Fluid (Foliar) Fertilizers for Turfgrass

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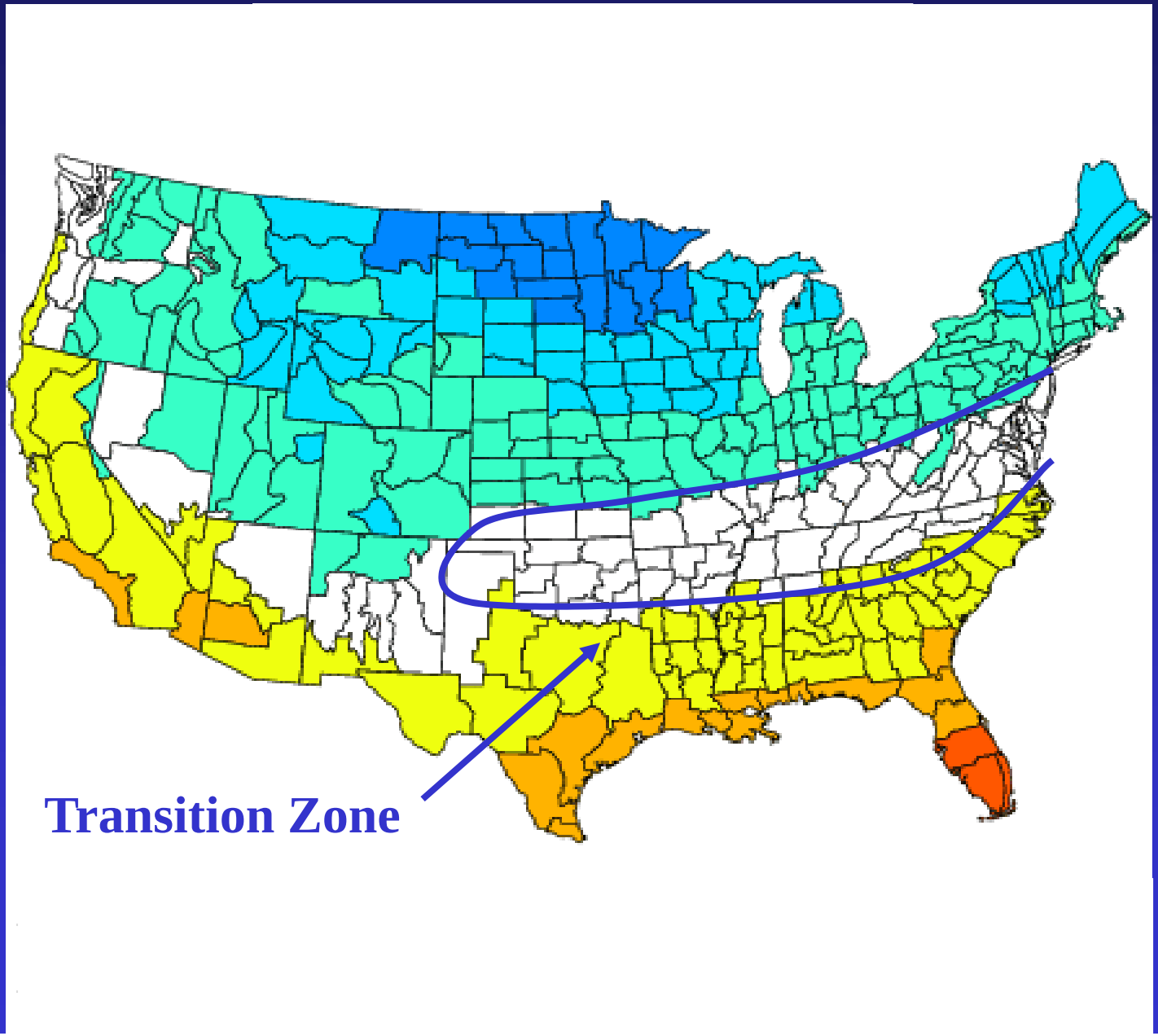
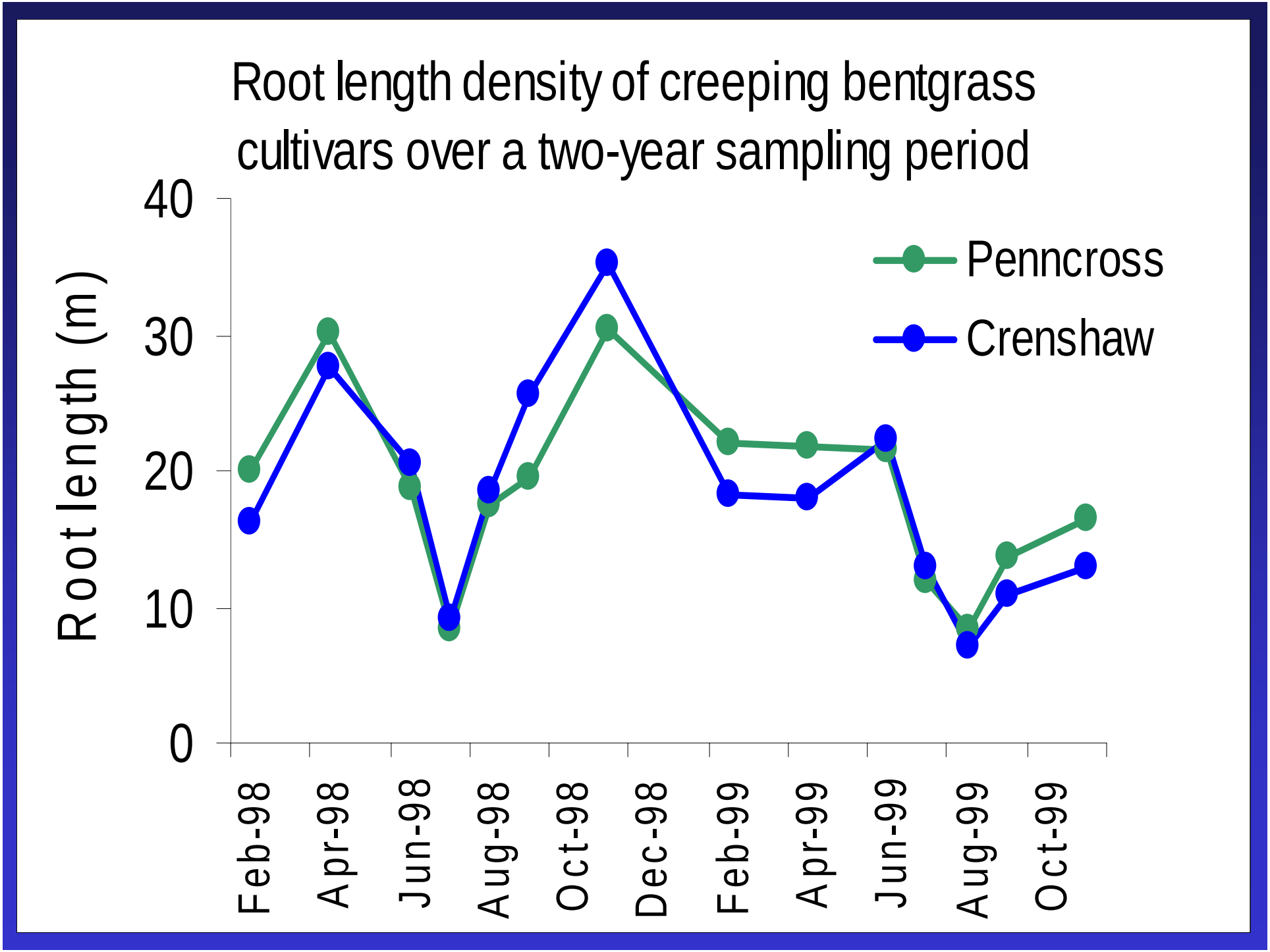
Turfgrass Production in the United States – Brief Introduction




