2013-2014 TREEE Summaries as of July, 2015.

The following proposals were selected for funding for the fiscal year of 2013-14.

	Title	Faculty Members	Funding Amount
1	Growth suppression of creeping bentgrass putting greens using combination plant growth regulators	Joseph Young, PhD Texas Tech University Mike Richardson, PhD University of Arkansas	$4,800
2	Aggie Turf Website Re-design and Update	Casey Reynolds, PhD Texas A&M Agrilife Extension	$7,000
3	The Effects of Various Aeration Practices and Soil Amendments on Soil Moisture	Casey Reynolds, PhD Texas A&M Agrilife Extension Ben Wherley, PhD Texas A&M Soil & Crop Science Department	$10,000
4	Evaluating Winter Overseeding vs. Painting of Bermudagrass under Traffic and Municipal Water Restrictions	Ben Wherley, PhD Texas A&M Soil & Crop Science Department Casey Reynolds, PhD Texas A&M Agrilife Extension	$7,500
5	Undergraduate Scholarships		$4,000
		Total Funding Amount	$33,300

Title: Growth suppression of creeping bentgrass putting greens using combination plant growth regulators.

Investigators: Dr. Joseph Young and Ramzi White, Texas Tech University

Program funding: $4,800 for year 1 of research

Project objectives:

The objectives of this research were to determine the growth suppression potential of sequential applications and develop growing degree day models for plant growth regulators (PGRs) applied to creeping bentgrass putting greens in Lubbock, TX and Fayetteville, AR.

Methods for Evaluation:

Sequential applications of all PGR's (Table 1) were made every 2 weeks from the end of April to August, whereas modelling applications were made every 6 to 8 weeks to capture the suppression, rebound, and return to general growth with each PGR application. Products were applied to creeping bentgrass putting greens grown on sand-based rootzones at two golf courses in Lubbock, TX. Following the initial application, significant phytotoxicity occurred on treatments containing paclobutrazol; therefore, application rates were lowered from moderate rates to low rates until July (Table 1) Clippings were collected from both sites two days per week, oven-dried, and weighed to determine relative growth compared to untreated control. Every two weeks between sequential applications, visual turf quality (standard 1-9 scale with 6 being minimum acceptability) and digital image analysis (percent green cover and color) was conducted for each treatment.

Table 1: List of commercially available products evaluated with mode of action, active ingredient, and rates applied.

Trade name	Active Ingredient	Mode of Action	% Active Ingredient	Application rate (Mod)	Application rate (Low)
				---------ml/ha--------	
Primo Maxx	Trinexapac-ethyl	Late GA inhibition	0.113	44.91	44.91
Trimmit	Paclobutrazol	Early GA inhibition	0.229	91.02	91.02
Cutless	Flurprimidol	Early GA inhibition	0.160	188.2	71.22
Legacy	Flurprimidol	Early GA inhibition	0.133	96.97	52.70
	Trinexapac-ethyl	Late GA inhibition	0.050	36.57	19.87
Musketeer	Flurprimidol	Early GA inhibition	0.056	73.00	49.86
	Paclobutrazol	Early GA inhibition	0.056	73.00	49.86
	Trinexapac-ethyl	Late GA inhibition	0.014	18.25	12.46

Sequential application results

The initial application was made on 25 April 2014, and at that time the putting greens were not growing as aggressively as they typically do during the summer. The limited growth rate may have been a result of limited natural precipitation (0.71 inches year to date at application) or cooler temperatures than expected during that time period. The moderate rate of many of these products combined with limited growth rate may have resulted in the high phytotoxicity observed on treatments containing paclobutrazol (Fig. 1). Although the phytotoxicity present resulted in unacceptable putting green quality, these treatments also contained significantly darker green color than untreated control treatments or other products evaluated in the trial (Fig. 1). The analysis performed to calculate dark green color index (DGCI) only considered pixels within the selection criteria used (Hue 60-120; Saturation 10-100). Therefore, any plant material exhibiting phytotoxic symptoms would not have been used to determine DGCI. The treatments containing paclobutrazol generally appeared darker green compared to other plots with the naked eye, so the statistical differences presented could be visually observed in this side-by-side evaluation of products.

The suppression of all products were good following this initial application, but the high levels of phytotoxicity with those treatments containing paclobutrazol resulted in much greater relative growth suppression (Fig. 2). Primo Maxx, Cutless, and Legacy reached their greatest suppression level 10 days after application of the moderate rate following 176 GDD accumulated. Subsequent applications on 14 May and 28 May were applied at the lower rate listed due to the phytotoxicity present from some treatments. Shoot suppression was maintained prior to the third sequential application (28 May) when the creeping bentgrass began to exhibit the increased growth rate typically observed during summer months. The increased growth rates and lower product rates likely reduced the overall efficacy resulting in greater relative growth than control treatments for some products. The increased growth rate was beneficial for Trimmit and Musketeer because they were able to continue recovering from the initial suppression observed to become similar to other products evaluated. Cutless appears to not be suppressing growth in these figures, but a lower use rate was applied to these treatments throughout the first three sequential applications, which may have not been a rate sufficient enough to inhibit shoot growth effectively once the bentgrass growth began to increase at the end of May and first of June.

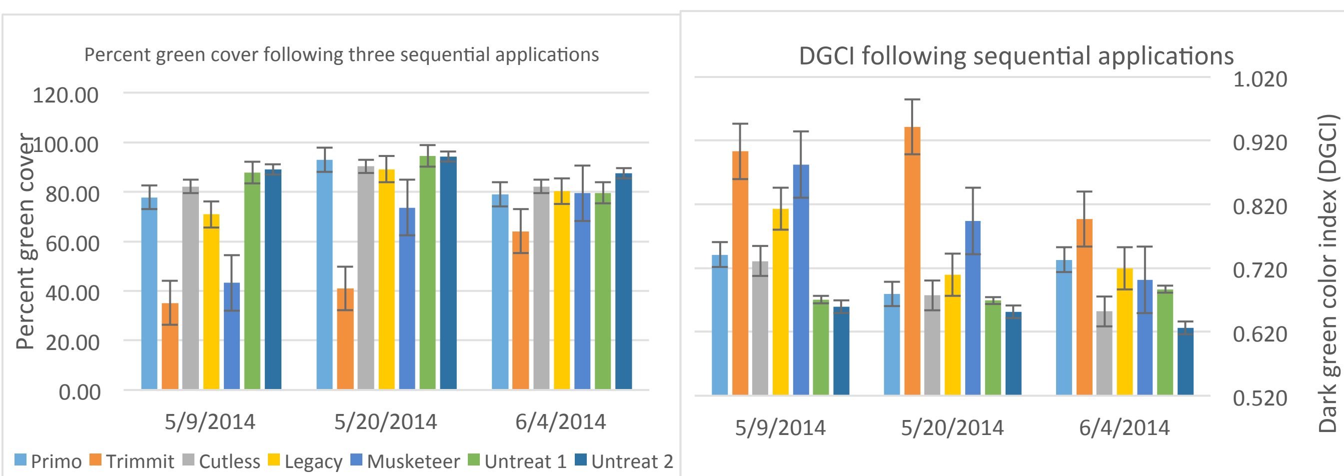


Figure 1. Digital image analysis for the first third of sequential applications. Overlapping error bars sharing a letter are statistically similar at α = 0.05.

