

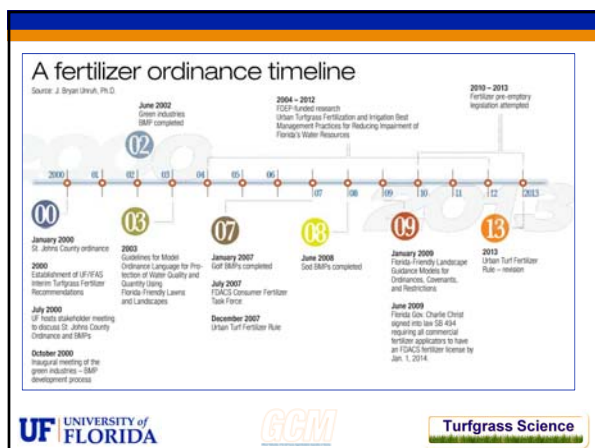
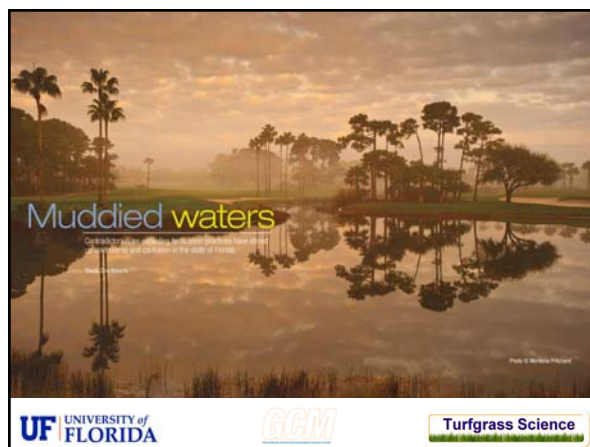
# What's New?

*Research Impacting Florida's Green Industry*

J. Bryan Unruh, Ph.D.

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## 2014 and Beyond

- Increasing level of scrutiny over what you do.
- BMPs are a starting point – not an end point!
- Fewer inputs are expected!
- Final revision of the Urban Turf Rule

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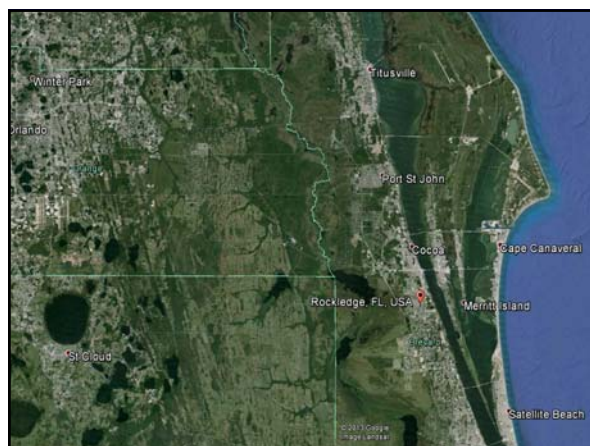
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## Increased Scrutiny

- Environmental activist groups have momentum.
  - General public poorly understands the issues.
- Increasing level of scrutiny over what you do – even from those whom you consider allies (i.e., your members).
  - Some, knowingly and unknowingly, are working against the efforts of the green industry.
    - Work to educate your members about the importance of plant nutrition.

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## Increased Scrutiny City of Rockledge Florida



Mark Jacobs of Save Our Aquifer said: "We need to stop polluting the lagoon with lawn fertilizers. It is more important to have a healthy lagoon than to have unnaturally green turf grass. Many people I know have healthy turf grass and use no fertilizers; polluting the lagoon with lawn fertilizers is a completely senseless and unnecessary waste."

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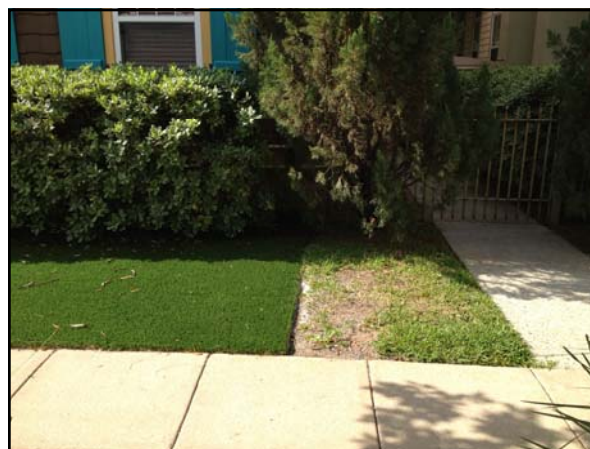
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## Indian River Lagoon

5 lots being landscaped with artificial turf



Is this an "OK" use of artificial turf?





At the root of the problem are nitrogen urea fertilizers, which are overused in Florida lawn care practices, as well as in Florida agriculture (more on this later). According to a Sierra Club report linking fertilizers to Red Tide blooms, residential fertilizer use in the state of Florida **increased by 153,533.95 tons or 45% from 2003 to 2006 alone.** One might ask the question to Floridians: is the "health" of your lawns (read: aesthetic appearance) more important than the health of the Gulf of Mexico (and by implication, your own health)?

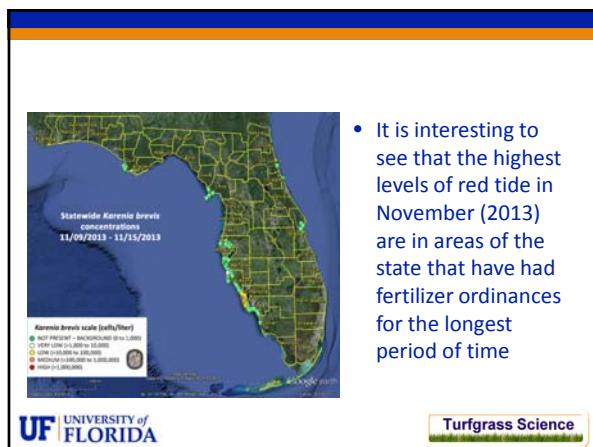
TOTAL NUTRIENTS BY TYPE FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES From July, 2005 To June, 2006						
	CONTAINER				USE	
	TOTAL	BAG	BULK	LIQUID	PUMP	NONPUMP
<b>MULTINUTRIENT</b>						
NITROGEN	179,828.04	42,105.13	118,718.92	21,889.02	191,443.94	27,415.09
PHOSPHATE	74,899.87	16,461.21	51,284.63	8,167.18	68,277.82	6,722.05
POTASH	233,000.00	29,761.48	601,117.75	22,132.00	103,846.49	16,149.24
<b>SINGLE NUTRIENT</b>						
NITROGEN	43,891.32	8,941.03	38,450.27	17,841.03	38,168.17	4,743.25
PHOSPHATE	1,794.86	194.92	1,112.94	487.43	1,727.47	27.41
POTASH	16,189.59	3,828.28	15,296.31	88.89	17,885.76	1,351.22
<b>ORGANIC</b>						
NITROGEN	625.82	811.46	214.14	0.00	448.14	289.68
PHOSPHATE	885.73	457.99	232.73	0.00	344.39	312.82
POTASH	719.10	429.71	289.39	0.00	408.39	310.74
<b>TOTAL NUTRIENTS</b>						
NITROGEN	223,719.36	48,056.73	157,499.21	39,629.95	191,612.11	32,158.34
PHOSPHATE	77,271.16	16,883.91	52,244.19	8,169.20	69,822.19	6,750.07
POTASH	233,889.59	34,022.91	178,875.79	22,231.79	121,811.71	21,504.22

Florida Fish and Wildlife Conservation Commission

Home | Research | Red Tide

### Red Tide FAQ

**Has coastal (nutrient) pollution caused the Florida red tide?**  
In contrast to the many red tide species that are fueled by nutrient pollution associated with urban or agricultural runoff, there is no direct link between nutrient pollution and the frequency or severity of red tides caused by *K. brevis*. Florida red tides develop 10-40 miles offshore, away from man-made nutrient sources. Red tides occurred in Florida long before human settlement, and severe red tides were observed in the mid-1900s before the state's coastlines were heavily developed. However, once red tides are transported inshore, they are capable of using man-made nutrients for their growth.



- It is interesting to see that the highest levels of red tide in November (2013) are in areas of the state that have had fertilizer ordinances for the longest period of time

### BMPs vs. BMPs

- BMPs mean different things to different people!
  - To some, it simply means best management practices as opposed to the not-so-best management practices.
  - In Florida, BMPs can signify regulatory influence!
    - FDACS – Ag BMPs
    - FDEP – Urban BMPs

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### The axe has fallen. . .

- Beginning January 2014, ALL commercial fertilizer applicators **MUST BE** certified by FDACS in order to make ANY TYPE of fertilizer application to:
  - Commercial turf or ornamental areas;
  - Turf or ornamental areas of parks or fields (other than agricultural areas);
  - Turf or ornamental area of any residential property.
- Prior to issuance of this certification, the applicator **MUST PROVIDE** proof of having received training in "Green Industry Best Management Practices" taught by UF/IFAS.

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### The axe has fallen. . .

"You must enclose a certificate of completion of training issued by the University of Florida (UF/IFAS) and/or Department of Environmental Protection (DEP) with this application."

