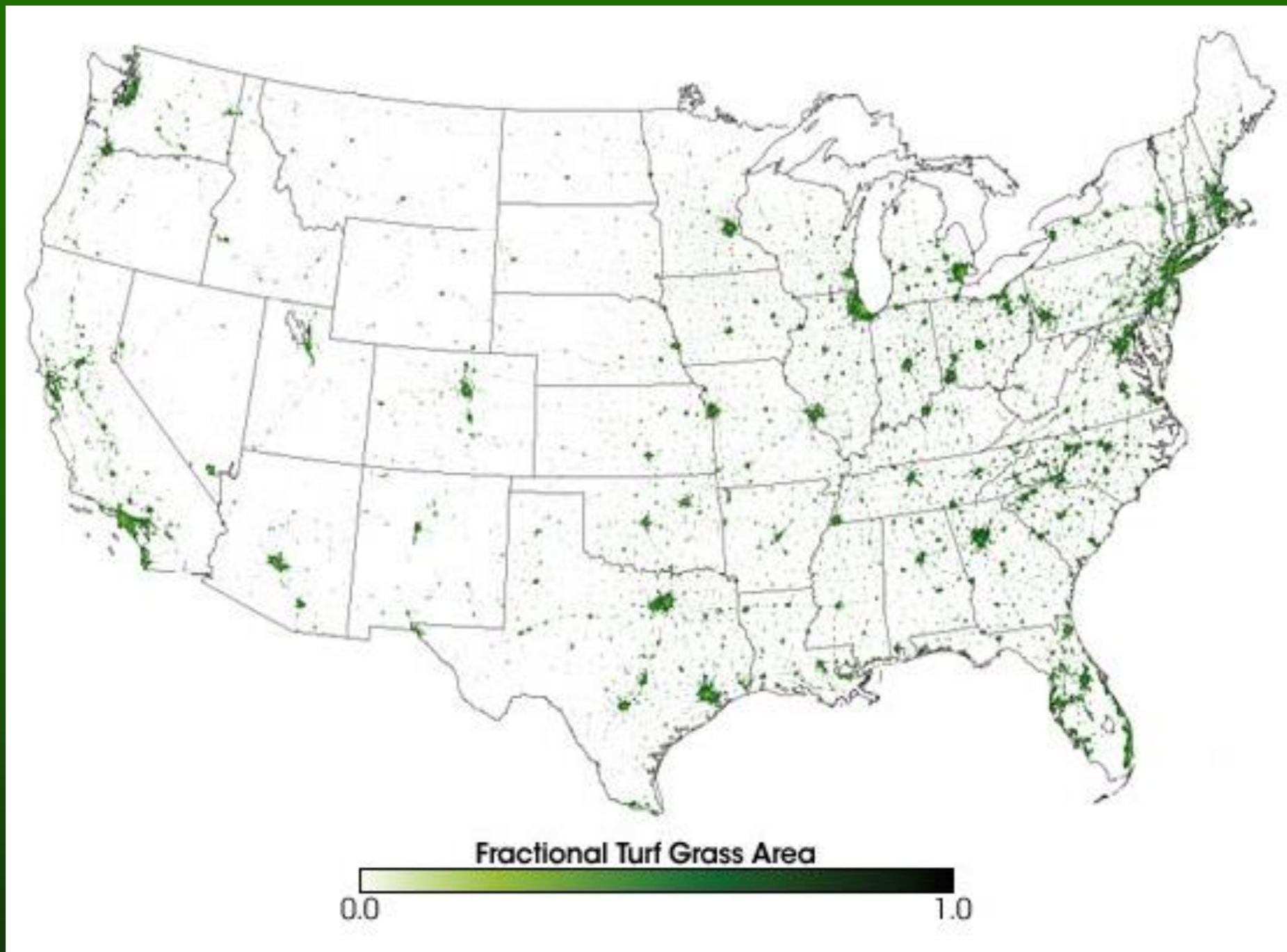


# Recovering Lawns From the Drought of 2012

Dr. Lee Miller  
Extension Turfgrass Pathologist  
University of Missouri





According to satellite imagery estimates, turfgrass has 3 times the acreage of corn: the most planted agronomic crop.