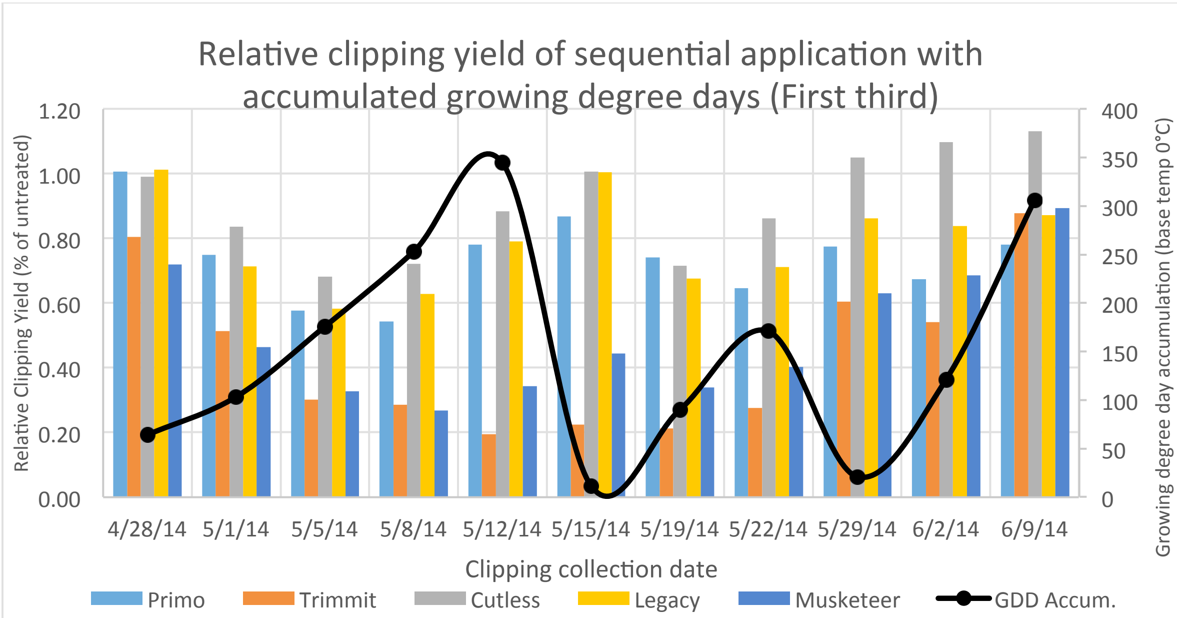


Figure 2. Sequential applications were made on 25 April, 14 May, and 28 May 2014.

The second group of sequential applications applied 10 June, 25 June, and 9 July were all three at the low use rate during a rapid growth period. These factors provided a situation with no additional phytotoxicity and similar coverage values following these sequential applications. However, the untreated control treatments generally maintained higher green cover compared to treatments with PGRs (Fig. 3). Primo Maxx treatments diminished in coverage each collection date, whereas Cutless and Legacy generally provided greater green cover than other treatments. There were very few differences in DGCI for the second set of sequential applications, but the untreated control treatments generally had numerically lower DGCI (Fig. 3). During this period, the darker green color of treatments containing paclobutrazol were not as evident.

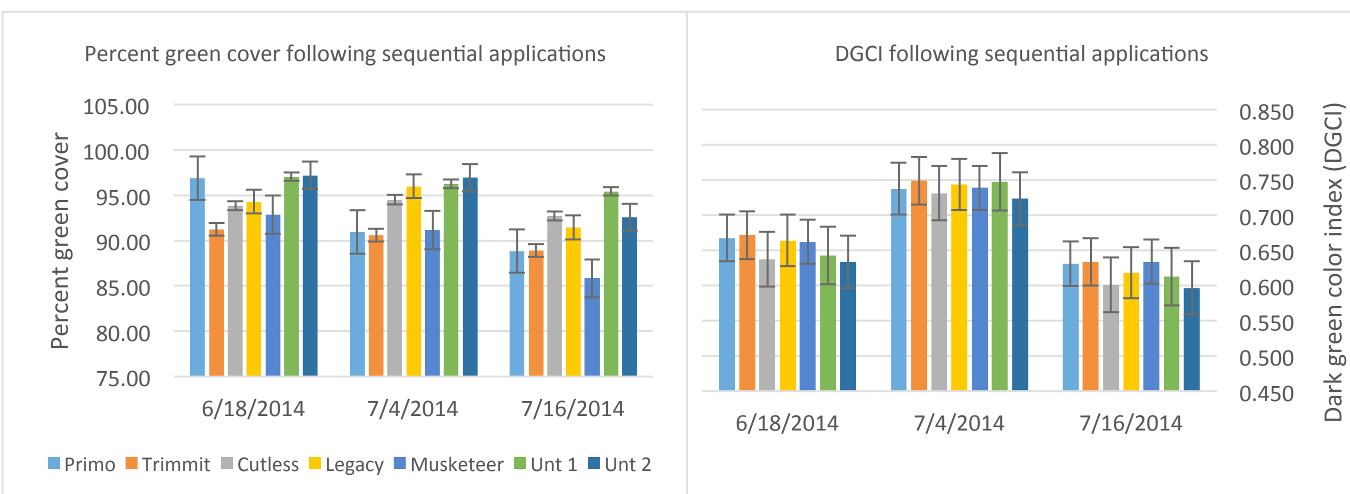


Figure 3. Digital image analysis for the second third of sequential applications. Overlapping error bars sharing a letter are statistically similar at α = 0.05.

Prior to the sequential application on 25 June, all the products exhibited greater growth rates than the untreated control. Although suppression of growth was reduced by 30-40%, similar to suppression observed with previous applications, the higher growth rate at application meant the relative clipping yield was only reduced to an equal growth rate of untreated treatments (Fig. 4). All the PGRs still suppressed growth for 150 to 250 GDD accumulation, but the rebound when the products lost effectiveness was much stronger in this case making it difficult to regain adequate suppression again.

