UC RIVERSIDE
UNIVERSITY OF CALIFORNIA

Turfgrass & Landscape Research Field Day

September 12, 2013

University of California Agriculture and Natural Resources

UCR turfgrass science

CA TURFGRASS & LANDSCAPE FOUNDATION
"Keeping California Green and Growing"

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 2013 UCR Turfgrass and Landscape Research Field Day. This marks the sixth 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.

Field Day continues to evolve to meet the interests and needs of our industry. For the second consecutive year, we welcome several of our industry partners under the Exhibitor's Tent. Please take the time to visit them and learn more about new products and services while enjoying complimentary food and beverages. On the research side, you will see several new state-of-the-art research areas designed to study water and salinity management issues on turf and landscapes. Last but not least, while this handout serves to give you a brief synopsis of our current research activities for the research tours, you can read or print our full research reports in their entirety from the Field Day website, **http://ucanr.org/sites/turfgrassfieldday**.

What is the California Turfgrass & Landscape Foundation (CTLF)? The CTLF is a 501(c)(3) organization made up of industry partners and individual stakeholders whose 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 stop by the CTLF booth and visit with Bruce Williams, CTLF Executive Director, and learn more about how you can make a difference in making our industry stronger than ever before. Also stay tuned for more information including past and present turfgrass and landscape research findings (including Field Day reports) on the Foundation's website, **www.CAtlf.com**.

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 Peggy Mauk, Sue Lee, Steve Ries, Sherry Cooper, and Lauren McNees. Production of this publication and online reports would not have been possible without assistance from Ms. Magali Lopez (UCR Class of 2010). 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 today's delicious food and beverages under the shade of tents!

Enjoy Field Day! And we hope to see you again next year on **Thursday, September 11, 2014.**

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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Jim Baird
John Chater
Tim Close
Elizabeth Crutchfield
Sean Cutler
Vic Gibeault
Jacob Gray
Darrel Jenerette
Toan Khuong
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Pace Turfgrass Research Institute

Wendy Gelernter
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Thanks for your support throughout the year!

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- Arysta Life Science
- Baroness
- BASF Specialty Products
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- Best Fertilizer
- Best West Turf
- Blue Moon Farms, LLC
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- California Golf Course Superintendents Association
- California Sod Producers Association
- California Turfgrass and Landscape Foundation
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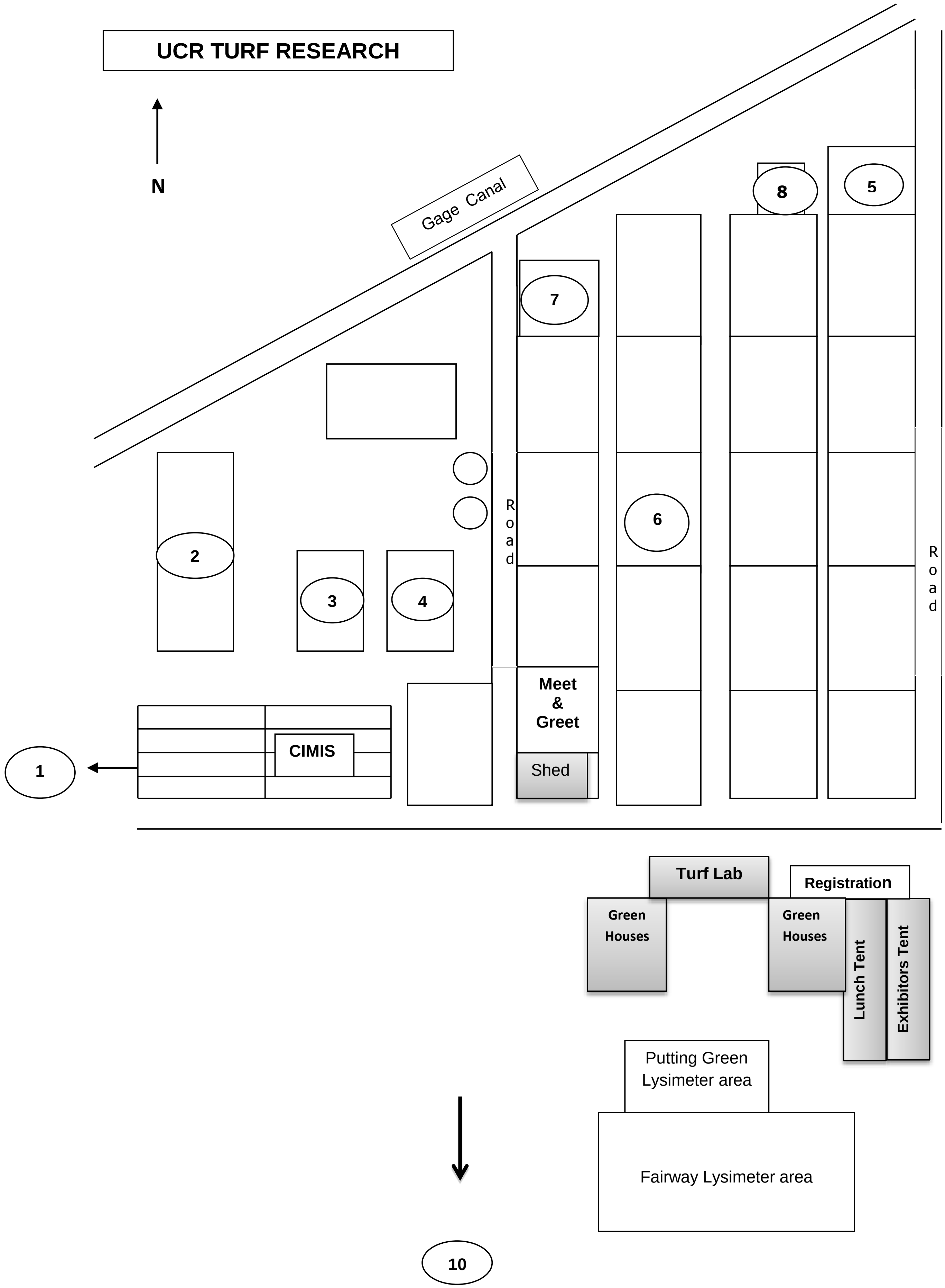

UCR TURF RESEARCH
N
Gage Canal
8
5
7
Road
2
3
4
6
Road
Meet & Greet
Shed
CIMIS
1
Turf Lab
Registration
Green Houses
Green Houses
Lunch Tent
Exhibitors Tent
Putting Green Lysimeter area
Fairway Lysimeter area
10

Turfgrass and Landscape Research Field Day Agenda

7:00 am **Exhibitor set-up**

7:30-8:30 **Registration and Trade Show**

8:30 **Welcome and Introductions**
Peggy Mauk, Mikeal Roose and Jim Baird

8:45 – 10:10 **Field Tour Rotation #1** (20 minutes/ station)

Stop #1 Black Tent: **Management of anthracnose, dollar spot and localized dry spots**
Tyler Mock, Ryan Nichols and Jim Baird

Stop #2 Red Tent: **Evaluation of products for turf water conservation**
Marco Schiavon

Stop #3 White Tent: **Establishment of turfgrass using subsurface drip vs. overhead sprinkler irrigation**
Bernd Leinauer and Matteo Serena

Stop #4 Blue Tent: **Evaluation of products to alleviate salinity stress**
Alea Miehls and Elena Sevostianova

10:10 – 10:40 **Break and Trade Show**

10:40 – 12:00 **Field Tour Rotation #2 (20 minutes / station)**

Stop #5 Black Tent: **Groundcovers and buffalograss for water conserving landscapes…how long can they go?**
Don Merhaut and Dennis Pittenger

Stop #6 Red Tent: **Postemergence control of crabgrass and broadleaf weeds**
Alea Miehls

Stop # 7 White Tent: **Drought tolerant turfgrasses for Southern California**
Jim Baird

Stop #8 Blue Tent: **Once and for all, do fungicides really offer plant health benefits?**
Ryan Nichols

12:00 – 1:00 **Lunch and Trade Show**

1:00 -1:30 **Concurrent Sessions**

Stop #9 Specialist/Advisor updates under the tent

Purple false brome (Brachypodium distachyon), a monocot model for studying host/pathogen interactions with root-knot nematodes- Ole Becker

Updates on Evapotranspiration Adjustment Factor and Spanish Language Materials for Professional Landscapers Projects - Janet Hartin

Biochar Effects on Turf Management - Elizabeth Crutchfield

Stop #10 Kikuyugrass Management – Tyler Mock
(bus will provide transportation)

1:30 – 2:00 Sessions repeat

2:00 Adjourn

CDPR Credits: 2.5 Hours

CIMIS Data Sep. 2012- Aug. 2013

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 2012	6.44 K	0.01 K	522 K	12.7	93.6	64.9 K	78.2	63	22	39	50.2	3.9 K	75.3
Oct 2012	4.38	0.17	407 K	10.9	82.0 K	56.7 K	68.2 K	68 K	29 K	48	45.3	3.6 K	66.5
Nov 2012	2.72	0.38 K	296 K	8.9 K	73.7 K	49.6 K	60.2 K	71 K	31 K	51 K	39.7 K	3.3 K	58.7 K
Dec 2012	1.70	1.59 K	219	8.6 K	62.5	43.9 K	52.3	79	42	60 K	37.4 K	3.2	54.4 K
Jan 2013	2.72	0.60 K	289	5.2 K	65.2 K	40.9 K	52.4	58	23	39 K	24.9 K	4.1 K	48.8 K
Feb 2013	3.18	0.84	372 K	6.2 K	65.7	41.3	53.2	68	28	47 K	30.6 K	4.0 K	52.2
Mar 2013	4.80	0.66	476 K	9.1	74.1 K	48.6	60.0	76	31	53	41.4	3.8	59.6
Apr 2013	5.71	0.00	544 K	9.6 K	75.4	51.2	61.9	73	31	51 K	41.9 K	4.6 K	63.2
May 2013	7.01 K	0.25	626 K	11.4 K	81.2 K	56.6 K	67.6	75	31	52 K	48.2 K	4.5 K	68.3
Jun 2013	7.36	0.00	684	14.1	86.3	59.8 K	71.3	78	32	55	53.7	4.4	72.1
Jul 2013	7.13	0.35	594	15.3 K	89.5 K	64.1 K	75.4	74	31	51 K	55.6 K	4.0 K	74.6
Aug 2013	7.37 K	1.20	600	14.2	91.9	62.9 K	75.9	74	25	47	53.5	3.9	72.7
Totals/Avgs	60.52	6.05	469	10.5	78.4	53.4	64.7	71	30	49	43.5	3.9	63.9

M - All Daily Values Missing	K - One or More Daily Values Flagged
J - One or More Daily Values Missing	L - Missing and Flagged Daily Values

W/sq.m = Ly/day/2.065	inches * 25.4 = mm	C = 5/9 * (F - 32)

m/s = mph * 0.447	kPa = mBars * 0.1

Stop #1: 2013 Turf Disease Trials: Anthracnose

Tyler Mock, Ryan Nichols, and Jim Baird

Anthracnose

Twenty eight fungicide treatments were evaluated for their ability to control anthracnose preventatively on an annual bluegrass green. 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. The study was set up as a randomized complete block experiment with four replications. Fungicide treatments were initiated on 18 June 2013 before disease symptoms were present. For fertility the plot received 0.3 lb N/1000ft^2 on 13 June 2013 and again on 9 August 2013. The plot was top dressed on 31 July 2013.

