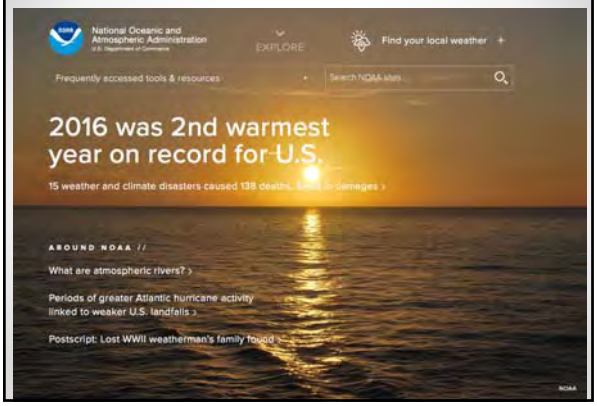
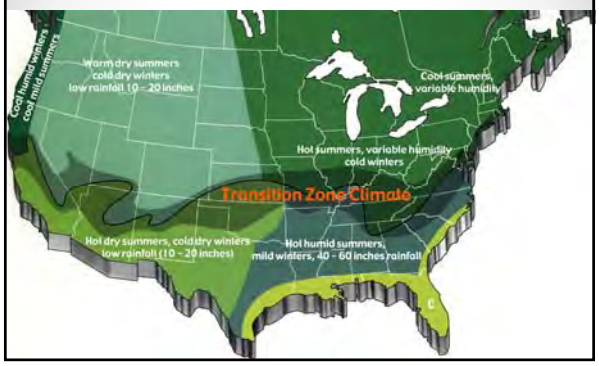
Dr. Gregg Munshaw
University of Kentucky

www noaa.gov

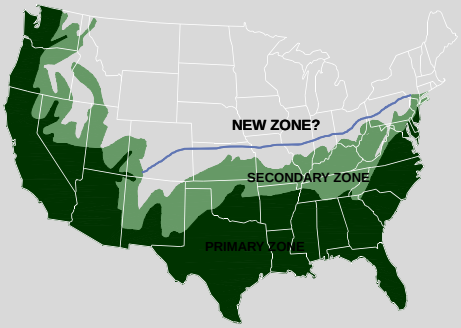


THE TRANSITION ZONE



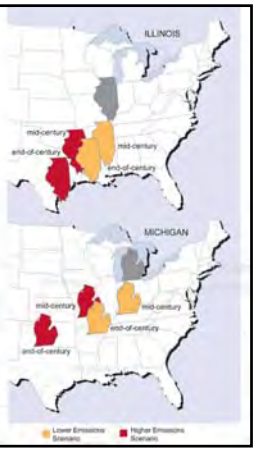
Warm Season Turfgrass Zones

(Based on low temperature exposure)

