CULTIVAR AND TRAFFIC EFFECTS ON POPULATION DYNAMICS OF *AGROSTIS* SPP. AND *POA ANNUA* MIXTURES

Progress Report to the United States Golf Association

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Executive Summary

A number of bentgrass cultivars have been commercially released for use on golf course playing surfaces in recent years; however, the relative differences in tolerance to traffic has not been studied. The goals of this research project are to identify bentgrass cultivars that exhibit an improved ability to compete against annual bluegrass invasion under traffic, and to determine whether the time of establishment affects the competitiveness of bentgrasses against annual bluegrass.

Seeding Date Trials. Trials were conducted in 1998 and 1999 on sandy loam to evaluate the influence of seeding date and bentgrass (creeping and velvet bentgrass) cultivar on the amount of bentgrass that will establish in competition with annual bluegrass plants. The least invasion of *Poa annua* during establishment occurred for the June and August seeding dates compared to the May, September, and October seeding dates. It was apparent that cultivar selection impacted the success of renovating *Poa annua* infested soil. Plots renovated with 'Penncross' had consistently lower bentgrass population than other cultivars. 'Penn A-4' and 'L-93' had consistently high bentgrass population for all seeding dates. 'SR 7200' (velvet bentgrass) had similar bentgrass populations to Penn A4 and L-93 in June and August seedings; however, SR 7200 had lower bentgrass population than these cultivars in the September and October seedings. Further evaluation of the 2000 data set will be available in 2001.

Traffic Trials. Field studies were initiated on sandy loam and sand root zones to evaluate the traffic tolerance of bentgrass cultivars and the subsequent resistance to encroachment by *Poa annua*. Wear and compaction treatments were applied 4 times per week to 15 cultivars of bentgrass using a modified walk-behind Sweepster and a Brouwer water-filled turf roller, respectively. Plots were evaluated during 2000 for turf quality and density and the amount of *Poa annua*.

Sandy Loam Putting Green Trial

Cultivars having the capacity to produce high density turf under putting green conditions have exhibited good to excellent tolerance to both wear and compaction treatment on a sandy loam. Velvet bentgrass has considerably better tolerance of traffic stresses than previously reported. High-density bentgrass cultivars have shown excellent resistance to annual bluegrass encroachment under a range of traffic conditions. Wear may be more detrimental for some bentgrass cultivars than others. Longer-term observation of cultivars under traffic is needed to fully assess the ability to persist under the chronic stresses of compacted soil.

Sand Root Zone Putting Green Trial.

Cultivars having the capacity to produce high density turf under putting green conditions have exhibited good to excellent tolerance to both wear and compaction treatment on a sand root zone. Velvet bentgrass has considerable better tolerance of traffic stresses than previously reported. Longer-term observation of cultivars under traffic is needed to fully assess the ability to persist under the chronic stresses of a compacted soil.

Fairway Trial. All bentgrass cultivars maintained high bentgrass population (>90%) under non-trafficked conditions. Under traffic, however, large differences in bentgrass population had developed among cultivars by 7 August 2000. The velvet bentgrass, 7001, has exhibited the greatest tolerance to traffic as measured by annual bluegrass invasion. Other high-density bentgrasses including Penn G-1, Penn A-4, and SR 7200 have exhibited good tolerance to traffic. Thus, velvet bentgrass had considerable better tolerance of traffic stresses than previously reported. Longer-term observation of cultivars under traffic is needed to fully assess the ability to persist under the chronic stresses of a compacted soil.

Introduction

A number of bentgrass cultivars have been commercially released for use on golf course playing surfaces in recent years; however, the relative differences in tolerance to traffic has not been studied. The goals of this research project are to identify bentgrass cultivars that exhibit an improved ability to compete against annual bluegrass invasion under traffic, and to determine whether the time of establishment affects the competitiveness of bentgrasses against annual bluegrass.

Seeding Date Trials

Objectives

Identify the time of year for bentgrass seeding that optimizes the establishment of bentgrass against annual bluegrass, and assess the potential differences between bentgrass cultivars for the ability to establish against annual bluegrass.