Results:

- ✓ Overall, anthracnose disease pressure and distribution were moderate.
- ✓ The cool early summer, heavy rain events, and hot humid late summer created an abnormal anthracnose presence making detection variable from week to week.
- ✓ Several fungicides or fungicide programs reduced disease severity compared to the untreated control.

Notes:

Treatment list

Trt No.	Type	Treatment Name	Rate	Rate Unit	Appl Code
1	CHK	control			
2	FUNG	Xzemplar	0.26	fl oz/1000 ft2	ABDEFHI
3	FUNG	Xzemplar	0.26	fl oz/1000 ft2	ABDEFHI
	FUNG	Trinity	1	fl oz/1000 ft2	ABDEFHI
4	FUNG	Lexicon	0.34	fl oz/1000 ft2	ABDEFHI
5	FUNG	Secure	0.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDEFHI
6	FUNG	Secure	0.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Appear	6	fl oz/1000 ft2	ABDEFHI
7	FUNG	Medallion L	1	fl oz/1000 ft2	ABDEFHI
	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Appear	6	fl oz/1000 ft2	ABDEFHI
8	FUNG	Medallion L	1	fl oz/1000 ft2	ABDEFHI
	FUNG	Appear	6	fl oz/1000 ft2	ABDEFHI
9	FUNG	Heritage	0.4	oz wt/1000 ft2	A
	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDFI
	FUNG	Appear	6	fl oz/1000 ft2	ABDEFHI
	FUNG	Briskway	0.5	fl oz/1000 ft2	DEH
	FUNG	Secure	0.5	fl oz/1000 ft2	FI
10	FUNG	Daconil Action	3.5	fl oz/1000 ft2	AFHI
	FUNG	Appear	6	fl oz/1000 ft2	ABDEFHI
	FUNG	Briskway	0.5	fl oz/1000 ft2	BDE
11	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ADFI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	A20744	0.5	oz wt/1000 ft2	BEH
12	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	A20744	0.3	oz wt/1000 ft2	BEH
13	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	A20744	0.5	oz wt/1000 ft2	BEH
14	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ADFI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	A20744	0.3	oz wt/1000 ft2	BEH
	FUNG	Secure	0.5	fl oz/1000 ft2	BEH
15	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ADFI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	A20744	0.5	oz wt/1000 ft2	BEH
	FUNG	Secure	0.5	fl oz/1000 ft2	BEH
16	FUNG	A20744	0.3	oz wt/1000 ft2	ADFI
	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	Briskway	0.5	fl oz/1000 ft2	BEH
17	FUNG	A20744	0.3	oz wt/1000 ft2	ADFI
	FUNG	Secure	0.5	fl oz/1000 ft2	ADFI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	Daconil Action	3.5	fl oz/1000 ft2	BEH
	FUNG	Briskway	0.5	fl oz/1000 ft2	BEH
18	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABDEFHI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	Briskway	0.5	fl oz/1000 ft2	BEH
19	FUNG	A12531	3.6	fl oz/1000 ft2	ADFI
	FUNG	Chipco Signature	4	oz wt/1000 ft2	ADFI
	FUNG	A20581	0.472	fl oz/1000 ft2	BEH
20	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ADFI
	FUNG	Appear	6	fl oz/1000 ft2	ADFI
	FUNG	A15457	0.236	fl oz/1000 ft2	BEH
21	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABEHI
	FUNG	Secure	0.5	fl oz/1000 ft2	DF
	FUNG	Briskway	0.62	fl oz/1000 ft2	DF
	FUNG	Appear	6	fl oz/1000 ft2	ABDEFHI
22	FUNG	Daconil Action	3.5	fl oz/1000 ft2	ABEFI
	FUNG	Appear	6	fl oz/1000 ft2	ABDEFHI
	FUNG	Briskway	0.5	fl oz/1000 ft2	BEF
	FUNG	Secure	0.5	fl oz/1000 ft2	DH
23	FUNG	Tourney	0.37	oz wt/1000 ft2	ADH
	FUNG	Insignia	0.9	fl oz/1000 ft2	BE
	FUNG	Signature	4	oz wt/1000 ft2	F
	FUNG	Daconil 1000	3.2	oz wt/1000 ft2	F
24	FUNG	Encartis	3	fl oz/1000 ft2	ACEG
25	FUNG	Encartis	4	fl oz/1000 ft2	ADF
26	FUNG	Triton Flo	0.75	oz wt/1000 ft2	AH
	FUNG	Daconil Ultrex	3.2	oz wt/1000 ft2	BDEF
	FUNG	Insignia	0.9	fl oz/1000 ft2	BE
	FUNG	Chipco Signature	4	oz wt/1000 ft2	DF
27	FUNG	Disarm C	6	fl oz/1000 ft2	ABDEFHI
28	FUNG	Torque	0.6	fl oz/1000 ft2	ADFI
	FUNG	Legend	3	fl oz/1000 ft2	ADFI
	FUNG	Affirm	0.9	oz wt/1000 ft2	BEH
	FUNG	Spectro	3.6	oz wt/1000 ft2	BEH
29	FERT	NH4SO4	0.2	lb/1000 ft2	ABDEFHI

Application Code: All of the treatments were put down every 14 days except for treatments 24 and 25 which went down on 21 day and 28 day intervals respectively.

Anthracnose Study Plot Map

North/Trees

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

Road

Stop #1: 2013 Turf Disease Trials: Dollar Spot

Ryan Nichols, Tyler Mock, Jim Baird, Peggy Mauk, and Rui Li

Dollar Spot

Fifteen fungicide treatments and one nitrogen treatment were evaluated for their ability to control dollar spot (*Sclerotinia homoeocarpa)* preventatively on a creeping bentgrass/annual bluegrass green, established in 2005 from sod. Beginning in May 2013, nitrogen was reduced on the turf followed by inoculation with the fungus on June 14, 2013. Inoculation was achieved by spreading dollar spot infested grain evenly across the study area. The inoculum was allowed four days to colonize on the turfgrass, and then all treatments were started on June 18, 2013.

Spray Record:

Timing	A	B	C
Date	18 June 2013	2 July 2013	16 July 2013
Time	6am	6am	6am
Temperature	69.2 F	68.9 F	61.4 F
Wind	Calm	Calm	Calm
Conditions	Sunny	Overcast	Overcast

Timing	D	E	F
Date	30 July 2013	13 August 2013	27 August 2013
Time	6am	6am	6am
Temperature	60.6 F	60 F	71.5 F
Wind	Calm	Calm	Calm
Conditions	Sunny	Sunny	Cloudy

Results:

- ✓ Overall, dollar spot disease pressure was good, reaching 53% on untreated plots, and 56% on nitrogen treated plots by late July.
- ✓ Most all fungicides or fungicide programs provided effective control of dollar spot throughout the study period.
- ✓ No fungicide treatments showed signs of phytotoxicity during the study period.

Acknowledgements:

Special thanks to Dr. Peggy Mauk, Director of Agricultural Operations, and Rui Li for their help and support in preparing the inoculum, and to BASF, Syngenta, and Crop Production Services for providing fungicides and support throughout the study.

Notes:

2013 Turf Disease Trials: Dollar Spot

No.	Treatment	Company	Rate (oz/M)	Timing (d)
1	Control	--	--	--
2	Daconil Action	Syngenta	3.5	14
3	Daconil Action	Syngenta	7.0	14
4	Daconil Action Appear	Syngenta	3.5 6.0	14
5	Daconil Action Appear	Syngenta	7.0 6.0	14
6	Daconil Ultrex A9180	Syngenta	3.2 0.008	14
7	Daconil Ultrex A9180	Syngenta	6.4 0.016	14
8	Daconil Ultrex A9180 Appear	Syngenta	3.2 0.008 6.0	14
9	Daconil Ultrex A9180 Appear	Syngenta	6.4 0.016 6.0	14
10	Chipco Signature A12531	Syngenta	4.0 3.6	14
11	Chipco Signature A12531	Syngenta	8.0 7.2	14
12	Honor	BASF	6.0	14
13	Encartis	BASF	6.0	14
14	Xzemplar	BASF	6.0	14
15	Lexicon	BASF	4.0	14
16	NH_4SO_4	--	6.0	14

2013 Turf Disease Trials: Dollar Spot

Plot Map:

North

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

Stop #1: Evaluation of Products to Alleviate Localized Dry Spot (LDS) and Drought Stress

Jim Baird, Marco Schiavon, Jacob Gray, and Katarzyna Zak

Summary

In 2013, five trials were conducted on three golf courses in northern California and at the UC Riverside turfgrass research facility. Three experiments were conducted on putting greens and two on fairway turf. LDS was variable both among and within experimental areas. Collectively, however, the following observations were made.

- ✓ Under non-limiting irrigation and little or no LDS, few differences were found among all treatments.
- ✓ Revolution and TriCure AD performed best when water was withheld and LDS was prevalent.
- ✓ On putting greens, moisture retention was inversely related to firmness.
- ✓ Please see http://ucanr.edu/sites/turfgrassfieldday/ for the complete report on the UCR trial. The entire LDS report will be available in October 2013.