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## BMPs are a Starting Point

Employment Classification*	2009	2010	2011	2012
Pesticide: Handlers, Sprayers, and Applicators, Vegetation	2,130	2,890	3,070	3,280
**Landscaping and Groundskeeping Workers	76,880	73,090	69,040	70,540
Grounds Maintenance Workers and All Other	460	630	1030	1140
<b>Total</b>	<b>79,470</b>	<b>76,610</b>	<b>73,140</b>	<b>74,960</b>

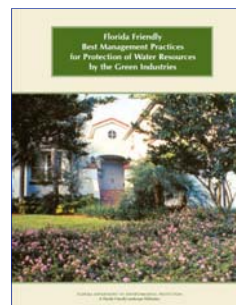
\*Estimates are based on Standard Occupational Classification Codes.  
<http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/occupational-employment-statistics-and-wages>

\*\*Landscape or maintain grounds of property using hand or power tools or equipment. Workers typically perform a variety of tasks, which may include any combination of the following: sod laying, mowing, trimming, planting, watering, fertilizing, digging, raking, sprinkler installation, and installation of mortarless segmental concrete masonry wall units. Exclude "Farmworkers and Laborers, Crop, Nursery, and Greenhouse" (45-2092).



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## BMPs are a Starting Point



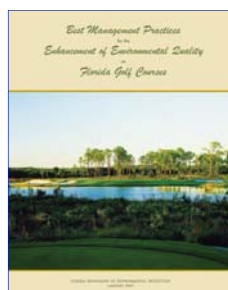
Year	Total Certified	Total Attended	Classes
2010	3,894	4,676	181
2011	3,236	3,953	169
2012	3,051	3,799	180
2013	4,807	5,759	254
<b>Total</b>	<b>22,938</b>	<b>27,305</b>	<b>1,073</b>

**As of 9:12 AM - 30,672**

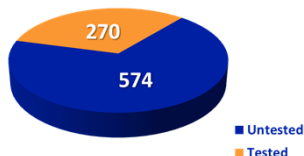


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## BMPs are a Starting Point

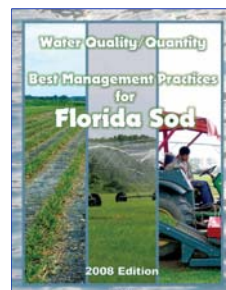


### FGCSA BMP Certified Superintendents

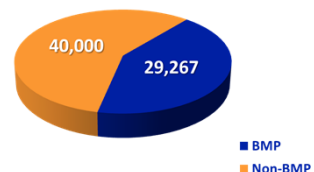


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## BMPs are a Starting Point



### Sod Acres Enrolled



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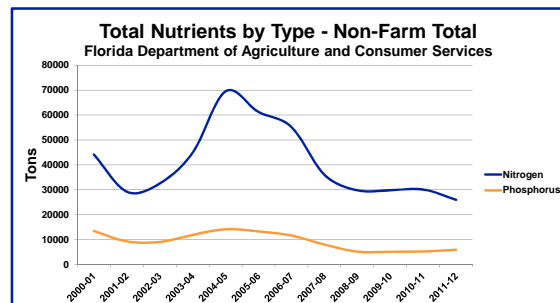
## BMPs are a Starting Point

- The goal of fertilizer BMPs is to match nutrient supply with turf requirements and to minimize nutrient losses.
  - Selection of BMPs varies by location, and those chosen for a given site are dependent on local soil and climatic conditions, turf variety, management conditions, and other site specific factors.

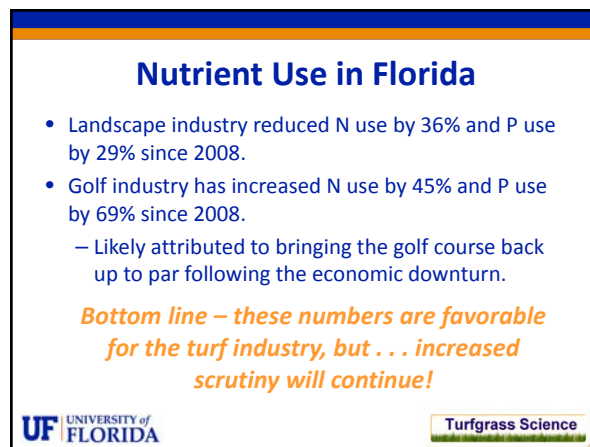
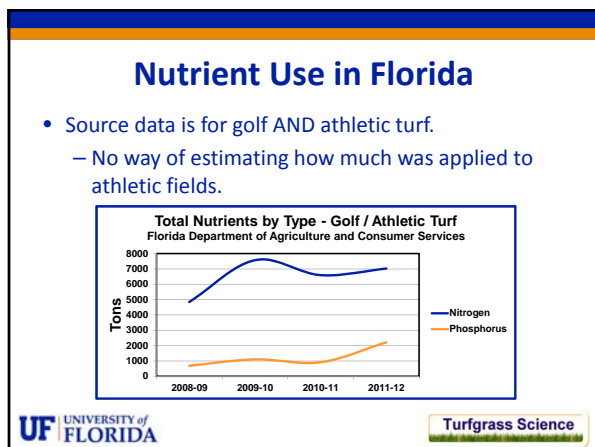
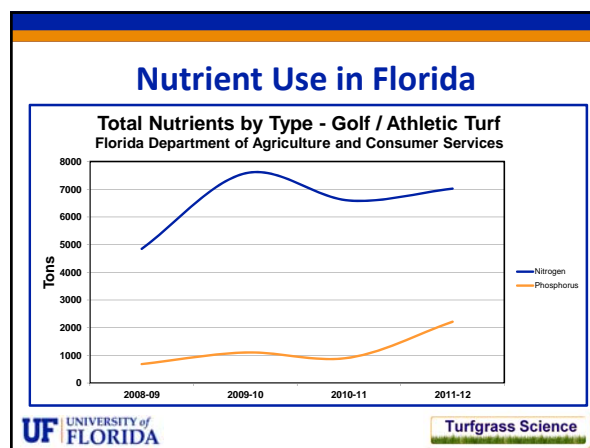
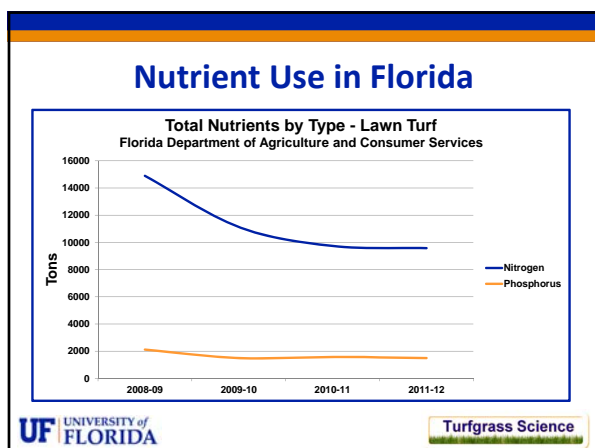


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## Nutrient Use in Florida



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### Trends in Nutrient Management Education

#### Nutrient Use Efficiency

- Generally defined as yield per unit input of fertilizer.
  - In turf, we don't measure "yield" directly.

#### 4R Nutrient Stewardship

- Right Source – Matches fertilizer type to plant needs.
- Right Rate – Matches amount of fertilizer to plant needs.
- Right Time – Makes nutrients available when plants need them.
- Right Place – Keeps nutrients where plants can use them.

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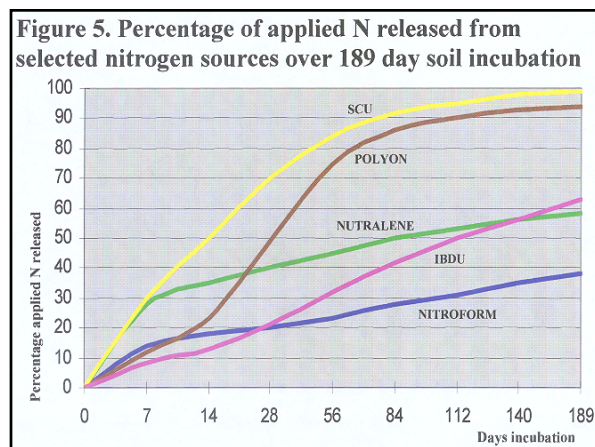
### 4R Nutrient Stewardship

- Right Source
- Right Rate
- Right Time
- Right Place

– Source, time, and place are more frequently overlooked and may hold more opportunity for improving performance.

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Total Nitrate Leached From Treatments and % Applied 2008-2011			
	Total N applied lbs/1,000 ft <sup>2</sup>	Total nitrate leached lbs/1,000 ft <sup>2</sup>	% applied
St. Augustinegrass	-	1.7	
Centipedegrass	-	0.9	54.7% less than St. Augustine
Untreated	0	0.5	-
Am. Nitrate (34-0-0) @ 49 kg N	11	1.2	6.3
Urea (46-0-0) @ 49 kg N	11	1.0	4.8
30% SRN (16-0-8) @ 49 kg N	11	1.2	6.5
50% SRN (19-0-19) @ 49 kg N	11	0.8	2.8
PCU (41-0-0) @ 49 kg N	11	0.7	1.4
PCU (41-0-0) @ 98 kg N	12	1.2	6.1
BSD (6-2-0) @ 49 kg N	11	0.7	1.4



**Getting a Response. . .**

- Research shows that you need 0.30 lbs / 1,000 ft<sup>2</sup> of available nitrogen to see a response in turf.

