

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

Project Title: Cultivar and Traffic Effects on Population Dynamics of *Agrostis* spp. and *Poa annua* Mixtures

Over the past decade, there has been a concerted effort by turfgrass breeders to develop improved cultivars of creeping and velvet bentgrasses that are denser, finer, more aggressive, more stress tolerant, and are more competitive than older industry standards. This affords the opportunity to take advantage of the genetic improvements in competitive ability of these bentgrasses in an annual bluegrass control program. The goals of this research project are to identify bentgrass cultivars that exhibit an improved genetic competitive ability against annual bluegrass invasion under the influence of traffic, and to determine if the time of year for establishment affect the competitive posture of bentgrasses against annual bluegrass invasion.

Putting green trials established on 2 dates in 1995 and 1 date in 1996 have consistently shown differences in the amount annual bluegrass in mixed stands with bentgrass cultivars.

Data collected in June 1998

- Percent annual bluegrass invasion on 8 June 1998 indicated L-93 had less annual bluegrass invasion than all cultivars in the August 1995 seeded trial. Penncross had a higher percent annual bluegrass invasion than all remaining cultivars in the same seeding date. In the September 1995 seeded trial, A-4, L-93, and Southshore had less percent annual bluegrass invasion than Penncross; A-4 and L-93 also had less annual bluegrass invasion than Providence. A-4, Southshore, and G-2 showed less annual bluegrass invasion than Penncross in the June 1996 seeded trial.

Data collected in October 1998

- A-4 and L-93 had less percent annual bluegrass invasion than all cultivars except Southshore in the August 1995 seeded trial. Southshore had less annual bluegrass invasion than Providence and Penncross. L-93 had less annual bluegrass invasion than all cultivars except A-4 and G-2 in the September 1995 seeded trial. A-4, Southshore, and G-2 had less annual bluegrass invasion than Penncross. A-4 also had less annual bluegrass invasion than Pennlinks in the same seeding date. L-93 had less annual bluegrass invasion than Penncross and G-2 in the June 1996 seeded trial. A-4 had less annual bluegrass invasion than Penncross in the same seeding date.

A trial was initiated in 1998 to evaluate the time of year for bentgrass establishment that may enhance the competitive ability of bentgrass species and cultivars against annual bluegrass. Initial data indicates that a June seeding date resulted in less annual bluegrass invasion than seeding dates in May and August. This would be expected based on the fact that annual bluegrass is a winter annual, and peak seed germination periods would be late-summer to early-fall.

Two additional trials were established in 1998. Both were established on soil and are intended to be managed under putting green and fairways conditions. Both trials will assess the population dynamics between bentgrass and annual bluegrass under four levels of traffic. A third trial will be established on a sand-based (USGA style) root zone and maintained as a putting green (construction of the root zone was completed in October 1998). This third trial will also evaluate the effect of traffic on bentgrass and annual bluegrass population dynamics. More than a dozen cultivars of two bentgrass species are being evaluated in these three trials. Data will be collected for the percent population of each species as well as turf performance for each cultivar treatment under each level of traffic.

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Project Title: Cultivar and Traffic Effects on Population Dynamics of *Agrostis* spp. and *Poa annua* Mixtures

Introduction

Over the past decade, there has been a concerted effort by turfgrass breeders to develop improved cultivars of creeping and velvet bentgrasses that are denser, finer, more aggressive, more stress tolerant, and are more competitive than older industry standards. This affords the opportunity to take advantage of the genetic improvements in competitive ability of these bentgrasses in an annual bluegrass control program. The goals of this research project are to identify bentgrass cultivars that exhibit an improved genetic competitive ability against annual bluegrass invasion under the influence of traffic, and to determine if the time of year for establishment affect the competitive posture of bentgrasses against annual bluegrass invasion.

Bentgrass species and cultivar competition with annual bluegrass as influenced by time of establishment.

1995/1996 Seeding Date Trial

Objectives: Identify creeping bentgrass cultivars with superior competitive ability against annual bluegrass. Preliminary evaluation of the time of establishment (seeding date) on creeping bentgrass competitive ability 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.
- Study Design - 8 entries (7 creeping bentgrass cultivars; 1 unseeded check) in a RCBD with 4 replications. Study was replicated 3 times as 3 separate seeding dates.