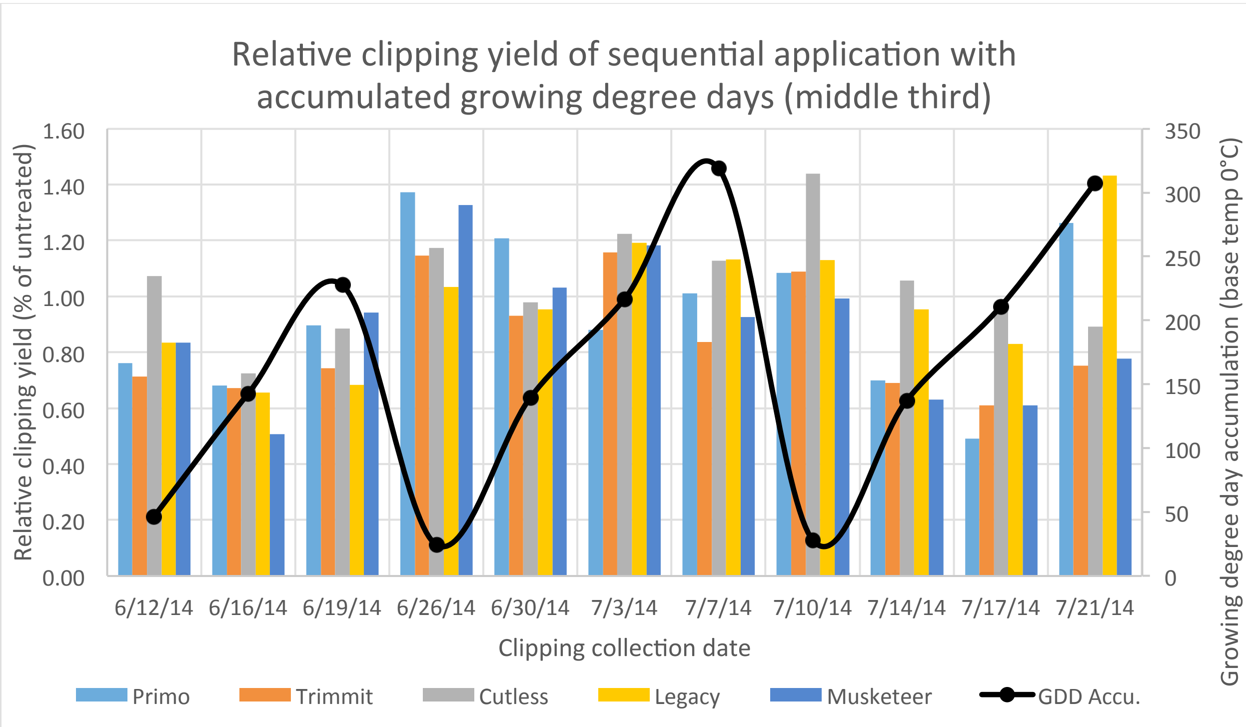


Figure 4. Sequential applications were made on 10 June, 25 June, and 9 July 2014.

The final three sequential applications were made on 25 July, 8 August, and 20 August. Due to the increased growth rates, less suppression, and lack of phytotoxicity observed since the initial application; each of these last sequential applications were made at the moderate rate. This also included increasing the rate of Cutless in this last portion of the trial. At these moderate rates, there were not significant increases in phytotoxicity similar to those observed at the initiation of the study (Fig. 5). However, the untreated control and Primo Maxx treatments had statistically better green cover than the other PGR treatments (Fig. 5). Following the first two sequential applications in this time period, there was little difference in DGCI among PGRs and untreated control treatments; however, the PGR treated plots all had significantly better DGCI than untreated plots following the final sequential application (Fig. 5). The increased color remained through the final image collection date two weeks after application.

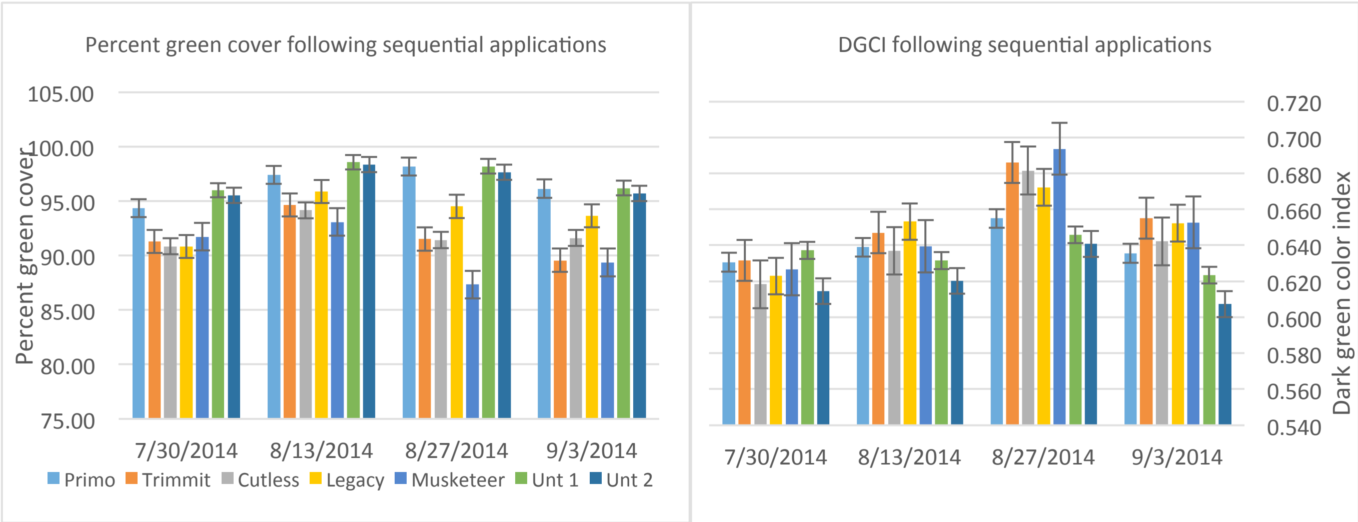


Figure 5. Digital image analysis for the last third of sequential applications. Overlapping error bars sharing a letter are statistically similar at α = 0.05.

The increased rate applied during the later portion of the summer greatly increased the efficacy and suppression of creeping bentgrass shoot growth with Trimmit, Cutless, Legacy, and Musketeer. Although Primo Maxx also provided adequate suppression, the level of suppression was much less. The final three sequential applications of Primo Maxx appeared to maintain a more consistent growth pattern without experiencing a rebound. After the final sequential application, Trimmit, Cutless, and Musketeer equally suppressed shoot growth to the final clipping date, but the effectiveness of Legacy appeared to weaken more rapidly as relative clipping yield climbed more quickly (Fig. 6). This may be an indication that the trinexapac-ethyl was becoming less effective based on the growth rates of the Primo Maxx treatments.

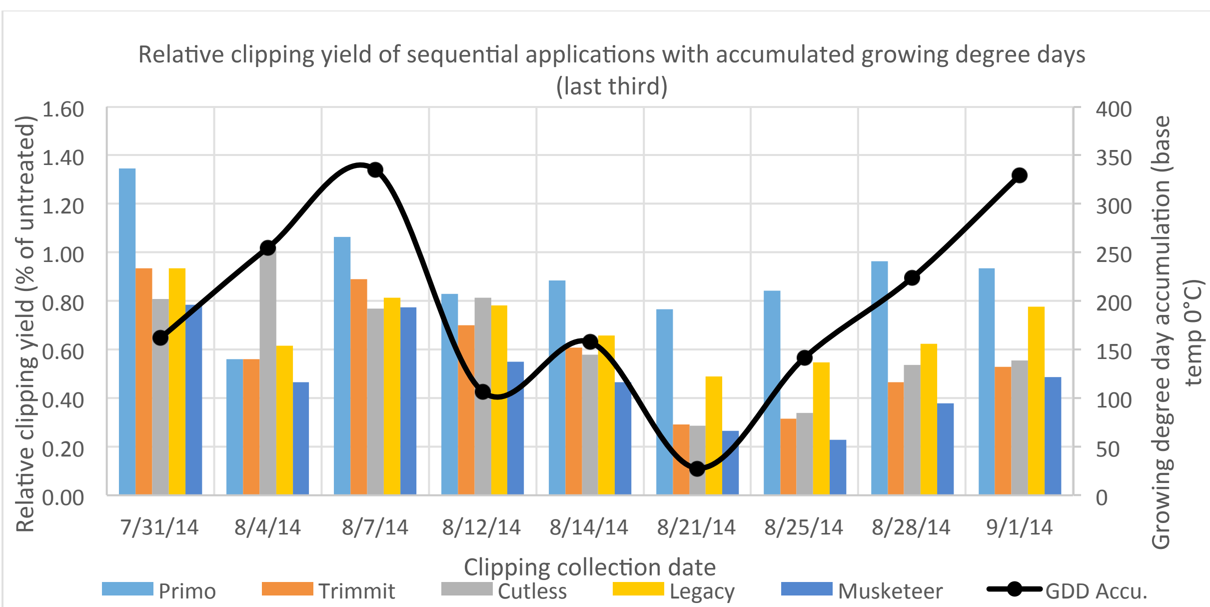


Figure 6. Sequential applications were made on 24 July, 8 August, and 20 August 2014.

