UNIVERSITY OF CALIFORNIA
UC RIVERSIDE

Turfgrass & Landscape Research Field Day

September 13, 2012

University of California Agriculture and Natural Resources

UCR turfgrass science

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

Exhibitors

Be sure to visit our Exhibitors in the Exhibitor Tent. Thank you!

BASF Turf and Ornamental

California Turfgrass and Landscape Foundation

Crop Production Services

Dow AgroSciences

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Gowan USA

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IRROMETER Company

KISSS America

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West Coast Turf

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UNIVERSITY OF CALIFORNIA
UC RIVERSIDE

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 2012 UCR Turfgrass and Landscape Research Field Day. This marks the fifth consecutive year of this event under my watch. Time flies when you're having fun! 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. This year, for the first time, 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 new 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 12, 2013.**

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

UCR Turfgrass and Landscape Team 2012 (and Honorary Members)

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Jim Baird
Brent Barnes
Tim Close
Sean Cutler
Vic Gibeault
Robert Green
Chris Hohn
Nick Hoisington
Darrel Jenerette
Magali Lopez
Adam Lukaszewski
Don Merhaut
Alea Miehls
Tyler Mock
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Department of Environmental Sciences

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Jim Downer
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John Karlik
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Loren Oki
David Shaw
Cheryl Wilen

New Mexico State University

Bernd Leinauer
Marco Schiavon
Matteo Serena
Elena Sevostianova

Pace Turfgrass Research Institute

Wendy Gelernter
Larry Stowell

Thanks for your support throughout the year!

- AA Equipment
- A-G Sod
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- Aquatrols
- Arysta Life Science
- Baroness
- BASF Specialty Products
- Bayer Environmental Sciences
- Becker Underwood
- Best Fertilizer
- Best West Turf
- Blue Moon Farms, LLC
- California Golf Course Owners Association
- California Golf Course Superintendents Association
- California Sod Producers Association
- California Turfgrass and Landscape Foundation
- Calsense
- Central California Gold Course Superintendents Association
- Cleary Chemical
- Coachella Valley Association of Governments
- Coachella Valley Water District
- Creative Ecosystems
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- Florasource, LTD
- FMC
- Golf Course Superintendents Association of Northern California
- Golf Course Superintendents Association of Southern California
- Golf Ventures West
- Gowan Turf & Ornamental
- Grigg Brothers
- Growth Products
- Hi-Lo Desert Golf Course Superintendents Association
- Irrometer
- Jacklin Seed by Simplot
- Kurapia.com
- Lebanon Turf Products
- Links Seed
- Loveland Products
- Mark Burchfield, Victoria Club
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- Moghu Research Center
- Monsanto
- National Turfgrass Evaluation Program (NTEP)
- Northern California Golf Association
- Numerator Technologies
- Ocean Organics
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- Pacific Sod
- PBI Gordon
- Pickseed
- Pure Seed Testing
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- RIT Grove Management
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- Sierra Nevada Golf Course Superintendents Association
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- Southern California Turfgrass Council
- Southern California Turfgrass Foundation
- Southland Sod Farms
- Sports Turf Managers Association-Greater L.A. Basin Chapter
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- Tru-Turf
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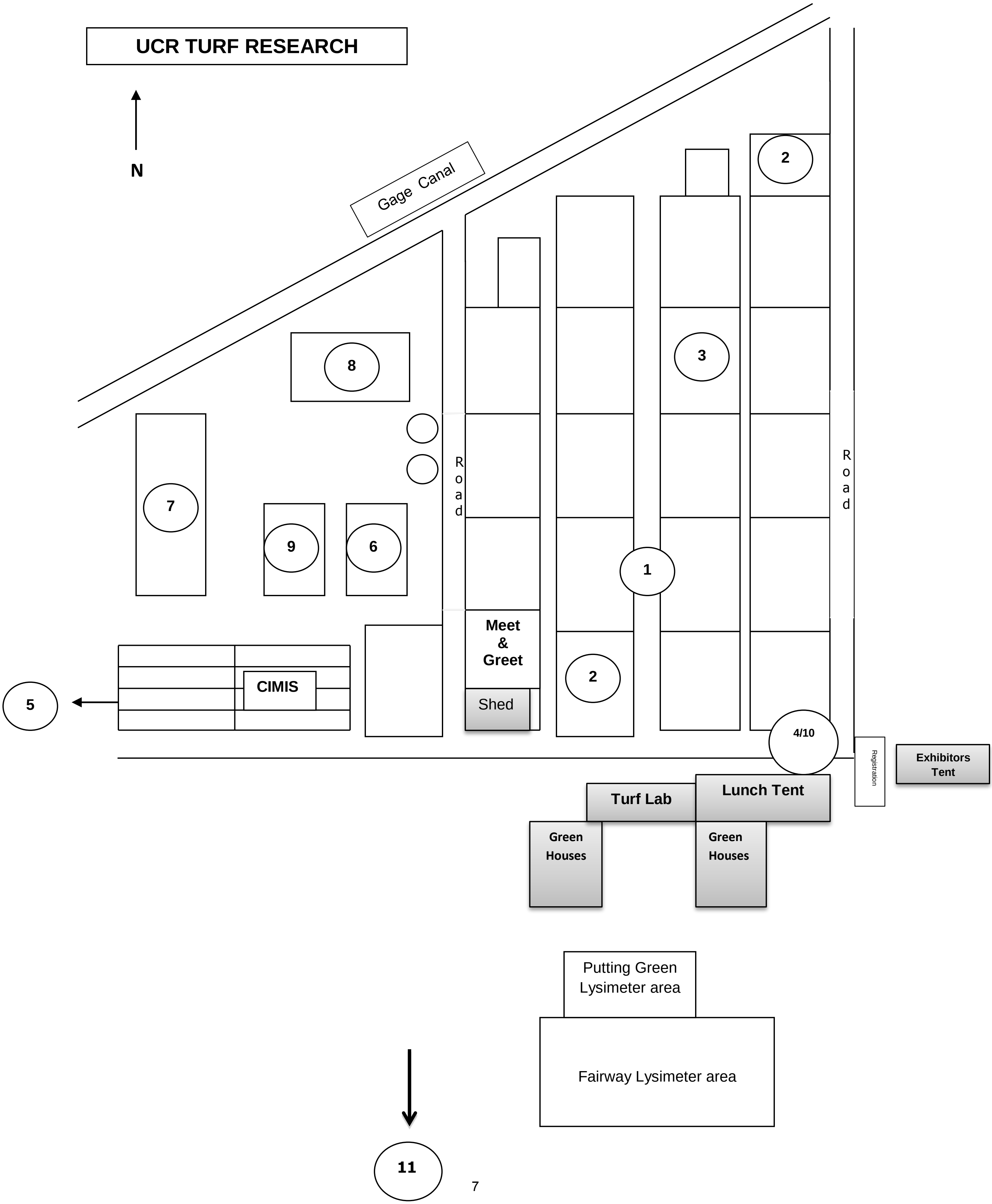
- United States Department of Agriculture (USDA)
- United States Golf Association (USGA)
- Valent Professional Products
- Victoria Club
- West Coast Turf


