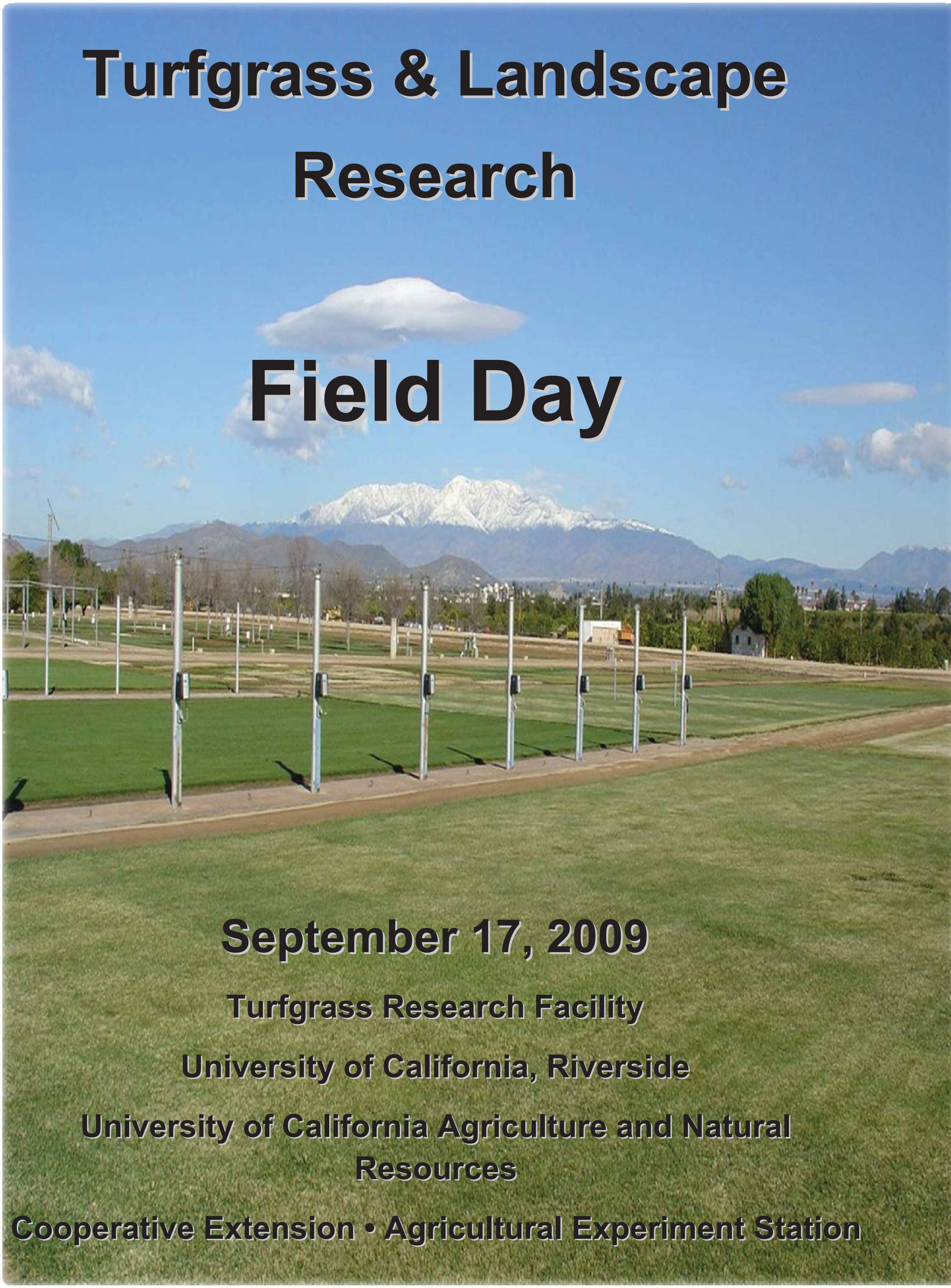

Turfgrass & Landscape Research

Field Day

September 17, 2009

Turfgrass Research Facility

University of California, Riverside

University of California Agriculture and Natural Resources

Cooperative Extension • Agricultural Experiment Station

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Welcome to Field Day!

On behalf of the entire UCR Turfgrass and Landscape Team, let me be among the first to welcome you to the 2009 UCR Turfgrass and Landscape Research Field Day. Last year's event was packed with 16 stops highlighting the breadth of our research programs. At that time, many of the studies were newly launched. This year, we will focus on just eight stops where research is ongoing and many important findings are to be seen and discussed. In addition, please take the time at your leisure to identify the top performing cultivars in the National Turfgrass Evaluation Program (NTEP) tall fescue, zoysiagrass, seashore paspalum, and bermudagrass variety trials. All in all, there will be more time to focus on our research activities and to ask questions of the team of experts from the University of California.

By the end of the day, I think you will agree that our programs are headed in the right direction in terms of striving to meet both the short- and long-term challenges facing the turfgrass and landscape industries. I am most proud of the teamwork and trans-disciplinary approach to Turfgrass and Landscape Management exhibited by UCR and UC faculty, advisors, staff, and students. Scientists who are leaders in their respective fields are coming together to lend their expertise toward the advancement of scientific knowledge in our arenas.

As we come together as a Green Industry to see and hear about the latest research, let's be mindful of the importance of strengthening and consolidating industry resources for continued support at the University of California. With your help, the best is yet to come!

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, Sue Lee, Steve Ries, Frank Wong, and Linda Coco. Production of this booklet would not have been possible without Camaron Cabrera and Kathie Carter. Staff and students from Agricultural Operations, Frank Wong's Lab, and my group 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!

Sincerely,

James H. Baird, Ph.D.

Assistant Specialist in Cooperative Extension and Turfgrass Science

Voice: 951-827-4619 · Fax: 951.827-4437 · WWW.PLANTBIOLOGY.UCR.EDU

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Kathie Carter
Amit Chatterjee
Tim Close
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Robert Green
Darrel Jenerette
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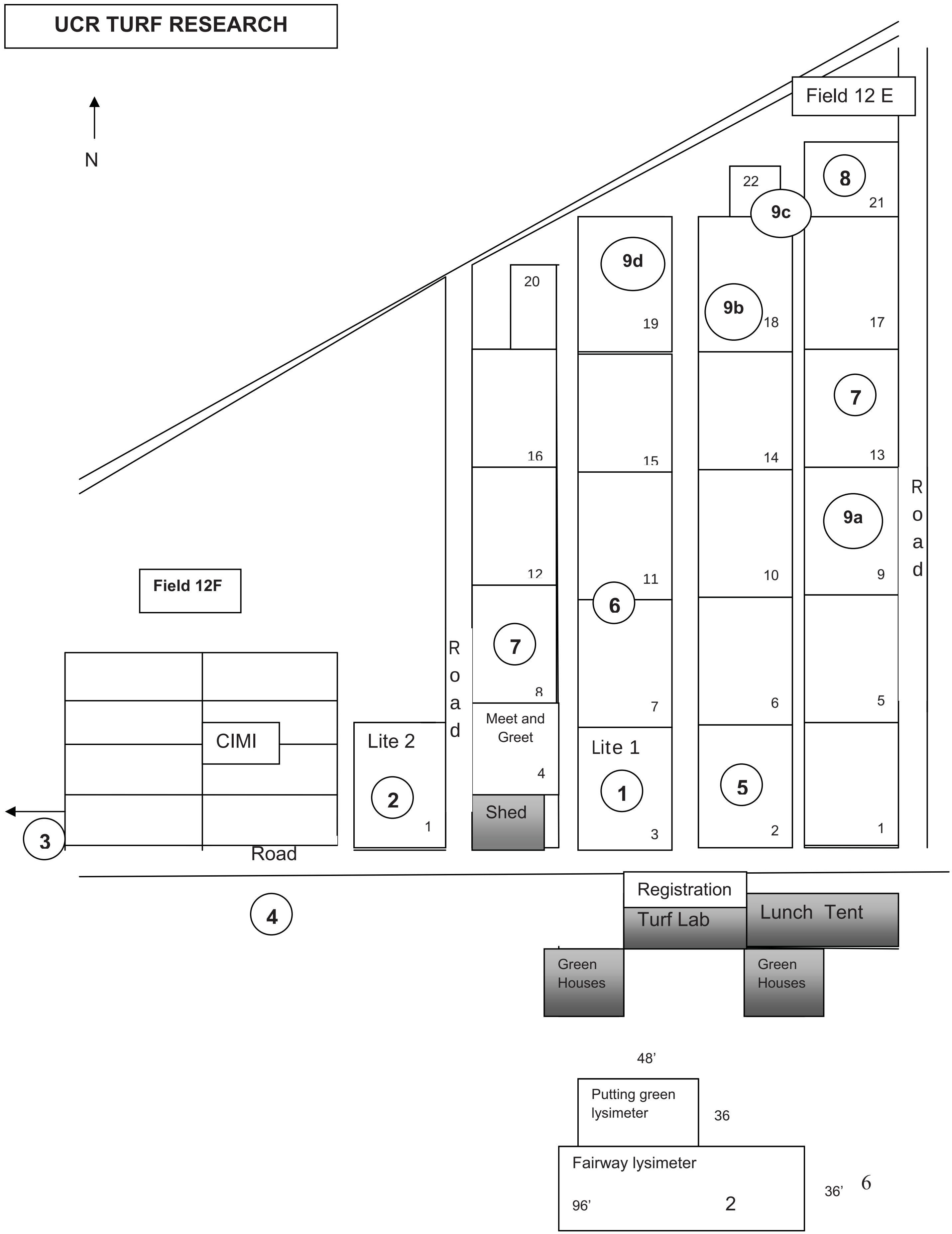
USDA Salinity Laboratory
Dennis Corwin
Catherine Grieve
Scott Lesch
James Poss
Don Suarez

Department of Agricultural Operations
Steve Cockerham
Dave Kleckner
Steve Ries
Vince Weng

Ask The Experts

The following people will be present during Field Day to answer your burning questions and turf and landscape plants, and issues related to their care and maintenance.

Jim Baird – Turf Management, Water Use/Conservation, Weed Management
Ashley Basinger- Environmental Horticulture
Ole Becker - Nematology
Dave Burger- Developmental physiology of woody perennials; plant propagation; turfgrass management
Amit Chatterjee – Plant Ecology
Steve Cockerham – Turf and Athletic Field Management
Amanda Crump- Horticulture, Sustainable Landscapes, Tree Health, Technology Transfer Evaluation, Pesticide Safety, Master Gardener Program
Jim Downer- Pathology of landscape ornamentals, Phytophthora Root Rot, Mulches, Potting soils, Palm horticulture (plus more)
Dave Fujino- Urban Horticulture
Jay Gan- Environmental fate, risk assessment and regulation of pesticides and emerging contaminants (Plus more)
Robert Green – Turf Management, Water Use/Conservation
Janet Hartin- Environmental horticulture, sustainable landscapes (irrigation and greenwaste management)
Darren Haver- Watershed Management, Chemical Fate
Mike Henry- Turf and landscape, Master Gardener Program
Kelly Kopp (Utah State) - Turf Management, Water Use/Conservation, Soils, Nutrition
Vince Lazaneo- Urban horticulture and pest management education
Bernd Leinauer (New Mexico State) - Turf Management, Irrigation Practices, Soils
Don Merhaut- Ornamental & Floriculture Crops
Loren Oki- CE Assistant Specialist, Landscape Horticulture
Dennis Pittenger- Landscape Management
Antoon Ploeg - Nematology
Steve Ries – Turf and Athletic Field Management
Kai Umeda (Univ. of Arizona)- Turfgrass, weed science, and pest management
Cheryl Wilen-Weed control, Weed ID, Kikuyugrass biology
Frank Wong- Urban plant pathology - Diseases of turfgrass and landscape ornamentals
Jian Xu- Soil and water management; waste water reuse


UCR TURF RESEARCH
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Registration
Turf Lab
Lunch Tent
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Green Houses
48'
Putting green lysimeter
36
Fairway lysimeter
36'
96'
2

Turfgrass and Landscape Research Field Day

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12:00 **LUNCH** Ask the Experts, On your own tour of NTEP Trials

Thanks for your support throughout the year!