We push species into areas where they are poorly adapted
• High air & soil temperatures
• High humidity
• Poor air movement
• Warm nights
• Low mowing heights


Root length density of creeping bentgrass cultivars over a two-year sampling period
Root length (m)
40
30
20
10
0
Penncross
Crenshaw
Feb-98
Apr-98
Jun-98
Aug-98
Oct-98
Dec-98
Feb-99
Apr-99
Jun-99
Aug-99
Oct-99

Fluids versus foliar

- In the turf industry a lot of our fluid fertilizer application is as a foliar application – low rates, light spray volume.
- Small amounts mixed in with fungicide apps.
- Commercial blends sold specifically as foliar products.

Possibilities for fluids in turf that are not foliars…

- UAN in sod production
- Fertigation
- Athletic fields

We have scant information about any of these possibilities.

When to Consider Foliar Fertilization

- need rapid correction of a deficiency.
- application of micronutrients.
- if significant soil fixation of the nutrient exists.
- sand-based soils with little exchange capacity.
- as a supplement to soil application.
- for nutrient uptake in times of stress, when there is limited root growth.

What makes foliar fertilization of turf different from other crops?

- Daily removal of leaf tissue.
- Frequent irrigation.
- Constructed, high-sand soil mixes.
- Growth stage is always vegetative.
- Can have dramatic changes in rooting due to stresses.

