

Annual Bluegrass Control in Fairway Height Creeping Bentgrass

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Introduction

This study was conducted on a mature stand of 'Penneagle' creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass (*Poa annua*) at the Valentine Turfgrass Research Center, Penn State University, University Park, PA. The objective of the study was to determine if selected materials could reduce the annual bluegrass population under simulated fairway conditions.

Methods and Materials

This study was a randomized complete block design with three replications. Treatments were applied on June 6 (JUNE), June 13 (7 DAT), June 20 (14 DAT), June 28 (21 DAT), July 11 (28 DAT), July 14 (35 DAT), July 18 (42 DAT), August 8 (56 DAT), August 18 (70 DAT), September 2 (84 DAT), September 14 (98 DAT), October 12 (112 DAT), October 24 (126 DAT), November 2 (140 DAT), November 4 (NOV), and Nov 22, 2005 (LATE NOV) using a three foot CO₂ powered boom sprayer calibrated to deliver 40 gpa and Betasan was applied at 80 gpa using two, flat fan, 11004 nozzles at 40 psi. After pre-emergent applications of Betasan the area was irrigated with 0.25" of water. The test area was maintained at 0.5 inch using a five-plex reel mower that collected clippings. Turfgrass was irrigated on an as needed basis to prevent moisture stress. The study was fertilized prior to green up (March 20, 2005) with 2 lbs /M of IBDU and again in May with 0.75 lb N/M of Urea. The test area received maintenance fungicide applications to control disease.

The test site consisted of approximately 45 percent creeping bentgrass and 55 percent annual bluegrass at the initiation of the study. The annual bluegrass population was visually evaluated on May 24, 2005 and May 9, 2006, on a plot by plot basis, to determine the baseline population and percent change of the population in each plot.

Results and Discussion

Turfgrass discoloration was rated five times during the study (Table 1). Only turfgrass treated with Velocity, alone or in combination with other materials, was rated below acceptable (7.0) at some time in the study.

Turfgrass quality was rated five times during the study (Table 2). Turfgrass quality was never rated below acceptable (7.0) on any rating date.

Turfgrass spring color was rated twice during the study (Table 3). On the April 13, 2006 rating date only turfgrass treated with Prograss, alone or in combination with other materials, was rated below 6.0. By the May 9, 2006 rating date, all turfgrass spring color was rated 9.0.

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The annual bluegrass population change was rate on May 9, 2006 (Table 4). Turfgrass treated with Trimmit plus Rubigan at 0.75 oz/M with or without an 18-3-1 fertilizer applied at the June, 28, 56, 112, and 140 DAT timings, Trimmit plus Rubigan at 1.5 oz/M applied at the June, 28, 56, 112, and 140 DAT timings, Velocity at 60 g ai/A June and 14 DAT plus Rubigan at 0.75 oz/M June 14, 42, 70, and 98 DAT, Trimmit with or without Rubigan at 0.75 oz/M plus an 18-3-1 fertilizer applied at the June, 28, 56, 112, and 140 DAT timings with or without Betasan at 5.6 oz/M applied at June, and 56 DAT timings, Trimmit plus Signature at 8 oz/M plus an 18-3-1 fertilizer applied at the June, 28, 56, 112, and 140 DAT timings with or without Betasan at 5.6 oz/M applied at June, and 56 DAT timings, Trimmit applied at the June, 28, 56, 112, and 140 DAT timings plus Rubigan at 0.75 oz/M applied at the June, 14, 28, 42, 56, 70, 84, 98, 112, and 140 DAT timings, Prograss alone or in combination with Trimmit at any rate, and Trimmit plus Signature applied at the June, 28, 56, 112, and 140 DAT timings reduced the annual bluegrass population by 70% or more, significantly more reduction than untreated.

It appears that annual bluegrass populations can be reduced in a mixed sward of creeping bentgrass/annual bluegrass using Trimmit, Velocity, and Prograss alone or in combination with a fertilizer, fungicides, and a preemergence. Although some turfgrass discoloration was noted there was no long lasting effect and the overall quality of the turfgrass was not adversely effected. There was a delay in the turfgrass spring color following applications of Prograss alone or in combination with Trimmit.