Sprayer Information

CO_2-powered backpack hand boom
Four TeeJet 8004VS flat fan nozzles; 9.5-inch spacing
Pressure: 30 psi; Groundspeed: 2 mph; Output: 2 gal/M

Spray Record

Timing	A	B	C
Date	14 June 2013	28 June 2013	4 July 2013
Time	5:45 to 7:30	5:45 to 6:40	6:45 to 7:00
Temperature	59F	70F	63F
Wind	Calm	Calm	Calm
Conditions	Overcast	Clear	Clear

Timing	D	E	F
Date	12 July 2013	8 August 2013	23 August 2013
Time	6:40 to 7:50	6:00 to 7:30	7:00 to 7:45
Temperature	70F	60F	68F
Wind	Calm	Calm	Calm
Conditions	Partly sunny	Clear	Clear

Timing	G	H	I
Date	29 August 2013	6 September 2013	
Time	9:00 to 9:15	6:45 to 8:45	
Temperature	79F	70F to 81F	
Wind	Calm	Calm	
Conditions	Clear	Partly Cloudy	

Ratings:

- Turf Quality (1 to 9 scale, 9 = best) – weekly and periodically as needed
- Localized Dry Spot (0 to 100%) – monthly and periodically as needed
- Turf Cover (0 to 100%)
- Soil Moisture (%)
- Green Firmness (Clegg Impact Tester)
- Droplet Penetration Test – 29 July 2013

2013 UCR Putting Green LDS Study
Riverside, CA

No.	Treatment	Company	Rate (oz/M)	Timing (d)
1	Control	--	--	--
2	A16982A	--	6.3	14
3	A16982A	--	12.6	14
4	Affinity	BASF	6.0	28
5	APSA-80	Amway	2.5	14
6	Aqua Plus	Creative Eco Systems	3.0	28
7	Aqueduct	Aquatrols	8.0	14 (28)
8	Revolution	Aquatrols	6.0	14 (28)
9	ES TC006A	--	9.0	21
10	Displace	Grigg Brothers	12.0	28
11	GB-6931	--	6.0	28
12	TriCure AD	Mitchell Products	6.0	28
13	Neptune	Numerator Technologies	6.0	28
14	Revert	Numerator Technologies	6.0	28
15	NT-01533	--	4.0	14
16	NT-0949	--	6.0	28
17	NT-R008	--	6.0	28
18	Cascade + Duplex	Precision Labs	5.0	21
19	PX13002	--	5.0	21
20	PX13011	--	4.0	21
21	PX13012	--	5.0	21
22	Microbic with SumaGrow	AgriBiotic Products	3.0	28
23 23	Revolution ES TC006A	Aquatrols --	6.0 9.0	21 rotation
24	Heritage TL	Syngenta	1.0	14
25 25	Heritage TL A16982A	Syngenta --	1.0 6.3	14 14
26 26	Briskway A16982A	Syngenta --	0.6 6.3	14 14
27	Lexicon	BASF	0.47	28
28 28	Lexicon Affinity	BASF BASF	0.47 6.0	28 28
29	Moisture Manager	John Deere	9.0	(28)
30	MegAlex*	ihammer	7.3	14
31	Upplause Plus*	ihammer	6.0	14
32	Control	--	--	--
33	Fleet	Simplot	8.0	28
34	Fleet	Simplot	16.0	28
35	Fleet	Simplot	8.0	14

*All treatments were watered in following application except 30 and 31.

2013 UCR Putting Green LDS Study

12G-6 (North →)

4 ft x 6 ft plots

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

Stop #2: Evaluation of Products for Turfgrass Water Conservation Using a Linear Gradient Irrigation System (LGIS)

Marco Schiavon and Jim Baird

Objectives:

1. Determine effective irrigation and chemical management practices to reduce water use.
2. Evaluate the ability of products to maintain acceptable turf quality under reduced water use.

Methods:

The LGIS area was sodded with ‘Tifway II’ bermudagrass on 7 August 2012. Areas of each plot that receive 10, 25, 55, 60, 65, 70, 75, 80, and 85% Eto were determined using catch cans to capture irrigation water. This procedure was repeated and validated every two weeks during the experiment. All treatments were applied initially on 5 April 2013. Every two weeks, plots were evaluated for turf quality, NDVI (measure of greenness), volumetric soil water content, and surface temperature in the irrigation zones representing 10 to 85% Eto.

Treatments:

See Table 1.

Results:

No treatment differences were found with respect to drought response. Although chemical treatment differences are not yet detected in any of the ratings collected, ET has a significant effect on turf quality and NDVI. In fact, the ratings differ when ET drops below 55%, with the 25% and the 10% ET treatment showing the lowest NDVI and soil moisture.

Acknowledgments:

Thanks to the Metropolitan Water District of Southern California; CTLF; Bayer, Growth Products; Grigg Brothers; Aquatrols; Numerator Technologies; Crop Production Services; Creative EcoSystems; and Syngenta for support of this research.

Table 1. List of chemicals used in the LGIS study.

No.	Treatment	Type	Dosage (oz./M)	Application Interval (Days)
1	UCR006P		5.88	14
2	UCR006P		7.35	14
3	UCR006P		8.82	14
4	UCR006P		11.75	14
5	Recovery Rx	Phosphite + Nutrients	5.00	14
6	PK Plus	Phosphite + Nutrients	6.00	14
7 7	Kelplex Ultraplex	Nutrients + Surfactant	2.00 4.00	7 7
8	Revolution	Surfactant	6.00	28
9	Neptune	Surfactant	6.00	28
10	Aquaplus	Polyacrylamide	3.00	28
11	Primo Maxx	Plant Growth Regulator	0.30	14
12	Control	--	--	--

*All treatments applied in a carrier volume of 2 gal/M.

LGIS Study Plot Plan

East

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

11	10	2	3	9	8	6	12	4	7	5	1	4	9	6	10	7	2	8	1	11	3	5	12
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Replication 3												Replication 4											

West

(Road)

Stop #3: Bermudagrass and Seashore Paspalum Establishment and Management Using Subsurface Drip Irrigation vs. Overhead Sprinkler Irrigation

Marco Schiavon, Jim Baird, Bernd Leinauer, and Matteo Serena

Objectives:

The objectives of this research are to determine how: 1) turfgrass species (tall fescue, bermudagrass and seashore paspalum); and 2) establishment date (multiple dates in spring and fall) are affected by subsurface drip irrigation (SDI) compared to overhead sprinkler irrigation (OSI) in Riverside, CA.

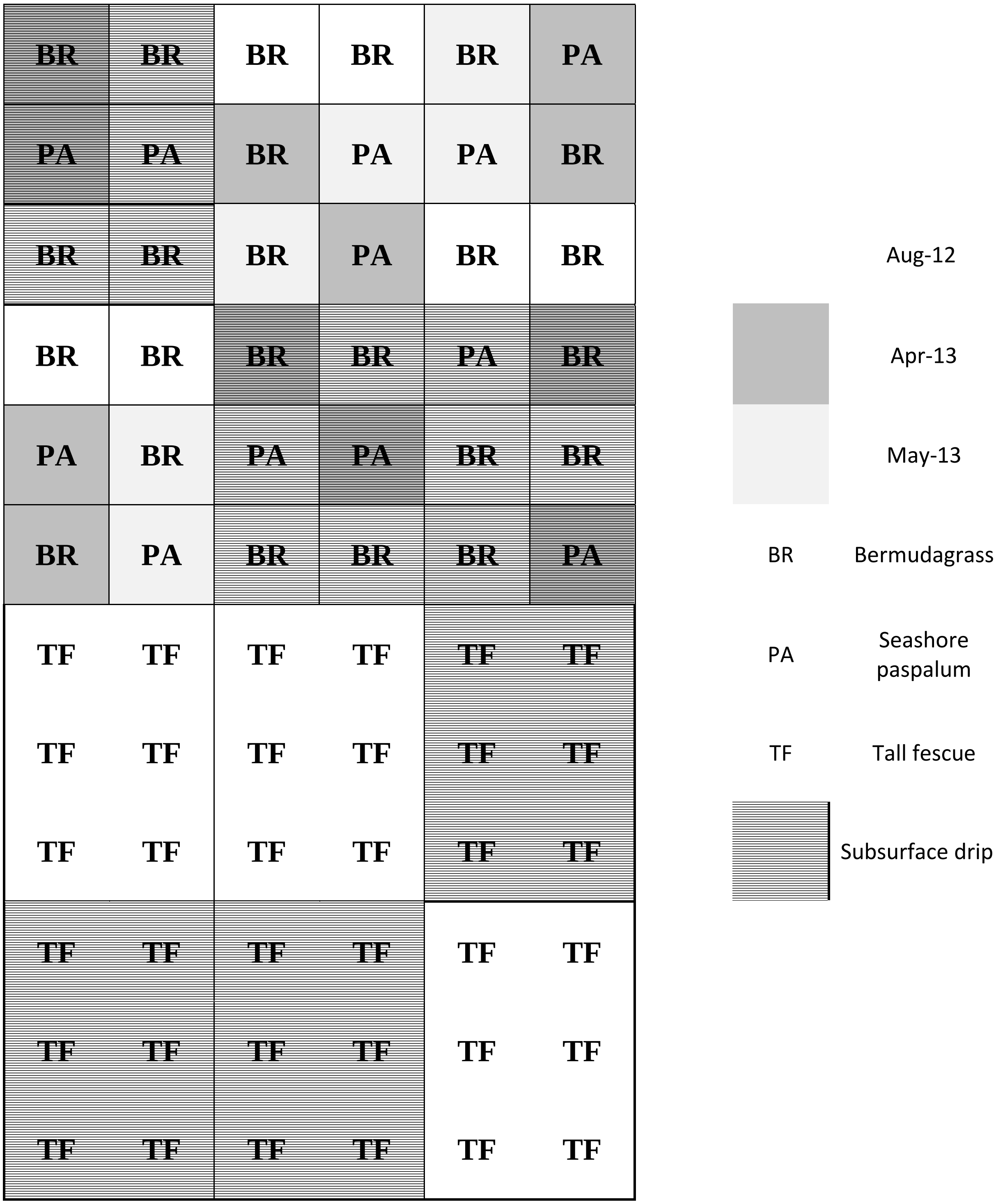
Methods:

A 5,400-ft^2 research area was constructed in July 2012 at the UCR Turfgrass Research Facility in Riverside. Soil is a Hanford fine sandy loam. The experimental design is a randomized split plot with 3 replications of each species and planting date. Main plots (20 ft by 20 ft) are irrigation type and species. Bermudagrass 'Princess 77' and seashore paspalum 'Sea Spray' were seeded at 1 lb PLS/M in August 2012 and again on 15 April and 15 May 2013. Both types of irrigation systems were set to 100% Eto. SDI consists of Toro DL2000; emitter flow rate (0.5 gal/h); 30 psi lines placed 3-4 inches deep; 1 ft by 1 ft grid between emitters and lines; Badger Series FM-1B Flow Sensors (2-50 gpm). OSI consists of Toro Precision Spray sprinklers; 30 psi; 20 ft spacing. Seedling counts and stand density are taken periodically throughout the experiment using Digital Image Analysis.