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- California Sod Producers Association
- Coachella Valley Association of Governments
  Coachella Valley Water District
- Golf Course Superintendents Association of Southern California
- Hi-Lo Desert Golf Course Superintendents Association
  San Diego Golf Course Superintendents Association
- South Coast Air Quality Management District
- Southern California Golf Association
- Southern California Section, Professional Golfers' Association of America
- Southern California Turfgrass Council
- Southern California Turfgrass Foundation
- Sports Turf Managers Association – Greater L. A. Basin Chapter
- University of California, Riverside Extension – Natural Resources
  United States Golf Association
- Women's Southern California Golf Association

United States Department of Agriculture (USDA)
Valent Professional Products
Victoria Club
West Coast Turf

Examining Turf's Carbon Footprint

Amit Chatterjee, Alea Miehls, Darrel Jenerette, Brent Barnes, and Jim Baird
Department of Botany and Plant Sciences
University of California, Riverside

Turfgrass is a key component of urban landscapes. In southern California, recent estimates have suggested 41% of the urbanized lands are covered with turfgrass. Throughout the United States turfgrass is the predominant crop species. Ecologists are curious about how this expanse of turf affects a variety of processes. How much water is required by this vegetation? How much carbon is stored in turf? How much nutrients are leached from turf? How sensitive is turf to altered management activities? How likely are invasive species associated with turf plantings? How much greenhouse gas emissions (including CO_2, methane, and NO_x) generated by turf stands? In native regions, ecologists are often concerned with identifying the causes for why species are located where they are. This interest is also evident in urban ecological research – why do people plant turf where they do? How do they make decisions between different turf varieties and how do they select alternatives to turf? Clearly, there is a growing interest in ecological science in developing a better understanding of turfgrass both from fundamental biochemical cycling to the choices leading to turf planting.

As a means of launching a long-term research program in turfgrass ecology, commonly used cultivars of nine cool- (C3) and warm- (C4) season turfgrass species were established from sod or plugs in 2008. Beginning in March 2009, whole plot CO_2 and H_2O exchange were measured every two weeks under non-limiting conditions for irrigation, fertility, and mowing height. These data will serve as a baseline for future experiments.

2009 Objectives

1. Determine association between water use efficiency and carbon dynamics among different turfgrass species and cultivars under non-limiting cultural practices.
2. Expand knowledge base about ecological role of turf in the landscape.

Location: UCR Turf Facility

Soil: Hanford fine Sandy loam

Mowing Heights: 12.5'' for cool-season grasses except fine fescues (no mow), 2.0'' warm-season grasses, except St. Augustinegrass and buffalograss (3'')

Experimental Design: Randomized complete block with 3 replications

Plot Size: 6' by 10'

Establishment: Treatments 1-12 were established on 7/17/2008, 13-16 on 7/25/08, 17-19 on 8/1/08, and 20 on 8/5/08

Fertility: 1 lb N/1000 ft^2 at planting; 0.5 lb N/1000 ft^2/wk during establishment and approximately once/month thereafter;

Irrigation Regimes: Once it was established, turfgrasses were subjected to warm-season irrigation regimes (approximately 60% Et_o/DU). Supplemental irrigation is applied to the coolseason turf as necessary by hand watering.

Data Collection: Turf quality, color, density, leaf firing/wilting, rooting, gas exchange, and leaf C and N content will be evaluated periodically throughout the study. Physiological measurements to include carbohydrate content, photosynthesis, chlorophyll fluorescence, soil respiration.

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

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. Bull's Eye Bermudagrass	**12. UC Verde Buffalograss**
3. Palmetto St. Augustinegrass	**13. El Toro Zoysiagrass**
4. Tifway II Bermudagrass	**14. Experimental Tall Fescue I**
5. Sea Spray Seashore Paspalum	**15. St. Augustinegrass**
6. Tifway 419 Bermudagrass	**16. Experimental Tall Fescue II**
7. De Anza Zoysiagrass	**17. Excalibre Seashore Paspalum**
8. Tifgreen 328 Bermudagrass	**18. Medallion Tall Fescue**
9. Bayside Blend K. Bluegrass/P. Ryegrass	**19. GN-1 Bermudagrass**
10. Hillside Fine Fescue	**20. Elite Plus T. Fescue/K. Bluegrass**

Preliminary Results:

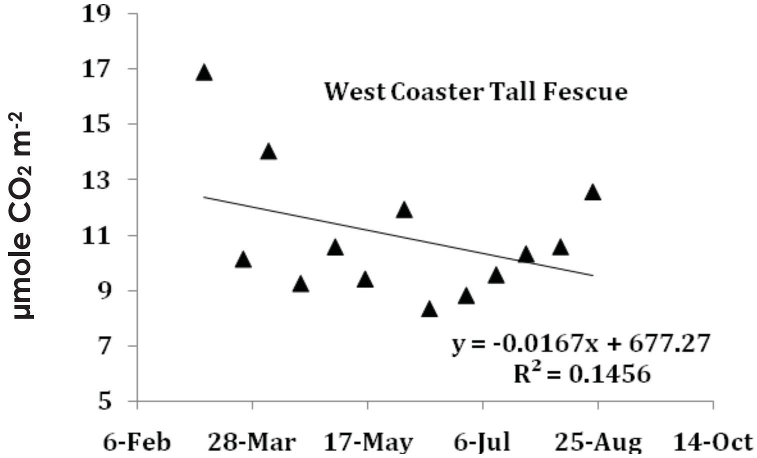
We determined leaf carbon (C) and nitrogen (N) content of different C3 and C4 turfgrass cultivars (Table 1). Leaf C content for C3 cultivars ranged between 36 to 43 percent, whereas, C4 cultivars contained 36 percent to 48 percent C. The isotopic analyses of δC^{13} showed a significant variation between C3 and C4 cultivars. C4 cultivars were enriched in C and depleted in the case of C3 cultivars. δC^{13}values for C3 grasses were in between -28 to -29‰ and -13 to -16‰ for the C4 grasses. There was no major difference in leaf N or δC^{15} N values between C3 and C4 cultivars.

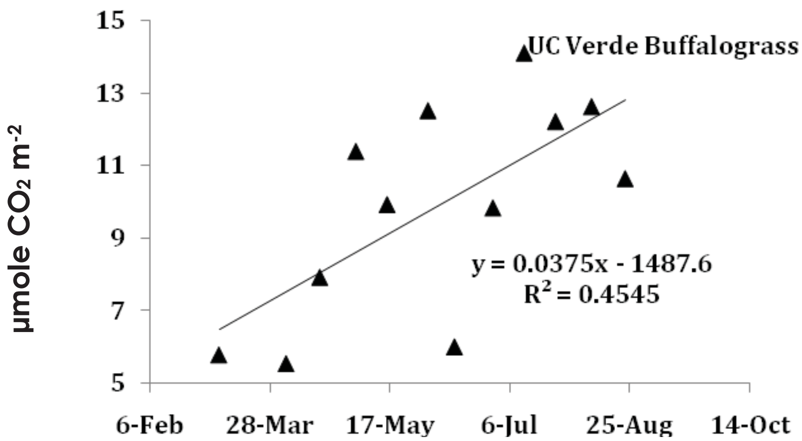
Table 1. Leaf carbon and nitrogencontent (%) and respective isotopic analyses of different turfgrass cultivars grown in California.

Cultivars	C%	δC^{13}‰	N%	δN^{15}‰
<u>*C3 cultivars*</u>				
Bayside blend K. Bluegrass/P. Ryegrass	41.09	-	2.63	2.86
Hillside Fine Fescue	38.56	-29.24	3.01	1.37
West Coaster Tall Fescue	36.53	-29.43	2.06	1.76
Experimental Tall Fescue I	42.49	-	2.20	4.74
Medallion Tall Fescue	36.43	-28.67	1.87	3.22
Elite Plus T. Fescue/K. Bluegrass	43.22	-	2.46	2.69
<u>*C4 cultivars*</u>				
Tifsport Bermudagrass	42.18	-14.79	2.29	2.66
Palmetto St. Augustinegrass	39.90	-13.89	2.13	5.53
Tifway II Bermudagrass	37.92	-15.85	3.07	5.41
Sea Spray Seashore Paspalum	39.28	-15.05	2.81	2.40
Tifway 419 Bermudagrass	45.94	-14.63	2.67	4.70
De Anza Zoysiagrass	48.87	-15.11	2.87	1.38
UC Verde Buffalograss	36.21	-	2.35	2.64
El Toro Zoysiagrass	39.26	-13.75	2.25	4.28
St. Augustinegrass	43.03	-16.32	2.87	2.19
Excalibre Seashore Paspalum	42.72	-16.33	2.3	4.02
GN-1 Bermudagrass	43.26	-15.67	2.31	4.63

Changes in gross primary productivity (GPP) or the amount of carbon fixed during photosynthesis over time (µmole CO_2 m^{-2} sec^{-1}) varied between C3 and C4 cultivars. Most of the C3 cultivars showed a decrease in GPP from March to August 2009 whereas the GPP of the C4 cultivars increased during the same period of time (Figure 1).

Figure 1. Changes in gross primary productivity (GPP; µmole CO_2 m^{-2} sec^{-1}) over time for representative C3 and C4 turfgrass cultivars grown in California.





Evaluation of Bentgrass Cultivars for Putting Greens in Southern California

Jim Baird, Brent Barnes and Steve Ries

Department of Botany and Plant Sciences

University of California, Riverside

Objectives: Evaluate performance of 19 creeping bentgrass cultivars and one velvet cultivar on a sand-based putting green under simulated championship conditions.

Location: UCR Turf Facility

Soil: Sand-based root zone

Mowing Height: Lowered to 0.135” by Field Day using Baroness walk-behind mower

Experimental Design: Split-plot with 4 replications per cultivar; bentgrass cultivars represent main plots; half of each plot received Primo Maxx at a rate of 0.125 oz./1000 ft^2/wk beginning on August 18, 2008.

Plot Size: 5’ by 11’

Establishment: Cultivars were seeded at a rate of 1 lb/1000 ft^2 on July 11, 2008

Fertility: 1 lb N/1000 ft^2 at planting; 0.5 lb N/1000 ft^2/wk until established; ≤ 0.5 lb N/1000 ft^2/month thereafter

Simulated Championship Conditions: Two weeks prior to Field Day, mowing, rolling, and trafficking using a traffic simulator equipped with metal golf spikes was increased to four times daily and irrigation was minimal using a hand-held hose.

Data Collection: Rate of establishment, turf quality, color, density, and rooting evaluated periodically throughout the study. Ball roll and firmness measured prior to Field Day.

Acknowledgments: Special thanks to Stover Seed Company, Seed Research of Oregon, Tee 2 Green, Lebanon, Simplot/Jacklin, Pickseed, and Links Seed for donating the seed; Syngenta Professional Products for donating the Primo Maxx; Best Turf West and Baroness for use of the mower; AA Equipment and Tru-Turf for use of the greens roller; Mark Burchfield, Superintendent of Victoria Club, and his staff for helpful suggestions and maintenance of mowing equipment; and Pat Gross, Director, USGA Green Section Southwest Region, for good advice and use of the TruFirm firmness instrument.

North

	Primo	Primo		Primo		Primo			Primo

Tyee	Penn A-4	Penn G-6	Declaration	T-1
Shark	007	MacKenzie	SR 1150	Brighton
L-93	LS-44	Alpha	Independence	Mariner
Seaside II	Dominant Plus	Dominant Xtreme7	Penncross	Lengendary Velvet
Alpha	Tyee	Shark	Independence	SR 1150
Legendary Velvet	T-1	Seaside II	Brighton	Penn G-6
Penncross	Dominant Xtreme7	L-93	007	Penn A-4
Declaration	Mariner	MacKenzie	LS-44	Dominant Plus
SR 1150	Declaration	T-1	LS-44	Alpha
Mariner	Brighton	Penn A-4	L-93	Dominant Plus
Tyee	Penn G-6	Penncross	Dominant Xtreme7	007
Seaside II	MacKenzie	Legendary Velvet	Independence	Shark
Mariner	SR 1150	Seaside II	Declaration	MacKenzie
007	Dominant Plus	Alpha	Penn G-6	Dominant Xtreme7
Penn A-4	T-1	Tyee	Legendary Velvet	L-93
LS-44	Shark	Independence	Penncross	Brighton

	Primo	Primo		Primo		Primo			Primo

Table 1. Evaluation of bentgrass cultivars for putting greens in southern California with increasing stress imposed by mowing height, frequency of cut, rolling, and simulated traffic.