Creeping bentgrass cultivar

1. L-93
2. A-4
3. G-2
4. Southshore
5. Providence
6. Penncross
7. Pennlinks
8. unseeded check

Seeding Dates

1. 18 August 1995
2. 15 September 1995
3. 10 June 1996

- Establishment - Seeding date plot areas sprayed with glyphosate approximately two weeks and 1 week prior to each seeding date. Plot areas core cultivated and verticut to prepare seed bed and bring annual bluegrass seed to the soil surface. Bentgrass varieties seeded into 4.6-m² plots.
- Mowing height was lowered to $\frac{5}{32}$ -inch (0.156-inch) in July 1996, and maintained at that height until June 1998 when a 0.140-inch height was used.
- Line-intersecting grid counts were used to determine the percent annual bluegrass on 30 July and 18 November 1996, 8 May and 7 July 1997, and 8 June and 13 October 1998 for all three seeding dates (studies).

Results:

- Data for percent annual bluegrass invasion in 1996 and 1997 were presented in the project proposal. Over all cultivars, the least amount of annual bluegrass was observed in the June 1996 seeded trial during the first year of the study; whereas the greatest amount of annual bluegrass was observed in the August 1995 seeded trial.

Line-intersect counting June 1998 (Fig. 1):

- Percent annual bluegrass invasion on 8 June 1998 indicated L-93 had less annual bluegrass invasion than all cultivars in the August 1995 seeded trial. Penncross had a higher percent annual bluegrass invasion than all remaining cultivars in the same seeding date. In the September 1995 seeded trial, A-4, L-93, and Southshore had less percent annual bluegrass invasion than Penncross; A-4 and L-93 also had less annual bluegrass invasion than Providence. A-4, Southshore, and G-2 showed less annual bluegrass invasion than Penncross in the June 1996 seeded trial.

Line-intersect counting October 1998 (Fig. 2):

- A-4 and L-93 had less percent annual bluegrass invasion than all cultivars except Southshore in the August 1995 seeded trial. Southshore had less annual bluegrass invasion than Providence and Penncross. L-93 had less annual bluegrass invasion than all cultivars except A-4 and G-2 in the September 1995 seeded trial. A-4, Southshore, and G-2 had less annual bluegrass invasion than Penncross. A-4 also had less annual bluegrass invasion than Pennlinks in the same seeding date. L-93 had less annual bluegrass invasion than Penncross and G-2 in the June 1996 seeded trial. A-4 had less annual bluegrass invasion than Penncross in the same seeding date.

Plan of work:

- Line-intersect grid counts in early spring 1999.
- Terminate study and repeat the 1998 Seeding Date Trial described below.