Foliar Materials in Turf:

- Tend to be at least a complete fertilizer.
- Usually have Fe or other micronutrient added as well.
- Applied with a recommended surfactant.
- May include some type of wetting agent or other additive.
- Can get really odd.

GUARANTEED ANALYSIS
0-0-3

Ingredients	% by Weight
Iron as Fe	10%
(77% EDTA)	
Humates and Humic Acids	10%
Cold Water Kelp	8%
Natural Sugars (sucrose), Vitamins, (B-Complexes, K) Amino Acids and	5%
Beneficial Bacteria	
Nitrogen Fixing Bacteria	App. 15 billion/lb.
Phosphorus Solubilizing Bacteria	App. 30 billion/lb.

3% Potassium ($K_2 0$) derived from Humate and Kelp

Typical Foliar Label:

Total Nitrogen (N)..... 18.0%

- **2.0% Ammonical Nitrogen**
- **1.5% Nitrate Nitrogen**
- **14.5% Urea Nitrogen**

Available Phosphoric Acid (P2O5)..... 3.0%
Soluble Potash (K20)..... 4.0%
Chelated Copper (Cu)..... 0.12%
Chelated Iron (Fe)..... 1.0%
Chelated Manganese (Mn)..... 0.1%
Chelated Zinc (Zn)..... 0.1%

Derived From: Urea, Ammonium Phosphate, Potassium Phosphate, Potassium Nitrate, Iron, Copper, Manganese, and Zinc Glucoheptonates.

Previous Foliar Work on Turf

- Not much out there.
- Usually focused on putting greens.
- If not, it's a cool season grass (KY blue).
- Most often iron.
- Web site research pages – not published literature.

Foliar Iron for Turf – a standard and widely use technique

- Green color with little leaf growth.
- Can maintain green color in turf with reductions in N fertilization (Fe applied at 2-3 lbs/A).
- Need both N and Fe for best color response.
- Reapplication necessary.
- Can get phytotoxic if applied when air temps > 85F

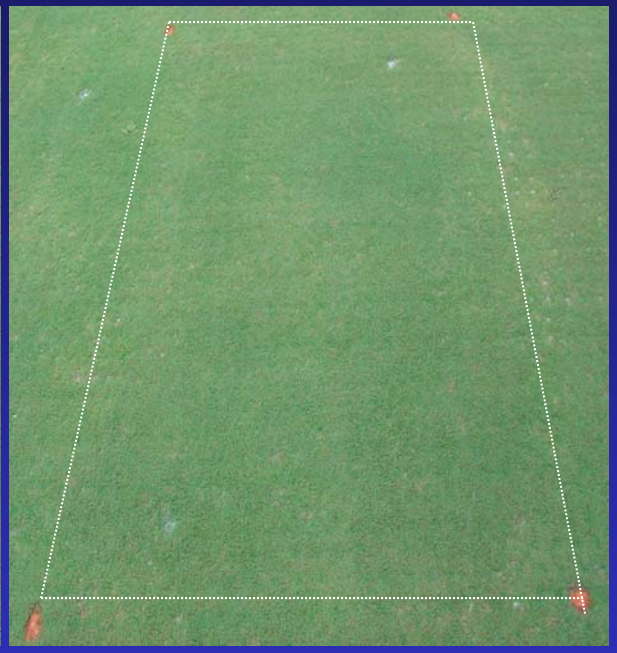
Starting to see some foliar N work…

Comparison of Liquid and Granular N Fertility on ‘TifEagle’ Bermudagrass

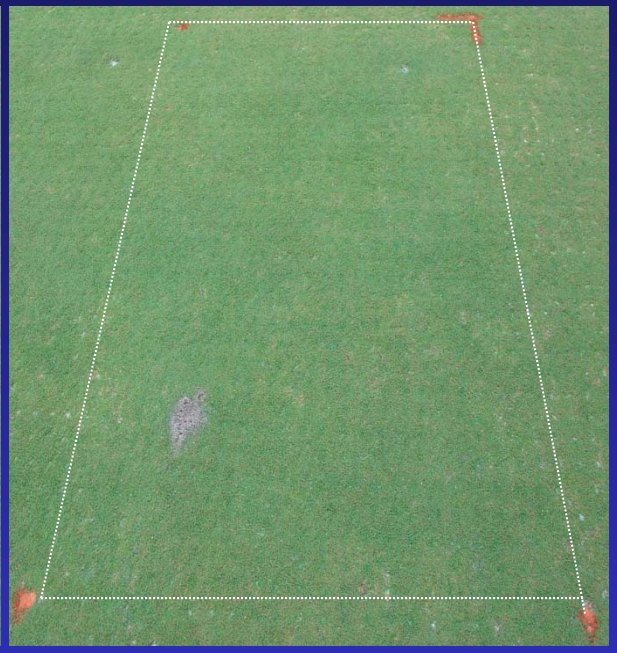
- 2 annual N inputs – 3.9 and 5.2 lb N/1,000 sq. ft (applied biweekly May-Sept)
- 100% granular, 50/50% granular/liquid, 100% liquid
- N sources were 18-3-18 granular, and 10-3-5 and 5-0-7 liquids (liquids derived from ammonium nitrate, urea, ammonium phosphate, potassium phosphate, potassium sulfate, ammonium sulfate)
- quality, color, tissue nutrient, and clipping yield data collected