MIZZOU TURF PATHOLOGY

# Why do we use so much turfgrass?

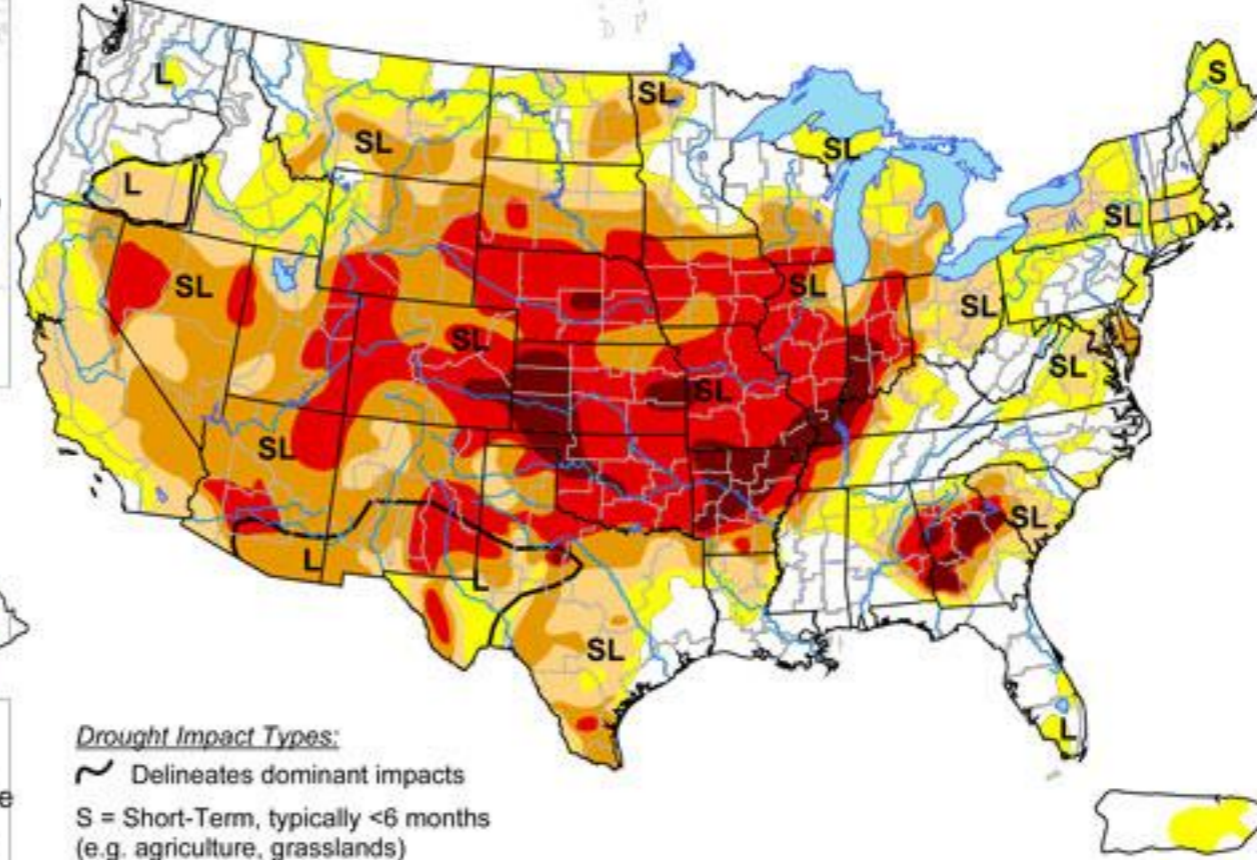
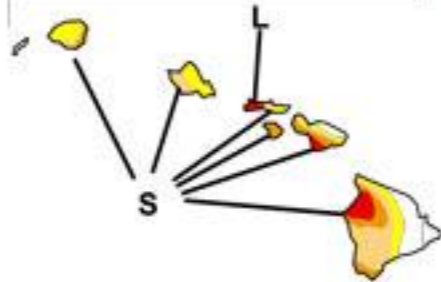
- Soil erosion control & dust stabilization
- Reduces precipitation runoff & contributes to flood control
- Enhances ground water recharge. (6x more holding of rainwater than a wheat field).
- Entrapment and biodegradation of organic chemicals
- Heat dissipation: football field has cooling capacity of 70 ton air conditioner!!!
- Glare reduction
- Noxious pest reduction: rodents can't hide from the hawks!!!
- Roadside safety: emergency stopping buffer zones
- Provides firebreak: green grass doesn't burn



Continental U.S. Vegetation Condition Comparison  
 Late-Jun/Early-Jul 2012 Compared to 23-year Average for Late-Jun/Early-Jul