Results:

Preliminary results up until June 2013 revealed that there is no difference in establishment speed between bermudagrass and seashore paspalum. Moreover, no statistical difference in turf cover was detected in plots irrigated either with SDI or sprinkler system. Until this date, plots seeded on April 15th reached higher percent gound cover in comparison to plots seeded on May 15th; our preliminary results indicate that anticipating the earliest recommended date of seeding for both bermudagrass and seashore paspalum would be preferable in order to provide the grass with enough time to establish before the winter season.

Subsurface Drip Irrigation Study Plot Plan



Stop #4: Evaluation of products to alleviate salinity stress

Marco Schiavon, Jim Baird, Alea Miehls, and Elena Sevostianova

Objectives:

To evaluate the efficacy of products on turf to reduce stress caused by irrigation with saline water.

Methods:

The plot area was sodded with 'Tifway II' bermudagrass on 6 August 2012 on a Hanford fine sandy loam with no pre-existing salinity issues. All treatments were applied initially on 4 April 2013. Since November 2012, plots have been irrigated at 75% ET_o exclusively with water (EC = 4.4 dS/m; see below) that contains the same ion composition as the Colorado River. Every two weeks, plots were evaluated for turf quality, leaf firing, and volumetric soil water content. In addition Digital Image Analysis and leachate are collected on the same day. Soil samples will be collected separately for each treatment and replication to assess salinity build up in the rootzone.

Chemical properties of saline irrigation water used in this study compared to potable irrigation water used elsewhere at the UCR turfgrass facility.

	Saline Irrigation Water	Potable Irrigation Water
pH	7.57	7.82
Hardness	938.23	215.18
Bicarbonate	209.84	214.72
Carbonate	0.01	0.01
EC (dS/m)	4.43	0.61
Na (ppm)	523.9	53.36
Cl (ppm)	996.27	31.13
Boron (ppm)	0.11	0.08
SAR (meq/L)	18.3	3.24
Nitrate Nitrogen (ppm)	5.11	5.18
Phosphate (ppm)	0.4	0.01
Potassium (ppm)	129.76	4.16
Magnesium (ppm)	151.99	12.24
Calcium (ppm)	126.03	66
Sulfate (ppm)	707.62	78.1
Manganese (ppm)	0.01	0.01
Iron (ppm)	0.11	0.05

Results:

To date, results for salinity alleviation are inconsistent. Only two products (ACA 2994 and Crossover) decreased salinity in leachate water on 2 data collection dates out of 11. ACA 2994 initially increased turf quality in comparison to control until July. Since then, no quality differences in comparison to control have been visible in the study.

Salinity Alleviation Study Treatment List

No.	Treatment	Company	Rate	Frequency (wks)
1	Untreated Control	--	--	--
2	ACA 3086	Aquatrols	8 oz/M	2
3	ACA 2994	Aquatrols	8 oz/M	2
4	ACA 1849	Aquatrols	3 oz/M	2
5 5	ACA 1849 Gypsum	Aquatrols	3 oz/M 5 lbs/M	2 2
6	ACA 2786	Aquatrols	4.5 oz/M	2
7 7 7 7	Cal-Vantage Kick Terreplex TriCure AD	EarthWorks Earthworks Mitchell Products Mitchell Products	5 oz/M 10 oz/M 1.5 oz/M 4 oz/M	Earthworks products rotated monthly with Mitchell Products
8	MC TP	Mitchell Products	2 oz/M	2
9	MC TP3	Mitchell Products	2 oz/M	2
10	Crossover	Numerator Tech.	5 lb/M	4
11	Revert	Numerator Tech.	6 oz/M	4
12	SST 8%CA	Numerator Tech.	8 oz/M	2
13	pHAcid Sprayable	Numerator Tech.	1.5 oz/M	2
14	Cal Plus	Westbridge Agric.	0.75 oz/M	2
15	Cal Plus	Westbridge Agric.	1.5 oz/M	2
16 16 16	DeSal EXP 2 EXP 5-0-1	Ocean Organics Ocean Organics Ocean Organics	0.75 oz/M 6 oz/M 6 oz/M	2 2 2
17 17	Displace Carboplex	Grigg Brothers Grigg Brothers	12 oz/M 6 oz/M	2 2
18 18	Elicitor Kelplex	Grigg Brothers Grigg Brothers	2 oz/M 2 oz/M	2 2
19 19	SumaGrow SumaGrow	Agribiotic Products Agribiotic Products	5 oz/M 3 oz/M	Initial 2
20	Soil System 1	LH Organics	50 g/18 gal	2 (every other month)
21	UCR001	UCR		Once
22	Turfcare NPN Turfcare NPN Turfcare 6-1-2	Gantec Gantec Gantec	0.1 oz/M 0.1 oz/M 2.3 lb/M	2 (Apr-May) 4 (Jun-Dec) Apr/May/Jul/Sep

Treatments applied by hand or with CO_2-powered sprayer and watered in after application.

Plot Plan
Salinity Alleviation Study
North

101 1	201 13	301 8	401 16	501 22	601 9
102 2	202 6	302 5	402 21	502 19	602 4
103 3	203 11	303 18	403 1	503 10	603 10
104 4	204 9	304 7	404 13	504 15	604 22
105 5	205 18	305 14	405 11	505 7	605 13
106 6	206 1	306 4	406 17	506 21	606 5
107 7	207 12	307 19	407 3	507 12	607 11
108 8	208 10	308 16	408 15	508 20	608 18
109 10	209 4	309 21	409 22	509 3	609 19
110 9	210 20	310 2	410 4	510 16	610 15
111 11	211 14	311 1	411 19	511 5	611 7
112 12	212 8	312 17	412 14	512 18	612 17
113 13	213 2	313 11	413 9	513 1	613 20
114 14	214 5	314 3	414 7	514 8	614 3
115 15	215 21	315 6	415 2	515 13	615 2
116 16	216 19	316 12	416 20	516 6	616 14
117 17	217 16	317 15	417 10	517 11	617 21
118 18	218 3	318 9	418 6	518 17	618 8
119 19	219 15	319 22	419 12	519 14	619 1
120 20	220 7	320 13	420 18	520 2	620 12
121 21	221 22	321 10	421 5	521 9	621 16
122 22	222 17	322 20	422 8	522 4	622 6

Soil test results for study area before and after application of saline irrigation and product treatments.

Soil Properties													
Date		pH	OM%	Bulk Density	EC (dS/m)	SAR	Olsen P ppm	K ppm	Ca ppm	Mg ppm	Na ppm	Cation Exchange Capacity	Soluble Salts (dS/m)
Nov. 2012	Before Saline Irrigation Treatment	6.6	0.01	0.14	6.5	0.81		261	1904	202	79	12.2	2.45
Apr. 2013	Before Product Treatment Applications	7.7	1.1	1.46	2.13	4.79	29.6	159	1653	351	283	12.8	0.64
Aug. 2013	Control	7.8	0.8	1.58	7.33	8.67	19.1	215	1534	425	487	13.9	0.85
Aug. 2013	Treatment 3	7.7	1	1.43	5.69	7.99	20.8	189	1346	375	450	12.3	0.79
Aug. 2013	Treatment 7	7.5	1.1	1.55	3.23	6.74	20	230	1313	382	413	12.1	0.71
Aug. 2013	Treatment 10	7.7	1.2	1.48	4.24	6.98	21.7	253	1428	384	386	12.7	0.72

Stop #5: Groundcovers for Water Conserving Landscapes

Principal Investigators
Donald Merhaut, Dennis Pittenger, Darrel Jenerette, Ryan Nichols, and Jim Baird
University of California Cooperative Extension and U.C. Riverside

Location
U.C. Riverside, Riverside, CA

Project Overview

This study of 17 groundcover plant materials and one turfgrass managed as a 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 2011 and have been challenged with irrigation of 60% of real-time reference evapotranspiration (ETo) since mid-May 2011. Beginning in May, 2012, irrigation was reduced to 40% of real-time reference evapotranspiration.

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 in the amount of 60% ETo or less; 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 to established and accepted protocol. Plant quality of each plot will be rated monthly on a scale of 1 to 9, with 9 = optimum/best plant quality and 1 = dead/worst plant quality.

Study Design

- 17 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 2009-2010
- No soil amendments

Background

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.

Results from 2012 indicate that Lantana, Honeysuckle, Red Apple, Ice plant, Saltbush, Coreathyrogene, Salvia, Rosemary, Australian Fushia, California Aster and Thyme are all thriving, though growth has slowed. The Cranesbill is almost dead. The other species are displaying various signs of drought stress such as leaf burning, smaller leaves, and stem dieback. However, these species recover following an irrigation event and will probably survive the summer. The only monocot, Buffalograss is green-brown, but temporarily shows green color following an irrigation event.