Totten, F. et al., 2005. ASA Abstracts

Picture 1. 100% liquid at 5.2 lb N/1,000 sq. ft (24-August-2003).



Picture 2. 50% liquid/50% granular at 5.2 lb N/1,000 sq. ft (24-August-2003).



Picture 3. 100% granular at 5.2 lb N/1,000 sq. ft (24-August-2003).

Totten, F. et al., 2005. ASA Abstracts

Comparison of Liquid and Granular N Fertility on 'TifEagle' Bermudagrass

- Turf quality higher at the higher N rate, regardless of N source
- 100% granular produced lower turf quality in July, but no sig. diff. due to N source in June or August.
- N form had no effect on clipping yield.
- %N in clippings was greatest with 100% liquid and 100% granular in June, no diff. due to N source in July or August.

Totten, F. et al., 2005. ASA Abstracts

Foliar Fertilization of Turfgrass – what we know

Iron

- Foliar is the recommended method to apply Fe
- Will need repeat application to counteract that removed in clippings
- Demonstrated color response

Manganese

- For turf – possible secondary bonuses via disease (take-all) suppression?

Boron

- For turf – no strong positive response to foliar B in field study

Nitrogen

- Mixed results – highly variable
- Time of day in which foliar was applied did not affect N uptake
- Some evidence that fertilization rates can be reduced, when compared to granular programs

Auburn Greenhouse Project – Foliar Fertilizers

- Eighty 2.5 in diam. cores of creeping bentgrass (G-2) pulled from a 2 yr old putting green.
- Moved to greenhouse, grown for 2 wk w/ complete fertility, clipped at 1/8 in. Two more weeks with no additional fertilizer.
- One application of various foliar sprays made to the bentgrass (1/2 oz N/1,000 sq. ft) + surfactant (1 gal/1,000 sq ft spray vol).

The Treatments

	Manufacturer	Analysis (N-P2O5-K2O)
Nutri-Rational True Foliar	Emerald Isle	8-0-4 + 8%Ca + 0.12%B
Suprema	Griggs Brothers	12-0-12 + 0.005%B + 1%Fe + 0.05%Mn + 0.05%Zn
Gary's Green	Griggs Brothers	18-3-4 + 0.12%Cu + 1%Fe + 0.1% Mn + 0.1% Zn
Nutri-Rational True Foliar	Emerald Isle	10-0-10 + 8%Mg + 0.06%Cu + 0.95%Fe + 2%Mn + 0.08%Zn
15-2-15	Growth Prod.	15-2-15
18-3-6	Growth Prod.	18-3-6
NutriFoliar	LebanonTurf	18-2-5 + 1.2%S + 0.1%Cu + 1%Fe + 0.1%Mn + 0.1%Zn
NutriFoliar	LebanonTurf	18-3-8 + 2.5%S
Urea		45-0-0
Surfactant (Induce)		

Auburn Greenhouse Project – Foliar Fertilizers

- After being sprayed with fertilizers all cores returned to greenhouse
- Split into ‘water from top’ and ‘water from side’ treatments – to evaluate effects of irrigation wash-off.
- 4 reps of each fertilizer x watering combination (2 x 10 factorial).
- Grown for 1 week after the fertilizer application.

Auburn Greenhouse Project – Foliar Fertilizers

- After 1 week all topgrowth harvested, weighed, and dried.
- Total N of topgrowth determined.
- Dry weight of roots also determined.

Entire experiment repeated in time.