Fig. 1 Line-intersect counting on 8 June 1998

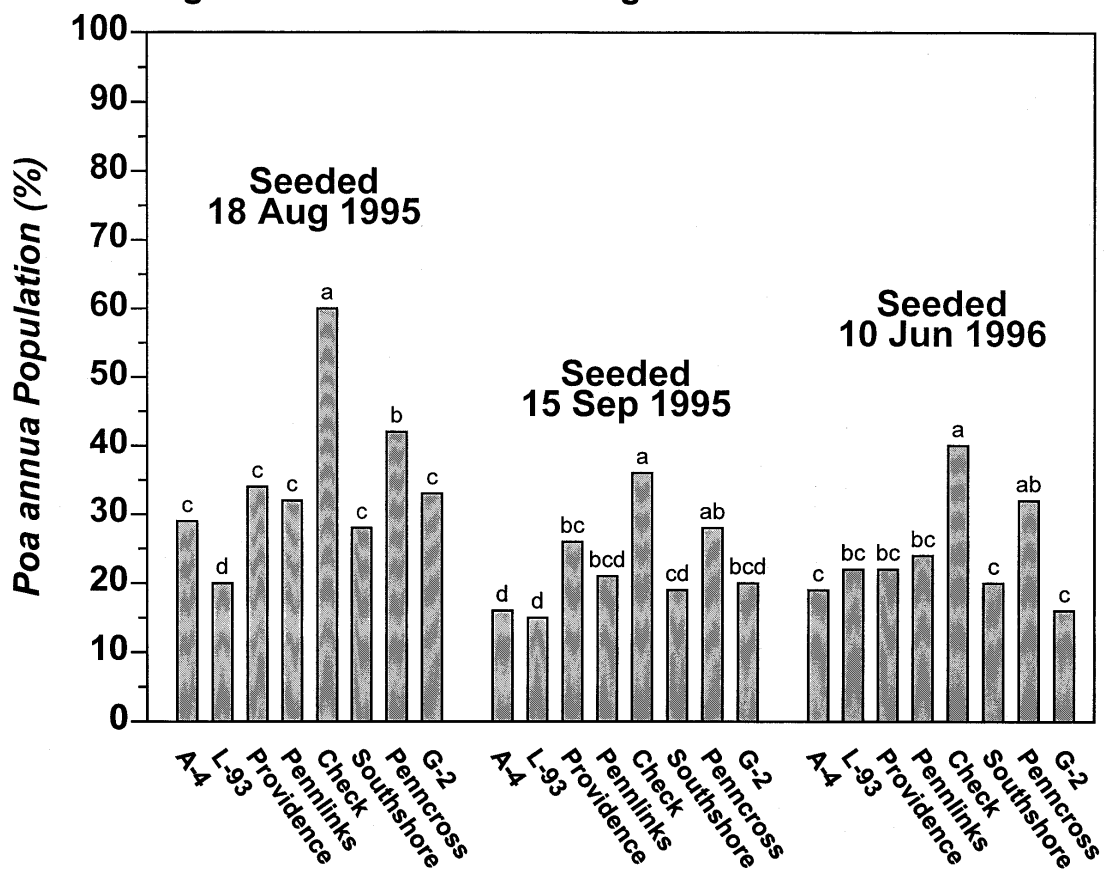
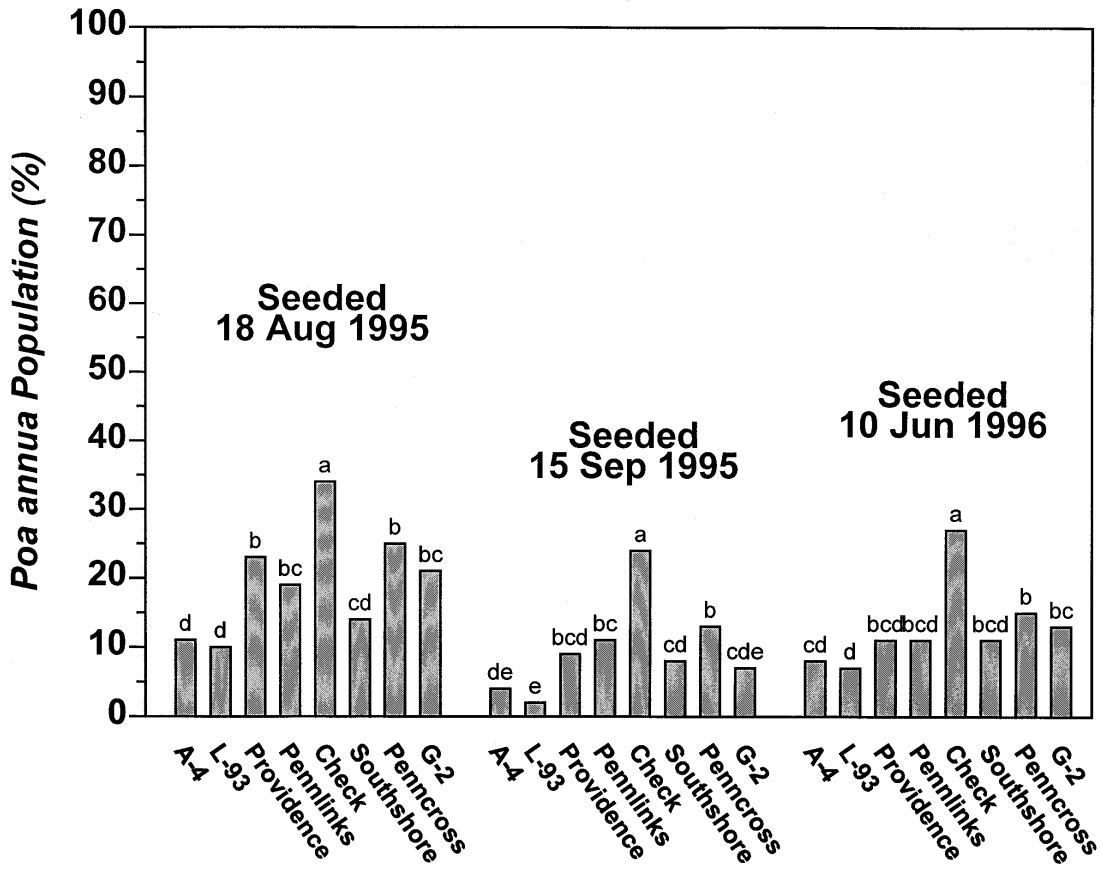


