Turfgrass & Landscape Research

Field Day September 15,2011

❖University of California, Riverside❖

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College of Natural and Agricultural Sciences
UC Division of Agriculture and Natural Resources
Agricultural Experiment Station and Cooperative Extension

Department of Botany and Plant Sciences-072
Riverside, CA 92521-0124

Welcome to Field Day!

On behalf of the entire UCR Turfgrass and Landscape Team, welcome (back) to the 2011 UCR Turfgrass and Landscape Research Field Day. This marks the fourth consecutive year of this event under my watch. We continue to strive to make Field Day one of the pinnacle events of our industry – a place where all come together annually to see old friends, share ideas, and learn about world-class research activities at UCR.

On a somber note, the recent departure of our turfgrass pathologist, Dr. Frank Wong, has left a huge void in an already sparse team of turfgrass specialists at the University of California (UC) and UC Cooperative Extension. Nevertheless, we forge ahead in the hopefully short interim period between turfgrass pathologists as evidenced by two fungicide trials that are showcased today.

I am very excited to report that the California Turfgrass & Landscape Foundation is off and running thanks in large part to the efforts of Bruce Williams, Executive Director, and a cast of dedicated, hard-working leaders of our industry. The Foundation's primary mission is to fund and support focused research and educational outreach in the areas of turfgrass, landscape, and related water use for the betterment of the stakeholders, conservation of resources and sustainability of the environment. In today's economic and environmental times, our industry needs statewide cohesiveness not fragmentation and the same is true among researchers and extension specialists. The Foundation is such a vehicle to make that happen. Please contact Bruce or myself for more information and stay tuned for the upcoming launch of the Foundation's website, www.CAtlf.org, a clearinghouse for California turfgrass and landscape information.

As you enjoy today's tours, please take a moment to thank those folks, mostly wearing shirts with our Turfgrass Science logo, who assisted with preparation for this event. Special thanks go to my fellow Field Day planning committee members including Steve Cockerham, Peggy Mauk (our new Director of Agricultural Operations!), Sue Lee, Steve Ries, Sherry Cooper, and Angela Oates. Production of this publication would not have been possible without Camaron Cabrera. Staff and students from Agricultural Operations, and my lab have worked tirelessly to make this event possible and are deserved of your appreciation. Last but not least, very special thanks to all of our industry partners for their generous donations to our turf and landscape programs throughout the year, and especially for the today's delicious barbeque lunch under the shade of a tent!

Enjoy Field Day! And we hope to see you again next year on **Thursday, September 13, 2012.**

Sincerely,

James H. Baird, Ph.D.

Assistant Specialist in Cooperative Extension and Turfgrass Science

UCR Turfgrass and Landscape Team 2011

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- Sierra Nevada Golf Course Superintendents Association
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- Southern California Golf Association
- Southern California Section, Professional Golfers' Association of America
- Southern California Turfgrass Council
- Southern California Turfgrass Foundation
- Southland Sod Farms
- Sports Turf Managers Association-Greater L.A. Basin Chapter
- Stover Seed Company
- Syngenta Professional Products
- Target Specialty Products
- Tee 2 Green
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- Tru-Turf
- United States Department of Agriculture (USDA)
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- Victoria Club
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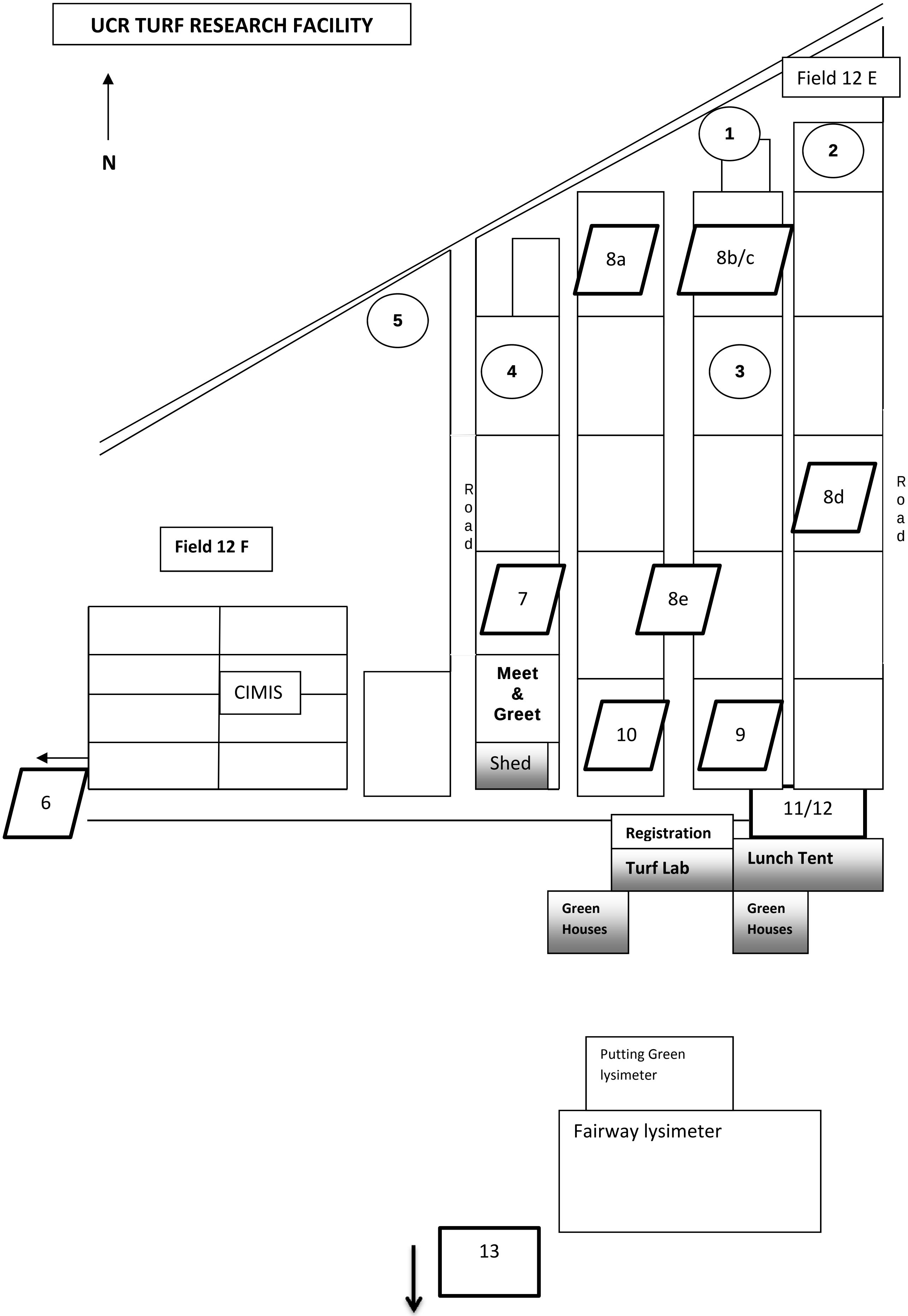
- Women's Southern California Golf Association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Turfgrass and Landscape Research Field Day
FIELD DAY SCHEDULE AND TABLE OF CONTENTS

CIMIS Data Sep. 2011- Aug. 2011

Los Angeles Basin-U.C. Riverside-44

Month Year	Tot ETo (in)	Tot Precip (in)	Avg Sol Rad (Ly/Day)	Avg Vap Pres (mBars)	Avg Max Air Tmp (F)	Avg Min Air Tmp (F)	Avg Air Tmp (F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (F)	Avg Wind Speed (mph)	Avg Soil Temp (F)
Sep 2010	5.45	0.02	439	11.6	89.6	59.4	73.2	67	25	44	48.1	3.8	70.6
Oct 2010	2.10	0.37	192	12.4	75.8	56.0	64.7	78	42	61	49.4	3.5	66.0
Nov 2010	3.22	1.00	325	6.9	70.7	46.7	58.4	66	26	43	33.0	4.4	56.7
Dec 2010	1.78	8.59	213	8.4	65.6	46.0	54.75	74	41	58	38.4	3.2	53.4
Jan 2011	2.91	0.32	279	6.0	68.2	45.6	56.4	60	25	40	30.1	4.0	51.6
Feb 2011	2.91	2.00	364	6.2	64.0	40.6	51.7	70	29	49	30.6	3.8	52.2
Mar 2011	4.22	1.30	426	8.8	69.6	46.6	57.2	78	34	56	40.8	3.8	57.5
Apr 2011	5.57	0.19	539	9.4	73.2	50.81	61.3	74	33	52	41.9	4.6	64.3
May 2011	6.67	0.34	627	9.6	75.1	51.8	62.7	73	32	52	44.8	4.8	66.2
Jun 2011	6.95	0.00	676	12.7	81.2	56.2	67.2	79	35	56	50.6	4.4	71.2
Jul 2011	7.76	0.29	652	14.5	89.5	62.6	74.6	75	30	50	54.4	4.2	75.6
Aug 2011	7.65	0.00	636	13.8	92.6	62.4	75.9	73	24	46	53.0	3.7	75.0
Totals/Avgs	57.19	14.42	447	10.0	76.3	52.1	63.2	72	30	51	42.9	4.0	63.4

Evaluation of Fungicides on Creeping Bentgrass Under Drought Stress

Jim Baird, Brent Barnes, Ryan Nichols, Tyler Mock, and Alea Miehls
Department of Botany & Plant Sciences
University of California, Riverside

Certain fungicides are known to improve plant health and abiotic stress tolerance in addition to providing protection against pathogens. This was a follow-up to a study conducted last year where we evaluated several fungicides, plant growth regulators (PGRs) and nitrogen on bermudagrass under deficit irrigation. Results pointed toward increased turf quality and greater rooting characteristics among the treatments under severe drought stress, most notably the Intrinsic brand of fungicides from BASF that contain pyraclostrobin. These results are supported by other research that has demonstrated enhanced rooting and plant health following application of this active ingredient.

The objectives of this study were to explore the fungicide plant health and rooting phenomena further by predisposing creeping bentgrass turf to fungicide applications followed by a gradual and then severe reduction in water. We also wanted to determine if the treatments play a role in turf recovery following core aeration.

Location: UCR Turf Facility

Soil: Loamy sand amended with sand topdressing

Experimental Design: Randomized complete block; four replications

Plot Size: 4 ft x 10 ft

Species/Cultivars: Creeping bentgrass (*Agrostis stolonifera* L.) 'Cobra'

Mowing Height: 0.180 inches; 3 days/wk

Irrigation: 80% ETo/DU; following initial application of fungicides on 4 August 2011, irrigation was reduced incrementally by lowering run time approximately 8% every week until the final fungicide applications were made 4 weeks later; plot area was then irrigated by hand deeply and uniformly followed by no irrigation for 5 days leading up to core aeration; minimal water was applied thereafter to prevent desiccation following cultivation and to evaluate drought stress tolerance among treatments leading up to Field Day.

Cultivation: standard practices include verticutting and solid-tine aeration alternated monthly with sand topdressing; on 9 Sep 2011, half of each plot was core aerated using ½-inch tines, cores removed, and entire plot area was topdressed with sand.

Fertility: 0.5 lbs N/1000 ft^2/month until July 2011
0.2 lbs N/1000 ft^2 on 26 August 2011
0.25 lbs N/1000 ft^2 on 10 September 2011

Sprayer: CO_2-powered hand boom
TeeJet 8004VS nozzles
9-inch spacing
12-inch boom height
Speed: 2 mph
Output: 87 GPA
Pressure: 32 psi @ tank

Data Collected: Bentgrass quality (1-9, 9 = best); NDVI (plant health); dollar spot severity (0-100%); bentgrass recovery from cultivation (1-9, 9 = best); drought severity (1-9, 9 = best); rooting characteristics

Acknowledgments: Thanks to BASF, Syngenta, Bayer, and Dow AgroSciences for their support of this research.

Preliminary Results:

- ✓ Turf stress resulting from five consecutive days without irrigation was minimal despite daytime high temperatures near or above 100F. This was partially due to the amount of irrigation applied beforehand to help ensure uniform moisture and drying in the root zone profile.

- ✓ Although this study was not intended to evaluate disease control, an outbreak of dollar spot disease occurred on the area, most likely due to leaner nitrogen fertility employed since the start of the study.

- ✓ The Intrinsic brand fungicides (Pillar, Honor, and Insignia), Daconil ACTion, and Interface effectively controlled the disease and thus also demonstrated the highest turf quality and numerically highest NDVI values after the five-day dry-down.

- ✓ Last year, a single treatment of 4 lbs N/1000 ft^2 applied as a granular helped improve, or at least did not worsen, bermudagrass health and rooting in response to drought stress. In case you have ever thought about it, never spray 4 lbs N/1000 ft^2 of ammonium sulfate on bentgrass turf at one time during the summer. Even irrigation shortly thereafter could not save the turf.

Evaluation of Fungicides on Creeping Bentgrass Under Drought Stress
UCR Turf Facility; Plot 12E-22; Plot size: 4 ft x 10 ft

North

10	4	10	7
9	1	3	6
8	3	6	4
7	7	8	8
6	2	1	5
5	6	4	10
4	8	9	9
3	10	2	3
2	5	7	1
1	9	5	2

Table 1. Bentgrass quality (1-9, 9 = best), NDVI, and dollar spot severity (0-100%) on 9 Sep 2011 following five days of no irrigation. Riverside, CA.

Trt	Product	Rate/M	Timing	Bentgrass Quality	NDVI	Dollar Spot
1	Untreated	--	--	7.3 bc	0.840 ab	7.5 bc
2	Pillar G	3 lb	AD	8.0 a	0.853 ab	0.0 c
3	Honor	1.1 oz	AD	8.0 a	0.860 a	0.0 c
4	Insignia SC	0.7 oz	AC	8.0 a	0.850 ab	0.0 c
5	Heritage WG	0.4 oz	AD	7.3 bc	0.843 ab	11.8 ab
6			AD	7.3 bc	0.830 b	21.3 a
7	Daconil ACTion	3.6 oz	ABD	8.0 a	0.855 ab	0.0 c
8	Signature	4 oz	ABD	7.0 c	0.838 ab	22.5 a
9	Interface	5 oz	ABD	7.8 ab	0.855 ab	0.0 c
10 10	40-0-0 21-0-0	2 lbs N 4 lbs N	A D	2.5 d	0.543 c	0.0 c
	LSD (α = 0.05)	**--**	**--**	**0.6**	**0.029**	**11.7**

Treatment means followed by the same letter are not significantly different (α = 0.05).

Application Dates: A = 4 August 2011
B = 18 August 2011
C = 26 August 2011
D = 2 September 2011

Table 2. Products tested in the bentgrass stress study.

Product	Manufacturer	Common Name(s)	Notes
Pillar G	BASF	Pyraclostrobin + Triticonazole	
Honor	BASF	Pyraclostrobin + Boscalid	Boscalid for dollar spot control
Insignia SC	BASF	Pyraclostrobin	
Heritage WG	Syngenta	Azoxystrobin	
Daconil ACTion	Syngenta	Chlorothalonil + Acibenzolar-S-methyl	
Signature	Bayer	Fosetyl-Al	Phosphonate fungicide with StressGuard pigment
Interface	Bayer	Iprodione + Trifloxystrobin	Premix of active ingredients 26GT and Compass with StressGuard pigments
40-0-0		Methylene urea	
21-0-0		Ammonium sulfate	

Groundcover Response to Limited Irrigation

Donald Merhaut[z], Dennis Pittenger[y], Darrel Jenerette[x], David Shaw[w], Ryan Nichols[v], and James Baird[z]

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This study of 17 groundcover plant materials and one turfgrass managed as an unmowed groundcover is designed to evaluate their adaptation to the inland valley climate of Southern California and their performance at a reduced level of irrigation (see table). The plants represent a mix of native, so-called California-Friendly, and non-native as well as woody and herbaceous plant materials. Replicated field plots were planted in late 2009 through early 2010 and have been challenged with irrigation of 60% of real-time reference evapotranspiration (ETo) since mid-May 2011.

The study objectives are to: (1) substantially expand the knowledge of groundcover water requirements; (2) evaluate the adaptation and performance of 17 groundcover and one turfgrass species in the inland valley climate when receiving water equal to or less than the amount needed by warm-season grass; and (3) evaluate the relative carbon fixation potential and water use efficiency among the plant species.

We are measuring plant response to irrigation by recording plant quality ratings of each species following established and accepted protocol. Plant quality of each plot is rated at least monthly on a scale of 1 to 9, with 9 = optimum/best plant quality and 1 = dead/worst plant quality. To estimate carbon fixation and water use efficiency of selected plant materials, a LI-COR 7500 open path infrared carbon dioxide and water analyzer will be used to measure carbon flux and evapotranspiration (ET) within each plot on a bi-weekly basis May 2011 to June 2012.

<u>Study Design</u>

- 18 species
- 1 irrigation treatment; 3 replications of each species
- 54 sub-plots 10 ft. × 10 ft. each
- Sprinkler irrigation
- Plants transplanted from containers or from flats as rooted cuttings 2009-2010
- No soil amendments
- Plots fertilized twice during establishment at 1 lb. N per 1000 $ft.^2$ per application
- Weeds managed with pre-emergent herbicides (oxadiazon and/or pendimethalin) and limited hand weeding

GROUNDCOVER RESPONSE TO LIMITED IRRIGATION STUDY – U.C. RIVERSIDE

Plot Map

NORTH

---ROAD---

Lonicera Japonica	Sedum mix	Mesembryanth. ?	Convolvulus sabatius	Buchloe dactyloides	Thymus pracox articus
Rosmarinus officianalis	Lantana montevidensis	Geranium X cantabrigiense	Geranium X cantabrigiense	Aptenia cordifolia	Atriplex cinerea
–	Hypericum caycinum	Corethrogyne flaginifolia	Juniperus horizontalis	Correa X unk.	Trachelospermum jasminoides
Atriplex cinerea	Corethrogyne flaginifolia	Lantana montevidensis	Geranium X cantabrigiense	Aptenia cordifolia	Sedum mix
Geranium X cantabrigiense	Trachelospermum jasminoides	Correa X unk.	Mesembryanth. ?	Lonicera japonica	–
Thymus pracox articus	Buchloe dactyloides	Hypericum caycinum	Juniperus horizontalis	Convolvulus sabatius	Rosmarinus officianalis
Corethrogyne flaginifolia	Rosmarinus officianalis	Thymus pracox articus	Atriplex cinerea	Aptenia cordifolia	Juniperus horizontalis
Buchloe dactyloides	Sedum mix	–	Hypericum caycinum	Correa X unk.	Mesembryanth. ?
Lantana montevidensis	Convolvulus sabatius	Trachelospermum jasminoides	Lonicera japonica	Geranium X cantabrigiense	Geranium X cantabrigiense

---TURF PLOT--

GROUNDCOVER RESPONSE TO LIMITED IRRIGATION STUDY – U.C. RIVERSIDE				
Specific Epithet	**Common Name**	**Source Size[z]**	**Date Planted**	**Notes**
1. Drosanthemum speciosum, Delosperma, Mesembryanthemum??	vygie, iceplant	Altman Plants #1 container	4-2-10	Newer iceplant introduction, spring flowering, re-flowers in summer, So. Africa native, (vygie is Afrikaans term for Mesembryanthemums, fam. Aizoaceae)
2. Rosmarinus officianalis 'Irene'	prostrate rosemary	Native Sons 4-in. pot	11-4-09	Reported to be very low-growing
3. Convolvulus sabatius (Convolvulus sabatius ssp. mauritanicus)	ground morning glory	Native Sons 4-in. pot	11-4-09 repltd 4-2-10	Reported to be drought resistant, 1-2 ft. H × 2-3 ft. W, lavender flowers, Italy-Yugos-No. Af. native, hardy to 25°F
5. Thymus pracox arcticus (T. praecox subsp. Arcticus; T. serpyllum) 'Pink Chintz'	creeping thyme	Native Sons 4-in. pot	11-4-09	Reported to grow 1-in. ht., pink flowers, attracts bees
6. Atriplex cinerea Poir.	coast or grey saltbush	Native Sons #1 container	11-4-09	Silver foliage, low-spreading, dioecious, Australian native
7. Correa X unk. 'Dusky Bells' ('Carmine Bells')	Australian fuchsia	Native Sons #1 container	11-4-09	Reported to be low wide-spreading, deep red flowers, Australian native
8. Geranium X cantabrigiense 'Biokova'	cranesbill	Native Sons #1 container	11-4-09	Reported very low and spreading, flowers winter-spring
9. Juniperus horizontalis 'Wiltonii'	blue rug juniper	Monrovia #1 container	12-2-09	Very flat dense growing, trailing branches, silver blue foliage
10. Hypericum calycinum L.	creeping St. Johnswort, Aaron's beard	Expertise Growers cuttings in flats	10-29-09	Low-growing, widely adapted, flowers primarily in spring and periodically in summer
11. Salvia sonomensis 'Gracias' (S. sonomensis X S. clevelandii)	creeping sage	Las Palitas #1 container	9-11-09	California native, reported low growing, wide spreading, lavender-blue flowers, possibly a hybrid of S. sonomensis X S. clevelandii, flowers winter/spring
12. Aptenia cordifolia (L.f.) N.E. Br. 'Red Apple' (A. cordifolia X A. haeckeliana?)	red apple	Expertise Growers cuttings in flats	10-29-09 add plt 4-2-10	Ice plant relative
13. Lantana montevidensis	trailing purple lantana	Expertise Growers cuttings in flats	10-29-09 add plt 4-8-10	Common landscape lantana, purple flowers spr.-summer
14. Trachelospermum jasminoides	star jasmine	Expertise Growers cuttings in flats	10-29-09	Vigorous once established, widely adapted
15. Sedum spp.	mixed sedums	Altman Plants 8 ft. × 8 ft. mats	3-31-10	Sod-like product with cuttings of 4 sedum spp. Rooted in jute mat under laden with plastic netting
16. Buchloe dactyloides 'U.C. Verde'	buffalograss	Todd Valley Farms plugs	4-8-09	Warm-season grass, a standard of performance under limited irrigation
17. Corethrogyne filaginifolia 'Silver Carpet'	California aster, common corethrogyne	Las Palitas #1 container	9-11-09	California native plant
18. Lonicera japonica 'Halliana'	Hall's honeysuckle, Japanese honeysuckle	Expertise Growers cuttings in flats	10-29-09	Very vigorous, reported to be tolerates drought well

[z] Plants from flats and plugs spaced 1.0 ft. o.c., 64 plants/plot; plants from 4-in. and #1 pots spaced 2.0 ft. o.c., 16 plants/plot

Evaluation of Seeded and Vegetative Buffalograss Under Simulated Traffic and Nitrogen Fertility

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Janet Hartin
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UC Cooperative Extension
San Bernardino and Los Angeles Counties

With decreasing fresh water resources and increasing water use restrictions on landscapes, the turf industry and general public are increasingly seeking alternative and low maintenance turfgrasses. Recently, there has been a lot of interest in using buffalograss [*Buchloe dactyloides* (Nutt.) Engelm.] on lawns and landscapes in Southern California. Buffalograss is a warm-season, stoloniferous turfgrass species native to North America. Of particular importance in areas where water availability is an issue, buffalograsses have a comparatively low water use rate. As importantly, buffalograsses exhibit a drought induced dormancy survival characteristic, with certain cultivars (e.g., 'UC Verde') demonstrating a very quick recovery once water is available. Buffalograsses also perform very well with little or no mowing.