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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 but 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
4. Thymus pracox arcticus 'Pink Chintz' (T. praecox subsp. Arcticus; T. serpyllum)	creeping thyme	Native Sons 4-in. pot	11-4-09	Reported to grow 1-in. ht., pink flowers, attracts bees
5. Atriplex cinerea Poir.	coast or grey saltbush	Native Sons #1 container	11-4-09	Silver foliage, low-spreading, dioecious, Australian native
6. 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
7. Geranium X cantabrigiense 'Biokova'	cranesbill	Native Sons #1 container	11-4-09	Reported very low and spreading, flowers winter-spring
8. Juniperus horizontalis 'Wiltonii'	blue rug juniper	Monrovia #1 container	12-2-09	Very flat dense growing, trailing branches, silver blue foliage
9. 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
10. 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
11. 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
12. 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
13. Trachelospermum jasminoides	star jasmine	Expertise Growers cuttings in flats	10-29-09	Vigorous once established, widely adapted
14. 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
15. Buchloe dactyloides 'UC Verde'	UC Verde buffalograss	Todd Valley Farms plugs	4-8-09	Warm-season grass, a standard of performance under limited irrigation
16. Corethrogyne filaginifolia 'Silver Carpet'	California aster, common corethrogyne	Las Palitas #1 container	9-11-09	California native plant
17. 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

rev. 8-30-13

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

Plot Map

NORTH

↑

---ROAD---

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

---TURF PLOT---

Stop #6: Postemergence Control of Crabgrass and Broadleaf Weeds in Bermudagrass

Alea Miehls and Jim Baird

Species: 'Princess 77' Bermudagrass

Spray Information: CO_2-powered bicycle sprayer
TeeJet 8003VS nozzles; 19-inch spacing
1 gal/M

Design: Randomized complete block; 3 replications

Plot size: 7 ft x 10 ft; 4-ft alleys

Application Dates: 13 June 2013 (initial application)
11 July 2013 (28 DAIT)

Crabgrass seed date: 26 April 2013

Weekly Ratings: Turfgrass Quality (1 to 9 scale, 9 = best)**,** Density (0-100%), and Color (1 to 9 scale, 9 = best), Turfgrass Injury (0-100%)
Crabgrass and broadleaf weed cover (0-100%)

Results:

- ✓ The majority of herbicide treatments provided effective control of crabgrass and other broadleaf weeds throughout the study period.
- ✓ The treatment combination of Tenacity (5 oz/A) + Xonerate (2 oz/A) + NIS (0.25% v/v) provided the best control of crabgrass, with no weed cover present 14 DAIT.
- ✓ Severe phytotoxicity (bleaching) was observed following treatment applications of Impact (1 oz/A) + Dicamba (8 oz/A) + MSO (0.5 %v/v), and Pylex (1 oz/A) + OneTime (64 oz/A) + MSO (0.5% v/v). However, the turf fully recovered within two weeks after application.

Notes:

2013 UCR Postemergence Broadleaf/Crabgrass Control in Bermudagrass
Riverside, CA

No.	Treatment	Company	Rate	Timing (d)
1	Control			
2	Dimension 2EW Dicamba NIS	Dow AgroSciences	32 oz/A 8 oz/A 0.25% v/v	0,28 0,28 0,28
3	MSMA Dicamba	Gordon's ProForm	87 oz/A 8 oz/A	0,28 0,28
4	Tenacity NIS	Syngenta	5 oz/A 0.25% v/v	0,28 0,28
5	Tenacity Dicamba NIS	Syngenta	5 oz/A 8 oz/A 0.25% v/v	0,28 0,28 0,28
6	Tenacity Xonerate NIS	Syngenta Arysta LifeScience	5 oz/A 1 oz/A 0.25% v/v	0,28 0,28 0,28
7	Tenacity Xonerate NIS	Syngenta Arysta LifeScience	5 oz/A 2 oz/A 0.25% v/v	0,28 0,28 0,28
8	Impact MSO	AMVAC	1 oz/A 0.5% v/v	0,28 0,28
9	Impact Dicamba MSO	AMVAC BASF	1 oz/A 8 oz/A 0.5% v/v	0,28 0,28 0,28
10	Tenacity Monument	Syngenta Syngenta	5 oz/A 10g/A	0,28 0,28
11	OneTime MSO	BASF	64 oz/A 0.5% v/v	0,28 0,28
12	Q4 NIS	Gordon's ProForm	128 oz/A 0.25% v/v	0,28 0,28
13	Solitare NIS	FMC	16 oz/A 0.25% v/v	0,28 0,28
14	Solitare NIS	FMC	21.3 oz/A 0.25% v/v	0,28 0,28
15	Drive XLR8 MSO	BASF	64 oz/A 0.5% v/v	0,28 0,28
16	Pylex OneTime MSO	BASF BASF	1 oz/A 64 oz/A 0.5% v/v	0,28 0,28 0,28

2013 UCR Postemergence Broadleaf/Crabgrass Control in Bermudagrass

North

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

Postemergence Control of Crabgrass in Tall Fescue

Alea Miehls and Jim Baird

Spray Information:	CO_2-powered bicycle sprayer TeeJet 8003VS nozzles; 19-inch spacing 1 gal/M
Design:	Randomized complete block; 3 replications
Plot size:	7 ft x 7 ft, 3-ft alleys
Application Dates:	13 June 2013 (initial application) 3 July 2013 (21 DAIT) + Initial application of SquareOne treatments (14-16) 11 July 2013 (28 DAIT) 25 July 2013 (21 DAIT - treatment 15 only)
Crabgrass seed date:	26 April 2013
Weekly Ratings:	Turfgrass Quality (1 to 9 scale, 9 = best), Density (0-100%), and Color (1 to 9 scale, 9 = best), Turfgrass Injury (0-100%), Crabgrass and broadleaf weed cover (0-100%)

Results:

- ✓ All treatments of Pylex + MSO at different rates and application timings provided the best crabgrass control following initial application and throughout the study period.
- ✓ Phytotoxicity was not observed for any herbicide treatments, except for Tenacity and Xonerate combinations; causing moderate discoloration and thinning of tall fescue for 14 DAIT.

Notes:

2013 UCR Postemergence Crabgrass Control in Tall Fescue
Riverside, CA

No.	Treatment	Company	Rate	Timing (d)
1	Control	-	-	-
2	Dimension 2EW NIS	Dow AgroSciences	32 oz/A 0.25% v/v	0,28 0,28
3	Tenacity NIS	Syngenta	5 oz/A 0.25% v/v	0,28 0,28
4	Tenacity Turflon Ester NIS	Syngenta Dow AgroSciences	5oz/A 16 oz/A 0.25% v/v	0,28 0,28 0,28
5	Tenacity Xonerate NIS	Syngenta Arysta LifeScience	5 oz/A 1 oz/A 0.25% v/v	0,28 0,28 0,28
6	Tenacity Xonerate NIS	Syngenta Arysta LifeScience	5 oz/A 2 oz/A 0.25% v/v	0,28 0,28 0,28
7	Impact MSO	AMVAC	1 oz/A 0.5% v/v	0,28 0,28
8	Impact Turflon Ester MSO	AMVAC Dow AgroSciences	1 oz/A 16 oz/A 0.5% v/v	0,28 0,28 0,28
9	Pylex MSO	BASF	1 oz/A 0.5% v/v	0,28 0,28
10	Pylex MSO	BASF	1.5 oz/A 0.5% v/v	0,28 0,28
11	Pylex MSO	BASF	1 oz/A 0.5% v/v	0,21 0,21
12	Pylex MSO	BASF	1.5 oz/A 0.5% v/v	0,21 0,21
13	Pylex MSO	BASF	4 oz/A 0.5% v/v	0 0
14	Square One NIS	FMC	12 oz/A 0.25% v/v	0 0
15	Square One NIS	FMC	12 oz/A 0.25% v/v	0,21 0,21
16	Square One NIS	FMC	18 oz/A 0.25% v/v	0 0
17	Acclaim Extra	Bayer	20 oz/A	0
18	Drive XLR8 MSO	BASF	64 oz/A 0.5% v/v	0 0

No.	Treatment	Company	Rate	Timing (d)
19	Tenacity NIS	Syngenta	5 oz/A 0.25% v/v	0,21 0,21
20	Solitare NIS	FMC	16 oz/A 0.25% v/v	0 0
21	Solitare NIS	FMC	21.3 oz/A 0.25% v/v	0 0
22	OneTime MSO	BASF	64 oz/A 0.5% v/v	0 0
23	Q4 NIS	Gordon's ProForm	128 oz/A 0.25% v/v	0 0

2013 UCR Postemergence Crabgrass Control in Tall Fescue

North

Bay 4

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

Bay 2

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

STOP #7: Drought Tolerant Turfgrasses for Southern California

Jim Baird and Adam Lukaszewski

Overview

Choosing or developing a species/cultivar with improved tolerance to drought/heat/salinity stress is an important approach toward sustainability of turfgrasses in the California landscape amidst declining water resources and increasing water use restrictions on lawns and landscapes. UC Riverside is taking several approaches to meet these challenges. Current research includes:

1. National Turfgrass Evaluation Program (NTEP) tests for tall fescue, perennial ryegrass, zoysiagrass, bermudagrass, and warm-season putting green turf (bermudagrass, zoysiagrass, seashore Paspalum).
2. Test comparing cultural management and traffic tolerance among seeded and vegetative buffalograss cultivars.
3. Turfgrass Water Conservation Alliance (TWCA) drought test on perennial ryegrass, Kentucky bluegrass, and tall fescue cultivars.
4. Evaluation of Kurapia (*Lippia nodiflora*) as a low-growing groundcover for improved stress tolerance.
5. Thanks to a new grant from the Metropolitan Water District of Southern California and the CTLF, we are positioned to hire a turfgrass breeder to accelerate our turfgrass improvement program for California climates. Broad objectives include:
    a. Developing cool-season grasses that stay greener longer with less water in the dry summer months. Focus will be on the fescues, ryegrass, and their hybrids.
    b. Developing warm-season grasses that retain their color during winter dormancy. Focus will be on bermudagrass and kikuyugrass.
    c. Improvement of kikuyugrass as a turfgrass species in California. Focus will be on winter color, shade tolerance, disease tolerance, and more desirable growth characteristics.
6. Evaluation of lawn and native grasses under deficit irrigation.
    a. Entries (following pages) were seeded on 10 May 2013.
    b. 4.0 lbs N/M and non-limiting irrigation during establishment.
    c. Plots mowed weekly at 2 and 4 inches since July.
    d. On August 15 (one month before Field Day) irrigation was turned off. Plots were then watered by hand 3X weekly to replace 50% CIMIS ETo.
    e. Plots rated weekly for drought stress (1-9 scale, 9 = best) and digital image analysis