Summary

This information was derived from the first summer of research that will be followed up in the summer of 2015 to verify the results. Hence, the information included here can only be defined as preliminary results until both years of data can be evaluated together. Additionally, this data is from one location in Lubbock. We are working with the other set of data from Lubbock, but the data were not as clear and easy to explain as these. The same trial was also conducted at the University of Arkansas in Fayetteville with the same data collected. Therefore, we will be able to evaluate growth suppression of these products in two different environments to ensure that growing degree day accumulation is an acceptable means to determine the proper spray intervals for these PGRs. We are also working with the data collected from our modelling applications. These same PGR’s were applied every 6-8 weeks as a means to graph the entire cycle of the PGR on relative growth. These data include the suppression observed initially and any rebound effect that may be observed prior to returning to similar relative growth to the untreated control. The data obtained from these applications illustrate the overall trend of that process, and we anticipate being able to fit regression curves to those different PGRs to better describe the complete cycle of PGR suppression for each product. Based on the data presented, there are a few preliminary findings that stand out following the first year of research.

- Applications of PGRs containing paclobutrazol resulted in unacceptable phytotoxicity when applied prior to rapid growth rates of creeping bentgrass in late spring.
- All plots that exhibited extreme phytotoxicity recovered once creeping bentgrass growth sped up during the summer months; however, PGR rates were reduced to lower label rates.
- Although unacceptable phytotoxicity occurred with treatments containing paclobutrazol early in the summer, the green portions of the plot had significantly higher DGCI compared to untreated controls throughout the trial.
- Based on relative clipping yield the day after applications were made, the PGRs do not affect growth rate until 2-4 days after application; therefore, sequential applications would need to be made a couple of days prior to losing efficacy.
- Moderate rates of PGRs during high growth periods provide improved suppression without significant phytotoxicity problems.

Title: AggieTurf Website Re-design and Update

Investigators: Casey Reynolds, PhD. Texas A&M University Agrilife Extension

Program Funding: $7,000

In the fall of 2013, the Texas Turfgrass Research, Extension, & Education Endowment (TREEE) decided to fund a re-design and update of the Texas A&M University Turfgrass Program website ‘Aggieturf.tamu.edu’. This proposal was funded in the amount of $7,000 and was dedicated towards a complete overhaul of the current AggieTurf website. Construction of the new website began in 2013 and is currently scheduled for a July 2015 release.

The new website will have the same Internet address as the existing website, which it will replace on the launch date, but will have an entirely new design and content. It will include agronomic information on: turfgrasses, weeds, and insects; Texas A&M Turfgrass Research & Academic Programs; Useful links; Social Media; Events; and others.

Current agronomic sections on the new website include:

- Turfgrass Identification & Growth – Descriptions of turfgrasses, their morphology, growth, and reproduction
- Texas Turfgrasses – Descriptions of turfgrass species suitable for Texas along with botanical descriptions, current varieties, growth habits, and management considerations
- Turfgrass Weeds – High resolution images of over 100 common weeds of Texas turfgrasses listed by common name, latin name, life cycle, etc. (Figure 1)
- Turfgrass Insects – High resolution images of the most common insect pests of Texas turfgrasses along with descriptions, life cycles, and treatment options (Figure 2)

Texas A&M University Turfgrass Research & Extension Programs:

- Texas A&M Turfgrass Faculty, Staff, and Graduate Student Information
- Current & Future Texas A&M Turfgrass Research Projects
- TREEE Proposals & Reports (Figure 3)
- Texas A&M Agrilife Extension Publications

Social Media & Useful Links:

- Twitter, Facebook, YouTube, and Flicker accounts – Updates, videos, & photos of Texas turfgrasses, common pests, cultural practices, etc.
- Links to turfgrass organizations – TTA, GCSAA, STMA, etc. (Figure 4)
- Links to state diagnostic labs
- ‘Locate Your County Agent’ tool – Links to county agents
- County agent training portal- Educational content designed to provide turfgrass training assistance to Texas A&M Agrilife agents

The new AggieTurf website will serve as the host site for current & future educational and event information for Texas A&M University and the citizens of Texas. This site will continue to grow with new content being added continuously.

Planned future content includes sections and/or extension publications such as:

- 2016 Texas Pest Control Recommendations Guide
- Turfgrass Management Calendars
- Bermudagrass SAFE Calendars
- Turfgrass Diseases
- Others…

So please check out the new site in July, follow us on Twitter at @AggieTurf and @mtelmore and/or Facebook, and tell us what you think!

Also, please check out the AggieTurf Website Movie Trailer on YouTube at https://www.youtube.com/watch?v=bIY16p_RVJU