Although buffalograss does have a place in the Southern California landscape, it is important to understand its weaknesses as well as its strengths. Like other warm-season turfgrasses with lower water use requirements, buffalograss will go dormant or turn straw brown color during the colder periods of winter except perhaps in coastal environments where temperatures are moderated by the ocean. In general, buffalograss also exhibits weak sod strength, and poor tolerance to shaded conditions and traffic.

UC Verde is a vegetatively-propagated buffalograss cultivar that resulted from a turfgrass improvement program at the University of California Davis and Riverside campuses. It was found that the new diploid female buffalograss cultivar exhibited superior drought tolerance, stolons of fine texture, and a competitive growth habit. Also, relative to other buffalograsses, it had shorter winter dormancy with superior color retention, and high turf density with a rapid stolon spreading rate and short plant height that provided a low maintenance turf of good quality. Although UC Verde is well adapted to our region, it is sold as plugs only. This can be both expensive and time-consuming to establish a stand of turf.

In this experiment, we sought to compare establishment rates, traffic tolerance, and other turf quality characteristics of UC Verde and three experimental seed-propagated lines of buffalograss from the University of Nebraska. These experimental lines were developed from parental materials that exhibited improved turfgrass performance and greater seed yield. All three lines are hexaploid. They have exhibited excellent heat tolerance and drought resistance characteristics. The lines will be named and limited seed of these releases will be available in 2011 or shortly thereafter.

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam
Experimental Design:	Randomized complete block with 3 replications
Plot Size:	12' by 12'
Plugs and Seed Established:	9 July 2010
Seeding Rate:	2 lbs/1000 ft^2
Plug Spacing:	18-inch spacing of UC Verde plugs
Fertility:	Once fully established in August 2011, plots were split by 2 and 4 lbs N/1000 ft^2/Yr
Traffic:	Two passes twice/week using Brinkman Traffic Simulator beginning in August 2011
Mowing Height:	2 inches
Irrigation Regimes:	Established for 8 weeks at 160% ET_o replacement, then irrigation was lowered to warm season historical crop coefficient values (ET_o*K_c)/DU
Data Collection:	turf quality, percent brown canopy tissue cover, color quality, percent cover, winter color retention, spring green up, response to simulated traffic
Acknowledgments:	Special thanks to Florasource, LTD for donating UC Verde plugs and the University of Nebraska for the experimental seed lines.

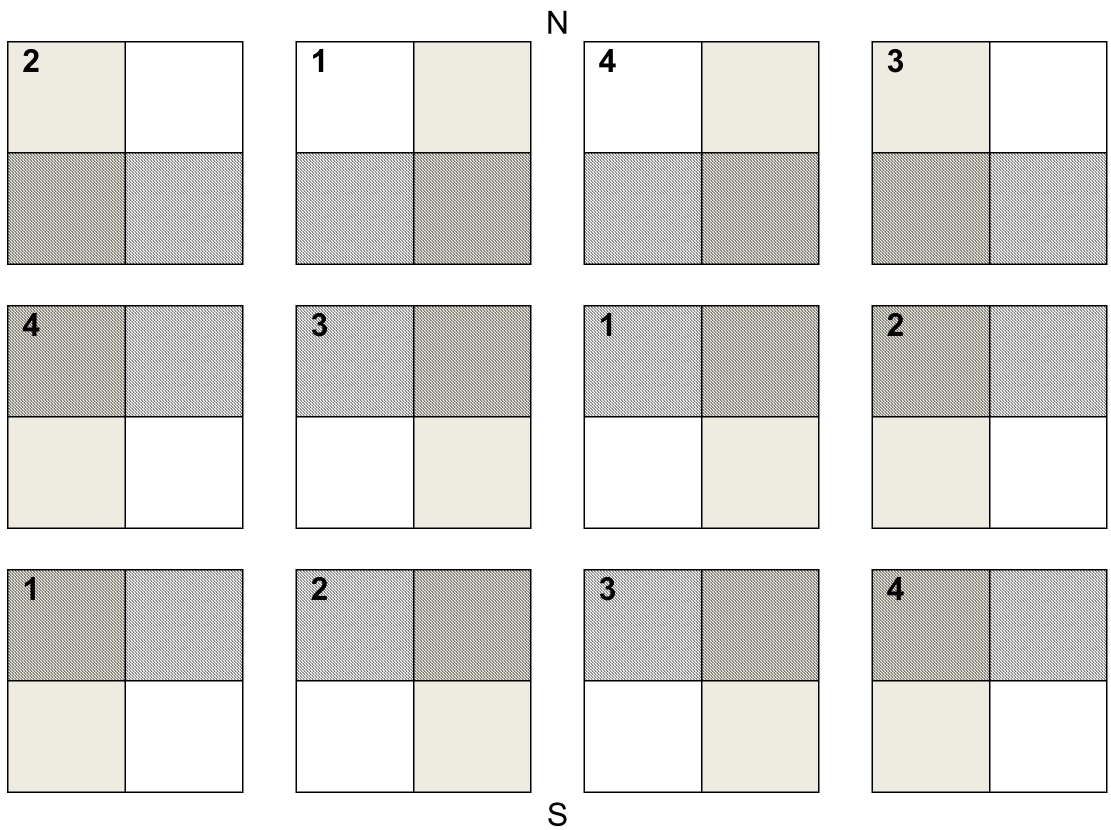
Preliminary Results:

- ✓ Residual herbicide leftover from a previous experiment hindered establishment of some of the plots; hence it was difficult to evaluate turf establishment. In general, UC Verde established much more rapidly from plugs compared to the seeded types.
- ✓ UC Verde retained its color much longer in the fall compared to the seeded types; however, the opposite was true for spring green up.
- ✓ In general, UC Verde provides a denser turf compared to the seed types. Thus far, we have not seen a lot of separation in turf performance and quality among the seeded types.

Treatments:

1. ‘UC Verde’ Buffalograss
2. Seeded Buffalograss NEBFG 07-4E
3. Seeded Buffalograss NEBFG 07-01
4. Seeded Buffalograss NEBFG 07-03

Plot Map:



Plot size 12' by 12' with 2' alleys

Traffic

2lb/M/Yr

4lb/M/Yr

Table 1. Buffalograss turf quality (1-9, 9 = best) in 2010. Riverside, CA.

	9/2/10		10/6/10		11/4/10		12/23/10	
Treatment								
UC Verde	6		6		6		3.3	a
NEBFG 07-4E	6		6		5		1	b
NEBFG 07-01	6		6		5		1	b
NEBFG 07-03	6		6		5		1	b
LSD (P=0.05)	NS		NS		NS		0.6	

Means followed by the same letter do not significantly differ (P=0.05). NS = Not significant.

Table 2. Buffalograss color quality (1-9, 9 = best) in 2010.

	9/2/10		10/6/10		11/4/10		12/23/10	
Treatment								
UC Verde	6.3		6.3		6		3.33	a
NEBFG 07-4E	7		7		5		1	b
NEBFG 07-01	7		7		5		1	b
NEBFG 07-03	7		7		5		1	b
LSD (P=0.05)	NS		NS		NS		0.58	

Means followed by the same letter do not significantly differ (P=0.05). NS = Not significant.

Table 3. Buffalograss cover (0-100%) in 2010.

	9/2/10		10/6/10		11/4/10		12/23/10	
Treatment								
UC Verde	56.7		91.7		97		97	
NEBFG 07-4E	42.3		60		70		70	
NEBFG 07-01	34.7		55.7		61.7		61.7	
NEBFG 07-03	28.3		41.7		50		50	
LSD (P=0.05)	NS		NS		NS		NS	

Means followed by the same letter do not significantly differ (P=0.05, LSD). NS = Not significant.

‘UC Verde’ Buffalograss Tolerance to Herbicides

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Buffalograss has been receiving a lot of attention recently in southern California as a drought tolerant and low maintenance alternative to commonly used turfgrass species such as tall fescue. Thus, more information is needed regarding its tolerance to agrochemicals, especially herbicides. Buffalograss is not a commonly used turfgrass species, thus tolerance and use information may be lacking on herbicide labels. This study was developed to evaluate newer or soon-to-be-released herbicides on ‘UC Verde’, a vegetatively-propagated cultivar developed by the University of California that is well adapted to southern California.

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam
Experimental Design:	Completely randomized design with 4 replications
Plot Size:	4’ by 6’
Species/Cultivars:	Mature stand of ‘UC Verde’ buffalograss established from plugs in July 2010
Application Information:	CO_2 backpack sprayer TeeJet 8002VS nozzles 9-inch nozzle spacing 12-inch boom height Speed 2.4 mph Output: 40 GPA Pressure: 20 psi @ ank
Application Timing:	A: 12 July 2011 B: 1 September 2011
Fertility:	4.0 lbs N/1000 ft^2/year
Mowing Height:	2 inches

Irrigation Regimes: Warm-season historic K_c : $(ET_o*K_c)/DU$

Data Collection: Total plot turf quality, percent weed tissue cover by species, and NDVI.

Acknowledgments: Thank you to: Florasource, LTD for donating the plant material; Arysta LifeScience, Moghu Research Center, BASF, PBI Gordon, Syngenta, and DuPont for their support

Results:

- ✓ Weed pressure was sporadic, therefore the focus of this study was on buffalograss tolerance to the herbicides.

- ✓ In general, all of the herbicides tested exhibited some degree of safety on UC Verde, ranging from excellent to injury at high or exaggerated rates. High rates of amicarbazone and Imprelis caused the most significant injury; however, turf eventually recovered. Application(s) of either herbicide at 3 oz/A or less would be advised from the standpoint of buffalograss safety.

- ✓ Application of the higher rate of Tenacity resulted in bleaching of buffalograss leaves within 1-2 weeks after application. This symptom is characteristic of the mode of action, and was short-lived.

- ✓ Turf injury may have resulted, in part, to high daytime temperatures around the time of applications in July and September. Hence, this study could be considered as a worse case scenario in terms of evaluating herbicides for potential buffalograss injury.

Buffalograss Herbicide Tolerance Plot Map

Plot Size: 4 ft x 6 ft

North

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	17	21	23
9	17	13	6	19	7	10	4	2	21	18	15	16
17	7	12	1	9	14	4	3	21	11	23	5	22
15	5	3	12	4	7	6	11	9	15	6	22	20
10	13	18	10	13	2	16	1	12	8	20	1	18
14	2	20	5	8	11	14	8	19	3	22	19	16

Table 1. Buffalograss quality (1-9, 9 = best) following application of herbicides. Riverside, CA.

Trt	Product	Rate	7 DAIT	14 DAIT	28 DAIT	49 DAIT	58 DAIT
1	Control	--	6.0 a	6.0 a	6.0 ab	6.8 ab	7.0 a
2	Amicarbazone	3 oz/A	6.0 a	6.0 a	6.0 ab	6.8 ab	7.0 a
3	Amicarbazone	6 oz/A	5.0 b	4.8 b	5.2 cd	6.8 ab	6.5 abc
4	Amicarbazone[a]	9 oz/A	4.2 c	3.0 cd	5.0 de	6.0 a-d	7.0 a
5	Methiozolin	2.8 oz/M	6.0 a	5.8 a	6.0 ab	6.2 a-d	6.0 cd
6	Methiozolin	4.2 oz/M	6.0 a	5.8 a	6.0 ab	6.8 ab	6.5 abc
7 7	Tower Pendulum AC	32 oz/A 48 oz/A	6.0 a	6.0 a	6.0 ab	6.0 a-d	6.8 ab
8	Katana	3 oz/A	5.8 a	5.8 a	6.0 ab	7.0 a	6.8 ab
9	Tower	21 oz/A	6.0 a	6.0 a	6.0 ab	6.8 ab	7.0 a
10	Tower[b]	21 oz/A	5.8 a	5.8 a	5.2 cd	5.2 b-e	6.8 ab
11	Tower	32 oz/A	6.0 a	6.0 a	6.0 ab	7.0 a	7.0 a
12	Tower[b]	32 oz/A	6.0 a	6.0 a	6.0 ab	6.0 a-d	6.8 ab
13	Tenacity 4SC	8 oz/A	5.8 a	6.0 a	5.8 bc	6.5 abc	6.2 abc
14	Tenacity 4SC	16 oz/A	5.2 b	6.0 a	6.0 ab	6.8 ab	4.0 h
15	Monument	10 g/A	6.0 a	6.0 a	6.0 ab	7.0 a	7.0 a
16	Monument	20 g/A	6.0 a	6.0 a	6.5 a	7.0 a	7.0 a
17 17	Tenacity 4SC Monument	8 oz/A 10 g/A	6.0 a	6.0 a	6.0 ab	6.8 ab	7.0 a
18	Imprelis	1.5 oz/A	5.0 b	5.5 a	5.8 bc	5.5 a-e	6.0 cd
19	Imprelis	3.0 oz/A	5.0 b	4.5 b	5.0 de	5.8 a-e	5.5 de
20	Imprelis	4.5 oz/A	4.0 cd	4.8 b	4.5 e	5.0 cde	4.8 fg
21	Imprelis	6.0 oz/A	3.8 d	3.2 c	3.8 f	4.8 def	4.8 fg
22	Imprelis[a]	9.0 oz/A	2.8 e	2.5 de	3.0 g	4.2 ef	5.2 ef
23	Imprelis[a]	12.0 oz/A	2.0 f	2.0 e	2.0 h	3.0 f	4.3 gh
	LSD (α = 0.05)	**--**	**0.5**	**0.6**	**0.6**	**1.7**	**0.5**

Treatment means followed by the same letter are not significantly different (α = 0.05).

[a]Treatment applied only once on 12 July 2011. Other treatments repeated on 1 September 2011. DAIT = Day after initial treatment. 58 DAIT = 8 days after second application.
[b]Spray output = 80 GPA; all other treatments = 40 GPA.

Table 2. NDVI on buffalograss following application of herbicides. Riverside, CA.

Trt	Product	Rate	7 DAIT	14 DAIT	28 DAIT	49 DAIT	58 DAIT
1	Control	--	0.70 a	0.60 ab	0.59 ab	0.76	0.83 abc
2	Amicarbazone	3 oz/A	0.67 a-e	0.59 a-d	0.61 a	0.76	0.82 abc
3	Amicarbazone	6 oz/A	0.66 b-e	0.58 a-e	0.54 b-e	0.74	0.82 a-d
4	Amicarbazone[a]	9 oz/A	0.65 c-f	0.54 cde	0.54 b-e	0.73	0.84 a
5	Methiozolin	2.8 oz/M	0.68 abc	0.61 a	0.58 abc	0.74	0.82 abc
6	Methiozolin	4.2 oz/M	0.68 a-e	0.58 a-e	0.59 ab	0.76	0.82 a-d
7 7	Tower Pendulum AC	32 oz/A 48 oz/A	0.68 a-e	0.59 a-d	0.57 a-d	0.74	0.82 a-e
8	Katana	3 oz/A	0.64 efg	0.60 ab	0.61 a	0.78	0.80 cde
9	Tower	21 oz/A	0.67 a-e	0.60 ab	0.58 ab	0.76	0.82 abc
10	Tower[b]	21 oz/A	0.64 efg	0.55 b-e	0.54 b-e	0.69	0.81 b-e
11	Tower	32 oz/A	0.68 a-d	0.62 a	0.61 a	0.77	0.82 abc
12	Tower[b]	32 oz/A	0.68 abc	0.58 a-e	0.57 abc	0.73	0.82 a-d
13	Tenacity 4SC	8 oz/A	0.69 ab	0.60 abc	0.58 abc	0.75	0.82 abc
14	Tenacity 4SC	16 oz/A	0.68 a-e	0.62 a	0.57 a-d	0.75	0.77 fg
15	Monument	10 g/A	0.69 ab	0.62 a	0.59 ab	0.74	0.82 abc
16	Monument	20 g/A	0.68 abc	0.63 a	0.60 a	0.79	0.83 abc
17 17	Tenacity 4SC Monument	8 oz/A 10 g/A	0.69 abc	0.60 ab	0.56 a-d	0.76	0.84 ab
18	Imprelis	1.5 oz/A	0.64 d-g	0.58 a-e	0.57 a-d	0.70	0.82 a-e
19	Imprelis	3.0 oz/A	0.60 g	0.53 ef	0.52 de	0.72	0.79 def
20	Imprelis	4.5 oz/A	0.60 g	0.54 cde	0.53 cde	0.71	0.77 fg
21	Imprelis	6.0 oz/A	0.61 fg	0.54 de	0.51 ef	0.69	0.75 g
22	Imprelis[a]	9.0 oz/A	0.56 h	0.48 fg	0.47 fg	0.71	0.82 abc
23	Imprelis[a]	12.0 oz/A	0.54 h	0.46 g	0.42 g	0.65	0.78 ef
	LSD (α = 0.05)	**--**	**0.04**	**0.06**	**0.05**	**NS**	**0.03**

Treatment means followed by the same letter are not significantly different (α = 0.05).
NS = Not significant.

[a]Treatment applied only once on 12 July 2011. Other treatments repeated on 1 September 2011. DAIT = Day after initial treatment. 58 DAIT = 8 days after second application.
[b]Spray output = 80 GPA; all other treatments = 40 GPA

Table 3. Herbicides tested in the buffalograss tolerance study.

Product	**Manufacturer**	**Common Name(s)**	**Notes**
Monument	Syngenta	Trifloxysulfuron	Sulfonylurea; broadleaf and sedge control; transition herbicide
Tenacity	Syngenta	Mesotrione	Based on a naturally occurring compound secreted by the Callistemon (bottlebrush) plant. Inhibits carotenoid biosynthesis, causing bleaching. Pre and post activity in most cool-season turf except bentgrass; CA registration pending in 2012
Amicarbazone	Arysta LifeScience	Amicarbazone	New triazolinone herbicide with pre and post grass and broadleaf activity in warm- and cool-season turf; U.S. turf registration pending in 2012
Methiozolin	Moghu Research Center	Methiozolin	New isoxazolinone herbicide for pre and post control of *Poa annua* and *Poa trivialis* in most warm- and cool-season turf
Tower	BASF	Dimethenamid	Preemergence control of broadleaf, grass, and sedge weeds; CA turf registration pending in 2012
Pendulum Aqua Cap	BASF	Pendimethalin	Dinitroaniline preemergence herbicide
Imprelis	DuPont	aminocyclopyrachlor	Broad spectrum broadleaf control; CA registration pending
Katana	PBI Gordon	Flazasulfuron	Sulfonylurea; broadleaf and sedge control; transition herbicide; not currently registered in CA

Evaluation of Ryegrasses, Fescues, and Their Hybrids Under Deficit Irrigation

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Cool-season turfgrasses dominate the landscape and golf courses throughout California and much of the U.S. because of their ability to retain green color year round, with supplemental irrigation, in drier climates. However, increasing drought frequency and diminishing water resources are jeopardizing the future of turf and its benefits to the game, urban culture, the environment, and the economy. Perennial ryegrass (*Lolium perenne* L.) is widely used because of its rapid germination and establishment; wear tolerance; and dark green color. By intercrossing with meadow fescue (*Festuca pratensis* Huds.) and recurrent selection for drought and heat tolerance, we have developed a population of perennial ryegrass with a marked increase in drought tolerance. This increase was associated with a dramatic increase in the frequency of introgression of *F. pratensis* chromatin on the short arm of chromosome 3. In studies in the United Kingdom on forage-type interspecific hybrids of fescues and ryegrasses, this specific segment of F. pratensis chromatin was associated with deep rooting, drought, heat, freezing, and flood tolerance. We believe that extreme selection applied to our materials favored the specific genome regions from *F. pratensis* responsible for drought and heat tolerance under Southern California conditions.

We now have populations of turf-type perennial ryegrass with high frequencies of *F. pratensis* introgressions that are related to stress resistance. The objective of this study was to test these populations in the field against commercially available tall fescue and perennial ryegrass cultivars under deficit irrigation (60% ETo).

