 13, 2008 and on the collars of greens at Sahalee on March 18, 2008. Seedhead formation was observed on the WSU Goss Facility green the week of March 17, 2008. Since we didn't get the project started until after seedhead had already begun to develop in 2008, we are continuing to collect soil temperatures from all sites for 2009.

We are presently developing degree day models based on lower base temperatures of 32 and 35 degree F to determine which would better correlate to *Poa* seedhead formation specific to the PNW. Due to inadequate data points between installation of Hobos and appearance of *Poa* seedhead formation for the first year of data collection, we were unable to develop a working model based on any credible critical cumulative value because of the short time span. In personal communication with Ron Calhoun from Michigan State University, we are going to count back 3 weeks from peak seedhead emergence and compare our soil temperatures at that time. Peak seedhead emergence was the last few days of March or early April of 2008 according to our observations. Counting back from this, our first Proxy application should go out around March 10th, 2009, with a second application of Proxy/Primo 21 days later.

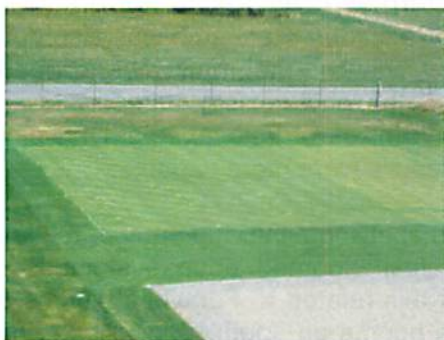
We continually microscopically monitored the WSU Goss Facility green for early seedhead formation from February, 2009. On February 26, 2009 we saw one seedhead beginning on the *Poa* green at the WSU Goss Facility, with the first flush of seedhead formation starting April 3, 2009. From what we've seen and information we've gotten from Michigan State University, it is far better to apply Proxy earlier than later. First application of Proxy to Goss Facility *Poa* green was done on March 12, 2009 with second application of Proxy/Primo on March 26, 2009.



**Annual bluegrass seedhead
on 3/27/08 at R.L. Goss**



***Poa annua* seedhead in fairway at
TPC Snoqualmie Ridge, 3/15/08**



**Proxy/Primo plots on *Poa*
green at R.L. Goss Facility**

PGR Applications

In a very recent conversation with researchers at Michigan State University, they informed us that after 8 years of work with growth regulators and comparing years when the growth regulators appeared to have failed and years when seedheads seemed to be suppressed, there actually was no difference in the seedhead suppression. In unpublished data, they have found that the Proxy/Primo combination reduces seedheads by 32 to 40% max every year. When fewer seedheads seem to be present, it was probably a light year for seedheads. If it looks like the growth regulator failed, but it was applied at what was thought to be the right time from previous years, it may have been a record-setting year for seedhead production. It may look like more seedheads, but the Proxy/Primo reduced it only by 32 to 40%, so it gives the impression that the growth regulator failed.

Our goal in developing a GDD model for the PNW is to provide healthier annual bluegrass greens with a surface that will putt more true for the golfers.

Literature Search

Heavy annual bluegrass seedhead are a serious problem on golf greens by reducing putting quality and smoothness especially in the spring. Timing of growth regulator applications for suppression of these seedheads has not been perfected to date. Work has been done evaluating growth regulators efficacy in several parts of the country. In 1985, Dr. Bruce Branham (Branham and Collins, 1986), conducted studies using mefluidide (Embark) at different rates and timings. Applications were based on accumulated growing degree-days using the formula:

$$\frac{\text{Max T} + \text{Min T}}{2} - \text{base} = \text{GDD} \quad \text{where}$$

Max T = highest temp recorded on that day

Min T = lowest temp recorded on that day

Base T = temp at which plant species begins to grow
(10 C or 50F for annual bluegrass)

GDD = growing degree days for that day

Using this model, they found that applications were most successful between 25 and 50 GDD. This is particularly difficult to determine for western WA, as we do not go totally dormant, which means this model will not work west of the Cascades. Research was also done by Kane and Miller (Kane, R. and Miller, L., 2003) in Illinois showing that mefluidide (Embark) was the most consistent in seedhead reduction. However, the phytotoxicity primarily to any bentgrass was a major concern. Ethephon (Proxy) with tank mixes of trinexapac-ethyl (Primo) provided good to excellent seedhead suppression, but the results were more variable.

In work done by Barker et al., 2004; this can be attributed to applying either too early or too late. In this study, it was determined that annual bluegrass first bloomed upon sustained soil temperatures of greater than 13C (55 F). They found that this related to Forsythia blooms on north-facing slopes just beginning to drop, while Forsythia blooms on south-facing slopes had dropped 50% at this temperature. Their results found that treatments applied within 2 weeks of seedhead production were the most effective for annual bluegrass suppression. The window of timing ("boot" stage) for PGR application can range from one or two days to a week (Borger et al, 2004). At this time frame, daily monitoring may be required. Primo Maxx (trinexapac-ethyl) provides little annual bluegrass seedhead suppression. Primo Maxx is a "class A" PGR. This class of PGRs blocks the production of gibberellic acid late in the production pathway in order to encumber the 1103-elongation of plant cells to reduce plant growth. Seedhead production is primarily driven by cell division, not cell elongation.

Timing of Applications of PGR's

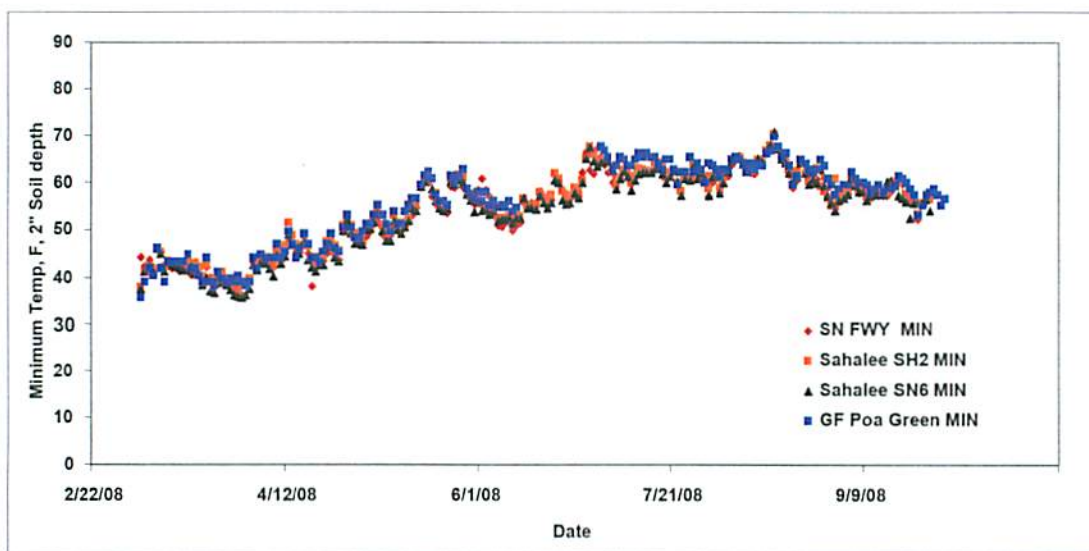
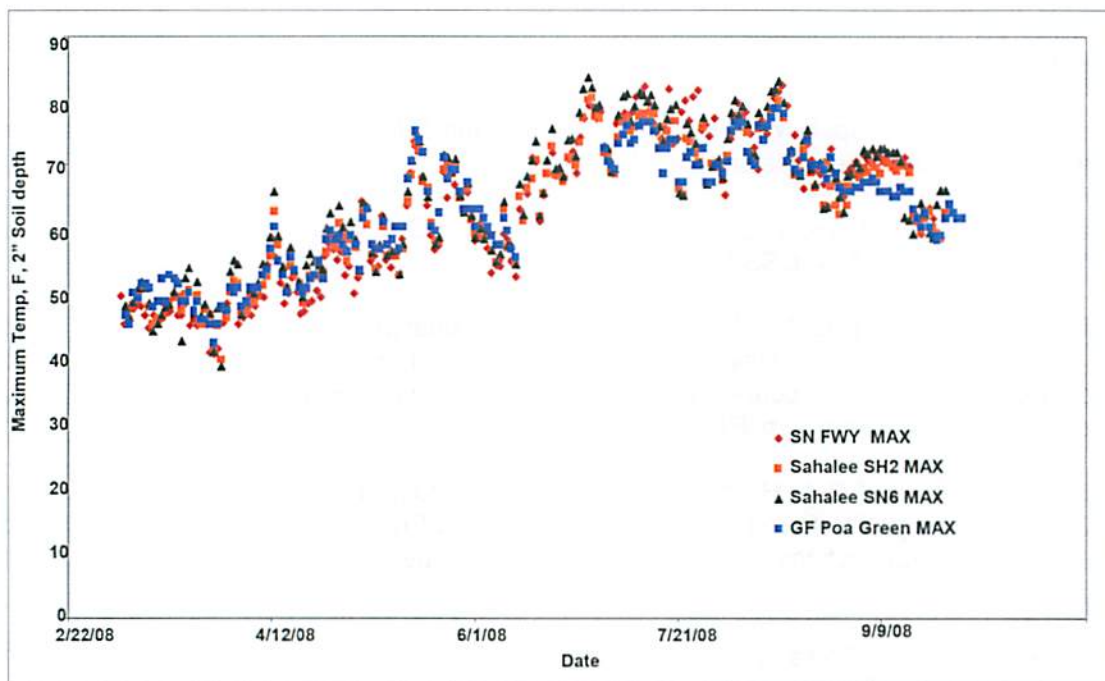
Michigan State University has been working on timing of Proxy/Primo tank mixes on creeping bentgrass/annual bluegrass stands for almost 8 years. They have developed a GDD Tracker system for both grasses and weeds for maximum control efficacy. With annual bluegrass, MSU's most recent recommendations for superintendents in the Midwest is to wait for two mowings after full green-up or 220-250 growing degree-days on the GDD32 degree-day model, results from their work in 2003-2005 showed greater success when the initial application was made earlier. The second application should be made 21 days after the first. Unfortunately, since we don't freeze in western Washington, this model will not work for us, however, it should work very well for central and eastern WA. <http://www.gddtracker.net>

PGR Application Rates

For Greens – Proxy/Primo tank mix should be 5 + 0.125 fl. Oz. per 1000 sq. ft. A regular Primo program can be implemented 14-21 days after the tank mix treatment.

For Fairways – Proxy/Primo tank mix should be 5 – 0.2-0.25 fl. oz. per 1000 sq. ft. When Proxy rates were reduced to 3 oz., the results were not as effective in reducing seedheads.

The benefits of a Proxy/Primo tank mix are the safening of the Primo on the annual bluegrass and the alleviation of the apple green color with Proxy on bentgrass. There is a synergism between the two products for seedhead suppression. Primo only delays seedhead expression when used alone. Proxy will reduce seedheads, but tank mixes have provided better seedhead suppression than just Proxy.



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STOP #9 Raspberry Root Rot Research

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David Bryla, USDA ARS, Corvallis; Luis Valenzuela-Estrada, Oregon State Univ.

Raspberry root rot is one of the most important diseases of red raspberries world-wide causing severe losses. Once a field has become infested, the disease organism cannot readily be eliminated. The best management method is an integrated approach that includes resistant cultivars and cultural methods. Only a few currently grown raspberries have significant levels of root rot resistance, and many of these cultivars produce commercially unacceptable fruit. A major focus of the WSU raspberry breeding program is to develop new raspberry cultivars that are more resistant to raspberry root rot.

Screening raspberry selections for resistance to root rot

Many areas of the Goss Farm are "blessed" with high levels of the root rot organism. This makes it possible to screen raspberry selections for their reaction to root rot. One hundred different selections or cultivars have been planted in this field in the last five years including 35 WSU selections, 40 BC selections, 1 USDA Corvallis selection and 25 cultivars. These plants are rated each year for survival and vigor. This planting has been very valuable for identifying resistant selections.

Identifying root traits associated with root rot resistance in red raspberry

Detecting differences in root traits among the cultivars may provide unique selection criteria for identifying genetic resistance to root rot. This study uses minirhizotrons to monitor root development over time using a miniature digital camera system. Probably the biggest advantage of minirhizotrons is that they provide detailed information on root morphology and demographics *in situ*, including root diameter, specific birth rates, age structure, age-specific death rate, and root lifespan.

A field of the seven raspberry cultivars were planted at the Puyallup Research Center in early June. Minirhizotron tubes were installed (30° off vertical and 4-ft deep) near the base of the plants to provide visual information on both the spatial and temporal distribution of roots in the soil. Images of roots that grow along the surface of the tubes are recorded periodically and analyzed for root production (length of roots produced since the previous sampling), root longevity (duration of each root from first appearance to disappearance), root diameter, and changes in root color (indicates accumulation of phenolics and other fungitoxic compounds) using an interactive PC-based software program (RooTracker, Duke University Phytotron).

All measurements will continue for at least 3 years, with the third year focusing primarily on the most promising traits found to give resistance to root rot. Additional analyses will be made in year 3 to identify chemical or molecular characteristics associated with the traits.

STOP #10 Effect of Mechanical Root Disruption at Transplant on Growth and Survival of Shore Pine and Scots Pine

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Circling roots that become girdling as diameter growth occurs are a common but preventable cause of the decline and death of trees and shrubs in the landscape. Girdling roots may inhibit normal water and nutrient flow thereby stressing the plant and leading to its decline. Trees stressed by girdling roots are more susceptible to disease and insect attack. Girdling roots may also compromise a tree's structural integrity making it more susceptible to blow-down. The presence of girdling roots often goes undetected because they remain underground and unseen while the affected tree or shrub slowly declines.

Circling roots are commonly associated with container-grown plants (Gouin 1983; Scagel and Mathers 2008) but can also occur in field-grown plants (Watson et al. 1990). A typical recommendation for disrupting circling roots at transplanting is to make several vertical cuts or slices through the roots encircling the surface of the root ball and to spread the roots outward into the planting-hole (Maleike and Hummel 1992; Watson and Himelick 1997; Harris et al. 2004). Unfortunately, efforts to correct circling roots at transplant are complicated by the potential presence of one or more zones of circling inside the root ball (Harris et al. 2004). These zones can be deep inside the root ball, typically corresponding to the series of containers used in production. Disruption of surface roots will not correct circling in deeper root zones. To date there has been little research to demonstrate the efficacy of treatments aimed at preventing girdling roots by correcting circling roots at transplant.

The objective of this research was to determine the effect of different degrees of root system disruption (washing, pruning, and straightening) at transplanting on growth and survival of Scots pine (*Pinus sylvestris*) and shore pine (*Pinus contorta*). Trees were grown in 1 liter containers until circling roots developed. In fall 2001, treatments were applied as plants were transplanted to 19 liter containers. Root disruption treatments in increasing order of severity were: 1) control, no disruption; 2) combed, roots untangled and spread; 3) cut and spread, four vertical cuts made through roots circling the root-ball periphery and the roots straightened; 4) washed roots near stem then cut and spread peripheral roots; 5) washed and pruned roots near stem then cut and spread peripheral roots; 6) washed growing medium from root system 7) washed and pruned entire root system. There were 8 replicate trees of each species per treatment.

Species response to root disruption varied. Scots pine was more tolerant of root disruption than shore pine. Visual browning of needles rated in spring 2002 indicated root disruption treatment did not influence Scots pine needle mortality. Shore pine needle mortality was significantly greater only in the two most disruptive treatments. After two years all Scots pines were alive while survival of shore pines varied from 50 to 100%. Half the shore pines in the most disruptive treatment died. All the shore pines in the least disruptive treatments 1) control, 2) combed, and 3) cut and spread were alive after 2 years.

Scots pine height and width was reduced only the first year after transplant with reductions typically greater in the most disruptive treatments. Surviving shore pine height and width reductions were greatest the first year but continued for 2 years after transplant. Caliper growth reductions were similar to height and width but lasted 2 years in Scots and 3 years in shore pines. Surviving trees were transplanted to the field in fall 2004 and measurements taken annually to fall 2008 indicated root disruption treatments no longer influenced quality or growth of either species. There has been no significant change in survival since trees were planted in the field.

The differential response of Scotch and shore pine to root disruption severity at transplant demonstrates the need for caution when making generalized recommendations for tree planting. While Scotch pine tolerated the most severe treatments, the loss of 50 or even 25% of shore pines to a root disruption treatment applied at transplant is not acceptable.

The short term reduction in growth after transplant associated with the cut and spread and comb treatments for correcting circling peripheral roots is a reasonable trade-off if these treatments will prevent root girdling and ensure long-term tree survival. In this study, 47 shore pines and 56 Scots pines representing the 7 root disruption treatments were transplanted to the field in November 2004. To date, no shore pine and only three Scots pines have died in the field, one each in the control, wash, and wash and prune treatments. Data collected in fall 2008, 7 years after treatment application and 4 years after transplanting to the field, indicated that root disruption at transplant did not influence growth, survival or quality of either species.

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STOP #11 Washington State University's Sudden Oak Death Program

Drs. Gary Chastagner and Marianne Elliott

What is Sudden Oak Death?

Sudden Oak Death (SOD) is a new plant disease killing oak and tanoak trees and infecting more than 100 additional plant species in North America and Europe. The disease is caused by the fungus-like pathogen *Phytophthora ramorum*, but was given the name Sudden Oak Death because infected oak trees can change rapidly in appearance from green and healthy-looking to brown and dead or dying in a matter of weeks.

Some characteristics of *Phytophthora*:

- It is a "water mold" closely related to brown algae and diatoms
- The pathogen spreads via the movement of infected plants, contaminated soil, aerial and water-borne spores
- *Phytophthora* causes economically important plant diseases such as potato blight and sudden oak death
- *Phytophthora* diseases on plants are identified by symptoms, microscopic examination and molecular testing
- Three recently identified exotic invasive species pose a potential threat to Washington's horticulture and forest industries – *P. ramorum*, *P. kernoviae*, and *P. alni*. Only *P. ramorum* has been found in Washington to date.

Does *Phytophthora* pose a threat to Washington?

Some *Phytophthoras*, like *P. ramorum*, are invasive species that will trigger a series of quarantines having a significant economic impact on the horticulture and forest products industry if they were to escape into the landscape. The destruction of infected plant material in nurseries to eradicate *P. ramorum* and prevent its further spread has already caused millions of dollars in losses to the nursery industry in California, Washington, and Oregon. One way to stop the damage an invasive species such as *P. ramorum* may inflict on an ecosystem and reduce its economic impact is to control or eliminate the species when its populations are still small.

Western Washington is a "high risk" area for *Phytophthora* diseases because of favorable environmental conditions, with an abundance of susceptible host plants for *P. ramorum* in wildland and urban areas. Until 2006, the disease had only been detected in or near nurseries in western Washington. The recent detection of *P. ramorum* in streams associated with infested nurseries illustrates the potential for this organism to spread from nurseries into Washington's natural and urban landscape.

What is the status of SOD in Washington State?

In June 2003, *P. ramorum* was confirmed for the first time in a Washington nursery. Since that time the Washington State Dept. of Agriculture (WSDA) has detected this pathogen in 45 nurseries. All three lineages (EU1, NA1 and NA2) of this pathogen have been detected in nurseries, and recently *P. ramorum* has been detected in several streams near infested nurseries, increasing the risk of regional quarantines that will likely have a major impact on the state's horticulture, nursery and forest products industries. All nurseries in CA, OR and WA that export known hosts materials out of state have to be inspected and found to be free of this pathogen. When infected plants are detected at a nursery, this triggers a series of steps aimed at its eradication, including the destruction plants and treatment of infested soil. WSDA is

placing a high priority on containing SOD and is doing everything possible to determine the extent of the problem and ways to eradicate or limit the spread of this disease.

WSU SOD education

With funding provided by the USDA Forest Service, WSU has developed a *P. ramorum* education program based at WSU Puyallup. Presently the SOD program develops educational material and gives workshops and research seminars relating to *P. ramorum* throughout Washington. Our website contains symptom identification guides, the "Virtual Oomycete Nursery", presentations, and materials for Master Gardeners. Use of this information will result in practices that will prevent an outbreak of *P. ramorum* and other invasive pathogens in the future and better plant health through improved disease management.

The educational program serves Washington State, but increased coordination with groups outside of Washington is underway as part of a regional grower assisted inspection program.

Research

Since 2003, the WSU Puyallup Ornamental Plant Pathology Program has been conducting research on *Phytophthora ramorum* relating to host range, epidemiology, and potential control options. Some current research projects include:

- Risk of disease development on conifers (Several conifer, including Douglas-fir are known hosts to this pathogen)
- Effectiveness of fungicides in controlling disease development
- Population genetics of *P. ramorum* in Washington State
- Sporulation potential on Pacific Northwest hosts
- Susceptibility and sporulation of *P. ramorum* on *Rhododendron* species and cultivars

Monitoring

Early detection is key in reducing the risk of widespread outbreaks and protecting Washington's nursery, landscape, and forest industries from the potentially devastating effects of a *P. ramorum* outbreak. *Phytophthora ramorum* and other *Phytophthoras* are closely related to brown algae and rely on the presence of water to complete their life cycle. Stream monitoring programs have been shown to be an effective approach to early detection and focus eradication efforts to high risk areas, thus reducing the threat this pathogen poses to our landscape and forest ecosystems. The WA Dept. of Natural Resources and WSDA are currently doing a limited amount of stream monitoring in Western Washington. In August we are hosting a workshop to discuss the development of an enhanced stream monitoring program for *P. ramorum* and other invasive *Phytophthoras*, such as *P. kernoviae* and *P. alni*.

Visit our website:

<http://www.puyallup.wsu.edu/ppo/sod.html>

For more information contact:

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APPENDIX 1

National Turfgrass Evaluation Program 2003 Bentgrass Fairway/Tee Trial

Eric Miltner, Gwen Stahnke, and Randi Luchterhand
Washington State University, Puyallup

A trial to evaluate bentgrass species for golf course fairway and/or tee use was established in September 2003 on Puyallup fine sandy loam soil at R.L. Goss Turfgrass Research Facility at Washington State University in Puyallup. There were 28 official entries, and four unofficial entries added by the WSU staff. Seven of the cultivars were colonial bentgrass (*A. capillaris*), one was velvet bentgrass (*A. canina*), and the remaining were creeping bentgrass (*A. stolonifera*). This trial was maintained under reduced-input maintenance conditions, as defined by NTEP. The mowing height was 0.5 inches, and the nitrogen fertilization rate was 0.25 – 0.38 lbs N per 1000 ft² per month during the growing season. Solid tine cultivation only was permitted, and vertical mowing was conducted to limit thatch development. Data collected from 2005 through 2007 is presented, averaged over all three years, ranked by Annual Mean Quality (average of January – December ratings). Commercially available varieties in the top statistical group based on Annual Mean Quality were Runner, Declaration, and Authority creeping bentgrasses, SR 7100 colonial bentgrass, and SR 7200 velvet bentgrass. Complete rankings for all varieties are in the accompanying table.

2003 National Turfgrass Evaluation Program Bentgrass Fairway/Tee Trial - 2005 - 2007 3-yr average data.

2003 National Turfgrass Evaluation Program Bentgrass Fairway/Tee Trial - 2005 - 2007 3-yr. Average Data.																
Entry Name	Quality Ratings												Genetic Color	Spring Greenup	Summer density	
	Annual mean	January	February	March	April	May	June	July	August	September	October	November				December
EWTR	6.4	5.3	5.0	5.7	6.6	6.8	7.0	7.2	7.2	6.7	7.2	6.1	5.7	6.4	5.6	7.3
Runner (IS-AP 14)	6.2	5.6	5.6	6.2	6.9	7.3	6.9	6.3	5.7	5.2	6.6	6.6	5.9	6.3	5.2	6.5
Declaration	6.1	6.1	5.7	5.9	6.8	7.0	6.6	6.3	5.0	4.9	6.6	6.3	6.2	6.9	5.9	6.8
Authority (235050)	6.1	5.2	5.0	5.6	6.3	6.8	6.3	6.1	6.4	6.6	6.9	6.4	5.6	6.6	4.7	6.7
SR 7200	6.0	4.8	4.4	5.9	6.2	6.0	6.3	6.6	6.7	6.9	6.8	6.2	5.8	7.7	5.9	7.7
13-M	5.9	5.7	4.9	6.2	6.7	6.3	5.9	5.8	5.6	6.0	6.4	6.1	5.8	6.3	5.3	6.7
SR 7100	5.9	5.0	4.4	5.6	6.3	6.0	6.1	6.8	6.7	6.4	6.3	5.4	5.8	5.9	6.1	7.0
Independence	5.8	5.1	5.0	5.4	6.1	6.3	6.3	6.2	6.1	5.6	6.2	5.8	5.4	7.0	4.9	6.7
Greentime (IS-AT 7)	5.8	5.0	4.6	5.6	6.1	6.4	6.3	6.0	6.2	6.2	6.0	5.8	5.2	6.3	5.2	7.0
T-1	5.8	5.6	5.3	6.0	5.8	5.9	5.4	5.7	5.7	6.0	6.2	5.9	5.8	7.8	5.6	6.2
Tiger II	5.8	4.8	4.4	5.1	5.8	6.1	6.0	6.3	7.0	6.3	6.4	5.6	5.1	6.2	5.4	6.5
L-93	5.7	5.2	4.8	5.0	5.7	6.0	5.7	6.0	6.0	5.9	6.2	6.3	6.1	6.4	4.9	5.8
Shark (23R)	5.7	5.1	4.7	5.7	6.2	6.1	6.0	5.8	5.6	5.7	6.7	5.9	5.3	6.9	5.4	6.5
MacKenzie (SRX 1GPD)	5.7	5.1	4.9	5.3	6.0	6.4	5.8	5.6	5.7	5.8	6.2	6.1	5.8	6.4	5.3	6.5
Alpha	5.7	5.1	5.1	5.6	5.9	6.1	5.9	5.6	5.8	5.9	6.2	6.0	5.3	7.3	5.1	6.0
Crystal Bluelinks (PST-O	5.7	5.0	4.9	5.3	5.2	5.9	6.1	6.2	6.1	6.1	6.0	5.7	5.7	7.2	5.7	6.5
Penneagle II	5.7	5.1	5.0	5.3	5.3	6.1	6.1	6.0	5.6	5.8	6.1	6.0	5.7	6.8	4.9	6.2
Bengal	5.7	4.9	5.2	5.4	5.6	5.9	5.7	5.8	6.0	6.1	6.1	5.9	5.3	6.7	5.0	6.3
SR 1119	5.6	4.9	4.7	5.3	5.9	6.1	5.9	5.8	5.7	5.4	6.1	5.8	5.2	7.0	4.7	6.3
Kingpin (9200)	5.5	5.1	5.0	5.4	5.9	5.9	5.4	5.6	5.7	5.4	5.9	5.7	5.3	7.1	5.6	6.3
PST-9NBC	5.5	4.3	4.4	5.0	5.4	5.8	5.9	6.4	6.2	6.0	5.9	5.0	5.1	7.1	5.6	6.7
LS-44	5.4	4.7	4.7	5.0	5.3	5.9	5.7	5.8	5.9	5.9	5.7	5.6	5.3	6.9	4.4	6.0
Bardot	5.4	4.7	3.9	5.0	5.3	5.6	5.3	5.8	6.3	6.2	6.0	5.4	5.2	5.9	6.0	6.5
SR 1160 (SRX 1PDH)	5.3	4.7	4.3	5.0	5.9	5.9	5.8	5.6	5.4	5.4	5.7	5.3	4.9	6.8	4.9	6.2
Princeville	5.3	4.7	4.4	5.0	5.1	5.0	5.6	5.6	5.7	5.9	5.9	5.4	5.3	6.3	4.7	6.0
Pennlinks II	5.2	4.4	4.3	4.8	5.0	5.2	5.4	5.4	5.4	5.4	5.7	5.4	5.2	7.0	4.8	5.7
SRX78122	5.1	4.6	4.2	4.6	5.1	5.3	5.0	5.4	5.6	5.7	5.7	5.2	5.1	5.8	5.6	6.8
Penncross	5.1	4.4	4.2	5.0	4.8	5.1	5.3	5.2	5.7	5.7	5.7	5.1	5.1	6.7	4.9	5.0
SR 7150	5.1	4.4	4.4	5.2	5.9	5.2	5.2	4.9	5.2	5.1	5.6	4.8	4.8	7.0	6.1	6.0
SRX 7EE4	4.9	4.3	3.6	4.8	5.2	5.3	4.8	5.3	5.2	5.3	5.3	5.2	4.6	7.8	5.7	7.0
PST-9VN	4.7	4.4	4.0	4.0	4.3	4.7	4.7	5.0	5.3	5.1	5.0	5.0	4.6	6.6	5.7	5.2
Seaside	4.1	3.9	3.8	3.4	4.0	4.1	4.2	4.1	4.3	4.4	4.6	4.6	4.3	6.0	5.6	4.5
Isd	0.6	0.7	0.6	0.8	1.0	0.8	0.8	0.8	1.0	0.9	0.9	0.8	0.7	0.6	0.9	0.9

List is ranked by the Annual Quality Mean (column 2) from best to worst quality.

