

# RUTGERS

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***The New Jersey Turfgrass Association***

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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State University of New Jersey in cooperation with the New Jersey Turfgrass Association. The purpose of this document is to provide a forum for the dissemination of information and the exchange of ideas and knowledge. The proceedings provide turfgrass managers, research scientists, extension specialists, and industry personnel with opportunities to communicate with co-workers. Through this forum, these professionals also reach a more general audience, which includes the public.

This publication includes lecture notes of papers presented at the 2017 GREEN EXPO Turf and Landscape Conference. Publication of these lectures provides a readily available source of information

covering a wide range of topics and includes technical and popular presentations of importance to the turfgrass industry.

This proceedings also includes research papers that contain original research findings and reviews of selected subjects in turfgrass science. These papers are presented primarily to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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Dr. Ann Brooks Gould, Editor  
Dr. Bruce B. Clarke, Coordinator

# TRAFFICKED AND NON-TRAFFICKED TALL FESCUE PERFORMANCE AT RUTGERS HORTICULTURAL RESEARCH FARM II DURING 2017

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The Rutgers Center for Turfgrass Science continues to assess the wear and traffic (wear and compaction) tolerance of existing tall fescue (*Schedonorus arundinaceus* [Schreb.] Dumort. syn. *Festuca arundinacea* Schreb. syn. *Lolium arundinaceum* [Schreb.] Darbysh.) cultivars and new experimental selections due to the frequent establishment of this species on sports fields and other recreational areas.

The Rutgers Wear Simulator (RWS) (Bonos et al., 2001) and Cady Traffic Simulator (CTS) (Henderson et al., 2005) are regularly used to impart traffic stress damage to turf plots at Rutgers Horticultural Research Farm II. A comparison of the damage caused by modified versions of these machines was recently reported (Park et al., 2016a).

Park et al. (2014, 2015, and 2016b) reported the ongoing performance of entries in the 2012 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test at the Rutgers Horticultural Research Farm II subjected to traffic stress imparted by the combined operation of the CTS and RWS.

The objective of this study was to assess the traffic tolerance of tall fescue cultivars and experimental selections in the 2012 NTEP Tall Fescue Test using a combination of the RWS and CTS during spring, summer, and autumn of 2017.

## MATERIALS AND METHODS

### Evaluation Trial

The one-hundred-sixteen (116) entries of the 2012 Tall Fescue Trial were seeded into 5 x 6-ft plots in September 2012 on a well-drained loam (sand = 33%; silt = 41%; clay = 26%) at Rutgers Horticultural Research Farm II in North Brunswick, NJ. Also included in the trial were the cultivar Mustang 4 and 3-way blends of Mustang 4 + Faith + Bullseye; Rebel IV + Rebel Advance + Brockton; and Justice + Virtue II + Greystone.

Soil test results from autumn 2015 indicated that the soil pH was 6.4; soil phosphorous and potassium were 121 and 408 pounds per acre (Mehlich 3), respectively. The test was mowed approximately two times per week at a height of 2.5 inches and irrigated to prevent drought stress.

A total of 3.0 lb of nitrogen (N) per 1,000 ft<sup>2</sup> was applied in 2016 (0.7, 0.6, and 0.6 lb of N per 1,000 ft<sup>2</sup> on 29 March, 15 June, and 31 August 2017, respectively).

Crabgrass (*Digitaria* spp.) was controlled with preemergence herbicide, and turfgrass diseases including brown patch (caused by *Rhizoctonia solani*) and *Pythium* spp. were controlled preventively

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during summer 2017 to ensure that entries were responding primarily to traffic.

### **Application of Wear and Traffic Stresses**

Traffic stress was applied to one-half of each plot using a combination of wear from the RWS and trampling by the CTS. In 2017, two passes of the RWS and two passes of the CTS were made per week for 8 weeks (32 total passes) during spring (11 April to 30 May), summer (26 June to 14 August), and autumn (11 September to 30 October). The RWS was operated at ground speed of 2.5 miles per hour (mph) and 250 rpm for the paddles. The CTS, developed using a turf cultivation unit (Toro Greens Aerifier, The Toro Co., Bloomington, MN), was operated in the forward direction at a speed of 1.0 mph. Every other pass of each machine was made in the opposite direction.

### **Evaluation of the Effects of Traffic**

Trafficked and non-trafficked plots were visually assessed for uniformity of turf cover (1 to 9 scale, where 9 = most complete turf cover) and fullness of turfgrass canopy (FTC) (0 to 100% scale, where 100% = full canopy) at the conclusion of each seasonal traffic period.

A digital camera (Canon PowerShot G12; Canon USA, Inc., Lake Success, NY) was positioned within an enclosed box equipped with artificial lighting to capture digital images of trafficked and non-trafficked plots at the conclusion of each seasonal traffic period. Individual digital image size was 1600 x 1200 pixels and camera settings included a shutter speed of 1/40 s, aperture of F2.8, ISO of 100, and focal length of 7 mm.

Images were imported into SigmaScan Pro (v. 5.0, SPSS, Inc., Chicago, IL) for digital image analysis (DIA). Green cover (0 to 100% scale, where 100% = complete green cover) was determined according to methods described by Richardson et al. (2001) using batch analysis programming developed by Karcher and Richardson (2005). A hue range of 50 to 107 and a saturation range of 0 to 100 were used in the software to identify green leaves in the images.

Trial data were analyzed as a 2 (traffic and no traffic) x 120 (entries) factorial arranged in a strip-plot design with the three replications. Data were

subjected to analysis of variance and means were separated using Fisher's protected least significant difference (LSD) test at  $p \leq 0.05$ .

### **Evaluation of Non-trafficked Plots**

Plots were rated for turfgrass quality monthly during April through October during 2016, and spring green-up was evaluated on 5 April 2017. A 1 to 9 rating was utilized for both parameters where 9 represented the best turfgrass quality and earliest spring green-up.

Analysis of variance was performed on these data as a single factor randomized complete block design with three replications. Means were separated using Fisher's protected least significant difference (LSD) test at  $p \leq 0.05$ .

## **RESULTS**

Traffic reduced uniformity of turf cover, FTC, and green cover of tall fescue during spring, summer, and autumn 2017 (Table 1). The entry factor had a significant effect on uniformity of turf cover and FTC during each season in 2017; however, the entry factor only had significant effect on green cover during spring and summer. Moreover, the entry effect interacted with the traffic factor for uniformity of turf cover and FTC during spring, summer and autumn. A significant traffic x entry interaction was observed for green cover during only summer and autumn.

### **Response to Spring Traffic: June 2017**

When subjected to traffic, entries with the best uniformity of turf cover and greatest FTC were Hemi, Rhambler 2 SRP (LSD), Firecracker SLS (PPG-TF-105), Memphis (GO-DFR), Olympus (RAD-TF-88), JS 916, and RAD-TF-92 (Table 2). Entries with the poorest uniformity of turf cover and least FTC were Thunderstruck (TD1), Traverse 2 SRP (W45), K12-MCD, Terrano, Temptation (OR-21), PST-5MVD, BAR Fa 120878, JS 825, Justice + Virtue II + Greystone, and Kentucky 31.

Green cover varied among entries but was independent of the level of traffic after spring 2017. Forty entries had the greatest green cover (averaged across traffic and no traffic plots) during spring 2017 (Table 1), whereas, fifty-two entries had the least green cover.

### **Response to Summer Traffic: August 2017**

Cultivars and experimental selections with best uniformity of turf cover and greatest FTC and green cover after summer 2017 traffic were JS 809, B23, Inspiration (PST-R5NW), Hemi, Michelangelo (LTP-F5DPDR), IS-TF 276 M2, RAD-TF-89, Nightcrawler (IS-TF 285), Aquaduct, K12-13, RAD-TF-92, Rambler 2 SRP, (LSD), PSG-8BP2, Olympus (RAD-TF-88), PST-5EX2, Comp. Res. SST, Fayette (IS-TF 291), Annihilator, Reflection (U45), BAR Fa 120878, JS 818, Caesar (TY 10), Mustang 4, 4th Millennium SRP (U43), and Rain Dance (PST-5SDT) (Table 3).

Entries with poorest uniformity of turf cover and the least FTC and green cover were Amity (CCR2), Unitus (IS-TF 289), Falcon V, Avenger II (PPG-TF-156), Screamer LS (PPG-TF-148), Traverse 2 SRP (W45), Embrace (PST-5EV2), PSG-PO1, Thunderstruck (TD1), PPG-TF-169, PPG-TF-135, and Marauder (Table 3).

### **Response to Autumn Traffic: October 2017**

Uniformity of turf cover, FTC, and green cover of entries depended on the level of autumn traffic, and cultivars and experimental selections with the best uniformity of turf cover and greatest FTC and green cover under trafficked conditions were Reflection (U45), Hemi, Rambler 2 SRP (LSD), JS 916, Inspiration (PST-R5NW), BAR Fa 120878, PSG-8BP2, Michelangelo (LTP-F5DPDR), JS 809, Supersonic (PPG-TF-170), B23, Hot Rod (Burl TF-136), Crossfire 4 (IS-TF 310 SEL), Caesar (TY 10), K12-13, IS-TF 276 M2, PST-5EX2, Regenerate, RAD-TF-92, JS 818, Mustang 4, Valkyrie LS (PPG-TF-172), 4th Millennium SRP (U43), Maestro (T 31), Nightcrawler (IS-TF 285), and Paramount (PPG-TF-137) (Table 4).