Fig. 2 Line-intersect counting on 13 October 1998



1998 Seeding Date Trial

Objectives: Identify the time of year for bentgrass establishment that enhances the competitive ability of bentgrass species and cultivars 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.
- Study Design – A split-plot factorial [6 entries (5 bentgrass cultivars and 1 unseeded check) x 5 seeding dates] with 4 replications.

Factors:	<u>Bentgrass cultivar/species</u>	<u>Seeding Dates</u>
	1. L-93/creeping	1. 16 May 1998
	2. A-4/creeping	2. 19 June 1998
	3. Providence/creeping	3. 20 August 1998
	4. Penncross/creeping	4. 19 September 1998
	5. SR-7200/velvet	5. 16 October 1998
	6. unseeded check	

- Establishment - Seeding date main-plot areas sprayed with glyphosate approximately two weeks and 1 week prior to each seeding date. Main-plot areas core cultivated and verticut to prepare seed bed and bring annual bluegrass seed to the soil surface. Bentgrass varieties seeded into 4.6-m² sub-plots.
- Line-intersecting grid counts to determine percent annual bluegrass invasion were made on 22 July 1998 for the May and June seeding dates (data not presented) and on 28 October 1998 for the May, June, and August seeding dates.

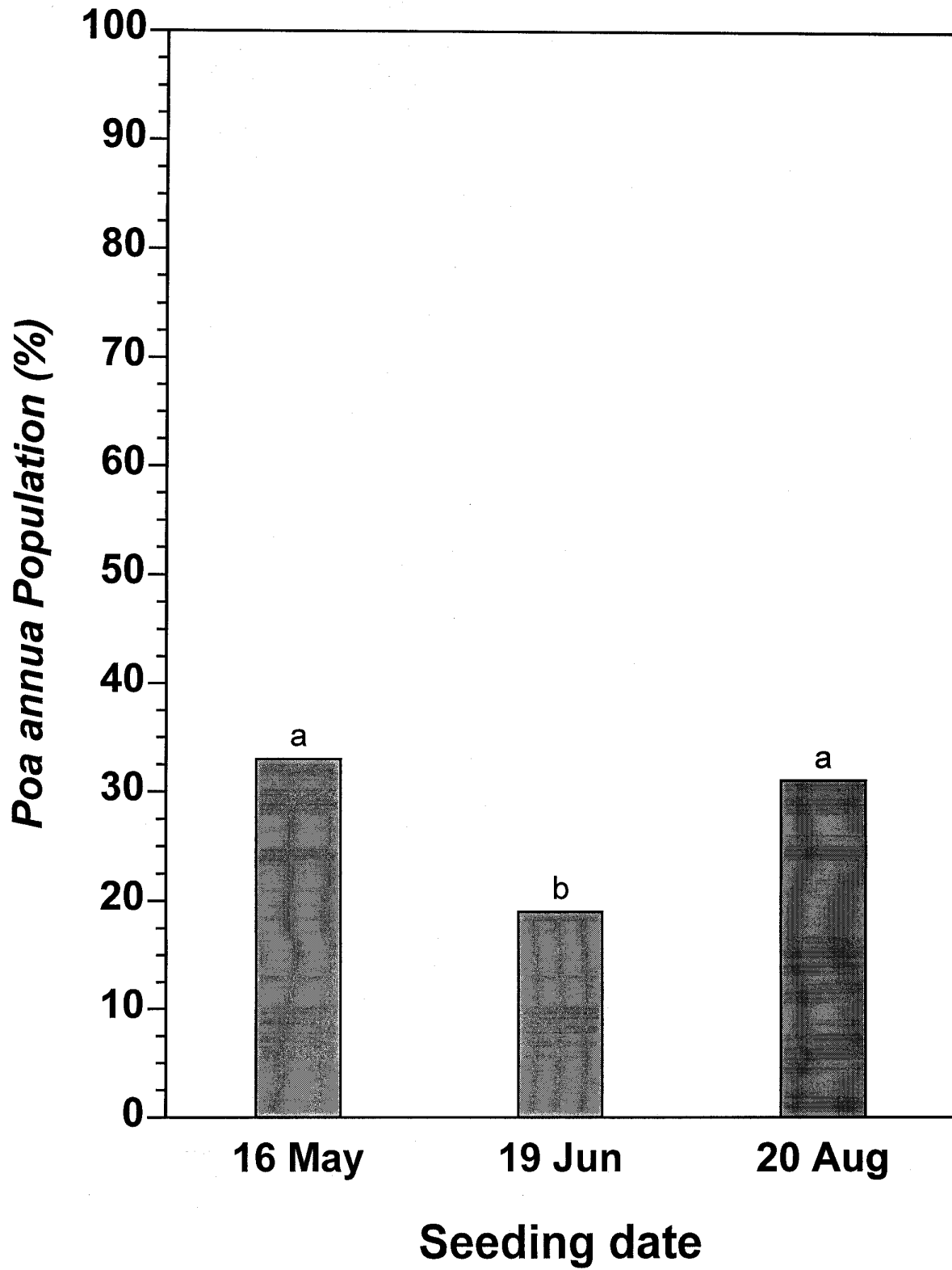
Results:

- Only main effects for the 28 October 1998 line-intersecting grid count were statistically significant (Anova not shown).
- Cultivar differences were statistically significant between seeded entries versus the unseeded check only (Anova not shown).
- Figure 3 shows the affect of seeding date on percent annual bluegrass invasion averaged over all cultivars. The June 1998 seeding date resulted in less annual bluegrass invasion than the May and August 1998 seeding dates. As a winter annual, annual bluegrass seed germination would be expected to be lowest during late -spring to early-summer seasons.