UCR TURF RESEARCH
N
Gage Canal
Road
Road
1
2
2
3
4/10
5
6
7
8
9
11
Meet & Greet
Shed
CIMIS
Registration
Exhibitors Tent
Turf Lab
Lunch Tent
Green Houses
Green Houses
Putting Green Lysimeter area
Fairway Lysimeter area

Turfgrass and Landscape Research Field Day Agenda

7:00 am **Registration and Trade Show**

8:00 **Welcome and Announcements**
Peggy Mauk and Jim Baird

8:20–9:40 **Field Tour Rotation #1 (20 minutes/stop)**

Stop #1: NTEP Perennial Ryegrass Ancillary Traffic Test
Brent Barnes

Stop #2: Groundcovers for Water Conserving Landscapes
Don Merhaut and Dennis Pittenger

Stop #3: Everything Buffalograss – Weeds, Traffic, Management
David Shaw

Stop #4: Overview of DWR Project to Document Health of 30 Mixed-Species Landscape Sites Throughout CA Under 3 ET Regimes
Janet Hartin

9:40–10:20 **Break, Refreshments, and Trade Show**

10:20–11:40 **Field Tour Rotation #2 (20 minutes/stop)**

Stop #5: Management of Anthracnose and Dollar Spot Diseases
Tyler Mock, Ryan Nichols and Peggy Mauk

Stop #6: Evaluation of Products for Salinity Management
Brent Barnes

Pathogenicity and Virulence of a Coachella Valley Root-Knot Nematode Population on Bentgrass
Hannes Witte, Antoon Ploeg, and J. Ole Becker

Stop #7: Evaluation of Products for Water Stress Management Using a Linear Gradient Irrigation System
Chris Hohn and Nick Hoisington

Stop #8: Drought and Irrigation Salinity Effects on Perennial Ryegrass
Alea Miehls, Don Suarez and David Crowley

Stop #9: Tall Fescue and Bermudagrass Establishment and Management Using Drip vs. Overhead Irrigation
Bernd Leinauer and Matteo Serena

11:45–12:45 **What's Happening Under the Tent?**

Stop #10: Pesticide Spill Control and Heat Stress
Sylvia Gutierez

12:45–2:00 **Barbeque Lunch and Trade Show**

1:30–2:00 **Kikuyugrass Anonymous**

(van transportation to and from Kikuyugrass research area)

Stop #11: Cultural and Chemical Management Factors Affecting Kikuyugrass Quality and Performance
Tyler Mock, Jim Baird and Larry Stowell

DPR Credits: 2 hours (other); 1 hour (Laws and Regulations)
Exhibitor Tent: 2 hours, 30 minutes