* To determine if ratings between two varieties are truly different, subtract the lower rating from the higher one. If the result is greater than the LSD value for that column, then the difference is real.

All data is a mean of three replications.

All ratings are on a scale of 1 to 9 (1 = dead, 9 = ideal, 5 = acceptable).

Trial planted September 2003.

Bardot, EWTR, Tiger II, Greentime, SR 7150, PST-9NBC, PST-9VN, SRX 78122, SRX 7EE4, and SR 7100 are colonail bentgrass (*Agrostis capillans*). SR 7200 is velvet bentgrass (*A. canina*). All others are creeping bentgrass (*A. stolonifera*).

SRX 78122, SRX 7EE4, SR 7200, and Sr 7100 are unofficial entries.

Varities available commercially as of 2008 are marked in bold type.

APPENDIX 2

National Turfgrass Evaluation Program 2003 Bentgrass Putting Green Trial

Eric Miltner, Gwen Stahnke, and Randi Luchterhand
Washington State University, Puyallup

A trial to evaluate bentgrass species and cultivars for putting green use was established in September 2003 on a sand-based putting green at the R.L. Goss Turfgrass Research Facility at Washington State University in Puyallup. There were 26 official entries, and two unofficial entries added by the WSU staff. Six of the cultivars were velvet bentgrass (*Agrostis canina*), and the remaining were creeping bentgrass (*A. stolonifera*). This trial was maintained under reduced-input maintenance conditions, as defined by NTEP. The mowing height was 0.14 – 0.16 inches, and the nitrogen fertilization rate was 0.25 – 0.5 lbs N per 1000 ft² per month during the growing season. Solid tine cultivation only was permitted, and vertical mowing, topdressing, and grooming were conducted to limit thatch development. Data collected from 2005 through 2007 is presented, averaged over all three years, ranked by Annual Mean Quality (average of January – December ratings). Commercially available varieties in the top statistical group based on Annual Mean Quality were Tyee, Shark, Independence, Authority, and 007 creeping bentgrasses, and Villa and Legendary velvet bentgrasses. Complete rankings for all varieties are in the accompanying table.

2003 National Turfgrass Evaluation Program Bentgrass Putting Green Trial - 2005-2007 3-yr average data

Entry Name	Quality Ratings												Genetic Color	Spring	Greenup	Summer density
	Annual mean	January	February	March	April	May	June	July	August	September	October	November	December			
Tyee (SRX1GD)	6.2	5.6	5.7	6.1	5.6	6.8	6.8	6.2	6.4	6.6	6.4	6.0	5.9	6.4	5.3	7.7
Villa (IS-AC 1)	6.2	5.8	4.8	5.7	6.4	6.6	6.1	6.9	6.4	6.6	6.2	6.4	6.0	7.7	5.4	8.7
Shark (23R)	6.1	5.1	5.2	6.2	6.0	6.6	6.3	6.4	6.4	6.7	6.3	6.0	5.8	6.4	5.1	7.3
Independence	6.0	5.1	5.6	5.8	6.1	6.4	6.3	6.2	6.8	6.4	6.4	5.8	5.6	6.7	5.3	7.0
Legendary	5.9	5.0	4.2	5.2	6.2	6.7	6.4	6.3	6.3	6.4	5.9	6.6	5.9	7.7	5.2	8.7
Authority (235050)	5.9	5.3	5.1	5.8	5.8	6.2	6.6	6.3	6.3	6.1	6.1	6.0	5.2	6.2	5.6	7.0
007 (DSB)	5.9	5.6	5.3	5.7	5.9	6.4	6.3	6.2	6.2	6.0	6.0	5.8	5.3	6.7	5.8	6.7
MacKenzie (SRX1GPD)	5.8	5.2	5.2	5.9	5.8	6.6	6.1	6.1	5.8	6.1	6.0	5.8	5.4	5.7	5.3	7.3
Greenwich	5.8	5.4	4.7	5.1	6.0	6.4	5.8	5.9	6.1	6.1	5.9	6.3	5.9	7.7	5.2	8.3
Venus (EFD)	5.8	5.4	4.6	5.6	5.8	6.0	5.7	5.8	6.2	6.3	5.7	6.1	6.0	7.6	5.6	8.2
Penn A1	5.6	5.3	4.8	5.7	5.2	6.2	5.4	5.6	6.0	5.8	6.0	5.8	5.3	6.7	4.8	6.5
CY-2	5.6	5.3	5.0	5.3	5.4	5.9	5.8	5.7	6.0	6.1	5.3	5.4	5.4	5.7	5.3	6.3
Declaration	5.5	5.1	5.2	5.9	5.3	6.0	5.9	5.7	5.9	5.8	5.3	5.1	5.2	6.6	5.9	6.5
Vesper	5.5	5.2	4.8	5.1	5.6	6.0	5.3	5.6	5.6	6.0	6.0	5.9	5.3	7.7	5.8	8.2
Benchmark DSR	5.2	4.7	4.9	5.1	5.2	5.4	5.3	5.1	5.3	5.3	5.2	5.4	5.2	7.0	5.7	6.2
Alpha	5.2	4.6	4.8	5.1	5.6	5.6	5.3	5.3	5.7	5.6	5.2	4.7	4.7	7.0	5.2	5.8
SR 7200	5.1	5.2	4.7	4.7	4.9	5.7	5.0	5.1	5.1	5.2	5.3	5.4	5.3	7.7	6.1	7.8
T-1	5.1	4.7	4.9	5.1	4.9	5.6	5.1	5.0	5.2	5.2	5.0	5.4	5.0	7.7	5.4	6.2
3.0797	5.1	4.9	4.1	4.7	4.8	5.3	4.9	5.2	5.6	5.3	5.1	5.9	5.3	7.4	5.2	7.8
Kingpin (9200)	5.1	4.8	5.0	5.2	4.8	5.0	5.4	5.2	5.1	5.1	5.2	5.1	4.9	6.8	5.4	6.2
13-M	5.0	4.7	4.8	5.4	5.1	5.3	5.3	4.7	5.1	5.2	5.4	4.9	4.6	6.3	5.3	6.0
Cobra 2 (IS-AP 9)	5.0	4.6	4.2	5.0	4.9	5.7	5.3	5.3	5.3	5.1	4.9	5.2	4.7	6.8	4.1	6.3
LS-44	4.9	4.6	4.1	4.6	4.9	5.6	4.9	5.2	5.3	5.3	5.1	5.2	4.4	6.8	4.6	6.0
Memorial (A03-EDI)	4.8	4.7	4.6	4.8	4.6	5.2	5.0	5.1	5.0	4.9	4.8	4.9	4.6	6.4	4.6	5.7
Bengal	4.8	4.7	4.7	4.9	4.7	5.1	4.8	4.9	5.0	4.9	4.6	4.8	4.6	6.8	5.1	5.5
SR 1119	4.7	4.2	4.4	4.6	4.9	5.3	4.8	4.8	4.8	4.9	4.7	4.9	4.4	6.9	4.4	5.7
SRX 1WICR1	4.7	4.1	4.0	4.6	5.0	5.0	5.1	5.2	5.3	4.9	4.9	4.4	4.1	6.2	4.0	5.8
Brighton	4.5	4.3	4.1	4.1	4.9	5.0	4.6	4.7	4.8	4.3	4.4	4.9	4.4	6.9	4.4	5.2
Pennlinks II	4.3	3.9	3.7	4.2	4.7	4.8	4.2	4.4	4.4	4.2	4.6	4.1	3.8	7.0	4.6	5.7
Pennncross	4.0	3.6	3.8	3.8	3.9	4.2	4.0	3.9	4.3	4.2	4.2	4.3	3.9	6.6	4.0	4.7
Isd	0.4	0.5	0.5	0.6	0.6	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.6	0.5	0.6	0.7

List is ranked by the Annual Quality Mean (column 2) from best to worst quality.

* To determine if ratings between two varieties are truly different, subtract the lower rating from the higher one. If the result is greater than the LSD value for that column, then the difference is real.

Trial planted September 2003.

SR 1119, Brighton, SRX 1WICR1, and 3.0797 are unofficial entries (added by WSU staff).

SR 7200, Legendary, Villa, Venus, Vesper, and Greenwich are velvet bentgrass (*Agrostis canina*). All others are creeping bentgrass (*A. stolonifera*).

All data is a mean of three replications.

All ratings are on a scale of 1 to 9 (1 = dead, 9 = ideal, 5 = acceptable).

Varieties available commercially as of 2008 are marked in bold type.

APPENDIX 3

2003 National Turfgrass Evaluation Program (NTEP) Fineleaf Fescue Trial

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On September 8, 2003, 60 cultivars of fine fescues, which included, slender creeping, strong creeping, chewings, hard and sheep fescues, were planted as part of a five-year NTEP evaluation trial. The Puyallup silt loam soil was prepared at the WSU R.L. Goss Turfgrass Research Facility for a Randomized Complete Block Design (RCBD) of 5' x 5' plots with three replications per cultivar. The seeding rate used was 4.4 lbs./1000 sq. ft. The seeded plots were individually raked as soon as they were seeded. A Scotts Starter fertilizer (19-25-5) was applied at a rate of 1 lb. N/ 1000 sq. ft. before the plots were raked, along with an application at label rate of granular metalaxyl (Subdue) to eliminate the possibility of damping off. Plots were covered with a growth blanket for a quicker establishment and to prevent cultivars from washing between plots with irrigation. Immediately after covering the plots with the blanket, the area was rolled with a landscape roller that was ½ filled with water to give us good seed to soil contact. The blanket was removed after 21 days, with excellent coverage of the plots. Temperatures in early September were warmer than normal and we had a mild winter. The plots showed almost full coverage by late spring. Plots are maintained at a mowing height of 1.25", two times a week, and receive approximately 3 lb N/ 1000 ft²/year. The primary objective in maintaining the trial under these conditions is to identify fine fescue cultivars that can be used in seed mixtures for low maintenance lawns and other similar areas. The previous fine fescue trial was conducted under fairway/tee conditions.

Two applications of paclobutrazol (TGR) have been made during spring of 2004 for control of annual bluegrass. The product used was Anderson's 14-0-28 w/TGR (High K) Plus Turf Enhancer, (a.i. 0.13% paclobutrazol) at half rate and applied two weeks apart beginning the end of April. This rate was 1.7 lbs. of product per 1000 sq. ft., and it was immediately watered in after application. Over the late spring and early summer, we saw the annual bluegrass die back quite readily as the fine fescues flourished. Quality ratings were done monthly; genetic color, percent living ground cover, and *P. annua* encroachment ratings were assessed annually. The similar cultivars for the 2003 and 2008 trial are: Treazure II, Boreal, Spartan II, Zodiac, Epic, Gotham, Cascade and we included Garnet, SR5130 and Shoreline.

Tables shown for 2003 National Fineleaf Fescue Trial Summary (2004-2007):

Table 5A: Mean Turfgrass Quality Ratings 2004-2007 for Riverside, CA and Puyallup, WA.

Fine fescue cultivars in Puyallup with quality from 5.3 to 4.7 are the best. Chewings fescues: only J-5, DP 77-9885 and Longfellow II were lower than the other Chewings fescues in quality.

Strong creeping red fescues: highest quality was from 5.3-4.7.

Hard and Sheep fescues: only Predator, SRX 3K and Scaldis were lower.

Slender Creeping: No significant differences between cultivars.

Table 49A: Red Thread Ratings for Fineleaf Fescue in Puyallup, WA, 2004-2007.

Hard and sheep fescues had the highest red thread ratings (least amount of red thread) of all of the fine fescue types.

Strong Creeping Red fescues had the next highest red thread ratings (low amount) with a very broad range with Celestial at the top with a 5.1 and Boreal with a 3.0 or the most red thread.

Chewings fescues were the third lowest in the amount of red thread ranging from 4.4 to 3.6.

Slender creeping fescue is in the same range for red thread incidence as Chewings fescues. They ranged from 4.1 to 3.7.

Table 50A: Percent Poa Annuu for Fineleaf Fescues in Puyallup, WA, 2004-2007.

There was a broad range of invasion levels of annual bluegrass, but the variation was too great to show any significant differences between cultivars. The only true difference was that Dawson E was significantly lower in percent of annual bluegrass than one other slender creeping red fescues in this trial (Shoreline).

Table 40A: Percent Establishment for Fineleaf Fescue Cultivars 2004-2007: Notice both WA1 (Pullman) and WA3 (Puyallup).

Puyallup: There were two big groups for percent establishment. The top group ran from 88.3 to 68.3, with the second group containing 66.7 to 51.7. The rest fall in the lowest category.

Chewings fescues: 88.3 to 75.2 is the highest establishment. Everything else below that is in one group.

Strong creeping red fescues have only two in a lower category, TL1 and Shademaster; otherwise all of the others were about 65.2 percent cover.

Hard fescues are split in half, with one group 86.7 to 72.2 and then anything lower than that.

Slender creeping red fescues have no significant differences in establishment.

Pullman: The overall fescues were divided into 3 groups of 10. The first is 76.4 to 66.1, then 66.0 to 55.7 and finally 55.6 to 45.3.

Chewings fescues: There are 2 groups. The highest is 73.3 to 62.2 and then another group below that.

Strong creeping red fescue: Three significant groups with the highest at 76.6 to 67.2, then 67.1 to 57.6 and finally 57.5 and below.

Hard and sheep fescue: All were the same except for Firefly, which was lowest by itself.

Slender creeping fescues had no differences in establishment.

Table 12A: Spring Greenup for Fineleaf Fescue Cultivars 2004-2007: Notice both WA1 (Pullman) and WA3 (Puyallup).

Puyallup: Chewings fescues: No significant differences in spring greenup.

Strong creeping red: No significant differences between them.

Hard and sheep fescues: Only Firefly was in the lowest group by itself.

Slender creeping fescues: No significant differences between them.

Pullman: Chewings fescues: Only one, Zodiac, was in a low group by itself. The rest were all the same.

Strong creeping fescues: Only Splendor is in a low group by itself.
Hard and Sheep fescues: No significant differences between any of them.
Slender creeping fescues: No significant differences between any of them.

Table 4A: Mean Turfgrass Quality Ratings of Fineleaf Fescue Cultivars by month for Pullman, WA, 2004-2007.

Turfgrass quality was rated from April to October 2004-2007. April was consistently the lowest month for quality. Soil temperatures went up in May and the fescues began greening up in May so that there were some significant differences in quality that did not exist in April as of yet. August and September gave the highest qualities when the soil temperatures are usually at their highest and the grasses would be growing in they were watered.

The fescues divided up into 3 significant groups. The highest group was 5.9 to 5.3, the next group was 5.2 to 4.6, and the last small group was 4.5 to 3.9.

Chewings fescues: Only one fescues, Musica, is significantly lower in quality overall from the rest.

Strong creeping red fescue: The first 12 with ratings of 5.9 – 5.3 are in the highest mean quality group. The second group goes from 5.2 to 4.6, with 3 cultivars in the third group from 4.4 to 4.1.

Hard and sheep fescues: Only SRX 3K, SR 3000 and Quatro are lower than the others in the group, 5.8 to 5.2.

Slender creeping red fescue: Only Dawson E was in the lowest quality group.

2003 NATIONAL FINELEAF FESCUE TEST

Entries and Sponsors

Entry No.	Name	Species	Sponsor
* 1	Razor	strong creeping	Pennington Seed
* 2	Predator	hard	Pennington Seed
* 3	7 Seas	chewings	Pennington Seed
* 4	Seabreeze	slender creeping	Standard Entry
* 5	Shademaster	strong creeping	Standard Entry
* 6	Fortitude (TL 53)	strong creeping	Turf Merchants, Inc.
* 7	Celestial	strong creeping	Turf Merchants, Inc.
* 8	Firefly (SPM)	hard	Turf Merchants, Inc.
* 9	Oracle	strong creeping	Lamorna Enterprises
*10	Reliant IV (A01630Rel)	hard	ProSeeds Marketing
*11	Culumbra II (ACF 174)	chewings	ProSeeds Marketing
*12	Splendor (ASC 245)	strong creeping	ProSeeds Marketing
*13	Epic (5001)	strong creeping	ProSeeds Marketing
*14	Audubon	strong creeping	Jacklin Seed by Simplot
*15	J-5 (Jamestown 5)	chewings	Jacklin Seed by Simplot
16	C-SMX	strong creeping	Ultra-Turf
*17	Jasper II	strong creeping	Standard Entry
*18	Spartan II (Pick HF #2)	hard	Pickseed
*19	Compass (ACF 188)	chewings	Mountain View Seed, Ltd.
*20	Wendy Jean (C03-RCE)	strong creeping	The Scotts Company
21	C03-4676	strong creeping	The Scotts Company
*22	Berkshire	hard	Standard Entry
23	IS-FRR 23	strong creeping	Brett-Young Seeds
*24	Class One (IS-FRR 29)	strong creeping	DLF International Seeds
25	DLF-RCM	strong creeping	DLF Trifolium
*26	Longfellow II	chewings	Standard Entry
*27	LaCrosse (IS-FRC 17)	chewings	LESCO, Inc.
*28	Quatro	sheep	Standard Entry
*29	Cardinal (IS-FRR 30)	strong creeping	Mountain View Seeds, Ltd.
*30	Gotham (IS-FL 28)	hard	LESCO, Inc.
31	TL1	strong creeping	LESCO, Inc.
*32	Garnet (Pick CRF 1-03)	strong creeping	Pickseed
33	BMXC-S02	strong creeping	Blue Mt. Seeds
*34	Boreal	strong creeping	Standard Entry
*35	SR 3000	hard	Standard Entry
*36	Dawson E	slender creeping	Standard Entry
*37	Scaldis	hard	Standard Entry
*38	Zodiac (BUR 4601)	chewings	Burlingham Seeds
*39	SR 5130 (SRX 51G)	chewings	Seed Research of Oregon
40	SRX 3K	hard	Seed Research of Oregon
*41	Shoreline (SRX 55R)	slender creeping	Seed Research of Oregon
*42	Ambassador	chewings	Lebanon Turf Products
*43	Oxford	hard	Lebanon Turf Products
*44	Pathfinder	strong creeping	Lebanon Turf Products
45	DP 77-9885	chewings	DLF Trifolium
46	DP 77-9886	chewings	DLF Trifolium
47	DP 77-9578	strong creeping	DLF Trifolium
48	DP 77-9360	strong creeping	DLF Trifolium
49	DP 77-9579	strong creeping	DLF Trifolium
*50	Treasure II (PST-4TZ)	chewings	Pure-Seed Testing, Inc.
51	PST-8000	strong creeping	Pure-Seed Testing, Inc.
*52	Musica	chewings	R.A.G.T.
*53	Cascade	chewings	Standard Entry

* COMMERCIALY AVAILABLE IN THE USA IN 2008.

TABLE 5A. MEAN TURFGRASS QUALITY RATINGS OF FINELEAF FESCUE CULTIVARS
GROWN AT TWO LOCATIONS IN THE PACIFIC REGION 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CA8	WA3	MEAN
EPIC (5001)	7.2	5.3	6.3
CARDINAL (IS-FRR 30)	7.2	4.9	6.1
MUSICA	6.6	5.4	6.0
FORTITUDE (TL 53)	7.3	4.7	6.0
TREAZURE II (PST-4TZ)	6.2	5.8	6.0
WENDY JEAN (C03-RCE)	7.0	4.9	6.0
ZODIAC (BUR 4601)	6.4	5.3	5.9
COMPASS (ACF 188)	6.9	4.8	5.9
DP 77-9886	6.2	5.4	5.8
C-SMX	6.9	4.7	5.8
AMBASSADOR	6.3	5.2	5.8
DAWSON E	6.8	4.7	5.8
LACROSSE (IS-FRC 17)	6.5	5.0	5.8
BMXC-S02	6.9	4.5	5.7
GARNET (PICK CRF 1-03)	6.6	4.8	5.7
SR 5130 (SRX 51G)	6.4	5.1	5.7
CASCADE	6.4	4.9	5.6
DLF-RCM	6.7	4.6	5.6
PST-8000	6.2	5.0	5.6
PATHFINDER	6.4	4.9	5.6
DP 77-9360	6.4	4.9	5.6
JASPER II	6.5	4.7	5.6
RELIANT IV (A01630REL)	6.2	5.0	5.6
COLUMBRA II (ACF 174)	6.3	4.9	5.6
CELESTIAL	6.8	4.4	5.6
IS-FRR 23	6.5	4.7	5.6
SHORELINE (SRX 55R)	6.4	4.7	5.6
CLASS ONE (IS-FRR 29)	6.5	4.6	5.5
J-5 (JAMESTOWN 5)	6.6	4.5	5.5
DP 77-9885	6.8	4.2	5.5
RAZOR	6.5	4.6	5.5
DP 77-9578	6.4	4.6	5.5
LONGFELLOW II	6.4	4.6	5.5
SPARTAN II (PICK HF #2)	6.1	4.9	5.5
SEABREEZE	6.3	4.6	5.5
TL1	6.4	4.6	5.5
7 SEAS	6.2	4.7	5.4
OXFORD	6.0	4.8	5.4
ORACLE	6.4	4.4	5.4
SPLENDOR (ASC 245)	6.4	4.4	5.4
DP 77-9579	6.3	4.5	5.4
C03-4676	6.5	4.2	5.4
BERKSHIRE	6.0	4.7	5.3
SHADEMASTER	6.5	4.0	5.3

TABLE 5A. MEAN TURFGRASS QUALITY RATINGS OF FINELEAF FESCUE CULTIVARS
(CONT'D) GROWN AT TWO LOCATIONS IN THE PACIFIC REGION 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CAB	WA3	MEAN
BOREAL	6.2	4.2	5.2
SR 3000	6.0	4.3	5.2
PREDATOR	6.0	4.2	5.1
FIREFLY (SPM)	5.8	4.4	5.1
GOTHAM (IS-FL 28)	5.5	4.6	5.0
QUATRO	5.6	4.4	5.0
AUDUBON	6.0	4.0	5.0
SRX 3K	6.0	4.0	5.0
SCALDIS	5.8	4.0	4.9
LSD VALUE	1.1	0.6	0.7
C.V. (%)	10.8	8.6	10.3

TABLE 5B. MEAN TURFGRASS QUALITY RATINGS OF CHEWINGS FESCUE CULTIVARS
GROWN AT TWO LOCATIONS IN THE PACIFIC REGION 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CAB	WA3	MEAN
MUSICA	6.6	5.4	6.0
TREASURE II (PST-4TZ)	6.2	5.8	6.0
ZODIAC (BUR 4601)	6.4	5.3	5.9
COMPASS (ACF 188)	6.9	4.8	5.9
OP 77-9886	6.2	5.4	5.8
AMBASSADOR	6.3	5.2	5.8
LACROSSE (IS-FRC 17)	6.5	5.0	5.8
SR 5130 (SRX 51G)	6.4	5.1	5.7
CASCADE	6.4	4.9	5.6
CULUMBRA II (ACF 174)	6.3	4.9	5.6
J-5 (JAMESTOWN 5)	6.6	4.5	5.5
OP 77-9885	6.8	4.2	5.5
LONGFELLOW II	6.4	4.6	5.5
7 SEAS	6.2	4.7	5.4
LSD VALUE	1.0	0.7	0.6
C.V. (%)	9.4	8.7	9.2

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 5C. MEAN TURFGRASS QUALITY RATINGS OF STRONG CREEPING RED FESCUE CULTIVARS
GROWN AT TWO LOCATIONS IN THE PACIFIC REGION 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CA8	WA3	MEAN
EPIC (5001)	7.2	5.3	6.3
CARDINAL (IS-FRR 30)	7.2	4.9	6.1
FORTITUDE (TL 53)	7.3	4.7	6.0
WENDY JEAN (C03-RCE)	7.0	4.9	6.0
C-SMX	6.9	4.7	5.8
BMXC-S02	6.9	4.5	5.7
GARNET (PICK CRF 1-03)	6.6	4.8	5.7
DLF-RCM	6.7	4.6	5.6
PST-8000	6.2	5.0	5.6
PATHFINDER	6.4	4.9	5.6
DP 77-9360	6.4	4.9	5.6
JASPER II	6.5	4.7	5.6
CELESTIAL	6.8	4.4	5.6
IS-FRR 23	6.5	4.7	5.6
CLASS ONE (IS-FRR 29)	6.5	4.6	5.5
RAZOR	6.5	4.6	5.5
DP 77-9578	6.4	4.6	5.5
TL1	6.4	4.6	5.5
ORACLE	6.4	4.4	5.4
SPLENDOR (ASC 245)	6.4	4.4	5.4
DP 77-9579	6.3	4.5	5.4
C03-4676	6.5	4.2	5.4
SHADEMASTER	6.5	4.0	5.3
BOREAL	6.2	4.2	5.2
AUDUBON	6.0	4.0	5.0
LSD VALUE	1.1	0.6	0.6
C.V. (%)	10.6	8.0	10.1

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 5D. MEAN TURFGRASS QUALITY RATINGS OF HARD AND SHEEP FESCUE CULTIVARS
GROWN AT TWO LOCATIONS IN THE PACIFIC REGION 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CA8	WA3	MEAN
RELIANT IV (A01630REL)	6.2	5.0	5.6
SPARTAN II (PICK HF #2)	6.1	4.9	5.5
OXFORD	6.0	4.8	5.4
BERKSHIRE	6.0	4.7	5.3
SR 3000	6.0	4.3	5.2
PREDATOR	6.0	4.2	5.1
FIREFLY (SPM)	5.8	4.4	5.1
GOTHAM (IS-FL 28)	5.5	4.6	5.0
QUATRO	5.6	4.4	5.0
SRX 3K	6.0	4.0	5.0
SCALDIS	5.8	4.0	4.9
LSD VALUE	1.3	0.7	0.7
C.V. (%)	13.5	10.0	12.6

TABLE 5E. MEAN TURFGRASS QUALITY RATINGS OF SLENDER CREEPING RED FESCUE CULTIVARS
GROWN AT TWO LOCATIONS IN THE PACIFIC REGION 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CA8	WA3	MEAN
DAWSON E	6.8	4.7	5.8
SHORELINE (SRX 55R)	6.4	4.7	5.6
SEABREEZE	6.3	4.6	5.5
LSD VALUE	0.9	0.5	0.6
C.V. (%)	8.8	7.2	8.7

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN.
STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 49A. RED THREAD RATINGS OF FINELEAF FESCUE CULTIVARS
AT PUYALLUP, WA 1/
2004-07 DATA