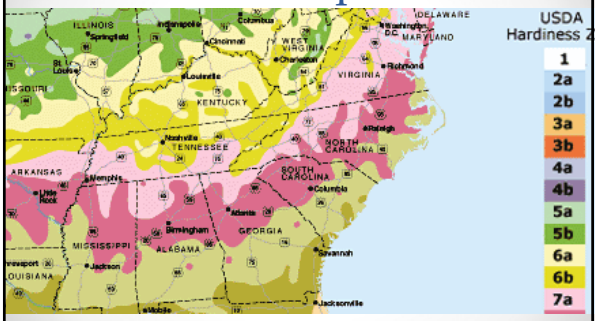


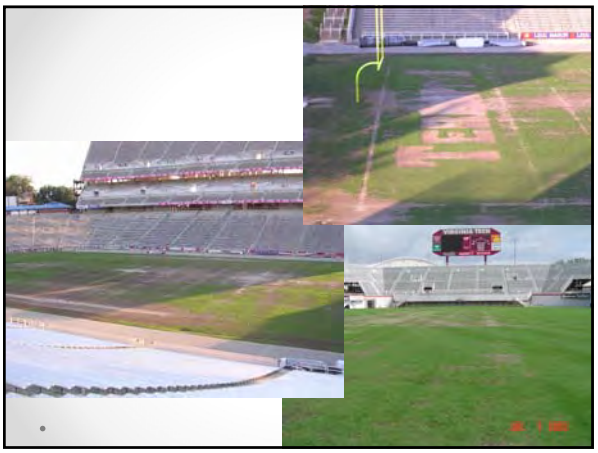
The EPA predicts…

- Average summer temperatures will increase by 3º F over the next few decades and could increase by over 10º F by the end of the century.

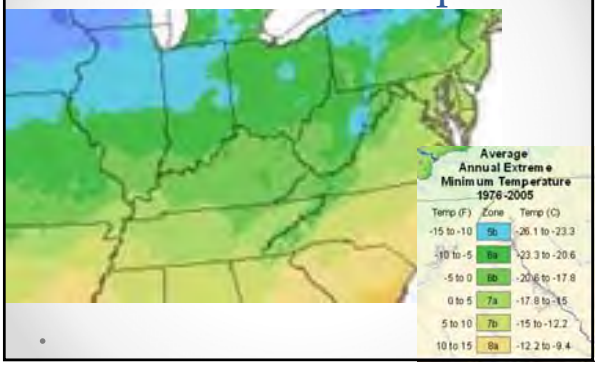


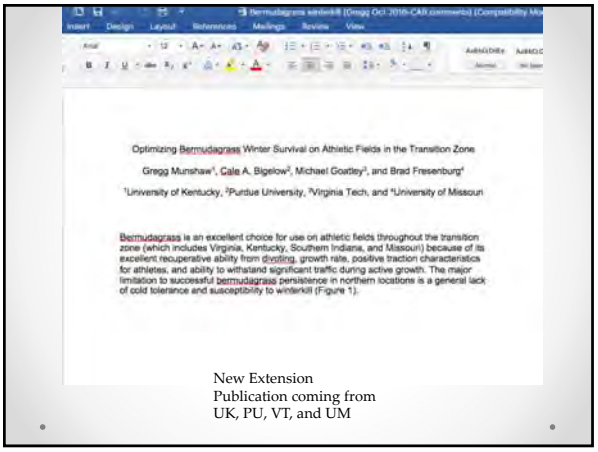
The old USDA hardiness map





The new USDA hardiness map





Optimizing Bermudagrass Winter Survival on Athletic Fields in the Transition Zone

Gregg Munshaw[1], Cale A. Bigelow[2], Michael Goatley[3], and Brad Fresenburg[4]

[1]University of Kentucky, [2]Purdue University, [3]Virginia Tech, and [4]University of Missouri

Bermudagrass is an excellent choice for use on athletic fields throughout the transition zone (which includes Virginia, Kentucky, Southern Indiana, and Missouri) because of its excellent recuperative ability from divoting, growth rate, positive traction characteristics for athletes, and ability to withstand significant traffic during active growth. The major limitation to successful bermudagrass persistence in northern locations is a general lack of cold tolerance and susceptibility to winterkill (Figure 1).

New Extension Publication coming from UK, PU, VT, and UM

Winter Comes to the Transition Zone but How Long/Severe varies each year

Mowing

"Can't you escape or something - The grass needs cutting?"

Mowing

- During active growth (summer), 0.5-1.0 inches
- Early fall, 1.0-1.5 inches
  - Increased CHO production and storage
  - Insulation
  - More leaf tissue may resist wear=longer seasonal durability
- Slight increases should not affect playability/ball roll

Overseeding Research

Images: (A.) The winter overseeded study area in Lexington, KY. (B-C.) Soil temperature monitoring equipment used to document the impact of overseeding on soil temperatures, (D.) removed cores from non-overseeded and winter overseeded bermudagrass ready for separation of stem tissue from soil for carbohydrate analysis, (E.) effects of the winter overseeding on bermudagrass spring green-up and density in Lexington, KY-2015.