Methods

- Field site - An existing mixed stand of 'Penncross' creeping bentgrass and annual bluegrass, with an established seed bank population of annual bluegrass. The first trial was initiated in 1998 and a second in 1999.
- Randomized complete block design with 3 or 4 replications using a split-plot factorial treatment combination (5 bentgrass cultivars x 5 seeding dates). An unseeded check was included to evaluate the rate of annual bluegrass establishment for each seeding date.

Factors:	Bentgrass cultivar/species	Seeding Dates
	1. L-93/creeping	1. May
	2. Penn A4/creeping	2. June
	3. Providence/creeping	3. August
	4. Penncross/creeping	4. September
	5. SR-7200/velvet	5. October

- Establishment - Seeding date main-plot areas sprayed with glyphosate approximately two weeks and 1 week prior to each seeding date. Main-plot areas were verticut and core cultivated to prepare a seedbed containing annual bluegrass seed. Bentgrass varieties seeded at 0.75 pound / 1000 ft^2 (5 g / 1.4-m^2 sub-plots).
- Line-intersecting grid counts to determine percent annual bluegrass invasion were made.

2000 Results

Data collected in 2000 is being summarized. Cursory examination of data indicates results in 2000 are similar to data presented in previous progress reports.

Plan of work for 2001

- Continue to monitor the annual bluegrass populations via line-intersect counting in the seeding trials initiated in 1998 and 1999 for evaluation of longer-term population dynamics.
- Summarize establishment data for both trials and submit to a scientific journal for peer-review.
- Submit trade journal article for USGA Green Section Record or Golf Course Management.

Putting Green Traffic Trials

Objectives

Two putting green studies were initiated on sandy loam and sand root zones to evaluate the traffic tolerance of bentgrass cultivars and the subsequent encroachment of annual bluegrass.

Methods

- Studies were arranged as a randomized block design with 3 or 4 replications using a split-plot factorial treatment combination of 15 bentgrass entries and 4 levels of traffic (no traffic, wear, compaction, and wear plus compaction). The traffic factor was arranged as main plot and subplot treatments were cultivars including creeping bentgrass (*Agrostis palustris* Huds.) and velvet bentgrass (*A. canina* L.) species; 15 cultivars were evaluated.
- The sandy loam study was seeded September 1998 and traffic treatments were initiated in August 1999. The sand root zone was seeded May 1999 and traffic treatments were initiated in October 1999.
- Bentgrass varieties were seeded at 5-g of seed into 4.6-m^2 plots on 30 September 1998. Before seeding, plot area was topdressed with soil cores taken from putting greens of Plainfield C.C. (Plainfield, NJ) that contained seed of annual bluegrass.
- Plots were fertilized sufficiently to produce a putting green quality turf (5 pounds of N per 1000 ft^2 in 1999). Annual fertilization of the sandy loam study was 5.7, 0.8, and 1.5 g m^{-2} of N, P, and K, respectively, in 2000. The sand study was fertilized with 9.8, 3.7, and 6.9 g m^{-2} of N, P, and K, respectively, in 2000.
- A mowing height of 2.9-mm (0.115-inch) was achieved in 2000, and mowing was performed 5 to 6 times per week.

- Wear and compaction treatments were applied 4 times per week using a modified walk-behind Sweepster and a Brouwer water-filled turf roller, respectively, from May through September. Compaction treatments also received 6 passes with a Wacker pavement roller (4 passes with vibration and 2 passes without).
- Irrigation and fungicides were applied as needed to avoid drought and disease stresses.
- Plots were evaluated during 2000 for turf quality and density and the amount of annual bluegrass encroachment.

Results of Sandy Loam Study

Turf Quality. A reduction in turf quality due to wear treatment was observed in May; whereas, compaction treatment did not reduce quality compared to non-trafficked plots until September (Table 1). Generally, wear and wear plus compaction treatments produced similar turf quality; however, a traffic by cultivar interaction was evident on 31 May, 14 Jul., and 30 Sep. 2000. The interaction on these dates indicated that the cultivars 'Penn A-4', 'MVB', and '7001' had little, if any, reduction in quality due to traffic treatments (Table 2).