N Source	7	14	28	56	84	112	140	182
% of Applied Nitrogen Released								
Nitroform	14	18	20	23	28	31	35	36
Nutralene	28	35	40	45	50	53	56	58
Polyon	12	23	49	75	86	90	93	94
SCU	30	50	70	84	92	95	98	99
IBDU	8	13	21	32	42	50	56	63
Osmocote	19	25	35	55	72	81	88	94
20-2-20	37	39	41	45	48	50	52	54

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**Nitrate Leaching During Turf Establishment:  
Sodded and Seeded Centipedegrass**

J. Bryan Unruh<sup>1</sup>, Laurie E. Trenholm<sup>2</sup>, Phil Moon<sup>1</sup> and Jerry B. Sartain<sup>2</sup>  
<sup>1</sup>West Florida Research and Education Center, Univ. of Florida, Jay, FL  
<sup>2</sup>Univ. of Florida, Gainesville, FL

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### Interesting Facts and Figures

- Over 120,000 water samples!
- Over 1,000,000 data points!
- Ph.D. Dissertations:
  - Pauric C. McGroary
  - Ronald Francisco Gonzalez Chinchilla
  - Min Liu
- M.S. Theses:
  - Shweta Sharma
  - Jinyong Bae



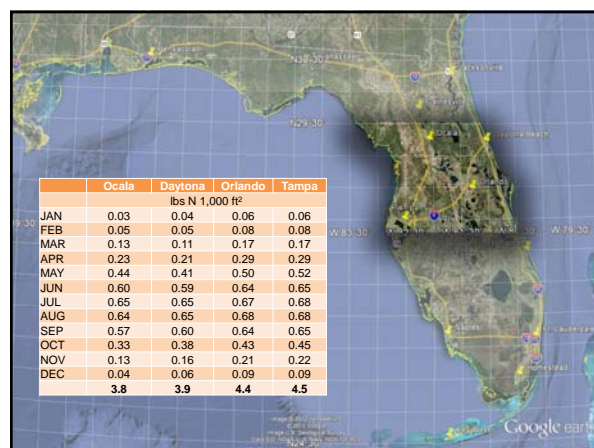
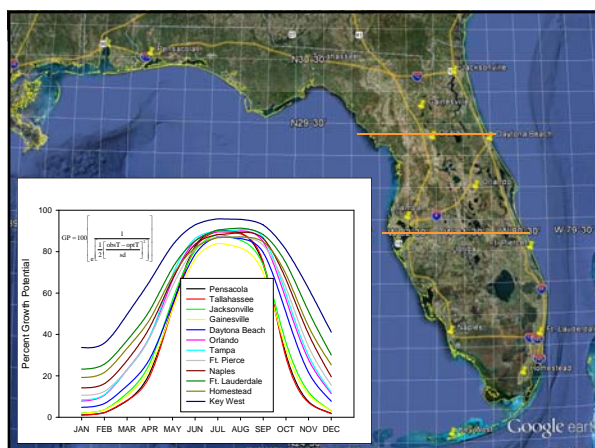


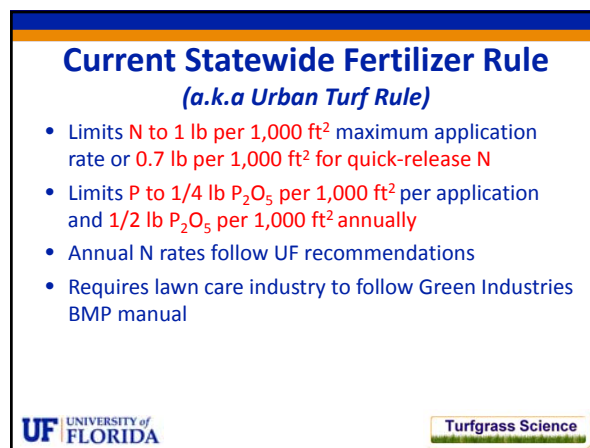
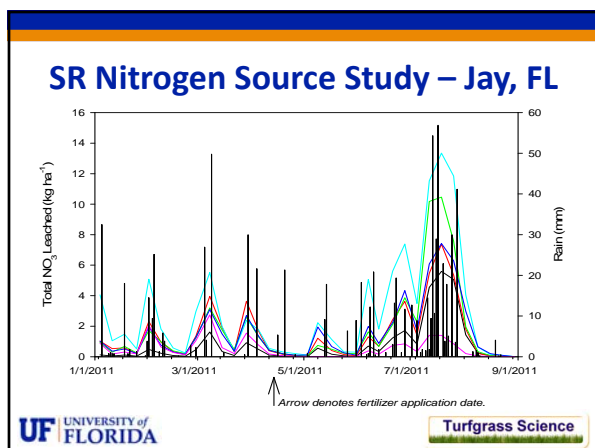
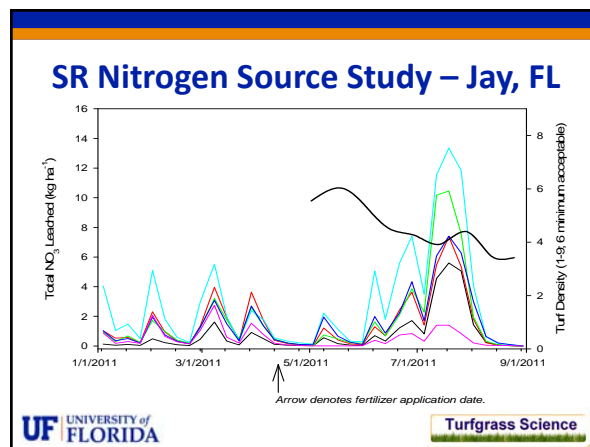
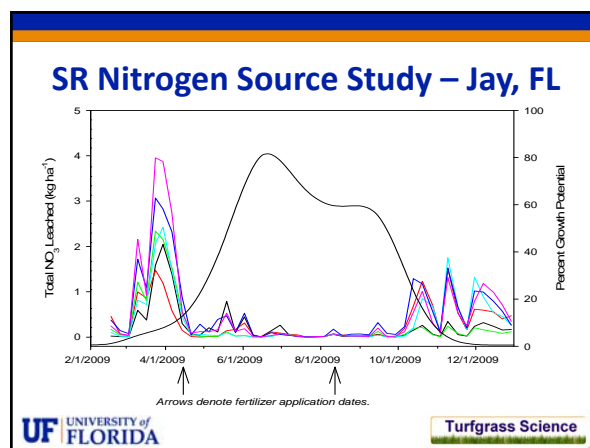
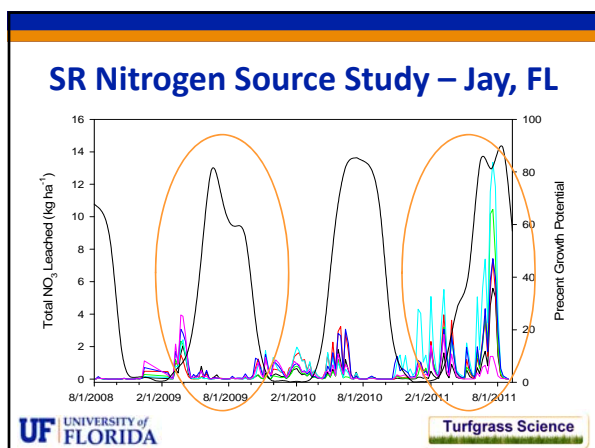


**Native Soil Removed Prior to Installation of Lysimeters**



**Soils Low in Phosphorus Placed Over Lysimeters**





### **Proposed Statewide Fertilizer Rule** (a.k.a Urban Turf Rule)

- “Actively Growing” means turf that needs mowing at least every two weeks.
- Nitrogen shall not be applied at an application rate greater than 0.7 lbs of readily available nitrogen, per 1000 sq. ft. per application at any one time based on the soluble fraction of formulated fertilizer.



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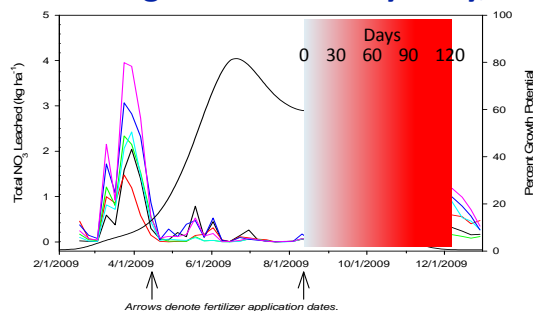
### **Proposed Statewide Fertilizer Rule** (a.k.a Urban Turf Rule)

- Not more than 2 lbs. of total nitrogen per 1000 sq. ft. per application may be applied during the spring or early summer;
- Not more than 1 lb total nitrogen per 1000 sq. ft. per application may be applied during the fall or winter.



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### **SR Nitrogen Source Study – Jay, FL**



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### **Proposed Statewide Fertilizer Rule** (a.k.a Urban Turf Rule)

- If a total controlled release product is applied, not more than 35% of the nitrogen in the controlled release fertilizer can be released within the first 7 days after application;
- Nitrogen applications cannot exceed the annual nitrogen recommendations in the Annual Fertilization Guidelines for Established Turfgrass Lawns in Three Regions of Florida, set forth herein.



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### **Proposed Statewide Fertilizer Rule** (a.k.a Urban Turf Rule)

- The following language shall appear conspicuously on bags of fertilizer sold at retail:

“Apply only to actively growing turf. “Do not apply near water, storm drains or drainage ditches. Do not apply if heavy rain is expected. Apply this product only to your lawn, and sweep any product that lands in the driveway, sidewalk, or street, back onto your lawn.”



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### **Proposed Statewide Fertilizer Rule** (a.k.a Urban Turf Rule)

- Minimum coverage area per container or bag shall be displayed prominently on the front of the container or bag. (i.e. This product covers 5,000 square feet, This bag feeds 4,000 square feet).



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## Nutrient Import from Sod

- Properly harvested sod comes with  $\sim \frac{1}{2}$ " of soil.
  - Nutrients applied at the farm are likely transported with the sod.
- Irrigation during sod establishment can be excessive if guidelines are not followed properly.



