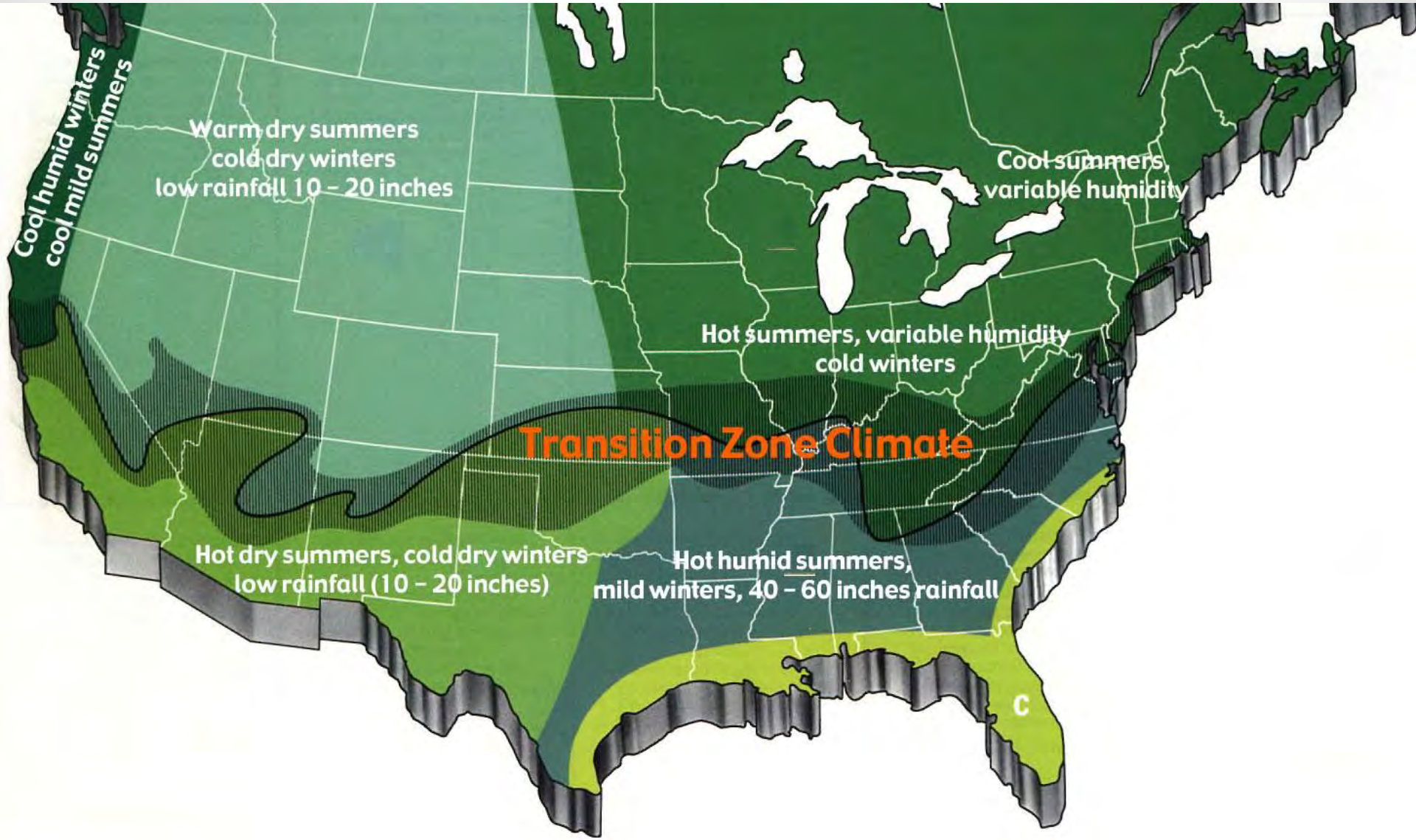

# Optimizing Bermudagrass Athletic Field Winter Survival in the Transition Zone

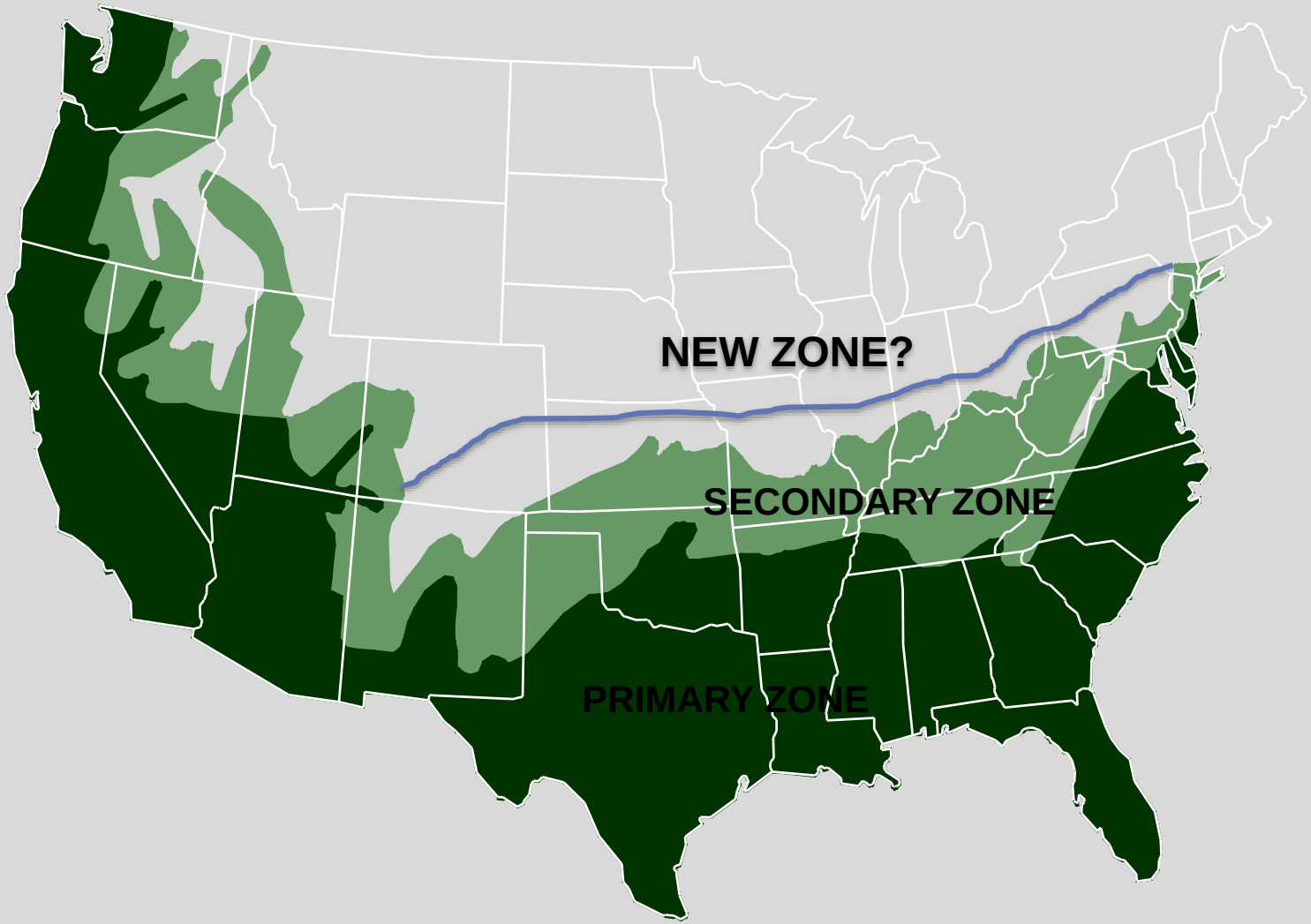
Marcus Dean, CSFM-Athletic Field Manager @kysteeler
Gregg Munshaw, PhD-Turf Extension Specialist @ukturf
University of Kentucky