CIMIS Data Sep. 2011- Aug. 2012

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 2011	5.47K	0.00	486	14.1	88.4	60.8K	72.6	76	29	53	53.7	3.4 K	72.5
Oct 2011	4.03K	0.43	385	10.4	81.6K	54.5	66.6	71	28	48	44.7	3.1	66.6
Nov 2011	2.45K	1.55	263	7.8	68.8	46.2	56.4	72	34	53	37.0	3.2	56.2
Dec 2011	2.82	0.39	260	4.9 K	65.4K	41.0	52.7	60	23	38 K	24.6K	4.4 K	48.3
Jan 2012	3.02K	0.38	278	5.3 K	71.1K	45.4	57.2	53	21	36 K	26.4K	3.7 K	51.3
Feb 2012	3.41K	0.64	360 K	6.6 K	67.6K	44.0	55.3	69	27	46 K	32.8K	4.2 K	53.3
Mar 2012	4.51K	0.96	458 K	7.6 K	68.8	45.0	55.9	72	32	51 K	35.6K	4.0 K	56.7
Apr 2012	5.85K	0.87	560 K	9.1 K	76.0K	49.8	61.8	72	30	49 K	40.6K	4.3 K	63.2K
May 2012	7.00K	0.04K	636	11.7K	80.7	54.8	66.4K	78 K	32 K	54	48.6	4.3 K	68.5K
Jun 2012	7.62	0.00	717	12.5K	84.8	57.0	69.2	76	29	52 K	50.2K	4.6 K	72.0
Jul 2012	7.93	0.07	670	13.7	89.7	61.6K	74.4	73	27	48	52.7	4.3 K	74.5
Aug 2012	7.83	0.18	604	15.0	95.2	68.0K	80.3	65	26	43	55.2	4.1 K	77.3
Totals/Avgs	61.94	5.51	473	9.9	78.2	52.4	64.1	70	28	48	41.8	4.0	63.4

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: National Turfgrass Evaluation Program Perennial Ryegrass Test

Brent Barnes, Jim Baird, Alea Miehls, Tyler Mock, Ryan Nichols, Steven Ries and Steven Cockerham

The National Turfgrass Evaluation Program (NTEP) was formed to create a nationwide evaluation process for new seeded cultivars. NTEP generates easy access to direct information on cultivar selection, maintenance, and different important characters in specific regions of the United States and Canada.

Seeding Date: 22 October 2010

Seeding Rate: 4 lbs/1000 ft^2

Traffic: Half of plots subjected to six passes twice/week for 10 weeks using Brinkman Traffic Simulator, beginning on 25 August 2011 and 27 August 2012

Top Performers in 2011 at UCR:

Turf Quality	Traffic
1. ISG-36	1. PICK 10401
2. CS-20	2. A-35
3. ISG-30	3. GO-G37
4. ISG-31	4. IS-PR 463
5. GO-G37	5. IS-PR 497

For more information about this and other NTEP studies, please visit **http://www.ntep.org.**

Notes:

Stop #2: 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.

Thus far, 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. Kurapia or Lippia, which is in the neighboring plot is off-color, but recovers temporarily after 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, 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. Lippia nodiflora	Kurapia, Lippia	Green Produce plugs	3-1-11	Selection for drought tolerance from Japan; Lippia is also a California native plant; low-growing, prolific white flowers
5. Thymus pracox arcticus (T. praecox subsp. Arcticus; T. serpyllum) 'Pink Chintz'	creeping thyme	Native Sons 4-in. pot	11-4-09	Reported to grow 1-in. ht., pink flowers, attracts bees
6. Atriplex cinerea Poir.	coast or grey saltbush	Native Sons #1 container	11-4-09	Silver foliage, low-spreading, dioecious, Australian native
7. Correa X unk. 'Dusky Bells' ('Carmine Bells')	Australian fuchsia	Native Sons #1 container	11-4-09	Reported to be low wide-spreading, deep red flowers, Australian native
8. Geranium X cantabrigiense 'Biokova'	cranesbill	Native Sons #1 container	11-4-09	Reported very low and spreading, flowers winter-spring
9. Juniperus horizontalis 'Wiltonii'	blue rug juniper	Monrovia #1 container	12-2-09	Very flat dense growing, trailing branches, silver blue foliage
10. Hypericum calycinum L.	creeping St. Johnswort, Aaron's beard	Expertise Growers cuttings in flats	10-29-09	Low-growing, widely adapted, flowers primarily in spring and periodically in summer
11. Salvia sonomensis 'Gracias' (S. sonomensis X S. clevelandii)	creeping sage	Las Palitas #1 container	9-11-09	California native, reported low growing, wide spreading, lavender-blue flowers, possibly a hybrid of S. sonomensis X S. clevelandii, flowers winter/spring
12. Aptenia cordifolia (L.f.) N.E. Br. 'Red Apple' (A. cordifolia X A. haeckeliana?)	red apple	Expertise Growers cuttings in flats	10-29-09 add plt 4-2-10	Ice plant relative
13. Lantana montevidensis	trailing purple lantana	Expertise Growers cuttings in flats	10-29-09 add plt 4-8-10	Common landscape lantana, purple flowers spr.-summer
14. Trachelospermum jasminoides	star jasmine	Expertise Growers cuttings in flats	10-29-09	Vigorous once established, widely adapted
15. Sedum spp.	mixed sedums	Altman Plants 8 ft. × 8 ft. mats	3-31-10	Sod-like product with cuttings of 4 sedum spp. Rooted in jute mat under laden with plastic netting
16. Buchloe dactyloides 'U.C. Verde'	buffalograss	Todd Valley Farms plugs	4-8-09	Warm-season grass, a standard of performance under limited irrigation
17. Corethrogyne filaginifolia 'Silver Carpet'	California aster, common corethrogyne	Las Palitas #1 container	9-11-09	California native plant
18. Lonicera japonica 'Halliana'	Hall's honeysuckle, Japanese honeysuckle	Expertise Growers cuttings in flats	10-29-09	Very vigorous, reported to be tolerates drought well