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam
Experimental Design:	Randomized complete block with 3 replications
Plot Size:	5 ft by 5 ft
Seed Established:	24 November 2010
Fertility:	0.5 lb N/1000 ft^2 approximately monthly
Mowing Height:	2 inches
Irrigation Regimes:	Maintained at (150% ET_O)/ DU until start of study, then 60% ET_o replacement divided into three times weekly irrigated by hand
Deficit irrigation Initiated:	29 June 2011

Data Collection: Turf quality (1-9, 9 = best; 6 = minimally acceptable turf), color quality (1-9, 9 = best, 6 minimally acceptable turf), percent cover brown tissue, clippings, soil water content per plot using TDR, and NDVI per plot; Electrolyte leakage

Acknowledgments: Special thanks to Seed Research of Oregon for donating all of the tall fescue and ryegrass cultivars, and Blue Moon Farms, LLC for donating the *Festuca pratensis* seed

Treatments:

1. 'Tulsa Time' Tall Fescue
2. 'Laura' Meadow Fescue
3. 'SR4220' Perennial Ryegrass
4. 3s" 16 Festulolium
5. VL 3s' Festulolium
6. 3s" 11 Festulolium
7. 'Zoom' Perennial Ryegrass

Plot Map:

North

1	2	3	4	5	6	7
5	3	7	4	1	6	2
3	2	7	6	5	1	4

South

Preliminary Results:

- ✓ As drought stress from deficit irrigation progressed, 'Zoom' perennial ryegrass has exhibited significantly greater turf quality and less straw tissue, followed next by the Festulolium populations and 'SR 4220' (backcross parent), and then the fescues (Tables 1 and 2).
- ✓ While deficit irrigation did reduce clipping yield over time, there were no significant changes among the species and cultivars as a possible effect of drought tolerance (Table 3).
- ✓ Thus far, our field and greenhouse studies continue to demonsrate increased turf quality of Festulolium compared to tall fescue in response to severe drought or deficit irrigation. However, our populations do not show a marked difference in comparison with 'SR 4220', the recurrent backcross parent in the Festulolium lines, and less superiority in comparison with 'Zoom' a commercial ryegrass cultivar selected for improved drought tolerance.
- ✓ Our studies will continue to determine the physiological and cytogenetic bases for these observations in the field, with the ultimate goal of developing a cool-season turfgrass that requires less water during the summer months.

Table 1. Quality (1-9, 9 = best) of turfgrasses in response to deficit irrigation imposed on 29 June 2011. Riverside, CA.

Treatment	0 DAT	14 DAT	28 DAT	42 DAT	57 DAT	70 DAT
‘Tulsa Time’ Tall Fescue	7	7	5.3 a	2.3 c	3 c	3 c
‘Laura’ Meadow Fescue	6	6	4 b	3.0 bc	3 c	3 c
‘SR4220’ Perennial Rye	7	6.3	5.3 a	4.0 ab	4 ab	4 b
3s” 16 Festulolium	7	6.7	5.7 a	3.3 abc	3.7 bc	3.7 b
VL 3s’ Festulolium	7	6.3	5.7 a	3.3 abc	3.7 bc	4 b
3s” 11 Festulolium	7	6.7	6 a	3.3 abc	3.3 bc	4 b
‘Zoom’ Perennial Rye	7	7	6.3 a	4.3 a	4.7 a	4.7 a
LSD (α = 0.05)	**NS**	**NS**	**0.9**	**1.1**	**0.7**	**0.6**

Means followed by the same letter do not significantly differ (P=0.05). NS = Not significant.

Table 2. Percent straw color leaves in response to deficit irrigation imposed on 29 June 2011. Riverside, CA.

Treatment	0 DAT	14 DAT	28 DAT	42 DAT	57 DAT	70 DAT
‘Tulsa Time’ Tall Fescue	2.3 c	5.7	28.3	70.0 a	73.3 a	70.0 a
‘Laura’ Meadow Fescue	3.7 bc	9.0	31.7	63.3 a	70.0 a	66.7 ab
‘SR4220’ Perennial Rye	5.7 a	11.7	28.3	38.3 bc	31.7 b	43.3 cd
3s” 16 Festulolium	5.7 a	8.3	28.3	56.7 ab	53.3 ab	50.0 bc
VL 3s’ Festulolium	5.0 ab	12.3	31.7	50.0 abc	41.7 b	46.7 cd
3s” 11 Festulolium	6.3 a	7.3	25.0	56.7 ab	53.3 ab	50.0 bc
‘Zoom’ Perennial Rye	5.0 ab	5.0	16.7	31.7 c	35.0 b	31.7 d
LSD (α = 0.05)	**1.7**	**NS**	**NS**	**21.5**	**23.7**	**17.2**

Means followed by the same letter do not significantly differ (P=0.05). NS = Not significant

Table 3. Dry clipping weight (grams) of turfgrasses in response to deficit irrigation imposed on 29 June 2011. Riverside, CA.

Treatment	0 DAT	14 DAT	28 DAT	42 DAT	57 DAT	70 DAT
‘Tulsa Time’ Tall Fescue	45.4 a	15.7 a	5.1	3.9 b	5.8 b	4.0 b
‘Laura’ Meadow Fescue	53.5 a	13.4 a	7.6	6.3 a	11.8 a	11.2 a
‘SR4220’ Perennial Rye	21.6 bc	6.0 c	5.6	2.6 b	4.8 b	3.8 b
3s” 16 Festulolium	19.5 bc	7.2 bc	3.2	2.5 b	4.9 b	3.2 b
VL 3s’ Festulolium	24.1 b	5.9 c	4.2	3.1 b	5.8 b	3.9 b
3s” 11 Festulolium	21.6 bc	11.5 ab	4.9	2.0 b	4.5 b	3.2 b
‘Zoom’ Perennial Rye	15.6 c	7.0 bc	3.3	2.9 b	3.3 b	3.3 b
LSD (α = 0.05)	**8.3**	**4.8**	**NS**	**2.1**	**4.7**	**3.3**

Means followed by the same letter do not significantly differ (P=0.05). NS = Not signific

Drought and Irrigation Salinity Effects on Perennial Ryegrass

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The use of reclaimed or other saline water sources for turf and landscape irrigation is inevitable in arid regions of the southwestern U.S. However, the use of saline water for turfgrass irrigation requires that salinity in the root zone be maintained at a level that does not adversely impact turf quality. The purpose of this study was to: 1) evaluate the interaction of drought and salinity on perennial ryegrass turf; 2) determine the leaching requirements for salinity management as influenced by several factors including irrigation water quality, soil physical and biological properties, turfgrass species, cultural practices, and rapid blight disease incidence; 3) evaluate new and existing technologies and practices for determining soil water and salinity; and 4) assess the population size and activity of plant growth promoting rhizobacteria (PGPR) in the turf rhizosphere in response to imposed drought and salinity stress. This research will help to develop new guidelines and recommendations regarding irrigation of turf with waters of elevated salinity, and perhaps contribute to significant reduction in water use on golf courses and other turf areas where salinity management is a concern.

In this study, we combined the line source method of generating a continuous distribution of saline or potable irrigation water with the application of different quantities of water, representing a range from deficit irrigation to leaching. The study area is composed of 12 main plots, each irrigated with water ranging from electrical conductivity (EC) = 0.6 to 4.6 dS/m. In the perpendicular direction, three of the 12 plots are irrigated at 80, 100, 120, or 140% ET_o. To more precisely determine the effects of salinity on turfgrass health and underlying soil, we subdivided each of the 12 main plots into 9 sub-plots ranging from low to high irrigation salinity.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam

Plot Size: 12 main plots (each 30’ x 30’); overall plot area is 10,800ft^2

Species: Perennial ryegrass 'SR 4550'

Seeding Date: 28 April 2011

Fertility: 0.5 lb N/1000 ft^2/month

Mowing Height: 2.5 inches; twice weekly

Irrigation: ET_o replacement based on CIMIS data from previous week

Saline/Deficit Irrigation: Initiated on 21 July 2011 at EC = 4.6 ds/m

Data Collection: Turfgrass uniformity and quality (1-9, 6 minimally acceptable), percent turfgrass groundcover, canopy temperature, and dry clipping yield are evaluated biweekly. Toro Turf Guard TDR sensors monitor soil moisture, salinity, and temperature continuously at 4" and 8" below the soil surface. Irrometer Watermark sensors monitor soil water potential also at 4" and 8". Leachate is sampled at 10" below the surface using suction lysimeters. Additional soil samples collected prior to salinity treatments and throughout the study to assess the change in population size and activity of PGPR in response to imposed drought and salinity stress.

Acknowledgements: Special thanks to the Metropolitan Water District of Southern California, USDA-ARS Salinity Laboratory, Toro, Irrometer, Seed Research of Oregon, and Campbell Scientific for funding, equipment, technical support for this project.

Preliminary Results

- ✓ Substantial decreases in dry clipping yield and visual turfgrass quality were found in plots receiving the highest salinity water (near saline irrigation lines) and less overall irrigation (80 and 100% ET_o).
- ✓ Soil salinity concentrations of ≥4 dS/m at 80% Et_o have resulted in a decrease in turfgrass uniformity, color, and overall quality.
- ✓ Without adequate water infiltration and drainage, soil salinity concentrations of ≥5 dS/m appear to cause damage to the turf for all irrigation regimes.
- ✓ It appears that irrigation replacement of $100\%<ET_o<140\%$ is needed to maintain color and quality of perennial ryegrass during the summer months in an inland Mediterranean climate like Riverside.
- ✓ Thus far, this study has clearly substantiated the need to maintain adequate surface and sub-surface drainage to help manage salts and for maintaining turfgrass that is both dry and firm enough for functional use.

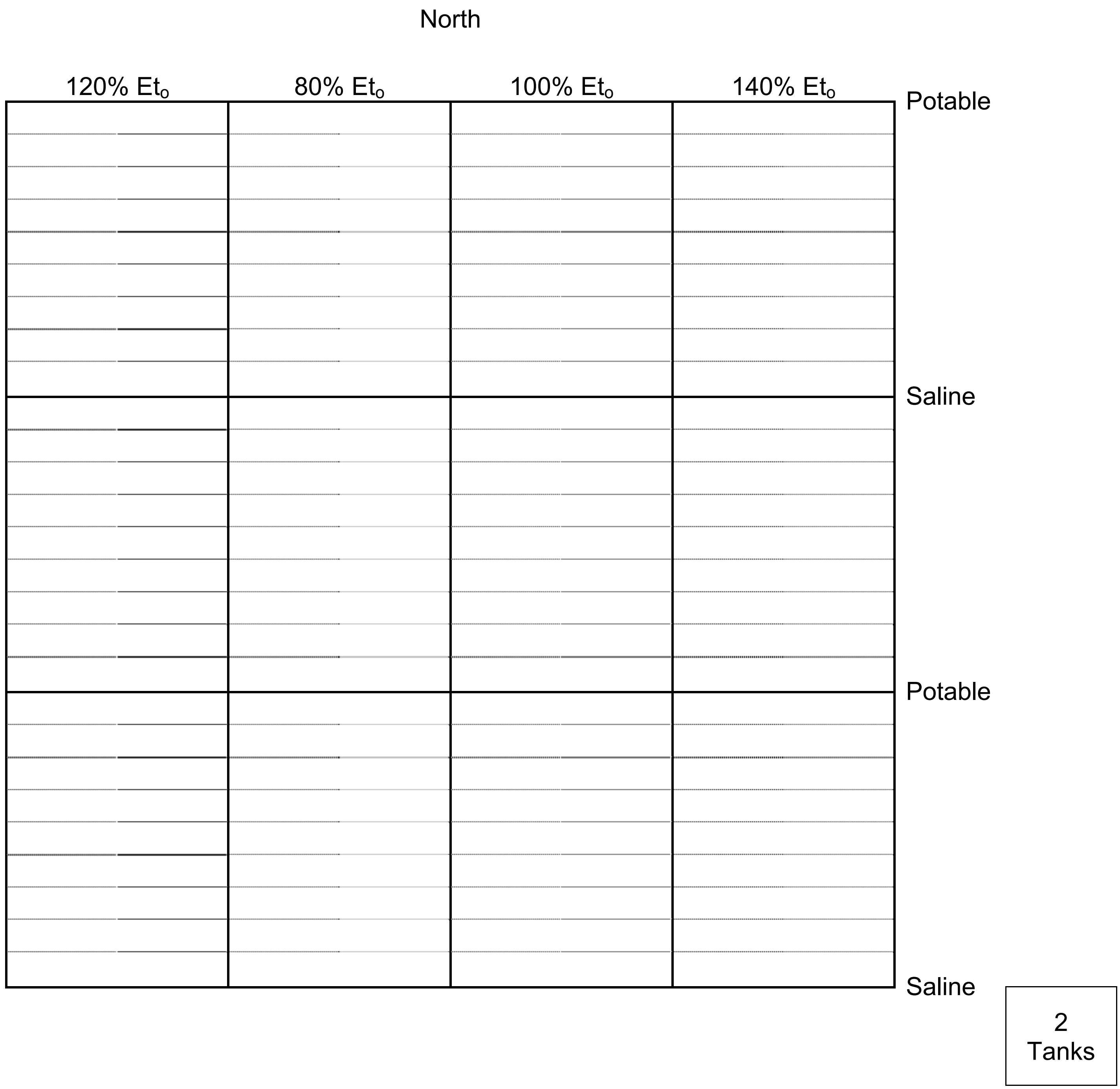
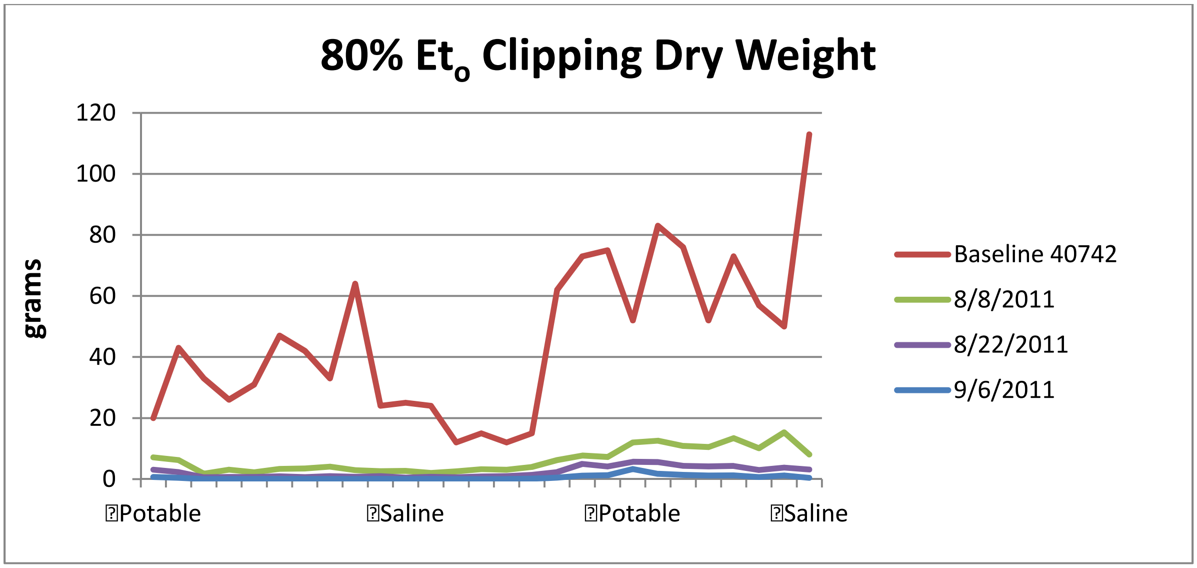
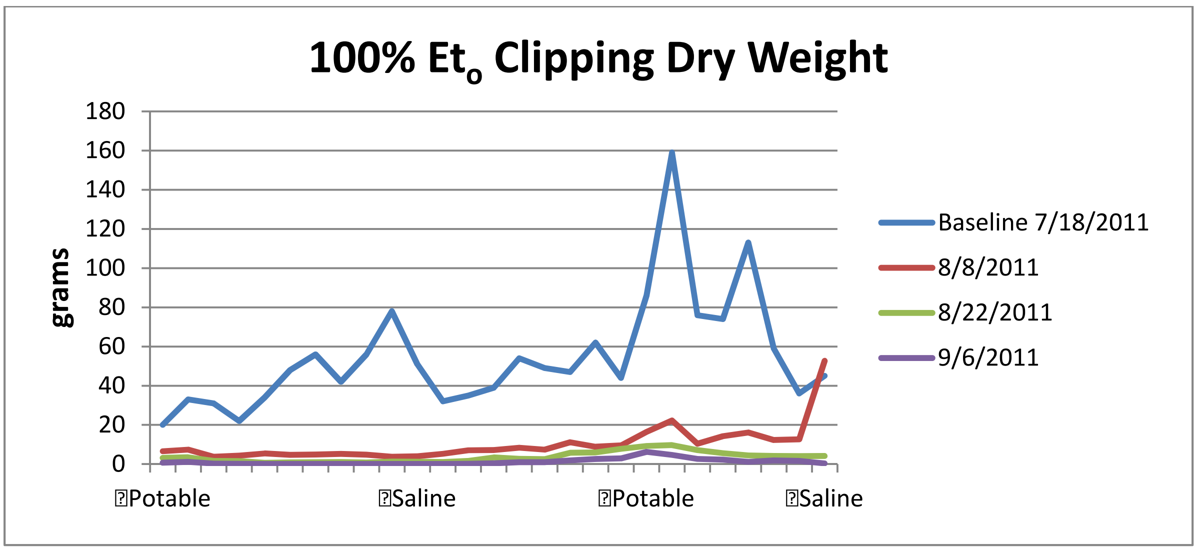


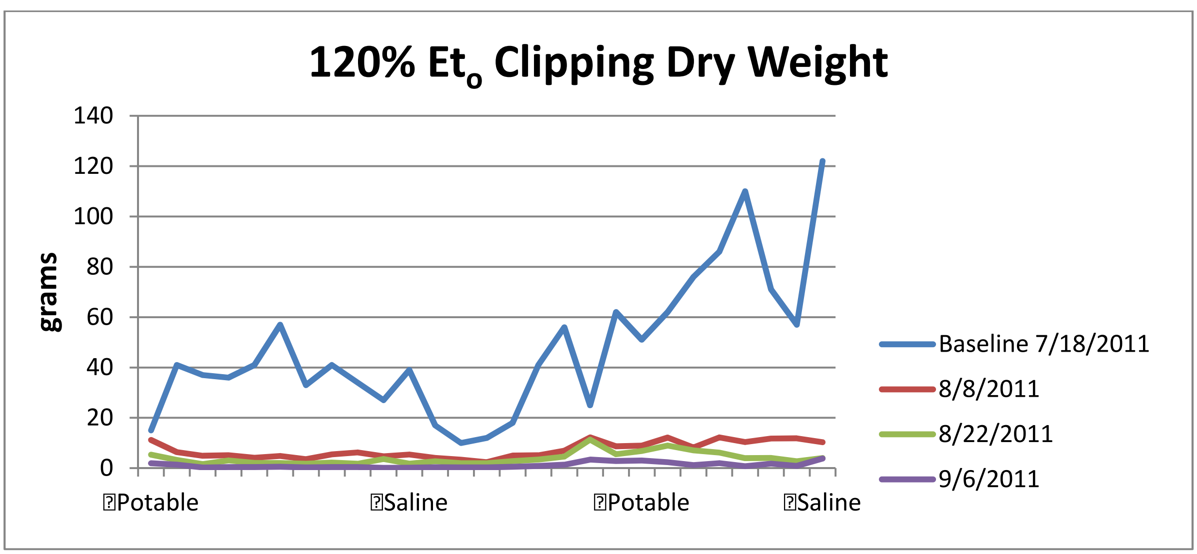
Figure 1. Plot plan of the drought and irrigation salinity experiment. Riverside, CA.



