OVERSEEDING STRATEGIES FOR NON-IRRIGATED, PESTICIDE-FREE ATHLETIC FIELDS, 2017

G.L. Maxey[1], V.H. Wallace[2], and J.J. Henderson[1]

[1]Department of Plant Science and Landscape Architecture
[2]Department of Extension
University of Connecticut, Storrs

INTRODUCTION

Athletic field managers have perceived reduced playing surface quality as a result of severe pesticide restrictions in Connecticut (Bartholomew et al., 2015). Considering these restrictions, there is a need for proven alternative methods that can increase turfgrass cover and reduce weed pressure without the use of pesticides. Aggressive and repetitive overseeding has been recommended as a critically important tool of the municipal turf manager to utilize in lieu of pesticides (Elford et al., 2008; Minner et al., 2008; Stier et al., 2008; Miller and Henderson, 2012; Henderson et al. 2013). However, many questions remain regarding the best turfgrass species, cultivar and seeding rate for overseeding in a non-irrigated situation.

The goal of this research is to develop the most effective overseeding strategies for non-irrigated, pesticide-free athletic fields in New England. The specific objectives are to determine the effects of turfgrass species, cultivar, and overseeding rate on turfgrass cover retention and demonstrate the effectiveness of aggressive overseeding.

MATERIALS AND METHODS

These studies, spanning two years, are currently being conducted on-site at multiple locations across Connecticut. These include Hebron Elementary School, Lebanon Middle School, and Shetucket Park in Windham, CT. The research area at each location was carefully placed in high wear portions of each non-irrigated athletic field.

The study was arranged in a 3 × 2 × 2 factorial in a randomized complete block design with three replications. The first factor, turfgrass species, had three levels: 1) perennial ryegrass (PRG, *Lolium perenne* L.), 2) tall fescue (TF, *Festuca arundinacea* Schreb.), and 3) Kentucky bluegrass (KBG, *Poa pratensis* L.). The second factor, overseeding rate, was either low or high, which is detailed in Table 1. The third factor, cultivar, had two levels: 1) previously tested cultivars that have met the Turfgrass Water Conservation Alliance (TWCA) criteria, and 2) untested cultivars that have not been certified with the TWCA criteria. Individual plots were 1.8 m x 2.7 m.

Two overseeding timings were selected per year (spring and fall) to take advantage of traditionally cooler temperatures and more frequent rainfall. Overseeding treatments were initiated at each location on 19 September 2016 and repeated per scheduled dates on 1 May 2017 and 23 August 2017. Before each overseeding event, initial qualitative assessments were taken of the total percentage green cover and turfgrass cover. Plots were core cultivated with a Toro 648 ProCore walk-behind unit (The Toro Company, Bloomington, MN) in one direction using 1.3 cm hollow-core tines on 5.1 cm spacing to a depth of 6.4 cm. The cores were broken-up and returned within their individual plots with a leaf rake. Seed was applied using handheld shakers in multiple directions. The seed was gently incorporated into the soil with the backside of a leaf rake. The research area was then rolled to ensure good seed to soil contact. Finally, the plot area was fertilized with a starter fertilizer (14-25-12) at the rate of 49 kg P_2O_5 ha^{-1}. Additional nitrogen was applied at a rate of 49 kg N ha^{-1} using a plastic-coated urea (43-0-0); bringing the total nitrogen applied at each overseeding event to 73 kg N ha^{-1}. The next seeding date is scheduled for early May 2018.

Data was collected at 2 and 4 weeks following overseeding events and monthly throughout the growing season. Qualitative ratings of percent green cover (weeds + turfgrass) and percent turfgrass cover were taken at all locations. Plots were rate for their overall color and quality based on a scale from 1 to 9, where 1 represented the lowest quality, 6 was the minimum acceptable quality, and 9 was the optimum quality. Starting in the spring 2017, Digital image analysis (DIA) was used to quantify dark green color and percent cover (Karcher and Richardson, 2005). The digital images were scanned by Sigma Scan software (Cranes Software International Ltd. Chicago, IL. 1991). Surface hardness was quantified using a Clegg Impact Hammer (2.25 kg). Soil volumetric water content was measured using a portable TDR probe (Spectrum Technologies, Inc. Plainfield, IL, VWC).

This study will continue for the spring and fall of 2018.