RED THREAD RATINGS 1-9; 9=NO DISEASE 2/

NAME	JULY	NOVEMBER	DECEMBER	MEAN
OXFORD	6.3	6.0	5.7	6.0
QUATRO	6.0	6.0	6.0	6.0
FIREFLY (SPM)	6.7	5.7	5.3	5.9
GOTHAM (IS-FL 28)	6.7	6.0	5.0	5.9
RELIANT IV (A01630REL)	6.3	6.0	4.7	5.7
SPARTAN II (PICK HF #2)	6.7	5.7	4.7	5.7
BERKSHIRE	7.0	5.0	4.3	5.4
PREDATOR	6.3	5.0	4.7	5.3
SR 3000	6.0	5.0	5.0	5.3
SRX 3K	5.3	5.0	5.3	5.2
CELESTIAL	5.7	4.7	5.0	5.1
DLF-RCM	6.0	4.7	4.7	5.1
FORTITUDE (TL 53)	7.0	4.0	4.3	5.1
PST-8000	5.0	5.3	5.0	5.1
DP 77-9578	6.0	4.3	4.7	5.0
WENDY JEAN (C03-RCE)	5.3	4.7	5.0	5.0
CLASS ONE (IS-FRR 29)	5.7	4.7	4.3	4.9
EPIC (5001)	5.3	4.7	4.7	4.9
SCALDIS	5.0	5.0	4.7	4.9
DP 77-9380	6.0	4.3	4.0	4.8
CARDINAL (IS-FRR 30)	6.0	4.3	3.7	4.7
MUSICA	6.3	3.7	3.3	4.4
DP 77-9579	5.0	4.0	4.0	4.3
RAZOR	5.3	4.0	3.7	4.3
ZODIAC (BUR 4601)	7.0	3.3	2.7	4.3
7 SEAS	6.3	3.3	3.0	4.2
COMPASS (ACF 188)	6.0	3.3	3.3	4.2
LONGFELLOW II	5.3	4.3	3.0	4.2
SR 5130 (SRX 51G)	5.7	4.3	2.7	4.2
TREASURE II (PST-4TZ)	6.3	4.0	2.3	4.2
PATHFINDER	5.0	3.3	4.0	4.1
SEABREEZE	6.3	3.3	2.7	4.1
AMBASSADOR	6.7	3.3	2.0	4.0
C-SMX	4.3	3.7	4.0	4.0
DP 77-9885	6.0	3.0	3.0	4.0
J-5 (JAMESTOWN 5)	6.0	3.3	2.7	4.0
TL1	3.7	4.0	4.3	4.0
C03-4676	3.7	3.7	4.3	3.9
DP 77-9886	5.0	3.7	3.0	3.9
GARNET (PICK CRF 1-03)	4.7	3.7	3.0	3.8
JASPER II	4.0	3.3	4.0	3.8
ORACLE	5.0	2.7	3.7	3.8
SHADEMASTER	4.7	3.0	3.7	3.8
SPLENDOR (ASC 245)	4.7	3.0	3.7	3.8
AUDUBON	4.3	2.7	4.0	3.7

TABLE 49A. RED THREAD RATINGS OF FINELEAF FESCUE CULTIVARS
(CONT'D) AT PUYALLUP, WA 1/
2004-07 DATA

RED THREAD RATINGS 1-9; 9=NO DISEASE 2/

NAME	JULY	NOVEMBER	DECEMBER	MEAN
CULMBRA II (ACF 174)	6.7	2.3	2.0	3.7
DAWSON E	3.3	3.7	4.0	3.7
SHORELINE (SRX 55R)	5.0	3.0	3.0	3.7
CASCADE	5.3	3.0	2.3	3.6
LACROSSE (IS-FRC 17)	6.0	2.3	2.3	3.6
BMXC-S02	4.3	2.7	3.3	3.4
IS-FRR 23	3.7	3.0	3.3	3.3
BOREAL	4.0	2.3	2.7	3.0
LSD VALUE	1.6	1.0	1.3	0.7
C.V. (%)	16.8	16.8	20.9	10.8

TABLE 49B. RED THREAD RATINGS OF CHEWINGS FESCUE CULTIVARS
AT PUYALLUP, WA 1/
2004-07 DATA

RED THREAD RATINGS 1-9; 9=NO DISEASE 2/

NAME	JULY	NOVEMBER	DECEMBER	MEAN
MUSICA	6.3	3.7	3.3	4.4
ZODIAC (BUR 4601)	7.0	3.3	2.7	4.3
7 SEAS	6.3	3.3	3.0	4.2
COMPASS (ACF 188)	6.0	3.3	3.3	4.2
LONGFELLOW II	5.3	4.3	3.0	4.2
SR 5130 (SRX 51G)	5.7	4.3	2.7	4.2
TREASURE II (PST-4TZ)	6.3	4.0	2.3	4.2
AMBASSADOR	6.7	3.3	2.0	4.0
DP 77-9885	6.0	3.0	3.0	4.0
J-5 (JAMESTOWN 5)	6.0	3.3	2.7	4.0
DP 77-9886	5.0	3.7	3.0	3.9
CULMBRA II (ACF 174)	6.7	2.3	2.0	3.7
CASCADE	5.3	3.0	2.3	3.6
LACROSSE (IS-FRC 17)	6.0	2.3	2.3	3.6
LSD VALUE	2.7	0.9	1.9	1.0
C.V. (%)	16.1	15.2	26.9	9.9

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

3/ RED THREAD RATED IN 2006 ONLY.

TABLE 49C. RED THREAD RATINGS OF STRONG CREEPING RED FESCUE CULTIVARS
AT PUYALLUP, WA 1/
2004-07 DATA

RED THREAD RATINGS 1-9; 9=NO DISEASE 2/

NAME	JULY	NOVEMBER	DECEMBER	MEAN
CELESTIAL	5.7	4.7	5.0	5.1
DLF-RCM	6.0	4.7	4.7	5.1
FORTITUDE (TL 53)	7.0	4.0	4.3	5.1
PST-8000	5.0	5.3	5.0	5.1
DP 77-9578	6.0	4.3	4.7	5.0
WENDY JEAN (C03-RCE)	5.3	4.7	5.0	5.0
CLASS ONE (IS-FRR 29)	5.7	4.7	4.3	4.9
EPIC (5001)	5.3	4.7	4.7	4.9
DP 77-9360	6.0	4.3	4.0	4.8
CARDINAL (IS-FRR 30)	6.0	4.3	3.7	4.7
DP 77-9579	5.0	4.0	4.0	4.3
RAZOR	5.3	4.0	3.7	4.3
PATHFINDER	5.0	3.3	4.0	4.1
C-SMX	4.3	3.7	4.0	4.0
TL1	3.7	4.0	4.3	4.0
C03-4676	3.7	3.7	4.3	3.9
GARNET (PICK CRF 1-03)	4.7	3.7	3.0	3.8
JASPER II	4.0	3.3	4.0	3.8
ORACLE	5.0	2.7	3.7	3.8
SHADEMASTER	4.7	3.0	3.7	3.8
SPLENDOR (ASC 245)	4.7	3.0	3.7	3.8
AUDUBON	4.3	2.7	4.0	3.7
BMXC-S02	4.3	2.7	3.3	3.4
IS-FRR 23	3.7	3.0	3.3	3.3
BOREAL	4.0	2.3	2.7	3.0
LSD VALUE	1.9	1.3	1.9	0.9
C.V. (%)	19.7	20.0	20.2	12.5

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

3/ RED THREAD RATED IN 2006 ONLY.

TABLE 49D. RED THREAD RATINGS OF HARD AND SHEEP FESCUE CULTIVARS
AT PUYALLUP, WA 1/
2004-07 DATA

RED THREAD RATINGS 1-9; 9=NO DISEASE 2/

NAME	JULY	NOVEMBER	DECEMBER	MEAN
OXFORD	6.3	6.0	5.7	6.0
QUATRO	6.0	6.0	6.0	6.0
FIREFLY (SPM)	6.7	5.7	5.3	5.9
GOTHAM (IS-FL 28)	6.7	6.0	5.0	5.9
RELIANT IV (A01630REL)	6.3	6.0	4.7	5.7
SPARTAN II (PICK HF #2)	6.7	5.7	4.7	5.7
BERKSHIRE	7.0	5.0	4.3	5.4
PREDATOR	6.3	5.0	4.7	5.3
SR 3000	6.0	5.0	5.0	5.3
SRX 3K	5.3	5.0	5.3	5.2
SCALDIS	5.0	5.0	4.7	4.9
LSD VALUE	1.3	1.2	2.3	0.8
C.V. (%)	10.6	10.4	17.2	7.3

TABLE 49E. RED THREAD RATINGS OF SLENDER CREEPING RED FESCUE CULTIVARS
AT PUYALLUP, WA 1/
2004-07 DATA

RED THREAD RATINGS 1-9; 9=NO DISEASE 2/

NAME	JULY	NOVEMBER	DECEMBER	MEAN
SEABREEZE	6.3	3.3	2.7	4.1
DAWSON E	3.3	3.7	4.0	3.7
SHORELINE (SRX 55R)	5.0	3.0	3.0	3.7
LSD VALUE	2.8	1.9	1.8	1.4
C.V. (%)	24.6	24.5	24.3	15.8

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

3/ RED THREAD RATED IN 2006 ONLY.

TABLE 50A. PERCENT POA ANNUA RATINGS OF FINELEAF FESCUE CULTIVARS 1/
AT PUYALLUP, WA 2/
2004-07 DATA

NAME	JULY	AUGUST	OCTOBER	MEAN
SHADEMASTER	33.3	25.0	25.0	27.8
DP 77-9885	26.7	21.7	28.3	25.6
CELESTIAL	25.0	20.0	30.0	25.0
SRX 3K	30.0	20.0	20.0	23.3
AUDUBON	21.7	25.0	20.0	22.2
DLF-RCM	25.0	15.0	26.7	22.2
LONGFELLOW II	25.0	21.7	18.3	21.7
PREDATOR	20.0	25.0	15.0	20.0
BERKSHIRE	23.3	13.3	21.7	19.4
FIREFLY (SPM)	20.0	26.7	11.7	19.4
C03-4676	23.3	13.3	18.3	18.3
DP 77-9579	15.0	15.0	23.3	17.8
SPLENDOR (ASC 245)	16.7	15.0	20.0	17.2
GOTHAM (IS-FL 28)	20.0	13.3	16.7	16.7
7 SEAS	13.3	20.0	15.0	16.1
J-5 (JAMESTOWN 5)	13.3	20.0	15.0	16.1
QUATRO	16.7	16.7	15.0	16.1
SR 3000	15.0	16.7	16.7	16.1
SHORELINE (SRX 55R)	16.7	18.3	10.0	15.0
CARDINAL (IS-FRR 30)	13.3	10.0	20.0	14.4
SEABREEZE	13.3	11.7	18.3	14.4
SCALDIS	10.0	16.7	15.0	13.9
TL1	11.7	13.3	16.7	13.9
CLASS ONE (IS-FRR 29)	13.3	11.7	15.0	13.3
BOREAL	10.0	11.7	16.7	12.8
DP 77-9360	13.3	11.7	13.3	12.8
OXFORD	11.7	13.3	13.3	12.8
DP 77-9578	16.7	6.7	13.3	12.2
GARNET (PICK CRF 1-03)	13.3	11.7	10.0	11.7
ORACLE	10.0	10.0	15.0	11.7
C-SMX	8.3	11.7	13.3	11.1
IS-FRR 23	10.7	10.0	11.7	10.8
PATHFINDER	11.7	10.0	10.0	10.6
PST-8000	6.7	11.7	13.3	10.6
RAZOR	10.0	8.3	13.3	10.6
RELIANT IV (A01630REL)	11.7	13.3	6.7	10.6
SPARTAN II (PICK HF #2)	13.3	10.0	8.3	10.6
FORTITUDE (TL 53)	8.3	11.7	10.0	10.0
COMPASS (ACF 188)	8.3	11.7	8.3	9.4
WENDY JEAN (C03-RCE)	14.0	8.3	5.0	9.1
BMXC-S02	10.0	6.7	10.0	8.9
CULUMBRA II (ACF 174)	6.7	8.3	11.7	8.9
DAWSON E	13.3	8.3	5.0	8.9
JASPER II	6.7	8.3	11.7	8.9
LACROSSE (IS-FRC 17)	6.7	10.0	8.3	8.3
EPIC (5001)	4.0	6.7	11.7	7.4
SR 5130 (SRX 51G)	5.7	10.0	6.7	7.4

TABLE 50A. PERCENT POA ANNUA RATINGS OF FINELEAF FESCUE CULTIVARS 1/
(CONT'D) AT PUYALLUP, WA 2/
2004-07 DATA

NAME	JULY	AUGUST	OCTOBER	MEAN
CASCADE	5.0	11.7	5.0	7.2
MUSICA	3.0	10.0	8.3	7.1
AMBASSADOR	5.7	5.0	6.7	5.8
ZODIAC (BUR 4601)	3.0	5.0	6.7	4.9
DP 77-9886	4.0	5.0	3.3	4.1
TREAZURE II (PST-4TZ)	2.0	6.7	3.3	4.0
LSD VALUE	25.7	19.0	26.1	20.4
C.V. (%)	75.3	58.1	67.3	59.4

TABLE 50B. PERCENT POA ANNUA RATINGS OF CHEWINGS FESCUE CULTIVARS 1/
AT PUYALLUP, WA 2/
2004-07 DATA

NAME	JULY	AUGUST	OCTOBER	MEAN
DP 77-9885	26.7	21.7	28.3	25.6
LONGFELLOW II	25.0	21.7	18.3	21.7
7 SEAS	13.3	20.0	15.0	16.1
J-5 (JAMESTOWN 5)	13.3	20.0	15.0	16.1
COMPASS (ACF 188)	8.3	11.7	8.3	9.4
CULUMBRA II (ACF 174)	6.7	8.3	11.7	8.9
LACROSSE (IS-FRC 17)	6.7	10.0	8.3	8.3
SR 5130 (SRX 51G)	5.7	10.0	6.7	7.4
CASCADE	5.0	11.7	5.0	7.2
MUSICA	3.0	10.0	8.3	7.1
AMBASSADOR	5.7	5.0	6.7	5.8
ZODIAC (BUR 4601)	3.0	5.0	6.7	4.9
DP 77-9886	4.0	5.0	3.3	4.1
TREAZURE II (PST-4TZ)	2.0	6.7	3.3	4.0
LSD VALUE	23.1	20.7	29.8	23.0
C.V. (%)	110.9	73.1	108.2	91.0

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

3/ PERCENT POA ANNUA RATED ONLY.

TABLE 50C. PERCENT POA ANNUA RATINGS OF STRONG CREEPING RED FESCUE CULTIVARS 1/
AT PUYALLUP, WA 2/
2004-07 DATA

NAME	JULY	AUGUST	OCTOBER	MEAN
SHADEMASTER	33.3	25.0	25.0	27.8
CELESTIAL	25.0	20.0	30.0	25.0
AUDUBON	21.7	25.0	20.0	22.2
DLF-RCM	25.0	15.0	26.7	22.2
C03-4676	23.3	13.3	18.3	18.3
DP 77-9579	15.0	15.0	23.3	17.8
SPLENDOR (ASC 245)	16.7	15.0	20.0	17.2
CARDINAL (IS-FRR 30)	13.3	10.0	20.0	14.4
TL1	11.7	13.3	16.7	13.9
CLASS ONE (IS-FRR 29)	13.3	11.7	15.0	13.3
BOREAL	10.0	11.7	16.7	12.8
DP 77-9360	13.3	11.7	13.3	12.8
DP 77-9578	16.7	6.7	13.3	12.2
GARNET (PICK CRF 1-03)	13.3	11.7	10.0	11.7
ORACLE	10.0	10.0	15.0	11.7
C-SMX	8.3	11.7	13.3	11.1
IS-FRR 23	10.7	10.0	11.7	10.8
PATHFINDER	11.7	10.0	10.0	10.6
PST-8000	6.7	11.7	13.3	10.6
RAZOR	10.0	8.3	13.3	10.6
FORTITUDE (TL 53)	8.3	11.7	10.0	10.0
WENDY JEAN (C03-RCE)	14.0	8.3	5.0	9.1
BMXC-S02	10.0	6.7	10.0	8.9
JASPER II	6.7	8.3	11.7	8.9
EPIC (5001)	4.0	6.7	11.7	7.4
LSD VALUE	29.6	15.4	24.9	19.8
C.V. (%)	75.5	52.8	57.8	55.0

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

3/ PERCENT POA ANNUA RATED ONLY.

TABLE 50D. PERCENT POA ANNUA RATINGS OF HARD AND SHEEP FESCUE CULTIVARS 1/
AT PUYALLUP, WA 2/
2004-07 DATA

NAME	JULY	AUGUST	OCTOBER	MEAN
SRX 3K	30.0	20.0	20.0	23.3
PREDATOR	20.0	25.0	15.0	20.0
BERKSHIRE	23.3	13.3	21.7	19.4
FIREFLY (SPM)	20.0	26.7	11.7	19.4
GOTHAM (IS-FL 28)	20.0	13.3	16.7	16.7
QUATRO	16.7	16.7	15.0	16.1
SR 3000	15.0	16.7	16.7	16.1
SCALDIS	10.0	16.7	15.0	13.9
OXFORD	11.7	13.3	13.3	12.8
RELIANT IV (A01630REL)	11.7	13.3	6.7	10.6
SPARTAN II (PICK HF #2)	13.3	10.0	8.3	10.6
LSD VALUE	28.2	20.7	20.0	20.0
C.V. (%)	60.9	48.9	52.6	45.8

TABLE 50E. PERCENT POA ANNUA RATINGS OF SLENDER CREEPING RED FESCUE CULTIVARS 1/
AT PUYALLUP, WA 2/
2004-07 DATA

NAME	JULY	AUGUST	OCTOBER	MEAN
SHORELINE (SRX 55R)	16.7	18.3	10.0	15.0
SEABREEZE	13.3	11.7	18.3	14.4
DAWSON E	13.3	8.3	5.0	8.9
LSD VALUE	7.7	15.5	14.0	5.7
C.V. (%)	23.1	52.2	54.1	19.2

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

3/ PERCENT POA ANNUA RATED ONLY.

TABLE 40A. PERCENT ESTABLISHMENT RATINGS OF FINELEAF FESCUE CULTIVARS 1/
2004-07 DATA 2/

NAME	IL1	ME1	NJ1	NJ2	SD1	VA1	WA1	WA3	MEAN
ORACLE	66.7	90.0	93.0	70.0	88.7	99.0	70.0	81.7	82.4
BOREAL	63.3	76.7	97.3	71.7	90.3	96.3	70.0	81.7	80.9
CELESTIAL	70.0	68.3	95.0	68.3	91.7	94.7	63.3	80.0	78.9
WENDY JEAN (C03-RCE)	70.0	63.3	97.3	63.3	91.3	95.0	66.7	80.0	78.4
DP 77-9579	73.3	80.0	89.7	58.3	88.0	93.0	70.0	76.7	78.4
DLF-RCM	53.3	75.0	96.0	61.7	87.7	96.3	76.7	75.0	77.7
MUSICA	66.7	70.0	88.3	55.0	92.3	97.7	66.7	83.3	77.3
ZODIAC (BUR 4601)	63.3	80.0	80.0	58.3	91.7	96.3	63.3	85.0	77.3
CASCADE	80.0	43.3	89.3	56.7	91.7	96.3	63.3	88.3	76.1
DP 77-9886	50.0	80.0	83.3	56.3	87.7	96.3	73.3	80.0	75.9
JASPER II	66.7	70.0	87.7	58.3	89.0	95.0	60.0	80.0	75.8
AMBASSADOR	56.7	63.3	87.0	63.3	93.0	99.0	63.3	80.0	75.7
C03-4676	53.3	70.0	91.0	58.3	92.3	96.3	66.7	75.0	75.4
IS-FRR 23	63.3	66.7	95.0	58.3	89.3	93.3	63.3	73.3	75.3
SHORELINE (SRX 55R)	60.0	78.3	89.0	55.0	90.3	96.3	66.7	66.7	75.3
C-SMX	70.0	66.7	85.0	57.5	91.3	95.0	60.0	76.7	75.3
EPIC (5001)	63.3	56.7	93.0	60.0	88.3	96.3	66.7	76.7	75.1
LONGFELLOW II	63.3	73.3	83.0	55.0	87.7	96.3	63.3	76.7	74.8
DP 77-9360	70.0	71.7	85.3	50.0	85.0	95.0	66.7	73.3	74.6
CLASS ONE (IS-FRR 29)	70.0	73.3	85.0	53.3	87.7	95.0	66.7	63.3	74.3
SR 5130 (SRX 51G)	70.0	71.7	75.0	53.3	91.7	93.3	60.0	73.3	73.5
RAZOR	53.3	53.3	91.7	63.3	90.0	94.7	63.3	78.3	73.5
J-5 (JAMESTOWN 5)	63.3	71.7	70.7	53.3	90.7	95.0	66.7	73.3	73.1
AUDUBON	70.0	65.0	83.3	51.7	88.7	95.0	56.7	73.3	73.0
LACROSSE (IS-FRC 17)	60.0	50.0	78.3	56.7	90.0	93.0	66.7	86.7	72.7
DP 77-9578	56.7	56.7	91.7	60.0	88.3	93.3	66.7	66.7	72.5
TREASURE II (PST-4TZ)	66.7	51.7	68.3	58.3	90.0	93.3	60.0	83.3	71.5
PATHFINDER	50.0	53.3	81.3	65.0	86.0	97.7	66.7	70.0	71.3
GARNET (PICK CRF 1-03)	66.7	51.7	84.0	50.0	87.3	95.0	63.3	71.7	71.2
QUATRO	60.0	60.0	70.0	58.3	86.7	97.7	53.3	80.0	70.8
PST-8000	60.0	50.0	78.3	61.7	88.3	96.3	60.0	70.0	70.6
FORTITUDE (TL 53)	50.0	66.7	84.0	48.3	90.0	91.7	56.7	76.7	70.5
SHADEMASTER	70.0	45.0	77.7	56.7	88.7	97.7	63.3	63.3	70.3
BERKSHIRE	46.7	46.7	81.0	61.7	92.3	93.3	53.3	86.7	70.2
DP 77-9885	53.3	65.0	80.7	50.0	89.7	90.0	56.7	73.3	69.8
GOTHAM (IS-FL 28)	46.7	58.3	71.7	50.0	94.7	91.7	60.0	80.0	69.1
CULMBRA II (ACF 174)	53.3	51.7	85.7	51.7	91.3	83.3	60.0	75.0	69.0
RELIANT IV (A01630REL)	43.3	63.3	67.3	53.3	93.0	94.7	56.7	78.3	68.8
CARDINAL (IS-FRR 30)	53.3	30.0	93.7	55.0	86.7	96.3	60.0	73.3	68.5
OXFORD	46.7	55.0	68.3	53.3	91.3	96.0	56.7	80.0	68.4
SPARTAN II (PICK HF #2)	43.3	58.3	74.0	53.3	93.0	94.7	56.7	73.3	68.3
TL1	50.0	48.3	85.0	53.3	86.7	94.7	63.3	65.0	68.3
SRX 3K	43.3	75.0	63.3	55.0	89.3	91.7	60.0	66.7	68.0
BMXC-S02	73.3	38.3	70.0	46.7	91.7	88.3	60.0	73.3	67.7
SCALDIS	56.7	40.0	71.7	51.7	91.7	95.0	56.7	73.3	67.1
SPLENDOR (ASC 245)	60.0	45.0	85.7	51.7	89.3	78.3	53.3	70.0	66.7
7 SEAS	60.0	46.7	80.3	45.0	87.7	96.3	50.0	66.7	66.6
DAWSON E	60.0	28.3	61.7	48.3	87.7	96.3	70.0	73.3	65.7
SEABREEZE	53.3	30.0	65.0	50.0	89.7	96.3	60.0	75.0	64.9

TABLE 40A. PERCENT ESTABLISHMENT RATINGS OF FINELEAF FESCUE CULTIVARS 1/
(CONT'D) 2004-07 DATA 2/

NAME	IL1	ME1	NJ1	NJ2	SD1	VA1	WA1	WA3	MEAN
COMPASS (ACF 188)	46.7	53.3	71.7	43.3	83.3	93.3	56.7	63.3	64.0
PREDATOR	46.7	33.3	65.0	46.7	90.7	91.7	50.0	60.0	60.5
SR 3000	46.7	15.0	58.3	43.3	89.3	95.0	50.0	66.7	58.0
FIREFLY (SPM)	30.0	50.0	56.7	35.0	81.7	88.3	46.7	60.0	58.0
LSD VALUE	20.2	31.5	19.8	8.7	6.7	6.2	10.3	15.0	6.0
C.V. (%)	21.5	33.5	15.2	9.8	4.6	4.1	10.4	12.5	14.7

TABLE 40B. PERCENT ESTABLISHMENT RATINGS OF CHEWINGS FESCUE CULTIVARS 1/
2004-07 DATA 2/

NAME	IL1	ME1	NJ1	NJ2	SD1	VA1	WA1	WA3	MEAN
MUSICA	66.7	70.0	86.3	55.0	92.3	97.7	66.7	83.3	77.3
ZODIAC (BUR 4601)	63.3	80.0	80.0	58.3	91.7	98.3	63.3	85.0	77.3
CASCADE	80.0	43.3	89.3	56.7	91.7	96.3	63.3	88.3	76.1
DP 77-9886	50.0	80.0	83.3	56.3	87.7	96.3	73.3	80.0	75.9
AMBASSADOR	56.7	63.3	87.0	63.3	93.0	99.0	63.3	80.0	75.7
LONGFELLOW II	63.3	73.3	83.0	55.0	87.7	96.3	63.3	76.7	74.8
SR 5130 (SRX 51G)	70.0	71.7	75.0	53.3	91.7	93.3	60.0	73.3	73.5
J-5 (JAMESTOWN 5)	83.3	71.7	70.7	53.3	90.7	95.0	66.7	73.3	73.1
LACROSSE (IS-FRC 17)	60.0	50.0	78.3	56.7	90.0	93.0	66.7	88.7	72.7
TREASURE II (PST-4TZ)	66.7	51.7	68.3	58.3	90.0	93.3	60.0	83.3	71.5
DP 77-9885	53.3	65.0	80.7	50.0	89.7	90.0	56.7	73.3	69.8
CULMBRA II (ACF 174)	53.3	51.7	85.7	51.7	91.3	83.3	60.0	75.0	69.0
7 SEAS	80.0	46.7	80.3	45.0	87.7	96.3	50.0	68.7	66.6
COMPASS (ACF 188)	46.7	53.3	71.7	43.3	83.3	93.3	56.7	63.3	64.0
LSD VALUE	22.3	33.1	20.9	8.7	6.0	5.6	11.6	13.1	6.2
C.V. (%)	22.8	33.0	16.3	10.1	4.1	3.7	11.6	10.5	15.1

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 40C. PERCENT ESTABLISHMENT RATINGS OF STRONG CREEPING RED FESCUE CULTIVARS 1/
2004-07 DATA 2/