Results, Experiment 1

Product Name/Treatment	Clipping wet wt	Root dry weight	N uptake
	g per core	g per core	g per core
Nutri-Rational Foliar 8-0-4	0.67 abc	0.17 a	0.0043 abc
Suprema 12-0-12	0.55 c	0.13 abc	0.0036 c
Gary's Green 18-3-4	0.80 a	0.14 abc	0.0053 a
Emerald Isle 10-0-10	0.78 a	0.12 bc	0.0048 ab
Growth Products 15-2-15	0.63 abc	0.12 bc	0.004 bc
Growth Products 18-3-6	0.66 abc	0.14 ab	0.0042 bc
NutriFoliar 18-2-5	0.60 bc	0.14 ab	0.0041 bc
NutriFoliar 18-3-8	0.74 a	0.11 bc	0.0047 ab
Urea 45-0-0	0.56 c	0.09 c	0.0035 c
Surfactant Only (Induce)	0.36 d	0.09 c	0.0024 d

Results, Experiment 2

Product Name/Treatment	Clipping wet wt	Root dry weight	N content
	g per core	g per core	percent
Nutri-Rational True Foliar 8-0-4	0.70 a	0.15 a	2.33 a
Suprema 12-0-12	0.71 a	0.19 a	2.11 bc
Gary's Green 18-3-4	0.73 a	0.18 a	2.15 b
Emerald Isle 10-0-10	0.71 a	0.13 a	2.07 bc
Growth Products 15-2-15	0.73 a	0.15 a	2.10 bc
Growth Products 18-3-6	0.60 a	0.14 a	1.95 c
NutriFoliar 18-2-5	0.67 a	0.17 a	2.03 bc
NutriFoliar 18-3-8	0.68 a	0.16 a	2.11 bc
Urea 45-0-0	0.67 a	0.16 a	2.07 bc
Surfactant Only (Induce)	0.45 b	0.16 a	1.76 d

Effect of method of watering – Experiment 2 (not significant in Exp 1)

Method by which water applied	Wet weight clippings	Dry weight clippings	Dry weight roots	N uptake
	grams per core			
Watered over top	0.62 b	0.17 b	0.16 a	0.003 b
Applied at side of core - no water touches leaf tissue	0.70 a	0.20 a	0.16 a	0.004 a

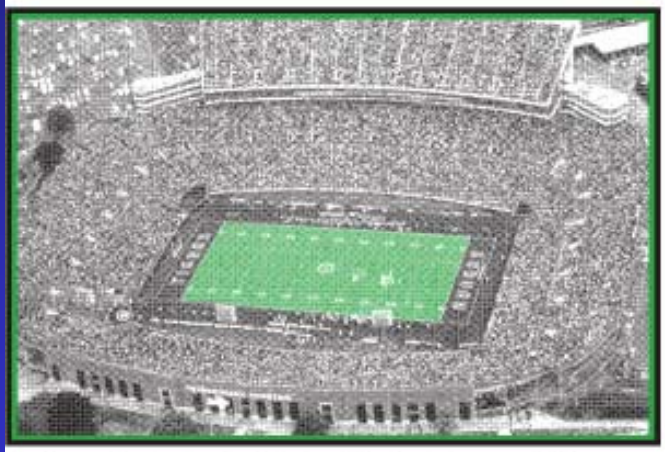
Results

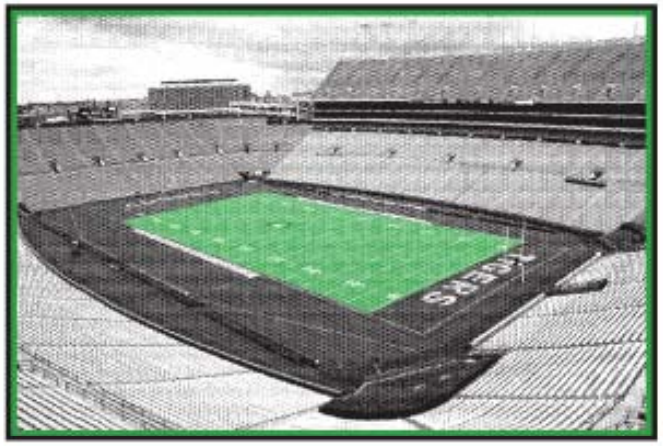
- Foliars produced increases in clippings and N content, one week after a single application.
- Yield and N content were always greater than that measured in the unfertilized (surfactant only) control.
- The effect of surface watering was mixed - no affect in one experiment; reductions in clipping yield and N uptake in the second.
- There were few consistent, strong responses due to a particular fertilizer source.

Where we go from here…

- examine the continued application of products, rather than a single application.
- include rates as a treatment variable.
- evaluate the products in the field (rates, comparison to granular, examine carrier volume).
- Look at fluids, and not just foliars, for large-scale turf fertilization.

NO MATTER WHEN THE GAME WAS PLAYED...





IT WAS PLAYED ON GRASS!

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