- Planted Futura 2000 at 0, 655, and 1310 lbs/ac
- Measured canopy temperatures through winter
- Measured CHO status through winter
- Monitored bermuda cover in spring

Overseeding

Overseeding Research

- Improved visual appearance in fall/winter
- Reduced spring density
- CHO reductions through winter—no effect from PR
- Only a slight temperature increase (+1.1ºF)

Overseeding

(What we know or think we know)

- PR is species of choice for athletic fields
- Suggested planting rates range from 218-1311 lbs/ac (Goatley, 2008; McCarty, 2016)
- Overseeded bermuda often has density issues in spring
- Bermuda needs 60-100 days with no competition to replenish CHOs (Askew, 2010)

Traffic Management

Dormant bermuda unable to recover following wear--Results in thin turf if excessive traffic

Best Traffic Tolerance		Not The Best Traffic Tolerance
Tifway	Astro	Princess
Tiftuf	North Shore	Yukon
Numex-Sahara	Latitude 36	Kashmir
Patriot		Celebration
Riviera		

Winter Traffic

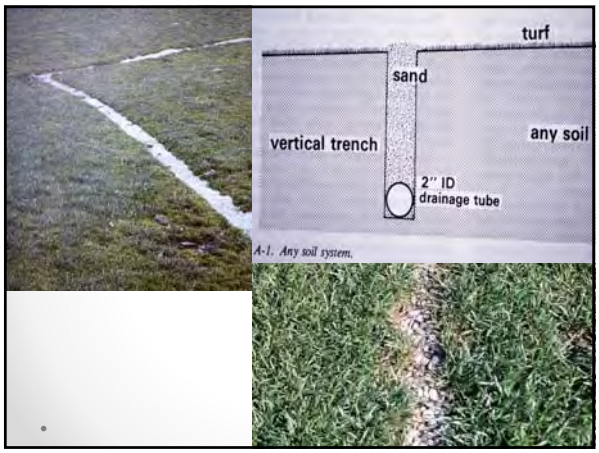
- Spring recovery/greenup in March approximately 50% for control plots, 15% for drained traffic, and <10% for wet traffic.
- Control areas reached 100% spring recovery/greenup in April vs. June for the areas receiving winter traffic.

Spring Greenup Following Traffic

Best	Not The Best
Latitude 36	Kashmir
Patriot	Princess
Tiftuf	Yukon
Riviera	North Shore*
Astro	Numex-Sahara*
	Tifway*
	Celebration

Traffic Management

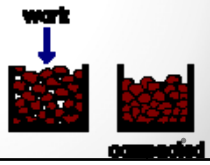
- Wet Fields result in soil displacement, poor footing, turf ripping
- Play on wet fields causes increased compaction (harder surface may equal more injuries)



IMPROVING POOR SOILS--

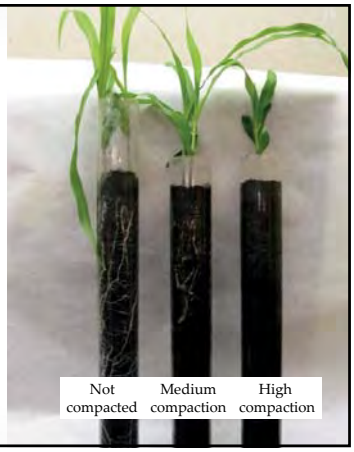
COMPACTION

- is a physical condition of soil resulting from the compression of the soil into a relatively dense mass… a reduction in macropore space
  - occurs in areas of high foot and/or vehicle traffic
  - mostly confined to the top 3-4 inches of the soil