Table 1. Discoloration of a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2005.

Treatment	Form	Rate (lb ai/A)	Timing	(------Discoloration ¹ -----)				
				6/9	6/20	6/28	7/6	7/11
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.0	8.7	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.3	9.0	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.5	8.3	10.0	10.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.0	8.7	10.0	10.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
VELOCITY	80WP	30 G AI/A	June/14 DAT	6.0	10.0	6.0	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	45 G AI/A	June/14 DAT	6.0	10.0	6.0	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	60 G AI/A	June/14 DAT	6.0	10.0	5.7	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	60 G AI/A	June/14 DAT	6.0	10.0	5.7	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	6.0	8.7	6.2	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/14/28/56/84/112 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.3	8.7	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.0	9.0	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56/ DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	8.3	8.3	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.7	9.0	10.0	10.0
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	8.7	8.7	10.0	10.0
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	10.0	10.0	9.3	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	10.0	10.0	10.0	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	10.0	10.0	10.0	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	10.0	9.7	10.0	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	10.0	10.0	10.0	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	10.0	10.0	10.0	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	10.0	10.0	10.0	10.0	10.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	10.0	9.7	10.0	10.0	10.0
CHECK				10.0	10.0	10.0	10.0	10.0

1 – Discoloration rated on a scale of 0 to 10 where 0= worst, 7 = acceptable, and 10 = no discoloration.

Table 1 (continued). Discoloration of a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2005.

Treatment	Form	Rate (lb ai/A)	Timing	(-----Discoloration ¹ -----)				
				6/9	6/20	6/28	7/6	7/11
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	10.0	9.7	10.0	10.0	10.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	10.0	10.0	10.0	10.0	10.0
VELOCITY	80WP	30 G AI/A	June/14 DAT	6.0	10.0	6.3	10.0	10.0
VELOCITY	80WP	45 G AI/A	June/14 DAT	6.0	10.0	5.7	10.0	10.0
VELOCITY	80WP	60 G AI/A	June/14 DAT	6.0	9.7	5.7	10.0	10.0
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	6.0	9.0	6.3	10.0	10.0
VELOCITY	17.6WP	30 G AI/A	June/14 DAT	6.0	8.3	6.0	10.0	10.0
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.3	8.7	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.7	8.0	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	6.0	10.0	10.0	10.0	10.0
VELOCITY	80WP	30 G AI/A	June					
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	10.0	9.7	10.0	10.0	10.0
VELOCITY	80WP	30 G AI/A	June	6.0	10.0	9.3	10.0	10.0
BETASAN	4EC	5.6 OZ/M	June/56 DAT	10.0	10.0	9.7	10.0	10.0
PROGRASS	1.5EC	0.75	NOV/LATE NOV	10.0	10.0	10.0	10.0	10.0
PROGRASS	1.5EC	0.75	NOV/LATE NOV	10.0	10.0	10.0	10.0	10.0
TRIMMIT	2SC	0.75	NOV/LATE NOV					
PROGRASS	1.5EC	0.375	NOV/LATE NOV	10.0	10.0	10.0	10.0	10.0
TRIMMIT	2SC	0.375	NOV/LATE NOV					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	10.0	7.7	8.3	10.0	10.0
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	10.0	9.7	10.0	10.0	10.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT					
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	10.0	8.7	10.0	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	10.0	8.7	10.0	10.0	10.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
VELOCITY	80WP	60 G AI/A	June/14 DAT	6.0	10.0	5.3	10.0	10.0
PSU EXP (PART A) WP		10.4 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
PSU EXP (PARTB) WP		11.2 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
PSU EXP (PART A) WP		20.8 OZ/M	June/28/56/112/140 DAT	6.0	10.0	10.0	10.0	10.0
PSU EXP (PARTB) WP		22.4 OZ/M	June/28/56/112/140 DAT					

1 – Discoloration rated on a scale of 0 to 10 where 0= worst, 7 = acceptable, and 10 = no discoloration.

Table 2. Quality, in terms of density, color, and uniformity of a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2005.