^{z} Plants from flats and plugs spaced 1.0 ft. o.c., 64 plants/plot; plants from 4-in. and #1 pots spaced 2.0 ft. o.c., 16 plants/plot **rev. 9-08-12**

Stop #3: Evaluation of Seeded and Vegetative Buffalograss Under Simulated Traffic and Nitrogen Fertility

David Shaw, Brent Barnes, Alea Miehls, Jim Baird, and Victor Gibeault

In this experiment, we sought to compare establishment rates, traffic tolerance, and other turf quality characteristics of UC Verde, a vegetatively-propagated cultivar, and three experimental seed-propagated lines of buffalograss from the University of Nebraska. These experimental lines were developed from parental materials that exhibited improved turfgrass performance, heat tolerance, and greater seed yield.

Plugs and Seed Established:	9 July 2010
Seeding Rate:	2 lbs/1000 ft^2
Plug Spacing:	18-inch spacing of UC Verde plugs
Fertility:	Once fully established in August 2011, plots were split by 2 and 4 lbs N/1000 ft^2/Yr
Traffic:	Two passes twice/week using Brinkman Traffic Simulator beginning in August 2011 and June 2012 for a total of 11+ weeks each year

Preliminary Results:

- ✓ UC Verde retained its color much longer in the fall compared to the seeded types; however, the opposite was true for spring green up.
- ✓ In general, UC Verde provides a denser turf compared to the seeded types. Thus far, we have not seen a lot of separation in turf performance and quality among the seeded types.
- ✓ Higher nitrogen levels increased quality of both trafficked and non-trafficked buffalograss, and traffic was less detrimental to more mature buffalograss turf in 2012.

Notes:

- ✓ NEBFG 07-03 is now ‘Sundancer’ seeded buffalograss.

Stop #4: Evapotranspiration Adjustment Factor Study

<u>Principal Investigators</u>: 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</u> (MAWA) = (ETo) (0.7) (LA) (0.62)
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):</u> Riverside, California
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

Stop #5: 2012 Turf Disease Trials: Anthracnose and Dollar Spot

Tyler Mock, Ryan Nichols, and Jim Baird

Anthracnose

Thirty-five fungicide treatments were evaluated for their ability to control anthracnose preventatively on an annual bluegrass "tee". Inoculation was achieved through repeated core aeration and dragging to spread the existing inoculum. The plot was originally established in 2007 from seed with 'Peterson's Creeping' annual bluegrass. Beginning in May 2012, nitrogen was withheld from the turf followed by initiation of fungicide treatments on 20 June 2012 before disease symptoms were present.

Results:

- ✓ Overall, anthracnose disease pressure was moderate to heavy throughout the study area. Disease pressure separated well into treatment blocks (replications).
- ✓ Several fungicides or fungicide programs significantly reduced disease severity compared to the untreated control. Those that resulted in less than 5% disease cover throughout the entire study are shown below:

Treatment 2	
Reserve 3.6 fl oz/1000 ft2	A
Reserve 3.6 fl oz/1000 ft2	C
Daconil Ultrex 3.2 oz/1000 ft2	E
Insignia 0.9 fl oz/1000 ft2	E
Reserve 3.6 fl oz/1000 ft2	G
Daconil Ultrex 3.2 oz/1000 ft2	I
Insignia 0.9 fl oz/1000 ft2	I
Reserve 3.6 fl oz/1000 ft2	K
Reserve 3.6 fl oz/1000 ft2	M
Treatment 4	
Reserve 3.6 fl oz/1000 ft2	A
Reserve 3.6 fl oz/1000 ft2	C
Daconil Ultrex 3.2 oz/1000 ft2	E
Insignia 0.9 fl oz/1000 ft2	E
Reserve 3.6 fl oz/1000 ft2	G
Daconil Ultrex 3.2 oz/1000 ft2	I
Insignia 0.9 fl oz/1000 ft2	I
Signature 4.0 oz/1000 ft2	K
Daconil Ultrex 3.2 oz/1000 ft2	K
Reserve 3.6 fl oz/1000 ft2	M
Treatment 14	
Briskway 0.62 fl oz/1000 ft2	AEIM
Daconil Action 3.5 fl oz/1000 ft2	CGK
Treatment 20	
Briskway 0.62 fl oz/1000 ft2	ACEGIKM
Daconil Action 3.5 fl oz/1000 ft2	ACEGIKM
Treatment 26	
A13703G 0.62 fl oz/1000 ft2	ACEGIKM
Appear 6.0 fl oz/1000 ft2	ACEGIKM