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## DEP-Funded Nutrient Leaching Study

### Effects of Sod Type, Irrigation, and Fertilization on Nitrate-Nitrogen and Orthophosphate-Phosphorus Leaching from Newly Established St. Augustinegrass Sod

John C. Dickinson,\* David M. Peck, John L. Chan, George H. Snyder, and Robert C. Wright

**ABSTRACT**  
Nitrogen and P leaching losses from fertilized sods were measured in lysimeters. In the present study, we measured the effects of sod type, irrigation, and fertilizer on leaching losses of nitrate-nitrogen (NO<sub>3</sub>-N) and P from sods. Sod types included St. Augustinegrass (SAG), bermudagrass (BER), and zoysiagrass (ZOI). Irrigation treatments included no irrigation (NOI), 10 mm (10I), and 25 mm (25I) of water per week. Fertilizer treatments included no fertilizer (NOF), 100 kg N/ha (100F), and 200 kg N/ha (200F). Sod was installed on 10/1/06. Irrigation was initiated on 10/1/06. Fertilizer was applied on 10/1/06. The study was conducted in a randomized block design. The results of the study are presented in this paper.

**Keywords:** sod, irrigation, fertilizer, nitrate-nitrogen, orthophosphate-phosphorus, leaching, St. Augustinegrass, bermudagrass, zoysiagrass.

**Introduction**  
Bermudagrass sods containing both N and P are frequently used in sod establishment. However, bermudagrass sods are not typically fertilized. Fertilizer is applied to sods after installation. The purpose of this study was to determine the effects of sod type, irrigation, and fertilizer on leaching losses of nitrate-nitrogen (NO<sub>3</sub>-N) and P from sods. The results of the study are presented in this paper.

Published online 10/1/06. DOI: 10.1007/s10343-006-9000-0

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At the onset of each trial, recently cut sod was installed in each of the lysimeters. Sod produced on muck soil for trials 1 and 2 was received from King Ranch (Belle Glade, FL). Soil analysis from the site showed 81.2% organic matter, 0.6% total N, and 0.06% total P. Sod from muck soil and for trial 3 was received from TJ Turf Farm (Delray Beach, FL), and was lower in organic matter, 58.5%, total N, 0.2%, and total P, 0.02%. Sod produced on sandy mineral soil was received from A. Duda and Sons (La Belle, FL). Soil analysis from the site showed 2.6% organic matter, 0.2% total N, and 0.01% total P. All soil analyses were conducted by A and L Southern Agricultural Laboratories, Inc. (Pompano Beach, FL).

- How much does a pallet of sod weigh?
- How much total N and P is contained in a pallet of sod?

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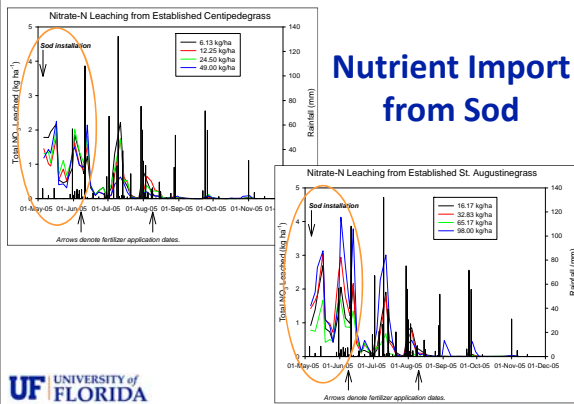
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	Pallet Weight	% Nutrient	Lbs/Nutrient/Pallet	Ft <sup>2</sup> /Pallet	Lbs/Nutrient/1,000 ft <sup>2</sup>
Mineral	2800	0.2 %N	5.6	450	12.4
	2800	0.02 %P	0.56	450	1.24
Muck	2000	0.6 %N	12	450	26.7
	2000	0.06 %P	1.2	450	2.67

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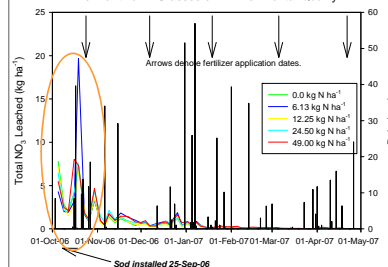
## Nutrient Import from Sod



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## Nutrient Import from Sod

### Impact of Fertilizer Applications to Semi-Dormant and Dormant Lawn Grasses on Environmental Quality



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## Practical Considerations

- Avoid fertilization of newly laid sod for 30 – 60 days.
  - Sufficient nutrients likely exist.
- Encourage sod installers/landscapers to inquire about the timing of the last farm-applied nutrients.
  - Use ranges rather than specific dates
    - < 2 weeks = no fertilizer for 60 days
    - 2 – 4 weeks = no fertilizer for 30 – 60 days
    - > 4 weeks = no fertilizer for 30 days
  - This could prove burdensome for less “tech-savvy” producers.

## THE DEVIL GRASS

Water-hungry St. Augustine grass sucking up fresh water

By MARCIA LANE | More by this reporter | marcia.lane@staugustine.com | Updated: 9:35 AM on Sunday, November 25, 2007

For Florida homeowners, nothing's more natural than the St. Johns River Water Management District thinking residents to rethink what's in their yards.

There's a particularly toxic form of St. Augustine grass, and lawns in general throughout the South.

St. Augustine grass is a real water user, and certain lawns in general," said Teresa Munson, a spokeswoman for the Water Management District.

SeminoleChronicle.com

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The enemy of an adequate water supply is St. Augustine grass, says Orange County Commissioner Bill Segal. Segal is working on a series of conservation measures along those lines. They include forbidding homeowner associations from mandating St. Augustine.

In fact, we should ban St. Augustine and sprinkler systems in new developments. We should encourage their elimination in existing neighborhoods by limiting irrigation to one hour a week.

Stainer said that the alternative grasses, Bahia and Empire Zoysia, are much more drought-tolerant than St. Augustine. Stainer also said that the Bahia and Empire Zoysia are easier to maintain, cost less, and use less fertilizer and less water - which means more money in your pocket.

"If an average resident were to include Florida-friendly, water-wise, drought-tolerant grasses and plants, they could save up to 40 percent annually on their utility bill," Stainer said.

## Turf Fight: Sod Growers Speak Up For St. Augustine

posted by Steve Hudak on Sep 16, 2008 4:59:29 PM

Discuss This: Comments (0) | TrackBack (0) | Linking Blogs | Add to del.icio.us | Dig it

TAVARES - Sod growers urged Lake County commissioners today to rework a controversial landscaping ordinance that would ban the planting of St. Augustine grass in new residential and commercial developments.

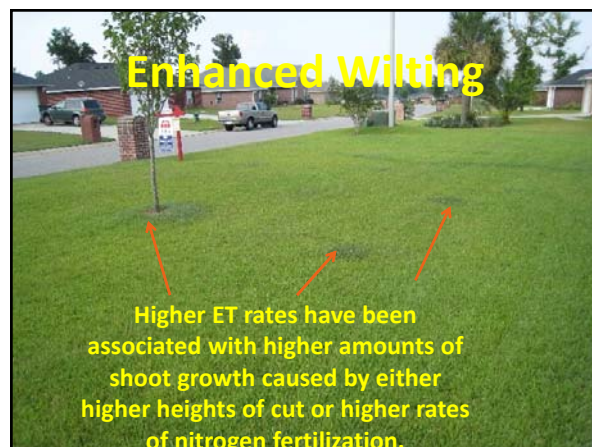
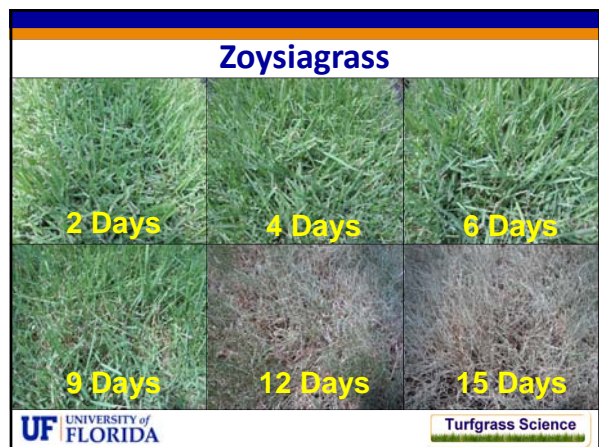
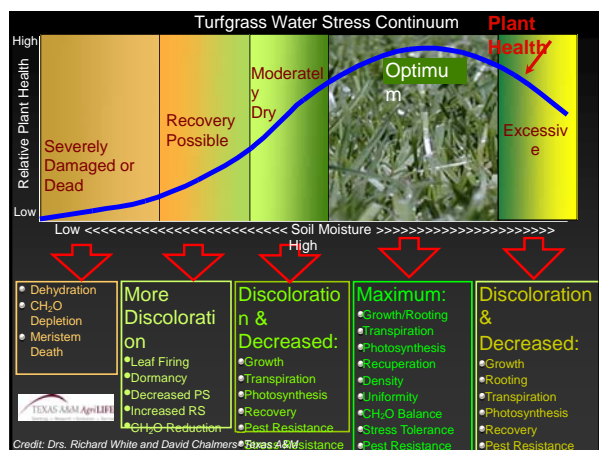
The proposed ordinance, aimed at conserving water, drew criticism from turf experts, some of whom argue that a ban on the popular lawn grass is senseless because the species is no less "drought-tolerant" than other turf.