An analysis of variance was completed to test for significant treatment effects (P <0.05) using the Mixed procedure in SAS statistical software 9.4 (SAS Institute. Cary, NC. 2004). Least square means were separated based on Fisher's protected least significant difference (LSD) test.

RESULTS AND DISCUSSION

The results were averaged across all locations and seasons. PRG treatments had significantly greater percent turfgrass, percent green cover, and the fewest weeds (Figures 1-4). Four weeks after seeding in the fall 2016, PRG showed the most turfgrass cover compared to KBG and TF (Figure 1). PRG, regardless of cultivars, exhibited 50% reduction in weed populations compared to TF and KBG (Figure 4). Additionally, it was observed that the high rate of PRG produced the highest turfgrass cover compared to all combinations of species and seeding rate (Figure 5). The high seeding rate for TF and KBG showed no differences compared to the low seeding rate (Figure 5). Figure 7 shows that PRG had the highest percent turfgrass cover for each season compared to the other species. It is speculated that the decrease in turfgrass cover in the fall is related to the increase in traffic compared to the spring and summer. Kentucky bluegrass was not different from control treatments in percent turfgrass and weed cover across every season, rate and/or TWCA combination (Figures 3-7).

LITERATURE CITED

Bartholomew, C., B.L. Campbell, and V. Wallace. 2015. Factors affecting athletic field quality after pesticide bans: the case of Connecticut. HortScience 50:99-103.

Elford, E.M.A., F.J. Tardif, D.E. Robinson, and E.M. Lyons. 2008. Effect of perennial ryegrass overseeding on weed suppression and sward composition. Weed Technol. 22:231-239.

Henderson, J.J., V.H. Wallace, J.H. Campbell. 2013. Best Management Practices for Pesticide-Free, Cool-

SeasonAthletic Fields. 16 pp. [Storrs, Connecticut]: College of Agriculture and Natural Resources, University of Conecticut.

Karcher, D.E., and M.D. Richardson. 2005. Batch analysis of digital images to evaluate turfgrass characteristics. Crop Sci. 45:1536-1539.

Miller, N. A., and J. J. Henderson. 2012. Organic management practices on athletic fields: Part 1: The effects on color, quality, cover, and weed populations. Crop Sci. 52(2):p. 890-903.

Minner, D.D., F.J. Valverde, and R.M. Pirtle. 2008. Seeding rates that maximize turf cover when
sown during traffic. Acta Hortic. 783: 57-65.

Stier, J. C., E. J. Koeritz, and M. Garrison. 2008. Timing the establishment of Kentucky bluegrass: Perennial ryegrass mixtures for football fields. *HortScience.* 43(1):p. 240-

Table 1. Turfgrass species, cultivars and seeding rates evaluated at the three locations.

Species	Cultivar	Low[a]	High	TWCA rating
		---- kg ha^{-1} ----		
Kentucky bluegrass	Full Moon	146	292	TWCA[b]
Kentucky bluegrass	Brooklawn	146	292	Non-TWCA
Perennial ryegrass	Manhattan 5	391	782	TWCA
Perennial ryegrass	Divine	391	782	Non-TWCA
Tall Fescue	Falcon 4	391	782	TWCA
Tall Fescue	Aztec	391	782	Non-TWCA