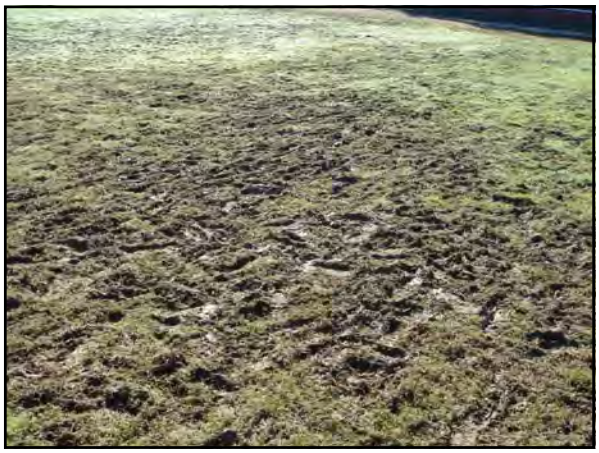


Importance of Soil Aeration:

- Root growth --
- Gas exchange… replace CO_2 and other possibly toxic gases with oxygen
- Microbial activity is supported by dequate aeration

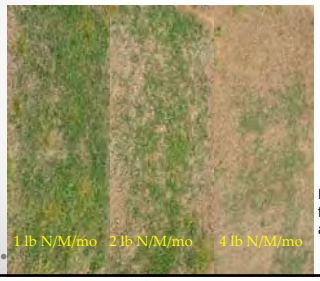


The Kentucky Crown



Nutrition

- Soil test!
- 0.5-1.0 lbs N/1000 sq ft/growing month



Bermudagrass winterkill in Kentucky following summer nitrogen applications

Use lots of signs with specific instructions.

Nutrition

- Judicious N apps in fall provide a little color but promote winter weeds
- Potassium 'winterizer'
  - K can increase in cell sap and act as an antifreeze
  - If soil test K is adequate, little benefit is gained by adding more and may overload exchange sites in soil limiting availability of other nutrients

Nutrition

"FEEDING THE SOIL"

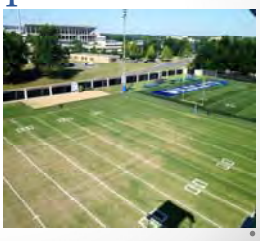
- Feeding the soil basic philosophy
  - Using less synthetic granular fert, more organic sources
  - Using less granular N, more liquid N released by microbial activity
  - Spraying molasses
  - Adding more microbes
  - Spraying foliar products have high levels of amino acids for plant health
  - Making a real effort to build up the carbohydrate level in the plant

Covers

- Two basic philosophies
  - Set and forget
  - Prolong growing season

Bermudagrass spring greenup differences between a lightweight cover (left) and a turf blanket (right).

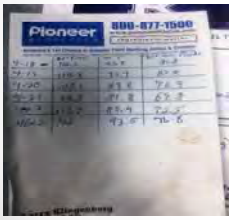
6/8/12, the first year of blankets in the spring and almost 1 year of "feeding the soil" plan



May 6,2014 83/52

5/1/15 and 4/25/16

Temperature readings under the covers at the surface, 1" soil temp, and surface uncovered



- 4/18 84/48
- 4/19 83/50
- 4/20 84/56
- 4/21 76/62
- 4/22 71/54
- 4/23 69/53

5/1/15 and 4/25/16

5/1/15 and 4/25/16


5/1/15 and 4/25/16


5/1/15 and 4/25/16

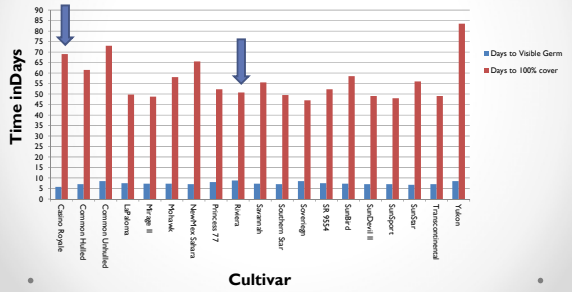

Winterkill!!!