80% Et$_o$ Clipping Dry Weight
grams
120
100
80
60
40
20
0
Potable
Saline
Potable
Saline
Baseline 40742
8/8/2011
8/22/2011
9/6/2011



100% Et$_o$ Clipping Dry Weight
grams
180
160
140
120
100
80
60
40
20
0
Potable
Saline
Potable
Saline
Baseline 7/18/2011
8/8/2011
8/22/2011
9/6/2011



120% Et$_o$ Clipping Dry Weight
grams
140
120
100
80
60
40
20
0
Potable
Saline
Potable
Saline
Baseline 7/18/2011
8/8/2011
8/22/2011
9/6/2011

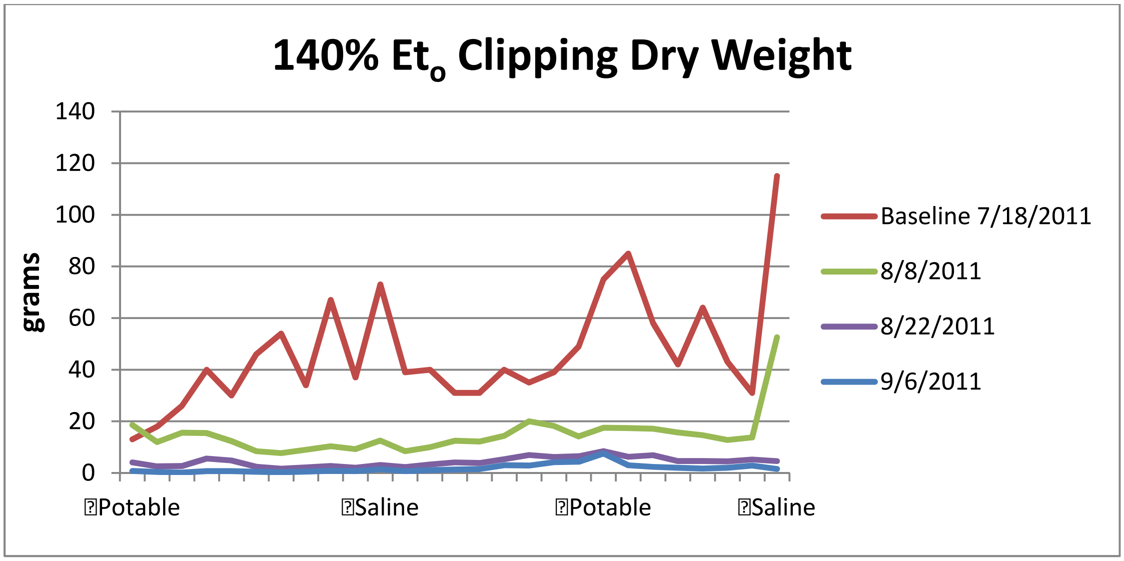
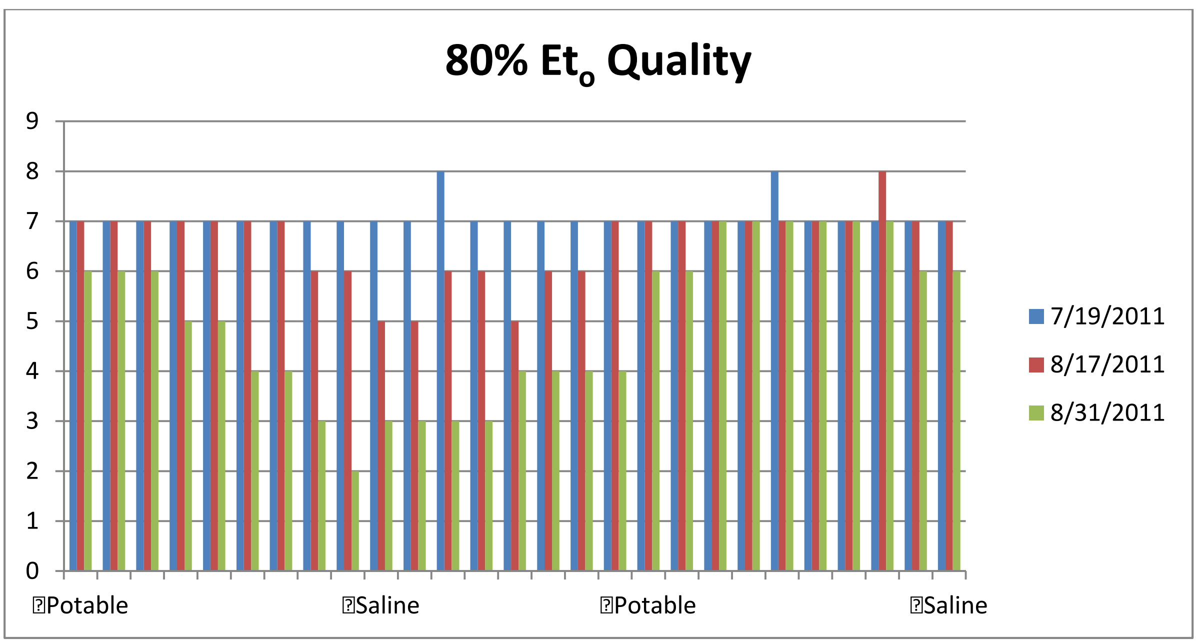
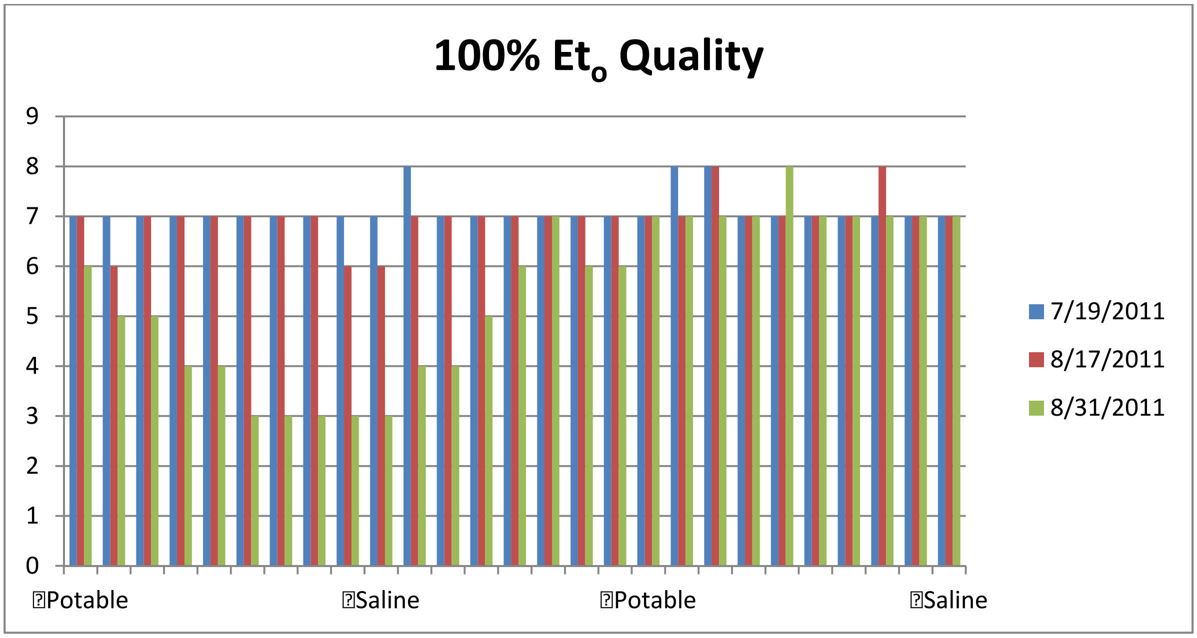


Figure 2. Dry clipping yield of perennial ryegrass prior to and following initiation of saline and deficit irrigation on July 21, 2011. Tick marks on x-axis represent sub-plots in between alternating irrigation lines that deliver potable and saline water.




100% Et_o Quality
9
8
7
6
5
4
3
2
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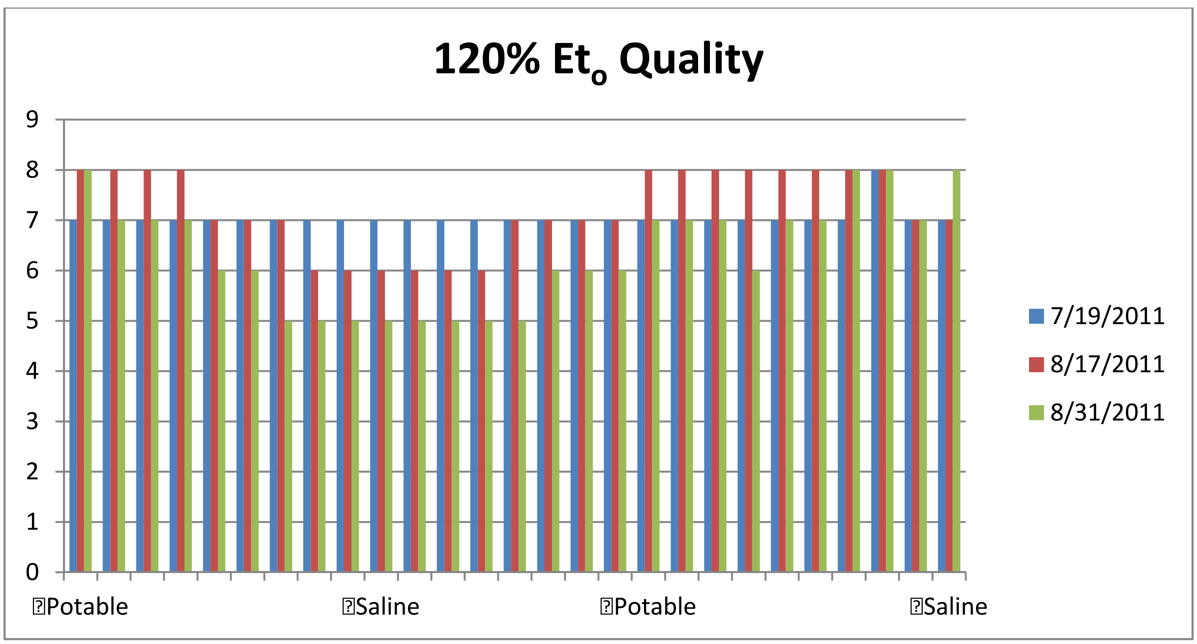
Potable
Saline
7/19/2011
8/17/2011
8/31/2011


120% Et_o Quality
9
8
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Potable
Saline
Potable
Saline
7/19/2011
8/17/2011
8/31/2011

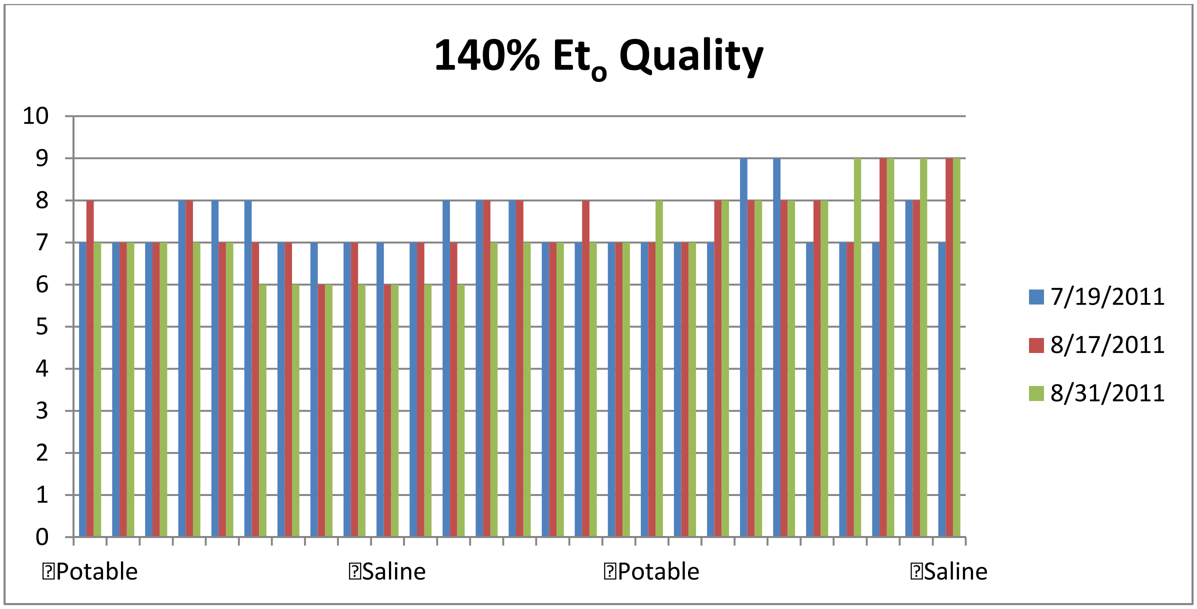

Figure 3. Perennial ryegrass quality (1-9, 9 = best, 6 =minimally acceptable) prior to and following initiation of saline irrigation on July 21, 2011. Tick marks on x-axis represent sub-plots in between alternating irrigation lines that deliver potable and saline water.

Figure 4. Data collected from Toro Turf Guard wireless sensors at 4 inches below soil surface prior to and following initiation of saline irrigation on July 21, 2011. Hole 1 (red line) = 140% ET$_o$ irrigation treatment. Hole 3 (green line) = 80% ET$_o$ irrigation treatment.

2011 Turf Disease Trials: Anthracnose and Dollar Spot

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Department of Botany & Plant Sciences

Anthracnose

Anthracnose is a common pathogen occurring on annual bluegrass. Twenty two fungicide treatments were evaluated for their ability to control anthracnose preventatively on an annual bluegrass "tee". Inoculation was achieved through core aeration and dragging in order to spread the existing inoculum. The plot was originally established in 2007 from seed with 'Peterson's Creeping' annual bluegrass. Beginning in May 2011, nitrogen was withheld from the turf followed by initiation of fungicide treatments on 1 June 2011 before disease symptoms were present.

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam amended with sand
Experimental Design:	Completely randomized with 6 replications
Plot Size:	4 ft x 6 ft
Fertility:	Monthly applications of 0.5 lbs/1000 ft^2 of nitrogen through April 2011. No nitrogen was applied from May until 26 August. Turf received 0.2 lbs N/1000 ft^2 using liquid calcium nitrate and again on 11 September.
Application Information:	CO_2 Backpack sprayer TeeJet 8004VS 9" nozzle spacing 12" boom height Speed: 2 mph Output: 87GPA Pressure: 32psi @ tank
Mowing Regime:	0.25 inches 3 days/wk
Irrigation Regime:	Daily according to ET requirements
Data Collection:	Percent disease cover and turf phytotoxicity measured visually
Acknowledgments:	Special thanks to BASF, Syngenta, Valent, DuPont, Bayer, Cleary Chemical, and Crop Production Services for providing fungicides and support

Results:

- ✓ Overall, anthracnose disease pressure was moderate throughout the study area and period with isolated sections where activity was severe and expanding as the summer progressed.

- ✓ Injury (thinning and 10-25% phyto) occurred from treatments 11 (BASF Program 1), 23 (Tourney), and to a lesser extent treatment 22 (Valent Program 1) (data not shown. Injury corresponded to application of the triazole (triticonazole or metconazole) active ingredient in these products or programs.

- ✓ Several fungicides or fungicide programs significantly reduced disease severity compared to the untreated control. Those that resulted in less than 10% disease cover by the end of the experiment included:

    1. Velista + Heritage (0%)
    2. BASF Program 1 (0.8%)
    3. BASF Program 4 (1.7%)
    4. Valent Program 1 (3.3%)
    5. Bayer Program 1 (4.2%)
    6. Bayer Program 3 (5%)
    7. Cleary Program 1 (6.7%)
    8. Velista + Banner Maxx (8.3%)

Anthracnose Fungicide Trial
Plot Map – 12G-4

North

21	8	17	23	4	5	18	6	16	3	5	11	12
7	15	13	17	2	16	9	19	13	14	20	2	20
16	19	17	13	4	9		23	8	2	13	22	22
5	1	8	23	1	11	18	6	21	4	3	23	15
21	17		22	17	6	14	16	12	23	12	7	19
10	21	11	5	3	22	12	1	15	3	4		2
15	1	22	21	1	20	13	16	7	16	4	14	23
13	18	8	11	10	19	2	22	17	20	14	6	8
4	21	15	18	9	10	9	2	3	7	20	10	14
	10	6	12	9	8	19	1	19	18	12	5	14
5	15	18	7	3	6	10	11	7	11		9	20

South (road)

Table 1. Anthracnose cover (0-100%) following application of fungicides. Initial application made on 1 June 2011. Riverside, CA.

Trt	Name	Rate Unit	Interval	6/24/11	7/8/11	7/22/11	8/6/11	8/19/11
1	Untreated Check			15.8 a	20 a	27.2 a	49.2 a	70 a
2	Cleary Program 1		14	4.2 a	6.7 a	3.7 a	4.5 ef	6.7 efg
3	Daconil ACTion	2.7 fl oz/1000 ft2	14	1.7 a	9.2 a	5 a	13 c-f	23.3 c-g
4	Daconil WeatherStik	2.7 fl oz/1000 ft2	14	17.5 a	25.8 a	30.8 a	42.5 ab	58.3 ab
5	EXC948	2.7 fl oz/1000 ft2	14	5 a	6.7 a	9.2 a	14.2 b-f	22.5 c-g
6	Medallion TL	1 fl oz/1000 ft2	14	12.5 a	17.5 a	24.5 a	38.3 abc	54.2 abc
7	Daconil ACTion	3.6 fl oz/1000 ft2	14	8.3 a	6.7 a	10 a	22.5 a-f	20 d-g
8	Daconil WeatherStik	3.6 fl oz/1000 ft2	14	11.7 a	5.8 a	6 a	5.8 def	11.7 d-g
9	EXC948	3.6 fl oz/1000 ft2	14	9.2 a	6.7 a	6.2 a	25.8 a-f	28.3 b-g
10	Medallion TL	1.3 fl oz/1000 ft2	14	8.3 a	14.2 a	20 a	33.3 a-d	43.3 a-d
11	BASF Program 1		21	5.8 a	3.3 a	2.5 a	4.2 ef	0.8 g
12	BASF Program 2		21	13.3 a	10 a	5.8 a	10.8 c-f	18.3 d-g
13	Velista	14 g/1000 ft2	14	14.2 a	9.5 a	8.3 a	18.3 b-f	35.8 b-f

Table 1 (Cont.).

Trt	Name	Rate Unit	Interval	6/24/11	7/8/11	7/22/11	8/6/11	8/19/11
14	Velista	14 g/1000 ft2	14	10.8 a	16.7 a	16.7 a	29.2 a-e	38.3 a-e
	Daconil WeatherStik	3.5 fl oz/1000 ft2						
15	Velista	14 g/1000 ft2	14	13.3 a	2.5 a	3.5 a	6 def	8.3 efg
	Banner Maxx	1 fl oz/1000 ft2						
16	Velista	14 g/1000 ft2	14	6.7 a	4.2 a	4.5 a	6.7 def	0 g
	Heritage	0.2 oz wt/1000 ft2						
17	Bayer Program 1		14	2.5 a	2.5 a	0 a	0 f	4.2 fg
18	Bayer Program 2		14	6.7 a	2 a	10 a	15 b-f	18.3 d-g
19	Bayer Program 3		14	3.3 a	1.7 a	3 a	9.2 def	5 fg
20	BASF Program 3		21	6.7 a	9.2 a	13.3 a	17.5 b-f	17.5 d-g
21	BASF Program 4		21	4.2 a	2.5 a	1.7 a	0.5 ef	1.7 g
22	Valent Program 1		14	17.5 a	9.5 a	12.5 a	15 b-f	3.3 fg
23	Tourney	0.37 oz/1000 ft2	14	13.3 a	6.7 a	15 a	15.8 b-f	20 d-g
	LSD (P=.05)			NS	NS	NS	28.71	32.65
	Standard Deviation			11.52	13.33	18.75	25.11	28.56
	CV			124.69	153.82	180.17	145.37	128.8

Means followed by same letter do not significantly differ according to Fishers Protected LSD (P= 0.05). NS = Not significant.

Table 2. Fungicide Programs for anthracnose. Rates in oz/1000ft2 unless otherwise noted.

14 day intervals

#	1-Jun	15-Jun	1-Jul	14-Jul	28-Jul	11-Aug	25-Aug
2	Torque 0.6 fl oz + Legend 3 floz	Affirm 0.9 oz + Spectro 3.6 oz	Torque 0.6 fl oz + Legend 3 fl oz	Affirm 0.9 oz + Spectro 3.6 oz	Torque 0.6 fl oz + Legend 3 fl oz	Affirm 0.9 oz + Spectro 3.6 oz	Torque 0.6 fl oz + Legend 3 floz
17	Reserve 4.8 SC 3.6 fl oz	Reserve 4.8 SC 3.6 fl oz	Daconil WeatherStik 3.2 fl oz + Insignia 0.9 oz	Reserve 4.8SC 3.6 fl oz	Daconil WeatherStik 3.2 fl oz + Insignia 0.9 oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz
18			Daconil WeatherStik 3.2 fl oz + Chipco Signature 4 oz	Reserve 4.8 SC 3.6 fl oz	Daconil WeatherStik 3.2 fl oz + Chipco Signature 4 oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz
19	Reserve 4.8 SC 3.6 fl oz	Reserve 4.8 SC 3.6 fl oz	Daconil WeatherStik 3.2 fl oz + Insignia 0.9 oz	Reserve 4.8 SC 3.6 fl oz	Daconil WeatherStik 3.2 fl oz + Insignia 0.9 oz	Daconil WeatherStik 3.2 fl oz + Chipco Signature 4 oz	Reserve 4.8SC 3.6 fl oz
22	Tourney .37 oz	Insignia 0.9 oz	Tourney .37 oz	Insignia 0.9 oz	Signature 4 oz + Daconil 1000 3.2 oz	Tourney .37 oz	

21 day intervals

#	1-Jun	23-Jun	14-Jul	4-Aug	25-Aug
11	Trinity 2 fl oz	Insignia SC 0.7 fl oz	Trinity 2 fl oz	Insignia SC 0.7 fl oz	Trinity 2 fl oz
12	Trinity 1fl oz	Insignia SC 0.7 fl oz	Trinity 1 fl oz	Insignia SC 0.7 fl oz	Trinity 1 fl oz
20	Curalan Gold 2.85 fl oz	Trinity 1 fl oz	Curalan Gold 2.85 fl oz	Insignia SC 0.7 fl oz	Curalan Gold 2.85 fl oz
21	Honor 1.1 oz	Trinity 1 fl oz	Honor 1.1 oz	Trinity 1 fl oz	Honor 1.1 oz

Dollar Spot

Dollar spot (*Sclerotinia homoeocarpa*) is one of the most economically important diseases on turfgrasses under high cultural intensity. Twenty two fungicide treatments were evaluated for their ability to control dollar spot on creeping bentgrass (*Agrostis stolonifera)*. Inoculation was achieved through core aeration and dragging in order to spread the existing inoculum. The green was a 90/10 mix of creeping bentgrass and annual bluegrass, established in 2005 from sod.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam amended with sand

Experimental Design: Completely randomized with 6 replications

Plot Size: 4 ft x 6 ft

Fertility: Monthly applications of 0.5 lbs/1000 ft^2 of nitrogen through April 2011. No nitrogen was applied during study.

Application Information: CO_2 Backpack sprayer
TeeJet 8004VS
9" nozzle spacing
12" boom height
Speed: 2 mph
Output: 87GPA
Pressure: 32psi @ tank

Mowing Regime: 0.25 inches 3 days/wk

Irrigation Regime: Daily according to ET requirements

Data Collection: Percent disease cover and turf phytotoxicity measured visually

Acknowledgements: Special thanks to BASF, Syngenta, Valent, DuPont, Bayer, Cleary Chemical, and Crop Production Services for providing fungicides and support

Results:

Disease pressure on the study area was medium to low severity due to high heat and low humidity during most of the summer. Consequently, most all fungicides or fungicide programs provided effective control of dollar spot throughout the study period. There was no turf injury from any of the treatments.