	# of Fairy Rings	Turf Quality	Wilt	Turf Quality	Turf Quality	Ball Roll Feet.Inches	Turf Quality
	6-16-09	**8-15-09**	**8-19-09**	**8-29-09**	**9-14-09**	**9-11-09**	**9-15-09**
Cultivar							
Tyee	4	6	7	7	5	9.6	2
Penn A-4	3	6	7	8	7	10.8	4.5
Penn G-6	2	6.5	7.5	7	7.5	10.9	7
Declaration	2	6	7	7	5.5	10.2	3
T-1	1	7	8	8	7	10.3	4.5
Shark	3	7	7	7	5.5	10.3	3.5
007	3	6	7.5	8	6	10.3	3
MacKenzie	2	7	8	7.5	7	10.2	5
SR 1150	0	6	7	7	4	10.2	2.5
Brighton	2	7	8	7	7.5	10.8	7.5
L-93	3	7	8	8	8	10.8	8
LS-44	1	7	8	7.5	7.5	10.7	6
Alpha	3	7	8	8	7	10.8	6.5
Independence	0	7	7	7	6.5	10.3	4
Mariner	0	6.5	8	7	7	11.0	7.5
Seaside II	2	7	8	8	7.5	10.8	7
Dominant Plus	3	7	8	7.5	8	10.9	7.5
Dominant Xtreme7	1	7	8	8	7.5	10.5	5
Penncross	0	6	7	6.5	6	10.9	7
Legendary Velvet	1	3.5	7	5	4	10.9	3
LSD (P=.05)	3.2	0.9	1.2	0.9	1.5	5 inches	1.5
CV	139.2	10.6	11.2	9.3	16.4	2.9	21.1

Preliminary Results:

- Highest ranked cultivars for turfgrass quality on 15 September 2009 were L-93, Brighton, Mariner, Dominate Plus, Penn G-6, Seaside II, and Penncross.
- Cultivars that ranked lowest in turfgrass quality were puffy or spongy in appearance and scalped as mowing height was lowered and mowing frequency increased.

Chemical Control of Anthracnose in Southern California, 2009

Dr. Frank Wong[1], Juanita Rios[1], Erica Serna[1] and Steve Ries[2]

[1]Department of Plant Pathology & Microbiology, UC Riverside

[2]Agricultural Operations, UC Riverside

Forty two fungicide treatments were evaluated for their effectiveness in controlling anthracnose (*Colletotrichum cereale*) on creeping bentgrass at UCR. The effectiveness of 26 of these is presented here.

Plots were inoculated on 25 May with anthracnose spores grown in the laboratory. The green was a 'Peterson's Creeping' annual bluegrass, established in 2007 from seed. Turf was mowed 3 days a week at a height of 0.25-in. and irrigated daily according to ET needs. Fungicide applications were initiated on 1 Jun at 7-, 14- or 28-day intervals until 8 Sep. Disease severity (% plot area affected) was evaluated every 14 days and AUDPC calculated based upon the sum of the total disease from 15 Jun to 25 Aug. Data was analyzed by ANOVA followed by means separation using Fisher's LSD (α=0.05)

Gary's Green Ultra (GGU) and P-K Plus (PKP), two fertilizers from Griggs Brothers were used to evaluate the effectiveness of nitrogen and phosphite fertilizers on anthracnose control. The mount of nitrogen in the 9 and 15 fl oz applications of Gary's Green Ultra is equal to 0.10 and 0.16 lb of nitrogen/1,000 sq ft per application, respectively. Calcium nitrate ($CaNO_3$) in 15.5-0-0 form, was applied as a comparison at 10 and 16 oz, equal to 0.10 and 0.16 lb of nitrogen/1,000 sq ft per application. The 6 fl oz application of P-K Plus contained the equivalent of 0.011 lb nitrogen and 0.12 P_2O_5 /1,000 sq ft per application.

Table 1. Results arranged by treatment

#	Treatment and rate/1,000 sq ft[z]	Interval	% anthracnose[y]						AUDPC[x]
			15 Jun	30 Jun	14 Jul	28 Jul	11 Aug	25 Aug	
6	Banner MAXX 1.3ME 2.0 fl oz..........	14	0.0 d	0.0 d	0.0 c	7.5 efg	0.0 g	0.0 f	7.5 g
34	$CaNO_3$ 15.5-0-0 10 oz......................	7	7.5 bcd	5.0 cd	7.5 bc	27.5 bcd	27.5 bcd	20.0 b-e	81.3 bc
35	$CaNO_3$ 15.5-0-0 16.5 oz..................	7	0.0 d	0.0 d	2.5 c	15.0 e-g	15.0 c-g	12.5 c-f	38.8 c-g
33	Daconil Ultrex 82.5 WG 1.8 oz	7	0.0 d	0.0 d	2.5 c	0.0 g	6.3 fg	0.0 f	8.8 g
29	GGU 13-2-3 15 fl oz plus PKP 3-7-18 6.0 fl oz	7	0.0 d	0.0 d	0.0 c	5.0 fg	12.5 d-g	10.0 efd	22.5 d-g
31	GGU 13-2-3 9.0 fl oz	7	0.0 d	0.0 d	2.5 c	25.0 b-e	30.0 bc	32.5 b	73.8 c-e
28	GGU 13-2-3 9.0 fl oz plus PKP 3-7-18 6.0 fl oz	7	0.0 d	0.0 d	0.0 c	10.0 e-g	17.5 c-f	10.0 efd	32.5 c-g
30	GGU 13-2-3 9.0 fl oz plus PKP 3-7-18 6.0 fl oz plus Daconil Ultrex 82.5 WG 1.8 oz	7	0.0 d	0.0 d	0.0 c	0.0 g	12.5 d-g	2.5 f	13.8 fg
26	Headway 1.39ME 1.0 fl oz...............	14	0.0 d	0.0 d	0.0 c	0.0 g	0.0 g	0.0 f	0.0 g
32	PKP 3-7-18 6.0 fl oz	7	0.0 d	0.0 d	2.5 c	40.0 abc	42.5 ab	47.5 a	108.8 b
7	Reserve 4.8SC 2.8 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	1.3 g	0.0 f	1.3 g
8	Reserve 4.8SC 3.2 fl oz	14	0.0 d	0.0 d	7.5 bc	10.0 e-g	3.8 fg	0.0 f	21.3 d-g
11	Reserve 4.8SC 3.2 fl oz plus Chipco Signature 80 WG 4.0 oz	14	0.0 d	0.0 d	0.0 c	5.0 fg	10.0 efg	2.5 f	16.3 fg
9	Reserve 4.8SC 3.6 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	1.3 g	0.0 f	1.3 g
10	Reserve 4.8SC 4.5 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	2.5 fg	1.3 f	3.1 g
38	Tourney 50WG 0.18 oz	14	0.0 d	0.0 d	0.0 c	5.0 fg	1.3 g	2.5 f	7.5 g
41	Tourney 50WG 0.28 oz	28	5.0 cd	5.0 cd	2.5 c	12.5 e-g	5.0 fg	2.5 f	28.8 c-g
37	Tourney G 30.4 oz...........................	14	0.0 d	0.0 d	2.5 c	42.5 ab	22.5 cde	25.0 bc	80.0 bc
36	Tourney G 40.8 oz...........................	28	0.0 d	0.0 d	7.5 bc	22.5 c-f	15.0 c-g	22.5 bcd	56.3 b-g
42	Trinity 1.69SC 0.50 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	3.8 fg	0.0 f	3.8 g
25	Trinity 1.69SC 1.0 fl oz	14	0.0 d	0.0 d	0.0 c	5.0 fg	5.0 fg	2.5 f	11.3 fg
2	Triton Flo 3.1SC 0.50 fl oz...............	14	0.0 d	0.0 d	0.0 c	0.0 g	2.5 fg	0.0 f	2.5 g
3	Triton Flo 3.1SC 0.75 fl oz...............	14	7.5 bcd	7.5 bcd	7.5 bc	0.0 g	0.0 g	0.0 f	18.8 efg
5	Triton Flo 3.1SC 0.75 fl oz plus Chipco Signature 80 WG 4.0 oz alt/w Daconil Ultrex 82.5 WG 3.2 oz	14	0.0 d	0.0 d	0.0 c	0.0 g	0.0 g	0.0 f	0.0 g
4	Triton Flo 3.1SC 1.0 fl oz.................	14	12.5 bcd	12.5 bcd	10.0 bc	0.0 g	0.0 g	0.0 f	28.8 c-g
1	Untreated check	---	30.0 a	27.5 a	37.5 a	50.0 a	57.5 a	57.5 a	216.3 a
	ANOVA P		0.006	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	LSD (α=0.05)		8.0	6.5	5.8	9.4	7.9	6.5	28.4

Footnotes:

[z] Treatments applied in 2 gal water per 1,000 sq ft at 35 psi using TeeJet 8002 nozzles.

[y] The average % anthracnose in four replicated plots, means followed by the same letter are statistically equal (Fisher's LSD with α=0.05)

[x] AUDPC = area under the disease progress curve (total disease), calculated as the sum of average disease severity between evaluation dates.

Table 2. Results arranged by AUDPC (total disease)

#	Treatment and rate/1,000 sq ft[z]	Interval	% anthracnose[y]						AUDPC[x]
			15 Jun	30 Jun	14 Jul	28 Jul	11 Aug	25 Aug	
1	Untreated check	---	30.0 a	27.5 a	37.5 a	50.0 a	57.5 a	57.5 a	216.3 a
32	PKP 3-7-18 6.0 fl oz	7	0.0 d bc	0.0 d	2.5 c	40.0 abc	42.5 ab bc	47.5 a	108.8 b
34	$CaNO_3$ 15.5-0-0 10 oz	7	7.5 d	5.0 cd	7.5 bc	27.5 bcd	27.5 d cd	20.0 b-e	81.3 bc
37	Tourney G 30.4 oz	14	0.0 d	0.0 d	2.5 c	42.5 ab	22.5 e	25.0 bc	80.0 bc
31	GGU 13-2-3 9.0 fl oz	7	0.0 d	0.0 d	2.5 c	25.0 b-e	30.0 bc	32.5 b bc	73.8 c-e
36	Tourney G 40.8 oz	28	0.0 d	0.0 d	7.5 bc	22.5 c-f	15.0 c-g	22.5 d	56.3 b-g
35	$CaNO_3$ 15.5-0-0 16.5 oz	7	0.0 d	0.0 d	2.5 c	15.0 e-g	15.0 c-g	12.5 c-f	38.8 c-g
28	GGU 13-2-3 9.0 fl oz plus PKP 3-7-18 6.0 fl oz	7	0.0 d	0.0 d	0.0 c	10.0 e-g	17.5 c-f	10.0 efd	32.5 c-g
41	Tourney 50WG 0.28 oz	28	5.0 cd bc	5.0 cd bc	2.5 c	12.5 e-g	5.0 fg	2.5 f	28.8 c-g
4	Triton Flo 3.1SC 1.0 fl oz	14	12.5 d	12.5 d	10.0 bc	0.0 g	0.0 g	0.0 f	28.8 c-g
29	GGU 13-2-3 15 fl oz plus PKP 3-7-18 6.0 fl oz	7	0.0 d	0.0 d	0.0 c	5.0 fg	12.5 d-g	10.0 efd	22.5 d-g
8	Reserve 4.8SC 3.2 fl oz	14	0.0 d bc	0.0 d bc	7.5 bc	10.0 e-g	3.8 fg	0.0 f	21.3 d-g
3	Triton Flo 3.1SC 0.75 fl oz	14	7.5 d	7.5 d	7.5 bc	0.0 g	0.0 g	0.0 f	18.8 efg
11	Reserve 4.8SC 3.2 fl oz plus Chipco Signature 80 WG 4.0 oz	14	0.0 d	0.0 d	0.0 c	5.0 fg	10.0 efg	2.5 f	16.3 fg
30	GGU 13-2-3 9.0 fl oz plus PKP 3-7-18 6.0 fl oz plus Daconil Ultrex 82.5 WG 1.8 oz	7	0.0 d	0.0 d	0.0 c	0.0 g	12.5 d-g	2.5 f	13.8 fg
25	Trinity 1.69SC 1.0 fl oz	14	0.0 d	0.0 d	0.0 c	5.0 fg	5.0 fg	2.5 f	11.3 fg
33	Daconil Ultrex 82.5 WG 1.8 oz	7	0.0 d	0.0 d	2.5 c	0.0 g	6.3 fg	0.0 f	8.8 g
6	Banner MAXX 1.3ME 2.0 fl oz	14	0.0 d	0.0 d	0.0 c	7.5 efg	0.0 g	0.0 f	7.5 g
38	Tourney 50WG 0.18 oz	14	0.0 d	0.0 d	0.0 c	5.0 fg	1.3 g	2.5 f	7.5 g
42	Trinity 1.69SC 0.50 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	3.8 fg	0.0 f	3.8 g
10	Reserve 4.8SC 4.5 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	2.5 fg	1.3 f	3.1 g
2	Triton Flo 3.1SC 0.50 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	2.5 fg	0.0 f	2.5 g
7	Reserve 4.8SC 2.8 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	1.3 g	0.0 f	1.3 g
9	Reserve 4.8SC 3.6 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	1.3 g	0.0 f	1.3 g
26	Headway 1.39ME 1.0 fl oz	14	0.0 d	0.0 d	0.0 c	0.0 g	0.0 g	0.0 f	0.0 g
5	Triton Flo 3.1SC 0.75 fl oz plus Chipco Signature 80 WG 4.0 oz alt/w Daconil Ultrex 82.5 WG 3.2 oz	14	0.0 d	0.0 d	0.0 c	0.0 g	0.0 g	0.0 f	0.0 g
	ANOVA *P*		0.006	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	LSD (α=0.05)		8.0	6.5	5.8	9.4	7.9	6.5	28.4