Turf Density. Compaction did not significantly reduce turf density on 8 May; whereas, the traffic treatments containing a wear component did lower density (Table 1). The interaction on 30 September indicated that turf density was lowered by compaction treatment on 'Penncross' plots; density of other cultivars was not affected by compaction (Table 2). The interaction also indicated that the cultivars 7001, MVB, 'SR 7200', Penn A-4, 'Penn G-2', and 'Century' maintained good to excellent density under all forms of traffic treatment.

Bentgrass Population. Bentgrass populations assessed on 3 July 1999 (before traffic treatment) indicated subtle differences between cultivars for annual bluegrass encroachment during establishment (Table 3). Traffic treatment affected bentgrass populations by November 1999. Wear treatment has decreased bentgrass populations; whereas, compaction has not altered species populations compared to non-trafficked plots. The interaction between cultivar and traffic observed on 28 July 2000 indicated that bentgrass population among cultivars depended on traffic treatment (Table 4). Bentgrass population in plots of Penn A-4, SR 7200, MVB, and 7001 were the highest and not altered by traffic treatment. Bentgrass population of SR 1020, Southshore, Penneagle, and Providence plots was lower than non-trafficked and/or compacted plots. Bentgrass population of SR 1119 was lowest in the wear treatment compared to non-trafficked and compacted plots. Bentgrass population of all other cultivars was not affected by traffic on 28 July 2000.

Conclusions. Cultivars having the capacity to produce high density turf under putting green conditions have exhibited good to excellent tolerance to both wear and compaction treatment on a sandy loam. Velvet bentgrass has considerably better tolerance of traffic stresses than previously reported. High density bentgrass cultivars have shown excellent resistance to annual bluegrass encroachment under a range of traffic conditions. Wear may be more detrimental for some bentgrass cultivars than others. Longer term observation of cultivars under traffic is needed to fully assess the ability to persist under the chronic stresses of compacted soil.

Results of Sand Study

Turf Quality. A reduction in turf quality due to wear treatment was observed by 31 May; whereas, compaction treatment did not reduce quality compared to non-trafficked plots (Table 5). Generally, wear and wear plus compaction treatments produced similar turf quality; however, a traffic by cultivar interaction was evident on 31 Sep. 2000 (Table 6). Good to excellent turf quality was observed on MVB, SR 7200, Penn A-4, and Penn G-2 plots over all levels of traffic. The interaction on 31 September indicated that the cultivars 'SR 1020', 'Southshore', and MVB had lower turf quality under wear treatment than the wear plus compaction treatment. Conversely, 'L-93' had lower quality under wear plus compaction treatment than wear treatment (Table 6).

Turf Density. Compaction did not significantly reduce turf density on 31 September; whereas, the traffic treatments containing a wear component did lower density (Table 5). The velvet bentgrasses MVB and SR7200 produced the highest turf density over all levels of traffic. The creeping bentgrasses that produced the highest density over all traffic treatments were Penn A-4 and Penn G-2. Regardless of traffic treatment, Penncross, 'Putter', 'Pennlinks', and 'Penneagle' produced the lowest density.

Bentgrass Populations. Annual bluegrass invasion into plots was minimal in 2000. Initial data has been collected to document the low level of infestation (data not shown).

Conclusions. Cultivars having the capacity to produce high density turf under putting green conditions have exhibited good to excellent tolerance to both wear and compaction treatment on a sand root zone. Velvet bentgrass has considerable better tolerance of traffic stresses than previously reported. Longer term observation of cultivars under traffic is needed to fully assess the ability to persist under the chronic stresses of a compacted soil.

Plan of Work for 2001

- Soil physical property data will be collected and analyzed.
- Bentgrass population data collected in 2000 will be summarized.
- Continue managing plots as putting green turf using procedures outlined above.
- Maintain traffic treatments throughout 2001 growing season.
- Monitor turf quality and annual bluegrass populations as affected by bentgrass cultivar and traffic in spring, summer and fall of 2001.