Figure 1. High-resolution images and descriptions of over 100 common Texas weeds

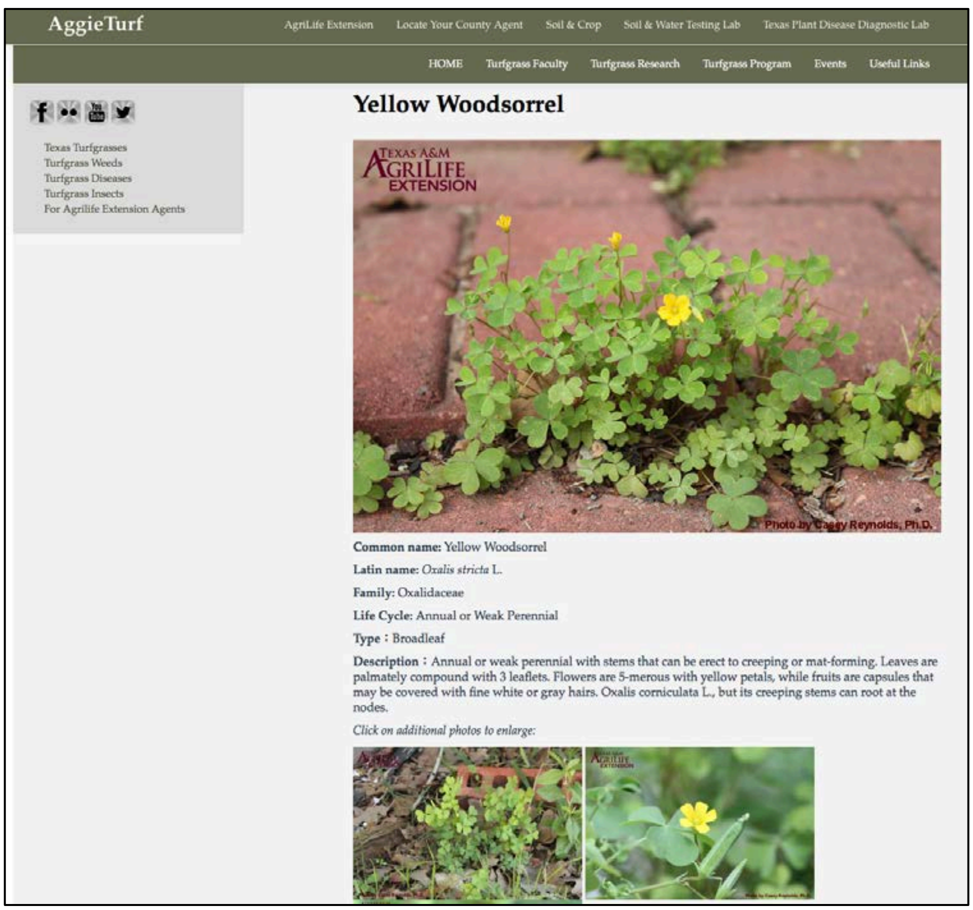


Figure 2. High-resolution images of common insect pests

Turfgrass Insects

Insects and Mites of Texas Turf

Casey Reynolds, PhD and Diane Silcox Reynolds, PhD

Insect Identification

Figure 1

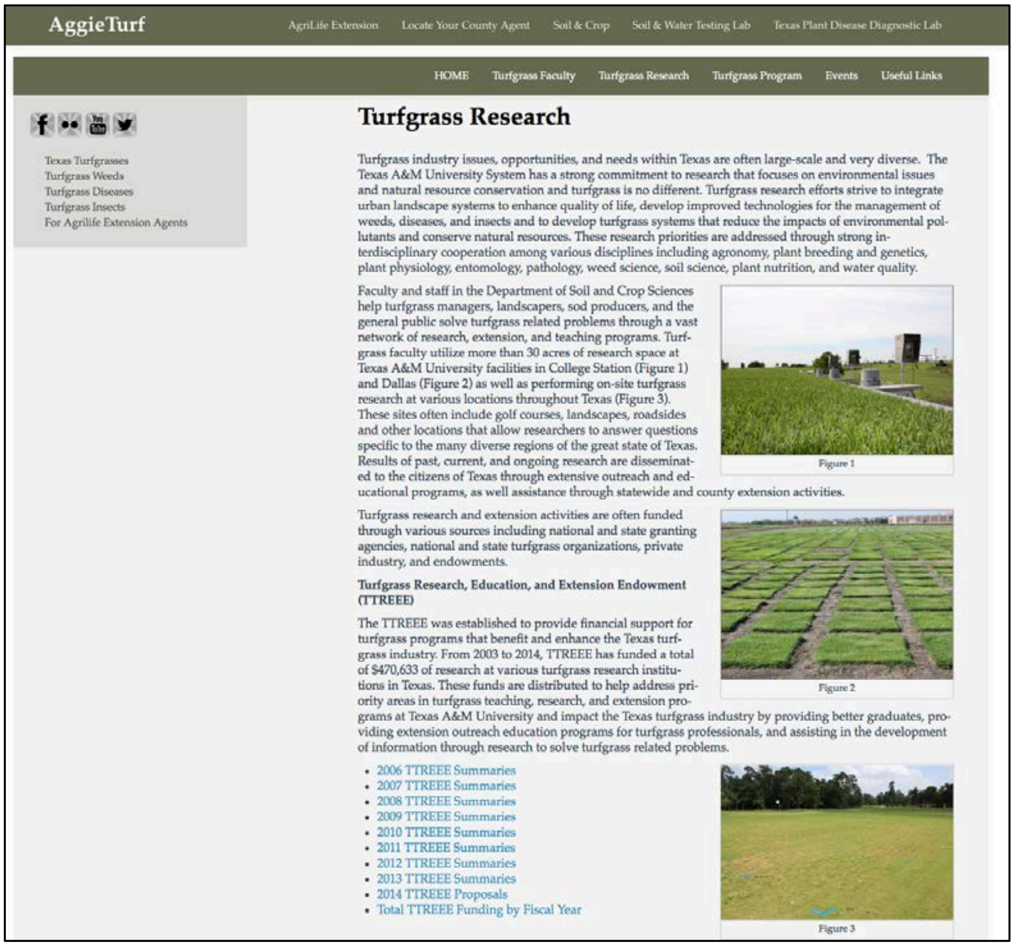
Insects provide numerous benefits to landscapes and golf courses including pollination of flowering plants, decomposition of organic residues, and aeration by tunneling arthropods such as earthworms. However, there are also several species that can be problematic in managed turfgrasses as a result of their chewing and/or sucking on plant tissue, up-rooting turf, creating mounds that can affect mowing, etc. In order to manage insect pests in turfgrasses, it is important to understand their function, life cycle, and habits.

Insects are distinguished from other arthropods by having a body with three distinct divisions: The head, the thorax, and the abdomen. The head typically contains mouthparts, simple or compound eyes, and a pair of antennae for sensory functions (Figure 1). The thorax typically contains two pairs of wings and three pairs of legs, while the abdomen contains various internal systems such as the digestive, respiratory, and reproductive tracts.

Metamorphosis

Insects develop through a process called metamorphosis, of which there are two types: gradual and complete. Insects that go through gradual metamorphosis have 3 stages: the egg, the nymph (immature stage), and the adult. Examples of turfgrass insects that go through gradual metamorphosis include mites, ground pearls, mealybugs, chinch bugs, and mole crickets. Insects that go through complete metamorphosis have 4 stages: the egg, the larva (immature stage), the pupa (resting stage), and the adult. Examples of turfgrass insects that go through complete metamorphosis include armyworms, billbugs, cutworms, fire ants, sod webworms, and white grubs. This is an important point to note because damage symptoms and insecticide treatment options often vary by life stage.

Figure 3. TTREEE Proposals and Summaries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Texas Turfgrasses
Turfgrass Weeds
Turfgrass Diseases
Turfgrass Insects
For Agrilife Extension Agents

Turfgrass Research

Turfgrass industry issues, opportunities, and needs within Texas are often large-scale and very diverse. The Texas A&M University System has a strong commitment to research that focuses on environmental issues and natural resource conservation and turfgrass is no different. Turfgrass research efforts strive to integrate urban landscape systems to enhance quality of life, develop improved technologies for the management of weeds, diseases, and insects and to develop turfgrass systems that reduce the impacts of environmental pollutants and conserve natural resources. These research priorities are addressed through strong interdisciplinary cooperation among various disciplines including agronomy, plant breeding and genetics, plant physiology, entomology, pathology, weed science, soil science, plant nutrition, and water quality.