Treatment	Form	Rate (lb ai/A)	Timing	Quality ¹				
				7/25	8/8	8/18	8/30	9/16
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	9.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	9.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	9.5	8.5
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	9.5	8.5
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
VELOCITY	80WP	30 G AI/A	June/14 DAT	8.7	8.0	9.0	9.0	8.5
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	45 G AI/A	June/14 DAT	9.0	8.5	9.0	9.0	8.5
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	60 G AI/A	June/14 DAT	8.7	9.0	9.0	9.0	8.5
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	60 G AI/A	June/14 DAT	8.5	9.0	9.0	8.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT					
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	9.0	9.0	9.0	9.0	8.5
RUBIGAN	1AS	0.75 OZ/M	June/14/28/56/84/112 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	8.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.3	9.5	9.5	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56/ DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	9.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	8.5	8.5
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	9.0	8.5
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	8.7	8.5	8.5	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	9.0	8.5	8.5	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	8.5	8.5	8.5	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	9.0	9.0	8.5	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	8.8	9.0	8.5	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
BETASAN	4EC	5.6 OZ/M	June/56 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	9.0	9.0	8.5	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	8.8	8.5	8.5	9.0	8.5
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	9.2	8.0	8.0	8.5	8.5
CHECK				8.7	8.0	8.0	8.5	8.5

1 – Quality rated on a scale of 0 to 10 where 0= worst, 7 = acceptable, and 10 = excellent quality.

Table 2 (cont.). Quality, in terms of density, color, and uniformity of a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2005.

Treatment	Form	Rate (lb ai/A)	Timing	-----Quality ¹ -----				
				6/9	6/20	6/28	7/6	7/11
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	8.8	8.5	8.0	8.5	8.5
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	9.2	9.0	8.0	8.5	8.5
VELOCITY	80WP	30 G AI/A	June/14 DAT	8.8	8.5	8.0	8.5	8.5
VELOCITY	80WP	45 G AI/A	June/14 DAT	9.0	8.5	8.0	8.5	8.5
VELOCITY	80WP	60 G AI/A	June/14 DAT	9.0	8.5	8.0	8.5	8.5
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	8.5	9.0	8.0	8.5	8.5
VELOCITY	17.6WP	30 G AI/A	June/14 DAT	8.7	8.5	8.0	8.5	8.5
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	8.0	9.5	9.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.3	9.0	9.5	9.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	8.7	8.0	8.5	8.5	8.5
VELOCITY	80WP	30 G AI/A	June					
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	9.2	8.5	8.5	8.5	8.5
VELOCITY	80WP	30 G AI/A	June	9.0	8.5	8.5	8.5	8.5
BETASAN	4EC	5.6 OZ/M	June/56 DAT	8.7	8.5	8.0	8.5	8.5
PROGRASS	1.5EC	0.75	NOV/LATE NOV	8.5	8.5	8.0	8.5	8.5
PROGRASS	1.5EC	0.75	NOV/LATE NOV	8.8	8.5	8.0	8.5	8.5
TRIMMIT	2SC	0.75	NOV/LATE NOV					
PROGRASS	1.5EC	0.375	NOV/LATE NOV	8.7	8.5	8.0	8.5	8.5
TRIMMIT	2SC	0.375	NOV/LATE NOV					
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	9.5	9.5	9.5	9.5	8.5
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT					
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	9.2	9.0	8.5	8.5	8.5
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT					
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	9.3	9.0	9.0	8.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	9.5	9.0	9.0	8.5	8.5
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT					
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT					
VELOCITY	80WP	60 G AI/A	June/14 DAT	9.2	9.5	9.0	8.5	8.5
PSU EXP (PART A) WP		10.4 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
PSU EXP (PARTB) WP		11.2 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT					
PSU EXP (PART A) WP		20.8 OZ/M	June/28/56/112/140 DAT	8.5	9.5	9.0	9.0	8.5
PSU EXP (PARTB) WP		22.4 OZ/M	June/28/56/112/140 DAT					

1 – Quality rated on a scale of 0 to 10 where 0= worst, 7 = acceptable, and 10 = excellent quality.

Table 3. Spring color of a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass in 2006.