Footnotes:

[z] Treatments applied in 2 gal water per 1,000 sq ft at 35 psi using TeeJet 8002 nozzles.

[y] The average % anthracnose in four replicated plots, means followed by the same letter are statistically equal (Fisher's LSD with α=0.05)

[x] AUDPC = area under the disease progress curve (total disease), calculated as the sum of average disease severity between evaluation dates.

Results

Disease severity was high, reaching an average of 57.5% disease in untreated plots by 11 Aug.

Amongst fertility based treatments, applications of P-K Plus (potassium phosphite, KH_2PO_3) alone initially had a reduction on anthracnose severity, but disease developed equal to the check later in the trial. Nitrogen applied as $CaNO_3$ or Gary's Green Ultra did have a more pronounced effect on anthracnose reduction, with slightly better effects seen with higher rates of nitrogen. Combinations of Gary's Green Ultra and P-K Plus were equivalent to nitrogen applied alone for overall disease reduction, but some benefits were seen over $CaNO_3$ or Gary's Green Ultra alone near the end of the evaluation period. Applications of Gary's Green Ultra, P-K Plus and Daconil were equivalent to Daconil applied weekly, but color and turf quality were higher (data not shown).

For the DMI fungicides (Banner, Tourney, Triton FLO) very good to excellent control was observed. However, the granular fungicide Tourney G, did not perform as well as the sprayable forms during some of the later evaluation dates. Tourney G also tended to show some burn on the turf. This is likely due to the worse distribution of the granular form compared to the sprayable one. Some discoloration was noticeable with Tourney (WG) and Trinity applications when repeated applications were made at high temperatures. The pigment present in Triton FLO likely masked any noticeable discoloration.

DMI mixtures such as Reserve (equal to Triton FLO & Daconil) and Headway (Banner MAXX & Heritage) also provided excellent disease control. Signature tank mixes and alternations also provided excellent disease control.

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	6	14	32	5	30	12	33	11	39	20
3	24	23	16	31	1	13	26	2	41	15	34	42
28	40	4	27	17	22	37	21	38	19	36	10	25
9	35	18	29	7	8	9	12	39	20	30	8	22
27	3	16	28	13	33	19	2	26	31	11	21	32
4	29	34	10	15	1	36	18	40	17	25	7	41
35	23	37	5	38	24	14	42	6	38	8	29	11
21	2	32	17	16	35	5	24	42	30	12	9	28
20	33	18	3	23	15	31	6	13	25	36	27	37
1	19	22	34	41	4	40	14	39	7	26	10	

Chemical Control of Dollar Spot in Southern California, Spring 2009

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Thirty four fungicide treatments were evaluated for their effectiveness in controlling dollar spot (*Sclerotinia homoeocarpa*) on creeping bentgrass at UCR. The effectiveness of 19 of these is presented here.

Plots were inoculated on 11 May with dollar spot infested grain. The green was a 90/10 mix of creeping bentgrass and annual bluegrass, established in 2005 from sod. Turf was mowed 3 days a week at a height of 0.25-in. and irrigated daily according to ET needs. Fungicide applications were initiated on 28 May at 14-, 21- or 28-day intervals until 9 Jul. Disease severity (% plot area affected) was evaluated every 14 days and AUDPC calculated based upon the sum of the total disease from 28 May to 23 Jul. Data was analyzed by ANOVA followed by means separation using Fisher's LSD (α=0.05)

Table 1. Results arranged by treatment

	Disease severity (%)^y					
Treatment & rate per 1,000 sq ft ^{z}	28 May	11 Jun	25 Jun	09 Jul	23 Jul	AUDPC^x
Banner MAXX 1.3ME 1.0 fl oz	2.5	8.8 b	5.0 b	1.3 b	0.0 d	16.3 bc
Bayleton 50 WG 0.50 oz	3.8	7.5 b	8.8 b	7.5 b	10.0 c	30.6 bc
Curalan 50EG 1.0 oz	6.3	0.0 b	0.0 b	0.0 b	0.0 d	3.1 bc
Eagle 20EW 1.4 fl oz	3.8	11.3 b	12.5 b	1.3 b	2.5 cd	28.1 bc
Emerald 70 WG 0.18 oz plus Daconil Ultrex 82.5 WG 1.8 oz	6.3	0.0 b	0.0 b	0.0 b	0.0 d	3.1 bc
Emerald 70WG 0.13 oz	6.3	3.8 b	0.0 b	0.0 b	0.0 d	6.9 bc
Emerald 70WG 0.18 oz	7.5	1.3 b	0.0 b	0.0 b	0.0 d	5.0 bc
Emerald 70WG 0.18 oz (21-day interval)	0.0	0.0 b	1.3 b	0.0 b	0.0 d	1.3 c
Emerald 70WG 0.18 oz (28-day interval)	3.8	0.0 b	0.3 b	0.0 b	0.0 d	2.1 c
Emerald 70WG 0.18 oz plus Daconil Ultrex 82.5 WG 3.2 oz	0.0	0.0 b	0.0 b	0.0 b	0.0 d	0.0 c
Emerald 70WG 0.18 oz plus Iprodione Pro 2SE 2 fl oz	5.0	0.0 b	0.0 b	0.0 b	0.0 d	2.5 c
Emerald 70WG 0.18 oz plus prodione Pro 2SE 3 fl oz	7.5	0.0 b	0.0 b	0.0 b	0.0 d	3.8 bc
Insignia 20WG 0.90 oz	11.3	6.3 b	0.0 b	0.0 b	7.5 cd	15.6 bc
Interface SC 4.0 fl oz	3.8	0.0 b	0.0 b	0.0 b	0.0 d	1.9 c
Reserve 4.8SC 3.2 fl oz	1.3	0.0 b	1.3 b	0.0 b	0.0 d	1.9 c
Tourney 50WG 0.28 oz	1.3	10.0 b	10.0 b	8.8 b	22.5 b	40.6 b
Trinity 1.69SC 1.0 fl oz	3.8	5.0 b	1.3 b	1.3 b	1.3 cd	10.0 bc
Triton Flo 3.1SC 0.50 fl oz	2.5	6.3 b	2.5 b	1.3 b	2.5 cd	12.5 bc
Untreated check #1	16.3	40.0 a	55.0 a	72.5 a	52.5 a	201.9 a
Untreated check #2	10.0	42.5 a	55.0 a	62.5 a	50.0 a	190.0 a
ANOVA *P*	0.2	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
LSD (α=0.05)		6.2	8.6	5.2	4.5	19.0

Table 2. Results arranged by total disease (AUDPC)

Treatment & rate per 1,000 sq ft [z]	Disease severity (%)[y]					AUDPC[x]
	28 May	11 Jun	25 Jun	09 Jul	23 Jul	
Untreated check #1	16.3	40.0 a	55.0 a	72.5 a	52.5 a	201.9 a
Untreated check #2	10.0	42.5 a	55.0 a	62.5 a	50.0 a	190.0 a
Tourney 50WG 0.28 oz	1.3	10.0 b	10.0 b	8.8 b	22.5 b	40.6 b
Bayleton 50 WG 0.50 oz	3.8	7.5 b	8.8 b	7.5 b	10.0 c c	30.6 bc
Eagle 20EW 1.4 fl oz..	3.8	11.3 b	12.5 b	1.3 b	2.5 d	28.1 bc
Banner MAXX 1.3ME 1.0 fl oz	2.5	8.8 b	5.0 b	1.3 b	0.0 d c	16.3 bc
Insignia 20WG 0.90 oz.......................................	11.3	6.3 b	0.0 b	0.0 b	7.5 d c	15.6 bc
Triton Flo 3.1SC 0.50 fl oz	2.5	6.3 b	2.5 b	1.3 b	2.5 d c	12.5 bc
Trinity 1.69SC 1.0 fl oz.......................................	3.8	5.0 b	1.3 b	1.3 b	1.3 d	10.0 bc
Emerald 70WG 0.13 oz......................................	6.3	3.8 b	0.0 b	0.0 b	0.0 d	6.9 bc
Emerald 70WG 0.18 oz......................................	7.5	1.3 b	0.0 b	0.0 b	0.0 d	5.0 bc
Emerald 70WG 0.18 oz plus Iprodione Pro 2SE 3 fl oz	7.5	0.0 b	0.0 b	0.0 b	0.0 d	3.8 bc
Emerald 70 WG 0.18 oz plus Daconil Ultrex 82.5 WG 1.8 oz............................	6.3	0.0 b	0.0 b	0.0 b	0.0 d	3.1 bc
Curalan 50EG 1.0 oz	6.3	0.0 b	0.0 b	0.0 b	0.0 d	3.1 bc
Emerald 70WG 0.18 oz plus Iprodione Pro 2SE 2 fl oz	5.0	0.0 b	0.0 b	0.0 b	0.0 d	2.5 c
Emerald 70WG 0.18 oz (28-day interval)	3.8	0.0 b	0.3 b	0.0 b	0.0 d	2.1 c
Reserve 4.8SC 3.2 fl oz	1.3	0.0 b	1.3 b	0.0 b	0.0 d	1.9 c
Interface SC 4.0 fl oz..	3.8	0.0 b	0.0 b	0.0 b	0.0 d	1.9 c
Emerald 70WG 0.18 oz (21-day interval)	0.0	0.0 b	1.3 b	0.0 b	0.0 d	1.3 c
Emerald 70WG 0.18 oz plus Daconil Ultrex 82.5 WG 3.2 oz............................	0.0	0.0 b	0.0 b	0.0 b	0.0 d	0.0 c
ANOVA *P*	0.2	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
LSD (α=0.05)		6.2	8.6	5.2	4.5	19.0

Footnotes:

[z] Treatments applied in 2 gal water per 1,000 sq ft at 35 psi using TeeJet 8002 nozzles at 14-day intervals unless otherwise specified.