Faculty and staff in the Department of Soil and Crop Sciences help turfgrass managers, landscapers, sod producers, and the general public solve turfgrass related problems through a vast network of research, extension, and teaching programs. Turfgrass faculty utilize more than 30 acres of research space at Texas A&M University facilities in College Station (Figure 1) and Dallas (Figure 2) as well as performing on-site turfgrass research at various locations throughout Texas (Figure 3). These sites often include golf courses, landscapes, roadsides and other locations that allow researchers to answer questions specific to the many diverse regions of the great state of Texas. Results of past, current, and ongoing research are disseminated to the citizens of Texas through extensive outreach and educational programs, as well assistance through statewide and county extension activities.

Figure 1

Turfgrass research and extension activities are often funded through various sources including national and state granting agencies, national and state turfgrass organizations, private industry, and endowments.

Turfgrass Research, Education, and Extension Endowment (TTREEE)

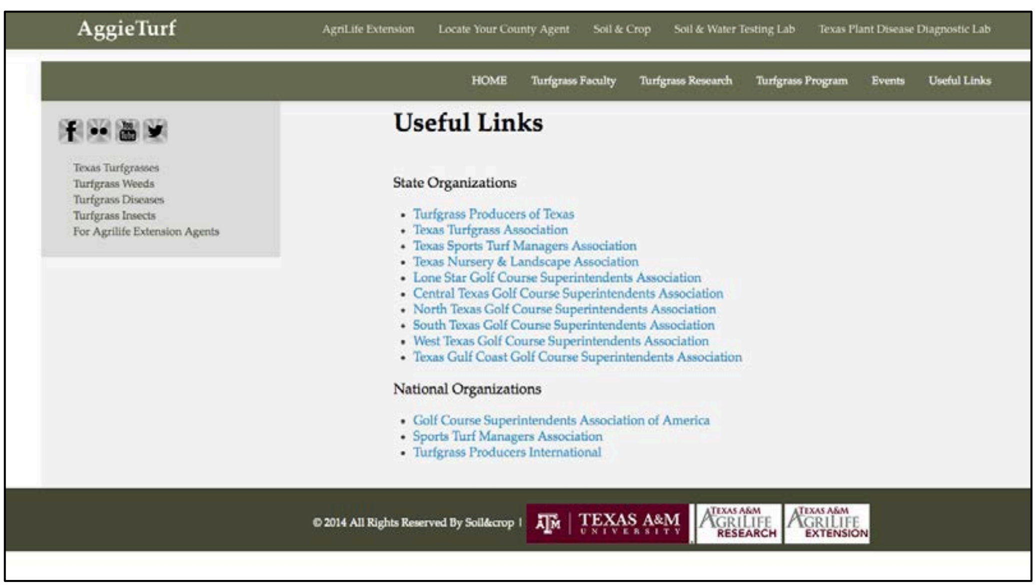
The TTREEE was established to provide financial support for turfgrass programs that benefit and enhance the Texas turfgrass industry. From 2003 to 2014, TTREEE has funded a total of $470,633 of research at various turfgrass research institutions in Texas. These funds are distributed to help address priority areas in turfgrass teaching, research, and extension programs at Texas A&M University and impact the Texas turfgrass industry by providing better graduates, providing extension outreach education programs for turfgrass professionals, and assisting in the development of information through research to solve turfgrass related problems.

Figure 2

- 2006 TTREEE Summaries
- 2007 TTREEE Summaries
- 2008 TTREEE Summaries
- 2009 TTREEE Summaries
- 2010 TTREEE Summaries
- 2011 TTREEE Summaries
- 2012 TTREEE Summaries
- 2013 TTREEE Summaries
- 2014 TTREEE Proposals
- Total TTREEE Funding by Fiscal Year

Figure 3

Figure 4. Useful Links


AggieTurf

AgriLife Extension | Locate Your County Agent | Soil & Crop | Soil & Water Testing Lab | Texas Plant Disease Diagnostic Lab

HOME | Turfgrass Faculty | Turfgrass Research | Turfgrass Program | Events | Useful Links

Texas Turfgrasses
Turfgrass Weeds
Turfgrass Diseases
Turfgrass Insects
For Agrilife Extension Agents

Useful Links

State Organizations

- Turfgrass Producers of Texas
- Texas Turfgrass Association
- Texas Sports Turf Managers Association
- Texas Nursery & Landscape Association
- Lone Star Golf Course Superintendents Association
- Central Texas Golf Course Superintendents Association
- North Texas Golf Course Superintendents Association
- South Texas Golf Course Superintendents Association
- West Texas Golf Course Superintendents Association
- Texas Gulf Coast Golf Course Superintendents Association

National Organizations

- Golf Course Superintendents Association of America
- Sports Turf Managers Association
- Turfgrass Producers International

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Title: The Effects of Various Aeration Practices and Soil Amendments on Soil Moisture

Investigators: Casey Reynolds, PhD. Texas A&M University Agrilife Extension and Ben Wherley, PhD. Texas A&M University Agrilife Research

Program Funding: $10,000

Impact Statement

The impacts of limited water on turfgrass health and performance make it extremely important to maximize the efficiency of irrigation and rainfall when it is available, especially in home lawns or athletic turf with limited root zones. While the benefits of aeration on soil water holding capacity are generally understood, a research/demonstration experiment to document and illustrate benefits of specific aeration methods, timing, and soil amendments would likely prove useful to homeowners and landscape operators looking to maximize water use and minimize runoff, particularly in re-constructed soils. Lastly, while factors like rainfall, water restrictions, irrigation system, etc. are difficult or impossible to change or control, aeration or application of soil amendments may be a behavior that homeowners are willing to adopt if the benefits to turfgrass performance are proven and demonstrated to be substantial.

Project Objectives

- To examine the benefits of various aeration practices on short and long-term soil moisture
- To examine the impacts of soil aeration methods and amendments on maximizing soil moisture
- To examine the impacts of soil aeration and amendments on reducing water use by maximizing time between irrigation cycles
- To demonstrate this type of research and potentially create and/or improve markets for professional landscape operators seeking to promote this service

Methods

These experiments would be conducted in College Station, TX with existing research plots that would be modified for this experiment. Irrigated plots of bermudagrass and St. Augustinegrass have been selected for study to represent the athletic field and home lawn markets, while experimental factors would include aeration method (core vs. deep-tine), aeration frequency (none, annually, multiple) and various soil amendments. Soil moisture sensors would monitor soil moisture based on treatment, while turfgrass health could be monitored through visual rating and digital imaging methods during periods of irrigation/rainfall, as well as drought.

2015 Project Update

We found out we received these funds on March 18th, 2014. Over the course of the following 3-4 weeks, 3 competing bids were collected from John Deere, Jacobsen, and Toro to send the quote through the Texas state bidding process, which was required due to the fact that the purchase was over $5,000. John Deere was awarded the bid and the request for purchase was sent to them on May 27th, 2014. We did not receive delivery of the aerator until October, and therefore missed the entire 2014 summer research season.

As a result, this work was started during the summer of 2015 at the Texas A&M University Turfgrass Field Lab in College Station, TX.

Treatment Variables

Irrigation Stress: from un-irrigated to un-stressed (0% to 20% volumetric water capacity)
Cultivation: no aeration to aeration every 6 weeks from June through September

Data Collection

Soil moisture: weekly (2 readings per subplot at the center of the plot) June 15- Oct 15
Turf Quality: weekly June 15- Oct 15
DIA % green cover: at start and every 2 wks June 15-Oct. 15
Water meter readings: at start and every 2 weeks June 15- Oct 15

We will not ask for any additional funds for this research and will proceed during 2015 using the 2014 protocol as outlined in the original TTREEE submission. Please accept my sincere apologies for this delay, but I did not anticipate the purchase process and vendor taking over 5 months to deliver this equipment.