## Drought Tolerance vs. Drought Resistance

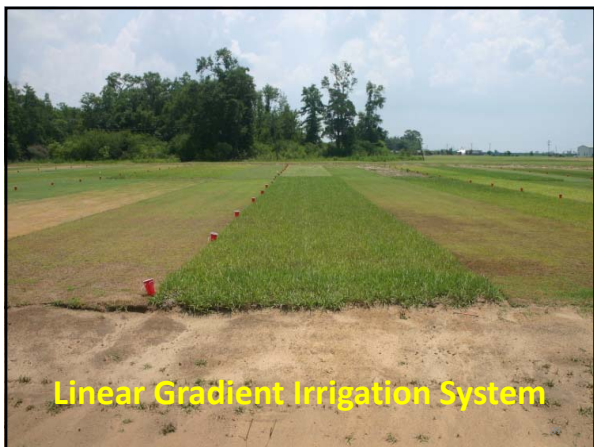
- Drought Resistance = the ability of a plant to survive prolonged drought stress through various mechanisms:
  - Drought Tolerance
    - Escape
    - Hardiness
  - Drought Avoidance
    - Limiting factors influencing soil water uptake
      - deep rooting
      - root viability
      - resistance to soil stresses
    - Limiting evapotranspiration (ET)

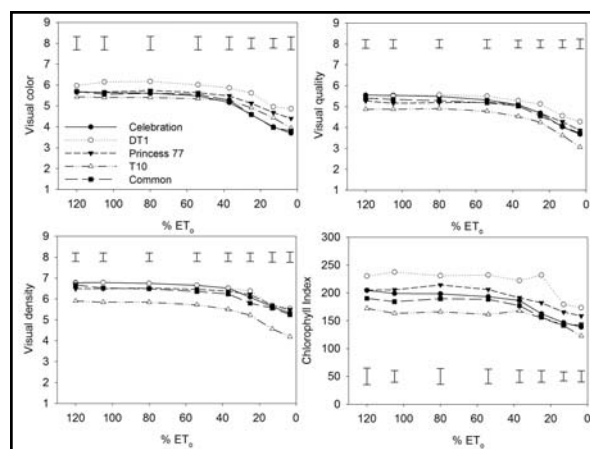
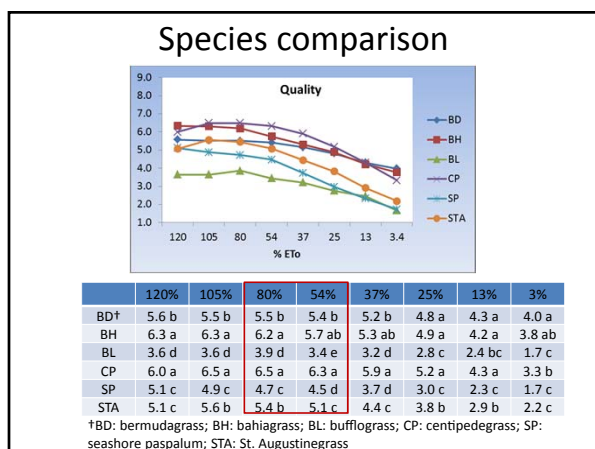
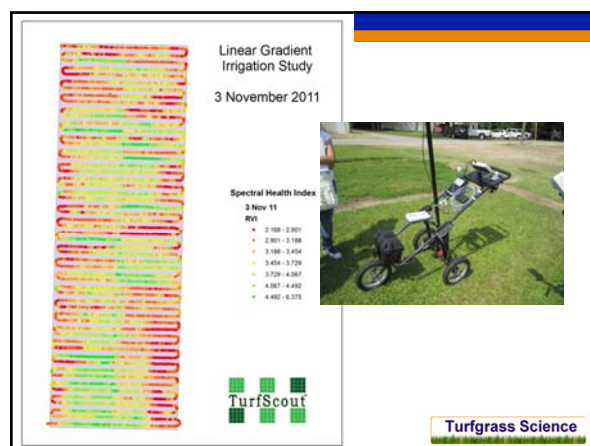
## A better phrase may be: Drought Response

- Grasses undergo many changes in response to drought.
  - Many of these responses go unnoticed but have a profound effect on the plant's ability to withstand drought.
    - Some are often very difficult to quantify.
  - Others are readily observed and easily quantified.

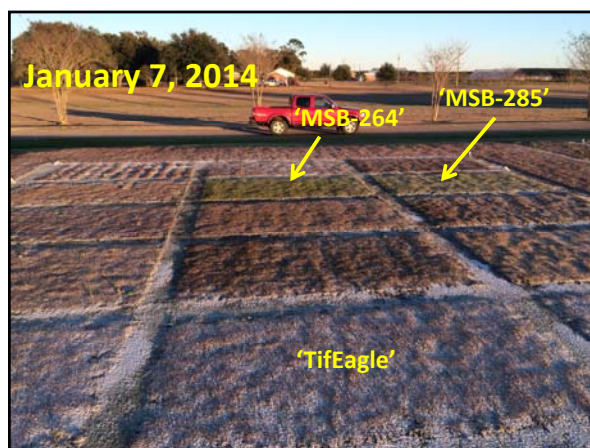
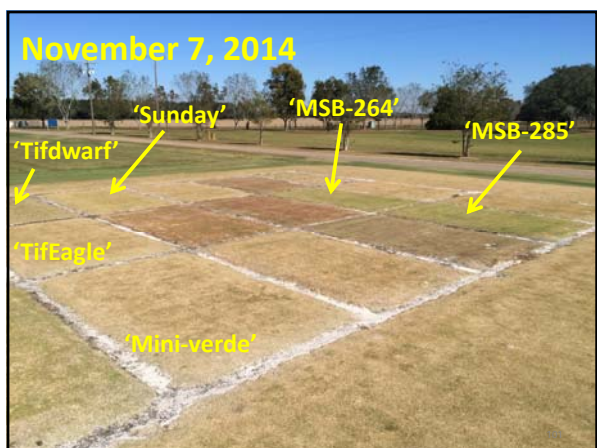
















**USGA Seashore Paspalum Study**



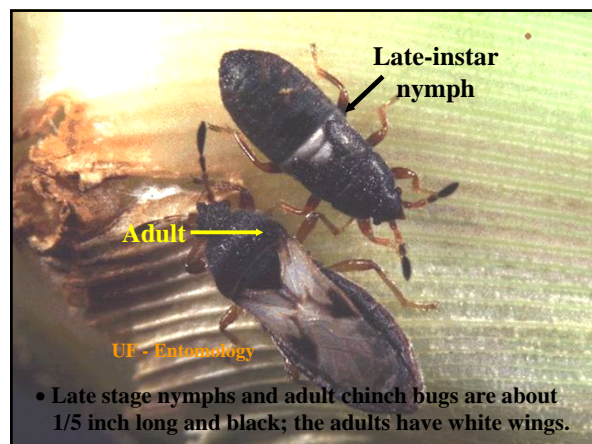
**Fairway Height Accessions**



**Lost Key Golf Club – Perdido Key,  
FL**



**Lost Key Golf Club – Perdido  
Key, FL**

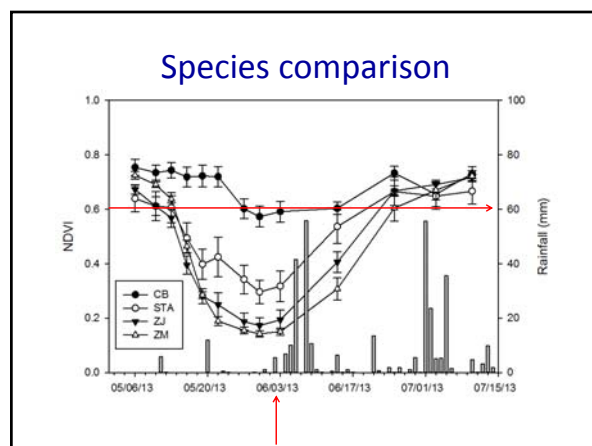


**Plant Genetics and Genomics to Improve Drought and Salinity Tolerance in Turfgrass Species for the Southern United States**

Texas AgriLife Research, Texas A&M System  
 University of Florida  
 University of Georgia  
 North Carolina State University  
 Oklahoma State University

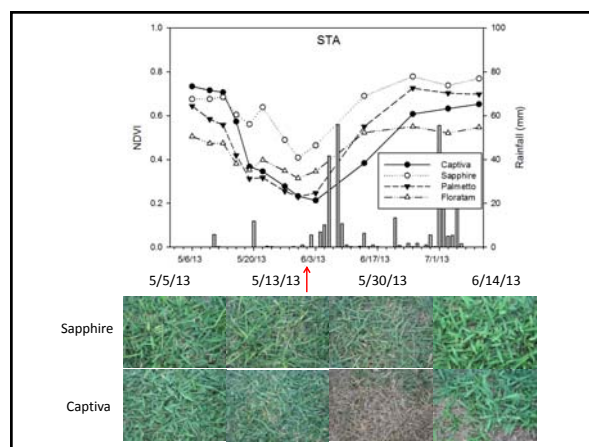
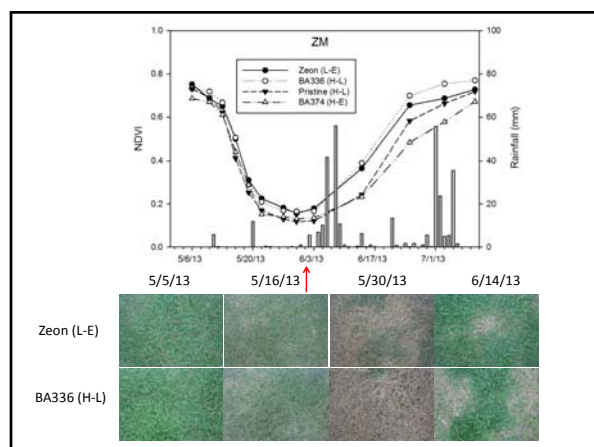
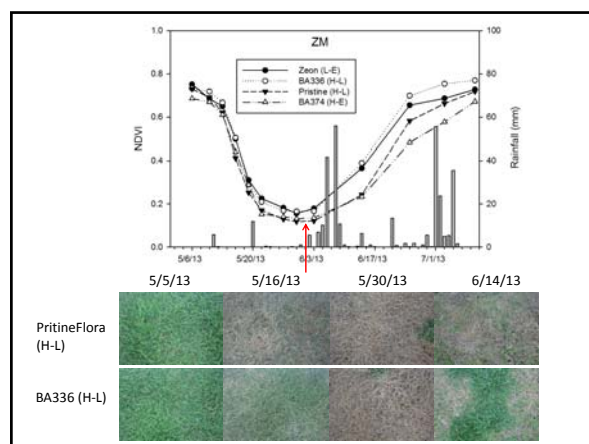
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Turfgrass Science