Treatment 9	
Lexicon 0.472 fl oz/1000 ft2	A
Signature 4.0 oz/1000 ft2	C
Encartis 4.0 fl oz/1000 ft2	C
Insignia 0.7 fl oz/1000 ft2	E
Segway 0.9 fl oz/1000 ft2	G
26GT 4.0 fl oz/1000 ft2	G
Fore Rainshield 8.0 oz/1000 ft2	G
Signature 4.0 oz/1000 ft2	I
Insignia 0.7 fl oz/1000 ft2	I
Segway 0.9 fl oz/1000 ft2	K
26GT 4.0 fl oz/1000 ft2	K
Daconil WeatherStik 4 fl oz/1000 ft2	K
Lexicon 0.472 fl oz/1000 ft2	M
Treatment 29	
A13703G 0.62 fl oz/1000 ft2	ACEGIKM
Daconil Action 3.5 fl oz/1000 ft2	ACEGIKM
Treatment 30	
Disarm 480 SC 0.36 fl oz/1000 ft2	ACEGIKM
Treatment 31	
Disarm C 6.0 fl oz/1000 ft2	ACEGIKM

Most treatments were applied on a two-week schedule. Each letter (A,B,C, etc.) represents one week.

Notes:

Stop #5: 2012 Turf Disease Trials: Dollar Spot
Ryan Nichols, Tyler Mock, Jim Baird, and Peggy Mauk

Dollar Spot

Twenty fungicide treatments and one nitrogen treatment were evaluated for their ability to control dollar spot (*Sclerotinia homoeocarpa)* preventatively on a creeping bentgrass (*Agrostis stolonifera*) "tee". The plot is a 90/10 mix of creeping bentgrass and annual bluegrass, established in 2005 from sod. Beginning in May 2012, nitrogen was withheld from the turf followed by inoculation of the turfgrass on June 12, 2012. Inoculation was achieved by spreading dollar spot infested grain evenly across the study area. The inoculum was allowed one week to colonize on the turfgrass, and then all treatments were started on June 19, 2012.

Acknowledgements:

Special thanks to Dr. Peggy Mauk, Director of Agricultural Operations, for her help and support in preparing the inoculum, and to BASF, Syngenta, Valent, DuPont, Bayer, Cleary Chemical, Arysta LifeScience and Crop Production Services for providing fungicides and support throughout the study.

Results:

- ✓ Overall, dollar spot disease pressure was good, reaching 41% cover by mid August on the untreated control, and 54% on the nitrogen treatment (0.2 lbs N/M/2 wks using sprayable NH_4SO_4) by early August.
- ✓ Most all fungicides or fungicide programs provided effective control of dollar spot throughout the study period.
- ✓ Only one fungicide treatment, Disarm M, showed signs of mild phytotoxicity during the study period. Phytotoxicity is known to be an issue for most DMI fungicides, especially in high heat conditions present throughout the study period. Thus myclobutanil, an active ingredient in Disarm M, may have been responsible for the turf injury.

Notes:

Stop #6: FIELD EVALUATION OF SOIL WATER QUALITY PRODUCTS

Brent Barnes, Alea Miehls, and Jim Baird

Objective: To evaluate the efficacy of experimental and commercial soil water quality (SWQ) products.

Methods: The study will be conducted at the UCR Turfgrass Research Facility, Riverside, CA. The soil is a Hanford fine sandy loam (pH = 7.7; EC = 1.21; SAR = 1.83) with no pre-existing salinity issues. The plot area was sodded with 'Tifway II' bermudagrass on 6 August 2012 and the turf is mowed three times per week at 0.75 inches. Standard bermudagrass cultural practices will be maintained throughout the study, including 3-6 lbs N/M/yr. Beginning September 2012, the area will be irrigated exclusively with saline water that mimics the ion composition of the Colorado River (Table 1). Initially, irrigation will be scheduled at 75% ETo to encourage salinity conditions. Increased irrigation amounts will likely be necessary later during the study.

Table 1. Composition of salts used to formulate saline irrigation water (EC ≈ 4.6 dS/m; SAR = 6.83) in the UCR salinity experiment.

	meq/L
$MgSO_4 \cdot 7H_2O$	11.3
Na_2SO_4	0.8
NaCl	18.6
$CaCl_2$	4.8
KCl	3.4

An initial irrigation water and soil sample will be collected prior to trial initiation and at the end of the experiment.

Treatments: Treatments will be applied by hand or using a calibrated CO_2 sprayer as prescribed by cooperators. Control plots will be treated with water only. Treatments will be watered in with over 2 cm of water immediately following application. This trial will last from Sep 2012 until approximately November 2013 (coinciding with the first significant natural precipitation event).

Data to be Collected: **Turf Quality and Wilt**- Every 7 days- Visual Rating of turf quality based on a 1-9 scale (Best quality = 9) and percentage of plot exhibiting LDS symptoms. First assessment will made prior to initial treatment application; **% Volumetric Water**-Every 7 days- Percent volumetric water will be collected from each plot using a moisture meter. Five measurements per plot will be collected; **EC**- Every 7 days-Salt concentration will be collected from each plot using an EC meter. Five measurements per plot will be collected; **Leaf Osmotic Potential**- Psychrometer. Readings collected every 14-28 days; **Leachate Collection**- Leachate will be collected every 14-28 days from suction lysimeters; **Soil Sampling**- Soil will be sampled prior to application and at the end of the trial; **Irrigation Water**- Water will be sampled prior to application and at the end of the trial; **Digital Image Analysis**- Digital images taken periodically during the trial.