Entries with poorest uniformity of turf cover and the least FTC and green cover under trafficked conditions were PST-5MVD, Annihilator, IS-TF-308 SEL, MET 1, PST-5DZP, Kentucky 31, Wichita (PPG-TF-151), Faith, PSG-PO1, Terrano, K12-MCD, PPG-TF-169, Screamer LS (PPG-TF-148), and Marauder.

### **Performance of Tall Fescue without Traffic**

Entries with the best multi-year average turf quality during 2013 to 2017 were Black Tail (PPG-TF-150), Regenerate, Traverse 2 SRP (W45), 4th Millennium SRP (U43), MET 1, F711, Raptor III

(ZW 44), Reflection (U45), Technique (RZ2), Bizem, Amity (CCR2), Titanium 2LS (PPG-TF-152), B23, Rambler 2 SRP (LSD), Rowdy (SRX-TPC), Avenger II (PPG-TF-156), Meridian (PST-5GRB), Rebounder (Pick-W43), Rockwell (LTP-TWUU), Firecracker SLS (PPG-TF-105), Firebird 2, ATF 1612, Valkyrie LS (PPG-TF-172), Fayette (IS-TF 291), IS-TF-308 SEL, Hemi, Embrace (PST-5EV2), Paramount (PPG-TF-137), Hounddog 8 (IS-TF 307 SEL), and Thor (PPG-TF-157) (Table 5).

Kentucky 31 had the poorest multi-year average turf quality in 2013 to 2017. Other entries with lower multi-year average turf quality (< 5.0) during this period were JS 819, PST-5EX2, Inspiration (PST-R5NW), PSG-TT4, Frontline (Exp TF-09), Marauder, BAR Fa 121089, BAR Fa 121091, Aquaduct, Annihilator, JS 825, Warhawk, Justice + Virtue II + Greystone, and BAR Fa 120878 (Table 5).

## **DISCUSSION**

Research results generated from turfgrass cultivar and experimental selection trials conducted over multiple years are critical for seed companies to make decisions on whether to commercialize experimental selections and how to market existing cultivars. The electronic presentation of trial results allows turfgrass practitioners to make research-based species and cultivar decisions for the facilities they manage. Moreover, results provide university extension and outreach personnel a means to deliver non-biased recommendations to end users in the form of presentations, reports, and fact sheets.

Data from the 2006 NTEP Tall Fescue Test were summarized in the Rutgers Cooperative Extension Fact Sheet (FS1186), *Tall Fescue Varieties for New Jersey Sports Fields*. Cultivar presentation was based on traffic tolerance, turfgrass quality, and brown patch susceptibility data generated at Rutgers Horticultural Research Farm II as well as other research sites. Entries comprising the 2012 NTEP Fescue Test will be presented according to these parameters in an updated Rutgers Cooperative Extension Fact Sheet following the creation of a final report of this trial by NTEP. A preliminary summary of seasonal traffic tolerance and multi-year average turfgrass quality for entries comprising the 2012 NTEP Tall Fescue Test at Rutgers Horticultural Research Farm II is presented in Table 6. Multi-location brown patch results are also summarized from 2015 and 2016.

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Table 1. Uniformity of turf cover, fullness of turf canopy, and green turf cover as affected by tall fescue entry and traffic level during 2017. (Includes all entries of the 2012 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

Level of Traffic	Spring Traffic <sup>1</sup>			Summer Traffic			Autumn Traffic		
	Uniformity of Turf Cover <sup>2</sup>	Fullness of Turfgrass Canopy <sup>3</sup>	Green Cover <sup>4</sup>	Uniformity of Turf Cover	Fullness of Turfgrass Canopy	Green Cover	Uniformity of Turf Cover	Fullness of Turfgrass Canopy	Green Cover
	--1 to 9 scale--	-----0 to 100% scale-----	-----0 to 100% scale-----	--1 to 9 scale--	-----0 to 100% scale-----	-----0 to 100% scale-----	--1 to 9 scale--	-----0 to 100% scale-----	-----0 to 100% scale-----
Traffic	8.9	97.9	87.3	8.9	96.8	90.6	8.6	91.6	91.5
No Traffic	5.2	52.8	75.2	4.0	40.9	65.4	3.0	29.9	60.4
Source of Variation									
Traffic	**	**	**	**	***	***	***	**	***
Entry	***	***	***	***	***	**	***	***	NS
Traffic x Entry	***	*	NS	**	***	***	**	***	*
CV (%)	11.5	10.0	4.4	16.6	12.2	8.5	17.2	12.4	10.9

<sup>1</sup> Ninety-six total machine passes were applied in 2017 using a combination of the Rutgers Wear Simulator and Cady Traffic Simulator during three eight-week periods in which two passes were made per week with each machine (spring [32 passes]: 11 April to 30 May; summer [32 passes]: 26 June to 14 August; and autumn [32 passes]: 11 September to 30 October).

<sup>2</sup> 9 = most dense, uniform canopy

<sup>3</sup> 100% = full canopy

<sup>4</sup> 100% = complete green cover; measured by digital image analysis (DIA)

NS, \*, \*\*, \*\*\* = Nonsignificant and significant at the 0.05, 0.01, and 0.001 probability level, respectively



Table 2. Uniformity of turf cover, fullness of turfgrass canopy as affected by the interaction of tall fescue entry and traffic, and green cover as affected by tall fescue entry during spring 2017. (Includes all entries of the 2012 National Turfgrass Evaluation (NTEP) Tall Fescue Test.)

Tall Fescue Entry	-----Spring Traffic <sup>1</sup> -----		Green Cover <sup>4</sup>		
	Uniformity of Turf Cover <sup>2</sup>	Fullness of Turfgrass Canopy <sup>3</sup>			
	No Traffic	Traffic	No Traffic	Traffic	
	-----1 to 9 scale-----		-----0 to 100% scale-----		
1 Reflection (U45)	9.0	5.7	100.0	61.7	84.1
2 JS 809	9.0	6.3	96.7	61.7	81.1
3 Inspiration (PST-R5NW)	9.0	5.3	95.0	53.3	82.4
4 Hemi	9.0	7.7	100.0	71.7	83.5
5 JS 916	9.0	6.7	98.3	63.3	82.6
6 Michelangelo (LTP-F5DPDR)	9.0	6.0	100.0	60.0	83.1
7 Rhambler 2 SRP (LSD)	9.0	7.0	98.3	66.7	86.0
8 PSG-8BP2	8.3	5.3	95.0	56.7	81.4
9 BAR Fa 120878	7.7	3.3	83.3	38.3	78.9
10 Supersonic (PPG-TF-170)	9.0	5.0	98.3	53.3	81.6
11 B23	9.0	6.3	100.0	63.3	83.8
12 IS-TF 276 M2	9.0	6.0	100.0	60.0	82.7
13 RAD-TF-92	9.0	6.7	96.7	61.7	83.5
14 K12-13	9.0	5.7	98.3	58.3	81.4
15 PST-5EX2	9.0	5.7	96.7	55.0	78.6
16 Hot Rod (Burl TF-136)	9.0	6.3	96.7	61.7	85.0
17 Crossfire 4 (IS-TF 310 SEL)	9.0	6.0	98.3	65.0	81.7
18 JS 818	8.7	5.3	98.3	50.0	79.9
19 Caesar (TY 10)	9.0	4.7	95.0	45.0	80.1
20 Regenerate	9.0	6.0	100.0	63.3	82.4
21 4th Millennium SRP (U43)	9.0	6.3	100.0	55.0	85.1
22 Valkyrie LS (PPG-TF-172)	9.0	6.3	100.0	65.0	82.1
23 Mustang 4	9.0	5.7	98.3	51.7	81.6
24 IS-TF-287	9.0	5.0	98.3	53.3	81.9
25 Maestro (T31)	9.0	4.7	100.0	50.0	79.5
26 RAD-TF-89	9.0	6.0	98.3	60.0	82.1
27 Nightcrawler (IS-TF 285)	9.0	5.3	98.3	51.7	83.0
28 Fayette (IS-TF 291)	9.0	6.0	100.0	56.7	83.1
29 Catalyst	9.0	5.3	98.3	53.3	81.9
30 Swagger (PST-5RO5)	8.3	4.3	98.3	48.3	79.8

(Continued)



Table 2. Tall fescue traffic test, spring 2017 (NTEP) (continued).