NAME	IL1	ME1	NJ1	NJ2	SD1	VA1	WA1	WA3	MEAN
ORACLE	66.7	90.0	93.0	70.0	88.7	99.0	70.0	81.7	82.4
BOREAL	63.3	76.7	97.3	71.7	90.3	96.3	70.0	81.7	80.9
CELESTIAL	70.0	68.3	95.0	68.3	91.7	94.7	63.3	80.0	78.9
WENDY JEAN (C03-RCE)	70.0	63.3	97.3	83.3	91.3	95.0	66.7	80.0	78.4
DP 77-9579	73.3	80.0	89.7	58.3	86.0	93.0	70.0	76.7	78.4
DLF-RCM	53.3	75.0	96.0	61.7	87.7	96.3	76.7	75.0	77.7
JASPER II	66.7	70.0	87.7	58.3	89.0	95.0	60.0	80.0	75.8
C03-4678	53.3	70.0	91.0	58.3	92.3	96.3	66.7	75.0	75.4
IS-FRR 23	63.3	66.7	95.0	58.3	89.3	93.3	63.3	73.3	75.3
C-SMX	70.0	66.7	85.0	57.5	91.3	95.0	60.0	76.7	75.3
EPIC (5001)	63.3	56.7	93.0	60.0	88.3	96.3	66.7	76.7	75.1
DP 77-9360	70.0	71.7	85.3	50.0	85.0	95.0	66.7	73.3	74.6
CLASS ONE (IS-FRR 29)	70.0	73.3	85.0	53.3	87.7	95.0	66.7	63.3	74.3
RAZOR	53.3	53.3	91.7	63.3	90.0	94.7	63.3	78.3	73.5
AUDUBON	70.0	65.0	83.3	51.7	88.7	95.0	56.7	73.3	73.0
DP 77-9578	56.7	56.7	91.7	60.0	88.3	93.3	66.7	66.7	72.5
PATHFINDER	50.0	53.3	81.3	65.0	86.0	97.7	66.7	70.0	71.3
GARNET (PICK CRF 1-03)	66.7	51.7	84.0	50.0	87.3	95.0	63.3	71.7	71.2
PST-8000	60.0	50.0	78.3	61.7	88.3	96.3	60.0	70.0	70.6
FORTITUDE (TL 53)	50.0	66.7	84.0	48.3	90.0	91.7	56.7	78.7	70.5
SHADEMASTER	70.0	45.0	77.7	56.7	88.7	97.7	63.3	63.3	70.3
CARDINAL (IS-FRR 30)	53.3	30.0	93.7	55.0	86.7	96.3	60.0	73.3	68.5
TL1	50.0	48.3	85.0	53.3	86.7	94.7	63.3	65.0	68.3
BMXC-S02	73.3	38.3	70.0	46.7	91.7	88.3	60.0	73.3	67.7
SPLENDOR (ASC 245)	60.0	45.0	85.7	51.7	89.3	78.3	53.3	70.0	66.7
LSD VALUE	20.7	29.3	16.3	8.0	5.3	7.0	9.5	16.5	5.7
C.V. (%)	20.5	29.7	11.5	8.5	3.7	4.6	9.2	13.9	13.5

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 40D. PERCENT ESTABLISHMENT RATINGS OF HARD AND SHEEP FESCUE CULTIVARS 1/
2004-07 DATA 2/

NAME	IL1	ME1	NJ1	NJ2	SD1	VA1	WA1	WA3	MEAN
QUATRO	60.0	60.0	70.0	58.3	86.7	97.7	53.3	80.0	70.8
BERKSHIRE	46.7	46.7	81.0	61.7	92.3	93.3	53.3	88.7	70.2
GOTHAM (IS-FL 28)	48.7	58.3	71.7	50.0	94.7	91.7	60.0	80.0	69.1
RELIANT IV (A01630REL)	43.3	63.3	67.3	53.3	93.0	94.7	56.7	78.3	68.8
OXFORD	46.7	55.0	68.3	53.3	91.3	96.0	56.7	80.0	68.4
SPARTAN II (PICK HF #2)	43.3	58.3	74.0	53.3	93.0	94.7	56.7	73.3	68.3
SRX 3K	43.3	75.0	63.3	55.0	89.3	91.7	60.0	68.7	68.0
SCALDIS	56.7	40.0	71.7	51.7	91.7	95.0	56.7	73.3	67.1
PREDATOR	46.7	33.3	65.0	46.7	90.7	91.7	50.0	60.0	60.5
SR 3000	46.7	15.0	58.3	43.3	89.3	95.0	50.0	66.7	58.0
FIREFLY (SPM)	30.0	50.0	56.7	35.0	81.7	88.3	46.7	60.0	56.0
LSD VALUE	16.8	36.3	24.0	10.5	9.9	5.7	10.1	14.5	6.5
C.V. (%)	22.5	44.8	22.0	12.8	6.8	3.8	11.5	12.4	17.4

TABLE 40E. PERCENT ESTABLISHMENT RATINGS OF SLENDER CREEPING RED FESCUE CULTIVARS 1/
2004-07 DATA 2/

NAME	IL1	ME1	NJ1	NJ2	SD1	VA1	WA1	WA3	MEAN
SHORELINE (SRX 55R)	60.0	78.3	89.0	55.0	90.3	96.3	66.7	66.7	75.3
DAWSON E	60.0	28.3	61.7	48.3	87.7	96.3	70.0	73.3	65.7
SEABREEZE	53.3	30.0	65.0	50.0	89.7	96.3	60.0	75.0	64.9
LSD VALUE	17.0	20.6	23.1	7.1	5.8	3.7	10.7	11.1	5.0
C.V. (%)	18.2	28.1	20.0	8.6	4.0	2.4	10.2	9.6	12.7

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 12A.

 SPRING GREENUP RATINGS OF FINELEAF FESCUE CULTIVARS 1/
 2004-07 DATA

SPRING GREENUP RATINGS 1-9; 9=COMPLETELY GREEN 2/

NAME	IA1	IL1	IL2	IN1	MA1	MI1	MN1	ND1	NE1	NJ1	NJ2	NY1	PA1	QE1	RI1	SD1	UT1	VA1	WA1	WA3	MEAN
MUSICA	8.3	5.6	7.1	6.3	6.0	5.6	5.2	4.3	4.9	8.7	5.0	6.4	5.9	3.0	6.1	6.2	4.8	6.8	5.7	4.8	5.8
JASPER II	7.8	5.2	5.3	6.3	6.0	6.5	5.7	4.7	5.0	4.0	7.3	6.6	5.3	3.0	5.2	6.2	4.3	6.8	6.3	4.8	5.7
RAZOR	7.7	5.3	5.7	6.3	6.0	6.4	6.0	4.8	4.3	4.0	7.7	7.0	4.8	3.0	5.3	6.3	3.7	6.0	6.0	5.4	5.6
DP 77-9886	8.0	5.7	4.6	6.6	6.2	5.0	6.3	4.3	3.9	8.3	5.3	6.7	5.6	3.0	5.2	5.5	5.3	6.5	5.0	4.6	5.6
C-SMX	7.7	4.5	5.3	6.3	5.4	6.5	6.0	4.6	5.1	5.3	5.7	6.9	4.4	2.7	4.8	6.7	4.6	6.0	5.7	4.9	5.5
ORACLE	7.7	5.5	6.1	5.8	5.9	4.9	6.2	4.8	3.8	3.3	6.0	6.6	5.8	2.8	7.0	5.8	3.9	5.8	5.7	4.7	5.5
WENDY JEAN (C03-RCE)	7.8	5.0	4.2	5.8	5.6	6.2	5.5	4.6	5.0	4.7	6.0	6.1	5.8	3.0	5.2	5.8	4.2	6.7	6.3	5.1	5.5
CASCADE	8.1	5.3	6.6	6.2	6.2	5.5	6.0	4.2	4.9	7.0	4.0	6.9	4.7	2.7	5.4	5.7	3.9	6.5	5.3	3.8	5.5
7 SEAS	7.8	4.8	4.1	6.4	5.8	6.1	5.2	4.5	5.0	6.0	6.3	6.4	4.2	3.0	4.3	6.2	4.9	6.8	4.7	4.7	5.5
AUDUBON	7.8	5.4	3.7	6.6	5.1	6.3	5.5	4.7	4.4	3.7	6.7	6.1	5.6	2.8	5.7	6.2	3.7	6.5	6.0	4.7	5.5
C03-4676	7.7	5.2	5.1	6.2	5.8	6.3	4.7	4.1	4.2	4.7	6.0	6.7	5.3	2.7	6.0	6.0	3.7	6.2	6.7	5.6	5.5
PATHFINDER	7.9	5.1	3.7	5.8	5.6	5.8	6.2	4.8	4.4	5.0	5.0	7.2	5.9	2.7	4.8	6.0	4.3	6.2	6.7	5.1	5.5
LONGFELLOW II	7.8	4.6	4.4	6.6	6.1	6.6	5.3	4.1	4.3	5.0	6.0	7.2	4.2	2.8	4.4	6.2	4.8	6.7	4.7	4.3	5.5
SR 5130 (SRX 51G)	7.5	4.7	5.2	5.8	5.6	6.4	5.7	4.3	5.1	7.0	5.3	6.4	4.2	2.7	4.3	6.7	5.3	5.7	4.7	4.4	5.5
SHADEMASTER	7.3	5.3	6.8	5.3	6.3	5.2	5.7	4.5	3.9	5.3	5.3	6.2	6.3	2.9	6.1	5.7	4.6	5.5	5.7	4.9	5.5
J-5 (JAMESTOWN 5)	7.6	5.0	4.0	6.3	5.9	6.3	5.7	4.3	4.4	5.3	4.7	6.4	4.8	3.4	5.1	6.0	4.4	6.2	4.7	4.3	5.5
LACROSSE (IS-FRC 17)	7.6	4.6	3.7	6.3	6.0	6.8	5.3	4.3	4.4	5.7	7.3	6.8	3.9	2.9	4.9	6.0	4.7	6.2	5.7	4.2	5.4
TL1	7.7	5.2	4.7	6.7	5.8	6.3	4.7	4.3	4.7	3.7	5.0	6.3	5.1	2.9	4.7	6.5	4.6	6.2	6.0	5.1	5.4
FORTITUDE (TL 53)	7.8	4.3	5.3	6.3	5.2	6.5	6.5	4.2	4.8	4.0	5.3	6.4	4.9	2.8	4.2	6.0	4.2	5.8	5.7	5.3	5.4
COMPASS (ACF 188)	7.8	4.7	3.9	6.3	6.0	6.4	5.0	4.1	4.8	5.3	5.3	6.7	4.2	3.0	4.2	6.3	4.8	6.5	5.0	4.1	5.4
GARNET (PICK CRF 1-03)	7.8	4.7	4.4	6.3	5.3	6.4	5.7	4.3	4.8	3.3	6.3	6.3	4.9	2.4	4.1	6.5	5.0	6.0	6.3	4.4	5.4
ZODIAC (BUR 4601)	7.8	5.5	3.7	6.3	5.9	6.0	6.0	4.2	4.3	6.3	4.7	6.6	3.6	2.8	4.8	5.8	5.2	6.0	4.3	4.3	5.4
AMBASSADOR	7.8	4.3	4.4	6.2	6.0	6.6	5.5	4.3	4.4	4.0	4.7	6.3	4.7	3.0	4.2	5.7	5.4	5.5	5.0	4.2	5.4
IS-FRR 23	7.5	4.8	4.4	5.8	5.6	6.3	5.3	4.3	4.6	3.3	6.0	6.4	5.2	2.7	5.0	6.0	4.1	5.8	6.3	5.1	5.4
DP 77-9578	7.8	5.2	4.9	5.4	5.0	6.3	5.0	4.6	4.8	3.7	6.0	7.0	4.3	3.1	5.1	6.0	4.2	5.2	6.3	4.9	5.4
TREASURE II (PST-4TZ)	7.8	4.6	4.8	5.8	5.2	5.7	5.5	4.3	4.8	6.7	5.3	6.6	4.3	2.8	4.1	5.7	5.3	6.0	4.7	4.2	5.3
CELESTIAL	7.7	5.2	5.0	6.0	5.7	6.3	5.2	4.5	4.7	3.3	6.3	6.0	4.0	2.6	5.0	5.8	2.7	6.2	6.0	5.2	5.3
CARDINAL (IS-FRR 30)	7.8	4.6	4.9	5.4	5.0	6.3	5.3	4.8	5.1	3.0	6.7	6.8	4.1	2.7	4.2	6.8	3.9	5.7	6.7	5.0	5.3
DP 77-9579	7.4	4.5	4.7	5.7	5.2	6.3	5.3	4.7	4.4	4.0	6.7	6.6	4.7	2.8	4.6	6.2	4.9	6.0	5.7	5.1	5.3
DP 77-9360	7.5	5.1	5.7	5.3	5.1	6.4	5.0	4.3	4.7	4.7	6.0	6.4	4.4	2.6	4.6	6.3	4.7	5.7	6.3	5.0	5.3
DLF-RCM	7.5	5.0	4.3	5.1	5.2	5.8	5.8	4.6	4.9	4.0	6.7	6.7	4.6	2.7	4.4	6.2	4.6	5.3	6.0	4.9	5.3
QUATRO	7.6	4.0	3.1	5.8	5.8	5.9	4.2	4.7	6.0	6.0	3.7	6.7	6.0	3.3	5.2	5.7	3.7	7.2	4.7	5.0	5.3
CULUMBRA II (ACF 174)	7.8	4.5	5.9	5.9	5.9	6.6	4.3	4.2	3.7	5.3	5.0	6.4	4.1	2.6	4.2	6.7	4.6	6.5	4.7	4.0	5.3
OXFORD	8.0	4.4	2.8	5.1	5.9	5.5	4.0	4.6	5.0	6.7	4.7	6.6	4.6	3.7	4.4	6.0	5.8	6.3	4.3	4.6	5.3
PST-8000	7.3	5.3	4.1	5.3	4.8	6.4	5.7	4.3	4.1	4.3	6.3	6.8	4.2	2.7	5.0	5.8	3.7	5.7	5.7	5.2	5.2
BOREAL	7.8	5.1	4.9	4.9	5.3	4.8	5.7	4.2	4.0	3.3	3.3	6.7	6.2	2.6	6.8	5.7	4.3	5.5	6.0	4.8	5.2
EPIC (5001)	7.8	5.1	4.6	5.9	5.3	6.0	5.5	4.3	4.3	3.7	6.7	5.9	4.0	3.0	4.2	6.3	3.8	4.8	5.3	4.9	5.2
PREDATOR	7.8	4.3	2.8	5.7	5.6	5.8	4.3	4.3	4.7	4.0	6.0	6.8	5.0	3.7	4.9	5.7	5.1	6.5	4.3	4.2	5.2
SEABREEZE	7.7	4.8	6.1	5.3	6.0	4.9	6.5	4.0	3.9	5.3	4.0	6.4	5.9	3.0	5.8	5.5	3.6	5.3	5.0	4.4	5.2
SHORELINE (SRX 55R)	7.9	4.2	5.7	4.9	5.6	5.4	4.7	3.8	4.0	5.3	4.7	6.8	5.3	2.8	6.4	5.5	4.8	6.2	5.0	4.4	5.2
CLASS ONE (IS-FRR 29)	7.7	4.5	3.6	5.3	5.1	6.3	6.2	4.4	3.9	2.7	5.7	6.8	4.4	2.7	4.6	6.0	4.9	5.3	5.7	4.8	5.2
SCALDIS	7.9	4.3	2.6	5.3	5.2	5.2	4.7	4.4	6.0	4.0	3.7	6.6	4.1	3.9	4.6	6.0	4.9	5.5	4.7	4.2	5.1
RELANT IV (A01630REL)	7.9	4.0	2.0	5.0	5.4	5.2	4.2	4.6	6.0	6.0	4.3	6.4	4.2	3.9	4.6	5.5	4.6	6.3	4.7	4.4	5.1
BMXC-S02	7.6	4.3	5.0	5.7	4.8	6.4	4.8	4.4	4.0	3.7	6.0	6.1	4.2	2.6	4.8	6.2	3.7	5.0	6.3	4.6	5.1
SPLENDOR (ASC 245)	7.3	4.5	4.3	5.4	4.3	6.8	4.3	4.2	4.7	2.0	5.7	6.7	3.2	2.6	4.2	6.2	4.8	4.5	5.0	5.2	5.1
SPARTAN II (PICK HF #2)	7.6	4.1	1.8	5.3	4.6	5.7	4.7	4.5	5.9	6.3	5.3	6.4	4.1	4.0	3.3	5.7	5.0	6.7	4.3	4.0	5.1

TABLE 12A. (CONT'D)

SPRING GREENUP RATINGS OF FINELEAF FESCUE CULTIVARS 1/
2004-07 DATA

SPRING GREENUP RATINGS 1-9; 9=COMPLETELY GREEN 2/

NAME	IA1	IL1	IL2	IN1	MA1	MI1	MN1	ND1	NE1	NJ1	NJ2	NY1	PA1	QE1	RI1	SD1	UT1	VA1	WA1	WA3	MEAN
GOTHAM (IS-FL 28)	7.6	4.0	3.4	5.0	5.6	5.3	4.0	4.4	5.4	6.7	4.7	6.6	4.3	3.9	3.8	5.7	4.4	6.5	4.0	4.3	5.1
BERKSHIRE	7.9	4.2	2.1	5.3	5.3	5.5	3.5	4.7	5.3	4.3	4.7	6.7	4.4	3.7	4.0	6.0	4.2	6.2	4.7	4.2	5.0
DAWSON E	7.7	4.1	5.2	5.4	5.7	4.6	5.2	4.3	3.9	4.3	4.3	6.3	3.9	3.0	6.2	5.3	4.3	5.0	5.3	4.8	5.0
SR 3000	7.8	4.3	1.7	5.1	5.3	5.0	4.0	4.3	5.8	3.3	4.3	6.2	3.4	3.6	5.0	6.2	4.9	5.7	4.3	4.2	5.0
FIREFLY (SPM)	7.8	3.8	2.3	4.9	5.6	6.0	4.2	4.3	5.0	5.0	5.0	6.3	4.0	3.7	4.7	6.0	4.7	6.3	4.3	3.9	5.0
DP 77-9885	7.7	4.5	3.3	5.3	5.0	6.3	4.7	4.1	3.3	4.0	5.7	6.6	3.3	2.7	3.9	6.2	5.0	5.5	4.0	3.8	5.0
SRX 3K	7.6	3.7	1.1	5.0	4.6	5.6	3.0	4.1	4.9	1.3	5.0	6.9	3.1	3.3	2.6	4.3	4.1	4.0	4.0	4.0	4.5
LSD VALUE	0.6	1.4	1.8	1.4	1.1	1.0	1.4	1.1	1.8	1.8	1.7	0.8	1.8	0.7	1.2	1.2	1.8	1.4	0.9	1.2	0.3
C.V. (%)	5.2	18.3	26.3	16.0	12.6	11.1	16.5	16.0	25.8	23.7	19.0	7.8	23.6	14.8	15.9	13.3	25.4	14.7	10.9	16.8	15.3

TABLE 12B.

SPRING GREENUP RATINGS OF CHEWINGS FESCUE CULTIVARS 1/
2004-07 DATA

SPRING GREENUP RATINGS 1-9; 9=COMPLETELY GREEN 2/

NAME	IA1	IL1	IL2	IN1	MA1	MI1	MN1	ND1	NE1	NJ1	NJ2	NY1	PA1	QE1	RI1	SD1	UT1	VA1	WA1	WA3	MEAN
MUSICA	8.3	5.6	7.1	6.3	6.0	5.6	5.2	4.3	4.9	8.7	5.0	6.4	5.9	3.0	6.1	6.2	4.8	6.8	5.7	4.8	5.8
DP 77-9886	8.0	5.7	4.6	6.6	6.2	5.0	6.3	4.3	3.9	8.3	5.3	6.7	5.6	3.0	5.2	5.5	5.3	6.5	5.0	4.6	5.6
CASCADE	8.1	5.3	6.6	6.2	6.2	5.5	6.0	4.2	4.9	7.0	4.0	6.9	4.7	2.7	5.4	5.7	3.9	6.5	5.3	3.8	5.5
7 SEAS	7.8	4.8	4.1	6.4	5.8	6.1	5.2	4.5	5.0	6.0	6.3	6.4	4.2	3.0	4.3	6.2	4.9	6.8	4.7	4.7	5.5
LONGFELLOW II	7.8	4.6	4.4	6.6	6.1	6.6	5.3	4.1	4.3	5.0	6.0	7.2	4.2	2.8	4.4	6.2	4.8	6.7	4.7	4.3	5.5
SR 5130 (SRX 51G)	7.5	4.7	5.2	5.8	5.6	6.4	5.7	4.3	5.1	7.0	5.3	6.4	4.2	2.7	4.3	6.7	5.3	5.7	4.7	4.4	5.5
J-5 (JAMESTOWN 5)	7.6	5.0	4.0	6.3	5.9	6.3	5.7	4.3	4.4	5.3	4.7	6.4	4.8	3.4	5.1	6.0	4.4	6.2	4.7	4.3	5.5
LACROSSE (IS-FRC 17)	7.6	4.6	3.7	6.3	6.0	6.8	5.3	4.3	4.4	5.7	7.3	6.8	3.9	2.9	4.9	6.0	4.7	6.2	5.7	4.2	5.4
COMPASS (ACF 188)	7.8	4.7	3.9	6.3	6.0	6.4	5.0	4.1	4.8	5.3	5.3	6.7	4.2	3.0	4.2	6.3	4.8	6.5	5.0	4.1	5.4
ZODIAC (BUR 4601)	7.8	5.5	3.7	6.3	5.9	6.0	6.0	4.2	4.3	6.3	4.7	6.6	3.6	2.8	4.8	5.8	5.2	6.0	4.3	4.3	5.4
AMBASSADOR	7.8	4.3	4.4	6.2	6.0	6.6	5.5	4.3	4.4	4.0	4.7	6.3	4.7	3.0	4.2	5.7	5.4	5.5	5.0	4.2	5.4
TREASURE II (PST-4TZ)	7.8	4.6	4.8	5.8	5.2	5.7	5.5	4.3	4.8	6.7	5.3	6.6	4.3	2.8	4.1	5.7	5.3	6.0	4.7	4.2	5.3
CULUMBRA II (ACF 174)	7.8	4.5	5.9	5.9	5.9	6.6	4.3	4.2	3.7	5.3	5.0	6.4	4.1	2.6	4.2	6.7	4.6	6.5	4.7	4.0	5.3
DP 77-9885	7.7	4.5	3.3	5.3	5.0	6.3	4.7	4.1	3.3	4.0	5.7	6.6	3.3	2.7	3.9	6.2	5.0	5.5	4.0	3.8	5.0
LSD VALUE	0.6	1.3	1.6	1.4	1.1	1.0	1.5	0.9	1.9	2.2	1.7	0.9	2.0	0.6	1.1	1.4	1.7	1.4	0.9	1.3	0.3
C.V. (%)	4.7	16.5	21.3	15.1	12.1	9.8	16.8	14.2	29.1	22.4	20.3	8.1	28.0	12.8	14.5	15.1	21.9	13.7	11.5	18.5	15.1

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 12C.

SPRING GREENUP RATINGS OF STRONG CREEPING RED FESCUE CULTIVARS 1/
2004-07 DATA

SPRING GREENUP RATINGS 1-9; 9=COMPLETELY GREEN 2/

NAME	IA1	IL1	IL2	IN1	MA1	MI1	MN1	ND1	NE1	NJ1	NJ2	NY1	PA1	QE1	RI1	SD1	UT1	VA1	WA1	WA3	MEAN
JASPER II	7.8	5.2	5.3	6.3	6.0	6.5	5.7	4.7	5.0	4.0	7.3	6.6	5.3	3.0	5.2	6.2	4.3	6.8	6.3	4.8	5.7
RAZOR	7.7	5.3	5.7	6.3	6.0	6.4	6.0	4.8	4.3	4.0	7.7	7.0	4.8	3.0	5.3	6.3	3.7	6.0	6.0	5.4	5.6
C-SMX	7.7	4.5	5.3	6.3	5.4	6.5	6.0	4.6	5.1	5.3	5.7	6.9	4.4	2.7	4.8	6.7	4.6	6.0	5.7	4.9	5.5
ORACLE	7.7	5.5	6.1	5.8	5.9	4.9	6.2	4.8	3.8	3.3	6.0	6.6	5.8	2.8	7.0	5.8	3.9	5.8	5.7	4.7	5.5
WENDY JEAN (C03-RCE)	7.8	5.0	4.2	5.8	5.6	6.2	5.5	4.6	5.0	4.7	6.0	6.1	5.8	3.0	5.2	5.8	4.2	6.7	6.3	5.1	5.5
AUDUBON	7.8	5.4	3.7	6.6	5.1	6.3	5.5	4.7	4.4	3.7	6.7	6.1	5.6	2.8	5.7	6.2	3.7	6.5	6.0	4.7	5.5
C03-4676	7.7	5.2	5.1	6.2	5.8	6.3	4.7	4.1	4.2	4.7	6.0	6.7	5.3	2.7	6.0	6.0	3.7	6.2	6.7	5.6	5.5
PATHFINDER	7.9	5.1	3.7	5.8	5.6	5.8	6.2	4.8	4.4	5.0	5.0	7.2	5.9	2.7	4.8	6.0	4.3	6.2	6.7	5.1	5.5
SHADEMASTER	7.3	5.3	6.8	5.3	6.3	5.2	5.7	4.5	3.9	5.3	5.3	6.2	6.3	2.9	6.1	5.7	4.6	5.5	5.7	4.9	5.5
TL1	7.7	5.2	4.7	6.7	5.8	6.3	4.7	4.3	4.7	3.7	5.0	6.3	5.1	2.9	4.7	6.5	4.6	6.2	6.0	5.1	5.4
FORTITUDE (TL 53)	7.8	4.3	5.3	6.3	5.2	6.5	6.5	4.2	4.8	4.0	5.3	6.4	4.9	2.8	4.2	6.0	4.2	5.8	5.7	5.3	5.4
GARNET (PICK CRF 1-03)	7.8	4.7	4.4	6.3	5.3	6.4	5.7	4.3	4.8	3.3	6.3	6.3	4.9	2.4	4.1	6.5	5.0	6.0	6.3	4.4	5.4
IS-FRR 23	7.5	4.8	4.4	5.8	5.6	6.3	5.3	4.3	4.6	3.3	6.0	6.4	5.2	2.7	5.0	6.0	4.1	5.8	6.3	5.1	5.4
DP 77-9578	7.8	5.2	4.9	5.4	5.0	6.3	5.0	4.6	4.6	3.7	6.0	7.0	4.3	3.1	5.1	6.0	4.2	5.2	6.3	4.9	5.4
CELESTIAL	7.7	5.2	5.0	6.0	5.7	6.3	5.2	4.5	4.7	3.3	6.3	6.0	4.0	2.6	5.0	5.8	2.7	6.2	6.0	5.2	5.3
CARDINAL (IS-FRR 30)	7.8	4.6	4.9	5.4	5.0	6.3	5.3	4.8	5.1	3.0	6.7	6.8	4.1	2.7	4.2	6.8	3.9	5.7	6.7	5.0	5.3
DP 77-9579	7.4	4.5	4.7	5.7	5.2	6.3	5.3	4.7	4.4	4.0	6.7	6.6	4.7	2.8	4.6	6.2	4.9	6.0	5.7	5.1	5.3
DP 77-9360	7.5	5.1	5.7	5.3	5.1	6.4	5.0	4.3	4.7	4.7	6.0	6.4	4.4	2.6	4.6	6.3	4.7	5.7	6.3	5.0	5.3
DLF-RCM	7.5	5.0	4.3	5.1	5.2	5.8	5.8	4.6	4.9	4.0	6.7	6.7	4.6	2.7	4.4	6.2	4.6	5.3	6.0	4.9	5.3
PST-8000	7.3	5.3	4.1	5.3	4.8	6.4	5.7	4.3	4.1	4.3	6.3	6.8	4.2	2.7	5.0	5.8	3.7	5.7	5.7	5.2	5.2
BOREAL	7.8	5.1	4.9	4.9	5.3	4.8	5.7	4.2	4.0	3.3	3.3	6.7	6.2	2.6	6.6	5.7	4.3	5.5	6.0	4.8	5.2
EPIC (5001)	7.8	5.1	4.6	5.9	5.3	6.0	5.5	4.3	4.3	3.7	6.7	5.9	4.0	3.0	4.2	6.3	3.8	4.8	5.3	4.9	5.2
CLASS ONE (IS-FRR 29)	7.7	4.5	3.6	5.3	5.1	6.3	6.2	4.4	3.9	2.7	5.7	6.8	4.4	2.7	4.6	6.0	4.9	5.3	5.7	4.8	5.2
BMXC-S02	7.8	4.3	5.0	5.7	4.8	6.4	4.8	4.4	4.0	3.7	6.0	6.1	4.2	2.6	4.8	6.2	3.7	5.0	6.3	4.6	5.1
SPLENDOR (ASC 245)	7.3	4.5	4.3	5.4	4.3	6.8	4.3	4.2	4.7	2.0	5.7	6.7	3.2	2.6	4.2	6.2	4.8	4.5	5.0	5.2	5.1
LSD VALUE	0.6	1.4	2.0	1.4	1.1	1.1	1.3	1.1	1.8	1.5	1.6	0.8	1.8	0.7	1.1	1.2	1.9	1.5	1.0	1.2	0.4
C.V. (%)	5.1	18.3	27.0	16.1	13.1	11.1	14.5	15.8	27.8	24.1	16.7	7.5	22.4	15.7	13.3	13.2	28.2	16.5	10.0	16.2	15.3

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN.
STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 12D.