# U.S. Drought Monitor

August 7, 2012  
 Valid 7 a.m. EDT



**KANSAS STATE UNIVERSITY**  
 Department of Agronomy

**Intensity:**

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

**Drought Impact Types:**

- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu/>



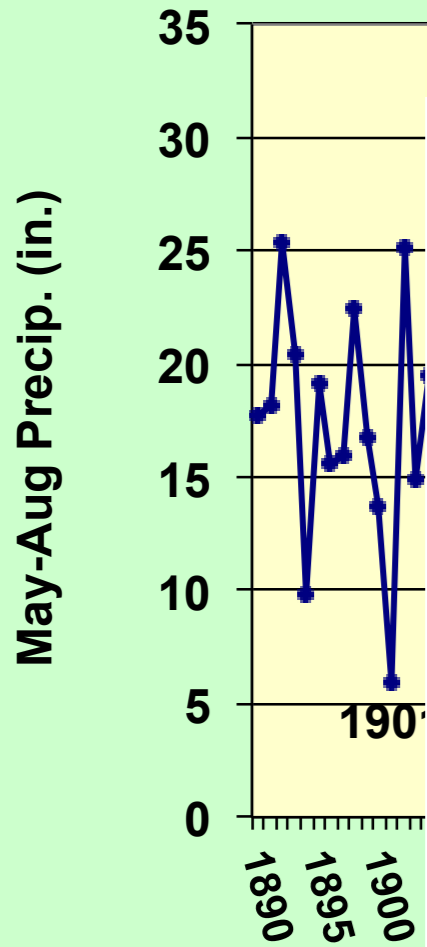
Released Thursday, August 9, 2012

Author: Mark Svoboda, National Drought Mitigation Center

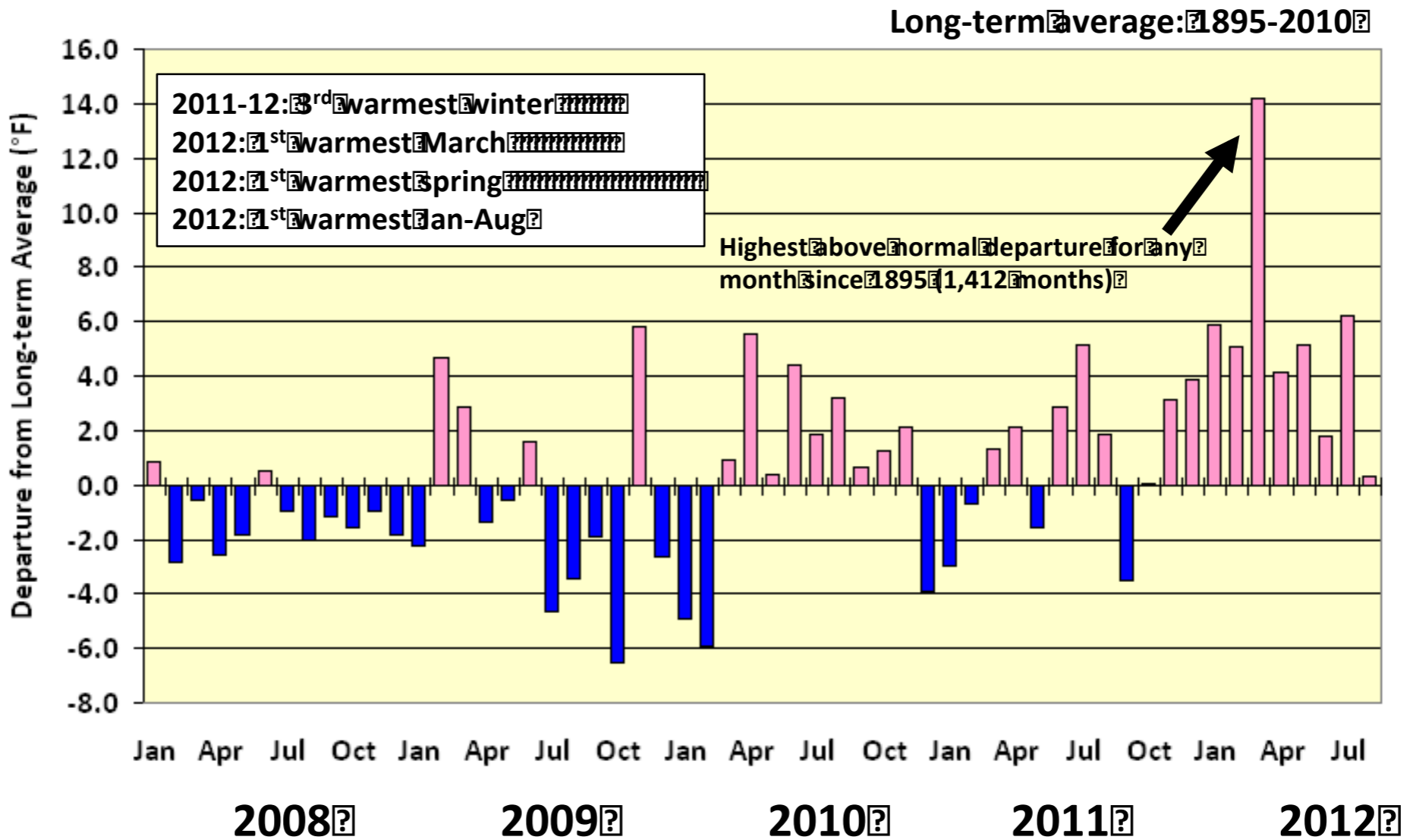


MIZZOU TURF PATHOLOGY

## May-Aug Precipitation Columbia, Missouri (1890-2012)

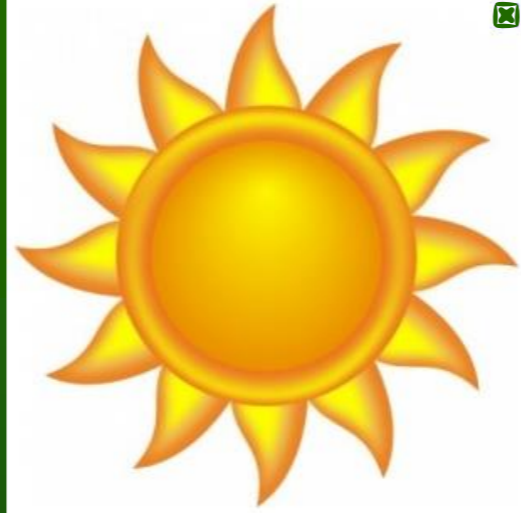


## Missouri Monthly Temperature Departure From Average\* Jan 2008 - Aug 2012





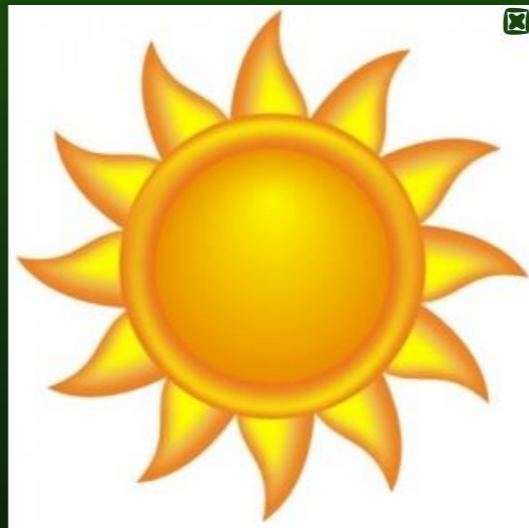
+



=



+



=



8/4/12

10/30/12



0/1/10

10/30/12





# Drought Resistance Mechanisms

## Escape

- ❖ Rapid development where plants complete their life cycle (go to seed) before or during a water deficit. *Poa annua*

## Avoidance

- ❖ Plants maintain high water potential by maintaining water uptake or reducing water loss. *Large root systems or adapted leaves with less stomata or stomata that close rapidly*

## Tolerance

- ❖ Low tissue water potential achieved by maintenance (or suspension) of regular physiological processes. *Dormancy in perennial grasses: 4-6 week grace period*



# Which Lawns Were Most Impacted

Cool season turfgrass lawns – particularly fine fescue shade mixtures and Kentucky bluegrass

Lawns that were watered inefficiently

- ❖ Particularly early in the summer if irrigation was applied too frequently = short roots

Lawns that were fertilized too late in spring/early summer

- ❖ More disease susceptible & favored shoot instead of root growth

Lawns that were mowed during dormancy or too short

- ❖ Not necessary

Lawns with too much organic matter/thatch

- ❖ Holds water too high in the soil profile



Thatch



# Irrigation



# Why is Irrigation Important

- Approximately 90% of plant tissue is comprised of water.
- Water is a major component of germination, photosynthesis, nutrient transport, plant turgidity, and transpiration.
- Summers often mean several weeks of drought that can be devastating to turfgrasses, especially cool-season species.
- Therefore, irrigation is often necessary for maintaining high quality turf.