Tall Fescue Entry	-----Spring Traffic <sup>1</sup> -----				
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>
	No Traffic	Traffic	No Traffic	Traffic	
	-----1 to 9 scale-----		-----0 to 100% scale-----		
31 Diablo (IS-TF 330)	9.0	5.3	98.3	56.7	84.0
32 PSG-TT4	8.7	5.0	95.0	51.7	80.5
33 Xtender (PPG-TF-139)	9.0	6.0	98.3	60.0	83.4
34 Paramount (PPG-TF-137)	9.0	5.0	98.3	55.0	80.2
35 Meridian (PST-5GRB)	9.0	6.3	100.0	63.3	82.0
36 Aquaduct	8.3	6.0	95.0	60.0	80.4
37 IS-TF 269 SEL	9.0	5.7	100.0	61.7	83.0
38 IS-TF-311	9.0	5.3	100.0	46.7	82.1
39 Bullseye	9.0	5.3	100.0	50.0	80.5
40 Rain Dance (PST-5SDT)	8.7	4.7	96.7	46.7	78.4
41 Bizem	9.0	5.7	98.3	56.7	84.1
42 Black Tail (PPG-TF-150)	9.0	6.0	100.0	61.7	83.5
43 Rebel IV + Rebel Advance + Brockton	9.0	5.3	96.7	55.0	82.0
44 PST-5BRK	9.0	5.3	98.3	53.3	80.2
45 F711	9.0	5.3	100.0	60.0	83.1
46 Saltillo (PST-5SALT)	9.0	5.0	98.3	51.7	79.4
47 Falcon IV	9.0	4.7	95.0	48.3	79.1
48 Rebounder (Pick-W43)	9.0	5.3	98.3	58.3	83.0
49 Temple (DZ1)	9.0	5.0	100.0	50.0	80.2
50 PST-5BPO	9.0	4.3	98.3	48.3	80.5
51 Comp. Res. SST	9.0	6.3	100.0	61.7	81.7
52 BAR Fa 121095	9.0	4.3	96.7	46.7	80.4
53 Memphis (GO-DFR)	9.0	6.7	100.0	65.0	79.5
54 JS 819	8.7	5.7	96.7	51.7	80.9
55 Rockwell (LTP-TWUU)	9.0	5.7	100.0	61.7	82.1
56 Rebel V (ATF 1736)	9.0	5.7	98.3	65.0	80.6
57 Firewall (PSG-WE1)	9.0	5.3	100.0	58.3	81.5
58 Hover (Burl TF-69)	9.0	5.0	100.0	58.3	81.0
59 Firecracker SLS (PPG-TF-105)	9.0	6.7	98.3	65.0	83.1
60 Grande 3	9.0	5.3	100.0	53.3	81.2

(Continued)

Table 2. Tall fescue traffic test, spring 2017 (NTEP) (continued).

Tall Fescue Entry	-----Spring Traffic <sup>1</sup> -----				Green Cover <sup>4</sup>
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		
	No Traffic	Traffic	No Traffic	Traffic	
	-----1 to 9 scale-----		-----0 to 100% scale-----		
61 ATF 1754	8.7	4.3	95.0	46.7	78.7
62 Rowdy (SRX-TPC)	9.0	6.3	100.0	66.7	83.2
63 PSG-GSD	8.7	5.0	95.0	45.0	83.8
64 ATF 1704	9.0	5.0	100.0	53.3	79.0
65 Rhizing Moon (IS-TF 305 SEL)	9.0	5.0	98.3	48.3	81.4
66 Hounddog 8 (IS-TF 307 SEL)	9.0	4.3	100.0	43.3	79.4
67 Dynamite LS (PPG-TF-145)	9.0	5.0	96.7	50.0	82.4
68 Falcon V	9.0	4.7	100.0	46.7	81.3
69 Avenger II (PPG-TF-156)	9.0	5.3	100.0	58.3	81.6
70 Olympus (RAD-TF-88)	9.0	6.7	98.3	63.3	82.8
71 Foxhound (IS-TF 284 M2)	9.0	6.3	98.3	63.3	80.2
72 MET-3	9.0	5.3	98.3	51.7	80.7
73 Turfway (IS-TF 282 M2)	9.0	5.3	100.0	58.3	80.9
74 BAR Fa 121091	8.3	4.0	93.3	43.3	79.4
75 Technique (RZ2)	9.0	6.0	98.3	60.0	83.2
76 Titanium 2LS (PPG-TF-152)	9.0	5.7	100.0	56.7	83.7
77 Kingdom (DB1)	9.0	5.3	98.3	56.7	81.2
78 ATF 1612	9.0	4.7	100.0	45.0	82.2
79 K12-05	9.0	5.7	98.3	53.3	80.7
80 Frontline (Exp TF-09)	9.0	4.7	95.0	50.0	79.3
81 Raptor III (ZW 44)	9.0	5.7	100.0	51.7	81.7
82 PPG-TF-115	9.0	4.7	98.3	51.7	81.4
83 PPG-TF-138	9.0	4.7	98.3	45.0	81.6
84 Unitus (IS-TF 289)	9.0	4.3	96.7	46.7	82.8
85 Fesnova	9.0	5.3	96.7	53.3	81.4
86 Warhawk	9.0	4.7	98.3	53.3	79.7
87 IS-TF-272	9.0	4.3	96.7	45.0	81.9
88 RAD-TF-83	9.0	4.7	98.3	46.7	79.5
89 204 Res. Blk4	9.0	5.7	100.0	55.0	81.8
90 Leonardo (LTP-FSD)	9.0	4.7	95.0	51.7	82.4
91 PST-5DZP	9.0	4.7	98.3	51.7	78.4
92 Thor (PPG-TF-157)	9.0	4.7	96.7	55.0	81.2
93 Faith	9.0	4.3	100.0	45.0	79.8
94 Ares (PPG-TF-142)	9.0	5.3	98.3	56.7	82.7
95 IS-TF-308 SEL	9.0	5.3	100.0	53.3	82.1

(Continued)

Table 2. Tall fescue traffic test, spring 2017 (NTEP) (continued).

Tall Fescue Entry	-----Spring Traffic <sup>1</sup> -----				
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>
	No Traffic	Traffic	No Traffic	Traffic	
	-----1 to 9 scale-----		-----0 to 100% scale-----		
96 Screamer LS (PPG-TF-148)	9.0	3.7	100.0	43.3	78.7
97 Embrace (PST-5EV2)	9.0	5.3	96.7	56.7	80.0
98 Annihilator	9.0	5.7	95.0	63.3	81.0
99 BAR Fa 121089	9.0	4.0	96.7	43.3	80.1
100 Mustang 4 + Faith + Bullseye	9.0	5.0	96.7	46.7	79.2
101 Firebird 2	9.0	5.0	100.0	55.0	82.5
102 GTO (Burl TF-2)	9.0	4.3	100.0	46.7	78.2
103 PST-5MVD	9.0	4.3	95.0	38.3	80.1
104 JS 825	8.7	3.3	93.3	38.3	77.5
105 Bloodhound (MET 6 SEL)	9.0	4.7	100.0	48.3	81.9
106 Kentucky 31	7.0	3.0	70.0	30.0	77.1
107 W41	9.0	5.3	100.0	53.3	82.1
108 Traverse 2 SRP (W45)	9.0	4.3	100.0	40.0	81.1
109 PPG-TF-169	9.0	4.3	100.0	48.3	77.1
110 K12-MCD	9.0	4.0	98.3	40.0	80.8
111 Terrano	9.0	4.0	98.3	40.0	79.8
112 MET 1	9.0	4.7	100.0	45.0	77.3
113 Temptation (OR-21)	9.0	3.7	95.0	40.0	80.3
114 Justice + Virtue II + Greystone	9.0	3.0	91.7	36.7	79.0
115 PPG-TF-135	9.0	4.3	100.0	45.0	81.8
116 Thunderstruck (TD1)	9.0	3.3	96.7	41.7	82.5
117 Wichita (PPG-TF-151)	9.0	4.0	100.0	43.3	79.1
118 Amity (CCR2)	9.0	5.0	100.0	46.7	79.8
119 Marauder	9.0	4.0	98.3	43.3	80.3
120 PSG-PO1	9.0	3.3	98.3	43.3	81.6
Columns (down) LSD at 5% =		1.3		12.4	3.9
Rows (across) LSD at 5% =		1.8		15.2	NA <sup>5</sup>

<sup>1</sup>Thirty-two total machine passes were applied using a combination of the Rutgers Wear Simulator and Cady Traffic Simulator during spring 2017 (four passes per week from 11 April to 30 May 2017)

<sup>2</sup>9 = most dense, uniform canopy

<sup>3</sup>100% = full canopy

<sup>4</sup>100% = complete green cover, measured by digital image analysis (DIA)

<sup>5</sup>not applicable

Table 3. Uniformity of turf cover, fullness of turfgrass canopy, and green cover as affected by the interaction of traffic and tall fescue entry during summer 2017. (Includes all entries of the 2012 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