Dollar Spot Fungicide Trial
Plot Map - 12G-6

North

21	8	17	23	4	5	18	6	16	3	5	11	12
7	15	13	17	2	16	9	19	13	14	20	2	20
16	19	17	13	4	9		23	8	2	13	22	22
5	1	8	23	1	11	18	6	21	4	3	23	15
21	17		22	17	6	14	16	12	23	12	7	19
10	21	11	5	3	22	12	1	15	3	4		2
15	1	22	21	1	20	13	16	7	16	4	14	23
13	18	8	11	10	19	2	22	17	20	14	6	8
4	21	15	18	9	10	9	2	3	7	20	10	14
	10	6	12	9	8	19	1	19	18	12	5	14
5	15	18	7	3	6	10	11	7	11		9	20

South (road)

Table 3. Dollar spot cover (0-100%) following application of fungicides. Initial application made on 1 June 2011. Riverside, CA.

Trt	Name	Rate	Interval	6/24/11	7/8/11	7/22/11	8/6/11	8/19/11
1	Untreated Check			38.3 a	60.8 a	47.5 a	44.2 a	51.7 a
2	Velista	8.4 g/1000 ft2	14	0 b	0 c	0 c	0 b	0 b
3	Velista	14 g/1000 ft2	14	0 b	0 c	0 c	0 b	0 b
4	Tourney	10.5 g/1000 ft2	14	0.8 b	1.7 bc	0 c	0 b	0 b
5	S-2200	0.5 fl oz/1000 ft2	14	0 b	0 c	0 c	0 b	0 b
6	S-2200	0.4 fl oz/1000 ft2	14	2.5 b	0 c	0 c	0 b	0 b
	Tourney	7.95 g/1000 ft2	14					
7	Tourney	0.1 oz wt/gal	14	0 b	3.3 bc	0 c	2.5 b	3.3 b
8	V-10277	2.5 lb/1000 ft2	14	3.3 b	5.8 b	3.3 bc	4.2 b	0 b
9	Interface	4 fl oz/1000 ft2	14	0 b	0 c	1.7 bc	0 b	0 b
10	Daconil ACTion	2.7 fl oz/1000 ft2	14	0 b	0 c	0 c	0 b	0 b
11	Daconil WeatherStik	2.7 fl oz/1000 ft2	14	3.3 b	3.3 bc	8.3 b	3.3 b	0 b
12	BASF Program 1		21	0 b	0 c	0 c	0 b	0 b
13	BASF Program 2		21	0 b	0 c	0 c	0 b	0 b
14		0.157 fl oz/1000 ft2	14	0 b	0 c	0 c	2.5 b	0 b
15		0.13 oz wt/1000 ft2	14	0 b	0 c	0 c	0 b	0 b
16		0.211 fl oz/1000 ft2	21	0 b	0 c	0 c	0 b	0 b
17		0.18 oz wt/1000 ft2	21	1.7 b	0 c	0 c	0 b	0 b
18		0.262 fl oz/1000 ft2	28	0 b	0 c	0 c	0 b	0 b
19		0.18 oz wt/1000 ft2	28	0.8 b	0 c	0 c	0 b	0 b
20		0.34 fl oz/1000 ft2	21	0.8 b	0 c	0 c	0 b	0 b
21		0.84 oz wt/1000 ft2	21	0 b	0 c	0 c	1.7 b	0 b
22		0.472 fl oz/1000 ft2	28	0.8 b	0 c	0 c	0 b	0 b
23		1.1 oz wt/1000 ft2	28	0 b	0 c	0 c	0 b	0 b
	LSD (P=.05)			7.91	4.64	7.86	8.75	7.63
	Standard Deviation			6.92	4.06	6.88	7.65	6.67
	CV			303.09	124.38	259.98	301.7	278.94

Means followed by same letter do not significantly differ according to Fisher's Protected LSD (P=0.05)

Table 4. BASF Programs for dollar spot. Rates in oz/1000 ft^2 unless otherwise noted.

Trt	1-Jun	23-Jun	14-Jul	4-Aug	25-Aug
11	Trinity 2 floz	Insignia SC 0.7 fl oz	Trinity 2 fl oz	Insignia SC 0.7 fl oz	Trinity 2 fl oz
12	Trinity 1floz	Insignia SC 0.7 fl oz	Trinity 1 fl oz	Insignia SC 0.7 fl oz	Trinity 1 fl oz
20	Curalan Gold 2.85 fl oz	Trinity 1 fl oz	Curalan Gold 2.85 fl oz	Insignia SC 0.7 fl oz	Curalan Gold 2.85 floz
21	Honor 1.1 oz	Trinity 1 fl oz	Honor 1.1 oz	Trinity 1 fl oz	Honor 1.1 oz

Table 5. Materials Tested in 2011.

Fungicide	Manufacturer	Common Names	Notes
Affirm 11.3WDG	Cleary Chemical	polyoxin-D	A new formulation of polyoxin-D similar to Endorse.
Banner Maxx II	Syngenta	propiconazole	
Curalan Gold	BASF	Vinclozolin	
Daconil ACTion	Syngenta	chlorothalonil + Acibenzolar-S-methyl	
Daconil WeatherStik	Syngenta	Chlorothalonil	
Heritage	Syngenta	Azoxystrobin	
Honor	BASF	Pyraclastrobin + boscalid	
Insignia SC	BASF	pyraclastrobin	
Interface 2.27SC	Bayer	iprodione + trifloxystrobin	A premix of the active ingredients in 26GT and Compass with StressGard pigment.
Legend	Cleary Chemical	Chlorothalonil	
Medallion TL	Syngenta	fludioxonil	
Reserve 4.8SC	Bayer	chlorothalonil + triticonazole	A premix of the active ingredients in Daconil and Triton FLO with StressGard pigment.
Signature	Bayer	fosetyl-Al	A phosphonate fungicide with StressGard pigment.
Spectro	Cleary Chemical	Chlorothalonil + Thiophanate methyl	
Torque	Cleary Chemical	tebuconazole	A new DMI fungicide.
Tourney	Valent	metconazole	A new DMI fungicide.
Trinity	BASF	triticonazole	A new DMI fungicide with StressGard pigment..
Velista	DuPont	penthiopyrad	A new SDHI fungicide in the same class as Emerald and ProStar with a different disease spectrum.

Weed Management and Transition Techniques for Converting Tall Fescue to Buffalograss for Water Conservation

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With drought and decreasing water availability becoming more of an issue in Southern California, home lawns are going to be more difficult to keep green year around using cool season turfgrasses like tall fescue. With the replacement of cool-season to warm-season turf, homeowners could reduce their landscape water use drastically. However, when converting home lawns, one must eradicate the existing lawn. This is usually done by sod removal or nonselective chemical control, and can be quite unsightly until the new turf establishes. Homeowners could choose to replace their lawn with sod, but this can be very expensive. So, many end up seeding or plugging if those options are available. This leaves bare areas of ground that, when well watered, establish weeds just as much as turf. With advancements in herbicide technology, there is greater potential for a smoother transition to warm season turf to reduce the unsightly appearance of dead, brown turf. The purpose of this study was to look into better methods of transitioning tall fescue to buffalograss by either seed or plugs using new and old herbicide chemistry.

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam
Experimental Design:	Randomized complete block with 3 replications
Plot Size:	7 ft by 7ft
Species/Cultivars:	Mature stand of ‘West Coaster’ tall Fescue; ‘UC Verde’ buffalograss (plugs) and a blend of three experimental varieties from the University of Nebraska: NE BFG07-03, NE BFG 07-01, and NE BFG 07-4E
Fertility:	4.0 lb N/1000 ft^2/year
Mowing Height:	2 inches
Plugs and Seed Established:	4 August 2010

Plug Spacing: 15 inches

Seeding Rate: 2 lbs/1000 ft^2

Irrigation Regimes: Established for 8 weeks at 160% ET_o replacement then irrigation was lowered to warm season (ET_o*K_c)/DU

Application Information: CO_2 Bicycle sprayer
TeeJet 8002DG nozzles
19" nozzle spacing
22" boom height
Speed 2 mph
Output: 30GPA
Pressure: 42 psi @ tank

Application of Roundup QuikPro: 27 July 2010 at 1.5 oz product per gallon in a backpack sprayer

Application Timing: A: 27 July 2010
B: 2 September 2010
C: 11 May 2011
D: 15 July 2011

Data Collection: Turf quality by species, percent weed cover by species, and percent turf cover by species

Acknowledgements: Special thanks to Florasource, LTD, University of Nebraska, Crop Production Services, Bayer, and Syngenta for donating the plant materials and herbicides used for this study. Also, thank you West Coast Turf for donating the tall fescue sod.

Results:

- ✓ This study was initiated in August 2010, which is late for establishment of warm-season turfgrasses like buffalograss. Nevertheless, we found that UC Verde established more rapidly from plugs than the NE seeded blend. By November 4, the final rating date in 2010, and May 5, the first rating in 2011, maximum buffalograss cover was achieved when the tall fescue was first treated with Roundup QuikPro followed by Speedzone Southern, Imprelis, or the sulfonylurea herbicides (Table 1).
- ✓ The best control of tall fescue was achieved by initial application of Roundup QuikPro followed by repeat applications of sulfonylurea herbicides (Table 2).
- ✓ Without a nonselective herbicide application, Celsius treatments were the most effective toward eradication of tall fescue and increasing buffalograss cover. Although not as effective without Roundup QuikPro, discoloration of tall fescue was more gradual with Celsius which may be more visually acceptable to homeowners, clients, etc. during transition.
- ✓ In 2011, broadleaf weed pressure mounted and some tall fescue lingered, thus two additional applications of the selective herbicides were made from each treatment. Weed populations shifted throughout the year. Herbicide efficacy data are presented in Tables 3-5.

Treatments:

Trt	Est. Method	Herbicide(s)	Rate(s)	Timing
1.	Seed	Roundup QuikPro (Control)	1.5 oz/gal	A
2.	Plugs	Roundup QuikPro (Control)	1.5 oz/gal	A
3.	Seed	Roundup QuikPro Imprelis	1.5 oz/gal 1.5 oz/A	A BCD
4.	Plugs	Roundup QuikPro Imprelis	1.5 oz/gal 1.5 oz/A	A BCD
5.	Seed	Roundup QuikPro Imprelis	1.5 oz/gal 3.0 oz/A	A BCD
6.	Plugs	Roundup QuikPro Imprelis	1.5 oz/gal 3.0 oz/A	A BCD
7.	Seed	Roundup QuikPro Imprelis	1.5 oz/gal 4.5 oz/A	A BCD
8.	Plugs	Roundup QuikPro Imprelis	1.5 oz/gal 4.5 oz/A	A BCD
9.	Seed	Roundup QuikPro Speedzone Southern	1.5 oz/gal 4.0 pt/A	A BCD
10.	Plugs	Roundup QuikPro Speedzone Southern	1.5 oz/gal 4.0 pt/A	A BCD
11.	Seed	RoundupQuikPro Celsius Revolver	1.5 oz/gal 2.45 oz/A 4.5 oz/A	A BCD BCD
12.	Plugs	RoundupQuikPro Celsius Revolver	1.5 oz/gal 2.45 oz/A 4.5 oz/A	A BCD BCD
13.	Seed	Roundup QuikPro Tenacity Monument Tenacity Monument	1.5 oz/gal 5 oz/A 10 g/A 8 oz/A 15 g/A	A B B CD CD
14.	Plugs	Roundup QuikPro Tenacity Monument Tenacity Monument	1.5 oz/gal 5 oz/A 10 g/A 8 oz/A 15 g/A	A B B CD CD
15.	Seed	Roundup QuikPro Tenacity Monument Monument	1.5 oz/gal 5 oz/A 10 g/A 15 g/A	A A B CD
16.	Plugs	Roundup QuikPro Tenacity Monument Monument	1.5 oz/gal 5 oz/A 10 g/A 15 g/A	A A B CD

17.	Seed	Celsius Celsius	2.5 oz/A 4.0 oz/A	A BCD
18.	Plugs	Celsius Celsius	2.5 oz/A 4.0 oz/A	A BCD
19.	Seed	Tenacity Tenacity Monument Tenacity Monument	5.0 oz/A 5.0 oz/A 10.0 g/A 8 oz/A 15 g/A	A B B CD CD
20.	Plugs	Tenacity Tenacity Monument Tenacity Monument	5.0 oz/A 5.0 oz/A 10g/A 8 oz/A 15 g/A	A B B CD CD
21.	Seed	Celsius Revolver	4.9 oz/A 9.0 oz/A	ACD ACD
22.	Plugs	Celsius Revolver	4.9 oz/A 9.0 oz/A	ACD ACD
23.	Seed	Tenacity Monument	5.0 oz/A 15.0 g/A	A BCD
24.	Plugs	Tenacity Monument	5.0 oz/A 15.0 g/A	A BCD

Plot Map:

North

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
11	4	5	3	12	6	13	10
16	14	22	7	19	20	1	21
18	24	8	15	23	9	17	2
7	21	10	14	12	1	18	3
16	11	15	24	23	4	6	17
5	8	12	20	2	19	22	9

South

Table 1. Buffalograss cover (0-100%) following application of selective herbicides in 2010 and 2011. Riverside, CA.

Trt	Product	Rate	11/4/10	5/10/11	7/7/11	8/3/11	9/7/11
1	Control	--	10.7 f-i	58.3 ab	56.7 bcd	56.7 b-g	55.0 efg
2	Control	--	23.3 bc	60.0 ab	73.3 ab	81.7 ab	81.7 a-d
3	Imprelis	1.5 oz/A	13.3 efg	50.0 abc	71.7 ab	78.3 a-d	68.3 b-f
4	Imprelis	1.5 oz/A	18.3 cde	58.3 ab	75.0 ab	80.7 abc	80.0 a-d
5	Imprelis	3.0 oz/A	9.7 ghi	51.7 ab	70.0 ab	71.7 af	71.7 a-e
6	Imprelis	3.0 oz/A	23.3 bc	61.7 ab	81.7 ab	85.0 ab	81.7 a-d
7	Imprelis	4.5 oz/A	5.7 i-l	45.0 a-d	76.7 ab	81.7 ab	83.3 abc
8	Imprelis	4.5 oz/A	25.0 b	65.0 a	71.7 ab	85.7 a	85.0 abc
9	Speedzone Southern	4.0 pt/A	12.3 e-h	63.3 ab	56.7 bcd	86.7 a	83.3 abc
10	Speedzone Southern	4.0 pt/A	33.3 a	63.3 ab	83.3 a	58.3 a-g	90.0 a
11	Celsius Revolver	2.45 oz/A 4.5 oz/A	3.0 jkl	18.3 d-g	73.3 ab	80.0 abc	85.0 abc
12	Celsius Revolver	2.45 oz/A 4.5 oz/A	20.0 bcd	66.7 a	80.0 ab	85.0 ab	88.3 ab
13	Tenacity Monument	8 oz/A 15 g/A	5.7 i-l	21.7 c-g	61.7 abc	66.7 a-f	73.3 a-e
14	Tenacity Monument	8 oz/A 15 g/A	16.7 def	51.7 ab	66.7 ab	76.7 a-e	85.0 abc
15	Monument	15 g/A	3.0 jkl	15.0 efg	40.0 cde	35.0 ghi	50.0 fg
16	Monument	15 g/A	9.0 g-j	41.7 a-e	75.0 ab	80.0 abc	81.7 a-d
17	Celsius	4.0 oz/A	3.0 jkl	8.3 fg	30.0 ef	45.0 fgh	53.3 efg
18	Celsius	4.0 oz/A	13.3 efg	35.0 b-f	66.7 ab	52.3 c-g	83.3 abc
19	Tenacity Monument	8 oz/A 15 g/A	1.3 kl	3.0 g	8.3 f	14.0 i	23.3 hi
20	Tenacity Monument	8 oz/A 15 g/A	7.3 g-k	4.7 g	7.3 f	12.3 i	20.0 i
21	Celsius Revolver	4.9 oz/A 9 oz/A	7.0 h-l	13.3 efg	35.0 de	50.0 d-g	61.7 d-g
22	Celsius Revolver	4.9 oz/A 9 oz/A	7.3 g-k	4.0 g	8.0 f	20.0 hi	43.3 gh
23	Monument	15 g/A	1.0 l	3.3 g	5.3 f	7.3 i	14.3 i
24	Monument	15 g/A	12.3 e-h	20.0 d-g	30.0 ef	48.3 e-h	66.7 c-f
	LSD (α = 0.05)	**--**	**6.29**	**28.35**	**26.32**	**28.98**	**20.82**

Table 2. Tall fescue cover (0-100%) following application of selective herbicides in 2010 and 2011. Riverside, CA.

Trt	Product	Rate	11/4/10	5/10/11	7/7/11	8/3/11	9/7/11
1	Control	--	1.0 f	5.0 g	5.0 efg	3.9 fgh	9.7 c-g
2	Control	--	0.7 f	4.3 g	3.7 fg	1.9 gh	5.0 e-h
3	Imprelis	1.5 oz/A	3.3 f	11.7 fg	14.3 a-d	15.0 c-f	18.3 abc
4	Imprelis	1.5 oz/A	4.0 f	15.7 fg	12.3 a-e	12.3 c-g	15.0 a-d
5	Imprelis	3.0 oz/A	8.3 def	14.3 fg	14.0 a-d	17.3 b-e	21.7 ab
6	Imprelis	3.0 oz/A	4.7 f	10.0 fg	9.0 c-f	10.7 d-h	13.3 b-e
7	Imprelis	4.5 oz/A	1.7 f	9.0 fg	6.7 c-g	6.7 e-h	7.3 d-h
8	Imprelis	4.5 oz/A	6.7 ef	12.3 fg	10.0 b-f	9.3 d-h	10.7 c-f
9	Speedzone Southern	4.0 pt/A	2.3 f	4.0 g	3.7 fg	5.0 fgh	6.3 d-h
10	Speedzone Southern	4.0 pt/A	4.0 f	6.7 g	3.3 fg	2.7 gh	5.7 d-h
11	Celsius Revolver	2.45 oz/A 4.5 oz/A	0.0 f	1.7 g	0.0 g	0.0 h	0.0 h
12	Celsius Revolver	2.45 oz/A 4.5 oz/A	0.0 f	0.0 g	0.0 g	0.0 h	0.0 h
13	Tenacity Monument	8 oz/A 15 g/A	0.0 f	0.7 g	0.0 g	0.0 h	0.0 h
14	Tenacity Monument	8 oz/A 15 g/A	0.0 f	2.3 g	0.0 g	0.0 h	0.0 h
15	Monument	15 g/A	0.0 f	1.0 g	0.0 g	0.0 h	0.3 gh
16	Monument	15 g/A	0.0 f	1.7 g	0.0 g	0.0 h	0.0 h
17	Celsius	4.0 oz/A	7.3 ef	30.0 ef	20.0 a	20.0 bcd	23.3 a
18	Celsius	4.0 oz/A	5.0 f	18.3 fg	13.3 a-e	9.4 d-h	10.7 c-f
19	Tenacity Monument	8 oz/A 15 g/A	41.7 b	65.0 bc	12.3 a-e	28.3 ab	11.7 c-f
20	Tenacity Monument	8 oz/A 15 g/A	46.7 b	80.0 ab	20.0 a	40.0 a	15.0 a-d
21	Celsius Revolver	4.9 oz/A 9 oz/A	36.7 bc	61.7 bcd	15.0 abc	20.0 bcd	9.0 c-h
22	Celsius Revolver	4.9 oz/A 9 oz/A	70.0 a	88.3 a	18.3 ab	23.3 bc	9.7 c-g
23	Monument	15 g/A	21.7 cde	50.0 cde	9.0 c-f	11.7 c-h	5.0 e-h
24	Monument	15 g/A	23.3 cd	41.7 de	6.3 d-g	11.7 c-h	2.7 fgh
	LSD (α = 0.05)	**--**	**15.93**	**21.96**	**8.56**	**11.92**	**9.63**

Table 3. Mare's Tail (*Conyza canadensis*) cover (0-100%) following application of herbicides on 11 May and 15 July 2011. Riverside, CA.