Title: Evaluating Winter Overseeding vs. Painting of Bermudagrass Under Municipal Water Restrictions and Traffic

Investigators: Casey Reynolds, PhD. Texas A&M University Agrilife Extension and Ben Wherley, PhD. Texas A&M University Agrilife Research

Program Funding: $7,500

Background

Given concerns with budget cuts and municipal irrigation water restrictions imposed in many areas of the southern U.S. in recent years, some turf managers are finding it increasingly difficult to justify the practice of overseeding, while giving increased consideration to use of colorants during the dormancy period. Although a municipality may allow an irrigation variance during establishment, irrigating every 7 or even 14 days through the fall and winter might not be adequate for maintaining desired levels of density and growth due to excessive play or limited rainfall in many regions. Yet when not overseeded, months of wear and traffic on dormant bermudagrass can become particularly detrimental. The primary objectives of this study were to 1) evaluate and compare winter performance of overseeded perennial and turf-type annual ryegrass blends under limited irrigation and traffic and 2) evaluate the benefit of fall colorant-treatment to bermudagrass and compare effects to overseeded or dormant turf.

Methodology

This study was conducted at the Texas A&M University Turfgrass Research Field Laboratory, College Station, Texas from October 2013 through May 2014 on a stand of Tifway Bermudagrass grown on a fine sandy loam soil. Studies were conducted under two different irrigation levels which were intended to simulate various stages of municipal water restrictions. One study received a single (0.8") weekly irrigation and the other received no supplemental irrigation (rainfall only, with 8.6" of rain received over the November- May period). Overseeding was performed in early October with either perennial ryegrass ('Futura' blend, Pickseed, USA) or turf type annual ryegrass ('Panterra SOS 400', Barenbrug USA) at a rate of 10 lbs. per 1000 sq. ft. Non-overseeded plots were either left untreated, or treated with a single early November application of turf colorant (Greenlawnger, Becker Underwood) just prior to dormancy (~50% green cover remaining in plots) at a rate of 7.5 gallons product per acre. Colorant was diluted to a ratio of 1 gallon Greenlawnger per 8 gallons water prior to application and applied using 8004VS flat fan nozzles. During the study, simulated traffic was applied to half of each plot using a Cady traffic unit at a rate of 4 passes per week, intended to simulate two football games between the hash marks from 40 yard line to 40 yard line. Overseeded plots were mowed to 1.25" weekly during the study with clippings returned. Monthly during the study, ratings were taken in plots. Data collected included turf quality and cover, percent wear, surface hardness, soil moisture, and spring bermudagrass transition differences in plots.

Comparative Performance of Perennial vs. Turf-Type Annual Ryegrass

Of particular interest in this study was the comparative performance and quality of perennial ryegrass and turf-type annual ryegrass, especially under the context of limited irrigation and traffic stress. Our data indicate that the two offered similar levels of quality from December through April in both 1 day/week irrigation as well as unirrigated studies. Under the 1 day/week irrigation, winter visual quality averaged 6.9 and 7.3 out of 9 (perennial and annual, respectively) in the absence of traffic (Figure 1). Under unirrigated (rainfall only) conditions, perennial and annual ryegrass winter quality was also very similar (5.4 and 5.3 out of 9, respectively), just above minimally acceptable quality (Figure 2). It should be noted that while overall visual quality ratings were similar between the species, perennial ryegrass did exhibit somewhat darker green color compared to the annual ryegrass. However, slightly superior upright growth, density, and uniformity of the annual ryegrass offset this, contributing to its similarly high quality during the study. The two species also exhibited similar levels of traffic tolerance under the 4 passes per week traffic level. When averaged across the season in irrigated plots, traffic caused a similar (<10%) reduction in quality in both species (Figure 1). How the two would compare under more intensive traffic is also of interest, but could not be gained from this current study. Finally, in May ratings of percent bermudagrass transition, similar levels of bermudagrass were observed (~60%) in both annual and perennial ryegrass overseeded plots.

Performance of Colorant-Treated Bermudagrass

We were also interested in evaluating the benefit and longevity of a single early November colorant application to bermudagrass. While colorant-treated plots held acceptable quality well into mid-January, ~8 to 10 weeks after treatment (Figure 3), mean seasonal quality of colorant-treated plots averaged 4.5 out of 9 in both irrigated and unirrigated conditions, which was significantly better quality and appearance than dormant turf, but inferior quality to overseeded plots in both irrigation levels (Figures 1,2). Because the colorant effects had noticeably faded by April, no differences in bermudagrass greenup between untreated and treated plots were observed in April or May ratings. Finally, colorant application mitigated the effects of traffic only slightly, relative to injury sustained by untreated plots (8 and 13% quality decrease, respectively). Because the effects of the single colorant application were relatively shortly lived, we could speculate that a repeat application of colorant midway through the winter might have allowed for aesthetically acceptable turf during the entire bermudagrass dormancy period as well as facilitated more rapid spring green-up.

Overseeding Effects on Surface Hardness

Surface hardness is an important indicator of surface performance as it relates to player safety. In this study, we were particularly interested in better understanding effects of irrigation level, traffic, and overseeding on surface hardness (g_{max}). Perhaps not surprisingly, surface hardness levels measured using a Clegg Impact Tester were generally higher under unirrigated conditions in this study. Across both irrigation levels, there were significant differences in surface hardness due to both treatment (overseeded vs. non-overseeded) and traffic (Figure 4). Surface hardness was noticeably reduced by reducing traffic as well as overseeding. On average, the hardest surfaces were detected under non-overseeded /trafficked treatments (77 g_{max}), followed by overseeded/trafficked (67 g_{max}), non-overseeded/non-trafficked (57 g_{max}) treatments, and overseededed/non trafficked (52 g_{max}). It should be noted that while differences were detected among treatments, to our knowledge, none of these levels would be considered high enough to be deemed a safety concern.

Summary

While winter overseeding with perennial ryegrass will continue to be commonly practiced within the sports turf industry, information on feasibility of alternative options for accommodating winter play in the context of water shortages will allow turf managers to make appropriate decisions in managing and protecting their turf during dormancy. Factors such as budget, irrigation/rainfall availability, and event schedules need to be taken into consideration. For situations where high traffic is received during bermudagrass dormancy, perennial ryegrass has been the standard, but with the development in improved turf-type annual ryegrasses, a more affordable option may be available for more limited budgets with little sacrifice in aesthetics. Turf managers with limited events may wish to consider fall colorant applications just prior to dormancy as an option to save time, maintenance, and resources. However, single applications appear to be relatively short lived, and repeat applications midway through the dormancy period may be necessary. All situations are different, and thus, various options should be considered by the turf manager.