# THE TRANSITION ZONE



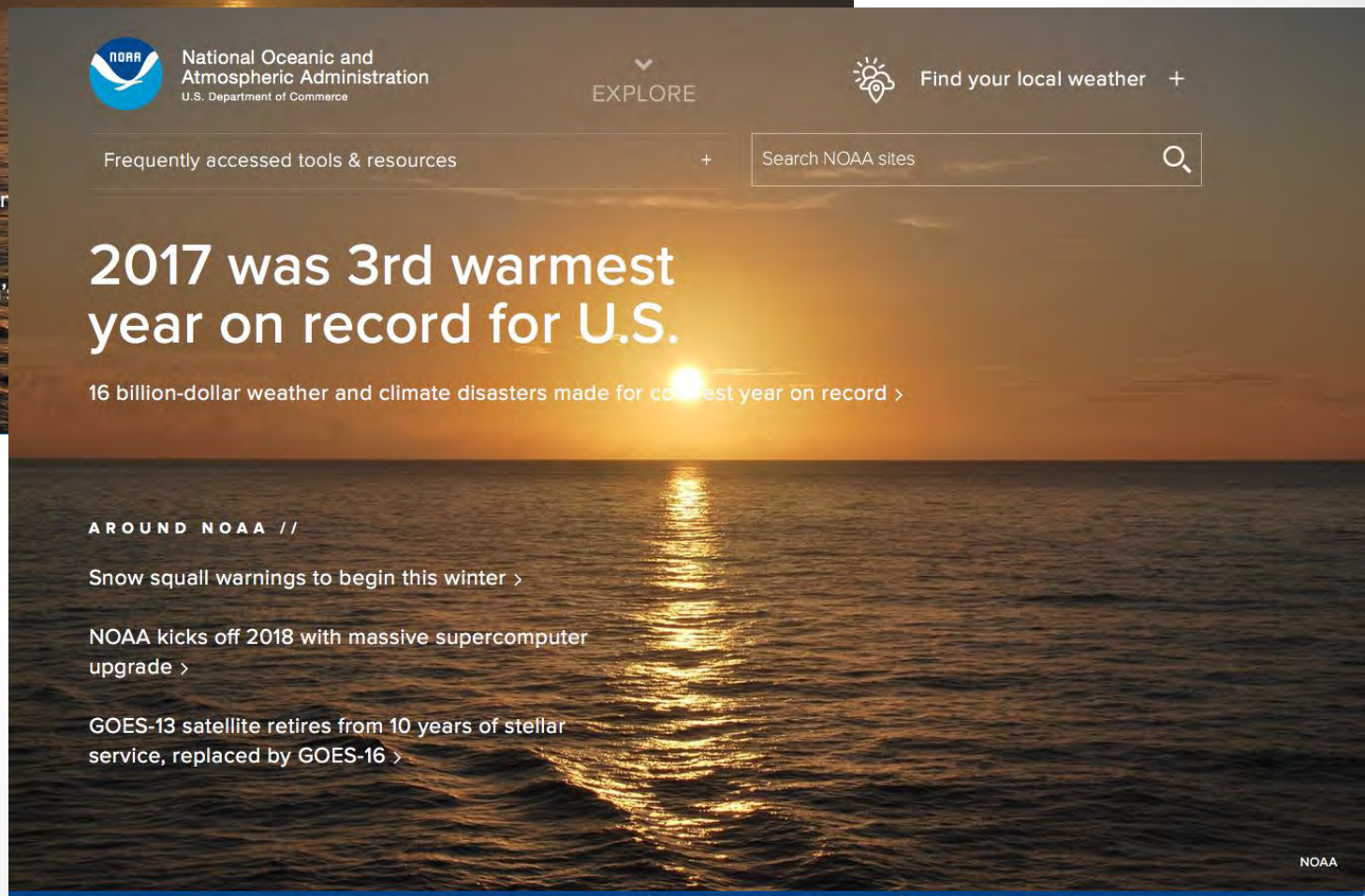
# Warm Season Turfgrass Zones

(Based on low temperature exposure)



# www.noaa.gov


National Oceanic and Atmospheric Administration
U.S. Department of Commerce
EXPLORE
Find your local weather +
Frequently accessed tools & resources +
Search NOAA sites
2016 was 2nd warmest year on record for U.S.
15 weather and climate disasters caused 138 deaths, $46B in damages ›
AROUND NOAA //
What are atmospheric rivers? ›
Periods of greater Atlantic hurricar
linked to weaker U.S. landfalls ›
Postscript: Lost WWII weatherman'


National Oceanic and Atmospheric Administration
U.S. Department of Commerce
EXPLORE
Find your local weather +
Frequently accessed tools & resources +
Search NOAA sites
2017 was 3rd warmest year on record for U.S.
16 billion-dollar weather and climate disasters made for co est year on record ›
AROUND NOAA //
Snow squall warnings to begin this winter ›
NOAA kicks off 2018 with massive supercomputer upgrade ›
GOES-13 satellite retires from 10 years of stellar service, replaced by GOES-16 ›
NOAA

CPC Search
CPC search Go

Map Explanations
Official Fcsts
Fcst Tools

About Us
Our Mission
Who We Are

Contact Us
CPC Information
CPC Web Team

Official 90-day Outlooks are issued once each month near mid-month at 8:30am Eastern Time. Please consult the schedule of 30 & 90-day outlooks for exact release dates.