Selection	-----Summer Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----			-----0 to 100% scale-----		
1 Reflection (U45)	9.0	5.0	98.3	48.3	91.1	70.4
2 JS 809	8.7	6.3	95.0	58.3	87.1	73.7
3 Inspiration (PST-R5NW)	9.0	6.0	95.0	56.7	90.2	76.5
4 Hemi	9.0	5.7	98.3	55.0	89.1	69.7
5 JS 916	9.0	5.7	96.7	55.0	91.2	66.3
6 Michelangelo (LTP-F5DPDR)	9.0	5.7	100.0	53.3	90.5	74.8
7 Rhambler 2 SRP (LSD)	9.0	5.3	96.7	51.7	91.2	69.5
8 PSG-8BP2	8.7	5.3	95.0	50.0	86.7	70.0
9 BAR Fa 120878	8.0	5.0	81.7	46.7	90.9	80.0
10 Supersonic (PPG-TF-170)	9.0	4.3	98.3	46.7	90.9	72.8
11 B23	9.0	6.0	100.0	60.0	91.1	72.3
12 IS-TF 276 M2	8.7	5.7	93.3	51.7	89.2	72.9
13 RAD-TF-92	9.0	5.3	98.3	51.7	92.4	75.9
14 K12-13	9.0	5.3	96.7	55.0	85.5	71.1
15 PST-5EX2	9.0	5.3	93.3	46.7	91.5	74.4
16 Hot Rod (Burl TF-136)	9.0	5.0	98.3	50.0	89.7	69.1
17 Crossfire 4 (IS-TF 310 SEL)	9.0	5.0	100.0	51.7	91.0	69.2
18 JS 818	8.7	5.0	95.0	46.7	89.7	75.6
19 Caesar (TY 10)	9.0	5.0	93.3	46.7	90.9	71.5
20 Regenerate	9.0	4.3	100.0	46.7	93.0	67.4
21 4th Millennium SRP (U43)	9.0	5.0	96.7	46.7	93.0	70.5
22 Valkyrie LS (PPG-TF-172)	9.0	5.0	100.0	48.3	90.5	64.9
23 Mustang 4	9.0	5.0	100.0	46.7	89.2	71.0
24 IS-TF-287	9.0	4.3	100.0	41.7	93.5	69.7
25 Maestro (T31)	9.0	4.3	98.3	41.7	89.8	60.7
26 RAD-TF-89	9.0	5.7	96.7	51.7	89.8	72.5
27 Nightcrawler (IS-TF 285)	9.0	5.7	95.0	51.7	90.4	71.2
28 Fayette (IS-TF 291)	9.0	5.0	98.3	50.0	91.5	72.0
29 Catalyst	9.0	5.0	96.7	51.7	89.0	66.3
30 Swagger (PST-5RO5)	9.0	5.0	98.3	50.0	90.0	69.2

(Continued)

Table 3. Tall fescue traffic test, summer 2017 (NTEP) (continued).

Selection	-----Summer Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----			-----0 to 100% scale-----		
31 Diablo (IS-TF 330)	9.0	4.7	98.3	46.7	91.3	68.0
32 PSG-TT4	8.7	4.7	95.0	43.3	89.2	70.3
33 Xtender (PPG-TF-139)	9.0	4.0	100.0	38.3	92.3	63.1
34 Paramount (PPG-TF-137)	9.0	4.0	98.3	45.0	92.6	64.2
35 Meridian (PST-5GRB)	9.0	6.0	96.7	55.0	91.4	67.5
36 Aquaduct	8.7	5.7	91.7	50.0	88.6	76.0
37 IS-TF 269 SEL	9.0	4.7	100.0	46.7	91.4	66.9
38 IS-TF-311	9.0	4.7	98.3	48.3	90.9	64.5
39 Bullseye	8.7	4.7	96.7	45.0	92.4	71.2
40 Rain Dance (PST-5SDT)	8.7	4.7	93.3	46.7	90.3	71.8
41 Bizem	9.0	4.3	98.3	45.0	92.7	67.4
42 Black Tail (PPG-TF-150)	9.0	4.0	96.7	40.0	91.7	55.7
43 Rebel IV + Rebel Advance + Brockton	9.0	3.7	95.0	40.0	90.7	69.5
44 PST-5BRK	8.7	3.7	95.0	35.0	90.6	71.2
45 F711	9.0	3.7	98.3	36.7	92.5	64.1
46 Saltillo (PST-5SALT)	8.7	3.7	93.3	35.0	90.6	64.9
47 Falcon IV	8.7	3.7	93.3	38.3	89.5	63.8
48 Rebounder (Pick-W43)	9.0	3.3	98.3	36.7	91.5	67.7
49 Temple (DZ1)	9.0	3.3	98.3	33.3	90.6	62.1
50 PST-5BPO	9.0	3.3	95.0	35.0	89.8	63.8
51 Comp. Res. SST	8.7	5.0	93.3	55.0	91.1	74.4
52 BAR Fa 121095	9.0	5.0	98.3	51.7	87.7	68.7
53 Memphis (GO-DFR)	9.0	4.7	96.7	45.0	87.7	70.8
54 JS 819	9.0	4.7	95.0	45.0	88.8	69.0
55 Rockwell (LTP-TWUU)	9.0	4.7	96.7	43.3	92.6	74.3
56 Rebel V (ATF 1736)	9.0	4.7	95.0	43.3	90.7	65.9
57 Firewall (PSG-WE1)	9.0	4.3	98.3	45.0	91.7	65.0
58 Hover (Burl TF-69)	9.0	4.3	96.7	40.0	90.5	72.6
59 Firecracker SLS (PPG-TF-105)	9.0	4.0	98.3	41.7	92.9	69.0
60 Grande 3	9.0	4.0	96.7	38.3	89.7	66.6

(Continued)

Table 3. Tall fescue traffic test, summer 2017 (NTEP) (continued).

Selection	-----Summer Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----			-----0 to 100% scale-----		
61 ATF 1754	9.0	4.0	98.3	40.0	91.2	66.9
62 Rowdy (SRX-TPC)	9.0	3.7	96.7	36.7	91.7	62.6
63 PSG-GSD	8.7	3.7	95.0	38.3	89.3	71.6
64 ATF 1704	9.0	3.7	96.7	43.3	93.5	61.3
65 Rhizing Moon (IS-TF 305 SEL)	8.7	3.7	95.0	33.3	91.0	64.2
66 Houndog 8 (IS-TF 307 SEL)	9.0	3.7	100.0	38.3	90.4	64.1
67 Dynamite LS (PPG-TF-145)	9.0	3.3	95.0	36.7	90.1	65.8
68 Falcon V	9.0	3.0	98.3	35.0	92.4	54.9
69 Avenger II (PPG-TF-156)	9.0	2.7	98.3	28.3	92.6	54.3
70 Olympus (RAD-TF-88)	9.0	5.3	98.3	48.3	90.5	70.8
71 Foxhound (IS-TF 284 M2)	9.0	4.7	98.3	41.7	90.4	66.7
72 MET-3	9.0	4.0	100.0	40.0	92.4	61.8
73 Turfway (IS-TF 282 M2)	9.0	4.0	98.3	41.7	89.8	64.8
74 BAR Fa 121091	9.0	4.0	95.0	46.7	89.6	70.0
75 Technique (RZ2)	9.0	3.7	98.3	38.3	91.8	62.1
76 Titanium 2LS (PPG-TF-152)	9.0	3.7	100.0	40.0	91.3	69.8
77 Kingdom (DB1)	8.7	3.7	96.7	36.7	87.6	63.3
78 ATF 1612	9.0	3.7	98.3	38.3	91.2	64.9
79 K12-05	9.0	3.3	100.0	33.3	87.1	60.5
80 Frontline (Exp TF-09)	8.0	3.3	90.0	33.3	90.7	60.5
81 Raptor III (ZW 44)	9.0	3.0	96.7	33.3	92.5	61.0
82 PPG-TF-115	9.0	3.0	98.3	35.0	88.6	60.6
83 PPG-TF-138	9.0	3.0	95.0	35.0	91.8	61.5
84 Unitus (IS-TF 289)	9.0	3.0	98.3	36.7	89.5	55.6
85 Fesnova	9.0	4.7	95.0	46.7	90.9	61.9
86 Warhawk	8.7	4.3	91.7	43.3	88.9	71.1
87 IS-TF-272	9.0	4.3	98.3	46.7	90.4	67.1
88 RAD-TF-83	9.0	3.7	98.3	40.0	90.4	71.1
89 204 Res. Blk4	9.0	3.3	98.3	33.3	91.8	65.3
90 Leonardo (LTP-FSD)	9.0	3.3	96.7	36.7	91.9	63.4
91 PST-5DZP	8.7	3.3	96.7	33.3	88.9	58.9
92 Thor (PPG-TF-157)	9.0	3.3	98.3	35.0	92.8	61.0
93 Faith	9.0	3.3	95.0	36.7	88.6	60.4
94 Ares (PPG-TF-142)	9.0	3.0	98.3	33.3	90.5	60.3
95 IS-TF-308 SEL	9.0	3.0	100.0	36.7	91.9	61.7

(Continued)

Table 3. Tall fescue traffic test, summer 2017 (NTEP) (continued).