## After 30 days of drought

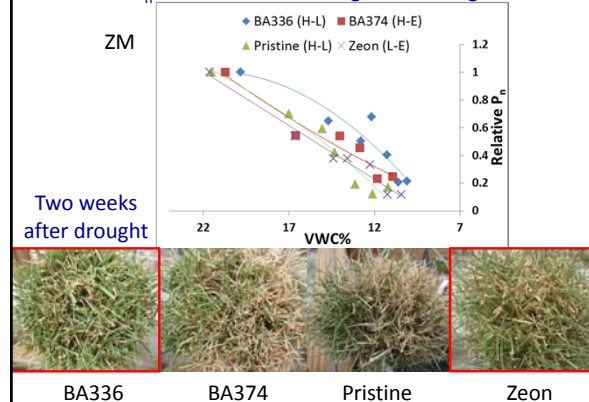


## Above-ground

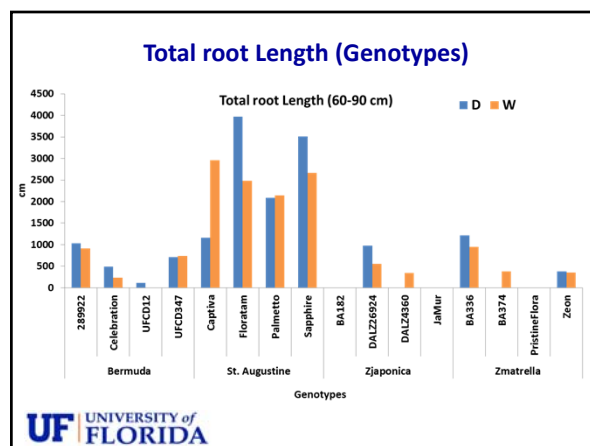
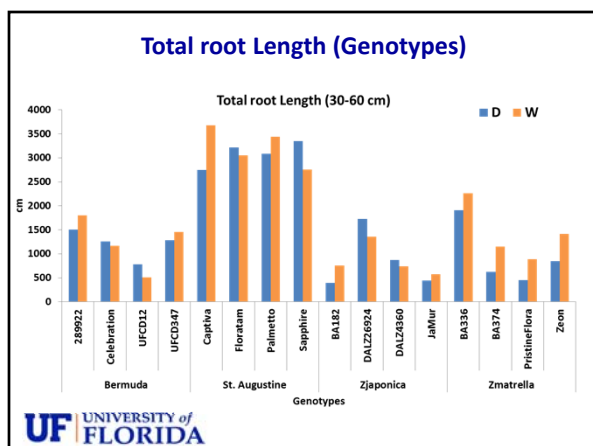
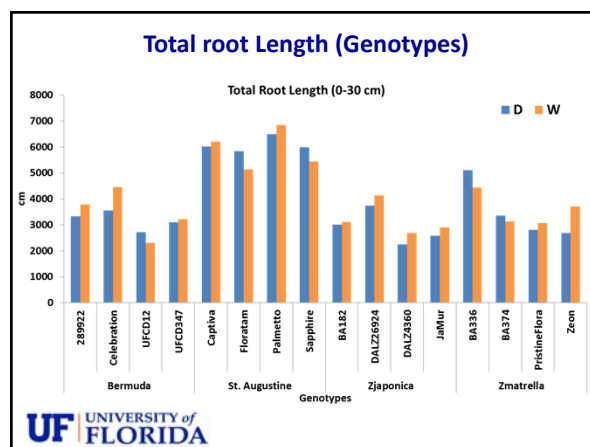
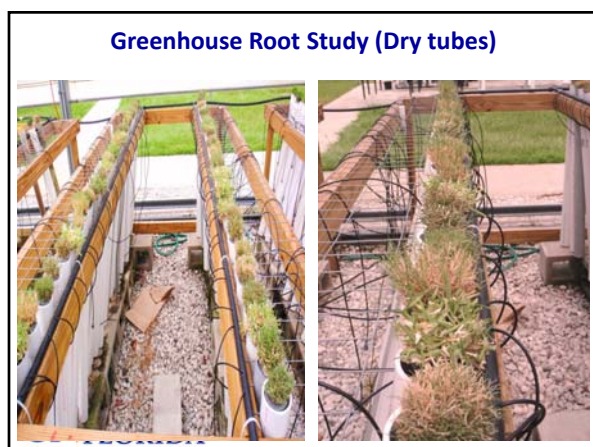
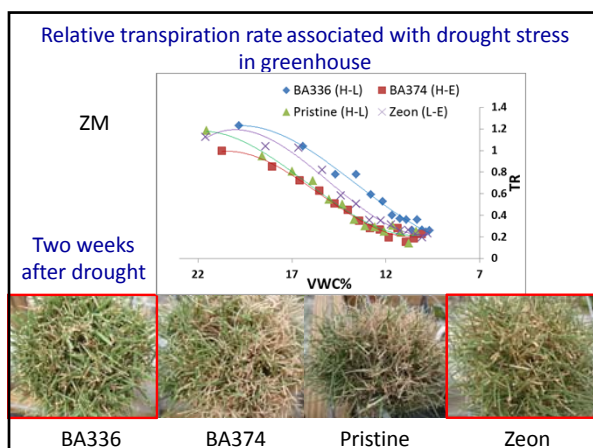
- Physiological measurements
  - Photosynthetic rate ( $P_n$ ) (Li-6200)
    - Stomatal closure (early stage of drought stress)
    - functionality limitation (later stage of drought stress and recovery)
  - Canopy transpiration rate (Li-6200)

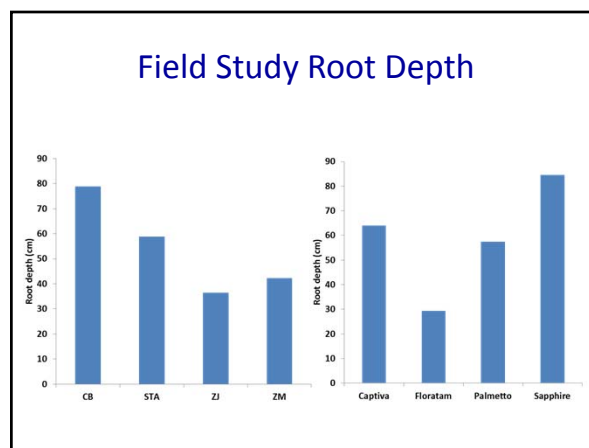
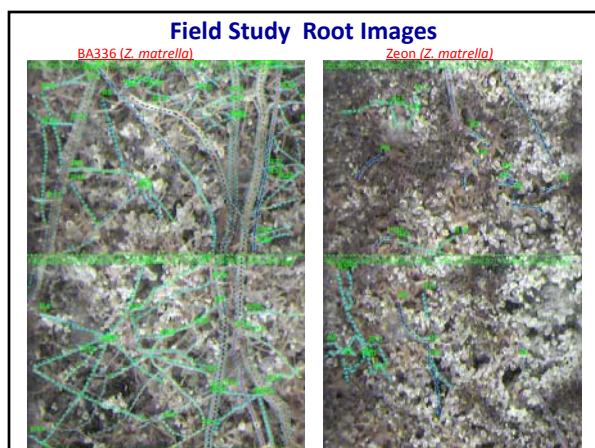
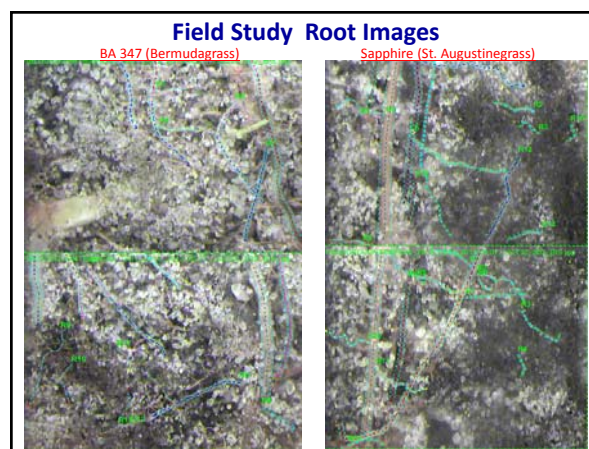
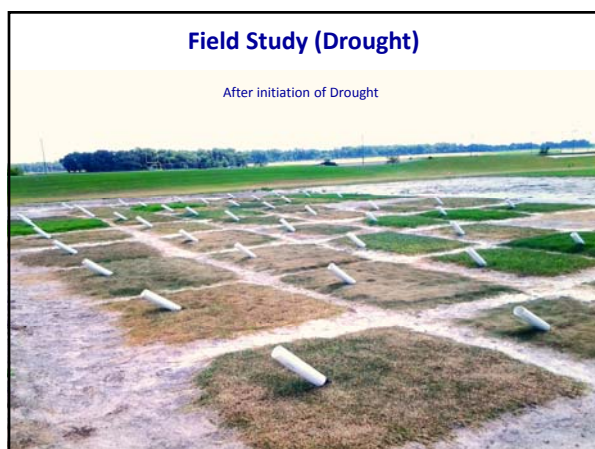
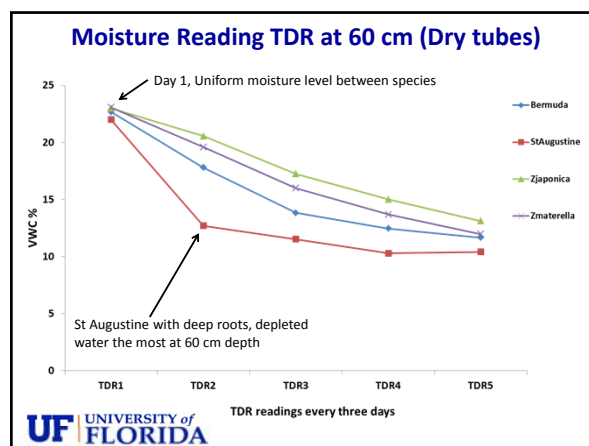
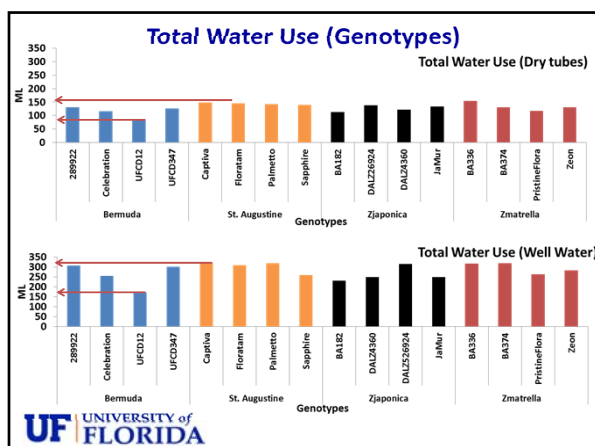