[b]Turfgrass Water Conservation Alliance

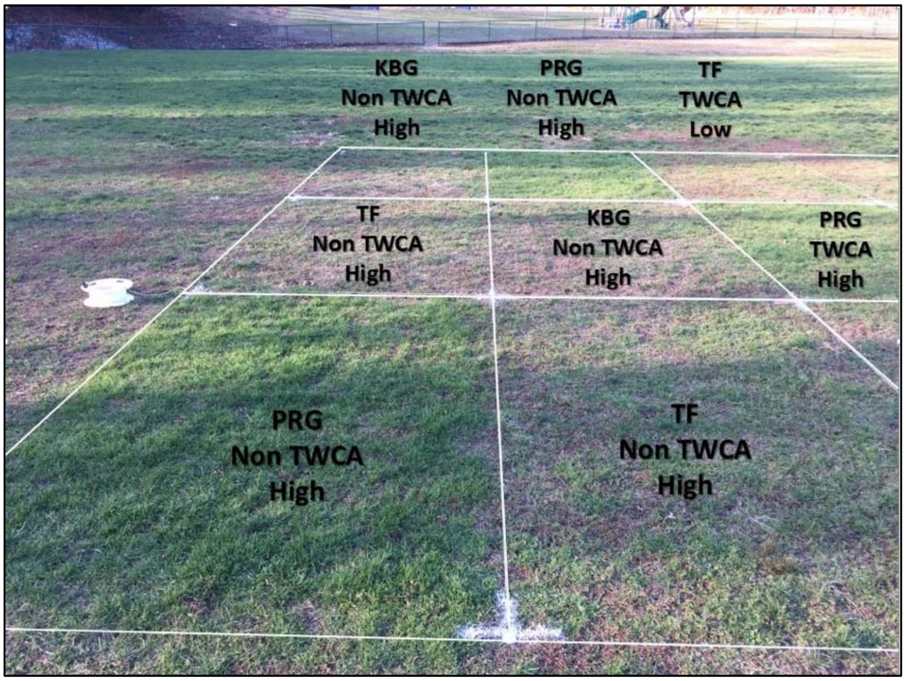

Figure 1. Shetucket Park in Windham, CT in October 2016. Four weeks after fall seeding, perennial ryegrass showed greater turfgrass cover than other turfgrass species.

Figure 2. Hebron Elementary in Hebron, CT in June 2017. Eight weeks after spring seeding, perennial ryegrass exhibited greater turfgrass cover than other turfgrass species and fewer weeds.

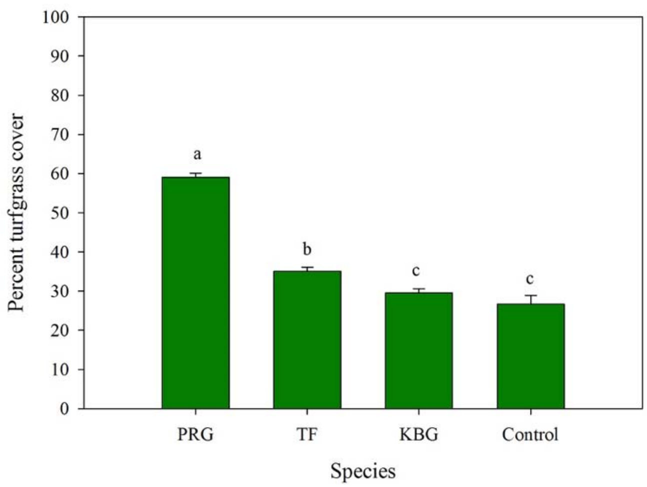

Figure 3. The effect of turfgrass species on qualitative percent turfgrass cover when averaged across all locations in 2016 and 2017. Data points with the same letter are not statistically different according to Fisher's protected LSD (P<0.05).

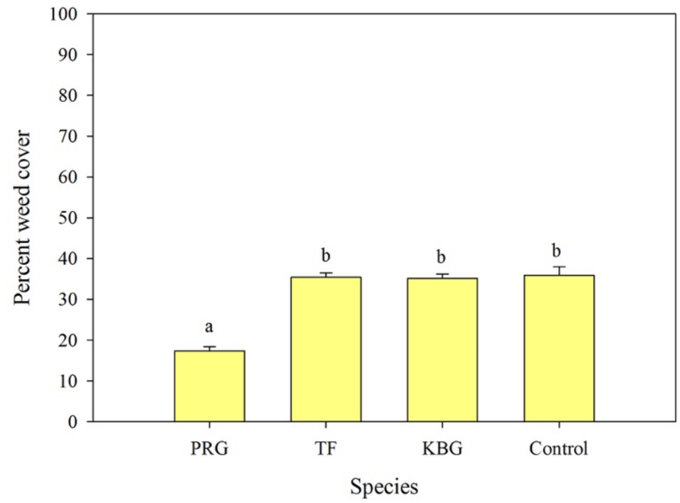

Figure 4. The effect of turfgrass species on qualitative percent weed cover when averaged across all locations in 2016 and 2017. Data points with the same letter are not statistically different according to Fisher's protected LSD (P<0.05).