SPRING GREENUP RATINGS OF HARD AND SHEEP FESCUE CULTIVARS 1/
2004-07 DATA

SPRING GREENUP RATINGS 1-9; 9=COMPLETELY GREEN 2/

NAME	IA1	IL1	IL2	IN1	MA1	MI1	MN1	ND1	NE1	NJ1	NJ2	NY1	PA1	QE1	RI1	SD1	UT1	VA1	WA1	WA3	MEAN
QUATRO	7.6	4.0	3.1	5.8	5.6	5.9	4.2	4.7	6.0	6.0	3.7	6.7	6.0	3.3	5.2	5.7	3.7	7.2	4.7	5.0	5.3
OXFORD	8.0	4.4	2.8	5.1	5.9	5.5	4.0	4.6	5.0	6.7	4.7	6.6	4.6	3.7	4.4	6.0	5.8	6.3	4.3	4.6	5.3
PREDATOR	7.8	4.3	2.8	5.7	5.6	5.8	4.3	4.3	4.7	4.0	6.0	6.8	5.0	3.7	4.9	5.7	5.1	6.5	4.3	4.2	5.2
SCALDIS	7.9	4.3	2.8	5.3	5.2	5.2	4.7	4.4	6.0	4.0	3.7	6.6	4.1	3.9	4.6	6.0	4.9	5.5	4.7	4.2	5.1
RELIANT IV (A01630REL)	7.9	4.0	2.0	5.0	5.4	5.2	4.2	4.6	6.0	6.0	4.3	6.4	4.2	3.9	4.6	5.5	4.6	6.3	4.7	4.4	5.1
SPARTAN II (PICK HF #2)	7.6	4.1	1.8	5.3	4.6	5.7	4.7	4.5	5.9	6.3	5.3	6.4	4.1	4.0	3.3	5.7	5.0	6.7	4.3	4.0	5.1
GOTHAM (IS-FL 28)	7.6	4.0	3.4	5.0	5.6	5.3	4.0	4.4	5.4	6.7	4.7	6.6	4.3	3.9	3.8	5.7	4.4	6.5	4.0	4.3	5.1
BERKSHIRE	7.9	4.2	2.1	5.3	5.3	5.5	3.5	4.7	5.3	4.3	4.7	6.7	4.4	3.7	4.0	6.0	4.2	6.2	4.7	4.2	5.0
SR 3000	7.8	4.3	1.7	5.1	5.3	5.0	4.0	4.3	5.8	3.3	4.3	6.2	3.4	3.6	5.0	6.2	4.9	5.7	4.3	4.2	5.0
FIREFLY (SPM)	7.8	3.8	2.3	4.9	5.6	6.0	4.2	4.3	5.0	5.0	5.0	6.3	4.0	3.7	4.7	6.0	4.7	6.3	4.3	3.9	5.0
SRX 3K	7.6	3.7	1.1	5.0	4.6	5.6	3.0	4.1	4.9	1.3	5.0	6.9	3.1	3.3	2.6	4.3	4.1	4.0	4.0	4.0	4.5
LSD VALUE	0.6	1.2	1.5	1.4	1.1	1.1	1.4	1.2	1.6	2.0	1.5	0.9	1.2	0.9	1.7	1.1	1.6	1.1	0.8	1.1	0.3
C.V. (%)	5.3	19.2	37.5	17.3	13.0	12.9	21.7	17.9	18.7	25.5	20.1	8.4	22.5	15.1	28.0	11.6	22.0	12.0	11.9	16.2	15.5

TABLE 12E.

SPRING GREENUP RATINGS OF SLENDER CREEPING RED FESCUE CULTIVARS 1/
2004-07 DATA

SPRING GREENUP RATINGS 1-9; 9=COMPLETELY GREEN 2/

NAME	IA1	IL1	IL2	IN1	MA1	MI1	MN1	ND1	NE1	NJ1	NJ2	NY1	PA1	QE1	RI1	SD1	UT1	VA1	WA1	WA3	MEAN
SEABREEZE	7.7	4.8	6.1	5.3	6.0	4.9	6.5	4.0	3.9	5.3	4.0	6.4	5.9	3.0	5.8	5.5	3.6	5.3	5.0	4.4	5.2
SHORELINE (SRX 55R)	7.9	4.2	5.7	4.9	5.6	5.4	4.7	3.8	4.0	5.3	4.7	6.8	5.3	2.8	6.4	5.5	4.8	6.2	5.0	4.4	5.2
DAWSON E	7.7	4.1	5.2	5.4	5.7	4.6	5.2	4.3	3.9	4.3	4.3	6.3	3.9	3.0	6.2	5.3	4.3	5.0	5.3	4.8	5.0
LSD VALUE	0.6	1.4	1.6	1.2	1.0	0.7	1.5	0.9	1.7	1.3	2.2	0.7	2.0	0.2	1.0	1.1	1.9	1.4	1.1	1.0	0.3
C.V. (%)	5.1	20.4	18.6	14.8	11.8	9.9	17.4	13.7	31.8	16.3	31.7	6.6	24.4	4.0	10.5	12.8	29.7	17.6	13.0	14.1	14.9

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN.
STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 4A. MEAN TURFGRASS QUALITY RATINGS OF FINELEAF FESCUE CULTIVARS FOR EACH
MONTH GROWN AT PULLMAN, WA (UPPER WEST/MOUNTAIN) 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF: MONTHS 2/

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
GARNET (PICK CRF 1-03)	4.3	5.7	5.8	6.1	6.3	6.2	6.1	5.9
RELIANT IV (A01630REL)	4.3	5.3	5.9	6.1	6.1	6.2	6.1	5.8
PST-8000	4.0	5.2	5.7	6.2	6.3	6.1	6.2	5.8
SPARTAN II (PICK HF #2)	4.2	5.0	5.7	6.6	5.9	6.2	6.2	5.8
FIREFLY (SPM)	4.0	4.7	5.8	6.0	6.0	6.3	6.0	5.6
GOTHAM (IS-FL 28)	4.0	4.9	5.9	6.0	6.0	5.8	6.1	5.6
CARDINAL (IS-FRR 30)	4.2	5.3	5.9	5.8	5.9	5.9	5.8	5.6
PREDATOR	4.0	5.1	5.6	6.1	5.8	6.0	6.0	5.6
OXFORD	3.7	4.6	5.8	6.1	6.3	6.0	6.0	5.6
DP 77-9578	3.7	5.0	5.6	5.7	6.0	6.2	5.9	5.6
DP 77-9360	3.5	4.9	5.7	6.1	6.1	5.9	5.8	5.5
COMPASS (ACF 188)	4.2	5.2	5.1	5.7	6.0	6.2	5.4	5.5
JASPER II	3.7	5.3	5.6	5.9	5.8	5.8	5.7	5.5
BERKSHIRE	4.0	4.8	5.6	5.8	6.0	5.8	5.8	5.5
LONGFELLOW II	4.2	5.1	5.2	5.6	5.7	6.0	5.9	5.5
CULUMBRA II (ACF 174)	4.5	5.1	5.2	5.6	6.0	5.9	5.3	5.5
EPIC (5001)	3.7	4.8	5.6	6.0	5.7	5.9	5.9	5.5
7 SEAS	4.5	4.9	5.1	5.4	5.7	6.1	5.7	5.4
TL1	3.2	4.3	5.2	5.9	6.1	6.1	6.2	5.4
BMXC-S02	4.2	5.2	5.3	5.4	5.8	5.8	5.4	5.4
RAZOR	4.0	5.0	5.0	5.8	5.6	5.9	5.9	5.4
C-SMX	3.7	5.0	5.6	5.6	5.6	5.9	5.6	5.4
AMBASSADOR	4.2	5.2	5.2	5.3	5.6	5.7	5.6	5.3
SHORELINE (SRX 55R)	3.5	5.1	5.4	5.4	5.8	5.4	5.4	5.3
WENDY JEAN (C03-RCE)	4.0	5.1	4.8	5.4	5.6	5.8	5.7	5.3
TREAZURE II (PST-4TZ)	4.3	4.9	5.7	5.1	5.1	5.7	5.4	5.3
LACROSSE (IS-FRC 17)	4.3	5.1	5.2	5.0	5.4	5.8	5.3	5.3
SCALDIS	3.2	5.0	5.3	5.7	5.6	5.4	5.7	5.2
AUDUBON	3.7	4.6	5.2	5.2	5.8	5.9	5.6	5.2
SR 5130 (SRX 51G)	4.3	5.2	5.1	4.9	5.3	5.7	5.3	5.2
FORTITUDE (TL 53)	3.7	4.7	4.7	5.2	5.8	5.9	5.4	5.2
C03-4676	3.2	4.1	4.7	5.4	5.9	6.2	5.8	5.2
CLASS ONE (IS-FRR 29)	3.2	4.3	5.1	5.6	5.8	5.8	5.3	5.1
ZODIAC (BUR 4601)	3.8	5.3	5.3	4.9	5.1	5.3	5.2	5.1
SRX 3K	3.2	4.2	5.2	6.0	5.8	5.2	5.2	5.1
DP 77-9579	3.0	5.0	5.3	5.2	5.2	5.6	5.3	5.1
SPLENDOR (ASC 245)	3.0	4.8	5.2	5.7	5.7	5.2	5.2	5.1
CELESTIAL	3.3	4.6	4.8	5.1	5.7	5.9	5.4	5.1
SR 3000	3.0	4.2	5.4	5.6	5.6	5.6	5.3	5.1
DP 77-9885	3.7	5.1	5.2	5.1	5.3	5.3	5.0	5.1
SEABREEZE	2.5	4.7	5.1	5.3	5.6	5.6	5.4	5.0
IS-FRR 23	3.2	4.6	4.4	4.9	5.8	5.8	5.4	5.0
PATHFINDER	3.3	4.2	5.0	5.2	5.3	5.6	5.3	5.0
DLF-RCM	3.5	4.7	4.8	5.0	5.2	5.6	5.2	4.9

TABLE 4A. MEAN TURFGRASS QUALITY RATINGS OF FINELEAF FESCUE CULTIVARS FOR EACH
(CONT'D) MONTH GROWN AT PULLMAN, WA (UPPER WEST/MOUNTAIN) 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF: MONTHS 2/

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
J-5 (JAMESTOWN 5)	3.8	4.7	4.9	4.8	5.0	5.6	5.1	4.9
DP 77-9886	3.7	4.7	5.0	4.8	5.0	5.4	5.1	4.9
CASCADE	3.8	4.4	4.7	5.1	5.4	4.9	5.1	4.9
QUATRO	3.3	3.8	4.9	5.1	5.7	5.1	5.3	4.8
MUSICA	4.0	4.6	4.6	4.9	4.6	4.9	4.4	4.6
DAWSON E	2.8	4.1	4.7	5.1	4.9	5.1	4.8	4.6
SHADEMASTER	2.7	3.2	4.3	4.8	4.9	5.2	4.8	4.4
BOREAL	3.0	3.9	4.1	4.4	4.2	4.3	4.8	4.2
ORACLE	2.3	3.6	4.1	4.4	4.3	4.6	4.7	4.1
LSD VALUE	1.0	1.0	0.7	0.9	0.9	1.0	0.8	0.6
C.V. (%)	24.4	23.1	13.6	17.1	18.2	19.8	14.7	12.8

TABLE 4B. MEAN TURFGRASS QUALITY RATINGS OF CHEWINGS FESCUE CULTIVARS FOR EACH
MONTH GROWN AT PULLMAN, WA (UPPER WEST/MOUNTAIN) 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF: MONTHS 2/

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
COMPASS (ACF 188)	4.2	5.2	5.1	5.7	6.0	6.2	5.4	5.5
LONGFELLOW II	4.2	5.1	5.2	5.6	5.7	6.0	5.9	5.5
CULMBRA II (ACF 174)	4.5	5.1	5.2	5.6	6.0	5.9	5.3	5.5
7 SEAS	4.5	4.9	5.1	5.4	5.7	6.1	5.7	5.4
AMBASSADOR	4.2	5.2	5.2	5.3	5.6	5.7	5.6	5.3
TREASURE II (PST-4TZ)	4.3	4.9	5.7	5.1	5.1	5.7	5.4	5.3
LACROSSE (IS-FRC 17)	4.3	5.1	5.2	5.0	5.4	5.8	5.3	5.3
SR 5130 (SRX 51G)	4.3	5.2	5.1	4.9	5.3	5.7	5.3	5.2
ZODIAC (BUR 4601)	3.8	5.3	5.3	4.9	5.1	5.3	5.2	5.1
DP 77-9885	3.7	5.1	5.2	5.1	5.3	5.3	5.0	5.1
J-5 (JAMESTOWN 5)	3.8	4.7	4.9	4.8	5.0	5.6	5.1	4.9
DP 77-9886	3.7	4.7	5.0	4.8	5.0	5.4	5.1	4.9
CASCADE	3.8	4.4	4.7	5.1	5.4	4.9	5.1	4.9
MUSICA	4.0	4.6	4.6	4.9	4.6	4.9	4.4	4.6
LSD VALUE	0.9	0.8	0.6	0.8	0.8	1.1	0.7	0.6
C.V. (%)	19.5	16.8	12.5	17.5	16.7	21.7	15.0	13.1

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN.
STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 4C. MEAN TURFGRASS QUALITY RATINGS OF STRONG CREEPING RED FESCUE CULTIVARS FOR EACH
MONTH GROWN AT PULLMAN, WA (UPPER WEST/MOUNTAIN) 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF: MONTHS 2/

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
GARNET (PICK CRF 1-03)	4.3	5.7	5.8	6.1	6.3	6.2	6.1	5.9
PST-8000	4.0	5.2	5.7	6.2	6.3	6.1	6.2	5.8
CARDINAL (IS-FRR 30)	4.2	5.3	5.9	5.8	5.9	5.9	5.8	5.6
DP 77-9578	3.7	5.0	5.6	5.7	6.0	6.2	5.9	5.6
DP 77-9360	3.5	4.9	5.7	6.1	6.1	5.9	5.8	5.5
JASPER II	3.7	5.3	5.6	5.9	5.8	5.8	5.7	5.5
EPIC (5001)	3.7	4.8	5.6	6.0	5.7	5.9	5.9	5.5
TL1	3.2	4.3	5.2	5.9	6.1	6.1	6.2	5.4
BMXC-S02	4.2	5.2	5.3	5.4	5.8	5.8	5.4	5.4
RAZOR	4.0	5.0	5.0	5.8	5.6	5.9	5.9	5.4
C-SMX	3.7	5.0	5.6	5.6	5.6	5.9	5.6	5.4
WENDY JEAN (C03-RCE)	4.0	5.1	4.8	5.4	5.6	5.8	5.7	5.3
AUDUBON	3.7	4.6	5.2	5.2	5.8	5.9	5.6	5.2
FORTITUDE (TL 53)	3.7	4.7	4.7	5.2	5.8	5.9	5.4	5.2
C03-4676	3.2	4.1	4.7	5.4	5.9	6.2	5.8	5.2
CLASS ONE (IS-FRR 29)	3.2	4.3	5.1	5.6	5.8	5.8	5.3	5.1
DP 77-9579	3.0	5.0	5.3	5.2	5.2	5.6	5.3	5.1
SPLENDOR (ASC 245)	3.0	4.8	5.2	5.7	5.7	5.2	5.2	5.1
CELESTIAL	3.3	4.6	4.8	5.1	5.7	5.9	5.4	5.1
IS-FRR 23	3.2	4.6	4.4	4.9	5.8	5.8	5.4	5.0
PATHFINDER	3.3	4.2	5.0	5.2	5.3	5.6	5.3	5.0
DLF-RCM	3.5	4.7	4.8	5.0	5.2	5.6	5.2	4.9
SHADEMASTER	2.7	3.2	4.3	4.8	4.9	5.2	4.8	4.4
BOREAL	3.0	3.9	4.1	4.4	4.2	4.3	4.8	4.2
ORACLE	2.3	3.6	4.1	4.4	4.3	4.6	4.7	4.1
LSD VALUE	1.0	1.1	0.7	0.9	0.8	1.0	0.7	0.6
C.V. (%)	24.2	24.5	15.1	17.0	15.9	18.0	13.4	12.7

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN.
STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

TABLE 4D. MEAN TURFGRASS QUALITY RATINGS OF HARD AND SHEEP FESCUE CULTIVARS FOR EACH MONTH GROWN AT PULLMAN, WA (UPPER WEST/MOUNTAIN) 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF: MONTHS 2/

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
RELIANT IV (A01630REL)	4.3	5.3	5.9	6.1	6.1	6.2	6.1	5.8
SPARTAN II (PICK HF #2)	4.2	5.0	5.7	6.6	5.9	6.2	6.2	5.8
FIREFLY (SPM)	4.0	4.7	5.8	6.0	6.0	6.3	6.0	5.6
GOTHAM (IS-FL 28)	4.0	4.9	5.9	6.0	6.0	5.8	6.1	5.6
PREDATOR	4.0	5.1	5.6	6.1	5.8	6.0	6.0	5.6
OXFORD	3.7	4.6	5.8	6.1	6.3	6.0	6.0	5.6
BERKSHIRE	4.0	4.8	5.6	5.8	6.0	5.8	5.8	5.5
SCALDIS	3.2	5.0	5.3	5.7	5.6	5.4	5.7	5.2
SRX 3K	3.2	4.2	5.2	6.0	5.8	5.2	5.2	5.1
SR 3000	3.0	4.2	5.4	5.6	5.6	5.6	5.3	5.1
QUATRO	3.3	3.8	4.9	5.1	5.7	5.1	5.3	4.8
LSD VALUE	1.3	1.2	0.6	0.9	1.3	1.2	0.9	0.6
C.V. (%)	30.5	27.1	11.8	17.1	23.5	22.2	17.1	12.8

TABLE 4E. MEAN TURFGRASS QUALITY RATINGS OF SLENDER CREEPING RED FESCUE CULTIVARS FOR EACH MONTH GROWN AT PULLMAN, WA (UPPER WEST/MOUNTAIN) 1/
2004-07 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF: MONTHS 2/

NAME	APR	MAY	JUN	JUL	AUG	SEP	OCT	MEAN
SHORELINE (SRX 55R)	3.5	5.1	5.4	5.4	5.8	5.4	5.4	5.3
SEABREEZE	2.5	4.7	5.1	5.3	5.6	5.6	5.4	5.0
DAWSON E	2.8	4.1	4.7	5.1	4.9	5.1	4.8	4.6
LSD VALUE	0.8	1.0	0.6	0.8	0.9	0.8	0.7	0.6
C.V. (%)	24.5	22.4	12.1	15.9	17.2	15.8	13.6	12.9

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

APPENDIX 4

2006 NATIONAL TURFGRASS EVALUATION PROGRAM (NTEP) TALL FESCUE TRIAL

Gwen Stahnke, Eric Miltner, Richard Bembenek and Randi Luchterhand

The National Turfgrass Evaluation Program (NTEP) tall fescue study was planted on September 6, 2006. The 12,312 sq. ft. area was planted with 171 different tall fescue cultivars at a rate of 6 1/2 lbs per 1000 sq. ft. The study was designed as a randomized complete block design (RCBD) with three replications of 4' x 6' plots. All plots were individually seeded by hand, raked, fertilized and rolled. The area was fertilized at 1 lb N per 1000 sq. ft. of 19-25-5 starter fertilizer. Germination occurred over 7 – 14 days. During the first year of establishment, the study area has received 4 lbs. N per 1000 sq. ft. Two applications of TGR growth regulator, (paclobutazol), were applied in the spring and fall of 2007. 2008 and one so far in 2009, at a rate of 2.9 lbs. per 1000 sq. ft. for *Poa annua* control.

EARLY ESTABLISHMENT

The trial was established on the native Puyallup silt loam soil at the R.L. Goss Turfgrass Research Facility. Germination was slow due to cool wet conditions in September 2006. The seeding rate was still too low (as it was for the previous NTEP Tall fescue trial) to get a quick establishment. A seeding rate of 8 lbs. per 1000 sq. ft. is necessary for better establishment and to help crowd out weeds in our location of the country. Plots were irrigated with above - ground aluminum pipe. Irrigation amounts applied were variable over the trial area due to wind. The entire plot area was covered with seed cloth to minimize seed washout and speed up germination. Germination was rapid under the seed cloth. We removed the seed cloth 2 weeks after seeding. Plots were mowed for the first time in October 2006, at a height of 2" with a rotary mower. The trial is mowed in alternating directions.

WEED MANAGEMENT FOR EARLY ESTABLISHMENT

Weeds encroached in late fall and early winter due to slow germination of the tall fescue seed. The study received 2 applications of herbicide over the course of the first year to minimize weeds. The first application made was Manage (0.9 grams per 1000 sq. ft.) for horsetail control. Without this application, germination and establishment of the tall fescue seed would have suffered greatly. The second application made was Stinger (clopyralid, 8.2 ml per 1000 sq. ft.) for control of speedwell, thistle, and shepherd's purse. Unfortunately, open areas where the grass weeds were pulled out could not be reseeded. In 2006 through 2009, the *Poa trivialis*, rough bluegrass, began to burn out with the warmer weather and possible stressful effects of TGR, but it continues to come back in the fall with the rains and cooler temperatures.

QUALITY DATA FOR 2007

In 2007, the first full year of this NTEP tall fescue study, the overall quality of the cultivars ranged from 4.7 to 3.0, with the LSD = 0.6. In 2009, 50 of the 113 cultivars planted are available. The top 12 cultivars that are commercially available are: Traverse SRP, Faith, 3rd Millennium SRP, Essential, Firenza, Wolfpak II, Speedway, Hemi, Van Gogh, SR8650, Rambler SRP and Padre. The next 25 of the commercially available

cultivars of tall fescue with the next best quality are: Monet, Firecracker LS, Bullseye, Spyder LS, Turbo RZ, Mustang 4, Talladega, Skyline, Cezanne RZ, Falcon IV, Turbo, Escalade, Raptor II, Renovate, AST9002, AST9003, Justice, Rebel IV, Titanium LS, Compete, Gazelle II Magellan, Silverado, Einstein, AST9001 and Rembrandt. The remaining 13 cultivars which were had the lowest quality, but are currently available are: Biltmore, Toccoa, Darlington, Plato, Lindbergh, Reunion, Aristotle, Tahoe II, Honky Tonk, Hudson, Tulsa Time, Hunter and finally KY-31.

ANNUAL BLUEGRASS INVASION DATA FOR 2008

Within the first two years, there was significant invasion by annual bluegrass into the tall fescue plots due to the lower initial seeding rate. However, there was still a difference in how much annual bluegrass established in cultivars. The most competitive cultivars that are available, with less than 18.4% annual bluegrass per plot are: Rhambler SRP, Traverse SRP, SR 8650, Faith, Mustang 4, Skyline, Padre, Firenza, Rebel IV, Ky-31, Essential and 3rd Millennium SRP. There are 8 of these which also were in the top quality ratings as well in the 2007 data. The rest of the cultivars that are commercially available are not significantly different and all have between 20 and 30% annual bluegrass invasion into the tall fescue.

SUMMARY

One of the not so positive qualities of tall fescue is that almost all of the cultivars turn and off-color of army green/tan in the winter west of the Cascades where the grass doesn't go totally dormant due to Net Blotch disease (a leaf spot). The leaf blades can have a water soaked look to them with this disease. Homeowners do not find this quality desirable and it can outweigh the good qualities of drought tolerance, shade tolerance, withstanding some wet soils and some traffic in some peoples' minds.

There is definitely a place for tall fescue to be planted both east and west of the Cascade Mountains. The tall fescue must be marketed appropriately in that its drought tolerance comes from deep roots, so you must have a deep soil (at least 6 inches) for them to grow in to take advantage of this the drought tolerance. Also, in western WA, the off-green color of the cultivars in the winter is something a homeowner needs to know about before they plant it.

**2006 NATIONAL TALL FESCUE TEST
Entries and Sponsors**

Entry No.	Name	Sponsor	Entry No.	Name	Sponsor	Entry No.	Name	Sponsor
*1	Ky-31	Standard Entry	*41	Firecracker LS (MVS-MST)	Mountain View Seeds	81	JT-36	Jacklin See
*2	Spyder LS (Z-2000)	Z-Seeds	*42	Mustang 4 (M4)	Pickseed	82	JT-45	Jacklin See
3	Braveheart (DP 50-9407)	DLF Trifolium A/S	43	0312	Pickseed	83	JT-42	Jacklin See
4	Umbrella (DP 50-9411)	DLF Trifolium A/S	44	PSG-TTST	Smith Seed Services	84	JT-33	Jacklin See
5	Cannavaro (DP 50-9440)	DLF Trifolium A/S	45	Col-1	Pickseed	85	BGR-TF1	Berger Seed
6	Greenbrooks (TG 50-9460)	DLF Trifolium A/S	46	J-130	Pickseed	86	BGR-TF2	Berger Seed
*7	Plato	Olsen Seed Company	47	Corona (Col-M)	Pickseed	*87	Gazelle II (PST-5HP)	The Scott
*8	Lindbergh	Olsen Seed Company	48	Crossfire 3 (Col-J)	Pickseed	*88	Wolfpack II (PST-5HMB)	The Sc
*9	Aristotle	Olsen Seed Company	*49	Hunter	LESCO, Inc.	89	AST 7002	Allied Seed
*10	Einstein	Olsen Seed Company	*50	Biltmore	LESCO, Inc.	90	AST 7001	Allied Seed
*11	Silverado	Standard Entry	*51	Padre	LESCO, Inc.	*91	Darlington (CS-TF1)	Columbia S
*12	Monet (LTP-610 CL)	Lebanon Seaboard Corp.	*52	Magellan	LESCO, Inc.	92	KZ-1	KZ Seeds
*13	Cezanne R2 (LTP-CRL)	Lebanon Seaboard Corp.	53	Catylust (NA-BT-1)	LESCO, Inc.	*93	Renovate (LS-11)	LESCO, Inc.
*14	Van Gogh (LTP-RK2)	Lebanon Seaboard Corp.	54	Stetson II (NA-SS)	LESCO, Inc.	*94	Compete (LS-06)	LESCO, Inc.
15	Ninja 3 (ATF 1247)	Ampac Seed Company	55	Finelawn Xpress (RP 2)	ProSeeds Marketing	*95	Hudson (DKS)	Smith Seed
16	Cochise IV (RKCL)	Ampac Seed Company	56	Falcon NG (CE 1)	ProSeeds Marketing	*96	Reunion (LS-03)	LESCO, Inc.
17	RK 4	Pennington Seed Company	57	Shenandoah Elite (RK 6)	ProSeeds Marketing	97	GWTF	Grassland O
18	RK 5	Pennington Seed Company	58	Falcon V (ATM)	ProSeeds Marketing	98	KZ-2	KZ Seeds
19	GE-1	Pennington Seed Company	59	Shenandoah III (SH 3)	ProSeeds Marketing	*99	AST9002 (AST-2)	Allied Seed
20	SC-1	Lewis Seed Company	60	BAR Fa 6363	Barenbrug USA	*100	AST9001 (AST-3)	Allied Seed
21	ATF 1328	Lewis Seed Company	61	BAR Fa 6253	Barenbrug USA	101	RNP	Pennington
*22	Skyline	Burlingham Seeds	*62	Talladega (RP 3)	Columbia Seeds	102	AST1001 (AST-4)	Allied Seed
*23	Hemi	Burlingham Seeds	*63	Tahoe II	Columbia Seeds	103	AST 7003	Allied Seed
*24	Turbo RZ (Burl-TF8)	Burlingham Seeds	64	06-WALK	Oregro Seeds	*104	AST9003 (AST-1)	Allied Seed
*25	Turbo	Burlingham Seeds	*65	Escalade	Oregro Seeds	105	J-140	Pickseed
*26	Bullseye	Burlingham Seeds	66	06-DUST	Oregro Seeds	106	Pedigree (ATF-1199)	Pennington
27	Trio (IS-TF-152)	Ampac Seed Company	*67	Honky Tonk (RAD-TF17)	Radix Research	*107	Justice	Standard En
28	Sidewinder (IS-TF-138)	Ampac Seed Company	68	PSG-85QR	Pickseed Genetics	*108	Rebel IV	Standard En
29	Rocket (IS-TF-147)	DLF International Seeds	69	STR-8GRQR	Seed Research of Oregon	*109	3rd Millennium SRP	Turf Merch
30	Jamboree (IS-TF-128)	DLF International Seeds	70	PSG-82BR	Pickseed Genetics	*110	Traverse SPR (RK-1)	Turf Merch
*31	Toccoa (IS-TF-151)	Columbia Seeds	*71	Faith (K06-WA)	The Scotts Company	*111	Rhambler SRP (Rhambler)	Turf M
32	Terrier (IS-TF-135)	DLF International Seeds	72	GO-18FD	Grassland Oregon	*112	Firenza	Integra See
*33	Raptor II (MVS-TF-158)	Mountain View Seeds	*73	SR 8650 (STR-8LMM)	Seed Research of Oregon	*113	Falcon IV	Standard En
34	IS-TF-159	Grassland Oregon	74	STR-8BB5	Seed Research of Oregon			
35	Aggressor (IS-TF-153)	DLF International Seeds	*75	Tulsa Time (Tulsa III)	Seed Research of Oregon			
*36	Essential (IS-TF-154)	DLF International Seeds	76	PSG-RNDR	Smith Seed Services			
37	Fat Cat (IS-TF-161)	DLF International Seeds	77	PSG-TTRH	Smith Seed Services			
38	MVS-341	Mountain View Seeds	*78	Speedway (STR-8BPDx)	Seed Research of Oregon			
39	MVS-1107	Mountain View Seeds	*79	Rembrandt	Standard Entry			
*40	Titanium LS (MVS-BB-1)	Mountain View Seeds	80	JT-41	Jacklin Seed by Simplot			

* COMMERCIALY AVAILABLE IN THE USA IN 2009.