**Footprinting due to drought stress**



# Irrigation: How Much?



**First, know how much water your sprinkler or irrigation system applies.**



MIZZOU TURF PATHOLOGY

# Determination of Turfgrass Water Use

## Potential Evapotranspiration

- One of the most common methods for determining water use is by measuring *potential evapotranspiration*.
- Potential evapotranspiration (Etp) is the theoretical water use of turfgrass plants and can serve as a reference for calculating irrigation requirements.





# Boone County Weather Stations

## Bradford Research and Extension Center (BREC)

- [Daily Weather Report - Bradford Research & Extension Center](#)
- [Weather Indices - Bradford Research & Extension Center](#)
- [Hourly Weather Data - Bradford Research & Extension Center](#)
- [Year-to-date Data - Bradford Research & Extension Center](#)
- [Evapotranspiration - Bradford Research & Extension Center](#)
- [Historical Archive - Bradford Research & Extension Center](#)
- [Real-Time Weather - Bradford Research & Extension Center](#)

## Jefferson Farm and Gardens

- [Daily Weather Report - Jefferson Farm and Gardens](#)
- [Weather Indices - Jefferson Farm and Gardens](#)
- [Hourly Weather Data - Jefferson Farm and Gardens](#)
- [Year-to-date Data - Jefferson Farm and Gardens](#)
- [Evapotranspiration - Jefferson Farm and Gardens](#)
- [Historical Archive - Jefferson Farm and Gardens](#)
- [Real-Time Weather - Jefferson Farm and Gardens](#)

## South Farms

- [Daily Weather Report - MU South Farms](#)
- [Weather Indices - MU South Farms](#)
- [Hourly Weather Data - MU South Farms](#)
- [Year-to-date Data - MU South Farms](#)
- [Evapotranspiration - MU South Farms](#)
- [Historical Archive - MU South Farms](#)



## Sanborn Field - University of Missouri

- [Daily Weather Report - Sanborn Field - University of Missouri](#)
- [Weather Indices - Sanborn Field - University of Missouri](#)
- [Hourly Weather Data - Sanborn Field - University of Missouri](#)
- [Year-to-date Data - Sanborn Field - University of Missouri](#)
- [Evapotranspiration - Sanborn Field - University of Missouri](#)
- [Historical Archive - Sanborn Field - University of Missouri](#)
- [Real-Time Weather - Sanborn Field - University of Missouri](#)



http://agebb.missouri.edu/weather/stations/boone/bull29s.htm  
Missouri We...ns - AgEBB Weather Underground Hotmail Peoplesoft

Commercial Agriculture Automated Weather Station Network  
Daily Weather Report  
Station: Boone County, South Farms (4 miles southeast of Columbia)  
10/3/2010

Max. Temp. = 60.6 deg. F  
Min. Temp. = 37.2 deg. F  
Avg. Temp. = 48.5 deg. F

Max. Wind = 14.2 mi/hr  
Time of Max Wind = 931 CST  
Avg. Wind = 4.3 mi/hr

Max. RH = 91.0 %  
Time of Max. RH = 700 CST  
Min. RH = 39.9 %  
Time of Min. RH = 1600 CST

Max. Bare Soil Temp. at 2 in. = 65.1 deg. F  
Time of Max. Bare Soil Temp. at 2 in. = 1500 CST  
Min. Bare Soil Temp. at 2 in. = 47.6 deg. F  
Time of Min. Bare Soil Temp. at 2 in. = 700 CST

Max. Bare Soil Temp. at 4 in. = 62.8 deg. F  
Time of Max. Bare Soil Temp. at 4 in. = 1800 CST  
Min. Bare Soil Temp. at 4 in. = 56.1 deg. F  
Time of Min. Bare Soil Temp. at 4 in. = 1000 CST

Max. Bare Soil Temp. at 8 in. = 61.1 deg. F  
Time of Max. Bare Soil Temp. at 8 in. = 2000 CST  
Min. Bare Soil Temp. at 8 in. = 57.0 deg. F  
Time of Min. Bare Soil Temp. at 8 in. = 1000 CST

Max. Bare Soil Temp. at 20 in. = 65.9 deg. F  
Time of Max. Bare Soil Temp. at 20 in. = 100 CST  
Min. Bare Soil Temp. at 20 in. = 64.7 deg. F  
Time of Min. Bare Soil Temp. at 20 in. = 0 CST

Avg. Vapor Press. = 0.7 mb  
Avg. Vapor Press. Def. = 0.5 mb

Precip. = 0.00 in

Radiation = 18.05 MJoules/sq. meter

Potential Evapotranspiration = 0.13 inches

Growing Degree Days (45 F) = 3.5  
Growing Degree Days (50 F) = 0.0  
Growing Degree Days (55 F) = 0.0  
Growing Degree Days (60 F) = 0.0

Heating Degree Days (65 F) = 16.5

Cooling Degree Days (65 F) = 0.0

Minimum Wind Chill Index (F) = 35.3

Maximum Livestock Heat Stress Index = 60

Definition of Categories...  
HTI < 75 ... No Stress  
HTI = 75 to 78 ... Alert  
HTI = 79 to 83 ... Dangerous  
HTI = > 83 ... Emergency

Estimated 70% of this number is adequate to maintain most turfgrasses.



# Calculations for 2012

- Span 7/8 – 7/22: No rain – estimated 3.467” of water lost to atmosphere
- 1 acre inch = 27,154 gallons of water;  
3.467” lost = 94,143 gallons
- 100 acre facility = 9.4 million gallons for total replacement
- Common totals of 300,000 gallons a day for the highest irrigated site, only equates to 44% ET replacement.