Selection	-----Summer Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----			-----0 to 100% scale-----		
96 Screamer LS (PPG-TF-148)	9.0	2.3	100.0	26.7	90.3	53.4
97 Embrace (PST-5EV2)	9.0	2.0	100.0	26.7	91.9	51.3
98 Annihilator	9.0	5.0	95.0	50.0	88.5	69.4
99 BAR Fa 121089	9.0	4.3	96.7	45.0	89.4	65.7
100 Mustang 4 + Faith + Bullseye	9.0	4.0	100.0	43.3	91.6	68.0
101 Firebird 2	9.0	3.7	100.0	36.7	91.4	62.9
102 GTO (Burl TF-2)	9.0	3.7	98.3	35.0	90.3	60.0
103 PST-5MVD	9.0	3.0	96.7	30.0	91.1	61.7
104 JS 825	8.3	3.0	93.3	31.7	84.5	68.5
105 Bloodhound (MET 6 SEL)	9.0	2.7	98.3	30.0	90.9	62.8
106 Kentucky 31	6.7	2.7	76.7	25.0	90.1	60.5
107 W41	9.0	2.3	96.7	28.3	92.7	58.9
108 Traverse 2 SRP (W45)	9.0	2.3	96.7	26.7	92.4	51.3
109 PPG-TF-169	9.0	2.0	100.0	25.0	90.4	49.5
110 K12-MCD	9.0	4.7	96.7	43.3	91.0	73.6
111 Terrano	9.0	3.7	95.0	33.3	90.5	61.0
112 MET 1	9.0	3.0	98.3	26.7	90.3	58.6
113 Temptation (OR-21)	8.7	2.3	95.0	26.7	90.0	57.5
114 Justice + Virtue II + Greystone	8.7	2.3	91.7	28.3	91.2	58.8
115 PPG-TF-135	9.0	1.7	96.7	25.0	93.1	47.2
116 Thunderstruck (TD1)	8.7	1.3	95.0	23.3	90.5	49.5
117 Wichita (PPG-TF-151)	9.0	3.0	100.0	35.0	92.2	59.6
118 Amity (CCR2)	9.0	2.7	100.0	30.0	93.3	57.0
119 Marauder	9.0	2.3	95.0	26.7	89.7	46.7
120 PSG-PO1	9.0	1.7	98.3	23.3	92.2	50.7
Columns (down) LSD at 5% =	1.8		13.6		10.6	
Rows (across) LSD at 5% =	1.8		14.0		17.7	

<sup>1</sup>Thirty-two total machine passes were applied using a combination of the Rutgers Wear Simulator and Cady Traffic Simulator during summer 2017: two passes per week from 26 June to 10 August, 2017

<sup>2</sup>9 = most dense, uniform canopy

<sup>3</sup>100% = full canopy

<sup>4</sup>100% = complete green cover; measured by digital image analysis (DIA)



Table 4. Uniformity of turf cover, fullness of turfgrass canopy, and green cover as affected by the interaction of tall fescue entry and traffic during autumn 2017. (Includes all entries of the 2012 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

Selection	-----Autumn Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----		-----0 to 100% scale-----			
1 Reflection (U45)	9.0	5.3	96.7	40.0	93.6	72.2
2 JS 809	8.7	4.7	83.3	33.3	88.4	73.9
3 Inspiration (PST-R5NW)	8.0	4.7	86.7	38.3	92.2	69.8
4 Hemi	9.0	4.7	88.3	45.0	91.6	67.0
5 JS 916	9.0	4.7	95.0	40.0	93.3	69.9
6 Michelangelo (LTP-F5DPDR)	8.7	4.7	95.0	35.0	92.1	73.3
7 Rhambler 2 SRP (LSD)	8.7	4.7	91.7	40.0	92.7	70.8
8 PSG-8BP2	8.7	4.7	86.7	36.7	88.5	70.1
9 BAR Fa 120878	6.7	4.7	70.0	36.7	92.1	78.5
10 Supersonic (PPG-TF-170)	9.0	4.7	98.3	33.3	91.8	66.9
11 B23	9.0	4.3	95.0	43.3	92.5	70.9
12 IS-TF 276 M2	8.7	4.3	88.3	38.3	92.3	67.9
13 RAD-TF-92	8.3	4.3	91.7	35.0	91.5	65.6
14 K12-13	9.0	4.3	96.7	38.3	89.6	71.2
15 PST-5EX2	8.0	4.3	86.7	36.7	92.9	69.4
16 Hot Rod (Burl TF-136)	9.0	4.3	95.0	41.7	91.6	74.8
17 Crossfire 4 (IS-TF 310 SEL)	9.0	4.3	98.3	40.0	92.3	70.1
18 JS 818	8.7	4.3	91.7	33.3	90.5	69.6
19 Caesar (TY 10)	9.0	4.3	95.0	40.0	92.6	67.6
20 Regenerate	9.0	4.3	96.7	36.7	91.7	65.0
21 4th Millennium SRP (U43)	8.7	4.0	96.7	36.7	93.6	72.3
22 Valkyrie LS (PPG-TF-172)	9.0	4.0	93.3	40.0	90.8	68.0
23 Mustang 4	8.3	4.0	91.7	40.0	91.5	74.2
24 IS-TF-287	9.0	4.0	100.0	33.3	91.4	61.4
25 Maestro (T31)	9.0	4.0	95.0	33.3	91.3	67.6
26 RAD-TF-89	8.7	3.7	96.7	36.7	90.7	63.3
27 Nightcrawler (IS-TF 285)	9.0	3.7	95.0	33.3	90.7	69.4
28 Fayette (IS-TF 291)	8.7	3.7	91.7	31.7	93.3	61.6
29 Catalyst	9.0	3.7	96.7	33.3	90.1	62.4
30 Swagger (PST-5RO5)	8.3	3.7	88.3	31.7	92.3	62.3

(Continued)

Table 4. Tall fescue traffic test, autumn 2017 (NTEP) (continued).

Selection	-----Autumn Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----		-----0 to 100% scale-----			
31 Diablo (IS-TF 330)	9.0	3.7	93.3	36.7	90.8	63.5
32 PSG-TT4	7.7	3.7	83.3	33.3	91.6	64.0
33 Xtender (PPG-TF-139)	9.0	3.7	95.0	31.7	91.4	56.9
34 Paramount (PPG-TF-137)	9.0	3.7	95.0	33.3	93.3	65.3
35 Meridian (PST-5GRB)	9.0	3.3	93.3	30.0	89.5	56.5
36 Aquaduct	8.3	3.3	88.3	36.7	91.4	65.3
37 IS-TF 269 SEL	9.0	3.3	91.7	30.0	92.1	56.5
38 IS-TF-311	9.0	3.3	95.0	33.3	92.5	63.4
39 Bullseye	9.0	3.3	98.3	26.7	93.5	55.9
40 Rain Dance (PST-5SDT)	8.0	3.3	85.0	30.0	91.3	53.6
41 Bizem	9.0	3.3	96.7	30.0	93.8	65.0
42 Black Tail (PPG-TF-150)	9.0	3.3	90.0	36.7	92.7	65.3
43 Rebel IV + Rebel Advance + Brockton	8.0	3.3	85.0	30.0	91.7	64.9
44 PST-5BRK	8.3	3.3	81.7	31.7	93.2	63.5
45 F711	9.0	3.3	93.3	28.3	92.9	57.8
46 Saltillo (PST-5SALT)	8.7	3.3	88.3	31.7	94.1	58.0
47 Falcon IV	8.3	3.3	88.3	31.7	90.9	59.7
48 Rebounder (Pick-W43)	9.0	3.3	96.7	28.3	91.8	64.7
49 Temple (DZ1)	9.0	3.3	96.7	28.3	92.9	60.3
50 PST-5BPO	8.7	3.3	90.0	33.3	91.9	58.5
51 Comp. Res. SST	8.7	3.0	88.3	28.3	88.0	59.9
52 BAR Fa 121095	8.7	3.0	91.7	30.0	91.0	59.0
53 Memphis (GO-DFR)	8.7	3.0	91.7	30.0	90.0	68.3
54 JS 819	7.7	3.0	85.0	33.3	89.3	73.0
55 Rockwell (LTP-TWUU)	8.7	3.0	93.3	26.7	92.4	59.9
56 Rebel V (ATF 1736)	8.7	3.0	91.7	31.7	91.6	59.0
57 Firewall (PSG-WE1)	9.0	3.0	93.3	31.7	91.9	62.9
58 Hover (Burl TF-69)	8.7	3.0	93.3	33.3	91.4	63.9
59 Firecracker SLS (PPG-TF-105)	9.0	3.0	93.3	31.7	92.9	61.0
60 Grande 3	9.0	3.0	93.3	30.0	92.4	57.8

(Continued)

Table 4. Tall fescue traffic test, autumn 2017 (NTEP) (continued).