Reports: The study will be presented at the UCR Turfgrass & Landscape Field Days on 12 Sep 2013. A preliminary report will be provided on 1 April 2013 and a final report on 1 December 2013.

Additional Sites: A similar study with abbreviated data collection will be conducted at Metropolitan Golf Links in Oakland and Monarch Bay Golf Club in San Leandro.

Pathogenicity and virulence of a root-knot nematode population (*Meloidogyne graminis*) on bentgrass

Witte, H., A. Ploeg, and J.O. Becker
Department of Nematology, University of California, Riverside, CA 92521.

We are investigating the biology and ecology of a root-knot nematode *Meloidogyne graminis* population recently discovered in roots of declining creeping bentgrass (*Agrostis stolonifera* L. cv. Penn A-4) greens on a golf course in Indian Wells, CA. The greens were established years earlier and were apparently unaffected until summer of 2005 when unthrifty growth was first observed. The decline increased each summer in severity until 2009, the year we started our investigation.

Greenhouse studies with *M. graminis* on creeping bentgrass (cv. Penn A-4) confirmed parasitism by the development of characteristic root galls and mature, reproducing root-knot nematode females (Fig. 1). However, even high infestation levels (1000 J2/100 cm^3) did not result in significant growth reductions of the grass under otherwise good growing conditions.

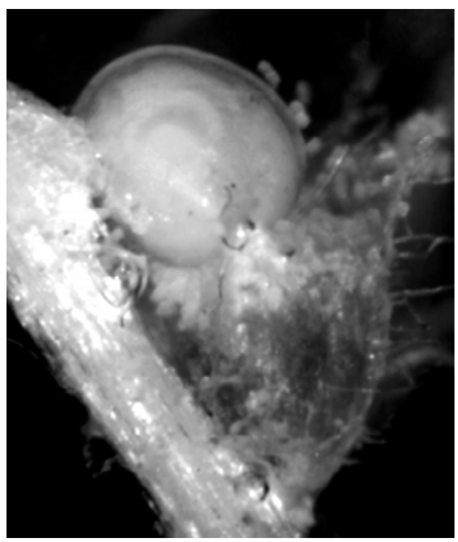

Fig. 1 Left: A galled bentgrass root containing juveniles of root-knot nematodes. The root was stained to visualize the otherwise transparent nematodes within the plant issue. Right: An egg producing female of *M. graminis* parasitizing a root.

Bentgrass quality frequently declines in summer when air and soil temperatures become less favorable for cool-season grasses. Studies at Kansas State University indicated that a decline in root activity of bentgrass occurred before a decrease in turf quality at soil temperatures of about 86˚F. Soil temperature recordings from irrigated turf at CIMIS stations in Rancho Mirage and in Cathedral City, CA between 2000 and 2004 showed that at 6 inches depth the temperature reached 90˚F only once per year (Fig. 2). During the following 5 years when disease symptoms appeared and became increasingly more severe, the number of days with soil temperatures at or above 90˚F was 22, 33, 45, 85, and 52 days, respectively. Thus, we hypothesized that at high soil temperatures additional root-knot nematode infestation may have accelerated the decline of the turf grass.

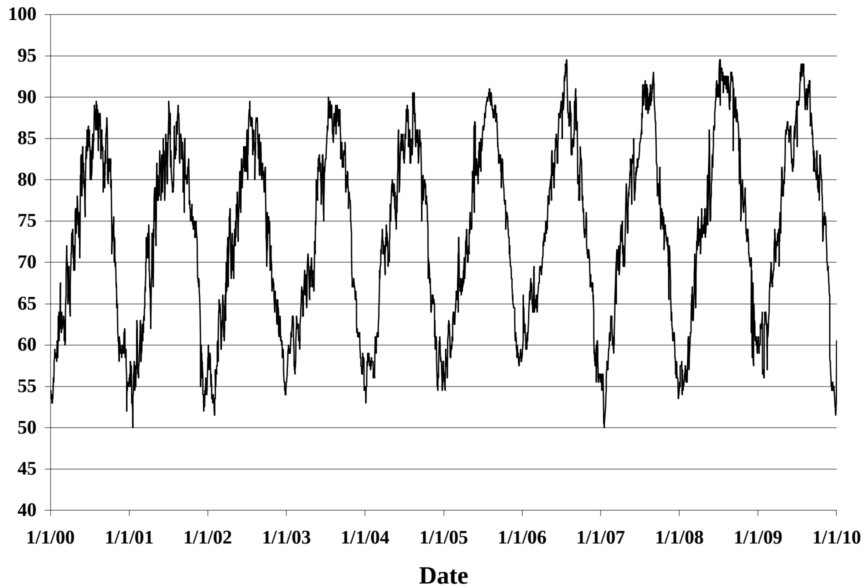

Fig. 2: Mean of maximum daily soil temperatures at 6 inches depth from CIMIS stations in Rancho Mirage, CA and in Cathedral City, CA between 2000 and 2010.

We tested this scenario in two independent greenhouse trials that utilized temperature regulated water tanks to keep the soil temperature of *M. graminis*-infested and nematode-free bentgrass cup cultures constant, each at 79˚F and 90˚F. The trials were arranged in a randomized complete block design with 6 replications. The grass was clipped only every other week to approximately 0.4 inch to avoid starving the roots of carbohydrates. After 6 months, the nematode population was determined by egg extraction and enumeration under 40X magnification.