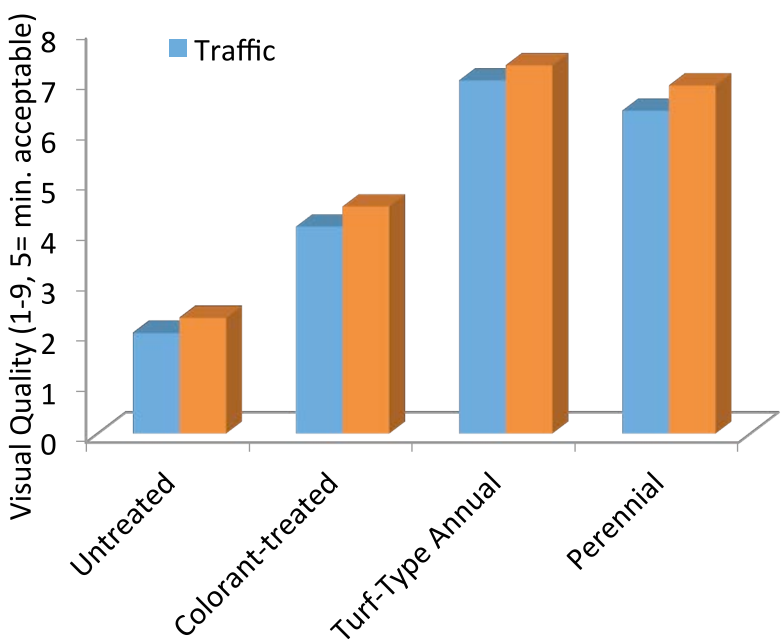

Figure1. Effect of traffic on visual quality in 1 day/week irrigated plots during bermudagrass dormancy for the colorant and overseeded treatments. Data have been averaged across the December through March period. Values ≥5 are considered acceptable quality.

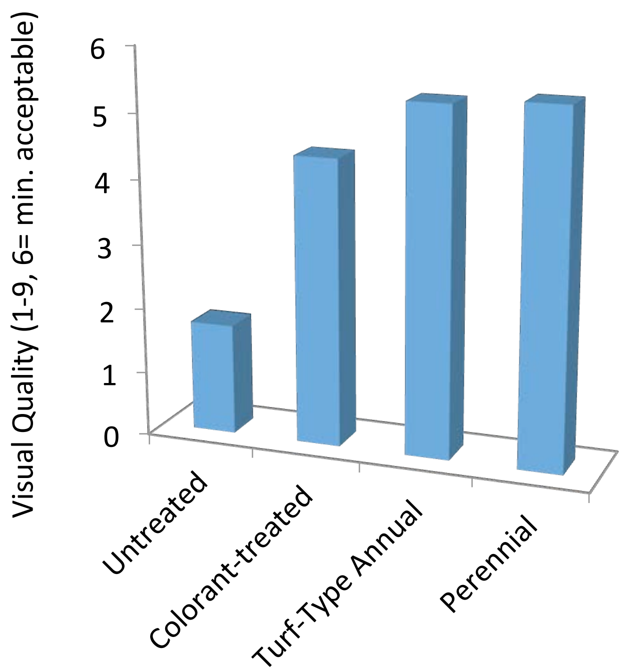

Figure 2. Visual quality of unirrigated plots during bermudagrass dormancy for the colorant and overseeded treatments. Data have been averaged across the December through March period. Values ≥5 are considered acceptable quality.

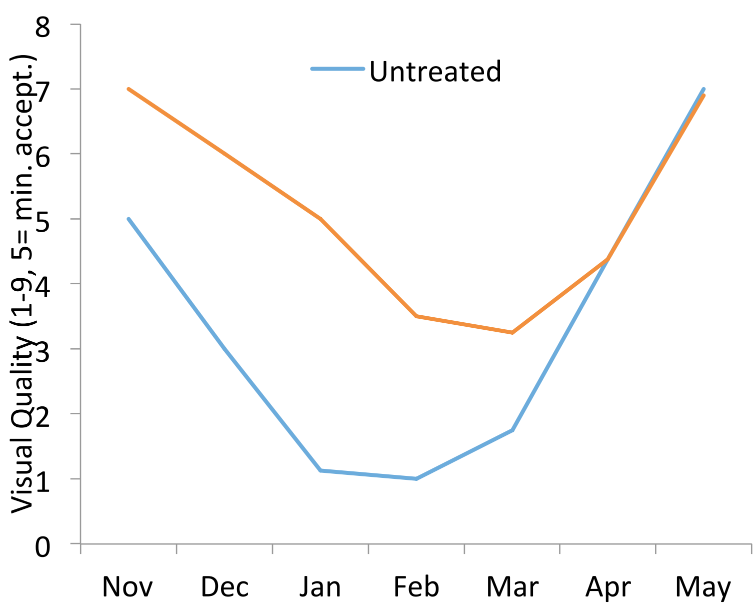

Figure 3. Visual turf quality of colorant-treated and untreated dormant bermudagrass in unirrigated plots during the winter and early spring. Values ≥5 are considered acceptable quality.

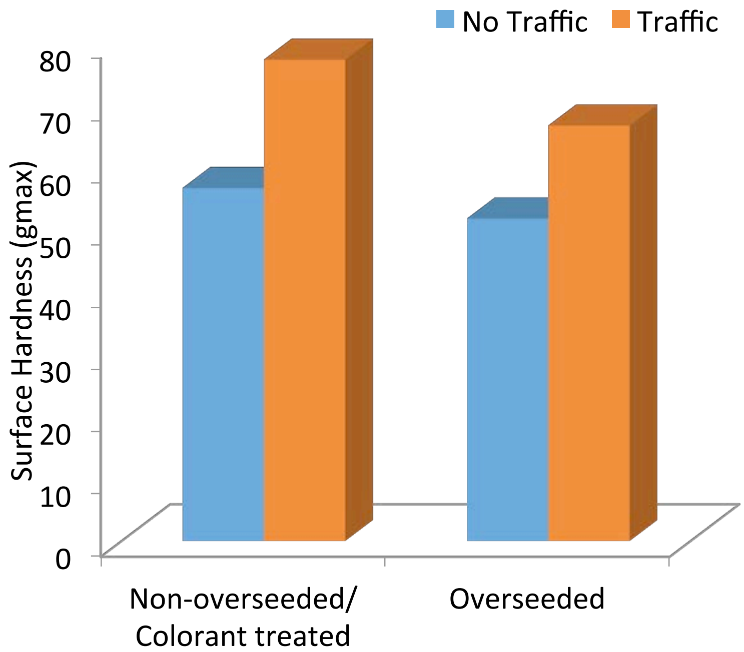

Figure 4. Clegg surface hardness (gmax) within irrigated plots during the study period. Overseeded treatment is average of annual and perennial ryegrass plots.

Figure 5. Photograph of the authors evaluating plot establishment early in the study.

Texas Turfgrass Research, Teaching and Extension Endowment Undergraduate Scholarship

Wayne Smith and Megan Teel

Current Status: Kevin Hejl was offered a Recruiting Scholarship for the Fall Semester 2014. He accepted and was admitted to the program and began pursuing a B. S. Degree in Turfgrass Science this Fall Semester. Kevin is the brother of Reagan Hejl and recent recipient of the R. C. Potts Endowed Assistantship. Reagan graduated with his Master's Degree in Agronomy in Spring 2014.

Two additional students were offered Recruiting Scholarships for the Spring 2015 Semester. One pursued other educational opportunities and one offer is still pending