Fairway Trial on Soil

Objectives

Field study was conducted to assess the tolerance of bentgrasses to traffic under fairway conditions and determine the subsequent susceptibility of bentgrass cultivars to annual bluegrass encroachment.

Methods

- Study arranged in a randomized block design with 3 replications using a split-plot factorial treatment combination of 15 bentgrass entries and 4 levels of traffic (no traffic, wear, compaction, and wear + compaction)]. The traffic factor was arranged as main plot and subplot treatments were cultivars including creeping bentgrass (*Agrostis palustris* Huds.) and velvet bentgrass (*A. canina* L.) species; 15 cultivars were evaluated.
- Bentgrass varieties seeded at $\frac{3}{4}$ pound / 1000 ft^2 (5-g of seed into 4.6-m^2 plots) on 17 October 1998. Before seeding, plot area was topdressed with soil cores taken from putting greens of Plainfield C.C. (Plainfield, NJ) that contained seed of annual bluegrass.
- Traffic treatments were initiated on 5 August 1999. Wear and compaction treatments were applied 4 times per week using a modified walk-behind Sweepster and a Brouwer water-filled turf roller, respectively, from May through September. Compaction treatments also received 6 passes with a Wacker pavement roller (4 passes with vibration and 2 passes without).
- Plots were fertilized with nitrogen at 5.3 and 0.5 pounds per 1000 ft^2 in 1999 and 2000, respectively.
- Plots were mowed three times per week at $^{13}/_{32}$-inch with clippings removed.
- Irrigation and fungicides were applied as needed to avoid drought and disease stresses.
- Plots were evaluated during 2000 for turf quality and density and the amount of annual bluegrass encroachment.

Results

- Bentgrass populations assessed on 3 July 1999 (before traffic treatment) indicated subtle differences between cultivars for annual bluegrass encroachment during establishment.
- Traffic affected bentgrass populations by March 2000; wear plus compaction treatment decreased bentgrass population of plots more than wear or compaction treatment. Both wear and compaction treatment decreased bentgrass compared to non-trafficked plots.
- Interaction of traffic and bentgrass cultivar on 7 August indicated that separation of cultivars based on bentgrass population was greater for trafficked plots than non-trafficked plots. Bentgrass population of 7001 plots was lowered with wear plus compaction treatment; all other cultivars had decreased bentgrass population under both wear and wear plus compaction treatment. Bentgrass population was similar for wear, compaction, and wear plus compaction treatments for the cultivars, Pennlinks and SR 7200.

Conclusions

All bentgrass cultivars maintained high bentgrass population (>90%) under non-trafficked conditions. Under traffic, however, large differences in bentgrass population had developed among cultivars by 7 August 2000. The velvet bentgrass, 7001, has exhibited the greatest tolerance to traffic as measured by annual bluegrass encroachment. Other high density bentgrasses including Penn G-1, Penn A-4, and SR 7200 have exhibited good tolerance to traffic. Thus, velvet bentgrass has considerable better tolerance of traffic stresses than previously reported. Longer term observation of cultivars under traffic is needed to fully assess the ability to persist under the chronic stresses of a compacted soil.

Plan of Work for 2001

- Soil physical property data will be collected and analyzed.
- Turf quality and density data for 2000 will be summarized.
- Continue managing plots as a fairway turf using procedures outlined above.
- Maintain traffic treatments throughout 2001 growing season.
- Monitor turf quality and annual bluegrass populations as affected by bentgrass cultivar and traffic in spring, summer and fall of 2001.

Table 1. Turf quality and density of putting green turf grown on a sandy loam as affected by traffic and bentgrass cultivar during 2000.