[y] The average % dollar spot in four replicated plots, means followed by the same letter are statistically equal (Fisher's LSD with α=0.05)

[x] AUDPC = area under the disease progress curve (total disease), calculated as the sum of average disease severity between evaluation dates.

Results

Disease severity was high, reaching an average of 72% disease in untreated plots by 9 Jul. All fungicide applications provided significant control of dollar spot as compared to the untreated checks.

Performance of Emerald (SDHI-class) and Emerald tank mixes was excellent. Even when applied at 21- or 28-day intervals, control was equal to applications made at 14-day intervals. Control of disease applied alone was equivalent to that of treatments that included a tank-mix partner (Daconil or Iprodione Pro). For resistance management, it is recommended that Emerald be applied in tank-mix with other fungicides and another fungicide be used in alternation after 2 sequential Emerald applications.

Curalan (dicarboximide-class) also performed very well in this trial as did Insignia (QoI-class). Amongst the DMIs (Banner, Eagle, Tourney, Trinity, and Triton) performance was excellent to very good, with Tourney appearing weaker than the others when used at these experimental rates. Premixed DMI-products such as Reserve (triticonazole plus chlorothalonil) and Interface appeared to have excellent activity against dollar spot.

2009 Materials Under Trial

Trade Name	Manufacturer	Active Ingredient	Class	FRAC Code
Banner MAXX 1.3ME	Syngneta Professional Products	propiconazole	DMI	3
Bayleton 50WG	Bayer ES	triadimefon	DMI	3
Calcium nitrate (15.5-0-0)	---	calcium nitrate	---	
Concert 4.3SE	Syngneta Professional Products	chlorothalonil + propiconazole	multi-site + DMI	M5 + 3
Curlan 50EG	BASF Corp.	vinclozlin	dicarboximide	2
Daconil Ultrex 82.5 WG	Syngneta Professional Products	chlorothalonil	multi-site	M5
Eagle 20EW	Dow Agroscience	myclobutanil	DMI	3
Emerald 70WG	BASF Corp.	boscalid	SDHI	7
Gary's Green Ultra (13-2-3)	Grigg Brothers	urea, ammonium phosphate, potassium phosphate, potassium nitrate, iron, copper, manganese, and zinc glucoheptonates		
Headway 1.39ME	Syngneta Professional Products	azoxystrobn + propiconazole	QoI + DMI	11 + 3
Insignia 20WG	BASF Corp.	pyraclostrobin	QoI	11
Interface SC	Bayer ES	iprodione + trifloxylstrobin	dicarboximide + QoI	2 + 11
Iprodione Pro 2SE	BASF Corp.	iprodione	dicarboximde	2
P-K Plus (3-7-18)	Grigg Brothers	urea, ammonium sulfate, ammonium phosphate, potassium phosphite	---	---
Reserve 4.8SC	Bayer ES	chlorothalonil + triticonazole	multi-site + DMI	M5 + 3
Chipco Signature 80WG	Bayer ES	fosetyl-al	phosphonate	33
Tourney 50WG	Valent Professional Products	metconazole	DMI	3
Tourney G	Valent Professional Products	metconazole	DMI	3
Trinity 1.69SC	Bayer ES	triticonazole	DMI	3
Triton Flo 3.1SC	Bayer ES	triticonazole	DMI	3

Management of Root-knot Nematode Damage in Tomato.

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Funding from the UC-IPM Demonstration Grants Program is gratefully acknowledged.

Background: Root-knot nematodes (*Meloidogyne* species) are the most damaging nematodes in a wide variety of crops grown in California. There are many different root-knot nematode species, but in the warm climate areas of inland Central and Southern California, two species; *M. incognita* and *M. javanica* are most often associated with crop damage. These nematodes have a wide host range including many vegetables, ornamentals, and fruit crops. Above-ground, nematode-affected plants can show a range of symptoms that indicate that roots are not functioning properly. Symptoms can include wilting, stunting, yellowing, or general poor growth. Symptoms on the roots of infected plants consist of root-galling. This can be very obvious on some crops such as cucurbits, and tomato. To control root-knot nematodes, nematicides can be used effectively in commercial agriculture. However, because most nematicides are highly toxic, and therefore are subject to restrictions as to how, how much, when, where, and in which crops they can be used, they are not available to home gardeners.
Other, non-chemical approaches can be used that lower the nematode populations and/or prevent major nematode damage. Examples of such approaches include growing nematode-resistant varieties, using crop rotation with non-hosts or nematode-antagonistic plants, fallowing, and soil solarization.

The goal of this study is to show effects of such strategies when used separately and when used in combination on nematode infestation of tomato.

Trial design:
The trial is located at the UCR Agricultural Operations Center, Riverside. The trial consist of 100 micro-plots. Each microplot is a concrete tube (diameter 3 ft), open at the bottom, 5 ft-dug into ground, containing root-knot nematode infested sand (range 150 – 5,000 per 100 cc at start of trial).
<u>Main Treatments (5) march-may 2009:</u>

1. dry fallow (F)
2. marigold *Tagetes patula* cv. Single Gold
3. oil radish *Brassica sativa* cv. TerraNova
4. mustard Brassica juncea cv. Nemfix
5. dry fallow-Basamid nematicide.

Crops were grown to flowering, cut, chopped and incorporated. Soil samples were collected. Basamid™was applied. All microplots were watered to capacity.
<u>Sub-Treatments (2) may 2009:</u>

micro-plot covered with clear plastic for 3 wks (+)
micro-plot not covered (-)

Soil and air temperatures were recorded in several covered and non-covered plots. After removal of plastic, samples were collected.
<u>Sub-sub-Treatments (2) june-current (2009):</u>

susceptible tomato var. Floralina (S)
resistant tomato var. Celebrity (R)

Three four-wk-old tomato transplants were planted in each micro-plot 24 hr. after removal of plastic. One month after transplanting, plants were removed to leave 2 tomato plants per plot.

At harvest, fruit yield per plot, root-galling and nematode soil-populations will be determined. Data will be analyzed statistically to determine if main, sub, and sub-sub treatments affected tomato yield, root symptoms and nematode levels, and which treatment combination resulted in highest/lowest yields and nematode levels.

Evaluation of Cool-season Turfgrasses under Deficit Irrigation

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Irrigating turfgrasses below the optimal irrigation water requirement, or deficit irrigation, is one method to conserve irrigation water. The optimal irrigation water requirement is the optimal turfgrass water requirement adjusted for irrigation application uniformity and sometimes application efficiency. An irrigation amount of 80% below the optimal for cool-season turfgrasses would be considered a good start in most situations. Developing new cool-season turfgrasses with increased drought tolerance would also reduce the irrigation water requirement. Hybrids of perennial ryegrass with meadow fescue (*Festulolium*) are being developed and tested at UCR. They have shown an extraordinary capacity to survive during periods of drought.

Objective The objective of this study was to evaluate relative drought tolerance among *Festulolium* and tall fescue experimental lines, tall fescue commercial varieties, and commercial seed mixtures in the field when subjected to deficit irrigation during the warm season.

Materials and Methods This study was conducted at the UCR Turf facility on a specially-constructed irrigation plot. The native soil texture is a Hanford fine sandy loam, though the upper 4-inch root zone is a loam. The plot included 12 independently-controlled irrigation cells, each 20.0 x 20.0 ft. Each irrigation cell had a pop-up sprinkler at each of the four corners (Toro 300 Stream Rotor Series). The plot was controlled with a Hunter ICC controller. On July 11, 2008, *Festulolium* and tall fescue experimental lines, tall fescue commercial varieties, and commercial seed mixtures were seeded as shown on the plot plan. *Festulolium* was seeded at 4.4 lb/1000 ft^2 and all other treatments were seeded at 7.0 lb/1000 ft^2. Commercial seed mixtures were grown in 10.0- x 10.0-ft plots (4 plots per cell) while all other treatments were grown in 5.0- x 5.0-ft plots (16 plots per cell). Plots of all treatments were well established, representative, and well watered to the 9- to 12-inch soil depth before deficit irrigation was initiated on May 10, 2009. For 13 weeks, May 10 to August 7, all cells were irrigated at 80% ETcrop for cool-season turfgrass (80% CS turf), except for three cells (1,6,10) which were irrigated at 100% ETcrop for cool-season turfgrass (100% CS turf). Weekly irrigation amount was calculated by using the previous 7-day CIMIS ETo, monthly cool-season turfgrass crop coefficients, and a factor of 0.8 for 80% CS turf and a factor of 1.0 for 100% CS turf. Total weekly irrigation run time for each cell was calculated by using the irrigation precipitation rate (PR) for each cell. This was equally divided into four irrigation days per week and four irrigation cycles per irrigation day (16 start times per week). No adjustments were made for irrigation distribution uniformity (DU). Irrigation catch can tests were conducted on each cell on April 30. Average DU was 77% and average PR was 0.66 inch/hour. Irrigation heads were checked and adjusted once every 4 weeks. During the 13-week study, total CIMIS ETo was 14.24 inch, average total irrigation for the nine cells irrigated at 80% CS turf was 19.25 inch (74% CIMIS ETo), and the same for the three cells irrigated at 100% CS turf was 19.25 inch (91% CIMIS ETo). Rainfall during this period was 0.02 inch. Between January 1 and August 7, 2009, the plot was fertilized with a 15-5-8 fertilizer on the following dates and N rates (lb/1000 ft^2): March 2 (1.0); April 8 (0.4); May 7 (0.3); June 8 (0.3), and July 8 (0.3). Beginning in the second week of April, the plot was mowed two times per week at a 2.5-inch mowing height with a walk-behind rotary mower; clippings were collected. During July and August, the mowing frequency was reduced to not less than one mowing per week. Once every 3 weeks, visual turfgrass quality ratings were taken on a 1 to 9 scale with 1 = brown turf, 5 = minimally acceptable, and 9 = best tall fescue/cool-season turf. Many home lawn owners would be satisfied with a quality rating of 6. Percent brown leaf coverage ratings (0% to 100%) were taken once every 2 weeks. These ratings started on July 6 when there was sufficient expression of this trait. Cells with 5.0- x 5.0-ft plots had relatively large areas of brown leaf coverage from mid-July to the premature end of the study (August 7) due to irrigation patterns. This issue was more evident on cells being irrigated at 80% CS turf than 100% CS turf. As expected, these large brown areas confounded the data and made it difficult to ascertain actual plant treatment performance. To overcome this, we increased the number of replications to six by considering only treatments 1-12 in cells being irrigated at 80% CS turf (see plot plan, cells 3,4,8,9,11, and 12). Additionally, outliers were judiciously removed from the data set which was then statistically analyzed according to a randomized complete block design. Treatment means, shown under Study I in Tables 1 and 2, are fairly representative of actual performance without excessive influence from irrigation patterns. Cells containing 10.0- x 10.0-ft plots of commercial seed mixtures did not have excessive irrigation patterns. These data were statistically analyzed according to a randomized complete block design and treatment means are shown under Study II in Tables 1 and 2.

Results

1. Turfgrass quality substantially declined in July and August, following a mild June. In terms of **overall visual turfgrass quality**, all plant treatments, except Fawn tall fescue, produced at least a minimally acceptable turfgrass quality in both Study I and II (Table 1). In Study I, tall fescues had significantly higher overall quality than *Festulolium* (exception was Fawn tall fescue). In Study II, differences among commercial seed mixtures for overall quality were not significantly different, though differences were significant for the first three rating dates.

2. Percent brown leaf coverage was generally lower on August 1 than on July 18 for plant treatments other than tall fescue. Tall fescues exhibited significantly less **overall percent brown leaf coverage** than *Festulolium* in Study I. Similarly, there was a biological trend that tall fescue commercial seed mixtures in Study II (Scotts Landscapers' Mix and Pennington tall fescue) exhibited lower overall percent brown leaf coverage than commercial seed mixtures containing perennial ryegrass or Kentucky bluegrass or fine fescues (Pennington Sun/Shade and Scotts Traffic Mix).

3. *Festulolium* and commercial seed mixtures containing perennial ryegrass or Kentucky bluegrass or fine fescues exhibited nitrogen deficiency symptoms which resulted in slow shoot growth and recovery, less green leaf color, and increased brown leaf coverage. This negatively affected both visual turfgrass quality and percent brown leaf coverage ratings.