# Irrigation - What Time of Day?

## Early morning: 4 AM to 8 AM

- Evaporative losses minimized (Cooler temperatures)
- Better distribution of water (Calm winds)
- Knocks dew & guttation fluids off leaf blades and decreases leaf wetness period discouraging fungal growth and infection



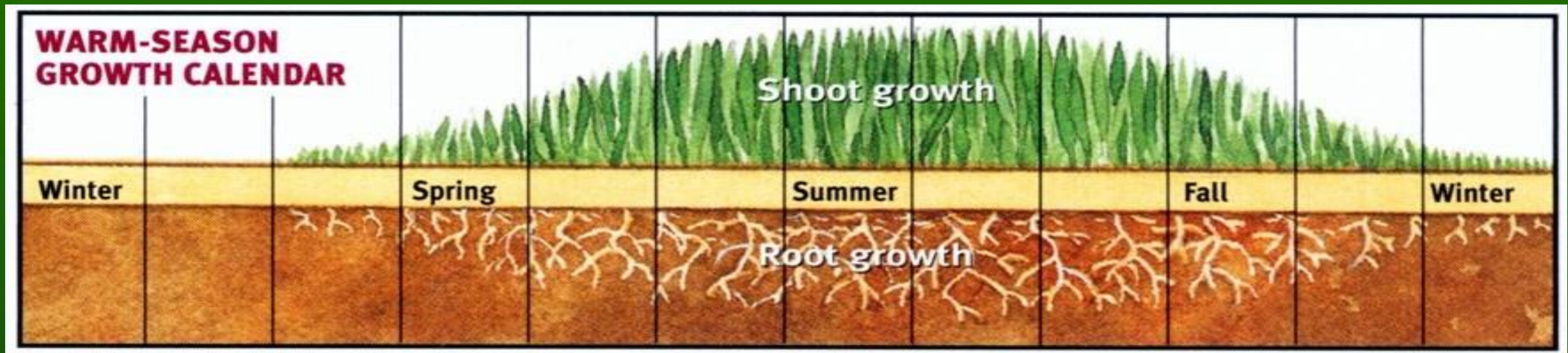
# When its time to start over

- What? - Species selection
- When? – Best times of year
- How? – Site preparation/seeding plan

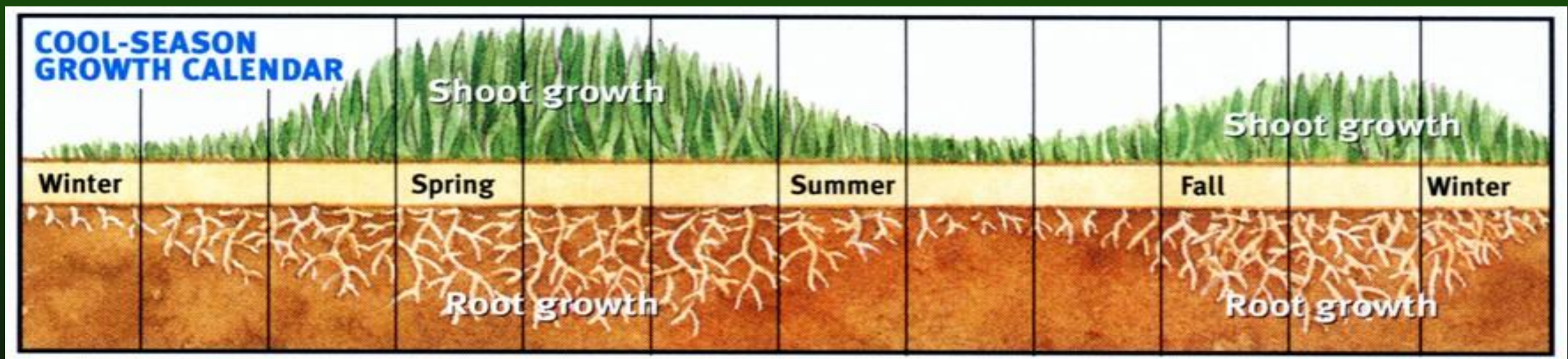




# What? - 2 Choices



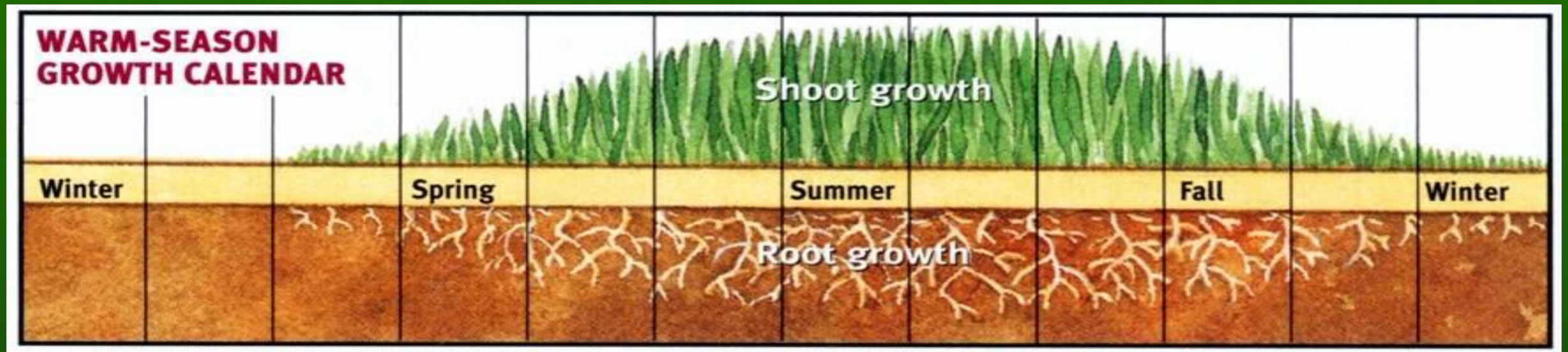
Bermudagrass, Zoysiagrass, St. Augustinegrass, Buffalograss



Bentgrass, Bluegrass, Fescue, Ryegrass



# Warm Season Grasses



- Six month growing season - (May to October)
- Best root growth at 75 to 85°F, turf green-up begins at 55°F.
- Best shoot growth at 80-95°F.