HOME > Outlook Maps > Monthly to Seasonal Outlooks > Seasonal Outlooks

# Three-Month Outlooks

## OFFICIAL Forecasts

### Feb-Mar-Apr 2018

Click here for information about the three-month outlook

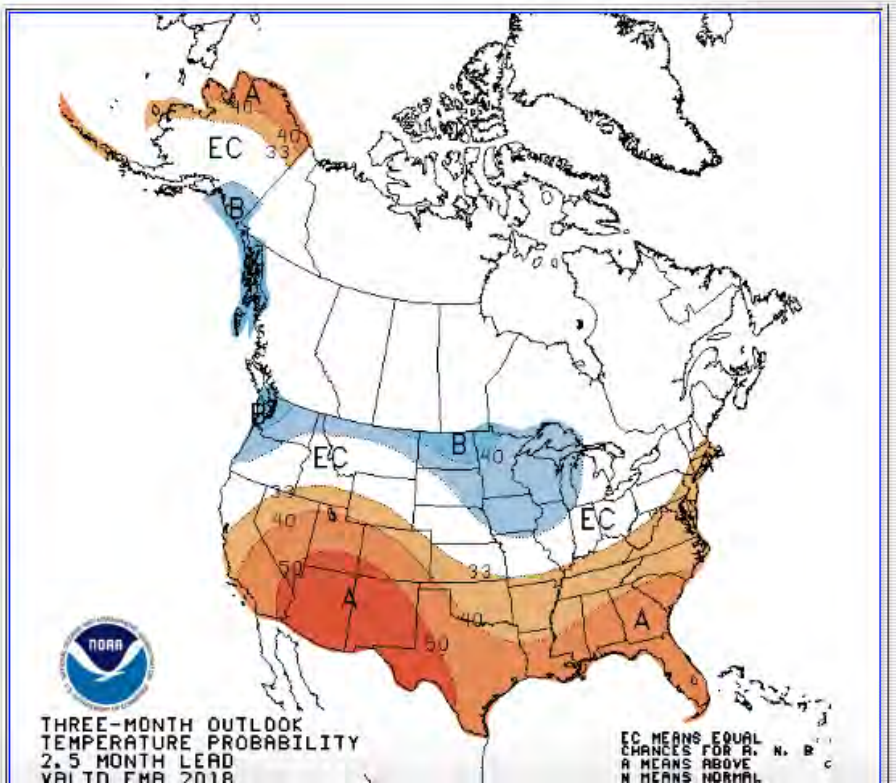
[UPDATED MONTHLY FORECASTS SERVICE CHANGE NOTICE]
[EXPERIMENTAL TWO-CLASS SEASONAL FORECASTS]

**Text-Format Discussions**
Monthly
Long Lead
30-& 90-Day Hawaiian

**More Outlooks**
0.5mn DJF 2017 - 18
1.5mn JFM 2018
2.5mn FMA 2018
3.5mn MAM 2018
4.5mn AMJ 2018
5.5mn MJJ 2018
6.5mn JJA 2018
7.5mn JAS 2018
8.5mn ASO 2018
9.5mn SON 2018
10.5mn OND 2018
11.5mn NDJ 2018 - 19
12.5mn DJF 2018 - 19
0.5mn Dec 2017

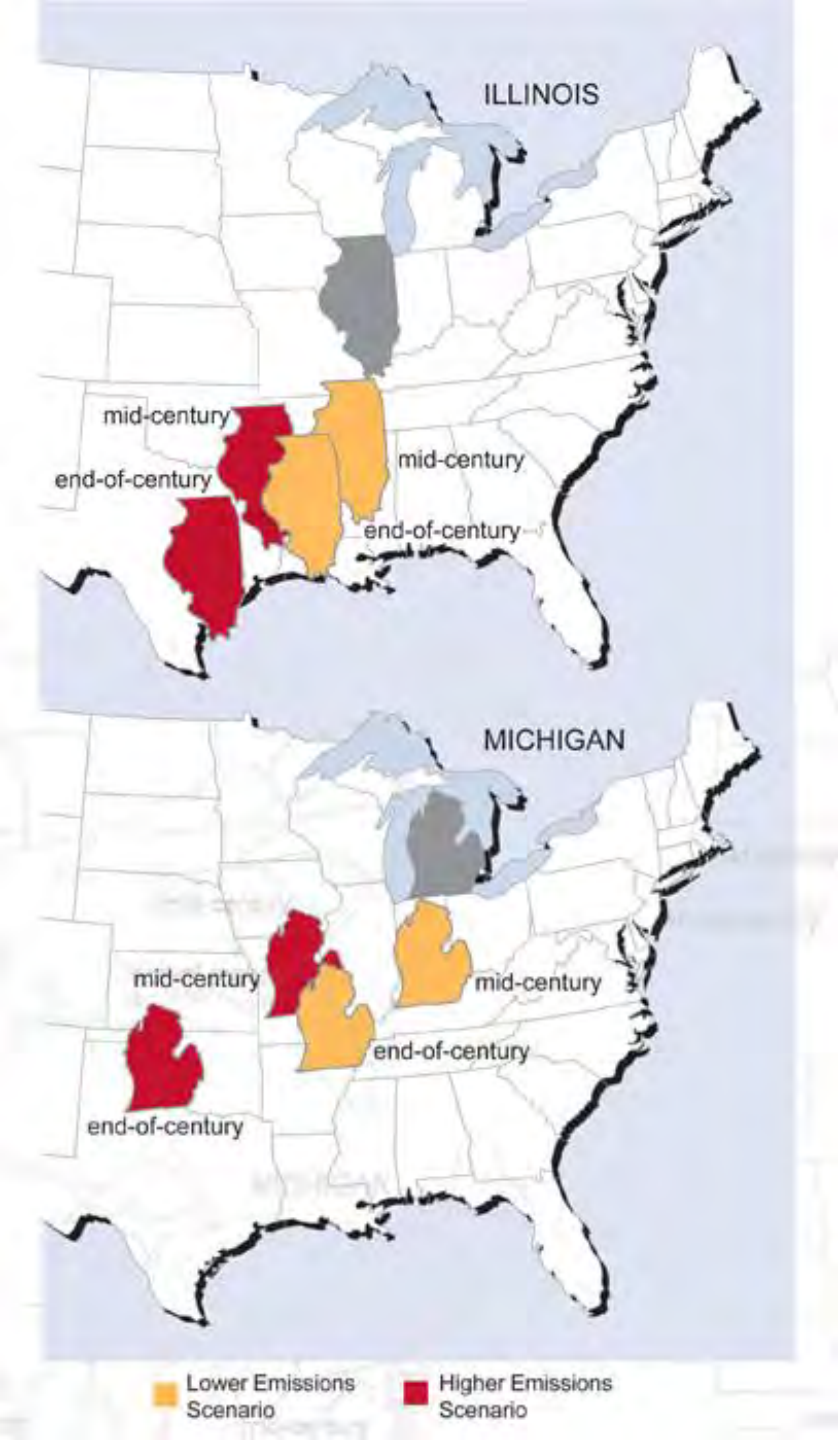
Climatological Values (1981-2010) for FMA