UCR Lawn/Native Grass Deficit Irrigation Study

No.	Product/Species/Variety	Company	Seeding Rate lbs/1000 ft^2
1	Delta Native Bentgrass ➢ *Agrostis pallens*	Delta Bluegrass Company	1.5
2	Delta Native Mow Free Mix ➢ *Festuca rubra* Molate 40% - Red Fescue ➢ *Festuca occidentalis* 30% - Western Fescue ➢ *Festuca idahoensis* 30% - Idaho Fescue	Delta Bluegrass Company	3.0
3	Delta Native Biofiltration Mix ➢ *Stipa pulchra* - Purple Needlegrass ➢ *Festuca rubra* Molate – Red Fescue ➢ *Hordeum californicum* – California barley ➢ *Hordeum brachyantherum* – Meadow barley	Delta Bluegrass Company	3.0
4	Delta Bolero Plus Mix 90/10	Delta Bluegrass Company	5.0
5	Delta 90/10 Fescue/Blue Mix	Delta Bluegrass Company	5.0
6	MVS Tall Fescue ➢ Spyder LS	Mountain View Seeds	5.0
7	MVS Tall Fescue ➢ PPG-TF105	Mountain View Seeds	5.0
8	MVS Tall Fescue ➢ Titanium LS	Mountain View Seeds	5.0
9	MVS Tall Fescue ➢ PPG-TF142	Mountain View Seeds	3.0
10	MVS Tall Fescue ➢ PPG-TF156	Mountain View Seeds	3.0
11	MVS Tall Fescue ➢ PPG-TF145	Mountain View Seeds	3.0
12	Stover Native All- Purpose Mix ➢ *Bromus carinatus* 20% ➢ *Nassella* (*Stipa*) pulchra 31% ➢ *Festuca rubra* Molate 31% ➢ *Deschampsia cespitosa* var Holciformis 8% ➢ *Agrostis pallens* (*Diegosensis*) 6% ➢ *Koeleria macrantha* 4%	STOVER Seed Company	1.12
13	Stover Native Fine Fescue Mix ➢ *Festuca rubra* Molate 37% ➢ *Festuca occidentalis* 37% ➢ *Koeleria macrantha* 11% ➢ Deschampsia cespitosa var Holciformis 15%	STOVER Seed Company	0.62
14	Stover Native Bentgrass ➢ *Agrostis pallens* (Diegosensis) Siskiyou thingrass	STOVER Seed Company	0.69

No.	Product/Species/Variety	Company	Seeding Rate lbs/1000 ft^2
15	Cutting Edge Sun & Shade Mix ➢ Tall Fescue 19.8% ➢ Chewings Fescue 19.8% ➢ Hard Fescue 19.7% ➢ Kentucky Bluegrass 19.4% ➢ Perennial Ryegrass 19.4%	Cutting Edge	5.0
16	Pearl's Premium Ultra Low Maintenance Lawn Seed - Sunny Mix ➢ 'Dakota' Tall Fescue 19.75% ➢ 'Frontier' P. Rye 19.75% ➢ 'Deepblue' Kentucky Bluegrass 19.65% ➢ 'Harpoon' Hard Fescue 19.65% ➢ 'Carmen' Chewings Fescue 19.65%	Pearl's Premium	5.0
17	New Millenia Dwarf Fescue Blend ➢ '2nd Millenium' Tall Fescue ➢ 'Focus' Tall Fescue ➢ 'Avenger' Tall Fescue	STOVER Seed Company	5.0

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

North →

4-inch mowing height

2-inch mowing height

Stop #8: Once and for all, do fungicides really offer plant health benefits?

Ryan Nichols, Jim Baird, and Marco Schiavon

Beneficial effects of fungicides

Certain fungicides are purported to promote plant health and abiotic stress resistance in addition to fungicidal action. This study was conducted to determine if fungicides can promote plant health under simulated golf course tournament stress conditions. The study green was subjected to tournament conditions on 20 July 2013 allowing for a minimum of 2 applications for treatments on 28-day intervals and 4 applications for treatments on 14-day intervals. Simulated tournament conditions included increased mowing, rolling, and minimal irrigation. Irrigation was done by hand, syringing the green to maintain moisture levels below 10% during the 7-day period. Aboveground measurements of turf quality and Normalized Difference Vegetation Index (NDVI) were taken during the 7-day simulated tournament conditions. Root samples were taken on day 0 and day 8 for winRHIZO analyses. The experiment was repeated one month later.

Spray Record:

Timing	A	B	C
Date	18 June 2013	2 July 2013	16 July 2013
Time	8am	8am	8am
Temperature	67.8 F	74.8 F	71.2 F
Wind	Calm	Calm	Calm
Conditions	Sunny	Overcast	Overcast

Timing	D	E	F
Date	6 August 2013	20 August 2013	3 September 2013
Time	8am	8am	8am
Temperature	60.7 F	70 F	80 F
Wind	Calm	Calm	Calm
Conditions	Sunny	Sunny	Sunny

Results:

- ✓ Overall, there were no visual differences among fungicides and the untreated control for stress tolerance during RUN 1 of the 7-day simulated tournament conditions.
- ✓ No fungicide treatments showed signs of phytotoxicity during the study period.

Notes:

2013 UCR Turf Health Trial

No.	Treatment	Company	Rate (oz/M)	Timing (d)	g or ml/1 L
1	Control	--	--	--	
2	Insignia	BASF	0.7	28	3
3	Honor	BASF	1.1	28	4
4	Disarm 480SC	Arysta	0.36	28	1.4
5	Heritage (WG)	Syngenta	0.4	28	1.5
6	Daconil Action	Syngenta	3.5	14	14
7	Velista	Syngenta	0.5	14	2
8	Chipco Signature	Bayer	8.0	14	30

Plot Map:

West

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

Purple false brome (*Brachypodium distachyon*), a potential model host for studying pathogen interactions with root-knot nematodes.

Becker[1], J. O., J. Smith Becker[1], A. Ploeg[1], G. W. Douhan[2], H. Witte[1] and J. P. Vogel[3]
[1]Department of Nematology, and [2]Department of Plant Pathology and Microbiology, University of California, Riverside, CA 92521, [3]USDA-ARS Western Regional Research Center, Genomics and Gene Discovery Unit, Albany, CA 94710.

Model organisms are species that share many essential biological properties with organisms of specific interest and have advantageous characteristics such as small size, short generation time, large number of progeny or compact genome. For the past few decades *Arabidopsis thaliana*, a member of the mustard family, has been widely studied as a model for flowering plants in plant biology, in particular for basic research in genetics and molecular biology. However, as a dicotyledon, there are limitations to the validity of information obtained regarding monocotyledons which comprise many of the major food crops.

The small annual grass species *Brachypodium distachyon* is native to the Mediterranean region although now it occurs worldwide. It is of no agronomical importance but it is closely related to cool season cereal crops, forage and turf grasses that are taxonomically grouped in the grass subfamily *Pooideae*. Similar to Arabidopsis it has a number of favorable intrinsic characteristics that has propelled its status from an obscure wild plant to an increasingly popular model for grain and biofuel grasses.

The objective of our study was to determine its research utility for studies with root-knot nematode species (*Meloidogyne* spp). This group of nematodes has a worldwide distribution and parasitizes almost every plant species. Nearly 100 *Meloidogyne* species are known but less than 10 are of major economic importance. They account for approximately half of the $110 billion economic impact attributed annually to the activity of all plant parasitic nematodes worldwide.

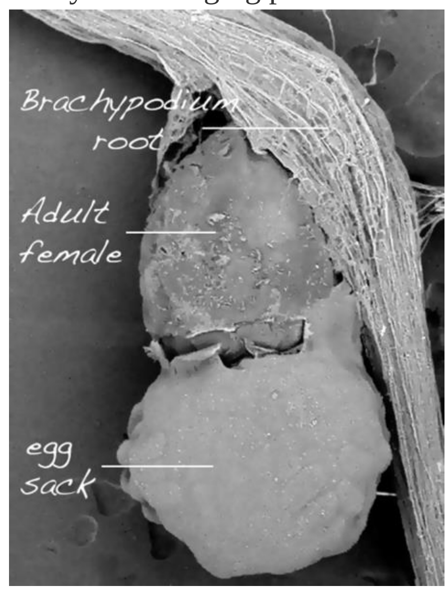
Resistant plant cultivars are primary tools to manage root-knot nematode populations and to mitigate their crop damage. Information obtained from studies with the host/pathogen combination *Brachypodium/Meloidogyne* may therefore foster breeding efforts in some of the related crops with economic importance.

Second stage juveniles of root knot nematodes invade roots typically just behind the root tip. They initiate a permanent feeding site by injecting small metabolites into cells near the central cylinder that turn into nurse cells on which the nematodes will feed for the rest of their life. In some plants these cells may enlarge to nearly 100-fold and cause the root to develop knots or galls. While those symptoms are quite easy to detect on tomato or melon roots, root galls on grasses are either very small or absent. Consequently we were interested to utilize soil-free growth pouches that allow non-destructive observation of plant/nematode interaction through their transparent plastic film. In addition we used the Ray Leach "Cone-tainer" system (Stuewe & Sons, Tangent, OR).

Tall growth cells are cone-shaped, drain well and are arranged in sturdy 98-cell rack that allows for excellent plant growth with minimum space requirements.

Seeds of various *B. distachyon* inbred lines were imbibed in water and surface decontaminated in 10% commercial bleach. After a week of moist incubation at 4˚C the seed was planted in plastic cones with pasteurized sandy soil or soil-free growth pouches. Both growth systems were infested with second-stage juveniles of either *M. incognita* or *M. graminis*. Individual pouches and cone cells were arranged in a randomized complete block design with 6 replications and incubated at 26±2˚C in ambient light in a greenhouse.

In the growth pouches, slight root swellings caused by nematode parasitism were observed under a dissecting scope after 15-17 days. Eventually the enlarging posterior of *Meloidogyne* females broke through the root surface. After approximately 27 days a jelly-like mass extruded from the female that contained eggs. This glycoprotein sack produced by rectal glands in the females protects the eggs against biotic and abiotic hazards such as predation and dessication. The extent of root knot nematode egg production among the *B. distachyon* lines differed considerably. *Meloidogyne graminis* had a higher egg reproduction than *M. incognita* with approximately 300 eggs/female and 5-fold higher egg population density per root length than *M. incognita*.



In many growth pouches fungal growth was observed after two to three weeks that grew out of the *Brachypodium* seeds and produced abundant dark and hairy, ball-shaped fruiting bodies (perithecia). ITS rDNA sequence analysis identified the fungus as *Chaetomium globosum*, a common plant endophyte belonging to the Phylum Ascomycota. Although no obvious effects on root-knot nematodes were observed, endophytic activity may increase plant resistance to plant pathogens. The fungus has been previously described as a potential biocontrol agent against various plant pathogens including root knot nematodes. Its potential influence on pathogen-host interactions in *Brachypodium* requires further studies.

In summary, *B. distachyon* is a suitable host for *M. graminis*. Large differences in *Meloidogyne* reproduction of tested inbred lines indicated useful genetic variability that could be of interest for resistance breeding research. Identification of resistance genes in *Brachypodium* against *Meloidogyne graminis* and possible other root knot nematode species might allow the detection of similar gene sequences in turf grasses that are inherited from a shared ancestor. Effective fungicidal seed coatings might be useful to reduce the potential influence of *C. globosum* in future resistance screening tests.