5/1/15 and 4/25/16


Seeded bermudagrass germination and establishment

- Field Study
  - 19 Commercially Available Cultivars
  - All cultivars seeded 27 June 2010 & 30 June 2011
  - Seeding Rate .25 lbs PLS per M
  - Plots covered with Remay© germination blankets
    - Prevent seed movement and contamination
  - Irrigated 3 times per day
    - Adequate to maintain a damp soil

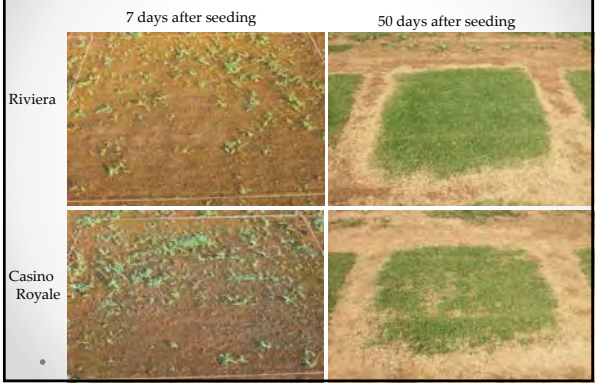
Seeded bermudagrass germination and establishment



Seeded bermudagrass germination and establishment

- Grassy weeds – Goosegrass (*Elusine indica*)
- Major problem during germination and establishment
  - Germinates quickly after soil is disturbed
  - Germinates quicker than the fastest bermuda cultivars
  - Competes for light, water, and nutrients

Germination & Establishment



Seeded bermudagrass germination and establishment

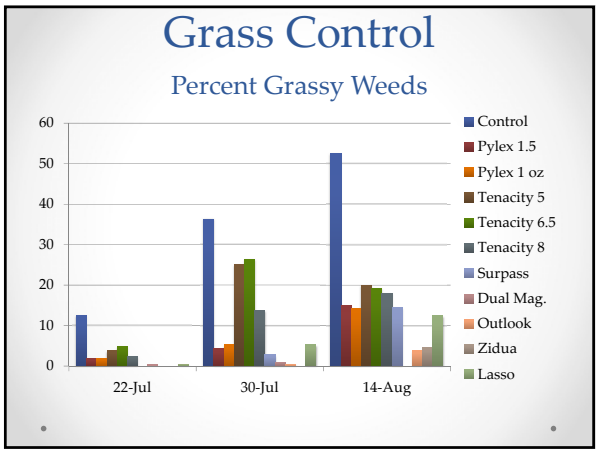
- Imperative to have weed control strategy and products on hand prior to seeding
  - Newly emerged bermuda seedlings very tolerant to :
    - MSMA (1oz/M) 10 – 14 day intervals
  - Newly emerged bermuda seedlings much more sensitive to Relvover®
    - apply up to 1 wk prior to seeding or 2 wks post emergence of new seedlings
    - 0.4 – 0.6 oz. / M or 0.013 – 0.038 lbs a.i. / acre

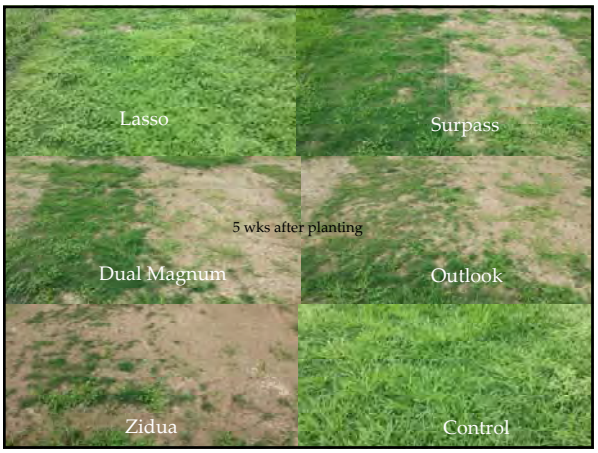
Seeded bermudagrass germination and establishment