Plan of work for 1999:

- Line-intersect grid count on September and October seeding dates when fully established in spring 1999.
- Monitor annual bluegrass invasion during 1999 growing season.
- Repeat entire trial on a different site in 1999.

Fig. 3 Affect of seeding date on *Poa annua* populations



**Bentgrass species and cultivar competition with annual bluegrass
as influenced by traffic.**

Soil Greens Trial

Objectives: To assess bentgrass species and cultivar competition with annual bluegrass in response to wear, compaction, and wear + compaction on a soil green trial.

Methods:

- Field site - An existing mixed stand of creeping bentgrass cultivars and annual bluegrass, with a low seed bank population of annual bluegrass.
- Study Design – Split-plot factorial [16 entries (12 creeping bentgrass cultivars, 3 velvet cultivars/experimental entries and 1 unseeded check) x 4 levels of traffic (no traffic, wear, compaction, and wear + compaction)] with 4 replications. Traffic factor arranged as main plot and entries established as sub-plots.

Entry/species

1. L-93/creeping
2. A-4/creeping
3. G2/creeping
4. Century/creeping
5. SR1119/creeping
6. Providence/creeping
7. Southshore/creeping
8. SR1020/creeping
9. Penneagle/creeping

Entry/species

10. Putter/creeping
11. Pennlinks/creeping
12. Penncross/creeping
13. SR7200/velvet
14. 7001/velvet
(experimental)
15. MVB/velvet
(experimental)
16. unseeded check

- Establishment - Trial plot area sprayed with glyphosate to kill existing stand. Plot area was topdressed with soil cores from putting greens of Plainfield C.C. (Plainfield, NJ) that contained seed of annual bluegrass. Plot area was also core cultivated and verticut to prepare a seed bed. Bentgrass varieties were seeded at 5-g of seed into 4.6-m² plots on 30 September 1998.