Trt	Product	Rate	5/10/11	5/25/11	6/9/11	6/27/11	7/7/11	7/21/11	8/3/11	9/7/11
1	Control	--	4.3 b-g	10.7 ab	13 a	14 a	14 a	16.7 a	14.0 a	15.7 a
2	Control	--	4.7 b-g	11.7 a	12.3 a	11.7 a	10 b	14.0 a	10.7ab	5.0 b
3	Imprelis	1.5 oz/A	3 c-g	7.3 a-e	5.7bcd	1.3 d-g	1 efg	0.3 fg	0.0 e	0.0 d
4	Imprelis	1.5 oz/A	4.7 b-g	4.3 d-g	4.3 b-f	2 d-g	0.7 fg	0.3 fg	0.0 e	0.0 d
5	Imprelis	3.0 oz/A	3.7 b-g	3.7 d-g	2 d-g	0 g	0 g	0.0 g	0.0 e	0.0 d
6	Imprelis	3.0 oz/A	2.7 d-g	3.7 d-g	2 d-g	0.7 fg	0 g	0.0 g	0.0 e	0.0 d
7	Imprelis	4.5 oz/A	6.7 a-d	6.3 b-f	3.3 c-g	1 efg	0.7 fg	0.0 g	0.0 e	0.0 d
8	Imprelis	4.5 oz/A	2.7 d-g	2.3 fg	1.3 fg	0 g	0 g	0.0 g	0.0 e	0.0 d
9	Speedzone Southern	4.0 pt/A	5 b-f	6 b-f	5.3 b-e	3.3 cde	3.3 c-g	3.0 d-g	0.7 e	1.0 cd
10	Speedzone Southern	4.0 pt/A	5.3 b-f	5.7 c-g	3 c-g	2 d-g	1.7 d-g	1.7 efg	0.3 e	0.3 d
11	Celsius Revolver	2.45 oz/A 4.5 oz/A	10.3 a	11.3 a	8 b	5.7 bc	6 c	8.0 b	5.7 cd	1.7 cd
12	Celsius Revolver	2.45 oz/A 4.5 oz/A	4.3 b-g	3 efg	5.7 bcd	2 d-g	2.7 c-g	2.3 efg	0.3 e	0.3 d
13	Tenacity Monument	8 oz/A 15 g/A	7 abc	8 a-d	4.7 b-f	6 b	6 c	7.3 b	3.3 de	1.0 cd
14	Tenacity Monument	8 oz/A 15 g/A	4 b-g	6.3 b-f	5 b-f	2.3 d-g	2.3 c-g	5.0 b-e	0.7 e	0.0 d
15	Monument	15 g/A	3.3 n-g	5.7 c-g	3 c-g	3.7 bcd	6 c	7.0 bc	11.7 a	3.0 bcd
16	Monument	15 g/A	6.3 a-e	6 b-f	6 bc	3.7 bcd	5 cd	6.3 bcd	5.0 cd	4.0 bc
17	Celsius	4.0 oz/A	6.3 a-e	9.3 abc	4.7 b-f	2.7 def	4.7 cde	3.7 c-f	1.0 e	0.3 d
18	Celsius	4.0 oz/A	7.3 ab	8 a-d	7.3 b	2 d-g	2.3 c-g	2.7 efg	0.3 e	0.0 d
19	Tenacity Monument	8 oz/A 15 g/A	2.7 d-g	3 efg	1.7 efg	1.3 d-g	2 d-g	2.3 efg	1.3 e	1.0 cd
20	Tenacity Monument	8 oz/A 15 g/A	1.3 fg	1 g	0.3 g	1 efg	0.3 fg	0.7 fg	0.0 e	0.0 d
21	Celsius Revolver	4.9 oz/A 9 oz/A	2.7 d-g	2 fg	1.7 efg	0.3 fg	0.3 fg	0.0 g	0.0 e	0.0 d
22	Celsius Revolver	4.9 oz/A 9 oz/A	0.7 g	1 g	0 g	0 g	0 g	0.3 fg	0.0 e	0.0 d
23	Monument	15 g/A	2.3 efg	2.7 efg	1.7 efg	1.3 d-g	2 d-g	2.0 efg	6.7 cd	2.7 bcd
24	Monument	15 g/A	2.3 efg	2.7 efg	2.3 c-g	2 d-g	4 c-f	3.7 c-f	7.3 bc	4.0 bc
	LSD (α = 0.05)	**--**	**4.08**	**4.86**	**3.83**	**2.56**	**3.76**	**3.51**	**3.47**	**3.02**

Table 4. Brass Buttons cover (0-100%) following application of herbicides on 11 May and 15 July 2011. Riverside, CA.

Trt	**Product**	**Rate**	**5/10/11**	**5/25/11**	**6/9/11**	**6/27/11**	**7/7/11**	**7/21/11**	**8/3/11**	**9/7/11**
1	Control	--	4.7 ab	4.0 abc	3.0 a	3.7 a	0.7 a	0.3	0.0	0.0
2	Control	--	4.7 ab	3.7 bcd	3.0 a	0.7 b	0.0 c	0.0	0.0	0.0
3	Imprelis	1.5 oz/A	1.7 bcd	1.7 b-e	1.0 b	0.0 b	0.0 c	0.0	0.0	0.0
4	Imprelis	1.5 oz/A	4.0 abc	4.3 ab	1.0 b	0.0 b	0.0 c	0.0	0.0	0.0
5	Imprelis	3.0 oz/A	3.0 a-d	2.0 b-e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
6	Imprelis	3.0 oz/A	4.7 ab	4.0 abc	0.7 bc	0.0 b	0.0 c	0.0	0.0	0.0
7	Imprelis	4.5 oz/A	1.3 bcd	1.3 b-e	0.3 bc	0.0 b	0.0 c	0.0	0.0	0.0
8	Imprelis	4.5 oz/A	6.3 a	7.3 a	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
9	Speedzone Southern	4.0 pt/A	4.0 abc	2.0 b-e	0.3 bc	0.3 b	0.3 b	0.0	0.0	0.0
10	Speedzone Southern	4.0 pt/A	6.3 a	2.7 b-e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
11	Celsius Revolver	2.45 oz/A 4.5 oz/A	2.7 a-d	1.7 b-e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
12	Celsius Revolver	2.45 oz/A 4.5 oz/A	3.7 a-d	2.3 b-e	0.3 bc	0.0 b	0.0 c	0.0	0.0	0.0
13	Tenacity Monument	8 oz/A 15 g/A	3.0 a-d	1.0 b-e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
14	Tenacity Monument	8 oz/A 15 g/A	0.7 cd	0.0 e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
15	Monument	15 g/A	2.7 a-d	0.3 de	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
16	Monument	15 g/A	2.7 a-d	1.0 b-e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
17	Celsius	4.0 oz/A	1.7 bcd	0.3 de	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
18	Celsius	4.0 oz/A	0.7 cd	0.7 cde	0.0 c	0.0 b	0.0 c	0.0	2.0	0.0
19	Tenacity Monument	8 oz/A 15 g/A	0.7 cd	0.0 e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
20	Tenacity Monument	8 oz/A 15 g/A	0.0 d	0.0 e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
21	Celsius Revolver	4.9 oz/A 9 oz/A	1.7 bcd	1.0 b-e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
22	Celsius Revolver	4.9 oz/A 9 oz/A	0.0 d	0.0 e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
23	Monument	15 g/A	1.3 bcd	0.0 e	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
24	Monument	15 g/A	2.3 bcd	0.3 de	0.0 c	0.0 b	0.0 c	0.0	0.0	0.0
	LSD (α = 0.05)	**--**	**3.86**	**3.41**	**0.99**	**1.06**	**0.27**	**NS**	**NS**	**NS**

Table 5. Purple Cudweed cover (0-100%) following application of herbicides on 11 May and 15 July 2011. Riverside, CA.

Trt	Product	Rate	5/10/11	7/7/11	7/21/11	8/3/11	9/7/11
1	Control	--	5.7 abc	7.3 b-e	7.3 def	6.3 cde	5.7 b-e
2	Control	--	5.7 abc	5.7 c-f	8.0 c-f	5.0 cde	6.3 b-e
3	Imprelis	1.5 oz/A	0.7 de	0.7 ef	0.0 f	0.0 e	0.0 e
4	Imprelis	1.5 oz/A	0.0 e	0.0 f	0.0 f	0.0 e	0.0 e
5	Imprelis	3.0 oz/A	0.7 de	0.0 f	0.0 f	0.0 e	0.0 e
6	Imprelis	3.0 oz/A	0.0 e	0.0 f	0.0 f	0.0 e	0.0 e
7	Imprelis	4.5 oz/A	5.0 a-d	0.7 ef	0.0 f	0.0 e	0.0 e
8	Imprelis	4.5 oz/A	2.0 cde	0.3 f	2.7 def	0.0 e	0.0 e
9	Speedzone Southern	4.0 pt/A	7.7 ab	5.3 c-f	7.3 def	4.0 cde	2.7 cde
10	Speedzone Southern	4.0 pt/A	7.3 ab	5.7 c-f	6.0 def	3.0 cde	1.7 de
11	Celsius Revolver	2.45 oz/A 4.5 oz/A	0.0 e	7.3 b-e	6.7 def	6.7 b-e	6.7 b-e
12	Celsius Revolver	2.45 oz/A 4.5 oz/A	8.0 a	10.0 bc	12.3 bcd	9.0 b-e	9.7 bc
13	Tenacity Monument	8 oz/A 15 g/A	7.3 ab	8.7 bcd	11.7 b-e	13.3 bc	12.3 b
14	Tenacity Monument	8 oz/A 15 g/A	3.3 b-e	13.3 b	19.0 b	19.0 b	12.3 b
15	Monument	15 g/A	8.3 a	25.0 a	31.7 a	33.3 a	30.0 a
16	Monument	15 g/A	3.3 b-e	9.7 bc	18.3 bc	12.7 bcd	11.7 b
17	Celsius	4.0 oz/A	5.0 a-d	4.3 c-f	6.7 def	6.3 cde	7.3 b-e
18	Celsius	4.0 oz/A	1.7 cde	1.7 ef	2.3 def	1.7 cde	0.0 e
19	Tenacity Monument	8 oz/A 15 g/A	1.3 cde	2.7 def	3.3 def	5.7 cde	6.3 b-e
20	Tenacity Monument	8 oz/A 15 g/A	1.0 de	0.7 ef	1.7 ef	2.3 cde	6.7 b-e
21	Celsius Revolver	4.9 oz/A 9 oz/A	2.7 cde	1.0 ef	1.7 ef	0.7 de	1.3 de
22	Celsius Revolver	4.9 oz/A 9 oz/A	0.0 e	0.0 f	0.0 f	0.7 de	1.3 de
23	Monument	15 g/A	1.7 cde	2.3 def	4.3 def	5.0 cde	7.3 b-e
24	Monument	15 g/A	1.7 cde	3.7 c-f	5.3 def	5.3 cde	7.7 bcd
	LSD (α = 0.05)	**--**	**4.56**	**6.79**	**10.33**	**12.60**	**7.53**

The National Turfgrass Evaluation Program at UCR

S.T. Cockerham and S.B. Ries, Agricultural Operations University of California, Riverside

The National Turfgrass Evaluation Program (NTEP), a cooperative effort between the non-profit National Turfgrass Federation, Inc., and the United States Department of Agriculture (USDA), is designed to coordinate evaluation trials of turfgrass varieties and promising selections in the United States and Canada. Information such as turfgrass quality, color, density, resistance to diseases and insects, tolerance to heat, cold, and drought can be used by seed and sod distributors and plant breeders to determine the broad picture of the adaptation of a cultivar. Results can also be used by sports turf managers, golf course superintendents, landscape architects, landscape contractors, ground managers and consultants to determine if a cultivar is well adapted to a local area.

Local and state government entities, such as parks and highway departments, use NTEP for locating resource-efficient varieties. Most important, growers and consumers use NTEP extensively to purchase drought tolerant, pest resistant, attractive and durable seed or sod. It is the acceptance by the end-user that has made NTEP the standard for turfgrass evaluation in the U.S.A. and other countries worldwide.

Four NTEP studies are currently underway at UCR. Plot maps follow. Results for leaf texture, color, density, and winter color (warm-season grasses), as well as annual progress and final reports, can be found at http://www.ntep.org/.

2007 NTEP Bermudagrass Trial

8	5	16	13	23	24	7	28
11	27	17	15	6	18	14	1
4	9	3	30	12	20	21	10
2	25	29	19	31	22	26	13
23	8	30	19	22	16	1	27
12	17	14	10	28	25	24	15
3	11	20	2	5	31	29	9
26	6	4	21	7	18	15	24
21	18	12	17	10	11	6	20
22	23	27	28	2	5	16	8
25	19	29	7	30	31	26	4
13	9	14	1	3			

NTEP Bermudagrass Entries

1. Riviera *
2. Princess 77 *
3. NuMex-Sahara *
4. SWI-1070
5. SWI-1081
6. SWI-1083
7. SWI-1113
8. SWI-1117
9. SWI-1122
10. Midlawn *
11. Tifway *
12. Premier
13. SWI-1057
14. BAR 7CD5
15. Gold Glove *
16. Sunsport *
17. Patriot *
18. Latitude 36
19. Northbridge
20. RAD-CD1
21. OKS 2004-2
22. PSG 91215
23. PSG 94524
24. IS-01-201
25. Pyramid 2
26. Hollywood
27. Yukon *
28. Veracruz *
29. PSG 9BAN
30. PSG PROK
31. PSG 9Y2OK

* Commercially available in 2011

2007 NTEP Seashore Paspalum Trial

5	6	2	4	3	1	3
6	1	5	2	4	5	4
6	1	3	2			

Seashore Paspalum Entries

1 Salam *
2 Sea Isle 1 *
3 SRX 9 HSCP
4 UGA 7
5 UGA 22
6 UGA 31

- Commercially available in 2011

2007 NTEP Zoysiagrass Trial

5	3	6	1	10	9	4
2	7	8	11	7	2	1
5	6	10	8	3	9	4
11	3	4	8	10	7	6
2	11	5	1	9		

NTEP Zoysiagrass Entries

1 Zenith *
2 Meyer *
3 Zorro *
4 DALZ 0501
5 DALZ 0701
6 DALZ 0702
7 Shadowturf *
8 L1F
9 29-2
10 240
11 380-1

* Commercially available in 2011

2006 NTEP Tall Fescue Trial (north block)

100	109	40	31	61	103	91	50	11	32
4	65	86	24	25	95	96	111	73	38
93	70	57	9	89	27	64	53	112	43
20	30	21	10	74	19	26	22	56	108
49	52	84	60	72	8	78	62	80	42
14	77	5	6	68	37	82	39	113	28
2	44	17	16	1	79	36	35	66	18
90	63	13	34	88	98	106	23	45	46
97	54	101	105	76	87	15	59	7	3
110	47	58	71	92	48	51	69	41	67
99	107	83	75	94	12	102	29	81	33
104	55	85							

2006 NTEP Tall Fescue Trial (middle block)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113							

2006 NTEP Tall Fescue Trial (south block)

42	66	111	23	65	13	69	95	99	43
103	50	8	49	110	109	45	88	52	48
72	101	68	19	100	44	78	75	113	73
25	105	92	41	7	67	59	24	79	96
85	77	70	83	57	35	76	9	61	97
62	33	106	46	74	30	51	34	98	28
39	5	36	102	54	56	112	2	90	94
84	26	15	10	107	86	47	14	27	87
16	32	53	22	37	4	12	38	93	104
82	6	58	60	80	18	108	89	29	55
17	71	21	63	11	1	3	64	91	20
31	81	40							

2006 NTEP Tall Fescue Entries

1	KY-31 *	31	Toccoa *	61	BAR Fa 6253	91	Darlington *
2	Spyder *	32	Terrier	62	Talladega *	92	Gold Medallion *
3	Braveheart	33	Raptor II *	63	Tahoe II *	93	Renovate *
4	Umbrella	34	Tanzania	64	06-WALK	94	Compete *
5	Cannavaro	35	Garrison	65	Escalade *	95	Hudson *
6	Greenbrooks	36	Essential *	66	06-DUST	96	Reunion *
7	Plato *	37	Fat Cat	67	Honky Tonk *	97	GWTF
8	Lindbergh *	38	MVS-341	68	PSG-85QR	98	Sunset Gold *
9	Aristotle *	39	MVS-1107	69	STR-8GRQR	99	AST9002 *
10	Einstein *	40	Titanium LS *	70	PSG-82BR	100	AST9001 *
11	Silverado *	41	Firecracker LS *	71	Faith *	101	RNP *
12	Monet *	42	Mustang 4 *	72	GO-1BFD	102	AST1001
13	Cezanne Rz *	43	0312	73	SR 8650 *	103	AST7003 *
14	Van Gogh *	44	PSG-TTST	74	STR-8BB5	104	AST9003 *
15	Ninja 3	45	Col-1	75	Tulsa Time *	105	J-140
16	Cochise IV	46	J-130	76	PSG-RNDR	106	Pedigree *
17	RK 4 *	47	Corona	77	PSG-TTRH	107	Justice *
18	RK 5	48	Crossfire 3	78	Speedway *	108	Rebel IV *
19	GE-1	49	Hunter *	79	Rembrandt *	109	3rd Millenium SRP *
20	LS 1200	50	Biltmore *	80	JT-41	110	Traverse SRP *
21	LS 1010	51	Padre *	81	JT-36	111	Rhambler SRP *
22	Skyline *	52	Magellan *	82	JT-45	112	Firenza *
23	Hemi *	53	Catalyst	83	JT-42	113	Falcon IV *
24	Turbo RZ *	54	Stetson II	84	JT-33		
25	Turbo *	55	Finelawn Xpress	85	Integrity *		
26	Bullseye *	56	Falcon NG	86	Xtremegreen *		
27	Trio	57	Shenandoah Elite *	87	Gazelle II *		
28	Sidewinder	58	Falcon V *	88	Wolfpack II *		
29	Rocket	59	Shenandoah III *	89	AST 7002 *		
30	Jamboree	60	BAR Fa 6363	90	AST 7001 *		

* Commercially available in 2011

2010 NTEP Perennial Ryegrass Trial (east block)

N

81	42	58	80	88	14	80
72	34	57	79	87	63	40
7	3	56	78	86	60	67
87	59	55	77	85	35	81
86	47	54	76	84	87	56
71	61	53	75	83	66	27
73	68	52	74	82	20	11
30	19	51	73	81	54	62
60	83	50	72	12	16	7
77	18	49	71	62	21	9
82	31	48	70	43	36	51
13	23	47	69	15	10	64
36	76	46	68	48	24	4
53	88	45	67	38	25	30
85	63	44	66	29	79	75
6	65	43	65	57	71	45
64	80	42	64	88	38	29
10	66	41	63	58	34	31
39	54	40	62	5	59	47
1	32	39	61	68	55	18
84	74	38	60	83	28	86
4	58	37	59	33	53	13

S

2010 NTEP Perennial Ryegrass Trial (west block)

N

41	50	18	36	82	52
40	56	17	35	61	44
33	70	16	34	70	74
25	78	15	33	84	48
27	22	14	32	15	39
8	2	13	31	12	2
21	35	12	30	22	19
37	26	11	29	41	72
20	55	10	28	23	85
	42				
	76				
75	28	9	27	43	8
16	52	8	26	3	77
67	14	7	25	49	57
51	44	6	24	1	50
24	46	5	23	46	78
49	69	4	22	6	73
5	45	3	21	65	17
17	11	2	20	37	26
9	79	1	19	69	32

S

2010 Perennial Ryegrass Entries

1 Rinovo
2 CL 11601
3 PR 909
4 CL 11701
5 APR 2036
6 Linn
7 Uno
8 DLF LGD-3026
9 DLF LGD-3022
10 PSRX-S84
11 SRX-4RHD
12 P02
13 S85
14 LTP-RAE
15 Allante
16 Insight
17 Sienna
18 Brightstar SLT
19 CL 307
20 APR 2320
21 APR 2038
22 PPG-PR 121
23 PPG-PR 128
24 PPG-PR 133
25 PPG-PR 134
26 LTP-PR 135
27 PPG-PR 136
28 PPG-PR 137
29 PPG-PR 138
30 PPG-PR 140
31 PPG-PR 142
32 PPG-PR 143
33 PPG-PR 164
34 PPG-PR 165
35 BAR Lp 10969
36 BAR Lp 10972
37 BAR Lp 10970
38 2NJK
39 BAR Lp 7608
40 Pinnacle
41 APR 2445
42 Fiesta 4
43 GO-G37
44 CS-20
45 ISG-36
46 ISG-31
47 A-35
48 CS-PR66
49 CST
50 JR-178
51 JR-192
52 PSRX-3701
53 Pick 10401
54 Mach I
55 RAD-PR62
56 RAD-PR55R
57 IS-PR 409
58 IS-PR 463
59 IS-PR 469
60 IS-PR 479
61 IS-PR 487
62 IS-PR 488
63 IS-PR 489
64 IS-PR 491
65 IS-PR 492
66 DLF LGT 4182
67 ISG-30
68 PST-204D
69 PST-2NKM
70 PST-2DR9
71 PST-2MG7
72 PST-2TQL
73 PST-2AG4
74 PST-2MAGS
75 PST-2K9
76 PST-2BNS
77 PST-2ACR
78 Rio Vista
79 CL-301
80 Bonneville
81 PSRX-4CAGL
82 GO-DHS
83 GO-PR60
84 GM3
85 PRX-4GM1
86 SRX-4MSH
87 Pick 4DFHM
88 Palmer V

Weed Control During Establishment of Tall Fescue

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Weed management in turf is often challenging, especially during establishment from seed as very few herbicides are safe or labeled on seeded or seedling turfgrasses. The objective of this study was to evaluate two new herbicides, Tenacity (Mesotrione) from Syngenta and amicarbazone from Arysta LifeScience, that can be applied at tall fescue seeding for control of many grass and broadleaf weeds. They are soon to be registered for use on turf in California. We compared these herbicides to other new, newly formulated, or existing herbicides that must be applied postemergence of turf and weeds.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam

Experimental Design: Randomized complete block; four replications

Plot Size: 7 ft x 10 ft; 3-ft alleys

Species/Cultivars: Tall fescue (*Festuca arundinacea* Schreb.) 'Millennium'

Mowing Height: 2 inches; first cut on 11 September 2011

Irrigation: Six times daily during grow-in; 80% ETo/DU thereafter

Fertility:
0.5 lb N/1000 ft^2 on 23 August 2011 (seeding)
0.5 lb N/1000 ft^2 on 3 September 2011
1 lb N/1000 ft^2 on 10 September 2011

Sprayer:
CO_2-powered bicycle
TeeJet 8002VS nozzles
20-inch spacing
22.5-inch boom height
Speed: 1.5 mph
Output: 40 GPA
Pressure: 44 psi @ tank

Data Collected: Tall fescue cover and injury (0-100%); Weed cover and control (0-100%)

Acknowledgments: Thanks to Syngenta, BASF, Arysta LifeScience, Dow AgroSciences, and DuPont for their support of this research.