Selection	-----Autumn Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----			-----0 to 100% scale-----		
61 ATF 1754	8.7	3.0	96.7	26.7	91.8	54.5
62 Rowdy (SRX-TPC)	9.0	3.0	93.3	26.7	91.5	54.7
63 PSG-GSD	8.3	3.0	90.0	35.0	92.6	67.6
64 ATF 1704	9.0	3.0	100.0	33.3	92.1	62.0
65 Rhizing Moon (IS-TF 305 SEL)	8.7	3.0	93.3	28.3	92.2	54.2
66 Houndog 8 (IS-TF 307 SEL)	9.0	3.0	96.7	30.0	91.5	60.9
67 Dynamite LS (PPG-TF-145)	9.0	3.0	93.3	31.7	92.9	65.8
68 Falcon V	8.7	3.0	95.0	30.0	92.3	64.9
69 Avenger II (PPG-TF-156)	9.0	3.0	95.0	28.3	92.9	54.4
70 Olympus (RAD-TF-88)	8.0	2.7	80.0	31.7	85.9	55.8
71 Foxhound (IS-TF 284 M2)	9.0	2.7	95.0	30.0	89.9	58.1
72 MET-3	9.0	2.7	98.3	30.0	93.0	64.8
73 Turfway (IS-TF 282 M2)	9.0	2.7	90.0	33.3	91.1	60.0
74 BAR Fa 121091	8.3	2.7	86.7	26.7	90.6	58.6
75 Technique (RZ2)	9.0	2.7	98.3	26.7	91.0	58.4
76 Titanium 2LS (PPG-TF-152)	9.0	2.7	100.0	28.3	92.4	65.0
77 Kingdom (DB1)	8.7	2.7	88.3	30.0	91.2	65.4
78 ATF 1612	9.0	2.7	95.0	30.0	92.6	59.4
79 K12-05	8.7	2.7	91.7	30.0	90.9	59.8
80 Frontline (Exp TF-09)	8.0	2.7	85.0	30.0	92.2	64.7
81 Raptor III (ZW 44)	9.0	2.7	98.3	30.0	91.1	54.8
82 PPG-TF-115	8.3	2.7	90.0	26.7	87.9	56.3
83 PPG-TF-138	9.0	2.7	96.7	21.7	91.8	53.6
84 Unitus (IS-TF 289)	9.0	2.7	93.3	23.3	89.3	58.7
85 Fesnova	8.3	2.3	85.0	26.7	92.2	50.1
86 Warhawk	7.7	2.3	76.7	26.7	91.0	65.1
87 IS-TF-272	9.0	2.3	95.0	28.3	90.6	69.4
88 RAD-TF-83	8.0	2.3	85.0	26.7	92.2	57.6
89 204 Res. Blk4	9.0	2.3	93.3	26.7	93.8	55.8
90 Leonardo (LTP-FSD)	8.0	2.3	85.0	25.0	92.1	55.7
91 PST-5DZP	8.3	2.3	88.3	21.7	89.9	50.4
92 Thor (PPG-TF-157)	9.0	2.3	93.3	25.0	92.0	50.1
93 Faith	8.3	2.3	93.3	21.7	90.4	47.8
94 Ares (PPG-TF-142)	8.7	2.3	95.0	20.0	89.7	54.1
95 IS-TF-308 SEL	9.0	2.3	98.3	23.3	92.3	51.5

(Continued)

Table 4. Tall fescue traffic test, autumn 2017 (NTEP) (continued).

Selection	-----Autumn Traffic <sup>1</sup> -----					
	Uniformity of Turf Cover <sup>2</sup>		Fullness of Turfgrass Canopy <sup>3</sup>		Green Cover <sup>4</sup>	
	No Traffic	Traffic	No Traffic	Traffic	No Traffic	Traffic
	-----1 to 9 scale-----			-----0 to 100% scale-----		
96 Screamer LS (PPG-TF-148)	9.0	2.3	96.7	18.3	92.3	43.5
97 Embrace (PST-5EV2)	8.7	2.3	96.7	25.0	92.4	54.0
98 Annihilator	7.0	2.0	65.0	23.3	86.4	51.6
99 BAR Fa 121089	8.0	2.0	86.7	30.0	92.5	61.8
100 Mustang 4 + Faith + Bullseye	8.3	2.0	86.7	25.0	90.0	51.4
101 Firebird 2	9.0	2.0	98.3	26.7	89.4	51.2
102 GTO (Burl TF-2)	9.0	2.0	96.7	26.7	91.0	54.4
103 PST-5MVD	8.7	2.0	91.7	21.7	92.9	53.7
104 JS 825	7.7	2.0	73.3	21.7	89.5	61.2
105 Bloodhound (MET 6 SEL)	9.0	2.0	98.3	26.7	92.5	60.7
106 Kentucky 31	6.0	2.0	68.3	18.3	92.6	49.2
107 W41	8.7	2.0	98.3	25.0	91.8	56.7
108 Traverse 2 SRP (W45)	9.0	2.0	98.3	28.3	91.7	49.9
109 PPG-TF-169	8.7	2.0	98.3	20.0	92.1	46.9
110 K12-MCD	9.0	1.7	91.7	21.7	92.9	47.1
111 Terrano	8.7	1.7	95.0	20.0	91.6	47.7
112 MET 1	9.0	1.7	95.0	20.0	91.3	50.4
113 Temptation (OR-21)	8.3	1.7	88.3	23.3	90.5	63.1
114 Justice + Virtue II + Greystone	7.7	1.7	80.0	25.0	92.5	49.4
115 PPG-TF-135	9.0	1.7	91.7	25.0	93.2	46.3
116 Thunderstruck (TD1)	9.0	1.7	96.7	20.0	90.3	61.0
117 Wichita (PPG-TF-151)	9.0	1.3	88.3	18.3	94.0	48.3
118 Amity (CCR2)	9.0	1.3	95.0	21.7	91.8	55.3
119 Marauder	7.3	1.0	80.0	11.7	85.1	40.2
120 PSG-PO1	9.0	1.0	93.3	21.7	92.7	47.8
Columns (down) LSD at 5% =	1.6		12.9		13.7	
Rows (across) LSD at 5% =	1.7		14.2		13.3	

<sup>1</sup>Thirty-two total machine passes were applied using a combination of the Rutgers Wear Simulator and Cady Traffic Simulator during autumn 2017: two passes per week from 11 September to 30 October 2017

<sup>2</sup>9 = most dense, uniform canopy

<sup>3</sup>100% = full canopy

<sup>4</sup>100% = complete green cover; measured by digital image analysis (DIA)

Table 5. Performance of tall fescue entries without traffic in a turf trial seeded in September 2011 at North Brunswick, NJ. (Includes all entries of the 2012 National Turfgrass Evaluation Program (NTEP) Tall Fescue Test.)

Tall Fescue Entry	Turf Quality <sup>1</sup>					Spring Green-up <sup>2</sup> 5 April 2017
	2013-2017 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	
1 Black Tail (PPG-TF-150)	7.9	7.4	8.1	7.3	8.2	6.3
2 Regenerate	7.8	7.8	7.8	7.1	8.1	6.3
3 Traverse 2 SRP (W45)	7.8	7.3	8.1	7.2	8.0	6.0
4 4th Millennium SRP (U43)	7.7	7.2	7.2	7.9	7.4	6.3
5 MET 1	7.6	6.9	8.1	7.4	7.6	6.3
6 F711	7.6	6.7	8.3	7.9	7.4	6.0
7 Raptor III (ZW 44)	7.6	7.1	7.7	7.1	7.5	7.0
8 Technique (RZ2)	7.6	6.9	8.1	7.4	7.6	6.0
9 Reflection (U45)	7.6	6.7	7.1	7.4	8.1	5.7
10 Amity (CCR2)	7.5	6.8	7.6	7.6	7.8	6.3
11 Bizem	7.5	6.5	7.4	7.8	7.5	5.7
12 Titanium 2LS (PPG-TF-152)	7.5	7.0	7.7	7.1	7.1	6.0
13 B23	7.5	6.7	7.7	7.6	7.4	5.7
14 Rowdy (SRX-TPC)	7.4	6.4	7.3	7.5	8.0	6.0
15 Rhambler 2 SRP (LSD)	7.4	6.7	7.3	7.6	7.6	5.7
16 Avenger II (PPG-TF-156)	7.4	6.7	7.7	7.4	7.4	6.3
17 Meridian (PST-5GRB)	7.3	5.7	8.0	7.4	7.3	6.0
18 Rebounder (Pick-W43)	7.3	6.5	7.8	6.9	7.5	6.0
19 Rockwell (LTP-TWUU)	7.3	6.6	7.7	7.6	7.1	6.0
20 Firecracker SLS (PPG-TF-105)	7.3	6.8	7.0	7.9	7.0	5.3
21 Firebird 2	7.3	7.0	7.6	7.2	7.0	6.0
22 ATF 1612	7.2	7.4	7.2	7.1	6.7	6.0
23 Valkyrie LS (PPG-TF-172)	7.2	6.5	7.4	7.5	6.9	6.0
24 Paramount (PPG-TF-137)	7.2	6.7	7.3	7.0	6.9	6.3
25 Fayette (IS-TF 291)	7.2	6.5	7.3	7.4	7.0	5.7

(Continued)

Table 5. Tall fescue turf trial without traffic, 2017 (NTEP) (continued).