TABLE 9.

MEAN TURFGRASS QUALITY RATINGS OF TALL FESCUE CULTIVARS
GROWN AT TWO LOCATIONS 1/
IN THE PACIFIC REGION
2007 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CA6	WA3	MEAN	NAME	CA6	WA3	MEAN
*TRAVERSE SRP (RK-1)	7.1	4.7	5.9	JAMBOREE (IS-TF-128)	6.5	3.8	5.2
*FAITH (K06-WA)	7.1	4.6	5.8	*AST9003 (AST-1)	6.8	3.5	5.2
CATELYST (NA-BT-1)	6.8	4.7	5.7	*JUSTICE	6.4	3.9	5.2
*3RD MILLENNIUM SRP	7.1	4.4	5.7	ROCKET (IS-TF-147)	6.7	3.6	5.2
SHENANDOAH ELITE (RK 6)	7.2	4.3	5.7	BAR FA 6253	6.7	3.6	5.2
*MONET (LTP-610 CL)	7.5	3.9	5.7	SIDEWINDER (IS-TF-138)	6.8	3.5	5.1
*ESSENTIAL (IS-TF-154)	7.0	4.4	5.7	RNP	6.9	3.3	5.1
SC-1	7.0	4.3	5.7	BGR-TF1	6.6	3.7	5.1
*FIRENZA	6.7	4.5	5.6	JT-36	6.5	3.8	5.1
STR-8BB5	6.9	4.3	5.6	CANNAVARO (DP 50-9440)	7.1	3.1	5.1
RK 5	7.0	4.1	5.5	*REBEL IV	6.7	3.5	5.1
COCHISE IV (RKCL)	7.2	3.8	5.5	IS-TF-159	6.7	3.5	5.1
FALCON V (ATM)	7.2	3.8	5.5	*TITANIUM LS (MVS-BB-1)	6.2	4.0	5.1
RK 4	7.0	4.1	5.5	MVS-1107	6.3	3.8	5.1
*WOLFPACK II (PST-5WMB)	6.9	4.1	5.5	06-WALK	6.4	3.7	5.0
SHENANDOAH III (SH 3)	6.9	4.1	5.5	KZ-1	6.6	3.5	5.0
*SPEEDWAY (STR-8BPOX)	6.8	4.2	5.5	CORONA (COL-M)	6.5	3.6	5.0
*FIRECRACKER LS (MVS-MST)	7.0	3.8	5.4	PSG-85QR	6.4	3.7	5.0
*HEMI	6.6	4.2	5.4	JT-33	6.6	3.4	5.0
*VAN GOGH (LTP-RK2)	6.8	4.0	5.4	*COMPETE (LS-06)	6.5	3.5	5.0
*BULLSEYE	6.9	3.8	5.4	PEDIGREE (ATF-1199)	6.6	3.4	5.0
GO-1BFD	6.4	4.4	5.4	JT-45	6.5	3.4	5.0
*SPYDER LS (Z-2000)	6.9	3.8	5.4	*GAZELLE II (PST-5HP)	6.5	3.4	5.0
*SR 8650 (STR-8LMM)	6.6	4.1	5.4	BAR FA 6363	6.5	3.5	5.0
*RHAMBLER SRP (RHAMBLER)	6.2	4.5	5.4	TRIO (IS-TF-152)	6.4	3.6	5.0
AGGRESSOR (IS-TF-153)	6.9	3.8	5.3	FINELAWN XPRESS (RP 2)	6.2	3.8	5.0
J-140	6.4	4.2	5.3	FAT CAT (IS-TF-161)	6.7	3.2	4.9
*TURBO RZ (BURL-TF8)	6.7	3.9	5.3	*MAGELLAN	6.3	3.6	4.9
*MUSTANG 4 (M4)	6.7	3.9	5.3	NINJA 3 (ATF 1247)	6.6	3.3	4.9
*TALLADEGA (RP 3)	6.7	3.9	5.3	UMBRELLA (DP 50-9411)	6.5	3.3	4.9
PSG-82BR	6.3	4.3	5.3	*BILTMORE	6.6	3.2	4.9
*PADRE	6.5	4.1	5.3	PSG-TTRH	6.5	3.3	4.9
GREENBROOKS (TG 50-9460)	6.7	3.8	5.3	*SILVERADO	5.8	3.9	4.9
*SKYLINE	6.5	3.9	5.2	MVS-341	6.3	3.4	4.9
*CEZANNE RZ (LTP-CRL)	6.4	4.0	5.2	J-130	6.5	3.3	4.9
*FALCON IV	6.5	4.0	5.2	*TOCCOA (IS-TF-151)	6.6	3.2	4.9
*TURBO	6.8	3.6	5.2	KZ-2	6.7	3.0	4.9
*ESCALADE	6.7	3.7	5.2	*DARLINGTON (CS-TF1)	6.4	3.3	4.9
*RAPTOR II (MVS-TF-158)	6.9	3.5	5.2	*PLATO	6.4	3.3	4.8
FALCON NG (CE 1)	6.6	3.8	5.2	*EINSTEIN	6.3	3.4	4.8
GE-1	6.5	3.8	5.2	06-DUST	6.4	3.3	4.8
*RENOVATE (LS-11)	7.0	3.4	5.2	JT-42	6.3	3.4	4.8
BRAVEHEART (DP 50-9407)	6.7	3.7	5.2	STETSON II (NA-SS)	6.3	3.4	4.8
*AST9002 (AST-2)	6.9	3.4	5.2	*AST9001 (AST-3)	6.2	3.5	4.8
				AST1001 (AST-4)	6.4	3.3	4.8

* AVAILABLE IN 2009

TABLE 9. MEAN TURFGRASS QUALITY RATINGS OF TALL FESCUE CULTIVARS
(CONT'D) GROWN AT TWO LOCATIONS 1/
IN THE PACIFIC REGION
2007 DATA

TURFGRASS QUALITY RATINGS 1-9; 9=IDEAL TURF 2/

NAME	CA6	WA3	MEAN
COL-1	6.3	3.4	4.8
*LINDERBERGH	6.4	3.2	4.8
0312	6.6	2.9	4.8
*REMBRANDT	6.2	3.4	4.8
AST 7002	6.4	3.1	4.8
ATF 1328	6.3	3.2	4.8
AST 7003	6.2	3.4	4.8
PSG-TTST	5.9	3.6	4.7
JT-41	6.0	3.5	4.7
*REUNION (LS-03)	6.4	3.1	4.7
*ARISTOTLE	6.2	3.3	4.7
BGR-TF2	6.2	3.2	4.7
TERRIER (IS-TF-135)	6.2	3.1	4.7
STR-8GRQR	6.2	3.2	4.7
*TAHOE II	6.2	3.2	4.7
CROSSFIRE 3 (COL-J)	6.2	3.1	4.6
*HONKY TONK (RAD-TF17)	6.1	3.1	4.6
AST 7001	6.1	3.1	4.6
*HUDSON (DKS)	6.0	3.2	4.6
PSG-RNDR	6.2	3.0	4.6
*TULSA TIME (TULSA III)	5.9	3.2	4.6
GWTF	6.0	3.1	4.5
*HUNTER	6.0	3.1	4.5
*KY-31	3.5	3.3	3.4
LSD VALUE	0.6	0.6	0.4
C.V. (%)	5.6	10.4	7.3

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).

2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

* AVAILABLE IN 2009

TABLE 35. PERCENT POA ANNUA RATINGS OF TALL FESCUE CULTIVARS 1/
2008 DATA 2/

NAME	WA3	NAME	WA3
CANNAVARO (DP 50-9440)	40.0	PSG-RNDR	26.7
GWTF	36.7	*RAPTOR II (MVS-TF-158)	26.7
O6-DUST	33.3	ROCKET (IS-TF-147)	26.7
AST 7002	33.3	*SILVERADO	26.7
*FIRECRACKER LS (MVS-MST)	33.3	STETSON II (NA-SS)	26.7
JT-41	33.3	STR-BGROR	26.7
TERRIER (IS-TF-135)	33.3	*TITANIUM LS (MVS-BB-1)	26.7
AST 7001	30.0	J-130	25.0
ATF 1328	30.0	SIDEWINDER (IS-TF-138)	25.0
BGR-TF2	30.0	*SPEEDWAY (STR-8BPD)	25.0
*DARLINGTON (CS-TF1)	30.0	*SPYDER LS (Z-2000)	25.0
FINELAWN XPRESS (RP 2)	30.0	AGGRESSOR (IS-TF-153)	23.3
*HUNTER	30.0	BRAVEHEART (DP 50-9407)	23.3
JT-33	30.0	COCHISE IV (RKCL)	23.3
KZ-2	30.0	CORONA (COL-M)	23.3
*MONET (LTP-610 CL)	30.0	GE-1	23.3
PSG-TTST	30.0	JT-36	23.3
*REMBRANDT	30.0	*LINDBERGH	23.3
*RENOVATE (LS-11)	30.0	NINJA 3 (ATF 1247)	23.3
*REUNION (LS-03)	30.0	*PLATO	23.3
*TULSA TIME (TULSA III)	30.0	PSG-TTRH	23.3
*CEZANNE RZ (LTP-CRL)	28.3	RK 5	23.3
FAT CAT (IS-TF-161)	28.3	RNP	23.3
*HUDSON (DKS)	28.3	STR-8BBS	23.3
JAMBOREE (IS-TF-128)	28.3	*TAHOE II	23.3
*TOCCOA (IS-TF-151)	28.3	*TURBO	23.3
O312	26.7	UMBRELLA (DP 50-9411)	23.3
AST1001 (AST-4)	26.7	*VAN GOGH (LTP-RK2)	23.3
AST9002 (AST-2)	26.7	*WOLFPACK II (PST-5WMB)	23.3
*AST9003 (AST-1)	26.7	AST 7003	21.7
BGR-TF1	26.7	*AST9001 (AST-3)	21.7
COL-1	26.7	J-140	21.7
*COMPETE (LS-06)	26.7	TRIO (IS-TF-152)	21.7
*CROSSFIRE 3 (COL-J)	26.7	*ARISTOTLE	20.0
*ESCALADE	26.7	BAR FA 6363	20.0
*GAZELLE II (PST-SHP)	26.7	*BILTHORE	20.0
*HONKY TONK (RAD-TF17)	26.7	*BULLSEYE	20.0
IS-TF-159	26.7	*EINSTEIN	20.0
JT-42	26.7	FALCON IV	20.0
JT-45	26.7	FALCON NG (CE 1)	20.0
MVS-1107	26.7	*HEMI	20.0
PEDIGREE (ATF-1199)	26.7	*JUSTICE	20.0
PSG-850R	26.7	KZ-1	20.0
		*WAGELLAN	20.0

TABLE 35. PERCENT POA ANNUA RATINGS OF TALL FESCUE CULTIVARS 1/
(CONT'D)
2008 DATA 2/

NAME	WAS
PSG-82BR	20.0
KTALLADEGA (RP 3)	20.0
*TURBO RZ (BURL-TF8)	20.0
OG-WALK	18.3
*3RD MILLENNIUM SRP	18.3
*ESSENTIAL (IS-TF-154)	18.3
*KY-31	18.3
*REBEL IV	18.3
RK 4	18.3
SHENANDOAH ELITE (RK 6)	18.3
FALCON V (ATM)	16.7
*FIRENZA	16.7
GREENBROOKS (TG 50-9460)	16.7
MVS-341	16.7
*PADRE	16.7
SC-1	16.7
SHENANDOAH III (SH 3)	16.7
*SKYLINE	16.7
BAR FA 6253	15.0
CATELYST (NA-BT-1)	15.0
*MUSTANG 4 (M4)	15.0
*FAITH (KOG-WA)	13.3
GO-18FD	13.3
*SR 8650 (STR-GLMM)	13.3
*TRAVERSE SRP (RK-1)	13.3
*RHAMBLER SRP (RHAMBLER)	6.7
LSD VALUE	11.7
C.V. (%)	30.6

1/ TO DETERMINE STATISTICAL DIFFERENCES AMONG ENTRIES, SUBTRACT ONE ENTRY'S MEAN FROM ANOTHER ENTRY'S MEAN. STATISTICAL DIFFERENCES OCCUR WHEN THIS VALUE IS LARGER THAN THE CORRESPONDING LSD VALUE (LSD 0.05).
2/ C.V. (COEFFICIENT OF VARIATION) INDICATES THE PERCENT VARIATION OF THE MEAN IN EACH COLUMN.

* AVAILABLE IN 2009

APPENDIX 5

2008 Annual Bluegrass Fertility Trial

Oregon State University

Rob Golembiewski, Assistant Professor
Tom Cook, Professor Emeritus
Brian McDonald, Research Assistant

NTA Final Report

June 9, 2009

OBJECTIVE

By using balanced NPK + micros applied at a low rate (3.25 lbs N/1,000 sq ft/yr) or a high rate (6.5 lbs N/1,000 sq ft/yr), we are trying to determine if total annual NPK with or without added calcium, sulfur, or humates has any measurable impact on putting green turf quality, *Microdochium* patch disease, anthracnose disease, and/or turf species composition.

Note: This trial was initiated in 2006. A detailed review of this trial (including soil test values) from initiation through the end of 2008 is available on the OSU website found at the following link:

http://hort.oregonstate.edu/research_extension/turf_management/research_reports

Scroll down to the middle of the page under the heading:

**2008 Oregon State University/Washington State University
Turfgrass Field Day Reports**

Click on: Annual Bluegrass Fertility Trial 2006 – 2008

MATERIALS AND METHODS

A 90/10 greens grade sand/organic mix 12" deep was placed over a previously prepared native soil sub-surface and was planted in April of 2004 with aerifier plugs taken from greens at Corvallis Country Club. The grass was approximately 80% annual bluegrass and 20% Penn A-4 creeping bentgrass. The area was fertilized as needed during 2004 to develop functional putting turf. Maintenance fertilizer applications are made every two weeks as liquid sprays. Lime and gypsum (Huma Cal & Huma Phos) are applied twice a year after coring in granular form.

Turf was mowed at 0.100" five days a week during the spring and summer season and 0.130" during the winter season. Irrigation is applied as needed to produce healthy turf that is on the dry side. Coring and heavy topdressing is performed twice annually in spring and fall. Light sand topdressings are applied every other week during the spring, summer, and fall and approximately monthly during the winter. In the spring of 2008, all plots were verti-grooved with a Graden verticut machine to a depth of 1 inch in April to reduce the development of layering.

Fertilizer treatments were initiated in 2005 and are slated to continue for a minimum of 5 years or longer if funds are available to continue. Details for the fertilizer treatments are outlined below:

Trial 1: Low Nitrogen (Pounds of Ingredients/1,000 sq ft/yr)

Trt #	N	P ₂ O ₅	K ₂ O	Monthly Sulfur	Biannual Sulfate*	Ca	Humates
1	3.25	0.6	2.1	0.00	0	0	0
2	3.25	0.6	2.1	0.00	0	8.75	0
3	3.25	0.6	2.1	0.00	1.25	4.50	8.75
4	3.25	0.6	2.1	0.00	1.25	5.00	3.50
5	3.25	0.6	2.1	1.50	0	0	0
6	3.25	0.6	2.1	1.50	0	8.75	0
7	3.25	0.6	2.1	1.50	1.25	4.50	8.75
8	3.25	0.6	2.1	1.50	1.25	5.00	3.50
9	3.25	0.6	2.1	3.00	0	0	0
10	3.25	0.6	2.1	3.00	0	8.75	0
11	3.25	0.6	2.1	3.00	1.25	4.50	8.75
12	3.25	0.6	2.1	3.00	1.25	5.00	3.50

Trial 2: High Nitrogen (Pounds of Ingredients/1,000 sq ft/yr)

Trt #	N	P ₂ O ₅	K ₂ O	Monthly Sulfur	Biannual Sulfate*	Ca	Humates
1	6.5	1.2	4.2	0.00	0	0	0
2	6.5	1.2	4.2	0.00	0	8.75	0
3	6.5	1.2	4.2	0.00	1.25	4.50	8.75
4	6.5	1.2	4.2	0.00	1.25	5.00	3.50
5	6.5	1.2	4.2	1.50	0	0	0
6	6.5	1.2	4.2	1.50	0	8.75	0
7	6.5	1.2	4.2	1.50	1.25	4.50	8.75
8	6.5	1.2	4.2	1.50	1.25	5.00	3.50
9	6.5	1.2	4.2	3.00	0	0	0
10	6.5	1.2	4.2	3.00	0	8.75	0
11	6.5	1.2	4.2	3.00	1.25	4.50	8.75
12	6.5	1.2	4.2	3.00	1.25	5.00	3.50

* The sulfate comes from gypsum in Huma Cal and Huma Phos.

OBSERVATIONS AND RESULTS THROUGH 2007

Important Note: Because of space limitations, nitrogen treatments were not replicated. Therefore, comments comparing the High N Trial with the Low N Trial are only observations and are not statistically supported.

- The original low rate of nitrogen (3.25 lbs N/1,000 sq ft/yr) was too low to produce an adequate stand of turf on the new sand based root zone. During 2005 and 2006, the low fertility plots received additional nitrogen to enhance turf cover and increase competition with moss. The minimum rate of nitrogen to produce a functional putting turf on a new sand based root zone appears to be about 4.5 lbs of N/1,000 sq ft/yr. As of 2007, the standard application rate of nitrogen has been dropped back down to approximately 3.25 lbs of N/1,000 sq ft/yr. The high nitrogen plots are receiving 6.5 lbs of N/1,000 sq ft/yr.
- Turf quality has been higher in the high nitrogen plots and usually rates about one whole point higher. Low nitrogen plots are plagued with silvery thread moss but high nitrogen plots are largely moss free.
- *Microdochium* patch has been more severe on the high nitrogen plots than on the low nitrogen plots.
- In the high nitrogen plots, *Microdochium* patch disease increased on plots receiving supplemental lime at 8.75 lbs Ca/1,000 sq ft/yr. In general, increasing sulfur resulted in less *Microdochium* patch disease.
- There have been no apparent impacts from the humates thus far.
- Under low nitrogen fertilization with higher levels of calcium, there appears to be an increase in the percentage of bentgrass in treated plots.

2008 RESULTS

Note: The 2008 data was analyzed for main effects and interactions between sulfur and calcium. An interaction occurs, for example, when for a given calcium treatment, different disease severity is observed based on the rate of sulfur applied. As an example, in 2008 we have seen, on plots treated with lime, a decrease in *Microdochium* patch disease when sulfur was applied.

MICRODOCHIUM PATCH SEVERITY

In the High N Trial, there was an interaction between calcium treatments and sulfur treatments on all three rating dates – February, October, and November. The plots treated with lime had an increase in *Microdochium* patch disease, but when sulfur was applied at the medium or high rate, there was less disease. However, the plots treated with lime and sulfur still had more disease than plots that did not receive any calcium applications.

On plots treated with lime and sulfur, there was no decrease in disease when the rate of sulfur increased from the medium to the high rate. Sulfur additions did not decrease *Microdochium* patch disease on plots treated with Huma Phos (calcium sulfate).

On plots that did not receive any calcium, the high rate of sulfur decreased *Microdochium* patch disease, but only on the February rating date.

ANTHRACNOSE SEVERITY

Calcium and sulfur did not interact to affect anthracnose severity. However, in the High N Trial, plots treated with any calcium source had less anthracnose disease than plots that did not receive calcium. Surprisingly, higher sulfur rates did not increase anthracnose disease.

In the Low N Trial, plots treated with lime or Huma Cal (mix of lime and calcium sulfate) had less disease than plots treated with Huma Phos (calcium sulfate). However, unlike the High N Trial, plots treated with lime and Huma Cal were not statistically better than plots receiving no calcium. The explanation may be that the anthracnose pressure was too low to bring out any differences.

After one year's worth of anthracnose data, it is too early to recommend calcium treatments as a way to reduce anthracnose disease; especially given that the data shows a large increase in *Microdochium* patch disease when lime is applied.

PLOT QUALITY

There were two months – May and June – where the plots were not significantly affected by either *Microdochium* patch or anthracnose disease. During these two months there were no statistical differences in plot quality.

OBSERVATIONS (NOT SUPPORTED BY STATISTICS) AND COMMENTS

- In February 2008, *Microdochium* patch was similar in both high and low nitrogen plots. This outcome may reflect the enhanced turf quality in low nitrogen plots caused by the increase in base nitrogen levels.
- We continue to see that *Microdochium* patch disease increases when higher rates of nitrogen are applied.
- For the first time in the trial, anthracnose symptoms developed in the summer of 2008. A likely reason for the anthracnose was extremely low mowing heights throughout the summer (0.100") and no fertilizer applications from June 17th through August 23rd. These cultural practices were intentional and performed to encourage anthracnose development. However, this approach may have minimized the High N/Low N differences, and may have been responsible for the result that the high nitrogen plots had more anthracnose than the low nitrogen plots. It is possible that the moratorium on fertilizer applications during the summer impacted the high nitrogen plots more because they were used to regular, high nitrogen applications and the subsequent cessation of nitrogen was a bigger change, and thus more stress, than for the low nitrogen plots. The key to minimizing anthracnose may be consistent fertilizer applications throughout the summer rather than focusing on total annual nitrogen rates.
- Plots treated with lime had healthier turf during July and August. However, because of the presence of anthracnose, the plot quality ratings did not reflect this fact.

SUMMARY

Although the nitrogen levels were not replicated in this trial, given our results in the last 3 years, it seems safe to say that lower nitrogen applications decrease *Microdochium* patch disease, especially when lime is applied. However, as the *Microdochium* patch data on February 14, 2008 shows, lower rates of nitrogen do not completely prevent the infection, but may reduce the number of fungicide applications necessary.

Additionally, if lime is being applied for cultural reasons, sulfur applications can substantially decrease *Microdochium* patch disease, but not below the disease level that would have occurred had lime not been applied.

Therefore, the overall strategy to decrease *Microdochium* patch disease would be to:

1. limit fertilizer applications in late summer to the minimum necessary to allow the aerification holes to heal,
2. minimize fertilizer applications during fall, winter, and spring,
3. apply sulfur monthly at rates of 0.125 lbs of elemental sulfur per 1,000 sq. ft., or as an alternate strategy, apply a rate of 0.25 lbs of elemental sulfur per 1,000 sq. ft. for the 6 month period from September through March.

Surprisingly, monthly sulfur applications did not increase anthracnose disease. Given that we have heard many reports from superintendents indicating that high rates of sulfur increase anthracnose, it may be that our sulfur rates are not high enough to cause this effect.

In the High N Trial, we did see that all calcium applications reduced anthracnose disease which was a surprise. However, in the Low N Trial, an increase in anthracnose disease occurred on the plots that received Huma Phos (calcium sulfate). There were no differences in anthracnose disease between the untreated plots and the plots treated with either lime or Huma Cal (mix of calcium carbonate and calcium sulfate). Hopefully, the 2009 results will help clear up this confusion.

TRIAL PLANS FOR 2009

The trial for 2009 has been reconfigured. First, because the late summer anthracnose injury was interfering with *Microdochium* patch ratings in the fall, we decided to use one nitrogen rate (4.5 lbs N/1,000 sq ft./yr) and split the green by disease. Additionally, because Huma Cal and Huma Phos were no longer available from our supplier, we replaced these products with gypsum and Cal Phos, which do not have humates in them (we have not seen any effects from humates after 3 years). The Cal Phos is straight calcium phosphate and does not have gypsum in it.

SOURCE MATERIALS:

Soluble fertilizer is applied every two weeks except as noted during the summer.

- Basic N-P₂O₅-K₂O from Andersons 28-5-18 water soluble sprayable product with B (0.02%), Cu (0.07%), Fe (0.10%), Mn (0.05%), and Zn (0.05%)

Sulfur applied monthly from elemental sulfur – 3 Rates:

- No Sulfur (Treatments 1- 4)
- 0.125 lbs elemental sulfur per month (Treatments 5 – 8)
- 0.25 lbs of elemental sulfur per month (Treatments 9-12)

Calcium Products applied twice a year with coring at 12.5 lbs product per 1,000 sq. ft.

- Calcium from calcium carbonate (lime) (35% Ca)
- Huma Cal (18% Ca from gypsum and lime, 5 % Sulfur, 35 % humic substances)
- Huma Phos (5% P_2O_5 , 20% Ca from gypsum, 5% sulfur, 10% SiO_2 , 14% humic substances)

ACKNOWLEDGEMENTS:

We would like to thank the Western Canada Turfgrass Association and the Northwest Turfgrass Association for their continuing financial support of this trial. We would also like to thank Walrath Sand Products for donating the greens mix.