# Zoysiagrass

- Most commonly used warm season grass in Missouri, prominently in lawns and golf course fairways. Stolons and rhizomes for decent wear recovery (2ndary to Bermuda)
- Excellent cold tolerance. Good disease tolerance. Can have significant insect issues.
- ‘Meyer’ zoysiagrass most often planted in lawns.
  - Must be sodded/sprigged/plugged.
  - Requires 6-8 hours of sun a day.
  - Only requires 2 lbs of N/year.
  - Mow 1-2 inches: 1 time a week.
  - Keep the blade sharp!!!!



# Bermudagrass

- Stoloniferous and rhizomatous - extremely high spread potential. Makes it a good choice for sports fields and a nasty invasive weed.
- Low cold tolerance = low golf use, low lawn use, not suitable for N. Missouri. Good disease tolerance.



Zoysia vs common bermuda



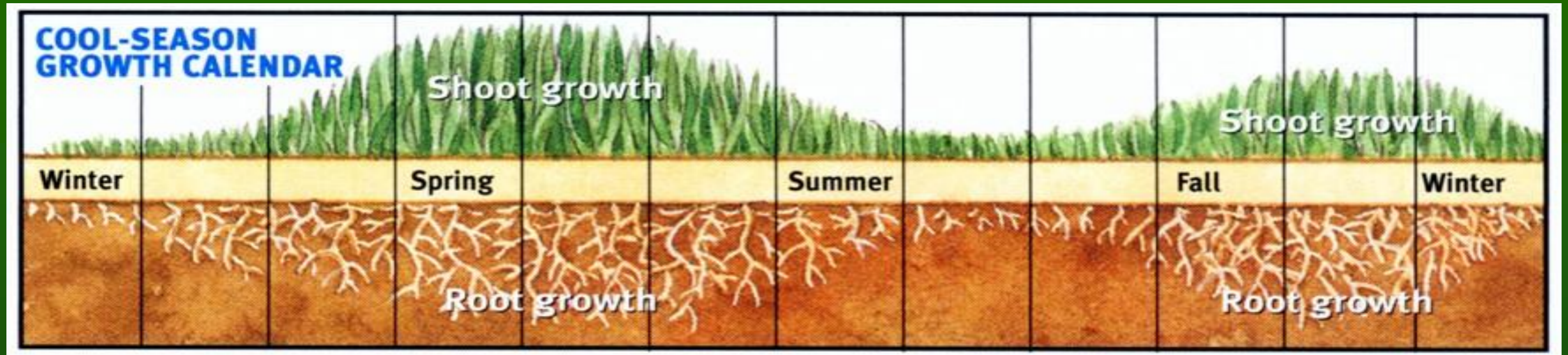
# Buffalograss

- Native warm-season that spreads slowly by stolons. Huge problem with weed competition
- Very deep root system. Heat, drought and cold tolerance.
- Tolerant of infertile compact soils; needs direct sunlight; not great wear tolerance.
- Can be a no-mow grass, reaching maximum height of 6-8 inches.

**Not There Yet!!!**



# Cool Season Grasses



- 9-10 month growing season - (March to November)
- Best root growth at 50 to 65°F; roots grow until soil freezes.
- Best shoot growth at 60-75°F.

# Tall Fescue

- Tall fescue is a bunch-type grass that is the most widely grown lawn species in Missouri.
- It stays green year round and can tolerate the heat and drought of summer better than other cool-season species, because it is deeper rooted.
- It is also disease resistant, tolerates heavy traffic, and persists with minimum care. Brown patch (and this year Pythium) however is it's weak link.
- It also has fair shade tolerance.



Turf-type tall fescue: rolled vernation, prominent evenly-spaced veins, tiny ligule and auricles



# Fine Fescue

- Another bunch type grass that is more shade tolerant than tall fescue.
- **HOWEVER**, it is not as drought tolerant as tall fescue and can be stressed very easily in hot conditions.
- The leaf width is also very fine compared to tall fescue. Therefore, weed competition can be much more of an issue.

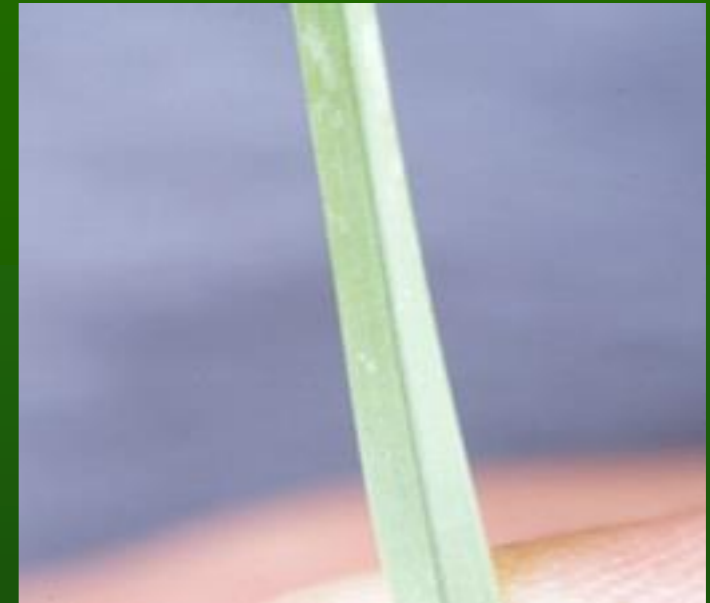


Turf-type tall fescue: rolled vernation, prominent evenly-spaced veins, tiny ligule and auricles