**Tools Used** (see Discussion for explanation)
Tools Discussion (updated as new tools are implemented) Canonical Correlation Analysis
Ensemble Canonical Correlation Analysis
Optimal Climate Normals
Climate Forecast System
Screening Multiple Linear Regression Tool
Probability of Exceedence

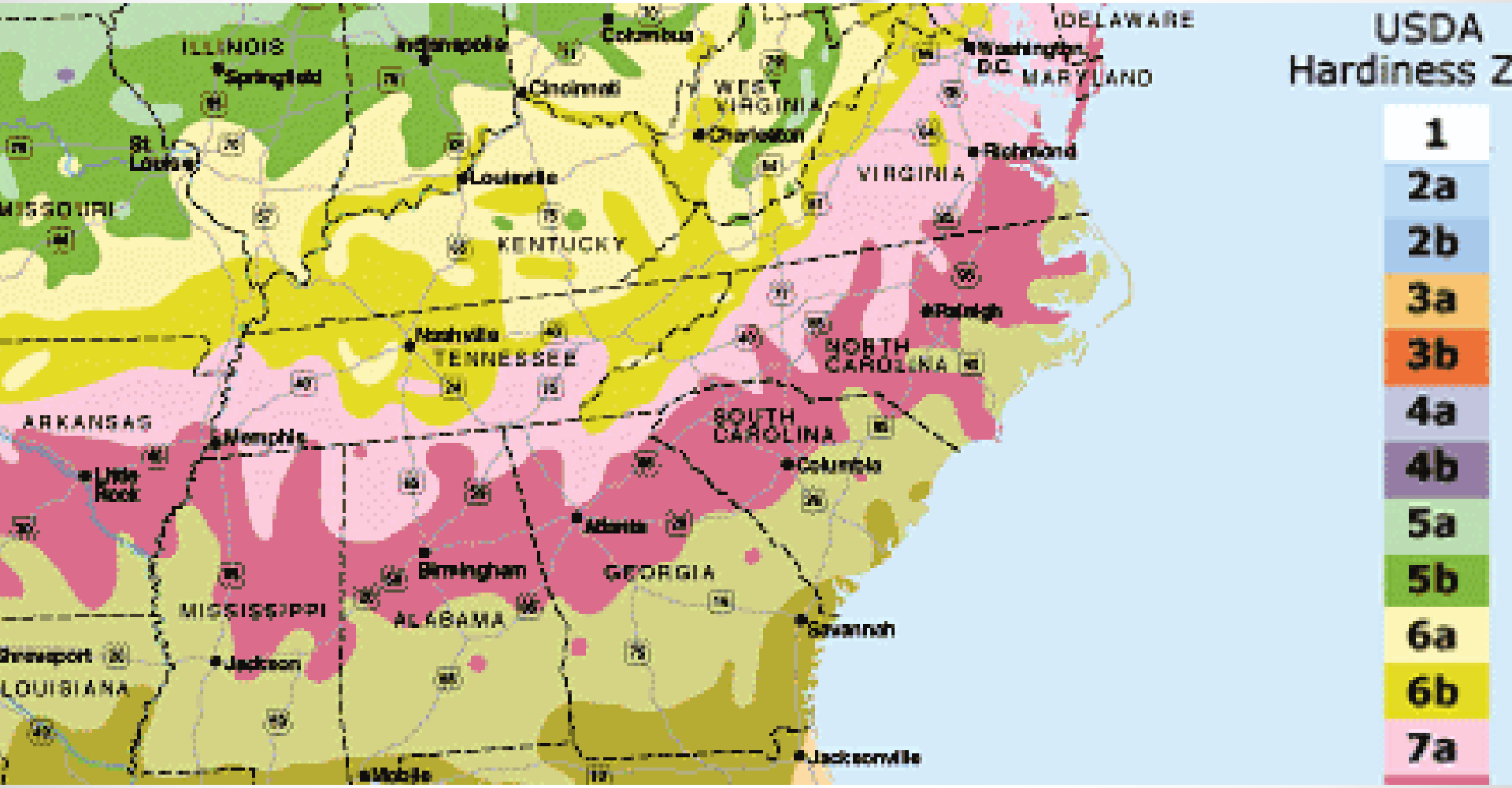


# The EPA predicts…

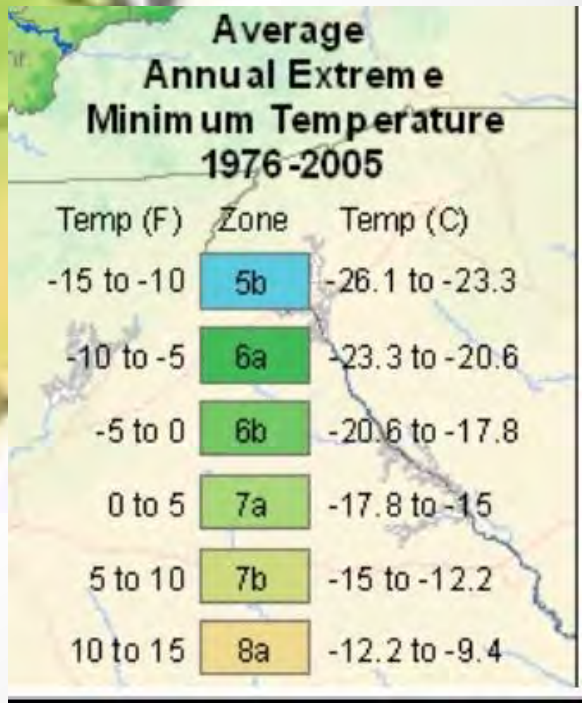
- Average summer temperatures will increase by 3º F over the next few decades and could increase by over 10º F by the end of the century.