	Turf Quality					Turf Density	
ANOVA Source	May 8	May 31	Jul 14	Aug 28	Sep 30	May 8	Sep 30
Traffic	**	**	***	***	***	**	***
Entry	***	***	***	***	***	***	***
Traffic*Entry	NS	*	***	NS	***	NS	**
Bentgrass Cultivar	9= best						
Penn A-4	8.4	8.5	8.1	7.6	7.7	8.1	7.6
MVB†	7.4	7.6	7.7	8.2	8.1	7.9	8.4
Penn G-2	8.2	8.4	7.8	7.3	7.8	8.3	7.7
SR 7200†	7.4	7.4	7.0	6.8	7.4	8.1	8.1
7001†	6.6	6.4	7.2	7.6	7.6	6.9	8.3
Century	7.0	7.3	7.3	6.6	6.9	7.6	7.1
L-93	6.2	6.9	6.8	5.9	6.1	6.4	6.4
SR 1119	6.2	6.6	6.2	5.8	5.9	6.3	6.1
Southshore	5.0	6.0	5.8	4.9	5.2	5.3	6.1
Providence	5.2	5.7	5.5	4.9	5.0	5.5	5.3
SR 1020	4.8	5.1	5.5	5.0	5.3	5.0	5.3
Penneagle	4.0	4.3	4.8	4.4	4.5	4.0	5.2
Putter	4.3	4.6	4.5	4.2	4.6	4.6	5.3
Pennlinks	3.5	4.1	4.0	3.6	4.1	3.8	4.3
Penncross	3.2	4.1	3.9	3.3	3.5	3.8	4.1
$L.S.D._{.0.05}$	0.5	0.5	0.5	0.6	0.4	0.6	0.5
Traffic Treatment							
No Traffic	6.3	6.5	6.6	6.5	6.9	6.6	7.2
Wear	5.6	6.1	5.7	5.2	5.4	5.9	5.8
Compaction	5.9	6.5	6.5	6.4	6.4	6.3	6.8
Wear plus Compaction	5.5	5.7	5.8	5.0	5.2	5.7	5.7
$L.S.D._{.0.05}$	0.4	0.5	0.2	0.4	0.4	0.4	0.4

†, Denotes velvet bentgrass.

Table 2. Turf quality and density of putting green turf grown on a sandy loam as affected by the interaction of traffic and bentgrass cultivar during 2000.

	Turf Quality												Turf Density			
	31 May				14 July				30 September				30 September			
Bentgrass	None	Wear	Com.†	Wear & Com.	None	Wear	Com.	Wear & Com.	None	Wear	Com.	Wear & Com.	None	Wear	Com.	Wear & Com.
MVB‡	7.5	7.3	7.8	7.8	7.9	6.9	8.3	7.5	9.0	7.5	8.3	7.5	9.0	7.8	9.0	8.0
Penn G-2	8.5	8.3	9.0	7.8	8.4	7.1	8.6	7.1	8.5	6.5	8.5	7.5	8.3	7.0	8.3	7.3
Penn A-4	8.8	8.8	8.5	8.0	8.6	7.4	8.6	7.9	8.0	7.3	8.3	7.3	8.0	7.5	7.8	7.3
7001‡	6.0	6.5	6.8	6.5	7.6	7.0	7.0	7.0	8.0	7.5	7.5	7.3	9.0	7.8	8.5	8.0
SR 7200‡	7.5	7.8	7.5	6.8	7.0	7.3	7.3	6.4	8.3	7.3	7.8	6.5	8.5	8.0	8.5	7.5
Century	7.8	7.0	7.8	6.8	7.4	6.8	8.1	7.1	7.8	6.3	7.0	6.5	7.5	6.8	7.3	7.0
L-93	7.3	7.3	7.5	5.8	7.5	6.6	6.9	6.1	7.3	6.0	6.0	5.0	7.5	5.5	6.8	6.0
SR1119	7.0	5.5	7.3	6.8	6.3	5.4	6.9	6.4	6.8	5.8	6.5	4.8	6.8	6.3	6.3	5.3
SR1020	5.3	5.0	5.8	4.5	5.5	4.0	6.5	6.0	6.0	4.3	6.5	4.3	6.5	4.0	6.3	4.3
Southshore	6.5	6.5	6.0	5.0	6.0	6.0	5.6	5.6	5.8	5.0	5.3	4.8	6.5	5.5	6.3	6.0
Providence	6.5	5.5	6.0	4.8	7.1	5.3	5.6	4.1	6.5	4.5	5.5	3.5	6.8	4.8	6.3	3.5
Putter	5.3	4.0	5.3	4.0	5.4	3.8	5.0	4.0	6.0	3.5	5.3	3.5	6.3	4.5	5.8	4.8
Penneagle	5.3	4.0	4.3	3.8	5.1	4.5	4.9	4.6	5.8	4.0	4.8	3.5	6.3	4.5	5.8	4.3
Pennlinks	4.5	4.0	4.5	3.5	4.6	3.9	4.5	3.0	4.8	3.8	5.0	2.8	5.3	3.8	5.3	3.0
Penncross	4.3	3.8	4.3	4.0	4.4	3.5	4.0	3.6	4.8	2.5	4.0	2.8	5.8	3.3	4.5	2.8
$L.S.D._{0.05}$		1.1				1.1				1.0				1.1		