Plan of work for 1999:

- Establish plots over winter 1998/1999 and spring 1999.
- Lower mowing height to 0.156-inch (⁵/₃₂-inch) or less during spring 1999.
- After established (approximately May 1999), traffic treatments will be applied on a weekly basis throughout 1999 growing season.
- Monitor plot turf performance.
- Monitor annual bluegrass invasion with line-intersect counting.

Fairway Trial on Soil

Objectives: To assess bentgrass species and cultivar competition with annual bluegrass in response to wear, compaction, and wear + compaction in a fairway trial.

Methods:

- Field site - An existing mixed stand of colonial bentgrass and annual bluegrass, with a low seed bank population of annual bluegrass.
- Study Design – Split-plot factorial [16 entries (13 creeping bentgrass cultivars, 2 velvet cultivars/experimental entries, and 1 unseeded check) x 4 levels of traffic (no traffic, wear, compaction, and wear + compaction)] with 3 replications. Traffic factor arranged as main plot and entries established as sub-plots.

Entry/species

1. L-93/creeping
2. A-4/creeping
3. G2/creeping
4. G1/creeping
5. Century/creeping
6. SR1119/creeping
7. Providence/creeping
8. Southshore/creeping

Entry/species

9. SR1020/creeping
10. Penneagle/creeping
11. Putter/creeping
12. Pennlinks/creeping
13. Penncross/creeping
14. SR7200/velvet
15. 7001/velvet
(experimental)
16. unseeded check

- Establishment - Trial plot area sprayed with glyphosate to kill existing stand. Plot areas verticut and mower scalped to remove debris. Plot area was topdressed with soil cores from putting greens of Plainfield C.C. (Plainfield, NJ) that contained seed of annual bluegrass. Bentgrass varieties seeded with 5-g of seed into 4.6-m² plots on 17 October 1998.

Plan of work:

- Establish plots over winter 1998/1999 and spring 1999.
- Lower mowing height to 0.375-inch (³/₈-inch) during spring 1999.
- After established (approximately May 1999), traffic treatments will be applied on a weekly basis throughout 1999 growing season.
- Monitor plot turf performance.
- Monitor annual bluegrass invasion with line-intersect counting.

Putting Green Trial on Sand-based Root Zone

Objectives: To assess bentgrass species and cultivar competition with annual bluegrass in response to wear, compaction, and wear + compaction on a USGA sand root zone.

Methods:

- Field site - An 85:15 sand:sphagnum peat root zone mixture, meeting USGA recommendations for putting green construction, constructed during 1998. (Completed 28 October 1998)
- Projected Study Design - Split plot [10 entries (7 creeping bentgrass cultivars, 2 velvet cultivars/experimental varieties and 1 unseeded check) x 4 levels of traffic (no traffic, wear, compaction, and wear + compaction)] with 3 replications. Traffic factor arranged as main plot and entries established as sub-plots.

Proposed Entries

<u>Entry/species</u>	<u>Entry/species</u>
1. L-93/creeping	6. Pennlinks/creeping
2. A-4/creeping	7. Penncross/creeping
3. G2/creeping	8. SR7200/velvet
4. Cato/creeping	9. MVB/velvet
5. Providence/creeping	(experimental)
	10. unseeded check

Plan of work:

- Install irrigation around green during fall 1998 (in progress).
- Topdress with soil cores from putting greens of Plainfield C.C. (Plainfield, NJ) containing annual bluegrass seed.
- Establish annual bluegrass on green during fall 1998 (grow-in under a cover over winter 1998/1999).
- Allow development, production and deposition of annual bluegrass seed in spring 1999.
- Establish bentgrass varieties during spring/summer 1999.
- Lower mowing height to 0.156-inch ($\frac{5}{32}$ -inch) by late-summer 1999.
- Traffic treatments applied on a weekly basis in fall 1999.
- Monitor annual bluegrass invasion.