Tall Fescue Entry	Turf Quality <sup>1</sup>					Spring Green-up <sup>2</sup> 5 April 2017
	2013- 2017 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	
26 Embrace (PST-5EV2)	7.2	6.0	7.4	7.5	7.3	7.8
27 IS-TF-308 SEL	7.2	5.9	7.6	7.1	7.6	8.0
28 Hemi	7.2	7.1	7.8	6.9	7.1	7.2
29 Thor (PPG-TF-157)	7.2	6.1	7.3	7.2	7.5	7.7
30 Houndog 8 (IS-TF 307 SEL)	7.2	6.7	7.4	7.3	6.9	7.6
31 Hot Rod (Burl TF-136)	7.1	6.2	7.9	6.8	7.1	7.4
32 PPG-TF-135	7.1	6.3	7.4	7.3	7.2	7.5
33 W41	7.1	6.2	6.9	7.4	7.0	7.9
34 RAD-TF-92	7.1	5.8	6.8	7.8	7.4	7.7
35 Bullseye	7.1	6.9	7.3	7.2	6.4	7.6
36 Temple (DZ1)	7.1	5.9	6.9	7.7	7.3	7.5
37 JS 916	7.0	5.8	7.2	7.3	7.0	8.0
38 GTO (Burl TF-2)	7.0	6.8	7.7	6.6	6.6	7.3
39 Bloodhound (MET 6 SEL)	7.0	6.2	7.1	7.0	7.3	7.2
40 IS-TF-311	6.9	6.2	7.6	7.0	6.8	7.2
41 MET-3	6.9	6.9	6.9	6.9	6.5	7.5
42 Wichita (PPG-TF-151)	6.9	6.2	6.6	7.6	6.6	7.5
43 Supersonic (PPG-TF-170)	6.9	6.4	7.0	7.1	6.6	7.3
44 ATF 1704	6.8	5.4	7.0	7.9	6.7	7.4
45 Screamer LS (PPG-TF-148)	6.8	5.4	7.2	7.0	6.7	8.0
46 Firewall (PSG-WE1)	6.8	6.8	8.0	6.1	6.3	7.0
47 Crossfire 4 (IS-TF 310 SEL)	6.8	5.5	6.5	6.8	7.2	8.0
48 Diablo (IS-TF 330)	6.8	6.0	7.3	7.0	6.8	7.0
49 Xtender (PPG-TF-139)	6.8	6.3	6.6	6.6	6.7	7.5
50 Maestro (T31)	6.7	5.6	7.1	7.3	6.6	7.0

(Continued)

Table 5. Tall fescue turf trial without traffic, 2017 (NTEP) (continued).

Tall Fescue Entry	Turf Quality <sup>1</sup>					Spring Green-up <sup>2</sup> 5 April 2017
	2013- 2017 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	
51 Hover (Burl TF-69)	6.7	6.2	6.5	6.6	6.8	6.3
52 Foxhound (IS-TF 284 M2)	6.7	6.1	6.9	6.6	6.8	5.3
53 Michelangelo (LTP-F5DPDR)	6.7	6.3	6.6	6.6	6.8	6.0
54 Trending (IS-TF 269 SEL)	6.7	5.6	6.7	6.5	7.1	5.0
55 IS-TF-287	6.6	5.0	6.8	7.4	6.2	6.0
56 Turfway (IS-TF 282 M2)	6.6	5.6	6.9	6.9	6.5	5.7
57 RAD-TF-89	6.6	6.4	6.7	6.7	6.1	5.7
58 Olympus (RAD-TF-88)	6.6	5.3	7.1	7.1	6.7	5.7
59 Falcon V	6.6	5.8	6.6	7.0	6.2	6.7
60 Rhizing Moon (IS-TF 305 SEL)	6.6	6.1	6.6	6.2	6.8	5.0
61 Catalyst	6.5	5.1	6.4	7.2	6.4	6.3
62 Grande 3	6.5	5.6	7.1	6.4	6.3	6.7
63 PPG-TF-169	6.5	5.1	6.9	6.9	6.5	6.7
64 Fesnova	6.5	6.3	6.8	6.6	6.3	6.0
65 Leonardo (LTP-FSD)	6.5	5.5	7.0	6.9	6.5	6.0
66 Nightcrawler (IS-TF 285)	6.5	5.4	5.8	6.6	7.0	5.0
67 Kingdom (DB1)	6.5	5.2	6.1	6.7	7.1	4.3
68 PSG-PO1	6.4	5.2	6.2	6.7	6.7	5.7
69 Unitus (IS-TF 289)	6.4	6.9	6.9	6.2	6.0	4.0
70 ATF 1754	6.2	5.5	6.8	6.4	5.4	6.0
71 Saltillo (PST-5SALT)	6.2	4.8	6.4	6.5	6.3	5.7
72 204 Res. Blk4	6.2	3.8	6.2	6.1	7.4	6.0
73 Faith	6.2	6.3	6.4	6.0	5.9	6.0
74 PPG-TF-138	6.2	4.8	6.5	6.3	6.3	5.7
75 Rebel V (ATF 1736)	6.2	5.3	6.5	6.2	6.1	6.7

(Continued)



Table 5. Tall fescue turf trial without traffic, 2017 (NTEP) (continued).

Tall Fescue Entry	Turf Quality <sup>1</sup>						Spring Green-up <sup>2</sup> 5 April 2017
	2013- 2017 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	2017 Avg.	
76 PST-5DZP	6.2	4.9	6.4	6.4	6.4	6.7	4.7
77 Ares (PPG-TF-142)	6.2	5.9	5.7	5.7	6.1	7.3	3.0
78 Mustang 4	6.1	5.7	5.9	6.3	6.2	6.4	6.0
79 IS-TF-272	6.0	4.9	6.1	5.7	6.5	7.0	4.3
80 Dynamite LS (PPG-TF-145)	6.0	4.8	5.8	6.1	6.2	7.1	3.7
81 K12-MCD	6.0	4.6	5.9	7.2	5.9	6.5	6.3
82 K12-05	6.0	3.9	5.7	6.9	6.4	7.0	4.7
83 Memphis (GO-DFR)	6.0	5.4	6.1	5.9	6.0	6.5	4.7
84 PST-5MVD	6.0	4.7	6.0	6.8	6.1	6.3	6.3
85 PST-5BPO	5.9	4.6	6.0	6.2	6.0	6.6	6.7
86 JS 818	5.9	5.0	5.4	6.7	6.1	6.5	4.7
87 Terrano	5.9	4.9	5.4	6.8	5.7	6.5	4.7
88 PSG-GSD	5.8	5.1	6.0	5.9	5.6	6.5	6.3
89 Caesar (TY 10)	5.8	5.1	5.6	6.1	5.9	6.5	5.7
90 Swagger (PST-5RO5)	5.7	4.7	5.7	6.4	5.8	6.2	5.3
91 Thunderstruck (TD1)	5.7	5.1	6.1	5.9	5.6	6.0	4.7
92 Mustang 4 + Faith + Bullseye	5.7	4.7	5.5	6.5	5.6	6.1	6.3
93 PPG-TF-115	5.6	4.3	5.9	5.9	5.7	6.5	5.7
94 PST-5BRK	5.6	4.5	5.7	6.2	5.5	6.3	5.3
95 IS-TF 276 M2	5.6	4.3	5.8	5.9	5.7	6.6	5.0
96 BAR Fa 121095	5.6	4.9	5.5	6.0	5.7	5.8	5.0
97 Temptation (OR-21)	5.5	4.6	5.4	5.7	6.1	5.9	4.7
98 K12-13	5.5	3.3	5.2	5.7	6.1	7.0	4.0
99 RAD-TF-83	5.4	4.5	5.4	6.1	5.7	5.6	6.0
100 JS 809	5.4	3.8	5.3	6.1	5.6	6.2	4.7

(Continued)

Table 5. Tall fescue turf trial without traffic, 2017 (NTEP) (continued).

Tall Fescue Entry	Turf Quality <sup>1</sup>						Spring Green-up <sup>2</sup> 5 April 2017
	2013- 2017 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	2017 Avg.	
101 Rain Dance (PST-5SDT)	5.3	4.3	5.5	5.8	5.3	5.6	6.0
102 Comp. Res. SST	5.2	3.5	5.3	5.5	5.6	6.1	5.0
103 Falcon IV	5.2	4.7	5.0	5.5	5.0	5.7	7.0
104 PSG-8BP2	5.2	4.5	5.3	5.6	5.0	5.4	5.7
105 Rebel IV + Rebel Advance+ Brockton	5.0	4.1	4.6	5.3	5.5	5.5	6.3
106 PST-5EX2	4.9	3.8	4.9	5.3	4.9	5.5	8.0
107 JS 819	4.9	3.7	4.6	5.1	5.3	5.5	5.0
108 Inspiration (PST-R5NW)	4.8	3.7	4.8	5.2	5.1	5.5	5.7
109 PSG-TT4	4.8	4.3	5.0	4.9	4.6	5.3	7.3
110 Frontline (Exp TF-09)	4.7	4.2	4.6	4.5	5.3	5.1	4.7
111 Marauder	4.7	2.9	5.0	5.0	5.3	5.4	5.7
112 BAR Fa 121089	4.6	3.2	4.2	5.0	5.2	5.3	7.3
113 BAR Fa 121091	4.6	3.7	4.0	5.3	4.8	5.0	4.7
114 Aquaduct	4.5	3.4	4.3	4.8	4.6	5.6	5.3
115 Annihilator	4.5	2.6	4.8	4.8	4.9	5.2	5.0
116 JS 825	4.2	3.4	4.0	4.5	4.6	4.4	3.0
117 Justice + Virtue II + Greystone	3.9	2.7	3.7	4.5	4.2	4.3	6.3
118 Warhawk	3.9	2.2	3.9	4.1	4.6	4.7	3.3
119 BAR Fa 120878	2.0	1.9	1.9	1.9	1.9	2.2	8.7
120 Kentucky 31	1.1	1.1	1.4	1.2	1.0	1.0	8.7
LSD at 5% =	0.7	1.3	0.9	1.2	1.0	1.1	1.1

<sup>1</sup>9 = best turf quality

<sup>2</sup>9 = earliest spring green-up

Table 6. Performance of tall fescue cultivars and experimental selections comprising the 2012 National Turfgrass Evaluation Program (NTEP) at multiple test locations.