Treatment	Form	Rate (lb ai/A)	Timing	(-----Spring Color ¹ -----)	
				4/13/06	5/9/06
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	7.3	9.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	7.8	9.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT		
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	7.5	9.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	7.7	9.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT		
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
VELOCITY	80WP	30 G AI/A	June/14 DAT	6.3	9.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT		
VELOCITY	80WP	45 G AI/A	June/14 DAT	6.3	9.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT		
VELOCITY	80WP	60 G AI/A	June/14 DAT	6.8	9.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT		
VELOCITY	80WP	60 G AI/A	June/14 DAT	6.8	9.0
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT		
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	7.2	9.0
RUBIGAN	1AS	0.75 OZ/M	June/14/28/56/84/112 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	8.0	9.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT		
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
BETASAN	4EC	5.6 OZ/M	June/56 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	7.8	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
BETASAN	4EC	5.6 OZ/M	June/56/ DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	7.7	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	8.0	9.0
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT		
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
BETASAN	4EC	5.6 OZ/M	June/56 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	8.0	9.0
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT		
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	7.3	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
BETASAN	4EC	5.6 OZ/M	June/56 DAT		
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	7.3	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
BETASAN	4EC	5.6 OZ/M	June/56 DAT		
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	7.5	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	7.0	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	7.3	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
BETASAN	4EC	5.6 OZ/M	June/56 DAT		
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	7.7	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	7.2	9.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	6.5	9.0
CHECK				6.0	9.0

1 – Spring color rated on a scale of 0 to 10 where 0= worst and 10 = green spring color.

Table 3 (cont.) Spring color of a mixed fairway height sward of 'Penneagle' creeping bentgrass and annual bluegrass in 2006.

Treatment	Form	Rate (lb ai/A)	Timing	-----Spring Color ¹ -----	
				4/13/06	5/9/06
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	6.0	9.0
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	7.2	9.0
VELOCITY	80WP	30 G AI/A	June/14 DAT	6.3	9.0
VELOCITY	80WP	45 G AI/A	June/14 DAT	6.3	9.0
VELOCITY	80WP	60 G AI/A	June/14 DAT	7.0	9.0
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	6.3	9.0
VELOCITY	17.6WP	30 G AI/A	June/14 DAT	6.3	9.0
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	6.7	9.0
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	8.0	9.0
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT		
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	6.5	9.0
VELOCITY	80WP	30 G AI/A	June		
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	6.3	9.0
VELOCITY	80WP	30 G AI/A	June	6.3	9.0
BETASAN	4EC	5.6 OZ/M	June/56 DAT	6.7	9.0
PROGRASS	1.5EC	0.75	NOV/LATE NOV	3.0	9.0
PROGRASS	1.5EC	0.75	NOV/LATE NOV	3.0	9.0
TRIMMIT	2SC	0.75	NOV/LATE NOV		
PROGRASS	1.5EC	0.375	NOV/LATE NOV	3.3	9.0
TRIMMIT	2SC	0.375	NOV/LATE NOV		
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	7.8	9.0
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT		
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	7.5	9.0
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT		
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	7.2	9.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT		
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	7.5	9.0
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT		
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT		
VELOCITY	80WP	60 G AI/A	June/14 DAT	7.5	9.0
PSU EXP (PART A) WP		10.4 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT		
PSU EXP (PARTB) WP		11.2 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT		
PSU EXP (PART A) WP		20.8 OZ/M	June/28/56/112/140 DAT	7.2	9.0
PSU EXP (PARTB) WP		22.4 OZ/M	June/28/56/112/140 DAT		

1 – Spring color rated on a scale of 0 to 10 where 0= worst and 10 = green spring color.

Table 4. Percent annual bluegrass population change in a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass. Ratings taken on May 9, 2006.