MICRODOCHIUM PATCH TABLES

Table 1: High N Trial - Percent *Microdochium* Patch (2/14/08)

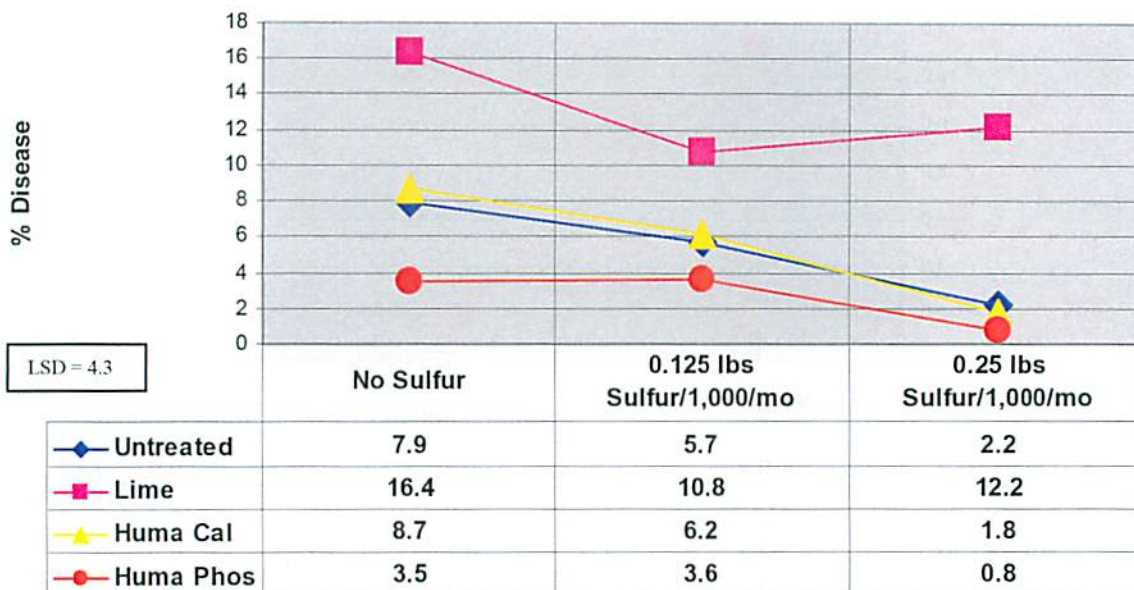


Table 2: Low N Trial - Percent *Microdochium* Patch (2/14/08)

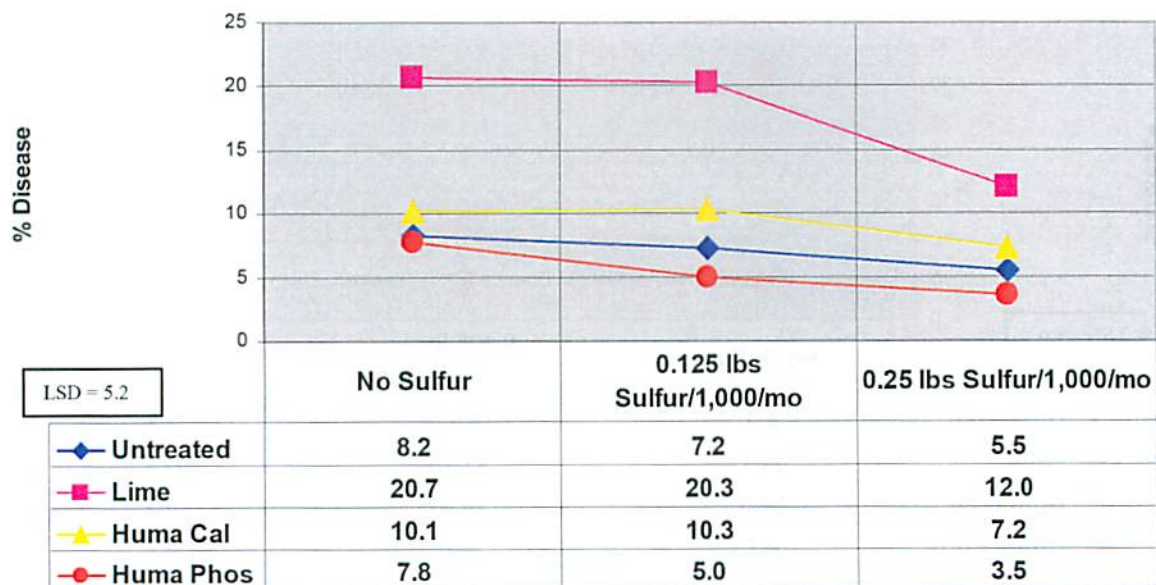


Table 3: High N Trial - Percent *Microdochium* Patch (10/6/08)

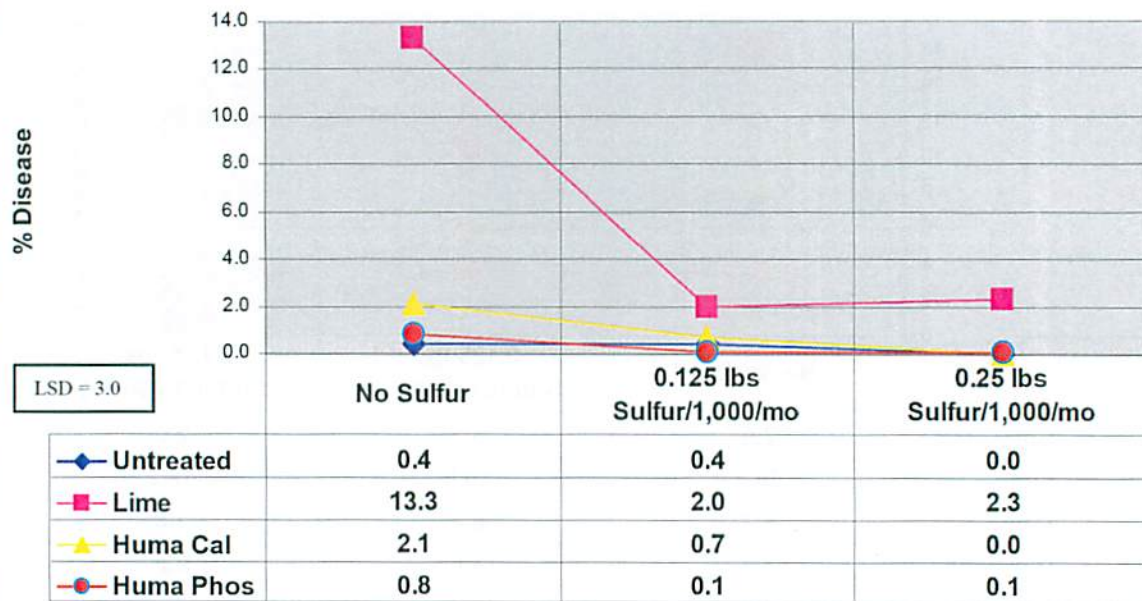
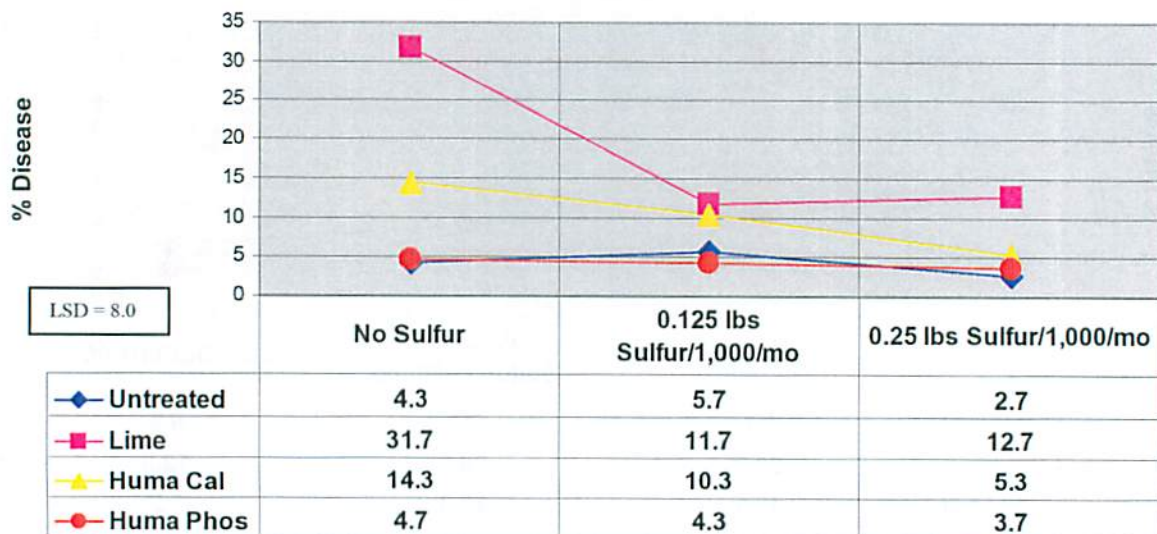


Table 4: High N Trial - Percent *Microdochium* Patch (11/14/08)



ANTHRACNOSE TABLES

Table 5: High N Trial - Percent Anthracnose (9/9/08)

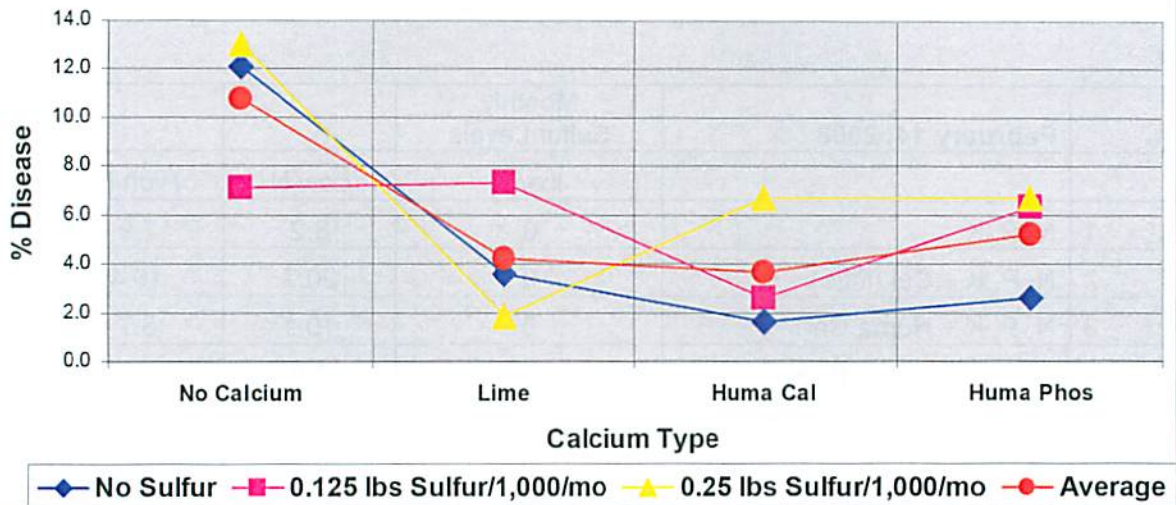
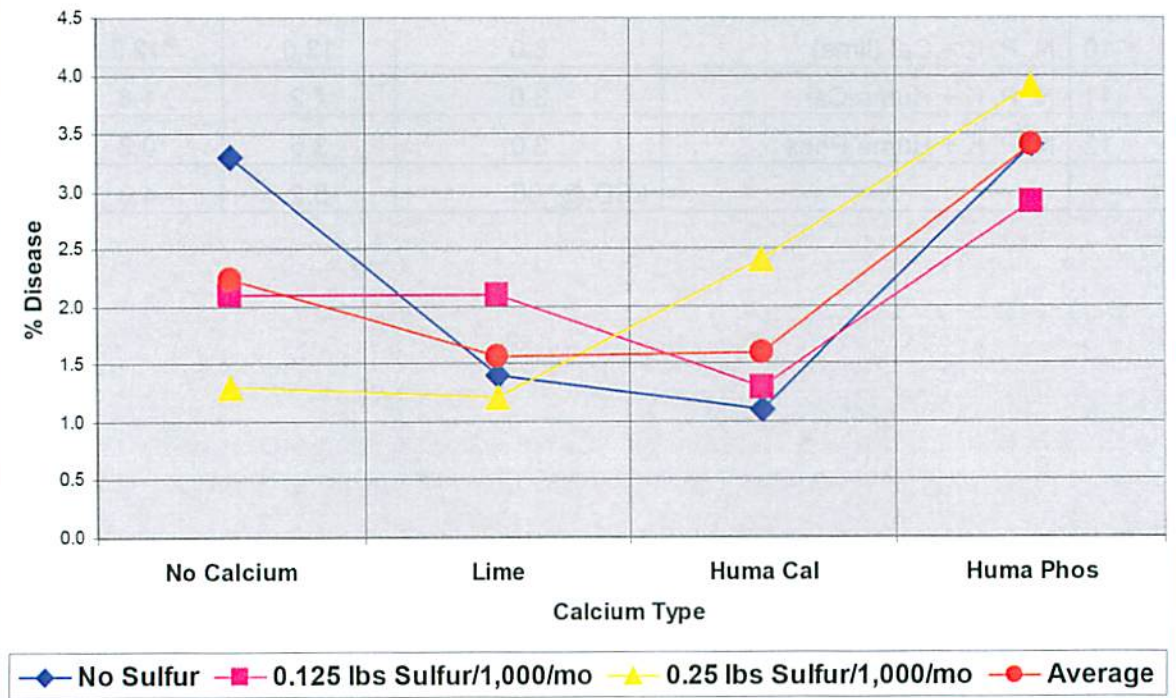


Table 6: Low N Trial - Percent Anthracnose (9/9/08)



SUPPLEMENTAL INFORMATION

High N Trial vs. Low N Trial Comparisons

Note: Nitrogen rates were not replicated so differences between Low N and High N have not been statistically tested.

Percent *Microdochium* patch

	February 14, 2008	Monthly Sulfur Levels		
		lbs/yr	Low N	High N
1	N, P, K	0	8.2	7.9
2	N, P, K + Cal (lime)	0	20.7	16.4
3	N, P, K + Huma Cal	0	10.1	8.7
4	N, P, K + Huma Phos	0	7.8	3.5
5	N, P, K	1.5	7.2	5.7
6	N, P, K + Cal (lime)	1.5	20.3	10.8
7	N, P, K + Huma Cal	1.5	10.3	6.2
8	N, P, K + Huma Phos	1.5	5.0	3.6
9	N, P, K	3.0	5.5	2.2
10	N, P, K + Cal (lime)	3.0	12.0	12.2
11	N, P, K + Huma Cal	3.0	7.2	1.8
12	N, P, K + Huma Phos	3.0	3.5	0.8
		LSD @ .05	5.2	4.3

SUPPLEMENTAL INFORMATION

High N Trial vs. Low N Trial Comparisons

Note: Nitrogen rates were not replicated so differences between Low N and High N have not been statistically tested.

Percent *Microdochium* patch

	October 6, 2008	Monthly Sulfur Levels		
		lbs/yr	Low N	High N
1	N, P, K	0	0.0	0.4
2	N, P, K + Cal (lime)	0	0.1	13.3
3	N, P, K + Huma Cal	0	0.8	2.1
4	N, P, K + Huma Phos	0	0.0	0.8
5	N, P, K	1.5	0.0	0.4
6	N, P, K + Cal (lime)	1.5	0.0	2.0
7	N, P, K + Huma Cal	1.5	0.0	0.7
8	N, P, K + Huma Phos	1.5	0.0	0.1
9	N, P, K	3.0	0.0	0.0
10	N, P, K + Cal (lime)	3.0	0.0	2.3
11	N, P, K + Huma Cal	3.0	0.0	0.0
12	N, P, K + Huma Phos	3.0	0.0	0.1
		LSD @ .05	ns	3.0

*ns = not significant

SUPPLEMENTAL INFORMATION

High N Trial vs. Low N Trial Comparisons

Note: Nitrogen rates were not replicated so differences between Low N and High N have not been statistically tested.

Percent *Microdochium* patch

	November14, 2008	Monthly Sulfur Levels		
		lbs/yr	Low N	High N
1	N, P, K	0	.9	4.3
2	N, P, K + Cal (lime)	0	.8	31.7
3	N, P, K + Huma Cal	0	1.5	14.3
4	N, P, K + Huma Phos	0	1.1	4.7
5	N, P, K	1.5	.8	5.7
6	N, P, K + Cal (lime)	1.5	1.0	11.7
7	N, P, K + Huma Cal	1.5	1.5	10.3
8	N, P, K + Huma Phos	1.5	1.5	4.3
9	N, P, K	3.0	1.1	2.7
10	N, P, K + Cal (lime)	3.0	1.7	12.7
11	N, P, K + Huma Cal	3.0	.9	5.3
12	N, P, K + Huma Phos	3.0	.8	3.7
		LSD @ .05	ns	8.0

*ns = not significant

SUPPLEMENTAL INFORMATION

High N Trial vs. Low N Trial Comparisons

Note: Nitrogen rates were not replicated so differences between Low N and High N have not been statistically tested.

Percent Anthracnose

	September 9, 2008	Monthly Sulfur Additions		
		lbs/yr	Low N	High N
1	N, P, K	0	3.3	12.1
2	N, P, K + Cal	0	1.4	3.6
3	N, P, K + Huma Cal	0	1.1	1.6
4	N, P, K + Huma Phos	0	3.4	2.6
5	N, P, K	1.5	2.1	7.1
6	N, P, K + Cal	1.5	2.1	7.3
7	N, P, K + Huma Cal	1.5	1.3	2.6
8	N, P, K + Huma Phos	1.5	2.9	6.3
9	N, P, K	3.0	1.3	13.0
10	N, P, K + Cal	3.0	1.2	1.8
11	N, P, K + Huma Cal	3.0	2.4	6.7
12	N, P, K + Huma Phos	3.0	3.9	6.7
		LSD @ .05	2.3	7.7

APPENDIX 6

2008 CTBT Perennial Ryegrass Evaluation Trials, Goss Farm WSU-Puyallup

Dr. Gwen K. Stahnke and Richard Bembenek

In September, 2007, the plot area of Puyallup silt loam at the Goss Research Facility was sprayed with glyphosate, stripped, tilled and fumigated with Basamid to prepare the area for planting a new perennial ryegrass evaluation sponsored by the Cooperative Turfgrass Breeders of Oregon.

Plots were set up as 4 ft. x 6 ft. individual plots and replicated three times in a randomized complete block (RCBD). The data for the fall of 2007 and most of 2008 is listed in the charts on the next two pages. Even with the plot area being fumigated to limit the population of annual bluegrass that would compete with the new perennial ryegrass trial, the pressure from annual bluegrass was very high. In 2009, there is now a significant amount of annual bluegrass invasion all along the edges and throughout the entire set of perennial ryegrass plots.

Unfortunately, in December of 2008, we had a drive that was under the influence drive through our fencing and come through the third replication of the CTBT Perennial Ryegrass trial, which meant that we could not include the third replication in our ratings for the last year of the trial, as the 10 or so plots that the truck spun its tires through could not be put back to their original form to be evaluated.

For more information on all the trials held throughout the US go to:
www.ctbt-us.info

CTBT, 2007 Trial
Perennial Ryegrass Turf Trial
Location: Puyallup, Washington
Cooperator: Dr. Gwan Slahne

2008 Data

		Subjective Ratings										
SPONSOR	CULTIVAR	Percent Establishment 10 days	Establishment 8 weeks	Leaf Spot	Winter Diseases	Percent Poa annua	Density	Genetic Color 2007	Genetic Color 2008	Average Genetic Color 2007- 2008	Average Winter Turf Quality	Average Turf Quality
NexGen	Applaud II	56.97	5.33	4.67	4.33	4.00	8.33	6.67	8.00	7.33	5.00	6.07
NexGen	APR1985	73.33	4.67	5.00	4.67	6.67	7.33	6.00	7.33	6.67	4.80	5.83
Rutgers	GL-31	78.67	5.00	4.33	3.67	5.67	7.00	7.00	7.67	7.33	4.33	5.83
NexGen	APR2013	70.00	5.33	3.67	4.33	5.00	7.67	7.67	8.33	8.00	4.53	5.70
DLF-IS	Alt-Sior 3	73.33	7.33	4.33	4.00	6.67	7.33	7.33	7.33	7.33	4.67	5.53
PST	Manhattan 5 GLR	70.00	5.00	3.33	4.00	4.00	7.33	6.33	7.33	6.83	4.27	5.50
PST	PST-2TSE	66.67	5.00	4.67	4.33	4.67	7.00	5.67	6.00	5.83	4.67	5.47
DLF-IS	IS-PR 377	63.33	6.67	4.33	3.67	11.67	8.00	7.00	8.00	7.50	4.47	5.43
NexGen	APR2037	63.33	9.33	4.33	6.00	8.33	7.33	7.33	8.00	7.67	5.27	5.40
PST	PST-2NKM	73.33	5.00	3.67	4.00	6.67	8.33	6.67	7.00	6.83	4.33	5.40
DLF-IS	MBH2	80.00	5.33	3.33	3.33	5.00	7.00	5.67	6.33	6.00	4.13	5.40
Rutgers	Jet	80.00	5.00	4.33	4.00	5.67	7.00	6.33	6.67	6.50	4.60	5.33
Rutgers	APR1666	66.67	8.33	4.33	5.33	10.00	7.00	7.00	7.33	7.17	5.07	5.30
NexGen	APR2036	53.33	7.00	5.33	4.67	5.67	7.67	7.67	7.33	7.50	5.40	5.27
PSG	Zoom	76.67	7.00	4.67	5.33	10.87	7.33	7.67	7.67	7.67	4.87	5.27
PST	PST-2SHS	76.67	5.67	3.67	3.67	9.00	7.33	6.33	6.67	6.50	4.07	5.27
PST	PST-2MNG	76.67	5.33	4.00	3.33	5.00	7.00	6.67	7.67	7.17	4.13	5.23
NexGen	APR2026	56.67	6.00	4.33	4.33	8.33	7.33	7.00	6.67	6.83	4.73	5.17
NexGen	Applaud	70.00	7.00	3.67	3.00	11.67	7.33	7.00	7.33	7.17	4.13	5.17
Rutgers	1GSquared	66.67	5.67	4.00	3.07	5.67	8.33	7.67	7.67	7.67	4.53	5.17
PST	PST-2GSB	70.00	5.33	4.00	4.67	10.00	7.00	7.00	7.67	7.33	4.80	5.17
DLF-IS	IS-PR 381	63.33	6.67	4.33	4.33	7.33	7.67	7.67	7.67	7.67	4.40	5.13
NexGen	APR1977	66.67	5.33	4.67	4.33	7.33	8.00	6.33	6.67	6.50	5.53	5.10
NexGen	APR2038	63.33	5.00	5.00	5.00	8.33	7.67	7.00	7.33	7.17	4.67	5.10
NexGen	APR2035	30.00	6.33	4.33	4.33	10.00	8.00	7.33	7.33	7.33	5.07	5.07
Rutgers	Paragon GLR	70.00	5.67	4.33	4.67	10.00	7.33	6.67	7.33	7.00	4.40	5.07
Rutgers	Prelude IV	63.33	6.33	4.00	4.33	8.33	7.33	7.00	7.33	7.17	4.47	5.07
PST	PST-2AG4	70.00	6.67	4.00	3.33	6.67	7.33	7.67	7.00	7.33	4.53	5.07
DLF-IS	IS-PR 342	70.00	6.33	4.00	4.33	9.00	7.67	8.00	8.33	8.17	4.67	5.07
Rutgers	Pizzazz	56.67	6.67	3.33	4.00	9.00	8.00	6.00	7.33	7.67	4.53	5.00
PSG	A01PR Bulk	70.00	6.33	2.67	2.67	8.33	6.67	7.33	9.00	8.17	3.93	5.00
PST	PST-2NKMS	60.00	6.00	4.33	4.33	8.33	7.33	6.33	7.33	6.83	4.67	5.03
PSG	Penguin 2	70.00	5.00	3.33	3.33	6.67	6.67	6.00	7.00	6.50	4.07	4.97
NexGen	APR2033	56.67	6.33	6.00	6.33	10.00	7.67	7.33	7.32	7.33	5.47	4.93
PSG	Dasher 3	70.00	6.67	4.00	3.33	8.33	8.00	7.67	8.33	8.00	4.73	4.93
PSG	SR 45 AB	53.33	4.33	3.33	3.67	10.00	7.33	5.33	6.00	5.67	4.33	4.93
NexGen	APR2096	80.00	6.00	3.67	4.00	8.33	8.67	8.00	8.00	8.00	4.60	4.90
NexGen	APR2025	63.33	6.33	4.33	4.33	18.33	6.33	7.33	7.00	7.17	4.60	4.90
PSG	Calypso III	63.33	6.33	3.00	3.00	10.00	7.00	7.67	7.67	7.67	4.20	4.90
NexGen	APR2089	66.67	6.00	4.67	4.33	10.00	7.33	7.33	7.33	7.33	5.07	4.87
NexGen	APR1980	63.33	6.67	5.00	13.33	10.00	8.00	7.67	7.33	7.50	4.67	4.87
Rutgers	HP-1	70.00	6.33	4.67	5.07	8.33	7.00	6.67	7.67	7.17	4.80	4.87
PST	PST-2J15	73.33	5.67	3.00	3.00	7.33	6.33	6.67	7.67	7.17	3.87	4.87
PST	PST-2TQL	56.67	5.33	3.33	3.00	8.33	7.67	6.67	8.00	7.33	3.73	4.87
DLF-IS	IS-PR 341	66.67	7.00	4.33	3.67	10.00	7.67	7.67	9.00	8.33	4.53	4.87
NexGen	APR2690	56.67	5.67	4.00	4.00	11.67	7.33	7.00	7.33	7.17	4.47	4.93
NexGen	Cutter	73.33	4.67	4.00	4.00	10.00	7.33	5.00	6.00	5.50	4.60	4.83
NexGen	APR1978	63.33	5.33	5.00	4.87	10.00	7.67	7.00	7.33	7.17	5.13	4.83
PST	PST-Syn-2US7	50.00	5.67	4.00	4.00	11.67	6.33	7.33	7.67	7.50	4.60	4.83
PST	PST-2USD	60.00	5.33	3.33	3.67	10.00	6.67	6.33	8.33	7.33	3.93	4.80
Rutgers	Palmar V	73.33	6.67	4.67	5.00	8.33	8.00	6.67	7.33	7.00	4.87	4.77
Rutgers	Protege GLR	73.33	6.67	5.67	4.00	8.33	7.00	7.67	7.33	7.50	4.93	4.77
	CV	13.92	11.34	19.66	44.94	55.14	9.44	9.52	8.08	6.63	9.10	13.88
	LSD	11.92	0.90	1.05	2.43	8.03	0.92	0.90	0.92	0.66	0.55	0.89
	GRAND MEAN	65.37	5.89	3.98	4.00	10.70	7.19	7.04	7.69	7.36	4.44	4.73
	MIN. MEAN	50.00	1.00	2.67	2.00	4.00	6.33	5.00	6.00	5.50	3.47	3.70
	MAX. MEAN	83.33	7.33	6.00	13.33	20.00	8.33	8.00	9.00	8.50	5.53	6.07

Percent Establishment 10 days = 1-100; 100=Established
Establishment 8 weeks = 1-9; 9=Established
Leaf Spot = Drechlera sicans = 1-100; 0=No Infection
Winter Diseases = Drechlera sicans, Microdochium patch, Red Thread = 1-100; 0=No Infection
Percent Poa annua = 0-100; 0=No Annual Bluegrass
Density = 1-9; 9=Most Dense
Genetic Color = 1-9; 9=Darkest
Average Genetic Color 2007-2008 = 1-9; 9=Darkest (2 ratings, 2 years of data)
Average Winter Turf Quality = 1-9; 9=Best; (5 ratings, Nov-Mar)
Average Turf Quality = 1-9; 9=Best (6 ratings)

C18T: 2007 Trial
Perennial Ryegrass Turf Trial
Location: Puyallup, Washington
Cooperator: Dr. Gwen Stahnke