# The old USDA hardiness map



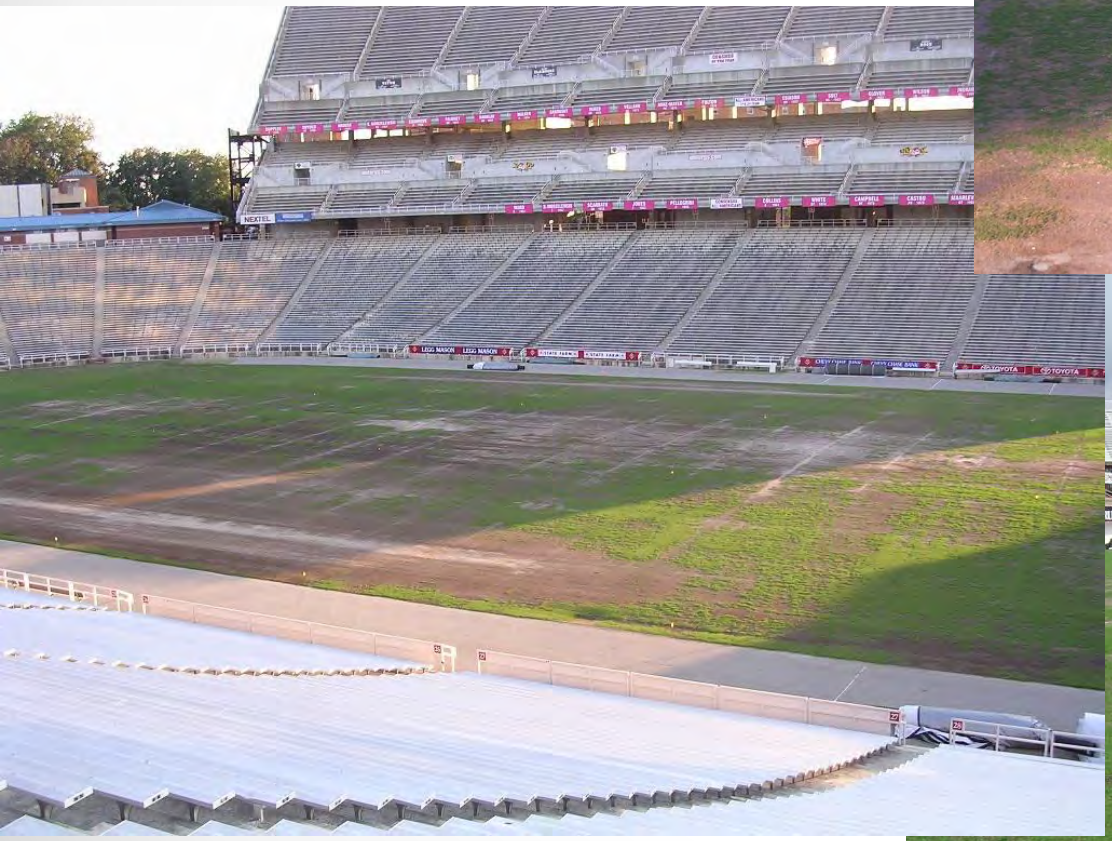
# The new USDA hardiness map




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

Winterkill!!!


LEGG MASON


NEXTEL
LEGG MASON
TOYOTA


VIRGINIA TECH
BLAIR
DODGE
SUNTRUST
JUL 7 2003

# Air Temperatures Lexington, KY Winter '17-'18

| Date | Low Temperature (F) |
|---|---|
| Dec. 27 | 10 |
| Dec. 28 | 10 |
| Dec. 29 | 14 |
| Dec. 30 | 12 |
| Dec. 31 | 8 |
| Jan. 1 | 3 |
| Jan. 2 | -2 |
| Jan. 3 | 4 |
| Jan. 4 | 8 |
| Jan. 5 | 7 |
| Jan. 6 | 1 |

Highest daytime temperature during this period = 30 $^{o}$F

Photos taken
Jan. 12, 2018

# Blue Grass Airport 10 Day Weather

12:10 pm EST Print

| DAY | DESCRIPTION | HIGH / LOW | PRECIP | WIND | HUMIDITY |
|---|---|---|---|---|---|
| TODAY JAN 12 | Wintry Mix | 35°/14° | / 80% | N 17 mph | 89% |
| SAT JAN 13 | Partly Cloudy | 25°/9° | / 10% | N 12 mph | 60% |
| SUN JAN 14 | Mostly Sunny | 26°/15° | / 0% | E 6 mph | 56% |
| MON JAN 15 | PM Rain/Snow Showers | 38°/3° | / 40% | SSW 15 mph | 58% |
| TUE JAN 16 | Cloudy | 12°/2° | / 20% | W 9 mph | 72% |
| WED JAN 17 | AM Clouds/PM Sun | 23°/7° | / 10% | W 9 mph | 70% |
| THU JAN 18 | Mostly Sunny | 31°/19° | / 10% | SW 9 mph | 60% |
| FRI JAN 19 | Partly Cloudy | 42°/31° | / 0% | SSW 10 mph | 65% |

# Causes of Winterkill

- Direct low temperature kill (varies with cultivar)
  - Duration of cold also a factor
- Heavy shade
- Poor drainage
- North facing slopes
- High spots (desiccation)
- Extended ice cover
- Winter traffic
- Heavy thatch
- Plant health

U of L Men's Soccer

AGR-228

University of Kentucky
College of Agriculture,
Food and Environment
*Cooperative Extension Service*

# Optimizing Bermudagrass Athletic Field Winter Survival in the Transition Zone

*Gregg Munshaw, Plant and Soil Sciences, University of Kentucky; Cale A. Bigelow, Agronomy, Purdue University; Michael Goatley, Crop and Soil Environmental Sciences, Virginia Polytechnic Institute and State University (Virginia Tech); Brad Fresenburg, Plant Sciences, 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 tolerance to close (e.g. < 1") cutting heights, summer vigor, positive traction characteristics for athletes, resistance to divoting and ability to withstand and recover from significant traffic during active growth. The major limitation to successful bermudagrass persistence in transition zone locations is a general lack of cold tolerance and susceptibility to winterkill (Figure 1).

Although during most winters temperatures are sufficiently warm enough

greater cold tolerance than common bermudagrass that are still available in the marketplace. Many of the older cultivars, however, do not have the improved turf quality characteristics such as increased shoot density, finer leaves, improved wear and recovery characteristics, and less susceptibility to scalping that are common in many newer cultivars. Bermudagrass cultivars commonly grown in the transition zone include Latitude 36, Northbridge, Patriot, Premier Pro, Quickstand, Riviera, VaMont, and Yukon. To view the list of the top performing bermudagrasses in the transition zone, see www.ntep.org.