Table 1. Tall fescue and weed cover (0-100%) 19 days after seeding and application of “A” herbicides, and prior to application of “B” herbicides. Riverside, CA.

Trt	Product	Rate/A	Timing	Tall Fescue Cover	Purslane Cover	Purple? Nutsedge Cover
1	Untreated	--	--	**68.8**	**20.0 ab**	**1.5 ab**
2	Tenacity	5 oz	A	**72.5**	**3.8 cd**	**0.3 b**
3	Tenacity	8 oz	A	**57.5**	**1.8 d**	**0.0 b**
4	Amicarbazone	4 oz	A	**63.8**	**13.8 bc**	**3.5 ab**
5	Amicarbazone	8 oz	A	**62.5**	**7.0 cd**	**2.0 ab**
6	Onetime	64 oz	B			
6	MSO	0.25% v/v	B	76.3	18.8 ab	1.3 b
7	Drive XLR8	64 oz	B		26.3 a	
7	MSO	0.25% v/v	B	70.0		3.5 ab
8	Turflon Ester	16 oz	B	67.5	26.3 a	5.5 a
9	Turflon Ester	32 oz	B	60.0	18.8 ab	1.3 b
10	Turflon Ester Ultra	16 oz	B	57.5	18.8 ab	1.3 b
11	Turflon Ester Ultra	32 oz	B	72.5	21.3 ab	1.8 ab
12	Imprelis	4.5 oz	B	63.8	28.8 a	3.8 ab
	LSD (α = 0.05)	**--**	**--**	**NS**	**11.5**	**NS**

Treatment means followed by the same letter are not significantly different (α = 0.05). NS = Not significant.

Application Dates: A = 23 August 2011
B = 11 September 2011 (approximate 2-3 leaf stage of tall fescue and after one mowing)

Preliminary Results:

- ✓ Daytime air temperatures were near or above 100F during most of the period of turf establishment.
- ✓ Both Tenacity and amicarbazone were safe on tall fescue applied at seeding.
- ✓ Tenacity and the 8 oz/A rate of amicarbazone significantly reduced purslane infestation 19 days after seeding.
- ✓ Although (purple?) nutsedge pressure was relatively light and sporadic early in the study, it appeared that Tenacity prevented emergence of this sedge species.

Weed Control During Establishment of Tall Fescue
Plot 12E-2; Plot size: 7 ft x 10 ft; 3-foot alleys

NORTH

11	3	6	9	2	5	7	10
3	5	7	10	4	1	8	12
8	6	1	4	12	9	11	2

VALVE BOXES

6	11	1	5	10	9	2	7
9	10	11	12	4	8	12	3
1	2	3	4	5	6	7	8

Table 2. Herbicides tested in the tall fescue establishment study.

Product	Manufacturer	Common Name(s)	Notes
Tenacity	Syngenta	Mesotrione	Pre and post weed control in mainly cool-season turf except bentgrass; based on a naturally occurring compound secreted by the Callistemon (bottlebrush) plant; inhibits carotenoid biosynthesis, causing bleaching; CA registration pending in 2012.
Amicarbazone	Arysta LifeScience	Amicarbazone	New triazolinone herbicide with pre and post grass and broadleaf activity in warm- and cool-season turf; U.S. turf registration pending in 2012
Onetime	BASF	Quinclorac + Mecoprop + Dicamba	
Drive XLR8	BASF	Quinclorac	Water-based formulation for uptake, efficacy, rainfastness
Turflon Ester	Dow AgroSciences	Triclopyr	
Turflon Ester Ultra	Dow AgroSciences	Triclopyr	New non-petroleum methylated seed oil solvent
Imprelis	DuPont	aminocyclopyrachlor	Broad spectrum broadleaf activity; CA registration pending

Carbon Fixation and Water Use Efficiency of Warm- and Cool-Season Turfgrasses

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Turfgrass is a key component of urban landscapes. In Southern California, recent estimates have suggested 41% of urbanized lands are covered with turfgrass, and throughout the United States, turfgrass is the predominant irrigated crop species. Climate change resulting in increasing temperature and drought coupled with diminishing water resources offer the greatest potential for severely impacting turfgrass and landscape use. Understanding that carbon sequestration (and denitrification) are dependent upon inputs of water and nutrients, our research strives to determine ways in which water and nutrient use can be minimized while at the same time maximizing carbon sequestration of turfgrasses and groundcovers.

As a means of launching a long-term research program in turfgrass ecology, commonly used cultivars of five cool-season (C3) and eleven warm-season (C4) turfgrass species and cultivars in mono- or polystands were monitored for 12 months beginning in March 2009 through March 2010 under non-limiting conditions, which served as a baseline for the current experiment. Starting in May 2011, six cool-season (C3), eight warm-season (C4) and one groundcover, Kurapia (*Lippia nodiflora* L.) will be monitored for 2 years under deficit irrigation. All cultivars were subjected to deficit irrigation (water stress) based on a percentage of the previous week's reference evapotranspiration (ET_o). Whole plot CO_2 and H_2O exchange was measured monthly for each cultivar. Gross ecosystem photosynthesis (GEP), or the amount of carbon dioxide exchanged between the turf and the atmosphere (μmole CO_2-C/m^2/sec) was evaluated. Water use efficiency (WUE), or the amount of CO_2 fixated by the turf per unit of water lost by evapotranspiration (ET) was also determined for each plot as GEP/ET.

2011-2013 Research Objectives
Determine association between water use efficiency and carbon dynamics among different turfgrass species and cultivars under deficit irrigation.
Expand knowledge base about ecological role of turf in the landscape.

Location:	UCR Turfgrass Research Facility
Soil:	Hanford fine sandy loam
Mowing Heights:	2.5 inches for cool-season grasses except fine fescues (mow once annually) and A-4 creeping bentgrass (0.5 inches). 1.25 inches for warm-season grasses, except St. Augustinegrass and buffalograss (2.5 inches) and Tifdwarf bermudagrass (0.5 inches).
Experimental Design:	Randomized complete block with 3 replications
Plot Size:	6' by 10'
Establishment:	Sod and plugs were established either in July and August 2008 or in 2010
Fertility:	Treatments 4,10,12: 2 lbs N/1000 ft^2/yr All other treatments: 4 lbs N/1000 ft^2/yr

Irrigation Regimes: Starting on May 1st 2011, all cultivars were hand irrigated at 80% reference evapotranspiration (ET_o) to establish uniform soil moisture throughout all the treatments. Two weeks later all cultivars were subjected to deficit irrigation (water stress) based on a percentage of the previous week's ET_o. From May 2011 to September 2011 deficit irrigation rates ranged 75-95% ET_o for cool-season grasses, 55-75% ET_o for warm-season grasses, and 55-75% ET_o for Kurapia. Hand watering was used to maintain uniform and accurate irrigation distribution.

Data Collection: A LI-COR 7500 open path infrared carbon dioxide and water analyzer are used to measure carbon flux and evapotranspiration (ET) within each plot on a monthly basis throughout the experiment. The LI-COR was attached to a tripod and placed on each turfgrass plot. A transparent chamber was used to cover the LI-COR during gas exchange measurements. Attached to the tri-pod was a small fan that helped mix the air within the chamber. Data were logged on a computer using the LI-COR software.

For each turfgrass plot, two measurements were taken. The first is net ecosystem exchange (NEE), which is gas exchange during photosynthesis and respiration. Placing the tripod on the center of the plot and covering it with the transparent chamber logged carbon dioxide and evapotranspiration measurements logged on the computer for approximately one minute. After the measurement was taken, the chamber was removed and vented. The second measurement was ecosystem respiration. The chamber was placed back over the tri-pod, which was covered by a shade cloth, allowing no light to penetrate the chamber. Data were logged for another minute while the chamber was covered. Additional measurements taken were canopy temperature using an infrared thermometer, soil temperature using a fluke thermometer with probe, as well as soil moisture content using a Hydrosense™. Leaf samples were collected in each plot and analyzed for leaf area, carbon and nitrogen isotope analyses. Measurements of NEE and respiration per plot determined gross ecosystem productivity (GEP) or how much carbon dioxide is being exchanged between the plant and the atmosphere/m^2/second. Water use efficiency or the amount of carbon dioxide taken up by a plant per unit of water lost was also determined for each plot using the LI-COR. A plant with high WUE takes up more carbon dioxide and transpires less water, which helps increase its ability to withstand drought.

Starting on May 1st 2011, all cultivars were hand irrigated at 80% reference evapotranspiration to establish uniform soil moisture throughout all the treatments. Two weeks later all cultivars were subjected to deficit irrigation (water stress) based on a percentage of the previous week's reference evapotranspiration (ET_o). From May 2011 to September 2011 deficit irrigation rates ranged 75%-95% ET_o for cool-season grasses, 55%-75% ET_o for warm-season grasses, and 55%-75% ET_o for Kurapia. Hand watering was used to maintain uniform and accurate irrigation distribution.

Results:

- ✓ Water use efficiency of all selected species/cultivars during May – September 2011 are presented in Figure 1.
- ✓ Data from Fig. 2 substantiates the greater water use efficiency (WUE) of warm-season turfgrasses compared to cool-season turfgrasses.
- ✓ Highest WUE under deficit irrigation was measured on Tifdwarf bermudagrass for the warm-season turfgrass species and, once again, Bayside Blend Kentucky bluegrass and perennial ryegrass for the cool-season turf.
- ✓ Kurapia was planted in May 2011 and required time to establish during much of the evaluation period. Thus, low WUE was indicative of bare ground during establishment.
- ✓ These data are "preliminary" in the sense of statistical evaluation and interpretation and thus should not be used for demonstrating superiority of one species/cultivar over another.

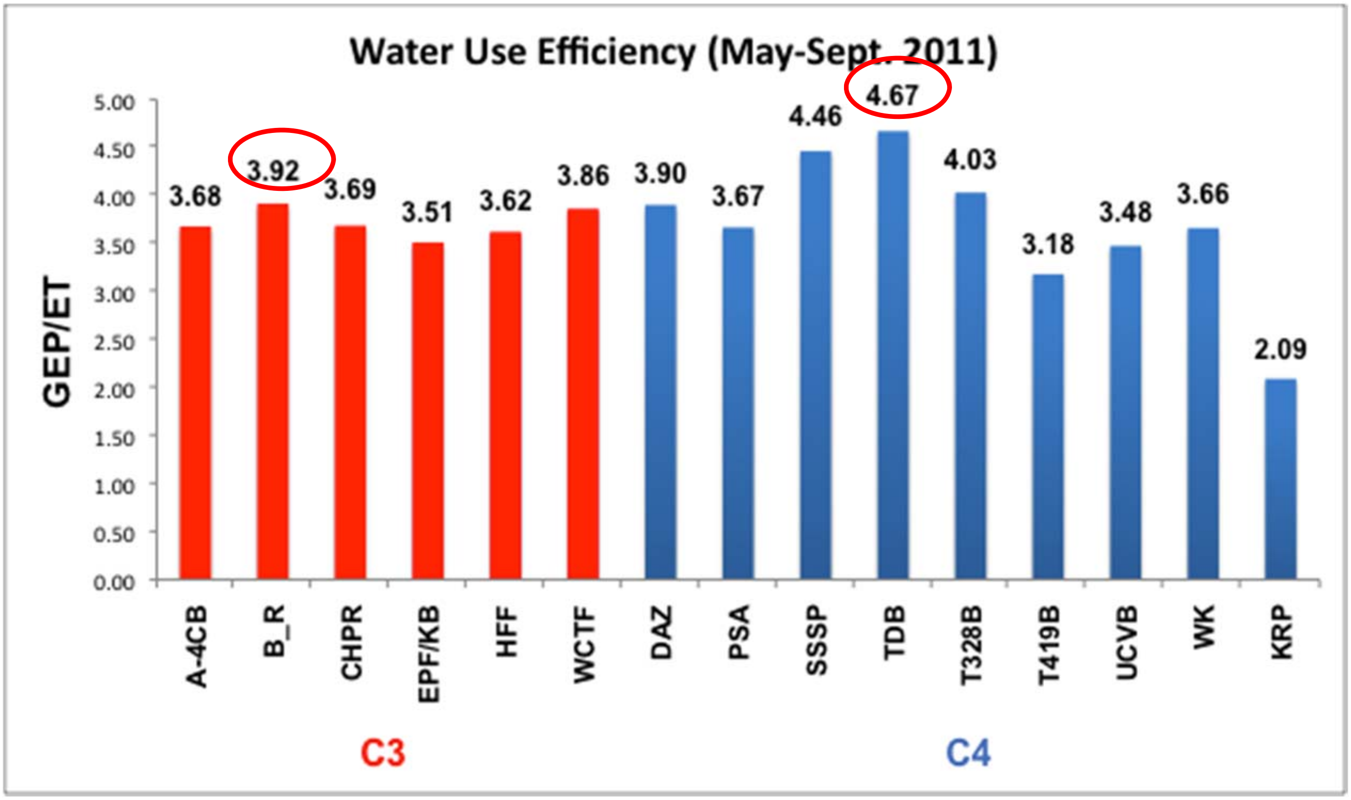

Figure 1: Water use efficiency (GEP/ET) of selected cultivars under deficit irrigation during May-Sept 2011. A-4CB= A-4 Creeping Bentgrass; B_R = Bayside Blend (80%KB/20%PR); CHPR= Chaparral Perennial Ryegrass; EPF/KB=Elite Plus (TF/KB); HFF=Hillside Fine Fescue (Strong/Slender/Chewings); WCTF = West Coaster Tall Fescue; DAZ=De Anza Zoysia; PSA= Palmetto St. Aug; SSSP=Sea Spray Seashore Paspalum; TDB=Tifdwarf Bermuda; T328B=Tifgreen 328 HB; T419=Tifway 419 HB; UCVB=UC Verde Buffalo; KRP= Kurapia.

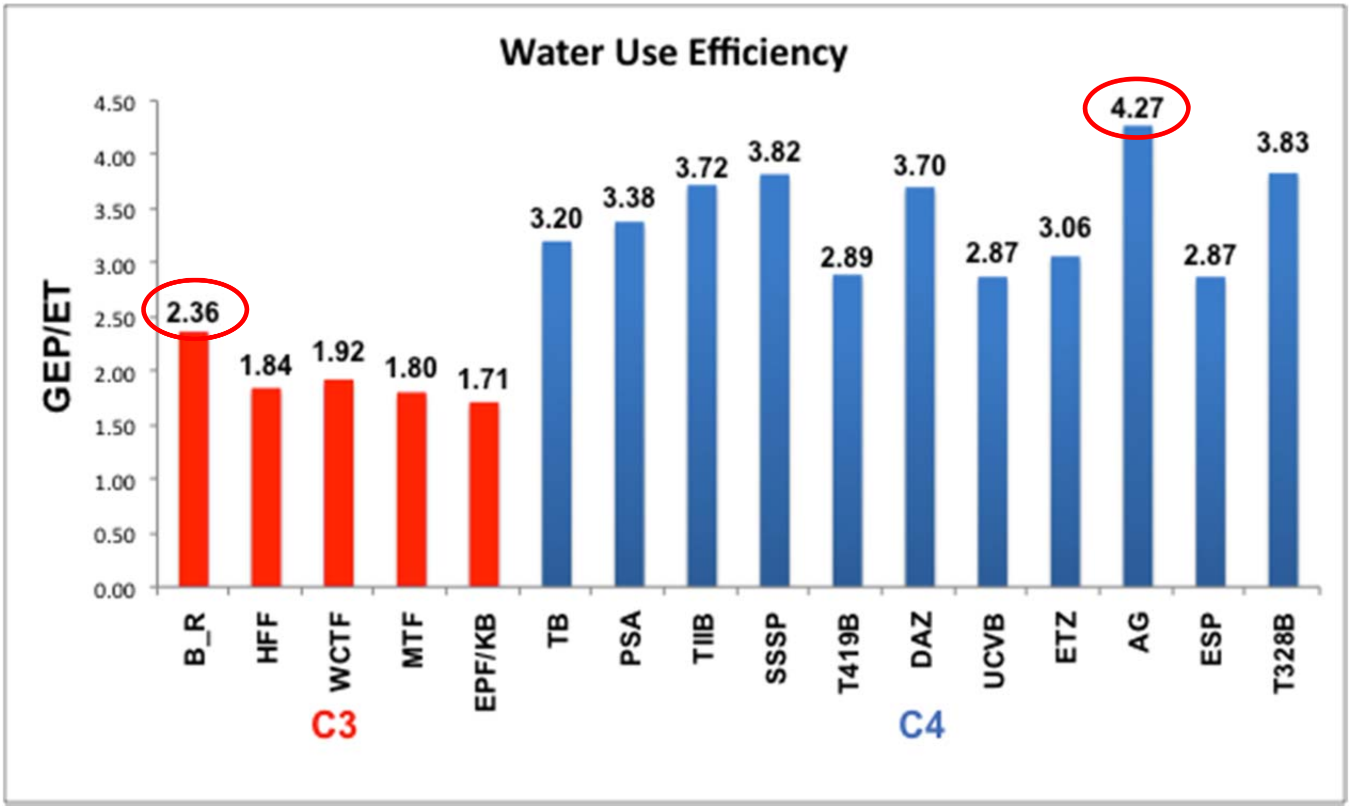

Figure 2: Water use efficiency (GEP/ET) of all cultivars under non-limiting conditions during March 2009-April 2010. Values greater than 1 indicate a cultivar that is water use efficient. Values less than 1 indicate a cultivar that is not water use efficient. B_R = Bayside Blend (80%KB/20%PR); HFF=Hillside Fine Fescue (Strong/Slender/Chewings); WCTF = West Coaster Tall Fescue; MTF= Medallion Tall Fescue; EPF/KB=Elite Plus (TF/KB); TB=Tifsport Hybrid Bermuda; PSA= Palmetto St. Aug; TIIB=Tifway II HB; SSSP=Sea Spry Seashore Paspalum; T419=Tifway 419 HB; DAZ=De Anza Zoysia; UCVB=UC Verde Buffalo; ETZ= El Toro Zoysia; SA=St. Aug; ESP= Excalibre Seashore Paspalum; T328B=Tifgreen 328 HB.

2010-11 Plot Plan

North

4	12	3	14	7
17	2	9	5	16
19	8	20	18	15
10	1	13	11	6
10	20	8	12	5
19	3	17	1	14
9	15	11	16	6
18	2	4	7	13
20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

Treatments:

1. Tifsport Bermudagrass	**11. West Coaster Tall Fescue**
2. Chaparral Perennial Ryegrass	**12. UC Verde Buffalograss**
3. Palmetto St. Augustinegrass	**13. El Toro Zoysiagrass**
4. Whittet Kikuyugrass	**14. A-4 Creeping Bentgrass**
5. Sea Spray Seashore Paspalum	**15. Common St. Augustinegrass**
6. Tifway 419 Bermudagrass	**16. Tifdwarf Bermuda**
7. De Anza Zoysiagrass	**17. Excalibre Seashore Paspalum**
8. Tifgreen 328 Bermudagrass	**18. Medallion Tall Fescue**
9. Bayside Blend Kentucky Bluegrass/Perennial Ryegrass	**19. Kurapia (Lippia nodiflora L.)**
10. Hillside Fine Fescue	**20. Elite Plus Tall Fescue/Kentucky Bluegrass**

Commercial Variety/Species	Variety/Composition	Origin/Producer	Mowing Height
Hillside Fine Fescue	‘Florentine GT’ Strong Creeping Red Fescue, ‘Seabreeze GT’ Slender Creeping Red Fescue, and ‘Tiffany’ Chewings Fescue.	Sod from West Coast Turf	Mow once/yr
Chaparral Perennial Ryegrass	Unstated varietal blend	Sod from West Coast Turf	2.5” rotary
Creeping Bentgrass	A-4	Sod from West Coast Turf	0.5” reel
Bayside Blend Kentucky Bluegrass and Perennial Ryegrass	Unstated varietal mixture; 80% KB/20% PR	Sod from West Coast Turf	2.5” rotary
West Coaster Tall Fescue	Unstated varietal blend	Sod from West Coast Turf	2.5” rotary
Medallion Tall Fescue	Unstated varietal blend	Sod from Pacific Sod	2.5” rotary
Elite Plus Tall Fescue and Kentucky Bluegrass	Unstated varietal mixture	Sod from A-G Sod	2.5” rotary
Tifway 419 Hybrid Bermuda	Tifway 419	Sod from West Coast Turf	1.25” reel
Tifsport Hybrid Bermuda	Tifsport	Sod from West Coast Turf	1.25” reel
Tifdwarf Hybrid Bermuda	Tifdwarf	Sod from West Coast Turf	0.5” reel
Tifgreen 328 Hybrid Bermuda	Tifgreen 328	Sod from A-G Sod	1.25” reel
El Toro Zoysiagrass	El Toro	Sod from Southland Sod	1.25” reel
DeAnza Zoysiagrass	DeAnza	Sod from West Coast Turf	1.25” reel
Palmetto St. Augustinegrass	Palmetto	Sod from West Coast Turf	2.5” rotary
Common St. Augustinegrass	Variety unknown	Sod from Southland Sod	2.5” rotary
UC Verde Buffalograss	UC Verde	Plugs from Florasource	2.5” rotary
Excalibre Seashore Paspalum	Excalibre	Sod from Pacific Sod	1.25” reel
Sea Spray Seashore Paspalum	Sea Spray	Sod from West Coast Turf	1.25” reel
Kurapia	*Lippia nodiflora* L.	Green Geo Co., Japan	No mowing
Kikuyugrass	Whittet	Sod from Emerald Sod	1.25” reel

Acknowledgments: Special thanks to West Coast Turf, Southland Sod Farms, Pacific Sod, A-G Sod Farms, Emerald Sod Farms, Florasource, Ltd, and Kurapia.com for donating the plant materials for this study.