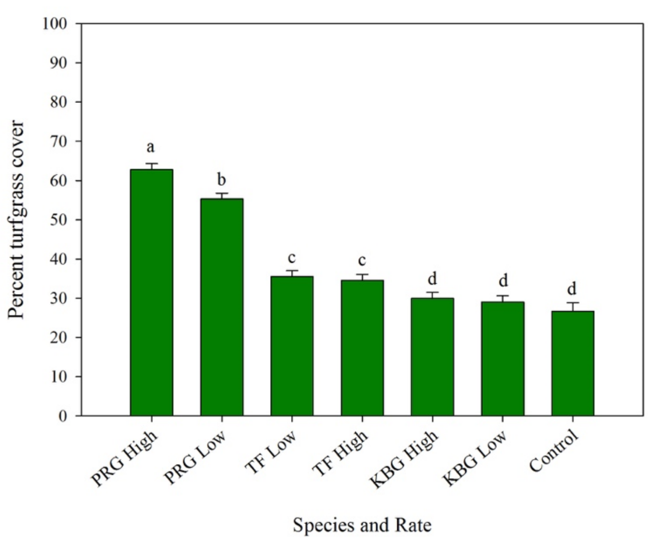

Figure 5. The effects of turfgrass species and seeding rates on qualitative percent turfgrass cover when averaged across all locations in 2016 and 2017. Data points with the same letter are not statistically different to Fisher's protected LSD (P<0.05). Low rate is considered the recommended rate and high rate is doubled the recommended rate.

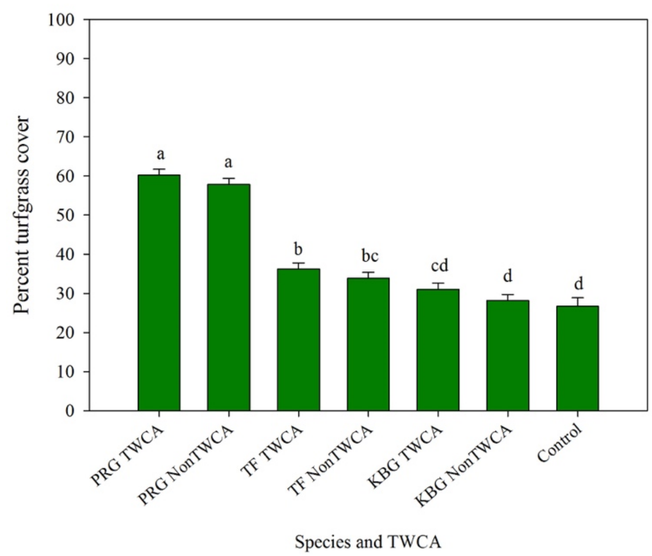

Figure 6. The effects of turfgrass species and TWCA on qualitative percent turfgrass cover when averaged across all locations in 2016 and 2017. Data points with the same letter are not statistically different according to Fisher's protected LSD (P <0.05). Turfgrass Water Conservation Alliance (TWCA).

Table of Contents

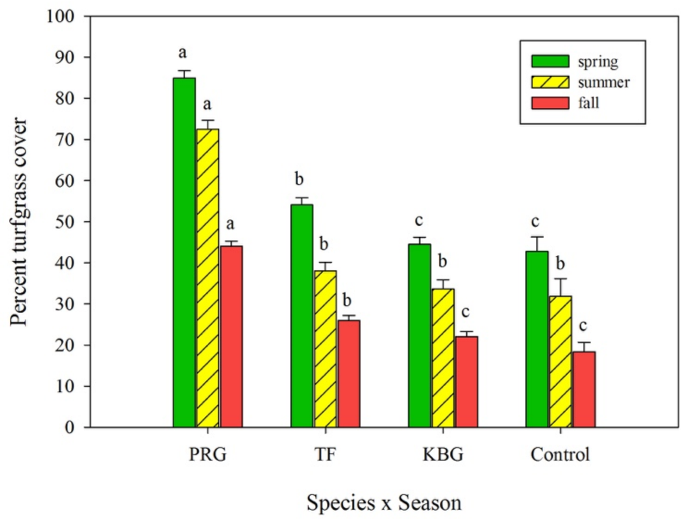

Figure 7. The effects of turfgrass species and seasons on qualitative percent turfgrass cover when averaged across all locations in 2016 and 2017. Mean separation indicates differences across season only. Data points with the same letter are not statistically different according to Fisher's protected LSD (*P* <0.05)