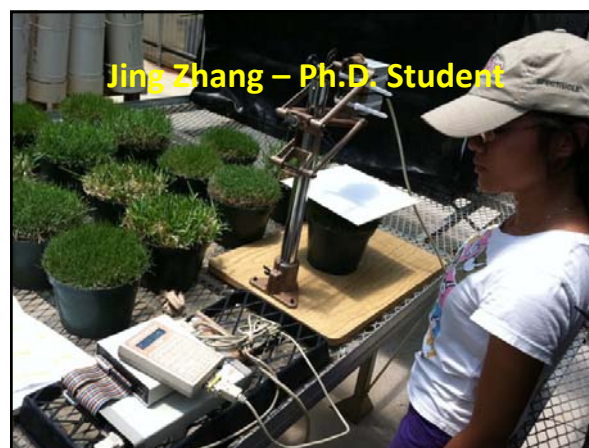
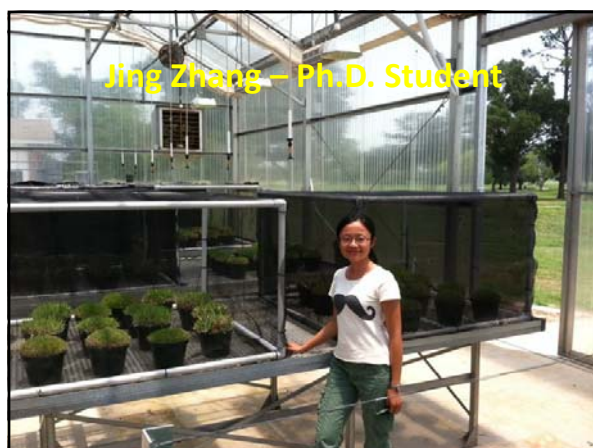
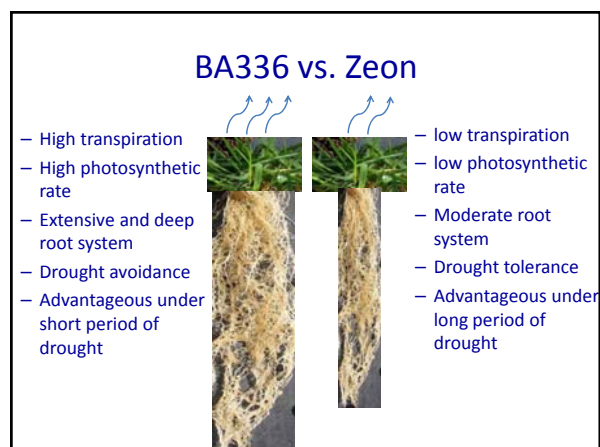
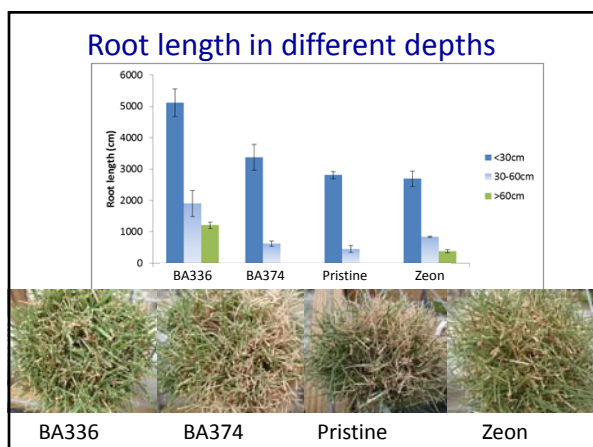
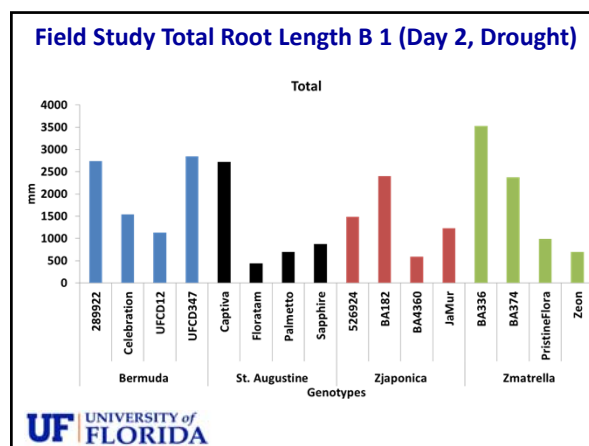
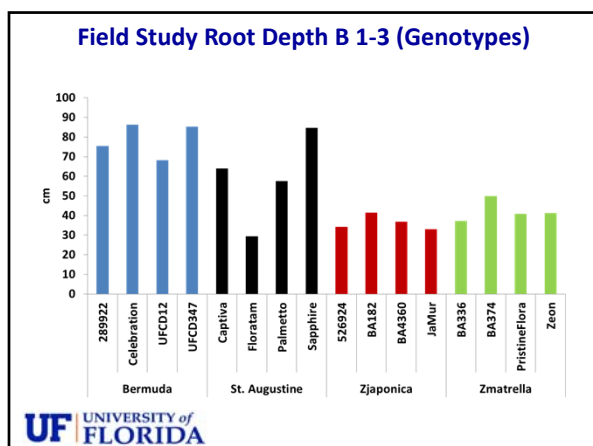
## Relative $P_n$ associated with drought stress in greenhouse



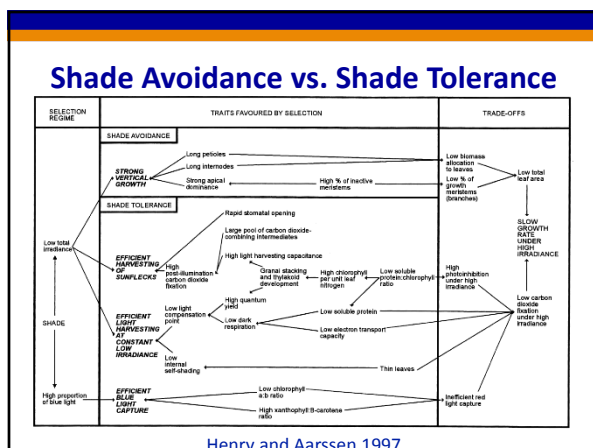
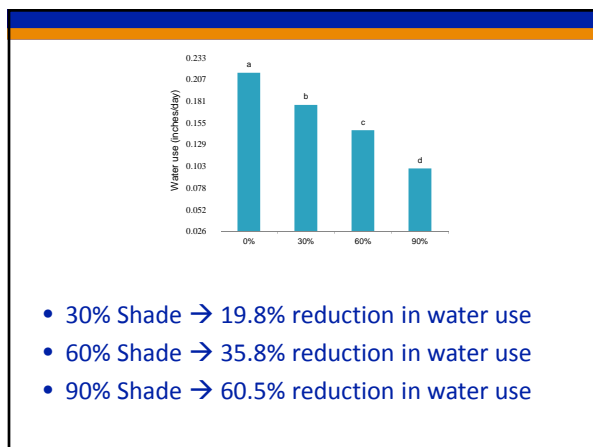
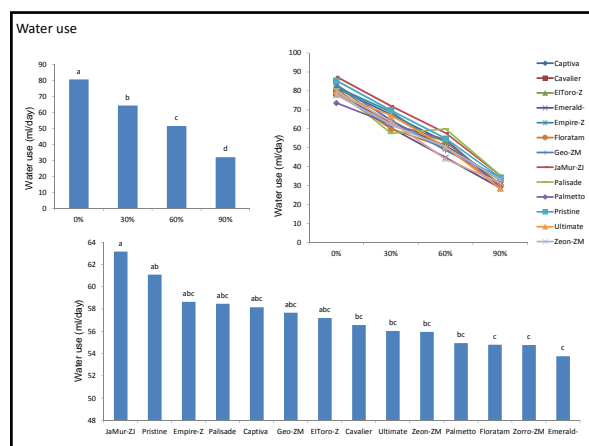
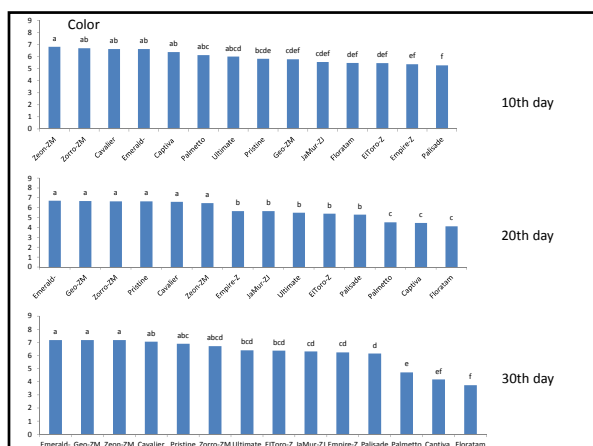












**Why DLI?**

- Greenhouse light transmittance – 30-75% (Both and Faust, 2004)
- Ease of measurement
- Changes in light intensity
  - Seasonal
  - Regional
  - Latitudinal

**Colors**  
INTEGRATED SCIENCE

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## DLI Requirements – Summer Avgs.