†, Com. denotes compaction.

‡, Denotes velvet bentgrass.

Table 3. Creeping bentgrass populations of putting green turf grown on a sandy loam as affected by traffic treatment and bentgrass entry.

		Creeping Bentgrass Population			
		Jul.	Nov.	Mar.	May
ANOVA		3†	11	13	13
Source		1999	1999	2000	2000
Traffic		NS	**	**	*
Bentgrass Cultivar (BC)		***	***	***	***
Traffic x BC		NS	NS	NS	NS
Traffic		---------- % ----------			
None		92	91	91	90
Wear		91	89	87	87
Compaction		92	90	90	88
Wear & Compaction		91	87	87	86
	$LSD_{0.05}$	NS	1	2	2
Bentgrass Entry					
Cultivar	Species				
A-4	Creeping	95	96	95	94
G-2	Creeping	95	93	93	92
SR 7200	Velvet	89	93	91	90
L-93	Creeping	93	89	89	88
7001	Velvet	84	89	85	87
MVB	Velvet	86	90	88	87
Century	Creeping	93	90	90	87
Putter	Creeping	92	90	90	87
Providence	Creeping	93	87	89	87
Southshore	Creeping	92	87	87	86
SR 1119	Creeping	91	85	86	86
SR 1020	Creeping	92	89	89	86
Penncross	Creeping	92	88	88	86
Pennlinks	Creeping	91	89	89	85
Penneagle	Creeping	91	87	88	85
	$LSD_{0.05}$	2	2	2	2

†, denotes data collected before traffic treatments initiated.

Table 4. Creeping bentgrass populations of putting green turf grown on a sandy loam as affected by traffic treatment and bentgrass on 28 July 2000.

Bentgrass	None	Wear	Com.†	Wear & Com.
	---------- % ----------			
MVB‡	96	94	94	93
Penn G-2	96	92	96	90
Penn A-4	95	92	95	94
7001	95	94	96	93
SR 7200‡	94	93	93	89
Putter	93	86	86	91
Century	92	93	94	89
SR1119	92	83	90	87
L-93	91	88	90	88
SR1020	90	85	90	83
Southshore	90	87	92	85
Penneagle	90	86	89	83
Pennlinks	90	85	90	85
Providence	89	87	89	83
Penncross	89	86	86	84
$L.S.D._{0.05}$		5		

†, Com. denotes compaction.

‡, Denotes velvet bentgrass.

Table 5. Turf quality and density of putting green turf grown on a sand as affected by traffic and cultivar during 2000.