New Extension Publication from UK, PU, VT, and UM
http://www2.ca.uky.edu/agcomm/pubs/AGR/AGR228/AGR228.pdf

# Mowing

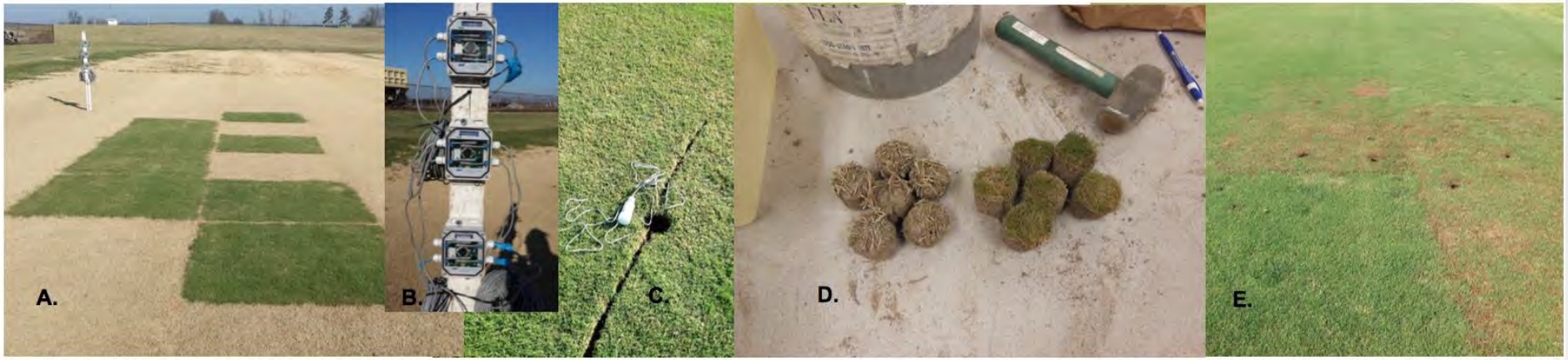
- During active growth (summer), 0.5-1.0 inches
- Early fall, 1.0-1.5 inches
  - Increased CHO production and storage
  - Insulation
  - More leaf tissue may resist wear=longer seasonal durability
- Slight increases should not affect playability/ball roll

# Overseeding

# 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)

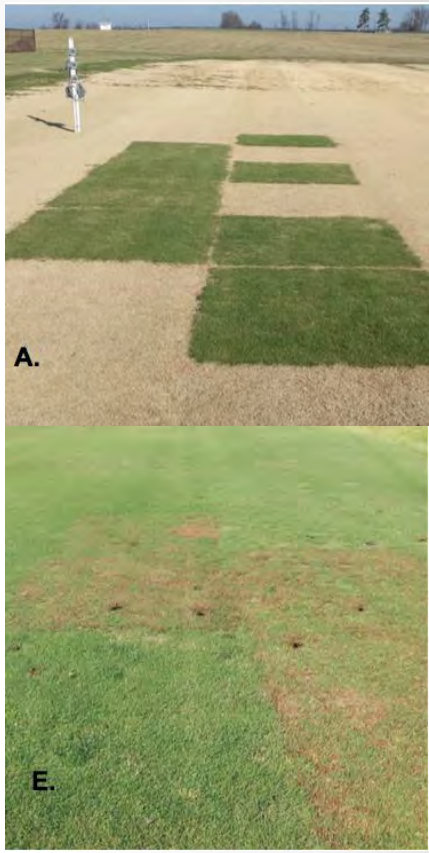
# Overseeding Research




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 Research




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

# Traffic Management

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

**Best Traffic Tolerance**

Tifway
Tiftuf
Numex-Sahara
Patriot
Riviera
Astro
North Shore
Latitude 36

**Not The Best Traffic Tolerance**

Princess
Yukon
Kashmir
Celebration

# Traffic Tolerance: Cultivar Differences

Riviera

Latitude 36

Tifway

# Spring Greenup Following Traffic

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


Latitude 36
Tiftuf
Northbridge
Astro
Patriot
Riviera
Tifway

# Winter Traffic



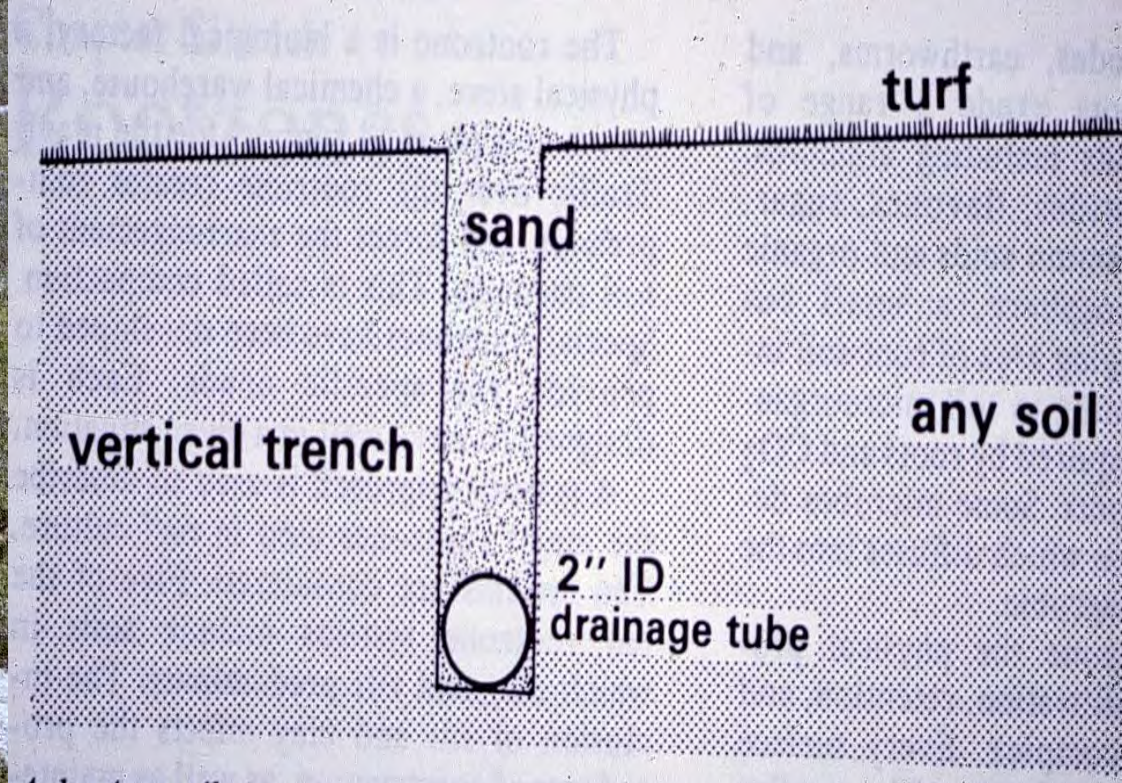
- Spring recovery/greenup in March approximately 50% for control plots, 15% for drained traffic, and <10% for wet traffic.