Turfgrass Cultivar	DLI requirement ( $\text{mol m}^{-2} \text{d}^{-1}$ )
Tifway bermudagrass	22.4
Celebration bermudagrass	19.5
TifGrand hybrid bermudagrass	18.6
Argentine bahiagrass	15.3
Tifblair centipedegrass	13.5
SeaDwarf seashore paspalum	13.2
Floritam St. Augustinegrass	11.8
Palisades zoysiagrass (japonica)	11.3
Diamond zoysiagrass (matrella)	11.3
Captiva St. Augustinegrass	10.9
Pristine zoysiagrass (matrella)	10.9
JaMur zoysiagrass (japonica)	10.0

## Cultivars

Species	Cultivar	Mowing Height (mm)	
		Low	High
Hybrid bermudagrass - <i>Cynodon spp.</i>	TifEagle	3.2	4.8
	Champion	3.2	4.8
	Jones Dwarf	3.2	4.8
Common bermudagrass - <i>Cynodon dactylon</i>	Tifway	12.7	38.1
	Celebration	12.7	38.1
	SeaDwarf	12.7	38.1

## Experimental Design

- Isolation house at Turfgrass Envirottron
  - Gainesville, FL
- Two month duration
  - May-June 2014
- 27 - 21°C day-night temperature



## Experimental Design

- Split-plot design
  - Main plot - shade
- Four shade regimes
  - 0, 30, 50, 70% shade



## Experimental Design

- Supplemental lighting
  - HPS with 1000 W bulbs, 0.9 m above canopy
  - Photoperiod of 12 h d<sup>-1</sup>
  - Temperature reduced by 13% under 70% shade

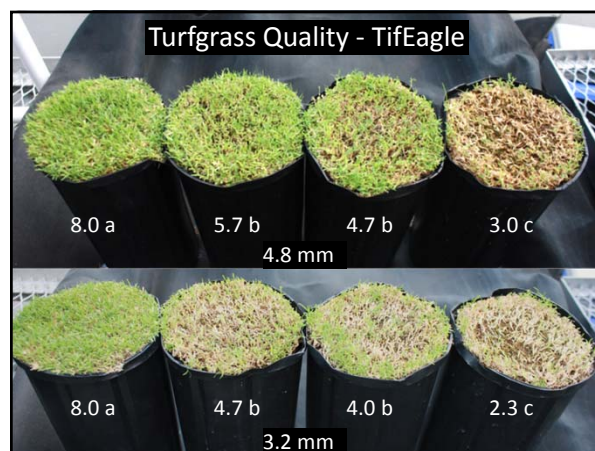
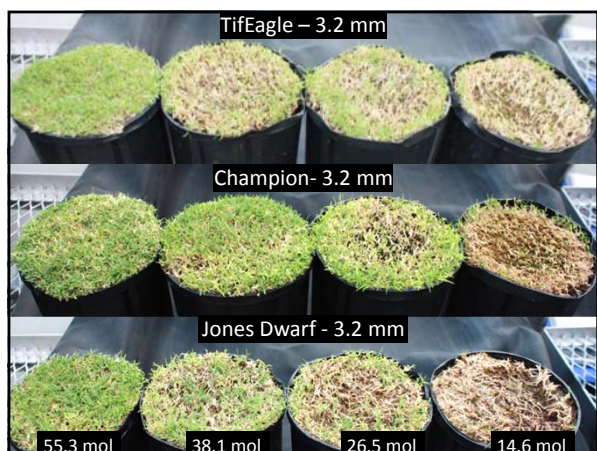
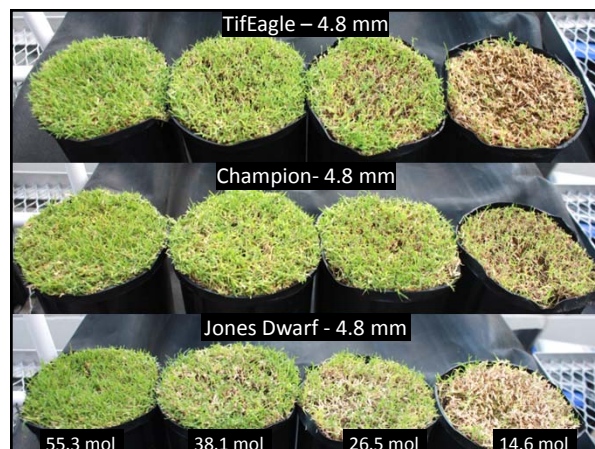
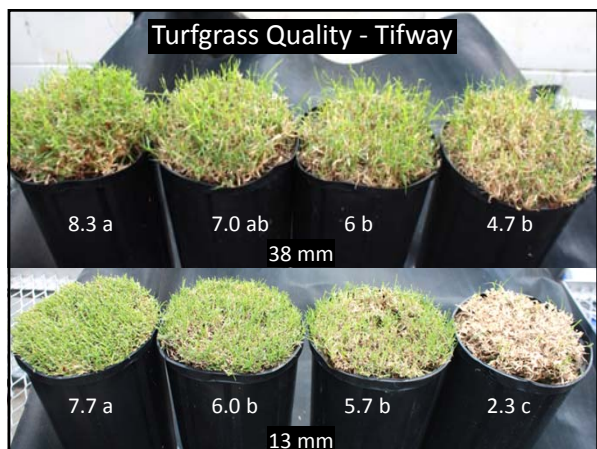
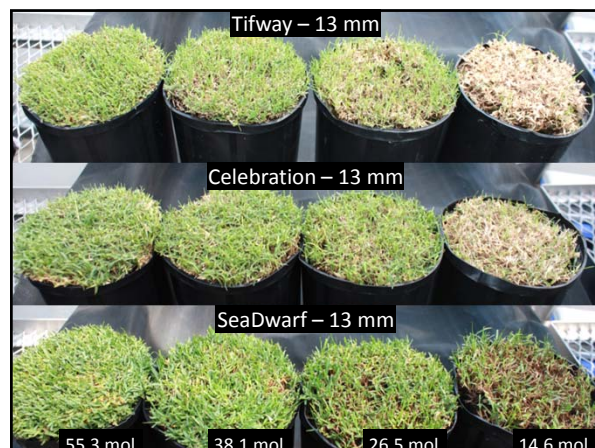
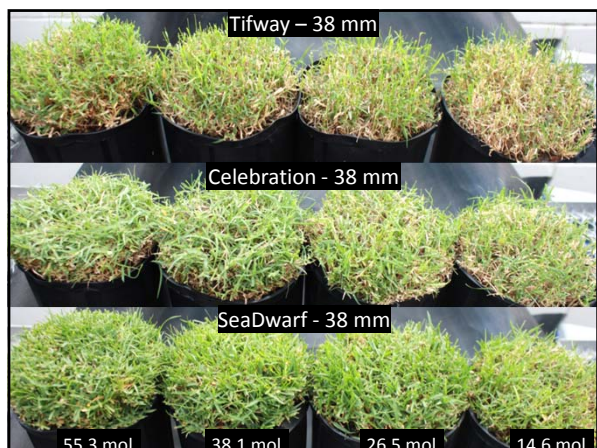


## Data Collection

- Collected weekly
  - Visual ratings (NTEP)
    - Quality (1-9, 6 acceptable)
  - Color and density
  - Biomass
  - NDVI
  - Leaf height and orientation









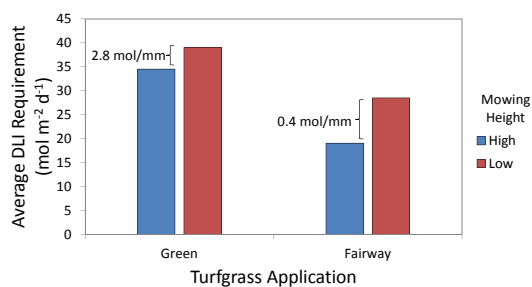
## DLI Requirements

Turfgrass Cultivar	DLI requirement ( $\text{mol m}^{-2} \text{d}^{-1}$ )*	
	Mowing Height	
	High	Low
Jones Dwarf bermudagrass	39.8	47.3
TifEagle bermudagrass	33.7	38.5
Champion bermudagrass	30.6	31.9
Tifway bermudagrass	23.3	32.6
Celebration bermudagrass	18.5	26.4
SeaDwarf seashore paspalum	15.6	27.0

\*Reduced to 93% observed DLI



## Summary



[www.gatorturf.com](http://www.gatorturf.com)  
<http://edis.ifas.ufl.edu>



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