There was more grass growth at the lower than the higher temperature but no differences in the weight of the grass clippings between infested and nematode-free treatments. At trial termination, the nematode population in the infested treatment was more abundant at the higher temperature. This was probably due to the faster development of the nematode, as its optimum temperature for development is closer to 90˚F than to 79˚F.

In conclusion, under otherwise good growing conditions parasitism of bentgrass cv. Penn A-4 by *M. graminis* did not appear to affect the fitness of the host even at high temperatures. Thus the cause of the observed turf grass decline may be related to other or additional biotic or abiotic stress such as short mowing height, traffic, water quality and quantity or secondary root infections by soilborne fungi. The result emphasizes the importance of accurate disease diagnosis to avoid futile and costly pesticide applications.

Stop #7: Evaluation of Products for Water Stress Management Using a Linear Gradient Irrigation System (LGIS)

Christopher E. Hohn, Nicholas Hoisington, and Jim Baird

In the Southwest and other areas of the United States, irrigation is necessary to maximize turf quality throughout the growing season. With the concern of water shortages rising, water conservation has become a major topic within the turf industry. Using a Linear Gradient Irrigation System (LGIS), researchers have put forth a significant effort to evaluate turfgrass species and germplasm for drought resistance (Qian 1999). However, there has been little investigation using LGIS to evaluate the effectiveness of chemical treatments to manage water stress on turf.

This study is assessing 11 different chemical treatments for water stress management of bermudagrass under variable rates of irrigation using a LGIS. The LGIS allows us to achieve multiple levels of irrigation while running a single irrigation program. The system is comprised of a single line of 13 valve-in-head sprinklers spaced at 16 ft, one-third of the normal sprinkler spacing. Each head is operated individually to prevent stream collision from adjacent sprinklers. The experiment has been established as a modified strip-plot design with chemical treatments (T) as main plots, irrigation levels (IL) as strips, and the combination of T and IL as subplots. Main plots are positioned perpendicular to the irrigation line to achieve the irrigation gradient. Based upon previous research conducted by Banuelos et. al. (2011) our target irrigation levels to evaluate are 85 to 55% of daily reference evapotranspiration (ETo).

No.	Treatment	Dosage (oz./M)	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	5.00	14
6	PK Plus	6.00	14
7	Kelplex	2.00	7
7	Ultraplex	4.00	7
8	Revolution	6.00	28
9	Neptune	6.00	28
10	Aquaplus	3.00	28
11	Primo Maxx	0.30	14
12	Control		

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

Cultivar: Tifway II sodded 8/07/2012

Fertility: 1.3 lbs N/M 8/17/2012

LGIS Initiated: 9/04/2012

Key Objectives:

1.) Establish which product(s)reduce stress under drought conditions.
2.) Determine effective irrigation and chemical management practices to reduce water use.
3.) Evaluate the ability of products to maintain acceptable turf quality under reduced water use.
4.) Contribute to the water conservation efforts of the turfgrass industry.

References:
Banuelos, J.B., et.al. "Deficit Irrigation of Seashore Paspalum and Bermudagrass" Agronomy Journal 103.6 (2011): 1567-1577.
Qian, Y.L. and M.C. Engelke. “Performance of Five Turfgrasses under Linear Gradient Irrigation” HortScience 34.5(1999): 893-896.

Stop #8: Leaching Requirements for Turfgrass Salinity Management and Water Conservation

Alea Miehls, James H. Baird, Donald L. Suarez, Catherine Grieve,
Bernd Leinauer and David Crowley

The purpose of this research is to help develop new guidelines and recommendations regarding the irrigation of turfgrass with saline water based on actual turf response under varying irrigation regimes. These recommendations can potentially lead to significant reductions in water use on golf courses and other turf areas where salinity management is a concern. Furthermore, we want to obtain a better understanding of plant-soil-microbial interactions under stress conditions, thereby providing valuable information regarding salinity and drought tolerance in plants.

Soil:	Hanford fine sandy loam
Plot Size:	12 main plots (each 30' x 30'); overall plot area is 10,800ft^2
Species:	Perennial ryegrass 'SR 4550'
Seeding Date:	28 April 2011
Fertility:	0.5 lb N/1000 ft^2/month
Mowing Height:	2.5 inches; twice weekly
Irrigation Regimes:	140, 120, 100 and 80% ET_o **(**replacement based on CIMIS data from previous week)
Saline/Deficit Irrigation:	Initiated on 21 July 2011 at EC = 4.2 dS/m, SAR = 6.83

Take Home Messages:

- ✓ Turfgrass quality was maintained with minimal turf loss during the first six months under the study parameters.
- ✓ However, after one year Irrigating with high saline water (4.2 dS/m), turfgrass quality has declined substantially with 50% cover remaining on turf irrigated at 140% ET_o, 10-20% at 120 and 100% $ET_{o,}$ and no living turf at 80% ET_o.
- ✓ As saline and drought conditions worsened, dry clipping yields have declined with currently minimal growth across all irrigation regimes.