Stop #9: Updates on Evapotranspiration Adjustment Factor and Spanish Language Materials for Professional Landscapers Projects

Janet Hartin, CE Environmental Horticulture Advisor, San Bernardino and Los Angeles Counties

Evapotranspiration Adjustment Factor Project (a contract received from California Department of Water Resources)

Principal Investigators: David Fujino (UC Davis), Janet Hartin (UC Cooperative Extension), & Loren Oki (UC Davis). Project Contractor: Bill Baker (William Baker & Associates)

California's population was 37 million in 2005 and is expected to reach 45 million by the year 2020. This projected increase, coupled with a severe multi-year drought and a statewide water distribution problem, necessitates further conservation of an already limited water supply. Landscape irrigation uses a significant amount of water. Residential water use totaled 5.9 million acre feet (MAF) in 2005. Of this, approximately, 54 percent (3.2 MAF) was used outdoors.

Increasing the use of practices leading to greater water use efficiency of large-acreage landscapes is consistent with goals of the CALFED Bay-Delta program to maximize existing water resources for assuring a steady and reliable water source for the future of California. While much progress has been made, a report issued by the California Urban Water Agencies entitled 'Water Conservation in Landscaping Act: A Statewide Implementation Review' indicated that maintenance was "the weakest link in the design, installation and maintenance scenario". The report recommended on-site auditing and greater education for contractors.

California Assembly Bill 1881 resulted in California enacting a law on January 1, 2010 reducing the Evapotranspiration Adjustment Factor (ETAF) from .8 to .7 in new landscapes over 2,500 square feet, mandating further water conserving measures in urban landscapes. Several 'best management practices' have been developed within UC ANR that can help the landscape industry maintain healthy landscapes and irrigate at or below the newly instated .7 ETAF, including: proper plant selection; proper irrigation system design and installation; hydrozoning; proper irrigation scheduling; mulching; and, regular maintenance of irrigation systems.

The goal of our California Department of Water Resources (DWR) project is to reduce water waste and increase adoption of .7ETAF by the landscape industry by setting up 30 large demonstrations sites at publically and commercially maintained landscape sites that exemplify research-based 'best management practices.' The sites represent a variety of ornamental plants with varying evapotranspiration rates growing under a wide array of plant densities and microclimates.

*<u>Maximum Allowable Water Allowance (MAWA) = (ETo) (0.7) (LA) (0.62)</u>
ETo = Reference Evapotranspiration (inches per year)
0.7 = ET Adjustment Factor
LA = Landscaped Area (square feet)
0.62 = Conversion factor (to gallons)
*Maximum Applied Water Allowance = _______ gallons/year

<u>Example of Maximum Applied Water Allowance (MAWA): Riverside, California</u>

Hypothetical Landscape Area = 50,000 sq ft
MAWA = (Eto) (0.7)* (LA) (0.62)**
MAWA = (51.1) (0.7) (50,000 sq ft) (0.62)
MAWA = 1,108,870 gallons per year
*ET Adjustment Factor ** Conversion factor from inches to gallons

We will be providing an extensive project update at the December 11, 2013 Turf and Landscape Institute at Etiwanda Gardens Conference Center in Rancho Cucamonga. Please register online at http://cesanbernardino.ucanr.edu/. (Click on 'environmental horticulture' on the left side of the website to access the registration form.)

Spanish Language Materials for Professional Landscapers Projects
(a contract received from CA Department of Pesticide Regulation)

Principal Investigator: Janet Hartin

Soil runoff and groundwater pollution are leading sources of water quality degradation in urban areas of Southern California and are largely due to overuse and improper use of pesticides and fertilizers. Approximately 75,000 Spanish-speaking landscapers and gardeners make decisions and/or apply pesticides and fertilizers annually in Southern California. Many lack adequate expertise in Integrated Pest Management (IPM) and safe use of pesticides in part due to inadequate training opportunities available in Spanish. Increasing educational services stressing pest prevention to this large clientele – which has quadrupled over 20 years - can significantly reduce overuse and misuse of pesticides in urban environments and improve the health and safety of the work environment for this segment of the profession.

A group of UC and external industry partners is developing and providing educational services to Spanish-speaking landscapers at 13 workshops that include hands-on as well as classroom training. Specific curriculum and activities used in the training is based on the results of focus groups and individual interviews that assessed the specific needs of this large clientele.

Subject matter for the workshops includes peer-reviewed materials from UC and other sources.

Specific practices taught will include:

- Proper plant selection (based on climate and microclimate conditions)

- Proper planting techniques (planting depth, planting density to prevent poor air circulation , etc.)

- Proper irrigation system design and installation

- Use of recommended maintenance practices to prevent pest outbreaks such as

    - irrigation scheduling based on plant water needs (as estimated by plant symptoms/health; weather-based measurements measured by CIMIS (temperature, solar radiation, relative humidity, and wind speed)

- fertilization (correct rate, method, timing)

- recommended pruning practices

- other (turf mowing, aeration, verticutting)

- Regular monitoring for pest outbreaks/Early pest detection and identification

- Use of chemical pesticides as a last resort in a safe and effective manner (this module will include laws and regulations regarding safe pesticide handling and use)

The project includes strong evaluation elements that will measure its impact. Specific tools include measuring change in subject matter expertise 'pre' and 'post' training and an assessment of pesticide use three months post-training which will be compared to benchmark data established before training occurred. The project builds on and greatly expand work previously completed on a DPR Alliance grant to provide enhanced educational services to Spanish-speaking residential gardeners in San Luis Obispo County and is oriented more to public and private landscape clientele rather than residential gardeners.

Please email Principal Investigator Janet Hartin (jshartin@ucanr.edu) if you are interested in attending or sending Spanish-speaking employees to an upcoming landscape workshop taught in Spanish or if you are interested in receiving hands-on and classroom training in Spanish at your own facility in Winter or Spring 2013/'14. The first training opportunity is December 11, 2013 at the Turf and Landscape Institute at Etiwanda Gardens Conference Center in Rancho Cucamonga. Please register online at http://cesanbernardino.ucanr.edu/. (Click on 'environmental horticulture' on the left side of the website to access the registration form.)

Stop #9: EFFECTS OF BIOCHAR ON FERTILIZER LEACHING

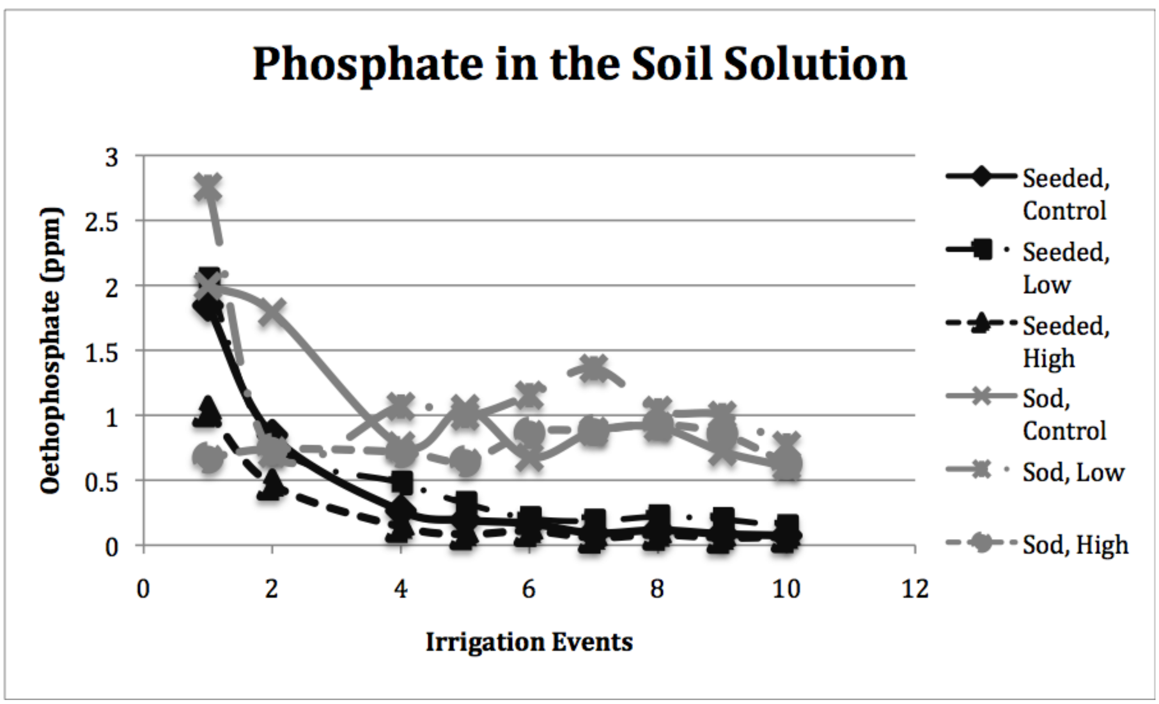
Elizabeth Crutchfield, Jim Baird, and Milt McGiffen

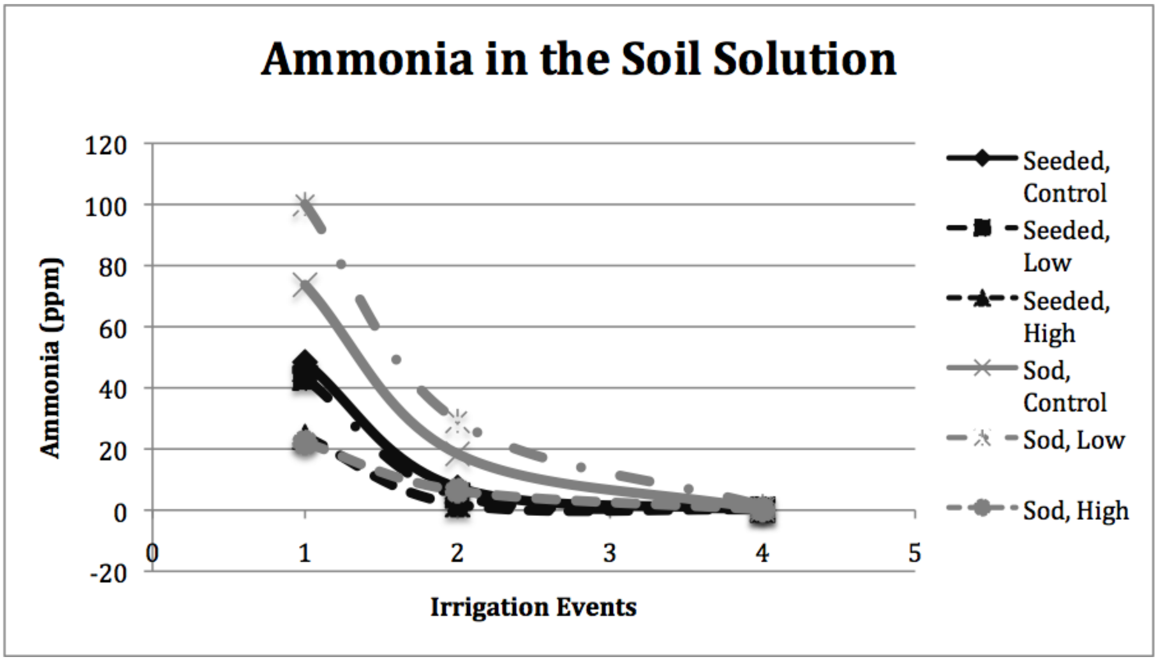
Objectives: To evaluate biochar's ability to reduce nutrient leaching from turfgrass.