4. Since this is only one study, caution should be exercised when interpreting results. Due to limitations of this study, a second study with a revised protocol was initiated on September 5, 2009. It involves the same plot and subjecting representative, well-watered plant treatments to no irrigation for 14 to 21 days. On the theme of change, it also should be noted that new and improved experimental lines of *Festulolium* are continually being developed.

Practicum

Based on **current** information, irrigating tall fescue and other cool-season turfgrasses at the equivalent of 74% CIMIS ETo is not sufficient irrigation for the inland summer conditions of Riverside. Justification for this point includes 1) overall turfgrass quality of the current study would have been lower if the study would have continued to the end of the summer instead of August 7, 2) past studies concluded that 80% CIMIS ETo was not sufficient irrigation to maintain satisfactory tall fescue during the summer in Riverside, and 3) the combination of irrigating at the equivalent of 74% CIMIS ETo, typical DUs, and variable soil conditions result in irrigation patterns with areas of brown turf.

NORTH

Cell 12

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

Cell 11

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

Cell 10

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

Cell 9

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

Cell 8

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

Cell 7

d	**a**
c	**b**

Cell 6

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

Cell 5

a	**b**
d	**c**

Cell 4

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

Cell 3

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

Cell 2

d	**c**
b	**a**

Cell 1

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

Treatments in 5 x 5 ft plots
Cells 3,11,12 contain 1-12 plus 13-16
Cells 1,4,6,8,9,10 contain 1-12 plus 17-20

Festulolium
1. B7.1143
2. B7.1142

Tall fescue
3. 6.1657
4. 6.0891
5. 6.1534
6. 5.0541
7. 6.0726
8. 7.0536
9. 7.0537
10. 7.0535
11. 7.0534
12. Fawn
13. 7.0543
14. 8.0151
15. 7.0542
16. 7.1359
17. Avenger
18. Firenza
19. Bonsai 3000
20. 2nd Millenium

Treatments in 10 x 10 ft plots
Cells 2,5,7

a. Pennington Turf Type Tall Fescue (39% Forte, 29%Duranna, and 29% Signia tall fescue)
b. Pennington Sun and Shade Mix (49% Integra perennial ryegrass; 10% Blue Bonnet and 10% Kenblue Kentucky bluegrass; 15% Flyer creeping red fescue; 15% Shadow II chewings fescue)
c. Scotts Select Turf Landscapers' Mix (44% Adobe and 44% Chinook tall fescue; 10% Gulf annual ryegrass)
d. Scotts Pure Premium High Traffic Mix (30% Roadrunner, 25% Inspire, and 19% Showtime perennial ryegrass; 25% Abbey Kentucky bluegrass)

Table 1. Visual turfgrass quality[1] of cool-season turfgrasses when irrigated at 74% CIMIS reference evapotranspiration (ETo) from May 10 to August 7, 2009 in Riverside, Calif.

Treatment	May 9	May 30	June 20	July 11	Aug. 3	Overall
			Study I[2]			
Festulolium						
B7.1143	5.7 c[3]	5.4 d	5.3 e	4.7 b	4.8 bc	5.3 c
B7.1142	5.7 c	5.5 d	5.6 d	4.2 c	4.2 d	5.2 c
Tall fescue						
6.0891	6.6 ab	6.6 a	6.3 ab	5.6 a	5.3 a	6.1 ab
7.0534	6.7 a	6.6 a	6.4 a	5.5 a	5.3 a	6.2 a
7.0536	6.5 b	6.5 abc	6.3 ab	5.6 a	5.3 a	6.1 ab
6.1534	6.6 ab	6.3 c	6.3 ab	5.7 a	5.4 a	6.1 ab
5.0541	6.6 ab	6.5 abc	6.3 ab	5.7 a	5.4 a	6.2 a
6.1657	6.5 b	6.4 bc	6.1 c	5.5 a	5.1 ab	6.0 b
7.0537	6.5 b	6.5 abc	6.2 bc	5.7 a	5.2 ab	6.2 a
7.0535	6.5 b	6.4 bc	6.2 bc	5.7 a	5.2 ab	6.1 ab
6.0726	6.4 b	6.5 abc	6.3 ab	5.7 a	5.0 ab	6.1 ab
Fawn	4.0 d	4.0 e	4.0 f	4.0 c	4.4 dc	4.1 d
			Study II[4]			
Scotts Landscapers' Mix[5]	4.8 b	5.0 c	5.2 c	5.0 a	5.2 a	5.0 a
Pennington tall fescue	6.2 a	6.0 a	6.0 a	5.4 a	4.2 a	5.7 a
Pennington Sun/Shade[6]	5.7 a	5.3 bc	5.6 b	4.8 a	4.9 a	5.3 a
Scotts Traffic Mix[7]	5.5 ab	5.4 b	5.5 b	5.0 a	4.6 a	5.2 a

[1] Visual turfgrass quality ratings were on a 1 to 9 scale where 1= brown turf, 9= best tall fescue/cool-season turf, and 5= minimal acceptance.
[2] Each of the 12 turfgrass treatments were grown in six replicate, 5.0- x 5.0- ft plots (cells 3, 4, 8, 9, 11, 12; see plot plan).
[3] Means within the same study and column followed by the same letter are not significantly different, Fisher's protected LSD test, *P*=0.05.
[4] Each of the four turfgrass treatments were grown in three replicate, 10.0- x 10.0- ft plots (cells 2, 5, 7; see plot plan).
[5] Seed mixture was 88% tall fescue and 10% annual ryegrass (see plot plan for more details).
[6] Seed mixture was 49 perennial ryegrass, 20% Kentucky bluegrass, 15% creeping red fescue, and 15% chewings fescue (see plot plan for more details).
[7] Seed mixture was 74% perennial ryegrass and 25% Kentucky bluegrass (see plot plan for more detail).

Table 2. Percent brown leaf coverage of cool-season turfgrasses when irrigated at 74% CIMIS reference evapotranspiration (ETo) from May 10 to August 7, 2009 in Riverside, Calif.

Treatment	July 6	July 18	Aug. 1	Overall
		Study I[1]		
Festulolium				
B7.1143	42 a[2]	46 b	29 ab	39 b
B7.1142	46 a	60 a	35 a	47 a
Tall fescue				
6.0891	14 b	18 cd	16 c	16 c
7.0534	17 b	14 d	16 c	16 c
7.0536	14 b	19 cd	18 c	17 c
6.1534	14 b	21 cd	17 c	17 c
5.0541	16 b	19 cd	17 c	18 c
6.1657	19 b	20 cd	19 c	19 c
7.0537	15 b	24 cd	20 c	20 c
7.0535	22 b	20 cd	18 c	20 c
6.0726	18 b	22 cd	23 bc	21 c
Fawn	18 b	27 c	22 bc	22 c
		Study II[3]		
Scotts Landscapers' Mix[4]	18 b	25 a	18 a	20 c
Pennington tall fescue	22 b	26 a	26 a	24 bc
Pennington Sun/Shade[5]	42 a	43 a	28 a	38 ab
Scotts Traffic Mix[6]	50 a	45 a	33 a	43 a

Each of the 12 turfgrass treatments were grown in six replicate, 5.0- x 5.0- ft plots (cells 3, 4, 8, 9, 11, 12; see plot plan).

[2] Means within the same study and column followed by the same letter are not significantly different, Fisher's protected LSD test, P=0.05.

[3] Each of the four turfgrass treatments were grown in three replicate, 10.0- x 10.0- ft. plots (cells 2, 5, 7; see plot plan).

[4] Seed mixture was 88% tall fescue and 10% annual ryegrass (see plot plan for more detail).

[5] Seed mixture was 49% perennial ryegrass, 20% Kentucky bluegrass, 15% creeping red fescue, and 15% chewings fescue (see plot plan for more detail).

[6] Seed mixture was 74% perennial ryegrass and 25% Kentucky bluegrass (see plot plan for more detail).

Strategies for Converting from Cool-Season Turf to Warm-Season Turf for Water Conservation

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Objectives: In 2008, a pilot study was initiated to determine optimal timing and planting rate of UC Verde buffalograss plugs along with eradication method of tall fescue to achieve the most rapid conversion to buffalograss with the least amount visual discoloration.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam

Experimental Design: Randomized complete block with 3 replications

Plot Size: 5' by 10'

Species/Cultivars: Mature stand of 'Crossfire 2' tall fescue; UC Verde buffalograss

Application of Roundup ProMax: 8/19/2008, 4.7 qts/A

Application Information:
CO_2 Bicycle sprayer
TeeJet 8002VS Nozzles
19" nozzle spacing
22" boom height
Speed: 1 mph
Output: 2gal/1000ft^2
Pressure: 41 psi @tank and 38 psi @handle
Calibration of 1060 ml/nozzle/minute

Plugs Established: 8/29/2008

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

Mowing Height: 3 inches

Irrigation Regimes: Once the buffalograss overcame transplant shock, plots were to be irrigated according to buffalograss water use needs. This was not done until 2008

Data Collection: Buffalograss rate of establishment and cover

Acknowledgments: Special thanks to Florasource, Ltd. and Monsanto for donating the UC Verde buffalograss and Roundup herbicide, respectively.

North

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

Treatments

1. Roundup entire plot, plant plugs at 6” spacing
2. Roundup entire plot, plant plugs at 12” spacing
3. Roundup entire plot, plant plugs at 18” spacing
4. Remove sod, plant plugs at 12” spacing
5. Roundup 10” strips, plant plugs within at 12” spacing
6. Roundup 10” strips, plant plugs within at 12” spacing; intended to repeat procedure on adjacent living turf in June 2009 (not completed)
7. Plant plugs at 12” spacing in untreated tall fescue turf

8-12. Same as treatments 1-7, but intended to plant in June and August 2009 (not completed)

Table 1. Establishment rate of UC Verde buffalograss and weed encroachment during conversion from tall fescue.

Cover	% Buffalo	% Buffalo	% Buffalo	% Poa annua	% Buffalo	% Broadleaf
Treatment	10-2-2008	11-10-2008	12-4-2008	5-12- 2009	5-12- 2009	5-12-2009
1. Roundup; 6 inch spacing	57	83	90	9	92	1
2. Roundup; 12”	30	58	67	17	83	2
3. Roundup; 18"	7	18	23	22	56	6
4. Remove sod; 12"	38	55	73	2	96	3
5. Roundup strips; 12”	10	13	15	3	25	1
6. Roundup strips; 12”	10	17	18	2	28	2
7. Untreated tall fescue; 12”	5	5	6	7		
LSD (P=.05)	9.4	13.6	21	6.7	14.6	6.6
CV	23.6	21.5	27.9	41.8	12.7	151

Results:

- Most rapid conversion occurred by eradicating existing stand of tall fescue and planting UC Verde on 6-inch spacing.
- 12-inch spacing resulted in slower establishment, but faster than 18-inch spacing.
- Removing sod prior to plugging did not provide an advantage for establishment of buffalograss compared to treatment with Roundup.
- Plugging UC Verde into living tall fescue turf is not advised.

Table 2. Effects of Revolver (foramsulfuron) herbicide applied on 8-11-09 on UC Verde buffalograss tolerance and control of tall fescue and weeds.

Description	Turf Injury (1-9,1=worst	Turf Quality (1-9,9= best)	% Leaf Fire (0-100)	% Spurge Control (0-100)	% Dandelion Control (0-100)	Turf Quality (1-9, 9 = best)	% Leaf Fire (0-100)
Treatment	8-19-2008	8-26-2009				9-09-2009	
1. Revolver 18oz/Acre	7	7	12			7	7
2. Untreated	7	7	17			7	13
3. Revolver 26oz/Acre	7	7	18			7	8
4. Untreated	6	6	6			7	12
5. Untreated	7	7	7			7	28
6. Revolver 26oz/Acre	7	7	7			6	90
7. Revolver 26oz/Acre	4	3	57			2	88
8. Revolver 26oz/Acre	7	5	23	20	40	2	90
9. Untreated	7	7	2	0	30	7	1
10. Revolver 18oz/Acre	5	3	57			2	87
11. Revolver 26oz/Acre	5	4	38			2	88
12. Untreated	5	5	38			6	32
LSD (P=.05)	1.9	1.9	30.4	NS	NS	1.2	26.7
CV	18.4	20.1	76.7			14	34.5

Results:

- Revolver caused only slight and short term discoloration on UC Verde buffalograss at both application rates and would serve as a good choice for selective removal of tall fescue and several weed species during conversio

On August 11, 2009, a second study was initiated to evaluate safety of Revolver (foramsulfuron) herbicide on UC Verde buffalograss and efficacy against tall fescue and weeds. Revolver was applied at 18 oz product/A on treatments 1 and 10 listed above, and 26 oz product/A on treatments 3, 6, 7, 8, and 11. Methylated seed oil was added to the tank at 0.5% v/v. The remaining treatments were untreated.