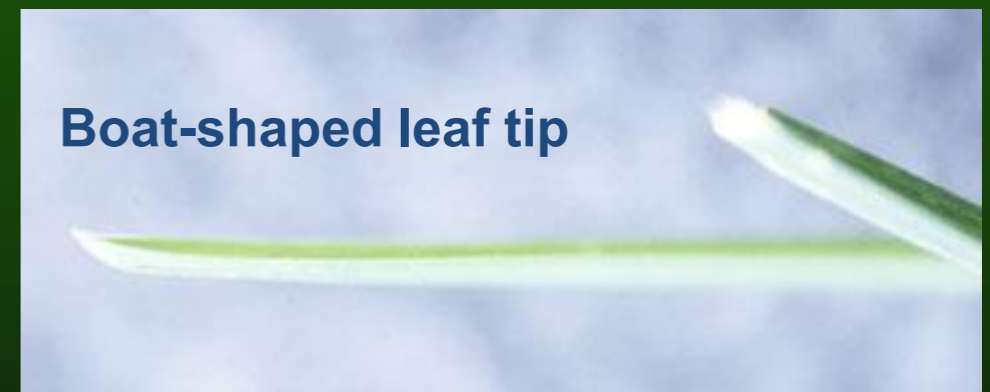


# Kentucky Bluegrass

- Dark blue-green color, aesthetically pleasing
- Rhizotomous and tillering growth can spread for fill-in of worn areas
- Less heat tolerance, drought resistance, and more disease susceptible than tall fescue.
- Used in lawn mixes with TF at 10% by seed volume at establishment or when over-seeding



Translucent mid-vein, folded vernation



Boat-shaped leaf tip



# Perennial Ryegrass

- Bunch grass
- quick germination/establishment (5-10 days)
- good wear tolerance/no recuperative potential
- poor stress tolerance, poor disease resistance
- good to use for over-seeding bare areas in athletic fields
- do not use more than 20% PR in mixtures



Perennial ryegrass leaf blades are much finer than tall fescue and very glossy on the back.



# Drought Resistance



# So What to Choose?

- Tall Fescue - Is the most popular for a reason. Good varieties for Missouri w/some brown patch resistance: (think art) Rembrandt, Picasso, Winning Colors (blend), Revolution (blend).
- LOTS of shade - Fine fescue (normally in mixtures of fine, red, chewings, etc.)
- Most costly establishment option - Zoysiagrass



## Selecting Turfgrasses for Missouri

### **Turfgrass selection**

Turfgrass selection is the most important cultural practice in turfgrass management and can have a major impact on turf quality. A quality lawn containing the recommended mixtures of species or blends of turfgrass varieties can be a difficult process and decision. Selecting turfgrass species depends on how you manage your lawn and what you expect of your lawn. Grasses differ in adaptation, cultural requirements and performance. Managing a lawn requires decisions on frequency of mowing, a fertilizer program, and your choice to water your lawn or not. Selections can also be based on existing environmental conditions (level of moisture, degree of sunlight, topography) and the purpose for which the grass will be used. The answers to these questions will help you decide which type of lawn you wish to establish.

### **Species selection**

Blends (3 to 4 varieties in equal portions) of Kentucky bluegrasses look rich with dark blue-green colors and have good resistance to brown patch disease, although they do require more inputs of fertilizer and water to maintain that rich cover through the summer months. They are also more susceptible to dollar spot, leaf spot, rust, and summer patch diseases. Selecting bluegrass varieties that offer resistance to some of these diseases is a practical first step in lawn establishment. Bluegrasses develop tillers and small rhizomes, which enable bluegrasses to recover from thinning or other problems. They grow well in full sun to partial shade and have good wear tolerance and recoverability.



Blends (three to four varieties in equal portions) of turf-type tall fescues can give deep emerald green appearances with a slightly coarser texture than the bluegrasses. They tend to be a deeper rooting plant, therefore requiring less water than a bluegrass lawn. They are not as susceptible to dollar spot and summer patch, but generally will require some fungicides for the control of brown patch disease. Several varieties of turf-type tall fescues offer superior resistance to brown patch and therefore will improve turf quality. Tall fescues will tiller to help with recovery, but tend to be clumpy with severe thinning. They also grow well in full sun to partial shade.

Mixtures, such as turf-type tall fescues (in a blend) with Kentucky bluegrasses (90 percent fescue, 10 percent bluegrass), combine the advantages or strengths of each species to mask the weaknesses of the other. Any grass seed mixture with perennial