Treatment	Form	Rate (lb ai/A)	Timing	(-----Population Change ^{1,2} -----) 5/9/2006
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	82.7a-d
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	91.1abc
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	74.0a-e
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	64.0a-g
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
VELOCITY	80WP	30 G AI/A	June/14 DAT	60.6b-h
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT	
VELOCITY	80WP	45 G AI/A	June/14 DAT	41.9e-l
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT	
VELOCITY	80WP	60 G AI/A	June/14 DAT	68.5a-f
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT	
VELOCITY	80WP	60 G AI/A	June/14 DAT	72.3a-e
RUBIGAN	1AS	0.75 OZ/M	June/14/42/70/98 DAT	
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	55.6c-I
RUBIGAN	1AS	0.75 OZ/M	June/14/28/56/84/112 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	83.3a-d
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
BETASAN	4EC	5.6 OZ/M	June/56 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	82.1a-d
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
BETASAN	4EC	5.6 OZ/M	June/56/ DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	79.1a-d
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	92.2abc
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
BETASAN	4EC	5.6 OZ/M	June/56 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	81.7a-d
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	-23.3rs
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
BETASAN	4EC	5.6 OZ/M	June/56 DAT	
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	-6.7o-s
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
BETASAN	4EC	5.6 OZ/M	June/56 DAT	
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	10.0l-s
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	-8.0o-s
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	21.2i-p
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
BETASAN	4EC	5.6 OZ/M	June/56 DAT	
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	10.0l-s
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	27.8h-o
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	2.3m-s
CHECK				6.7l-s

1 – Means followed by the same letter do not significantly differ (P = 0.05, Duncan’s New MRT).

2 – Negative numbers indicate an increase in annual bluegrass populations.

Table 4 (cont.) Percent annual bluegrass population change in a mixed fairway height sward of ‘Penneagle’ creeping bentgrass and annual bluegrass. Ratings taken on May 9, 2006.

Treatment	Form	Rate (lb ai/A)	Timing	(-----Population Change ^{1,2} -----) 5/9/2006
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	12.8k-r
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	-25.9s
VELOCITY	80WP	30 G AI/A	June/14 DAT	23.7i-p
VELOCITY	80WP	45 G AI/A	June/14 DAT	48.5d-k
VELOCITY	80WP	60 G AI/A	June/14 DAT	60.0b-h
VELOCITY	80WP	10 G AI/A	June/7/14/21/28/35 DAT	54.1d-j
VELOCITY	17.6WP	30 G AI/A	June/14 DAT	61.6a-h
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	76.3a-e
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	35.5f-m
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	19.4j-q
VELOCITY	80WP	30 G AI/A	June	
RUBIGAN	1AS	0.75 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	0.4m-s
VELOCITY	80WP	30 G AI/A	June	0.9m-s
BETASAN	4EC	5.6 OZ/M	June/56 DAT	29.8g-n
PROGRASS	1.5EC	0.75	NOV/LATE NOV	95.2ab
PROGRASS	1.5EC	0.75	NOV/LATE NOV	97.9a
TRIMMIT	2SC	0.75	NOV/LATE NOV	
PROGRASS	1.5EC	0.375	NOV/LATE NOV	95.0ab
TRIMMIT	2SC	0.375	NOV/LATE NOV	
TRIMMIT	2SC	0.4	June/28/56/112/140 DAT	79.3a-d
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	
SIGNATURE	80WP	8 OZ/M	June/28/56/112/140 DAT	-11.6p-s
RUBIGAN	1AS	1.5 OZ/M	June/28/56/112/140 DAT	
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	42.3e-l
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	
CUTLESS	50W	12 OZ/A	June/28/56/112/140 DAT	-16.7qrs
RUBIGAN	1AS	0.75 OZ/M	June/28/56/112/140 DAT	
18-3-1	1.8L	0.2 LB N/M	June/28/56/112/140 DAT	
VELOCITY	80WP	60 G AI/A	June/14 DAT	-3.3n-s
PSU EXP (PART A) WP		10.4 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	
PSU EXP (PARTB) WP		11.2 OZ/M	June/14/28/42/56/70/84/98/112/140 DAT	
PSU EXP (PART A) WP		20.8 OZ/M	June/28/56/112/140 DAT	32.2g-n
PSU EXP (PARTB) WP		22.4 OZ/M	June/28/56/112/140 DAT	

1 – Means followed by the same letter do not significantly differ (P = 0.05, Duncan’s New MRT).

2 – Negative numbers indicate an increase in annual bluegrass populations.