In 2009, a second turf conversion study was initiated at the UCR Turfgrass Research Center in Riverside and at the South Coast Field Station in Irvine.

Objectives

1. Investigate the most efficient and effective method(s) for converting turf from cool-season to warm-season species, thereby significantly reducing water use.
2. Compare five warm-season species and two establishment methods (seeding vs. plugging) in inland and coastal climates in southern California.
3. Evaluate use of a colorant in addition to mowing and fertility practices to offset or delay turf discoloration during conversion and dormancy.
4. Determine effects of establishment method on weed encroachment followed by best methods of weed eradication.

Study Locations

1. UCR Turfgrass Research Facility, Riverside
2. South Coast Research Field Station, Irvine

Existing Study Conditions

1. Mature tall fescue turf maintained under lawn conditions
2. Mowed 1-2 times/week at 2 inches using a rotary mower
3. Irrigated at ≥80% ET to maintain green color
4. 4+ lbs N/1000 ft^2/yr

Conversion Methods Prior to Planting

1. Apply nonselective herbicide (Roundup Pro Max) to eradicate tall fescue
2. Scalp tall fescue turf down to lowest height adjustment on rotary mower
3. Leave tall fescue as is

Turfgrass Species and Establishment Methods

1. ‘Tifsport’ hybrid bermudagrass plugs (chosen because of fall color retention and less aggressive growth habit)
2. ‘DeAnza’ zoysiagrass plugs (UCR release chosen because of fall color retention)
3. ‘UC Verde’ buffalograss plugs (UC release chosen because of exceptional drought resistance)
4. ‘Palmetto’ St. Augustinegrass plugs (species chosen because of shade tolerance)
5. ‘Sea Spray’ seashore paspalum plugs (species chosen because of exceptional salt tolerance)
6. ‘NuMex Sahara’ bermudagrass seed
7. ‘Sea Spray’ seashore paspalum seed

1.25-inch diameter plugs planted on 12-inch spacing
Seeding rate: 1 lb pure live seed/1000 ft^2 broadcast after solid tine aeration

Turfgrass Colorant

1. Half of each plot will be treated with Greenlawnger colorant every 3-5 weeks to help mask discoloration due to conversion practices and winter dormancy.

Study Conditions After Conversion

1. Syringed lightly 5 times/day for 3 weeks following planting.
2. Reduced irrigation to 60% ET_o to favor warm-season grasses
3. Mow scalped and Roundup plots 1-2 times/wk at 1.5 inches using a reel mower
4. Mow remaining plots 1-2 times/week at 2.5 inches using a rotary mower
5. 4 lbs N/1000 ft^2/yr with rates and frequency designed to optimize winter color retention based on previous research
6. Weed control as needed to maintain uniformity
7. Possible use of a selective herbicide like Revolver that will eradicate tall fescue and weeds from the stand of warm-season turf

Experimental Design

1. Completely randomized split (turf colorant) block with 3 replications per study location
2. 7 species/establishment methods x 3 conversion methods x 3 replications = 63 plots
3. Main plots: 7 ft x 7 ft; sub-plots 3.5 ft x 7 ft
4. 3,087 ft^2 study area/location

Ratings (monthly or as needed)

1. Warm-season turf cover (using 12-inch grid)
2. Turf quality
3. Turf color
4. Fall/winter color retention/spring greenup
5. Weed encroachment

Study Timeline

1. UCR study was planted on June 19, 2009 and South Coast study on July 15,2009

Acknowledgments

Special thanks to West Coast Turf and Florasource, Ltd. for donations of plant materials, and to Monsanto , Target Specialty Products, and Becker Underwood for donating chemicals.

Turf Conversion Study Plot Map

North

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

O O

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

South

O= Controller

1. No Removal, Tifsport Bermuda
2. No Removal, De Anza Zoysia
3. No Removal, UC Verde Buffalo
4. No Removal, Palmetto St. Augustine
5. No Removal, Sea Isle 1Seashore Paspalum
6. No Removal, Princess 77 Bermuda Seed
7. No Removal, Sea Spray Seashore Paspalum Seed
8. Scalp, Tifsport
9. Scalp, De Anza
10. Scalp, UC Verde
11. Scalp, Palmetto
12. Scalp, Sea Isle 1
13. Scalp, Princess 77 Seed
14. Scalp, Sea Spray Seed
15. Round Up, Tifsport
16. Round Up, De Anza
17. Round Up, UC Verde
18. Round Up, Palmetto
19. Round Up, Sea Isle 1
20. Round Up, Princess 77 Seed
21. Round Up, Sea Spray Seed

Postemergence Broadleaf Weed Control

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Objectives:	Evaluate existing, experimental, and biological herbicides for broadleaf weed control in combinations of 4 and 8 weeks prior to Field Day.
Location:	UCR Turfgrass Research Center, Riverside, CA
Soil:	Hanford fine sandy loam
Site Description:	Former low-input, reduced maintenance study established in May 2003 with 24 traditional, experimental, and native warm and cool season grasses. Until 2009, study received deficit irrigation for warm season turf (50% ET_o) and 1 lb N/1000 ft^2/year. In 2009, irrigation was returned to cool season (80% ET_o) level and fertilized with 2 lbs N/1000 ft^2 prior to application of herbicide treatments.
Experimental Design:	Randomized complete block with 3 replications; herbicide treatments were assigned randomly according to turfgrass species; therefore phytotoxicity to turfgrass was noted on a plot by plot basis; unless otherwise noted, each plot was divided into 4 sections: untreated, application 4 weeks before Field Day, 8 weeks, and 4 + 8 weeks.
Plot Size:	5' by 10'
Treatment Dates:	July 28, 2009 (8 weeks before Field Day) August 21, 2009 (4 weeks before Field Day)
Application Information:	CO_2 hand-boom sprayer; 45 or 90 GPA
Notes:	Irrigation was mistakenly turned off from July 28 to August 3; plots were well-watered on July 27.
Ratings:	Turfgrass phytotoxity (1-9, 9 = none); Percent weed control based on untreated area of each plot.

Post Emergence Broadleaf Weed Control Plot Map

5x10 Plots; 45 GPA

North

1A I	2B	3C	4D	5E	6F	7G	8H	9I
10J	11K	12L	13M	14N	15O	16P	17Q	18R
19S	20T	21U	22V	23W	24X	7B II	23T	12O
22J	9E	21Q	2H	14M	6R	8U	13N	24K
5W	15D	3X	10V	17F	11H	19C	20L	1S
16P	4A	18G	14N III	4U	22G	6K	15M	7Q
5D	16I	2F	18C	8S	1T	12B	13O	24R
10L	3H	17E	9V	19W	21P	11X	23A	20J

South

#	Treatment	Rate	Timing before Field Day	Letter	Name
1	Dow 0002 NIS	2.5pints/A 0.25% V/V	8 Weeks	A	Hybrid Texas bluegrass
2	Dow 0002 NIS	3.5pints/A 0.25% V/V	8 Weeks	B	*Zoysia tenuifolia*
3	Dow 0003 NIS	3pints/A 0.25% V/V	8 Weeks	C	Hard Fescue
4	Dow 0003 NIS	4pints/A 0.25% V/V	8 Weeks	D	Canada Bluegrass
5	Escalade 2 NIS	2.25pints/A 0.25% V/V	8 Weeks	E	Seashore Paspalum
6	Escalade 2 NIS	3pints/A 0.25% V/V	8 Weeks	F	Crested hairgrass
7	Trimec Classic NIS	3.0pints/A 0.25% V/V	8 Weeks	G	Russian wildrye
8	Trimec Classic NIS	4.0pints/A 0.25% V/V	8 Weeks	H	Blue grama ‘Hatchita’
9	Turflon Ester NIS	2pints/A 0.25% V/V	8 Weeks	I	Blue grama ‘Alma’
10	Turflon Ultra NIS	2pints/A 0.25% V/V	8 Weeks	J	Buffalograss ‘SWI 2000’
11	Touchdown NIS	2qts/A 0.25% V/V	8 Weeks	K	Sideoats grama
12	Touchdown NIS	2qts/A 0.25% V/V	4 Weeks	L	Bermudagrass ‘Sahara’
13	Touchdown Tenacity NIS	2qts/A 8oz/A 0.25% V/V	8 Weeks	M	Bermudagrass ‘Princess’
14	Tenacity NIS	8oz/A 0.25% V/V	8 Weeks	N	Saltgrass ‘A137’
15	Tenacity NIS Tenacity NIS	8oz/A 0.25% V/V 5oz/A 0.25% V/V	4 Weeks 8 Weeks	O	Saltgrass ‘A138’
16	Tenacity NIS	5oz/A 0.25% V/V	4 Weeks	P	Buffalograss ‘UC Verde’
17	Celsius MSO	3.5oz/A 0.5% V/V	8 Weeks	Q	Buffalograss ‘Legacy’
18	Celsius MSO	3.5oz/A 0.5% V/V	8 Weeks	R	Buffalograss ‘Cody’
19	Celsius MSO	4.5oz/A 0.5% V/V	8 Weeks	S	Zoysiagrass ‘De Anza’
20	Celsius MSO	4.5oz/A 0.5% V/V	8 Weeks	T	Zoysiagrass ‘Zenith’
21	Corn Gluten Meal	10lbs/1000ft2	8 Weeks and 4 Weeks	U	Spike Muhly
22	Urea	9lbs/1000ft2	8 Weeks and 4 Weeks	V	D. sporobolis ‘DT 18’
23	Clove Oil Urea	8% V/V 9lbs/1000ft2	8 Weeks and 4 Weeks	W	D. sporobolis ‘DT 12’
24	Clove Oil Corn Gluten Meal	8% V/V 10lbs/1000ft2	8 Weeks and 4 Weeks	X	D. sporobolis ‘DT 16’

Table 1. Percent control of broadleaf weeds (0-100) on 9-4-09, six weeks after 1st treatment (8 weeks before Field Day) and two weeks after 2nd treatment (4 weeks before Field Day). Turf Injury rated on a 1-9 scale, 9 = no injury.

Weed Species	**Dandelion**			**Spurge**			**Cudweed**			**Turf Injury**		
Timing	**1st**	**2nd**	**1+2**	**1st**	**2nd**	**1+2**	**1st**	**2nd**	**8+4**	**1st**	**2nd**	**1+2**
Trt #												
1	80	85	93	60	83	93	60	80	95	8	9	8
2	74	85	100	75	87	95	100	85	100	9	9	8
3	73	82	100	83	77	93	87	83	100	9	8	8
4	60	87	100	63	80	87	50	80	100	8	8	7
5	53	87	88	53	85	90	93	88	98	9	9	8
6	90	98	98	85	100	95	88	95	97	9	9	9
7	63	73	60	35	55	70	95	55	95	8	9	8
8	73	70	97	63	70	90	93	65	100	9	9	9
9	70	90	97	60	77	97	93	75	95	9	9	9
10	47	90	97	45	93	97	40	85	95	8	8	7
11	57	73	95	45	45	98	93	83	97	5	5	4
12	15	78		0	0		32	98		9	7	
13	63	98	100	48	48	100	95	98	100	7	7	5
14	11	90	100	53	30	80	45	90	90	9	7	7
15	52	90	90	10	10	67	80	80	100	9	9	9
16	13	58		13	13		0	58		9	8	
17	83	73	95	75	75	92	90	65	95	9	8	8
18	90	70	95	77	77	95	93	70	95	7	9	8
19	97	87	98	90	90	95	58	75	93	9	8	7
20	60	72	100	63	63	100	93	68	100	9	8	8
21	0	0	0	0	0	0	0	0	0	9	9	9
22	3	85	88	3	3	88	0	85	85	8	6	6
23	13	90	87	10	10	90	95	90	85	8	6	6
24	47	33	33	23	23	33	20	0	0	9	7	7
LSD (P=.05)	49.4	30.8	17.4	52.8	38.1	21.6	44.9	30.4	6.2	1.5	1.5	2.0
CV	55.8	24.3	12.1	67.7	42.4	15.4	40	24.6	4.2	10.6	11.3	16.4

Preliminary Results:

- Weed populations and densities varied among the plots and were impacted by turfgrass species.
- Several herbicides provided effective control of all broadleaf species, especially following two applications.
- Urea and Matran provide quick weed burndown (and turf injury) but weed recovery appears eminent.