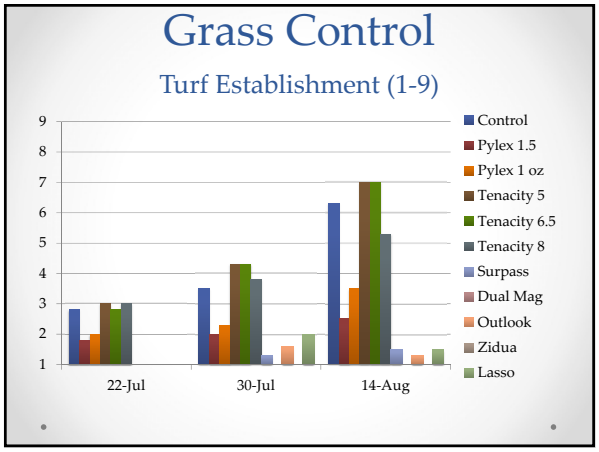
- Why is quick germination and establishment so important ?

Grass Control

- Treatments (all treatments applied prior to seeding and sprigging):
  - Control
  - Tenacity 5 fl oz/A
  - Tenacity 6.5 fl oz/A
  - Tenacity 8 fl oz/A
  - Pylex 1 fl oz/A
  - Pylex 1.5 fl oz/A
  - Lasso 1 qtA
  - Dual Magnum 0.67 pt/A
  - Outlook 7 fl oz/A
  - Zidua 2 oz/A
- Plots established and treated July 7
  - Latitude 36 and Riviera

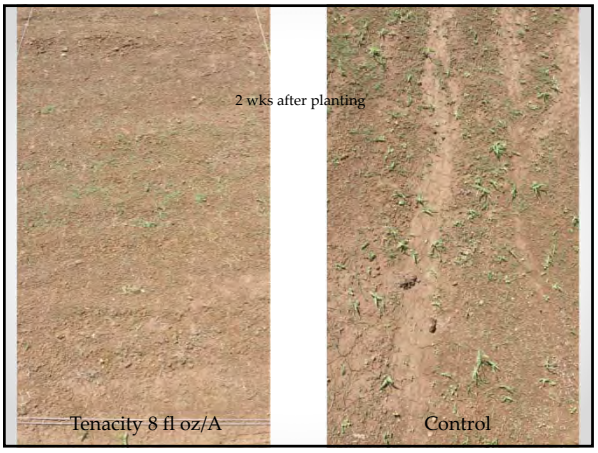

Grass Control
Percent Grassy Weeds
60
50
40
30
20
10
0
22-Jul
30-Jul
14-Aug
Control
Pylex 1.5
Pylex 1 oz
Tenacity 5
Tenacity 6.5
Tenacity 8
Surpass
Dual Mag.
Outlook
Zidua
Lasso


Lasso
Surpass
5 wks after planting
Dual Magnum
Outlook
Zidua
Control


Grass Control
Turf Establishment (1-9)
9
8
7
6
5
4
3
2
1
22-Jul
30-Jul
14-Aug
Control
Pylex 1.5
Pylex 1 oz
Tenacity 5
Tenacity 6.5
Tenacity 8
Surpass
Dual Mag
Outlook
Zidua
Lasso

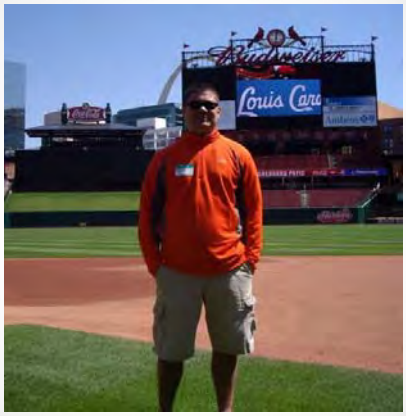

Sprig
Seed
Sprig
Seed
Tenacity 5 fl oz/A
Tenacity 6.5 fl oz/A
5 wks after planting
Tenacity 8 fl oz/A
Control
Sprig
Seed
Sprig
Seed