Studies on a *Meloidogyne* sp. (root-knot nematode) occurring in Coachella Valley turf grasses

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A severe decline in bentgrass *(Agrostis palustris cv Penn A-4)* occurred in all greens of a private golf club near Palm Desert, CA. In contrast, none of the Bermuda grass fairways and roughs *(Cynodon dactylon cv Tiff)* or ornamental landscape plants appeared to have similar problems. Bentgrass roots and soil sampled from affected areas contained high population densities of root-knot nematodes *(Meloidogyne sp.).* They were also present in samples from the fairways but they were not recovered from landscape plantings. Declining bentgrass had characteristic root galls with light to dark brown discoloration indicating advanced stages of root senescence. Such symptoms are often associated with secondary microbial infections that follow the initial root invasion by endoparasitic nematodes. For laboratory and greenhouse studies a root-knot population was raised on bentgrass from a single egg mass obtained from a parasitized root. In the past, root-knot nematodes in Coachella Valley turf were primarily identified as the barley root-knot nematode, *M. naasi*. However, in contrast to *M. naasi*, the bentgrass nematode exhibited an exclusive preference for the family of true grasses (Poaceae). Morphological and mitochondrial DNA phylogenetic analysis suggested a very close relationship to *M. graminis*. The nematodes were incubated under axenic conditions on excised corn roots. Such culture is a valuable research tool to study the nematode's life cycle and parasitism. The transparent medium allowed undisturbed microscopic observations of host-parasite interactions that are normally hidden in the soil environment. Based on such controlled condition studies and greenhouse experiments in temperature tanks, base temperature and heat sum for the completion of the life cycle were estimated at 8.4˚C (47.1˚F) and 500 degree-days, respectively. At an optimum temperature of 29˚C (84.2˚F) the life-cycle of the nematode was completed in approximately 24 days. Greenhouse studies at 25˚C (77˚F) with increasing population densities of the root-knot nematode did not result in significant growth reductions in 'Penn A-4' bentgrass despite causing abundant root galling. We hypothesize that the observed bentgrass decline required temperature stress and/or interactions with soilborne fungal pathogens in addition to a high root-knot nematode population density.

A grass root parasitized by a female root-knot nematode (with egg sack).

Plant Performance of 30 Large Established Landscapes in Six Climate Zones in California

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Background: The California Model Water Efficient Landscape Ordinance became effective, January 1, 2010 and applies to the following landscape projects:

(1) new construction and rehabilitated landscapes for public agency projects and private development projects with a landscape area equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check or design review;
(2) new construction and rehabilitated landscapes which are developer-installed in single-family and multi-family projects with a landscape area equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check, or design review;
(3) new construction landscapes which are homeowner-provided and/or homeowner-hired in single-family and multi-family residential projects with a total project landscape area equal to or greater than 5,000 square feet requiring a building or landscape permit, plan check or design review;
(4) existing landscapes limited to Sections 493, 493.1 and 493.2; and
(5) cemeteries. Recognizing the special landscape management needs of cemeteries, new and rehabilitated cemeteries are limited to Sections 492.4, 492.11 and 492.12; and existing cemeteries are limited to Sections 493, 493.1 and 493.2.
(b) This ordinance does not apply to:
registered local, state or federal historical sites;
ecological restoration projects that do not require a permanent irrigation system;
mined-land reclamation projects that do not require a permanent irrigation system; or
plant collections, as part of botanical gardens and arboretums open to the public.

Important Definitions:

“Establishment period of the plants” refers to the first year after installing the plant in the landscape or the first two years if irrigation will be terminated after establishment. .
Estimated Total Water Use” (ETWU) means the total water used for the landscape as described in Section 492.4.

“ET adjustment factor” (ETAF) is 0.7, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency. 0.7 ETAF was selected to enable plantings with a plant mix site-wide average of 0.5 and an average irrigation efficiency is 0.71 to remain green and healthy. It is calculated by: (0.7)=(0.5/0.71). ETAF for a “Special Landscape Area” shall not exceed 1.0. ETAF for existing non-rehabilitated landscapes is 0.8.

“Special Landscape Area” refers to an area of the landscape dedicated solely to edible plants, areas irrigated with recycled water, water features using recycled water and areas dedicated to active play such as parks, sports fields, golf courses, and where turf provides a playing surface.

The Maximum Applied Water Allowance is calculated using the equation:

MAWA = (ETo) (0.62) [(0.7 x LA) + (0.3 x SLA)]

Example One:

MAWA calculated for a hypothetical landscape project in Inland Southern CA with an irrigated landscape area of 50,000 square feet, an annual reference evapotranspiration value of 51 inches, no Special Landscape Area (SLA= 0, no edible plants, recreational areas, or use of recycled water).

MAWA = (ETo) (0.62) [(0.7 x LA) + (0.3 x SLA)]
MAWA = Maximum Applied Water Allowance (gallons per year)
ETo = Reference Evapotranspiration (inches per year)
0.62 = Conversion Factor (to gallons)
0.7 = ET Adjustment Factor (ETAF)
LA = Landscape Area including SLA (square feet)
0.3 = Additional Water Allowance for SLA
SLA = Special Landscape Area (square feet)
MAWA = (51.1 inches) (0.62) [(0.7 x 50,000 square feet) + (0.3 x 0)]
= 1,108,870 gallons per year
To convert from gallons per year to hundred-cubic-feet per year:
= 1,108,870/748 = 1,482 hundred-cubic-feet per year (100 cubic feet = 748 gallons)

Example Two (same scenario as above but includes edibles):

MAWA calculated for a hypothetical landscape project in Inland Southern CA with the same ETo value of 51.1 inches and total landscape area of 50,000 square feet used in Example One. However, within the 50,000 square foot project, there is now a 2,000 square foot area planted with edible plants. This 2,000 square foot area is considered to be a Special Landscape Area.

MAWA = (ETo) (0.62) [(0.7 x LA) + (0.3 x SLA)]
MAWA = (51.1 inches) (0.62) [(0.7 x 50,000 square feet) + (0.3 x 2,000 square feet)]
= 31.68 x [35,000 + 600] gallons per year
= 31.68 x 35,600 gallons per year or 1,127,808 gallons per year (1,508 hundred-cubic-feet/yr)

Our Project: In May 2011, University of California Cooperative Extension (UCCE) academics David Fujino, Loren Oki and Janet Hartin received funding from the CA Dept. of Water Resources to work with UCCE colleagues across the state to measure plant performance at 30 sites throughout California representing a variety of evapotranspiration rates, plant densities, and microclimates over 18-months. William Baker and Associates LLC has been contracted to oversee the project due to their extensive experience and knowledge in this area. An overview of the project and its implications will be discussed.

Optimal Management Practices for Kikuyugrass Quality and Playing Conditions

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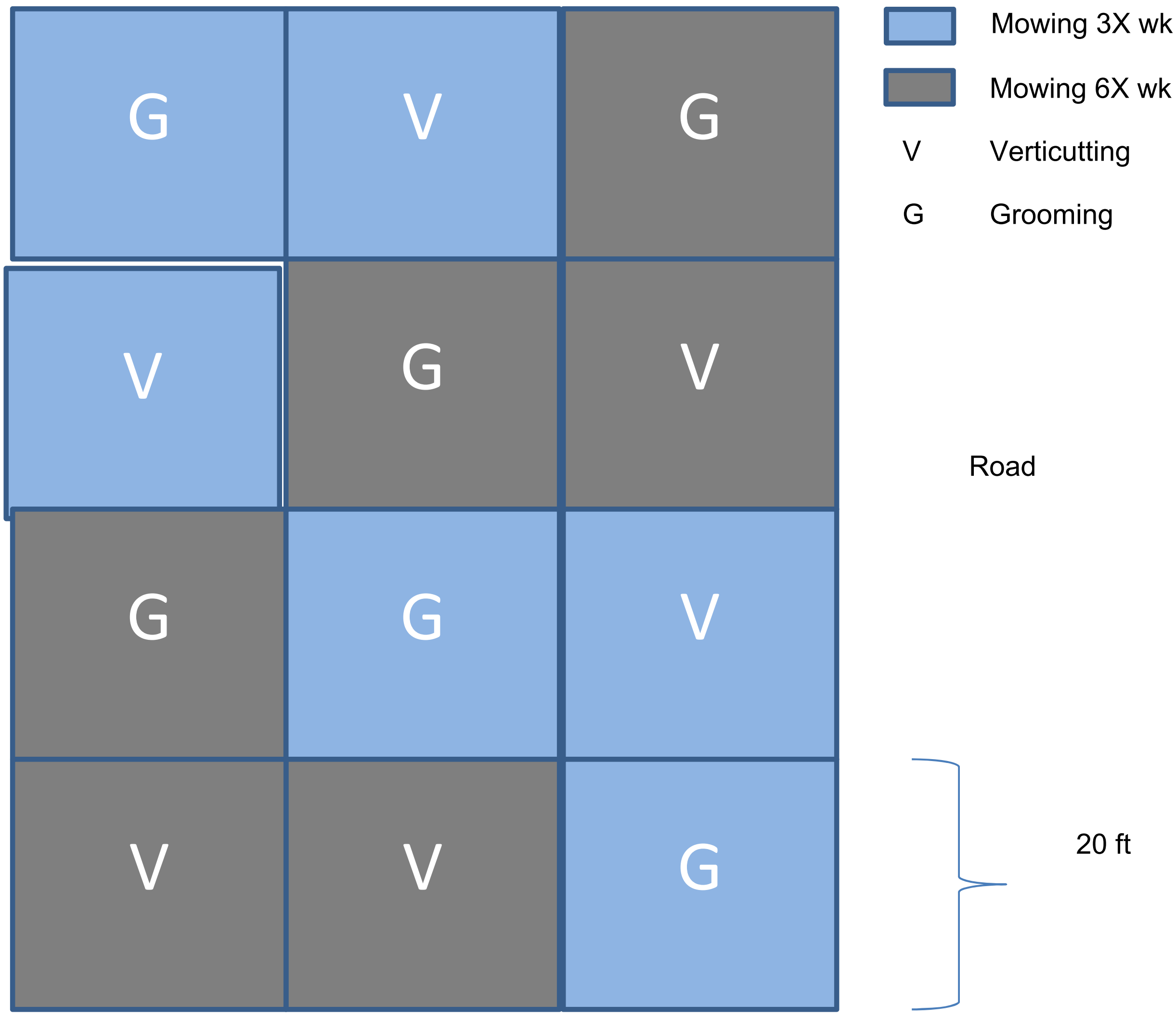
Kikuyugrass (*Pennisetum clandestinum* Hochst. ex Chiov.) is considered either an invasive weed or the desired species on many golf courses and other turf areas along coastal and inland California. As part of a comprehensive project aimed at Kikuyugrass improvement and management, a field study was initiated in August 2011 to identify cultural and chemical practices that are most important for producing quality turf and optimal playing conditions on golf course fairways. The cultivar 'Whittet' was established from sod on a Hanford fine sandy loam. A two-level, five-factor factorial design was used to evaluate mowing frequency (three vs. six times/wk), cultivation (grooming three times/wk vs. verticutting twice/yr), Primo Maxx (0 vs. 0.3 oz/1000 ft^2 biweekly), nitrogen (2 vs. 5 lbs/1000 ft^2/yr), and fungicide treatment (0 vs. monthly preventative applications according to disease activity). Turf quality was assessed visually and by normalized difference vegetation index (NDVI). Turf firmness and ball roll were measured with a Clegg Soil Impact Tester (2.5 kg hammer Gmax) and Pelz meter, respectively.

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam
Experimental Design:	2^5 Factorial with six replications
Plot Size:	Main plots (mowing frequency and cultivation) are 20 ft x 20 ft; Sub-plots (N, Primo, fungicide) are 5 ft x 5 ft
Sod Established:	25 July 2011
Species/Cultivars	Kikuyugrass 'Whittet'
Fertility:	0.5 lbs N /1000ft^2 using a complete fertilizer was applied on August 2. On September 1, 0.5 lb N/ 1000ft^2 using NH_4SO_4 was applied to N=5 treatments
Mowing Regime:	0.45 inches 3 days or 6 days/wk using a Baroness walk-behind tee mower
Cultivation Regime:	Grooming (light verticutting) 3 times/wk with verticutting unit on Baroness mower or aggressive verticutting twice annually using a dedicated machine
Irrigation Regime:	Historic ET warm-season/DU
Data Collection:	Turfgrass quality and % brown cover measured visually; Firmness measured with Clegg Soil Impact Tester; Color measured with NDVI; Ball roll measured with Pelz meter; Tension test measured with Ag ops tension cart

Acknowledgments: Special thanks to Emerald Sod, Eagle Golf Construction, Inc., Baroness, PACE Turf, LLC, La Jolla Country Club, and Mission Viejo Country Club for their support of supplies and equipment.

Field Map



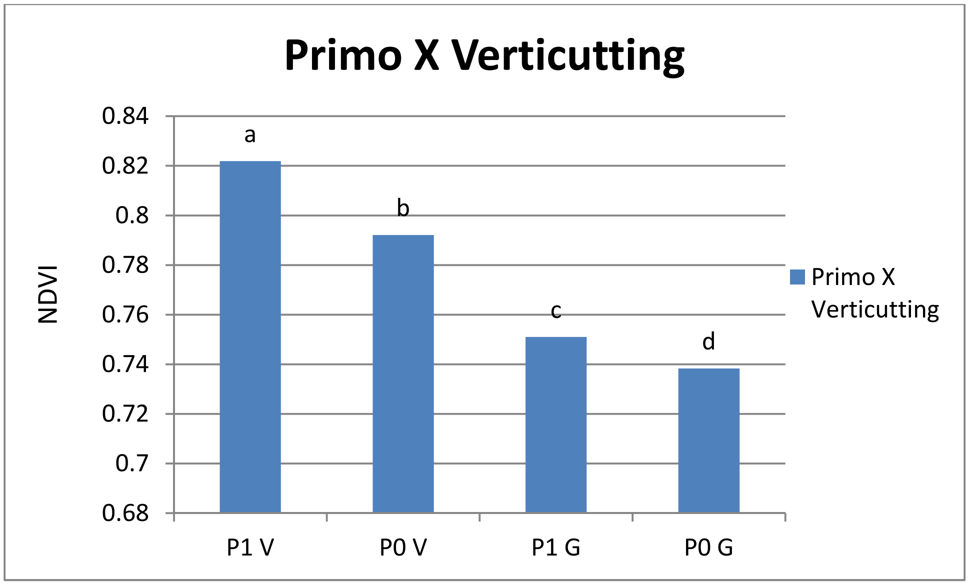


Figure 1. Interaction of Primo (P) application and cultivation on NDVI. Higher values correspond to greener, healthier turf. To date, no verticutting (V) treatment has been applied. Grooming (G) three times/wk resulted in turf thinning and subsequent lower NDVI. Primo helped to improve NDVI. Mean bars underneath the same letter are not significantly different (α = 0.05).

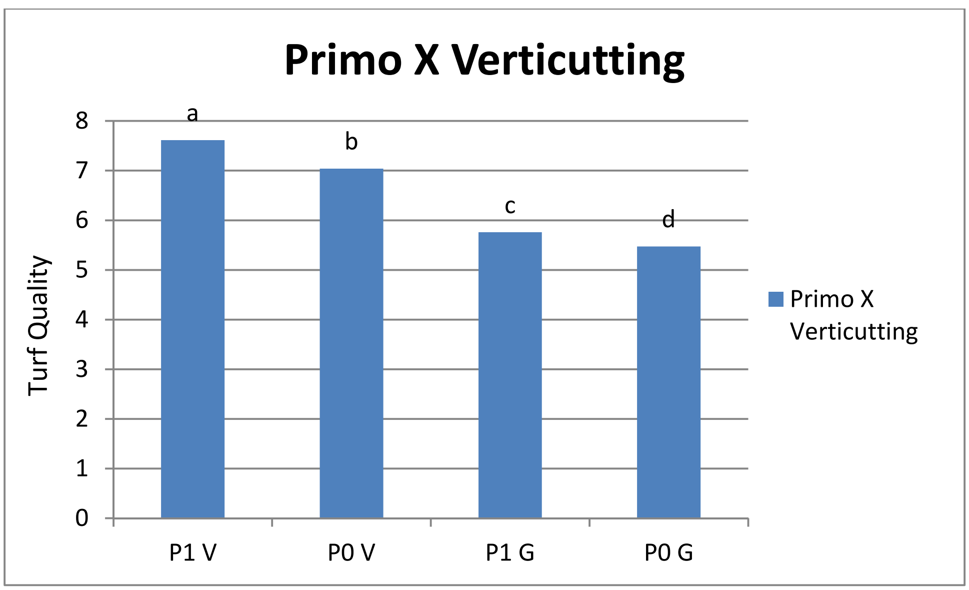


Figure 2. Interaction of Primo (P) application and cultivation on turf quality (1-9, 9 = best). To date, no verticutting (V) treatment has been applied. Grooming (G) three times/wk resulted in turf thinning and subsequent lower turf quality. Primo helped to improve turf quality. Mean bars underneath the same letter are not significantly different (α = 0.05).

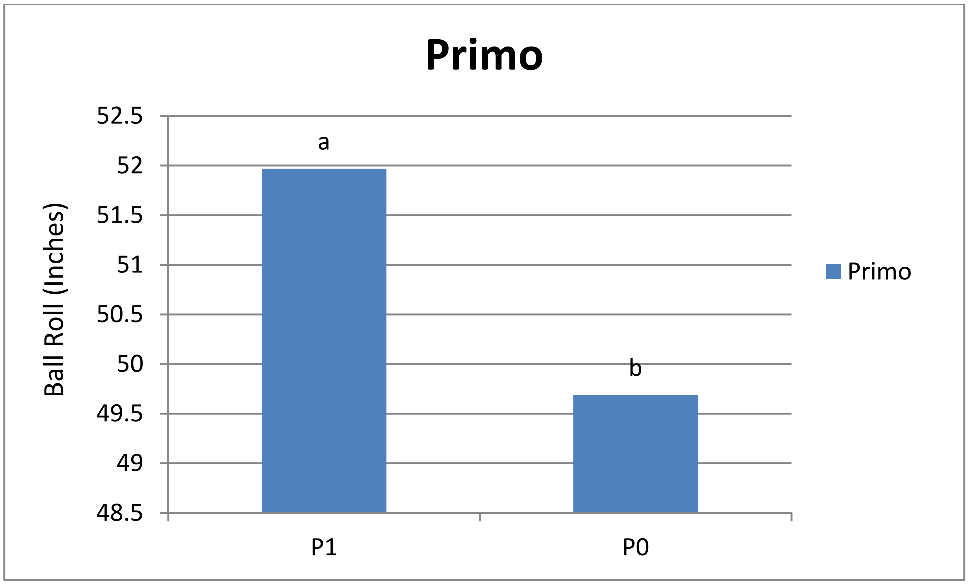


Figure 3. Interaction of Primo application on ball roll. Mean bars underneath the same letter are not significantly different (α = 0.05).

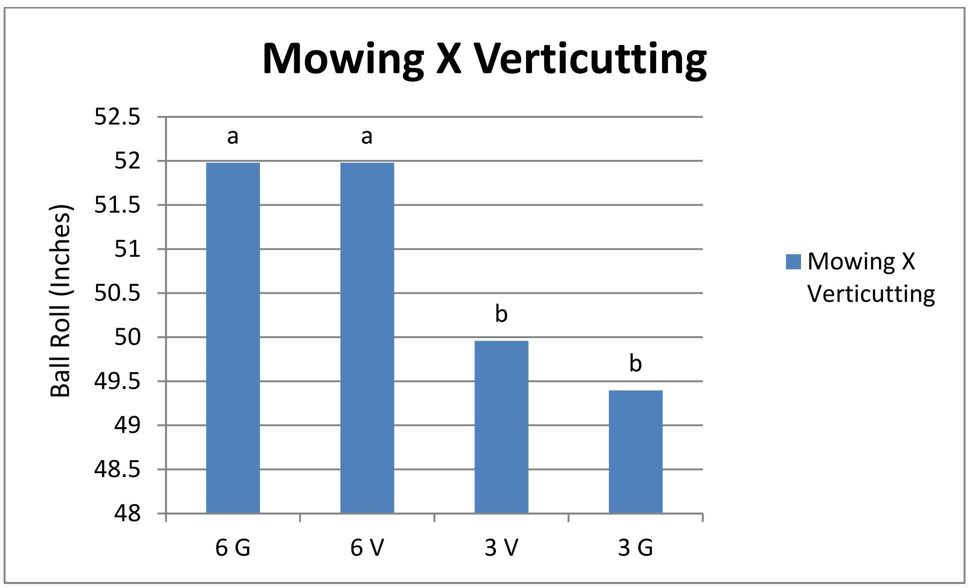


Figure 4. Interaction of mowing frequency and cultivation on ball roll. To date, no verticutting (V) treatment has been applied. Mowing six times/wk resulted in significantly greater ball roll regardless of cultivation practice. Mean bars underneath the same letter are not significantly different (α = 0.05).

Preliminary Results:

- ✓ Only six weeks into the start of the experiment, three bi-weekly applications of Primo Maxx have demonstrated great benefits in improving kikuyugras turf quality and ball roll.
- ✓ Although a significant increase in labor, fuel, and time, mowing six times/wk has already resulted in significantly greater ball roll distance on a turf that is often referred to as "Velcro."
- ✓ Although grooming (light verticutting) three times/wk thus far has resulted in a reduction in turf quality due to stand thinning on relatively immature sod, we predict that this treatment will result in significant overall benefits as the turf matures.

Save The Date

For Future Turfgrass & Landscape Research Field Day

Thursday, September 13, 2012

See You Then