2008 Data

		Subjective Ratings										
SPONSOR	CULTIVAR	Percent Establishment 10 days	Establishment 6 weeks	Leaf Spot	Winter Diseases	Percent Poa annua	Density	Genetic Color 2007	Genetic Color 2008	Average Genetic Color 2007- 2008	Average Winter Turf Quality	Average Turf Quality
NexGen	APR202-I	70.00	5.67	5.33	4.67	16.67	7.33	7.00	6.33	6.67	5.47	4.73
PSG	SRX 41PCS	66.67	4.67	3.33	4.00	13.33	6.33	5.67	7.33	6.50	4.27	4.73
PST	PST-2IAN	76.67	5.00	3.00	4.00	8.33	7.00	6.33	7.00	6.67	4.27	4.73
PST	PST-2MAGS	66.67	5.33	3.67	3.33	13.33	6.67	7.00	8.00	7.50	4.33	4.70
DLF-IS	IS-PR 340	70.00	7.00	3.67	4.33	16.67	7.33	7.33	8.33	7.83	4.60	4.70
DLF-IS	Manhattan II	83.33	4.00	4.33	4.33	15.00	7.00	5.00	6.33	5.67	4.33	4.70
PST	PST-2101-07	80.00	6.00	3.00	3.67	11.67	7.33	6.67	7.00	6.83	3.87	4.67
DLF-IS	IS-PR 378	56.67	6.33	3.33	3.67	15.00	7.33	7.67	8.33	8.00	4.27	4.67
NexGen	APR1959	53.33	6.33	5.00	5.00	11.67	7.67	7.00	8.00	7.50	5.00	4.67
PSG	06-K Lp	70.00	6.33	3.00	2.67	11.67	7.33	7.33	9.00	8.17	3.87	4.63
PSG	ND 07	50.00	6.00	4.33	4.00	6.67	7.67	7.67	8.67	8.17	4.67	4.63
Rutgers	Soprano	73.33	7.33	5.00	5.00	10.00	7.33	7.67	8.00	7.83	4.73	4.60
NexGen	APR1979	66.67	6.00	4.00	3.33	6.67	7.00	7.00	8.33	7.67	4.33	4.57
Rutgers	LineDrive GLS	70.00	5.67	4.33	4.07	11.87	7.00	6.67	7.33	7.00	4.63	4.57
PSG	05-II Lp	66.67	5.67	3.33	3.00	11.67	7.00	7.00	8.33	7.67	4.00	4.57
PST	PST-Syn-2RS7	56.67	5.67	3.67	4.00	8.33	6.67	6.67	7.67	7.17	4.33	4.57
PSG	SR 4600	83.33	6.00	5.33	5.33	16.67	7.67	7.00	7.33	7.17	5.27	4.53
PSG	06-Z Lp	66.67	5.67	3.33	3.33	11.67	6.67	6.67	6.33	6.50	3.67	4.53
NexGen	APR2032	80.00	6.00	4.67	4.67	10.00	7.00	6.33	6.67	7.50	5.40	4.50
NexGen	APR2034	83.33	6.33	5.00	4.33	13.33	7.67	7.00	8.00	7.80	4.73	4.50
PSG	05-II Lp	50.00	6.00	3.67	3.00	15.00	6.67	7.67	8.33	8.00	3.93	4.50
Rutgers	HU-1	63.33	6.67	4.67	4.33	11.67	6.33	7.33	7.67	7.50	4.60	4.43
PSG	06-C Lp EOB	63.33	6.00	3.00	2.33	15.00	6.67	8.00	8.33	8.17	3.80	4.40
PSG	05-C Lp ACF	66.67	5.33	3.00	2.67	13.33	7.33	7.67	8.00	7.83	3.80	4.40
PST	PST-2R9R-05	80.00	5.00	3.00	2.67	8.33	6.67	6.67	7.67	7.17	3.67	4.37
PSG	04-I Lp	70.00	5.67	3.33	3.67	13.33	7.67	8.00	8.33	8.17	3.93	4.33
PSG	05-I Lp	66.67	6.33	3.67	3.00	13.33	7.00	8.00	9.00	8.50	4.33	4.33
PST	PST-Syn-2GR7	56.67	5.33	4.00	3.00	10.00	6.67	7.33	8.00	7.67	4.13	4.33
NexGen	APR2031	60.00	5.67	4.67	4.67	13.33	7.33	7.00	8.67	7.83	5.07	4.33
PST	PST-Syn-204D	53.33	5.00	3.67	3.33	15.00	6.67	7.33	7.67	7.50	4.27	4.30
PST	PST-21H4	63.33	6.33	3.00	2.33	10.00	7.00	7.33	8.00	7.67	3.80	4.27
DLF-IS	IS-PR 382	70.00	6.33	3.67	3.67	11.67	7.33	8.00	8.33	8.17	4.20	4.27
DLF-IS	IS-PR 400	63.33	7.00	3.00	3.33	16.67	7.33	7.33	7.67	7.50	3.93	4.27
NexGen	APR2075	76.67	5.00	3.33	4.00	10.00	7.00	8.00	6.33	6.17	4.20	4.23
PSG	PM 102	70.00	5.67	2.67	3.00	13.33	7.00	8.00	9.00	8.50	4.33	4.23
PSG	GL3	70.00	6.33	4.00	3.67	11.67	7.00	7.33	7.33	7.33	4.20	4.17
PST	PST-2MAX-07	50.00	5.00	2.67	2.33	11.67	7.00	6.00	7.33	6.67	3.47	4.17
DLF-IS	IS-PR 313	70.00	5.67	4.00	4.67	13.33	7.33	7.33	7.67	7.50	4.33	4.17
NexGen	APR2064	60.00	5.67	5.67	6.00	15.00	7.00	8.00	8.67	8.33	5.27	4.10
Rutgers	Integro II	63.33	5.33	5.33	5.33	13.33	6.67	7.33	7.33	7.33	5.27	4.10
PSG	06-J Lp	66.67	6.00	3.00	3.00	15.00	6.67	7.33	8.67	8.00	4.00	4.10
DLF-IS	IS-PR 344	66.67	6.67	4.33	4.67	15.00	7.00	8.00	8.33	8.17	4.53	4.10
PSG	04-10 Lp	63.33	6.33	3.33	3.00	13.33	7.00	7.00	8.67	7.63	3.93	4.07
PST	PST-2MG7 Bulk	56.67	5.33	3.67	2.67	15.00	6.67	6.67	8.00	7.33	4.07	4.07
DLF-IS	IS-PR 411	70.00	7.33	4.67	4.00	13.33	6.67	7.67	8.67	8.17	4.60	4.07
PST	Silver Dollar	63.33	5.67	3.33	3.67	15.00	7.00	7.00	8.00	7.50	4.07	4.03
DLF-IS	IS-PR 410	70.00	6.00	4.00	3.33	13.33	6.67	7.00	8.33	7.67	4.33	4.00
PSG	04-10 Lp	66.67	5.67	3.00	2.67	11.67	7.00	7.33	9.00	8.17	3.60	3.93
PST	PST-2COL	50.00	5.33	3.00	3.33	18.33	6.67	6.67	8.00	7.33	4.00	3.93
PSG	Pick EJ	56.67	5.00	2.67	2.00	15.00	7.67	7.67	8.00	7.83	3.53	3.87
PSG	05-SP-I	66.67	5.67	3.33	3.00	20.00	6.67	7.67	8.00	7.83	3.80	3.87
PST	PST-2RS7S Bulk	56.67	4.67	4.67	5.33	18.33	6.67	5.67	7.00	6.33	5.00	3.73
PSG	06-B Lp	66.67	6.33	3.33	2.67	16.67	6.67	7.00	8.33	7.67	3.47	3.70
CV		13.52	11.34	19.66	44.84	55.14	9.44	6.52	8.88	6.63	9.10	13.88
LSD		11.92	0.80	1.03	2.43	8.03	0.92	0.50	0.92	0.66	0.55	0.89
GRAND MEAN		65.37	5.89	3.08	4.00	10.79	7.19	7.04	7.69	7.36	4.44	4.73
MIN. MEAN		50.00	4.00	2.67	2.00	4.00	6.33	5.00	6.00	5.50	3.47	4.70
MAX. MEAN		83.33	7.33	6.00	13.33	20.00	8.33	8.00	9.00	8.50	5.53	6.07

Percent Establishment 10 days = 1-100; 100=Established

Establishment 6 weeks = 1-9; 9=Established

Leaf Spot = Drechlera sicans = 1-100; 0=No Infection

Winter Diseases = Drechlera sicans, Microdochium patch, Red Thread = 1-100; 0=No Infection

Percent Poa annua = 0-100; 0=No Annual Bluegrass

Density = 1-9; 9=Most Dense

Genetic Color = 1-9; 9=Darkest

Average Genetic Color 2007-2008 = 1-9; 9=Darkest (2 ratings, 2 years of data)

Average Winter Turf Quality = 1-9; 9=Best (5 ratings, Nov-Mar)

Average Turf Quality = 1-9; 9=Best (6 ratings)

APPENDIX 7

Aeration Timing and the Use of Black Sand to Maximize Playability and Enhance Recovery

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The intermountain west has a relatively short growing season and, consequently, a short period for ideal golf playing conditions. In order to cope with these issues, golf course superintendents are continually pushing aeration of putting greens to the extreme ends of the growing season in order to minimize disruption to play. The objectives of this study are to: 1) determine the time of year that results in the shortest recovery time from aeration; 2) determine if the use of black sand can enhance recovery.

Research was conducted at the Turfgrass and Agronomy Research Center, Pullman, WA, on a research putting green. The putting green was constructed according to USGA green specifications and planted with 'T-1' creeping bentgrass (*Agrostis stolonifera* L.) in May 2005. The area was mowed five times weekly at .130 in. with clippings collected. Irrigation was applied to prevent water stress. The study area was fertilized weekly throughout the growing season with Summer Aid (25-0-25) and Eco MicroMix plus (5-0-0) (J.R. Simplot Company, Boise, ID) at .125 lbs. N 1000 ft² and 3 oz. 1000 ft² respectively.

There were twelve aeration dates beginning April 15, 2008 and two sand treatments at each date (Table 1). All plots were aerated using a Ryan Greensaire 24 (Ryan division of Textron Inc., Charlotte, NC) with ½ in. hollow tines and 2 in. by 2 in. spacing. One week prior to each aeration date, the corresponding sand treatment received 6 lbs. 1000 ft² of Micro 10 (10-4-16) (BEST Fertilizer, Lathrop, CA). Sand treatments include tan topdressing sand (Atlas Sand and Rock, Lewiston, ID), or black sand (Grass Roots Agronomics Inc., Emmett, ID) applied following aeration. Tan topdressing sand was applied at 800 lbs. 1000 ft². Black sand treatments received tan topdressing sand at 400 lbs. 1000 ft² followed by black sand at 400 lbs. 1000 ft². Prior to applying black sand, the tan topdressing sand was brushed into the aeration holes.

Data collected includes aeration injury recovery, turfgrass quality, and soil temperature. Aeration injury recovery was rated twice weekly until full recovery on a scale of 1 to 9; 9 is no detectable damage from aeration and 1 is no recovery from treatment. Turf quality was visually rated twice weekly until full recovery on a scale of 1 to 9; 9 is ideal, dark green uniform turf, 6 is minimum acceptable quality, and 1 is dead turf. Soil temperature was recorded twice weekly until full recovery. Soil temperature was measured at 3 in. with a digital temperature thermometer (Spectrum Technologies Inc., East-Plainfield, IL). Full recovery is determined when no visible damage from aeration is observed in 95% of the plot area.

The shortest recovery time was at the August 15, 2008 aeration date. In the spring and fall the shortest recovery time was May, 15 2008 and September, 1 2008 aeration dates respectively. Sand type was significant on the number of days to recovery. Black sand had an effect on reducing days to recovery before the May 15, 2008 aeration and after the September 15, 2008 aeration date. There was also a difference between sand type for turfgrass quality, with black sand having the greatest increase in quality before the June 1, 2008 aeration and after the August 15, 2008 aeration. No difference was detected in soil temperature measured at 3 in. between sand types. The data suggest that the use of black sand in the spring and fall will

improve turfgrass quality. Additionally, time to recovery for fall aeration was reduced by the use of black sand. This study is being repeated in 2009.

Table 1. Aeration and sand topdressing treatments on a 'T-1' creeping bentgrass green, Pullman, WA, 2008.

Aeration date	Sand	Tine type
Apr 15	Atlas	½" Hollow
Apr 15	Black	½" Hollow
May 1	Atlas	½" Hollow
May 1	Black	½" Hollow
May 15	Atlas	½" Hollow
May 15	Black	½" Hollow
Jun 1	Atlas	½" Hollow
Jun 1	Black	½" Hollow
Jun 15	Atlas	½" Hollow
Jun 15	Black	½" Hollow
July 1	Atlas	½" Hollow
July 1	Black	½" Hollow
Aug 15	Atlas	½" Hollow
Aug 15	Black	½" Hollow
Sept 1	Atlas	½" Hollow
Sept 1	Black	½" Hollow
Sept 15	Atlas	½" Hollow
Sept 15	Black	½" Hollow
Oct 1	Atlas	½" Hollow
Oct 1	Black	½" Hollow
Oct 15	Atlas	½" Hollow
Oct 15	Black	½" Hollow
Nov 1	Atlas	½" Hollow
Nov 1	Black	½" Hollow

Playability of a Bentgrass Golf Green Under Playing Conditions

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In the intermountain west, the growing season is relatively short. If the practice of aeration is extremely disruptive, it can make the already short playing season even shorter. This study seeks to determine the most efficient methods for removing organic matter while decreasing the recovery time from aeration to a minimum.

The study began May 2008 at the Palouse Ridge Golf Club, Pullman, WA. The research site was a practice chipping green. This green was constructed according to California green specifications and planted with 'T-1' creeping bentgrass (*Agrostis stolonifera* L.) in June 2007. The area was maintained by the golf course maintenance staff and will be utilized by golfers throughout the study.

The study consists of a total of five cultivation treatments, one untreated control (UTC) and two sand topdressing treatments (Table 1). After each cultivation treatment, either tan topdressing sand (Atlas Sand and Rock, Lewiston, ID), or black sand (Grass Roots Agronomics Inc., Emmett, ID) was applied.

Data collected during the 2008 growing season include cultivation injury recovery time, turf quality, surface firmness, soil temperature, thatch/mat depth, percent carbon for soil and thatch/mat layer, and water infiltration rate. The study will continue for three years (2008-2010).

In 2008, all the black sand treatments had higher quality compared to the tan sand treatments. The verticut only treatment and the ¼ in. hollow tine with verticut treatment had the highest quality when quality ratings were averaged over the entire year. The verticut only and the (UTC) were the firmest treatments. Sand type had no effect on firmness. The UTC had a thatch only layer since no topdressing sand was added and thus the shortest thatch/mat depth. All other treatments had a thatch/mat layer. The verticut only treatment had the deepest thatch/mat layer. There was no difference in thatch depth between any of the other treatments. Percent carbon in the thatch layer was highest in the UTC while there was no difference in percent carbon between the other treatments. The number of days injured per season was highest for the verticut only treatments but was lowest for the ¼ in. hollow tine with verticut treatment except for the UTC which had no injury. The ½ in. hollow tine with verticut treatment had the highest number of days with severe injury.

Table 1. Cultivation and sand topdressing treatments at the Palouse Ridge G.C. Pullman, WA, 2008.

Cultivation Type	Sand Type	Frequency		
		Greensaire II	Verticut	PlanetAir
1/2" Hollow Tine, PlanetAir	Tan	1 x year		Every 3 wk
1/2" Hollow Tine, PlanetAir	Black	1 x year		Every 3 wk
PlanetAir	Tan			Every 3 wk
PlanetAir	Black			Every 3 wk
1/2" Hollow Tine, Verticut	Tan	2x year	Every 3 wk	
1/2" Hollow Tine, Verticut	Black	2x year	Every 3 wk	
1/4" Hollow Tine, Verticut	Tan	2x year	Every 3 wk	
1/4" Hollow Tine, Verticut	Black	2x year	Every 3 wk	
Verticut	Tan		Every 1 wk	
Verticut	Black		Every 1 wk	
Untreated Control	None			
Untreated Control	None			

APPENDIX 8

Evaluation of Newer Crane Fly Control Products 2007-2008

Dr. Gwen K. Stahnke, Richard Bembenek and Michael Hummel-Hansen, WSU-Puyallup

Introduction

European and common crane fly control have been investigating products for use for well over 35 years. In past several years, some newer low toxicity products have become available on the market and we have had the opportunity to investigate the efficacy of these products.

Products

Arena – (Clothianidin) It is a preventative and curative grub control product. It should be applied in May through September, depending upon what insect you are targeting to control. It performs well on soil and surface feeding pests (White grubs, billbugs, pyrethroid-resistant chinch bugs).

Aloft GC G and Aloft GC SC – (Clothianidin and bifenthrin (G= 0.025% C + 0.125% B). Currently there are restrictions not to apply this product within 25 ft. radius of water sources. The liquid performs well on mole crickets, sod webworms, European chafer, green June beetle and other scarabs. The granule performs well on billbugs, chinch bugs, cutworms, armyworms, and annual bluegrass weevil (adult and larvae).

Late Fall 2007 Crane Fly Control: Snoqualmie Ridge, WA **Pretreatment: 12-18-07; Post-treatment: 2-25-08**

Treatment	Rate	Pre-Avg. larvae/ sq. ft.	Post-Avg. larvae/ sq. ft.	% Larval Reduction
Arena 50 WDG	6.4oz/A	44.5	15.3	69.1
Arena 50 WDG	10.6 oz/A	44.1	13.0	68.6
Arena 25 G	80 lbs./A	39.1	10.0	75.0
Arena 25G	125 lbs./A	48.7	21.5	48.2
Aloft	7.2 oz/A	55.6	0.4	99.6
Aloft	14.4 0z/A	57.5	3.1	95.9
Talstar EZ	0.2 lbs./A	48.3	0.4	98.9
Talstar EZ	0.4 lbs./A	52.1	0.8	98.5
Dursban DTI	1 lb. ai/A	51.8	0.4	99.3
Untreated		55.2	10.7	78.2

Provaunt 30 WG – (Indoxacarb) This product is in the oxadiaxine class. It is a reduced risk pesticide for use on aesthetic and recreational turf areas and plants. It does not impact natural arthropod and parasitoid populations. There is not a buffer zone required with an application

that is made. When applied, it should target eggs and small instar stages of the insects. Do not water the application area for 24 hours after application.

Acelepryn – (Chlorantraniliprole, anthranilic diamide class: causes paralysis due to calcium loss from open ryanodine receptors of insect muscles. It provides both foliar and systemic control of white grubs and other pests infesting landscape and recreational turfgrass and landscape ornamentals, interiorscapes and sod farms. This product has a high potential for runoff for several months or more after application. A well-maintained vegetative buffer strip between the application area and water should be provided. Applications should be made in April through September for preventative and early curative control of white grubs. Irrigate immediately after application.

Early Spring 2008 Crane Fly Control: Goss Farm, Puyallup, WA
Pretreatment: 2-18-07; Post-treatment: 3-18-08

Treatment	Rate	Pre-Avg. larvae/ sq. ft.	Post-Avg. larvae/ sq. ft.	% Larval Reduction
Provaunt 30WG	0.1125 ai/A	38.7	0	100
Provaunt 30WG	0.225 ai/A	32.3	0	100
Acelepryn	0.104 lbs. ai/A	48.3	0	100
Acelepryn	0.208 lbs. ai/A	23.4	0	100
Sevin SL	8 lbs./A	23.8	0	100
Talstar EZ	0.2 lbs./A	33.0	0	100
Talstar EZ	0.4 lbs./A	31.4	0	100
Untreated		29.1	2.0	93

In both sets of plots, they were set up as an RCBD of 5 ft x 10 ft plots with 5 replications per treatment. Presample cores were pulled as at the early second instar stage, but larvae were very small. Treatments were made on the dates indicated for each study. Liquid applications were applied with a CO₂ bicycle sprayer at 30 psi and 3 gal. of spray mix/M. Any granular applications were measured out per plot and applied using a shaker bottle. After application approximately 1/8 inch of water was applied to those that needed irrigation with an automatic irrigation system to wash the products into the thatch layer, as it was clear and dry with no rain in site at this time.

At 8 weeks after application (8WAT) 6 4-inch diameter cup cutter cores were pulled from the center of each treatment and place in plastic bags. All bags were transported to the WSU-Puyallup Research Station and stored in a cooler at 36F until they could be torn apart by hand to investigate for the presence of crane fly larvae within each core. The number of larvae

present per core was tallied, with each plot's number of larvae being totaled for one number (Column 1 of data). Each treatment (5 plots) were totaled and divided by 5 to get the crane fly per treatment (Column 2 of data). This number was divided by 6 (6cores per plot) and multiplied by 11.5 (the number needed to convert to crane fly larvae per sq. ft.) (Column 3 of data, Avg. Crane fly/sq. ft.). The average number of crane fly larvae per sq. ft. that I would ideally like to have would be 12 larvae/sq. ft.. However, in this study, populations were a little low with only 7.7 or 8 larvae/sq.ft. in the untreated control plots. However, the trends can still be seen with the treatments which were applied.

Results

Although the statistics are not shown here, all of the treatments significantly reduced the larval populations from the untreated control plots. I would feel more certain of the results if the population numbers post treatment were a little bit higher in the untreated control plots. This still gave an accurate estimate of the performance of the products at the early second instar stage, which shows they would all definitely reduce the populations and limit damage from both the larvae feeding and natural predators, such as birds, which can really tear up the grass.



Pt. Defiance Bowl on 3/18/09 with crane fly larval populations of 90 larvae per sq. ft. . The bird population had torn out almost all of the turfgrass and it was down to bare soil.



Pt. Defiance Bowl on 6/22/09 after an application of Provaunt was made in late April and the area was overseeded with perennial ryegrass before the Taste of Tacoma.

Pictures courtesy of Tom Balaban, Metro Parks, Tacoma

2009 Turfgrass Cultivars Evaluated In Western Washington/Oregon In Recent Years

The list of varieties below is in constant revision as new varieties are released or become available. Not all varieties are listed, as information is not always available for all varieties. When insufficient observation or inconsistent observation of a variety is the only information at hand, then those varieties may not appear on the list until more reliable information is available. Many varieties that performed very well in tests, in past years, may have been moved out of the 'best' group into the 'next lower' group (*italics*). The cultivars in **bold print** have the best test records during recent years in western Washington and Oregon. They should be used where high quality turf is expected. The cultivars in *italics* print have the next best records and will provide **good** quality turf but may be more susceptible to local diseases or may become discolored and less dense more often than the best cultivars. We suggest use of the best cultivars where they are available. Kentucky bluegrass is not well adapted to western Washington, so only the best cultivars should be used. Other Kentucky bluegrass cultivars may disappear from the turf. The letter following each cultivar is a color designation. VD = very dark; D = dark; MD = medium dark; M = medium; L = light.

Perennial Ryegrass

Kokomo II	D	Uno	MD	Zoom	M	Apple GL	D
Fiesta 4	D	Homerun	M	Cabo II	VD	Derby Extreme	D
Palmer IV	D	Fiji	VD	Stellar GL	VD	Protégé GLR	D
Allstar 3	M	Attribute	MD	Defender	M	Palace	D
Buena Vista	MD	Charismatic II	GLSR	MD	Exacta II	GLSR	VD
Calypso 3	D	OverDrive	M	Sunshine 2	D	Silver Dollar	D
Amazing GS	D	Primary	M	1G Squared	M	Transformer	ML
Cutter II	D	Mach I	M	Brightstar SLT	M	Grand Slam 2	M
Keystone 2	M	Citation Fore	M	Cutter II	D	Line Drive GLS	M
Edge II	D	Paragon GLR	D	Pianist	MD	Repell GLS	M
Secretariat II	GLSR	ML		Harrier	M	Regal 5	D
Panther GLS	M	Majesty II	VD	Dasher 3	M	Fusion	MD
Gray Star	M	Phenom	M	Top Gun II	MD	Delaware XL	VD
Ringer II	L	Revenge GLX	D	Pinnacle II	MD	Pleasure Supreme	MD
Galatti	MD	Manhattan 5 GLR	M	Nexus XR	D	Goalkeeper II	M
Wind Dance 2	D	Brea	M	Inspire	L	SRX 4682	M
Quicksilver	M	Gray Fox	M	Majesty II	VD	Monterey 3	M
Premier II	L	Barlennium	M	Palmer III	L	ASP6006	VD
Firebolt	VD	Accent II	M	Presidio	D	Hawkeye 2	M
ASP6004	D	ASP6001	D	Premier	VL	Affinity	VL

Fine Fescue Strong Creeping Red

Epic	MD	Cardinal	M	Fortitude	D	Wendy Jean	M
Garnet	MD	Pathfinder	MD	Jasper II	MD	Celestial	MD
Class One	M	Razor	M	Oracle	M	Splendor	D
CO3-4676	M	Boreal	MD	Shademaster	M		

Slender Creeping (SR)

Dawson E+	MD	Shoreline	D	Barcrown	MD	Marker	M
Napoli	MD	Barskol	MD	Seabreeze	L	Comfort	MD
Smirna	MD						

Chewings

Treasure II	MD	Musica	L	Zodiac	D	Compass	D
Tiffany	MD	Shadow II	MD	Weekend	D	Tamara	MD
Ambassador	D	SR 5130	MD	LaCrosse	D	Cascade	M
Culumbra II	D	J-5	MD	Longfellow II	D	7 Seas	MD
Banner III	D	Beauty	MD	Waldorf	MD	Highlight	M

Hard/Sheep

Berkshire	MD	Reliant IV	MD	Spartan II	D	Oxford	MD
Gotham	D	Bighorn (Sheep)	VD	Aurora w/Endo	D	Biljart	D
Discovery	D	Firefly	MD	SR 3000	MD	Quatro (Sheep)	MD
Nordic E	D	Osprey	D	Predator	D	Scaldis	M

Tall Fescue

Traverse SRP	M	Faith	M	3 rd Millennium SRP	M	Essential	M
Padre	D	Firenza	M	Wolfpack II	MD	Speedway	M
Hemi	M	Van Gogh	M	SR 8650	D	Rhambler SRP	M
Rebel IV	M	Mustang 4	M	Firecracker LS	ML	Bullseye	M
Spyder LS	M	Turbo RZ	M	Talladega	M	Skyline	M
Cezanne	M	Falcon IV	L	Turbo	ML	Escalade	ML
Renovate	D	AST9002	D	AST9003	D	Justice	M
Titanium LS	ML	Compete	D	Gazelle IV	M	Magellan	M
Silverado	L	Einstein	M	AST9001	D	Rembrandt	M
Biltmore	M	Toccoa	D	Darlington	D	Plato	ML
Lindbergh	M	Reunion	M	Aristotle	ML	Tahoe II	M

Kentucky Bluegrass

Champagne	M	Blackstone	M	Bariris	MD	Washington	M
Freedom II	D	Champlain	MD	Princeton 105	MD	Baritone	D
Odyssey	MD	Barzan	M	Serene	M	Boomerang	D
SR2284	MD	Shamrock	M	Brooklawn	M	Cynthia II	M
Julius	MD	Freedom III	MD	Avalanche	M	Chelsea	MD
Blacksburg II	M	Everglade	MD	Langara	MD	Limousine	M
Bodacious	MD	Lakeshore	ML	Cheetah	L	Serene	ML

Bentgrass

Note: all cultivars are creeping bentgrass unless indicated otherwise (c = colonial, v = velvet)

Putting greens:

Tyee	M	Shark	M	Independence	MD	Authority	M
007	MD	Villa (v)	D	Legendary (v)	D	Mackenzie	M
Greenwich (v)	D	Venus (v)	D				

Fairways/Tees/Other (only colonial bentgrass is recommended for use in lawns and similar areas):

Runner	M	Declaration	MD	Authority	M	SR 7100 (c)	L
SR 7200 (v)	D	Independence	MD	Greentime (c)	M	T-1	D
Tiger II (c)	M	L-93	M	Shark	MD	Mackenzie	M
Alpha	D	Crystal Bluelinks	D	Penneagle II	MD	Bengal	MD

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