Selective Removal of Persistent Perennial Ryegrass from Bermudagrass Turf

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Objectives:	Evaluate existing and experimental herbicides for removal of perennial ryegrass that persists in bermudagrass turf.
Location:	UCR Turfgrass Research Center, Riverside, CA
Soil:	Hanford fine sandy loam
Site Description:	'Princess' bermudagrass overseeded with Ewing Eagle Turfgrass Blend of perennial ryegrass (43% SR4600, 28% SR4220, 25% SR4330) on October 19, 2007
Experimental Design:	Randomized complete block with 3 replications
Plot Size:	5' by 8'
Treatment Dates:	July 23, 2009 (8 weeks before Field Day) July 28,2009 (Treatments 10,11 and 15 were applied) August 20, 2009 (4 weeks before Field Day) Turflon Ester was applied at 16 oz/A + 0.25% MSO nine days before Field Day to help reduce competition of bermudagrass and allow for easier determination of ryegrass control from herbicide treatments.
Application Information:	CO_2 bicycle sprayer; 39 psi (tank) 30 GPA
Ratings:	Turfgrass phytotoxicity (1-9, 9 = none); Percent ryegrass control compared to untreated control

Post emergence Control of Persistent Perennial Rye Grass in Bermuda Turf
Plot Map

5x8 plots; 30GPA

North

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

South

#	Treatment	Rate	Timing Before Field Day
1	Revolver MSO AMS	26oz/A 0.5% V/V 3lb/A	8 weeks
2	Revolver MSO AMS	26oz/A 0.5% V/V 3 lb/A	4 weeks
3	Specticle MSO	0.094oz/1000ft2 0.5% V/V	8 weeks
4	Specticle MSO	0.094oz/1000ft2 0.5% V/V	4 weeks
5	Celsius MSO	3.5oz/A 0.5% V/V	8 weeks
6	Celsius NIS	3.5oz/A 0.5% V/V	4 weeks
7	Monument NIS	15g/A 0.25% V/V	8 weeks
8	Monument NIS	15g/A 0.25% V/V	4 weeks
9	Monument NIS	10g/A 0.25% V/V	8 weeks and 4 weeks
10	Dow Exp. NIS	16oz/A 0.25% V/V	8 weeks
11	Dow Exp. NIS	8oz/A 0.25% V/V	8 weeks and 4 weeks
12	Kerb NIS	3lb/A 0.25% V/V	8 weeks
13	Kerb Revolver MSO AMS	1.5 lb/A 18 oz/A 0.5% V/V 3lb/A	8 weeks
14	Kerb Monument NIS	1.5lb/A 10g/A 0.25% V/V	8 weeks
15	Kerb Dow Exp. NIS	1.5 lb/A 8oz/A 0.25% V/V	8 weeks
16	Control		

Table 1. Bermudagrass phytotoxicity (1-9, 1 = dead) and percent control of perennial ryegrass (0-100) following application of herbicide treatments on 7-23-09 (trts 10, 11, 15 applied on 7-28-09). Treatments 2, 4, 6, 8, 9, and 11 were applied or repeated on 8-20-09.

	July 30,2009		**Aug 10, 2009**	**Aug 20, 2009**		**Aug 24, 2009**		**Aug31,2009**	**Sep 9,2009**
	Phyto	**% control**	**% control**	**% Control**	**Phyto**	**% Control**	**Phyto**	**%Contol**	**% control**
Trt #									
1	8	10	95	97	9	89	9	90	90
2	9	0	0	0	8	13	8	95	96
3	8	13	43	37	9	13	9	30	37
4	9	0	0	0	9	3	9	38	40
5	6	50	95	97	9	93	9	82	92
6	9	0	0	0	7	13	7	93	98
7	7	12	95	98	9	94	9	97	96
8	9	0	0	0	8	27	8	99	98
9	7	18	95	92	7	66	8	95	97
10	9	0	13	20	9	0	9	0	0
11	9	0	43	0	8	10	9	47	53
12	9	0	73	57	9	57	9	80	67
13	7	15	85	63	9	73	9	53	50
14	7	17	88	70	9	30	9	55	70
15	8	8	33	47	9	25	9	23	43
16	9	0	0	0	9	0	9	0	0
LSD (P=.05)	0.2	3.5	9.1	10.8	0.4	15.7	0.7	11.3	10.4
CV	1.8	23.2	11.5	15.4	2.8	24.7	4.8	11.1	9.7

Preliminary Results:

- Revolver, Monument, and Celsius provided the best overall control of ryegrass regardless of application date; however, Celsius did cause some short-term injury to bermudagrass.
- Kerb applied alone or in combination with other herbicides was not as effective for ryegrass control.

Groundcovers for Water Conserving Landscapes

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Landscape groundcovers are a diverse group of trailing or spreading plants that naturally form a continuous soil covering. They can range in height from about six inches to nearly three feet tall, and may be woody, herbaceous, or succulent. Groundcovers are often looked upon as turfgrass substitutes in irrigated landscapes of the southwestern United States based on the presumption they require less water and other inputs to maintain high aesthetic quality. There is limited research-based information quantifying water requirements and climatic adaptability of the many plants that are potential landscape groundcovers. Unlike turfgrass, much of the information describing groundcover irrigation needs is anecdotal and non-quantitative. Thus, it can be impossible to accurately compare water needs of many groundcovers to those of turfgrass.

In a previous study, we looked at six groundcovers representing a range of growth habits and potential adaptations to drought to compare their minimum water needs. We found they varied widely and unpredictably in their minimum water needs and drought responses. We concluded that many groundcover species (in our study *Vinca major*, *Baccharis pilularis*, *Drosanthemum hispidum*, and *Hedera helix*) are able to maintain acceptable landscape performance when presented with significant drought and have minimum water needs around 30-40% of ETo, which is similar to that of warm-season turfgrass. Other species (exemplified in our study by *Potentilla tabernaemontanii* and *Gazania* hybrid*)* are not able to withstand any drought and have minimum water needs similar to cool-season turfgrasses. Thus, the idea is not true that groundcovers in general require less water than turfgrass to remain aesthetically appealing in the landscape.

This new study of 18 groundcover plant materials is designed to evaluate their adaptation to the inland valley climate and their performance at a reduced level of irrigation. After these plants become established, we plan to challenge them with decreasing levels of irrigation beginning with 60% of real-time ETo. The plants represent a mix of native, so-called California Firendly, and non-native as well as woody and herbaceous plant materials.

<u>Plant Species:</u>

1. Arctostaphylos hybrid
2. Cotoneaster dammeri
3. Rosemarinus officinalis
4. Juniper procumbans nana
5. Achillea tomentosa
6. Lonicera japonica
7. Aptenia cordifolia
8. Trachelospermum jaminoides
9. Thymus praecox arcticus
10. Baileya multiradiata
11. Salvia ‘Gracias’
12. Ajuga reptans
13. Dahlea greggii
14. Lantana montevidensis
15. Hypericum repens
16. Cistus crispus
17. Corethrogyne filaginifolia
18. Grindelia stricta venulos

<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 #1 containers or from flats as rooted cuttings
- No soil amendments

The National Turfgrass Evaluation Program at UCR

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The National Turfgrass Evaluation Program (NTEP) is designed to develop and coordinate uniform evaluation trials of turfgrass varieties and promising selections in the United States and Canada. Test results can be used by national companies and plant breeders to determine the broad picture of the adaptation of a cultivar. Results can also be used to determine if a cultivar is well adapted to a local area or level of turf maintenance.

Information such as turfgrass quality, color, density, resistance to diseases and insects, tolerance to heat, cold, drought and traffic is collected and summarized by NTEP annually. Plant breeders, turfgrass researchers and extension personnel use NTEP data to identify improved environmentally-sound turfgrasses. 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 many other countries worldwide.

NTEP is a cooperative effort between the non-profit National Turfgrass Federation, Inc., and the United States Department of Agriculture (USDA). NTEP is headquartered at the Beltsville Agricultural Center (BARC) in Beltsville, Maryland U.S.A.

NTEP tests are initiated, established, maintained and evaluated using standardized testing protocols. Data is collected across the U.S.A. and Canada by university researchers using standard procedures and formats. Data is submitted to NTEP, computer formatted and statistically analyzed. Annual progress reports are produced for each species tested and at the end of the testing period, a final summary report is produced. NTEP reports can be found at http://www.ntep.org/.

At UCR there are four current NTEP studies:

entries		date planted
National Tall Fescue	113	Aug 06
National Bermudagrass	31	June 07
National Seashore *Paspalum*	6	June 07
National Zoysiagrass	11	June 07

AG Sod Company has generously helped support the care of the plots in the UCR NTEP program in 2007 and 2008.

2006 NTEP Tall Fescue Trial
(12E-1,5,9)

N

12E-9

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
(12E-1,5,9)

N

12E-5

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
(12E-1,5,9)

N

12E-1

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							

Entry		Entry		Entry		Entry	
1	KY-31	31	Toccoa	61	BAR Fa 6253	91	Darlington
2	Spyder	32	Terrier	62	Talladega	92	KZ-1
3	Bravheart	33	Raptor II	63	Tahoe II	93	Renovate
4	Umbrella	34	Aggressor	64	06-WALK	94	Compete
5	Cannavaro	35	Essential	65	Escalade	95	Hudson
6	Greenbrooks	36	Fat Cat	66	06-DUST	96	Reunion
7	Plato	37	IS-TF-161	67	Honky Tonk	97	GWTF
8	Lindbergh	38	MVS-341	68	PSG-85QR	98	KZ-2
9	Aristotle	39	MVS-1107	69	STR-8GRQR	99	AST9002
10	Einstein	40	Titanium	70	PSG-82BR	100	AST9001
11	Silverado	41	Firecracker LS	71	Faith	101	RNP
12	Monet	42	M4	72	GO-1BFD	102	AST-4
13	Cezanne Rz	43	0312	73	SR 8650	103	AST 7003
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	ATF-1199
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
20	SC-1	50	Biltmore	80	JT-41	110	Traverse SPR
21	ATF 1328	52	Padre	81	JT-36	111	Rhambler SPR
22	Skyline	52	Magellan	82	JT-45	112	Firenza
23	Hemi	53	Catelyst	83	JT-42	113	Falcon IV
24	Turbo RZ	54	Stetson II	84	JT-33		
25	Turbo	55	Finelawn Xpress	85	BGR-TF1		
26	Bullseye	56	Falcon NG	86	BGR-TF2		
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		

2007 NTEP Bermudagrass Trial
(12E-19)

N

12E-19

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			

2007 NTEP Bermudagrass Trial
(12E-19)

Entry	
1.	Riviera
2.	Princess 77
3.	NuMex-Sahara
4.	SWO-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.	PST-R6FLT
16.	Sunsport
17.	Patriot
18.	OKC 1119
19.	OKC 1134
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

2007 NTEP Zoysiagrass Trial
(12E-18S)

N

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		

Entry	
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

2007 NTEP *Paspalum vaginatum* Trial
(12E-18N)

N

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

entry	
1	Salam
2	Sea Isle 1
3	SRX 9HSCP
4	UGA 7
5	Uga 22