- Control areas reached 100% spring recovery/greenup in April vs. June for the areas receiving winter traffic.

# 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)


The key to a successful athletic field is 90% drainage and 10% common sense. If you don't have enough common sense, install more drainage."
--Mike Goatley




*A-1. Any soil system.*


CROWN OR SLOPE
1-1.75%
SLOPE

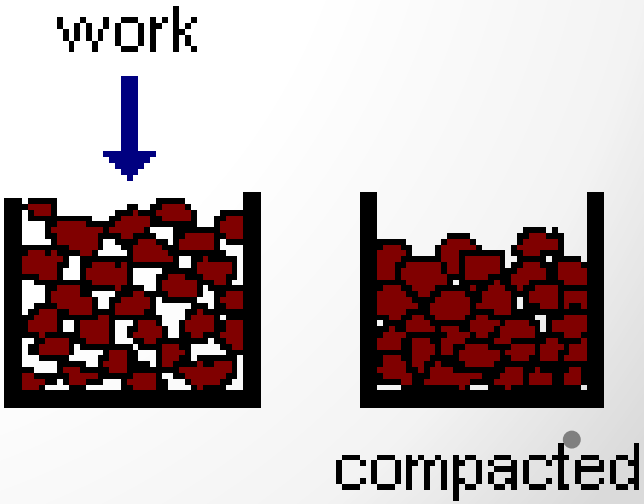

End Section Crown for Football Fields
Constructed with Native Soil
12 to 18" crown
160'
2'
Tile
McCarty, Landry & Miller