Tall Fescue Entry	Traffic Tolerance <sup>1</sup>			Turfgrass Quality <sup>2</sup>	Brown Patch	
	Spring	Summer	Fall		2015 <sup>3</sup>	2016 <sup>4</sup>
204 Res. Blk4						
4th Millennium SRP (U43)	X	X	X	X	X	X
Amity (CCR2)				X	X	X
Annihilator						
Aquaduct		X				
Ares (PPG-TF-142)						
ATF 1612				X		X
ATF 1704	X	X				
ATF 1754						
Avenger II (PPG-TF-156)	X	X		X	X	X
B23	X	X	X	X	X	X
BAR Fa 120878						
BAR Fa 121089						
BAR Fa 121091						
BAR Fa 121095		X				
Bizem	X		X	X		X
Black Tail (PPG-TF-150)	X		X	X		X
Bloodhound (MET 6 SEL)						X
Bullseye						
Caesar (TY 10)		X				

(Continued)

Table 6. Performance of tall fescue cultivars and experimental selections at multiple test locations (NTEP) (continued).

Tall Fescue Entry	Traffic Tolerance <sup>1</sup>			Turfgrass Quality <sup>2</sup>	Brown Patch	
	Spring	Summer	Fall		2015 <sup>3</sup>	2016 <sup>4</sup>
Catalyst	X	X	X		X	
Comp. Res. SST		X	X			
Crossfire 4 (IS-TF 310 SEL)	X	X	X			
Diablo (IS-TF 330)	X	X	X			
Dynamite LS (PPG-TF-145)						
Embrace (PST-5EV2)	X		X	X	X	X
F711	X	X	X	X	X	X
Faith						
Falcon IV					X	
Falcon V						X
Fayette (IS-TF 291)	X	X	X	X	X	
Fesnova						
Firebird 2	X			X		X
Firecracker SLS (PPG-TF-105)	X			X	X	
Firewall (PSG-WE1)	X	X				
Foxhound (IS-TF 284 M2)		X	X			
Frontline (Exp TF-09)						
Grande 3					X	
GTO (Burl TF-2)		X			X	X
Hemi	X	X	X	X	X	X

(Continued)

Table 6. Performance of tall fescue cultivars and experimental selections at multiple test locations (NTEP) (continued).

Tall Fescue Entry	Traffic Tolerance <sup>1</sup>			Turfgrass Quality <sup>2</sup>	Brown Patch	
	Spring	Summer	Fall		2015 <sup>3</sup>	2016 <sup>4</sup>
Hot Rod (Burl TF-136)	X	X	X		X	X
Houndog 8 (IS-TF 307 SEL)				X		
Hover (Burl TF-69)		X	X			
Inspiration (PST-R5NW)		X				
IS-TF 276 M2						
IS-TF-272						
IS-TF-287		X	X			
IS-TF-311	X	X	X		X	X
JS 809		X				
JS 818			X			
JS 819						
JS 825						
JS 916	X	X	X			
K12-05						
K12-13			X			
K12-MCD		X			X	
Kentucky 31						
Kingdom (DB1)						
Leonardo (LTP-FSD)					X	
Maestro (T31)		X	X		X	X

(Continued)

Table 6. Performance of tall fescue cultivars and experimental selections at multiple test locations (NTEP) (continued).

Tall Fescue Entry	Traffic Tolerance <sup>1</sup>			Turfgrass Quality <sup>2</sup>	Brown Patch	
	Spring	Summer	Fall		2015 <sup>3</sup>	2016 <sup>4</sup>
Marauder						
Memphis (GO-DFR)			X			
Meridian (PST-5GRB)	X	X	X	X		
MET 1				X	X	X
MET-3					X	X
Michelangelo (LTP-F5DPDR)		X	X		X	X
Nightcrawler (IS-TF 285)		X	X			
Olympus (RAD-TF-88)	X	X	X			
Paramount (PPG-TF-137)		X		X	X	X
PPG-TF-115						
PPG-TF-135	X				X	X
PPG-TF-138						
PPG-TF-169						
PSG-8BP2	X	X	X			
PSG-GSD		X			X	
PSG-PO1					X	
PSG-TT4						
PST-5BPO		X				
PST-5BRK					X	X
PST-5DZP						

(Continued)

Table 6. Performance of tall fescue cultivars and experimental selections at multiple test locations (NTEP) (continued).

Tall Fescue Entry	Traffic Tolerance <sup>1</sup>			Turfgrass Quality <sup>2</sup>	Brown Patch	
	Spring	Summer	Fall		2015 <sup>3</sup>	2016 <sup>4</sup>
PST-5EX2		X	X		X	X
PST-5MVD						X
RAD-TF-83						
RAD-TF-89	X	X	X			
RAD-TF-92	X	X	X			
Rain Dance (PST-5SDT)		X				
Raptor III (ZW 44)	X	X	X	X	X	X
Rebel V (ATF 1736)						
Rebounder (Pick-W43)			X	X	X	X
Reflection (U45)	X	X	X	X		X
Regenerate	X	X	X	X	X	X
Rhambler 2 SRP (LSD)	X	X	X	X	X	
Rhizing Moon (IS-TF 305 SEL)						
Rockwell (LTP-TWJU)	X	X		X	X	X
Rowdy (SRX-TPC)	X	X		X	X	X
Saltillo (PST-5SALT)						
Screamer LS (PPG-TF-148)						X
Standout (IS-TF-308 SEL)			X	X	X	X
Supersonic (PPG-TF-170)		X	X		X	X
Swagger (PST-5RO5)		X			X	

(Continued)



Table 6. Performance of tall fescue cultivars and experimental selections at multiple test locations (NTEP) (continued).

Tall Fescue Entry	Traffic Tolerance <sup>1</sup>			Turfgrass Quality <sup>2</sup>	Brown Patch	
	Spring	Summer	Fall		2015 <sup>3</sup>	2016 <sup>4</sup>
Technique (RZ2)	X	X	X	X	X	X
Temple (DZ1)	X	X	X		X	X
Temptation (OR-21)						
Terrano					X	
Thor (PPG-TF-157)				X	X	X
Thunderstruck (TD1)						
Titanium 2LS (PPG-TF-152)	X			X	X	X
Traverse 2 SRP (W45)				X	X	X
Trending (IS-TF 269 SEL)		X				X
Turfway (IS-TF 282 M2)						
Unitus (IS-TF 289)						
Valkyrie LS (PPG-TF-172)	X	X	X	X		X
W41	X					
Warhawk						
Wichita (PPG-TF-151)					X	X
Xtender (PPG-TF-139)	X		X			X

<sup>1</sup> Entries marked with an 'X' indicate best average uniformity of turf cover (top statistical ranking) after traffic during spring 2013-2017; summer 2013-2017; and autumn 2013-2017. Trial was conducted at the Rutgers Horticultural Research Farm II, North Brunswick, NJ

<sup>2</sup> Entries marked with an 'X' exhibited the best average turfgrass quality (top statistical grouping) during 2013 to 2017 at Rutgers Horticultural Research Farm II, North Brunswick, NJ

<sup>3</sup> Entries marked with an 'X' had the least average brown patch (top statistical grouping) in 2015 across four locations (Raleigh, NC; Adelphia, NJ; Stillwater, OK; Knoxville, TN). Data available at [ntep.org/data/tf12/tf12\\_16-5/tf1216t31.txt](http://ntep.org/data/tf12/tf12_16-5/tf1216t31.txt)

<sup>4</sup> Entries marked with an 'X' had the least average brown patch (top statistical grouping) in 2016 across six locations (Storrs, CT; West Lafayette, IN; Lexington, KY; College Park, MD; Raleigh, NC; Adelphia, NJ). Data available at [ntep.org/data/tf12/tf12\\_17-8/tf1217t30.txt](http://ntep.org/data/tf12/tf12_17-8/tf1217t30.txt)