Sprig
Seed
Sprig
Seed
Pylex 1.0 fl oz/A
Pylex 1.5 fl oz/A
Control
Sprig
Seed
5 wks after planting


2 wks after planting
Tenacity 8 fl oz/A
Control

2016

- The effect of Tenacity at planting for crab/goose control.
- Treatments:
  - Tenacity 0 fl oz/A
  - Tenacity 5 fl oz/A
  - Tenacity 8 fl oz/A
  - Tenacity 16 fl oz/A
  - Riviera and Latitude 36 bermudagrass
  - Compadre and Meyer zoysiagrass
  - Timings:
    - At planting (June 15)
    - 2 WAP
    - 4 WAP



C3/C4

- Plots established Nov. 5, 2015
- PhD Perennial Ryegrass
- HGT Kentucky bluegrass
  - 2.5 and 5.0 lbs PLS/1000 sq. ft
  - Vertical mow or not
- Control
- Each plot fertilized with:
  - Polyon 2.5 lbs N/1000 sq ft applied in Nov.
  - Urea 2.5 lbs N/1000 sq ft applied 1 lb in Nov, 0.5 lb in Mar, Apr, May
  - Control (no N)

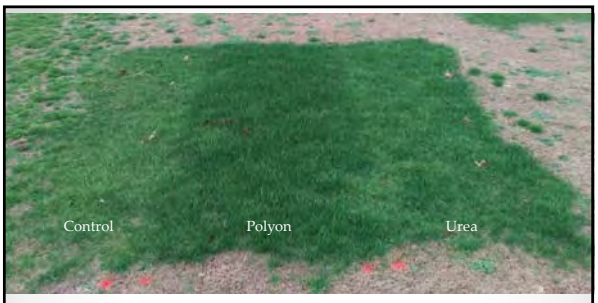


Photo taken Jan. 11 (2 months after fertilizing)

C3/C4

First year observations

- Excellent first winter color
- Better summer color KBG>PR>BG
- Not maintenance free (irrigation)
- May need to add seed each year
  - 2nd year color/cover only mediocre
- Polyon looked good

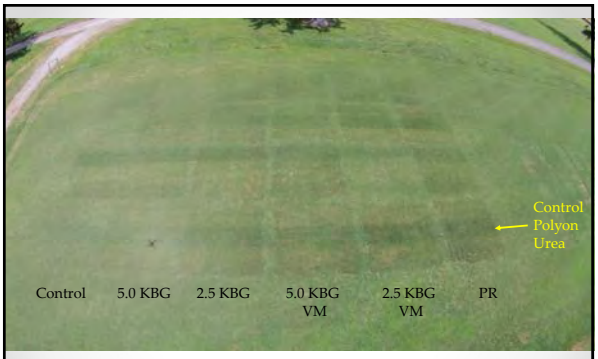


Photo taken June 28 (7 months after initial fertilizing)

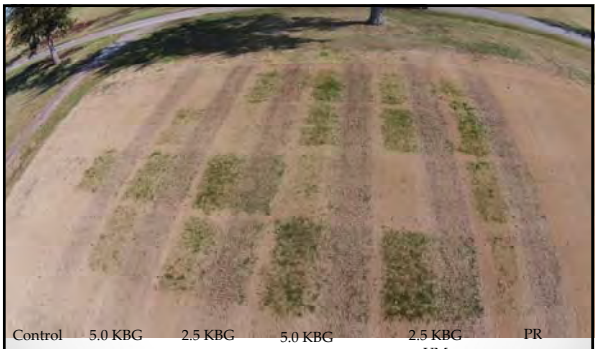


Photo taken Dec. 2 (13 months after initial fertilizing)