The Kentucky Crown

# IMPROVING POOR SOILS--

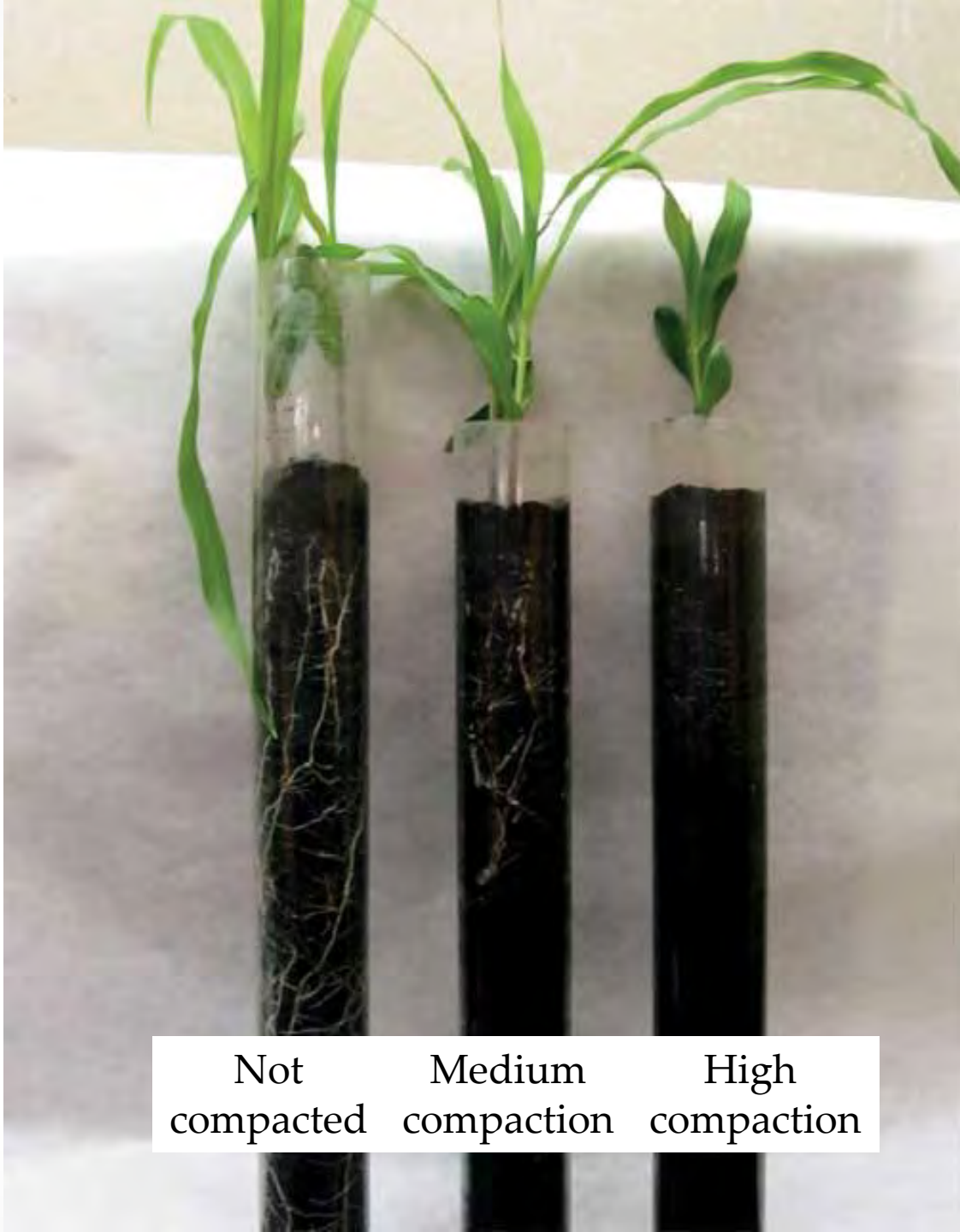
# COMPACTION

- 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



Measuring surface hardness with Clegg Impact Soil Tester

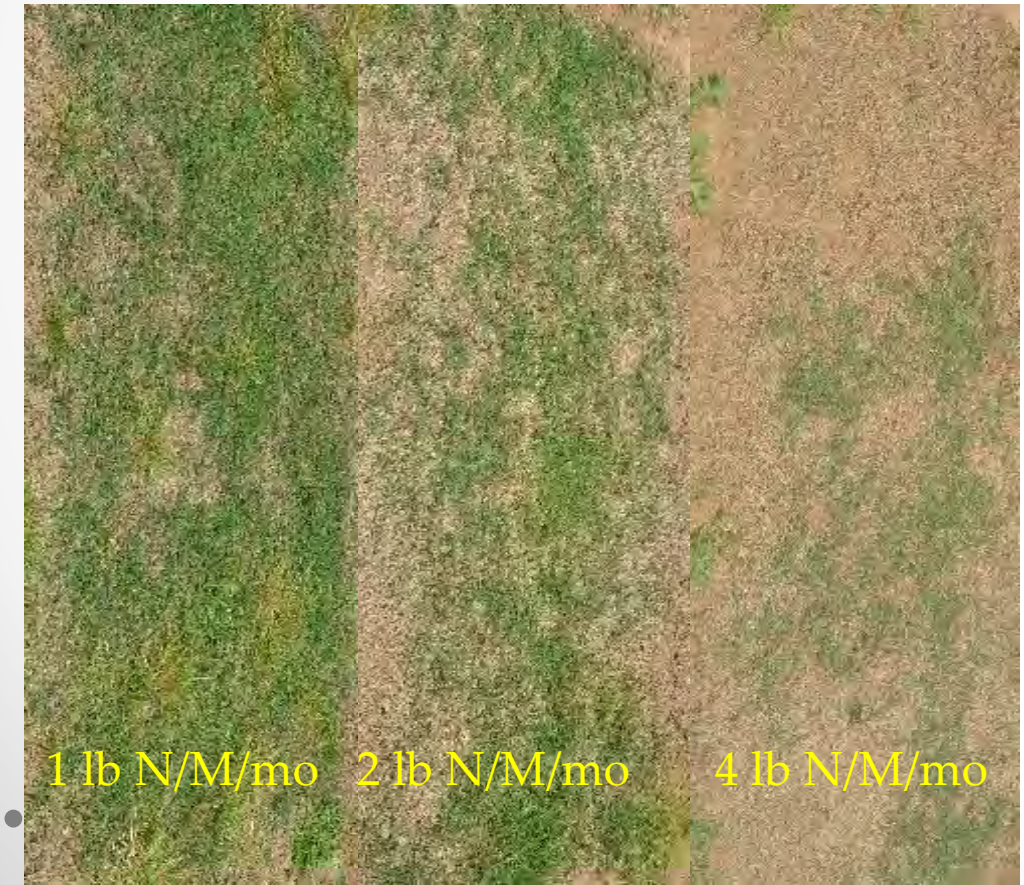
# Use lots of signs with specific instructions.




# Nutrition

# Nutrition

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




Bermudagrass winterkill in Kentucky following summer nitrogen applications

# 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

# Managing Bermudagrass in the Transition Zone

## 3 Keys to Management from a Sports Turf Manager

Fertility plan "feeding the soil"

Newer varieties(Latitude 36 and Northbridge vs Tifway 419)

Using growth blankets in the spring and fall to get a head start and prolong the growing season

# "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
  - 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

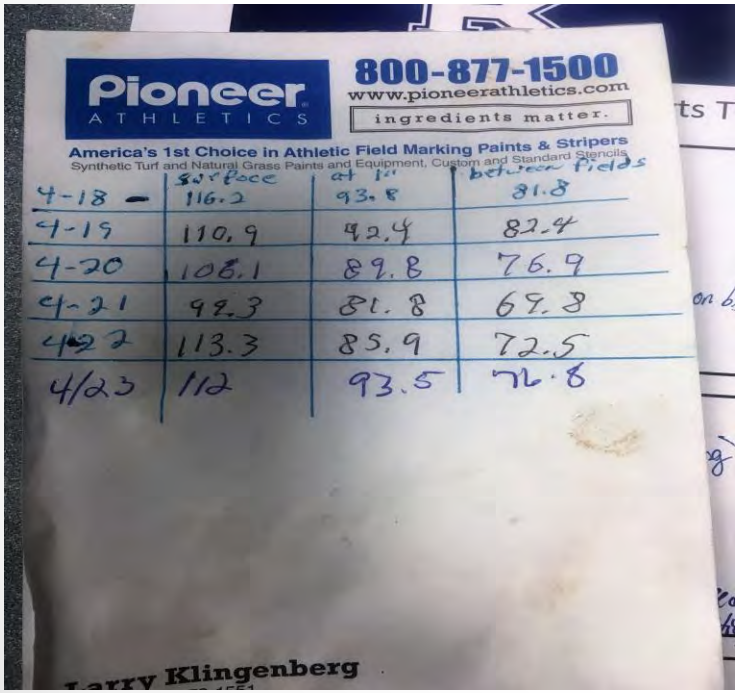
# Covers

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

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

# May 6, 2014 83/52

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




| | surface | at 1" | between fields |
|---|---|---|---|
| 4-18 | 116.2 | 93.8 | 81.8 |
| 4-19 | 110.9 | 92.4 | 82.4 |
| 4-20 | 108.1 | 89.8 | 76.9 |
| 4-21 | 99.3 | 81.8 | 69.8 |
| 4-22 | 113.3 | 85.9 | 72.5 |
| 4/23 | 112 | 93.5 | 76.8 |

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

# 1.5" Soil Temps 1/11/18

- Baseball (native soil) covered 50.8, uncovered 42 3oz woven polypropylene
- Practice Football (10" USGA) covered 48.3 uncovered 49.4 4oz non woven polypropylene
- Game Soccer (sand cap) covered 48 uncovered 41.8

  3oz woven polypropylene

  Practice Soccer (sand cap) covered 47.7 uncovered 47.5 2.7 oz polypropylene core sheathed in polyethelene

  Softball (native soil)

  uncovered 41.4

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

# 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

# 5/1/15 and 4/25/16


# 5/1/15 and 4/25/16


## Average Temperature and Total Rainfall Lexington, KY

# Dec 1-March 15

Year

- 2010 39-26-9.24"
- 2011 40-27-14.85"
- 2012 50-33-12.77"
- 2013 46-31-13.97"
- 2014 43-25-14.17"
- 2015 41-26-13.99"
- 2016 50-34-15.19"
- 2017 50-34-16.49"
- 2018 42-24-2.74"

Days below freezing and low

- 2010 8, 2/10-2/17, 2
- 2011 7, 12/13-12/19, -2
- 2012 3, 1/13-1/15, 13, 28,294 sqft.
- 2013 2 , 2/1-2/2, 5, 22,665 sqft.
- 2014 6, 2/6-2/11, -6, 15,081 sqft.
- 2015 6, 2/15-2/20, -18, 13,000 sqft.(used Latitude36)
- 2016 7, 1/18-1/24, 4, 6300 sqft.
- 2017 4,1/5-1/8, 4, 1575 sqft.
- 2018…13 12/25-1/6,-3





www.facebook.com/ukturf