Notes:

Stop #9: Tall Fescue and Bermudagrass Establishment and Management Using Subsurface Drip Irrigation (SDI) vs. Overhead Sprinkler Irrigation (OSI)

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

The objectives of this research were to increase awareness of SDI for California turf and landscapes and to compare turf establishment from seed between the two types of irrigation at different times in fall and spring.

Soil:	Hanford fine sandy loam
Design:	Randomized split plot with 3 replications; main plots (20 ft by 20 ft) are irrigation type and species; sub-plots are seeding dates
Species/ Seeding Rate:	Tall Fescue 'New Millennia'/8 lbs PLS/M Bermudagrass 'Princess'/1 lb PLS/M
Seeding Date:	23 August 2012
Fertility:	0.5 lb N/M (Milorganite) at seeding and 15 days after seeding
Irrigation Regimes:	120% and 100% Eto for tall fescue and bermudagrass, respectively
SDI:	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:	Toro Precision Spray sprinklers; 30 psi; 20 ft spacing
Acknowledgments:	This project was funded by The Toro Company. Calsense provided the flow sensors.
Preliminary Results:	Seedling counts taken on 5 September 2012 (13 days after seeding) indicated significantly greater establishment of tall fescue on SDI compared to OSI plots. No significant differences in bermudagrass establishment were found between SDI and OSI.

Notes:

Five Most Commonly Asked Questions about Subsurface Drip Irrigation (SDI) in Turf

1) **Why should I use SDI? What are the pros and cons of SDI?**
Subsurface drip irrigation systems irrigate more efficiently because they apply water from emitters placed within the rootzone. Advantages of SDI include the uninterrupted use of the turf area during irrigation, energy savings as a result of lower operating water pressure, no human exposure to irrigation water, reduced disease pressure, and potential water savings because irrigation is limited to the turf area and is not affected by wind drift or evaporation. Arguments against the use of SDI include high installation costs, difficulty in determining spacing and depth of pipes or emitters, a perceived inability to establish turf from seed or sod when using SDI, a perceived interference with regular maintenance, and a perceived inability to leach salts.

2) **How much more expensive is SDI?**
This question cannot be answered with a single number, as cost for material and installation (labor) depends on the soil type, and size and shape of the area to be irrigated. Subsurface Drip Irrigation systems for areas that require a large number of connections to the header lines can be significantly more expensive than a pop-up sprinkler system for the same area. However, a SDI system for areas with only few connections to the header lines (e.g. long and relatively narrow areas of turf) can be cheaper than a sprinkler system.

3) **Does SDI allow for regular maintenance practices such as granular fertilization or aerification? What if I have to apply pesticides that need to be watered in?**
Research has shown that turf irrigated from a SDI system can be fertilized with granular fertilizer without a loss in color or quality. If sufficient soil water is present, nutrients from the granule will become plant available regardless of whether water is applied from the surface or subsurface. However, most large turf areas with an SDI system have an injection system and apply liquid fertilizer. Home lawns can also be fertilized with a hose-end foliar/liquid fertilization system. If granular pesticide applications require watering-in from the surface either hand watering or a temporary surface irrigation system may have to be used. However, most turf pests can also be controlled by foliar pesticide applications. Core aeration can be applied if the drip lines are installed below the penetration depth of the core aerator. Deep tine aerification cannot be conducted on turf with SDI.

4) **How long will SDI systems last and should I be concerned of emitters clogging over time?**
We have no data available covering the longevity of SDI systems. We recommend and have installed all our SDI systems with filters (disk, screen, or sand) and flush valves to prevent clogging from sediments or other particles. Potential root intrusion can be addressed by using either ROOTGUARD® technology (e.g. Toro DL2000®) from Toro or the TECHFILTER® system from Netafim. Our oldest SDI system was installed in spring of 2003 and is still working fine.

5) **Can salts be leached with SDI?**
Several research reports have documented that SDI sytems are less effective than sprinkler systems at leaching salts from soils in the absence of adequate rainfall, particularly for rootzone depths above the drip lines. However, warm season grasses seashore paspalum, bermudagrass, and inland saltgrass, and cool season tall fescue did not exhibit a decline in summer quality despite salinity fluctuations in the rootzone.

Stop #11: Optimal Management Practices for Kikuyugrass Quality and Playing Conditions

Tyler Mock, Jim Baird, and Larry Stowell

A 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 period). 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:

- ✓ The bi-weekly applications of Primo Maxx have improved turf quality, ball roll, and color. And it has reduced scalping injury.
- ✓ Primo Maxx decreases the firmness of the turf, possibly due to increased shoot density.
- ✓ Only two months of data are available so far where the Kikuyu plots have been subjected to the verticutting treatment. From those two months we can compare how a weekly grooming treatment stands up to a 2x/yr verticutting regime. We have found that, once turf has recovered, verticutting gave better color, turf quality, reduced scalping, and had higher tensile strength when compared to the grooming treatment.
- ✓ As far as combinations of treatments are concerned, the best results have been found with combinations of Primo Maxx, verticutting, and high mowing frequency. For example, the best turf color resulted from combinations of verticutting/mowing 6 times per week and Primo Maxx/verticutting. A similar pattern was seen with turf quality ratings and scalping ratings.

Notes:

Save the Date

UCR Turfgrass & Landscape Research Field Day

Thursday, September 12, 2013

See you then!