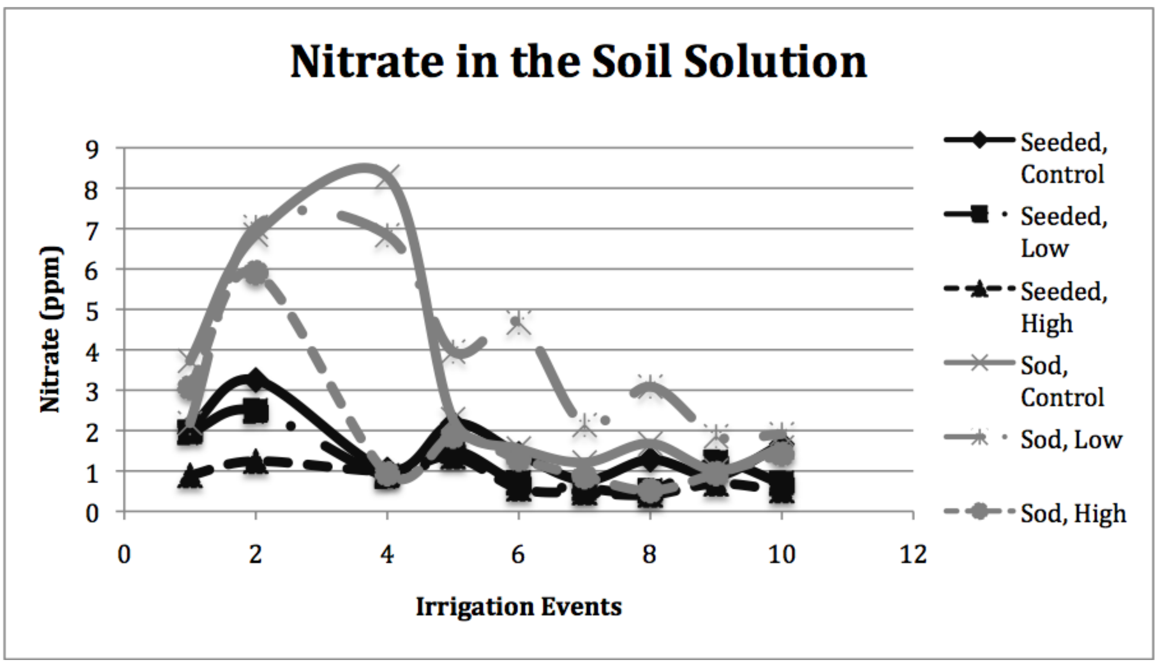
Methods: Biochar (Blue Sky Biochar) and tall fescue seed (450 lb/acre) were sown at roughly the same time, both at UC Riverside and at the West Coast Turf farm in Escondido. When mature, the sod from West Coast Turf was transplanted into plots along side the seeded plots at the UCR Turfgrass Research Facility. Suction lysimeters (Irrometer) were installed in each plot. The plots were fertilized with 2 lb N/1000 ft^2 using a 15-5-8 fertilizer (BEST Microgreen). Following fertilization, soil solution samples were taken from the lysimeters for 7 weeks following irrigation events. The soil solution was analyzed for nitrate, ammonia and ortho-phosphate concentrations.

Treatments: 3 rates of biochar were applied to both sod and the seeded turfgrass at rates of: 0 tons/acre (control), 2.8 tons/acre (low rate), and 14 tons/acre (high rate).

Results:







Discussion: With phosphate and the ammonia, there was a sharp decrease during the first few irrigation events as the nutrient was taken up by the turf or washed away. The nitrate increased as the ammonia nitrifies into nitrate and then decreased as it was washed away or absorbed. The sod treatments almost always had higher values in all three tested ions, likely because the transplanting process severs roots of the plants. In most cases, the high rate of biochar resulted in lower of concentrations each ion in the soil solution compared to the corresponding control and low biochar treatments.

Stop #10: Optimal Management Practices for Kikuyugrass Quality and Playing Conditions

Tyler Mock, Jim Baird, and Larry Stowell

This kikuyugrass (*Pennisetum clandestinum* Hochst. ex Chiov.) 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.

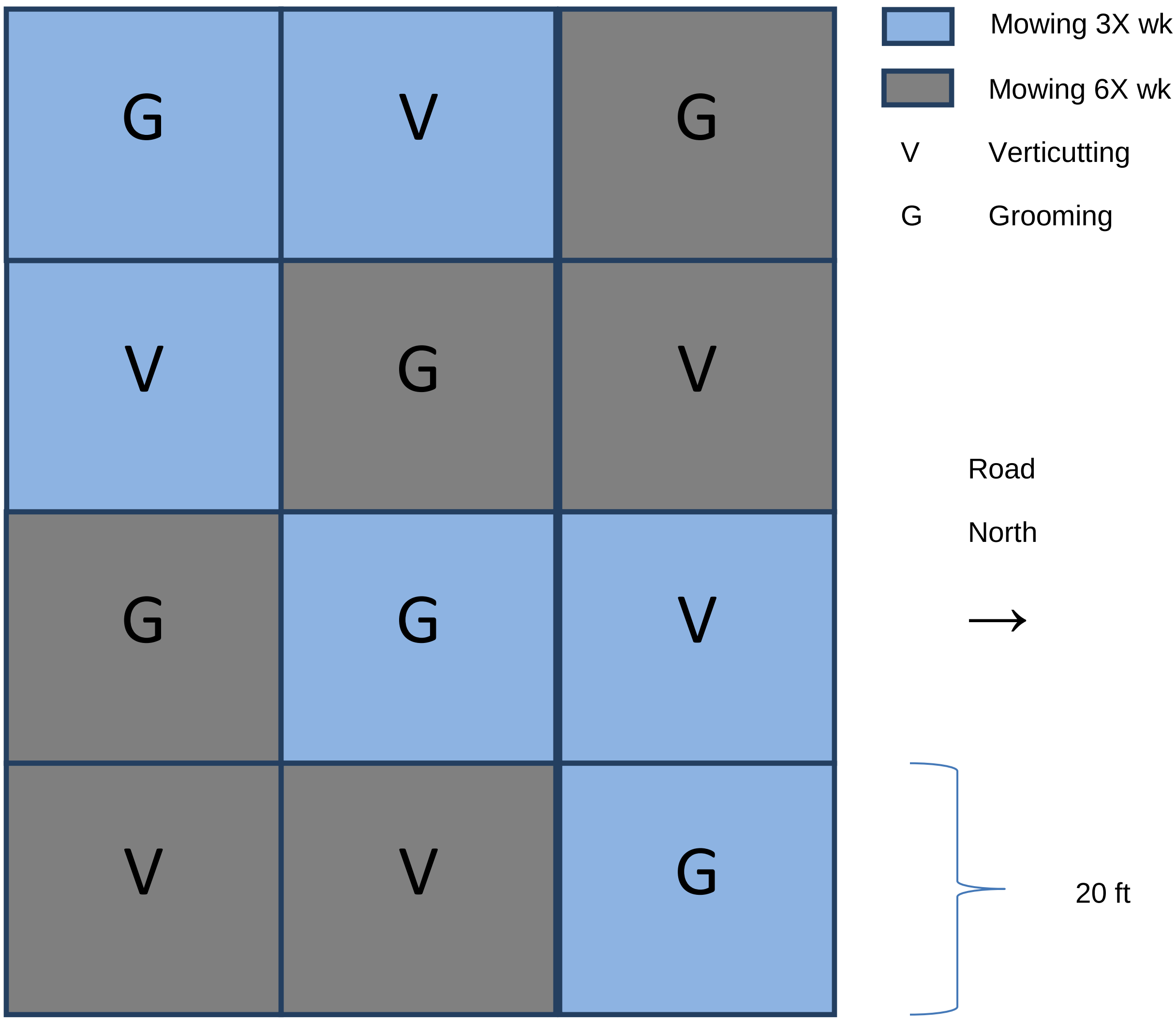
Take Home Messages:

- ✓ Bi-weekly applications of Primo Maxx improved turf quality, ball roll, color, and reduced scalping.
- ✓ Primo Maxx decreased firmness of the turf.
- ✓ Verticutting twice annually gave better color, reduced scalping, and produced firmer turf. Ball roll was significantly better following the grooming treatment 3 times weekly.
- ✓ Mowing 6 times per week showed small but significant increases in color, firmness, ball roll, and reduced scalping when compared to 3 times per week.
- ✓ Overall, Primo Maxx, verticutting 2 times per year, and mowing 6 times weekly gave the most positive ratings and interactions during 2012 and 2013.
- ✓ Fungicide treatments prevented disease pressure from Rhizoctonia large patch (*Rhizoctonia solani* AG 2-2) in the winter of 2012-2013, but had minimal effects on quality or other ratings during the growing seasons of both years.

Acknowledgments: Thanks to PACE Turf, LLC, Baroness, Syngenta, Crop Production Services, Emerald Sod Inc., Best Turf West, Eagle Golf Construction, and the CTLF.

Notes:

Kikuyugrass Management Study Field Map



Save the Date

UCR Turfgrass & Landscape
Research Field Day

Thursday, September 11, 2014

See you then!