	Turf Quality					Turf Density	
ANOVA	May	May	Jul	Aug	Sep	May	Sep
Source	8	31	4	28	31	8	31
Traffic	NS	**	*	**	***	NS	***
Cultivar	***	***	***	***	***	***	***
Traffic*Cultivar	NS	NS	NS	NS	**	NS	NS
Bentgrass							
Cultivar	9=best						
MVB†	8.3	8.1	8.4	8.3	7.7	8.6	8.2
SR 7200†	8.7	8.7	8.2	7.6	7.4	8.7	7.9
Penn A-4	8.1	8	8.1	7.1	6.8	8.0	6.8
Penn G-2	8.3	8.4	7.9	7.3	6.6	8.1	6.8
Century	7.3	7.2	7.3	6.3	5.8	7.5	6.1
L-93	6.8	6.8	6.7	6.3	5.6	6.6	5.4
SR 1119	6.8	7.7	7	6.3	5.3	6.8	5.4
SR 1020	5.3	5.3	5.8	5.4	5.1	5.2	5.4
Southshore	5.9	6.2	6.2	5.8	5.0	5.7	4.8
Providence	6.3	6.2	5.8	4.9	4.5	6.1	4.8
Cato	5.9	6.2	5.8	5.3	4.4	6.1	4.6
Penneagle	4.3	4.3	4.3	3.6	3.7	4.2	3.8
Pennlinks	4.4	4.3	4.3	3.9	3.6	4.3	3.8
Putter	4.3	4.2	4.3	4.1	3.3	4.6	3.5
Penncross	4.3	4.3	4.2	3.3	3.0	4.2	3.2
L.S.D.$_{0.05}$	0.5	0.6	0.6	0.6	0.4	0.5	0.4
Traffic Treatment							
No Traffic	6.4	6.6	6.8	6.6	6.1	6.4	6.5
Wear	6.0	5.8	5.9	5.2	4.1	6.2	4.2
Compaction	6.5	6.4	6.5	5.8	6.2	6.2	6.2
Wear & Compaction	6.4	6.7	5.9	5.3	4.3	6.4	4.5
L.S.D.$_{0.05}$	NS	0.3	0.5	0.5	0.4	0.6	0.5

†, Denotes velvet bentgrass.

Table 6. Turf quality of a putting green turf grown on a sand as affected by the interaction of traffic and bentgrass cultivar on 31 September 2000.

Bentgrass	None	Wear	Com.†	Wear & Com.
	---------- Turf Quality (9=best)----------			
MVB‡	8.5	6.2	8.8	7.2
SR 7200‡	8.0	6.5	8.8	6.3
Penn A-4	7.7	5.5	7.7	6.2
Penn G-2	7.7	5.5	7.8	5.5
Century	7.0	4.7	6.5	5.0
L-93	6.8	5.2	6.3	4.0
SR1119	5.7	4.3	6.3	4.7
SR1020	6.2	3.2	6.7	4.5
Southshore	5.5	3.8	6.0	4.7
Providence	5.8	3.3	5.5	3.5
Cato	4.7	3.3	6.0	3.7
Penneagle	4.7	3.0	4.3	2.7
Pennlinks	4.5	3.0	3.8	3.0
Putter	4.5	2.0	3.8	2.7
Penncross	4.0	2.0	4.0	2.0
L.S.D.0.05		0.8		

†, Com. denotes compaction.

‡, Denotes velvet bentgrass.

Table 7. Creeping bentgrass populations in fairway turf as affected by traffic and bentgrass entry.

		Creeping Bentgrass Population			
		Jul.†	Nov.	Mar.	May
		3	11	15	14
ANOVA Source		1999	1999	2000	2000
Traffic		NS	NS	**	**
Bentgrass Cultivar (BC)		***	***	***	***
Traffic x BC		NS	NS	NS	NS
Traffic		---------- % bentgrass ----------			
None		86	93	89	87
Wear		82	88	81	82
Compaction		83	90	84	82
Wear & Compaction		88	87	80	78
$LSD_{0.05}$				2	3
Bentgrass Cultivar	Species				
A-4	Creeping	88	96	92	90
G-1	Creeping	89	94	89	89
7001	Velvet	83	94	86	88
Putter	Creeping	84	91	87	84
G-2	Creeping	89	91	86	84
SR 7200	Velvet	86	92	84	82
Century	Creeping	82	86	83	82
Southshore	Creeping	88	89	81	82
Providence	Creeping	83	86	81	82
SR 1119	Creeping	84	86	78	82
L-93	Creeping	83	89	81	81
Penneagle	Creeping	82	90	86	79
Pennlinks	Creeping	84	88	82	79
Penncross	Creeping	85	86	81	79
SR1020	Creeping	81	85	78	77
	$LSD_{0.05}$	4	3	3	3

†, denotes data collected before traffic treatments initiated.