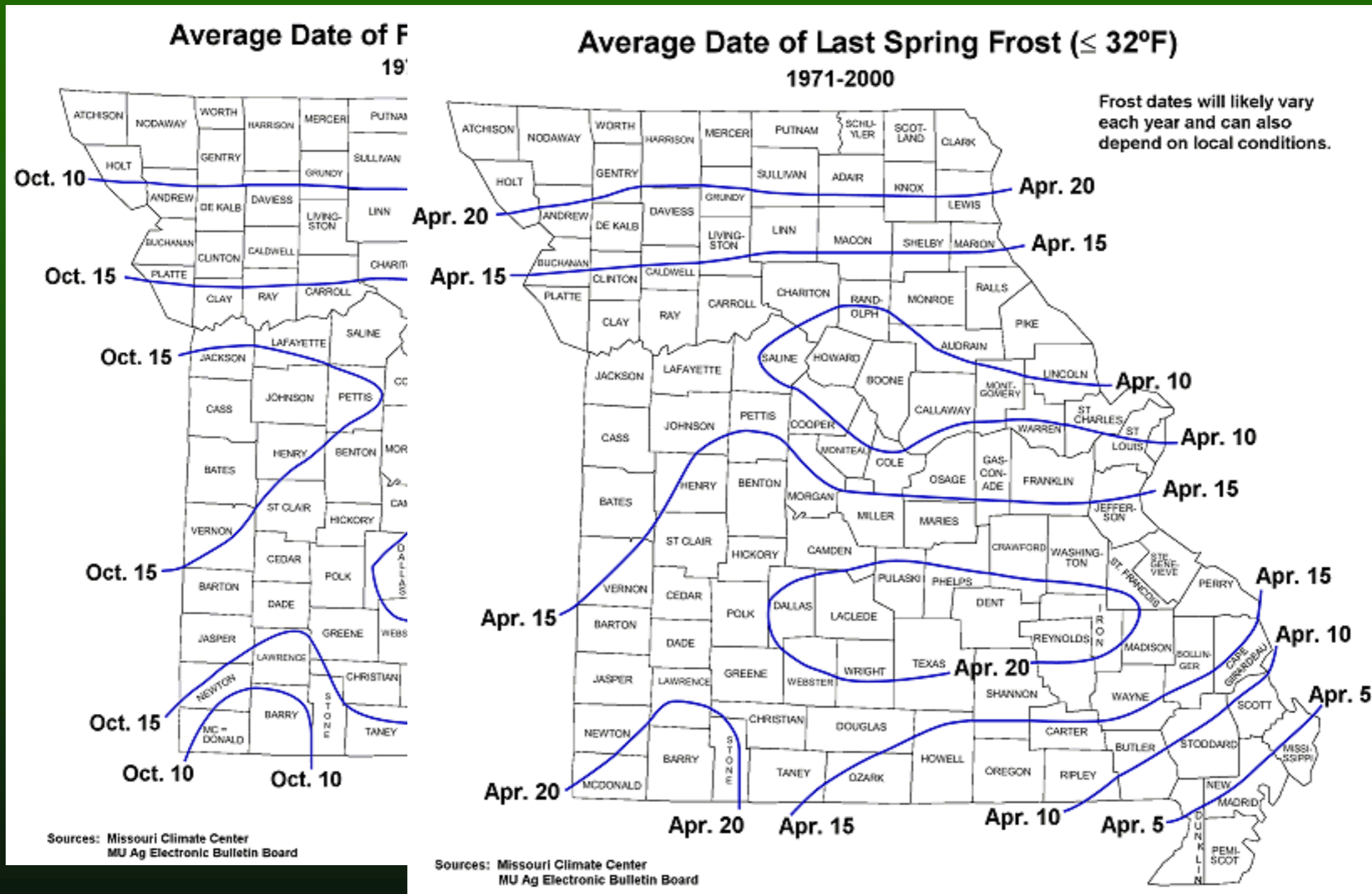
# When? - 2 Choices

- Cool season (i.e. tall fescue): Early fall – September 15<sup>th</sup> is a magic date.
- Warm season (i.e. zoysiagrass): late spring/early summer



# The Why of When?

## Cool Season – Early Fall



## Warm Season – Late Spring



# How? - 2 Choices

- Establish – “Kill and Till”
- Renovate

Personal preference dictates which one to do.









# Establishment

**Soil test**

**“Kill & Till”**

**Amend with lime if  
necessary**

**Grade**

**Starter fertilizer**

**Seed (2 directions)**

**Rake and roll**

**Mulch (1 bale/1000 sq ft)**

**Water (lightly and  
frequently)**



# Renovation

- **Control existing vegetation**
- **Set mower as low as possible**
- **Verticut or core aerify - disrupt soil surface**
- **Rake out loosened thatch and debris**
- **Add fertilizer**
- **Make one more pass with verticutter or aerifier**
- **Seed in two directions**
- **Lightly rake seed into soil surface.**
- **Water lightly and frequently**



# Top Drought Look-Alikes

- Zoysia
  - Large Patch (Fall/Spring)
  - Hunting billbugs (Late Spring/Summer)
  - Chinch bugs (Summer)
- Tall Fescue
  - Brown Patch (Summer)



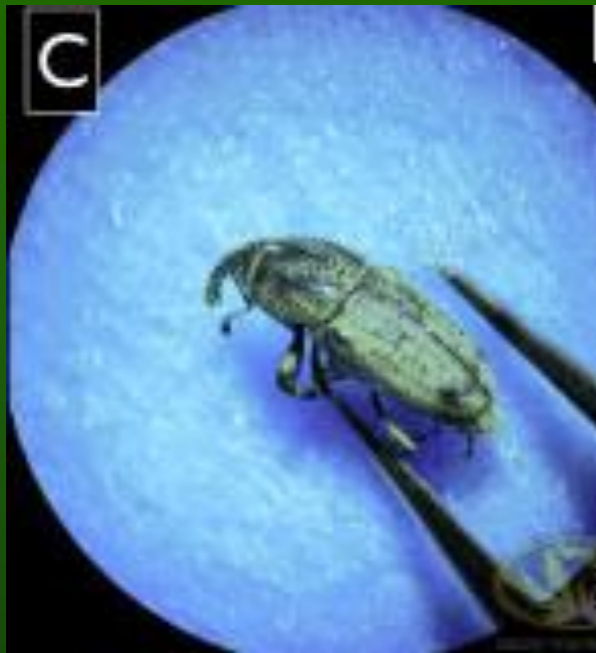
# Large Patch:

- Brown patch kissing cousin
- Infects zoysiagrass during fall and spring when growth is slowed down by cooler temperatures
- As name implies, large patches that may “fire” to orange margins when disease is active.





# Hunting Billbugs



- Difficult to diagnose - looks similar to chinch bug damage
- Zoysiagrass - looks droughty, will not recover with watering
- 'Meyer' (most prominent lawn cultivar) is also most susceptible





# Chinch Bugs

- Damage occurs in mid summer (mid June - August)
- Large fast spreading dead patches in zoysiagrass lawns, looks like drought stress
- Control normally covered by grub control products, do not specifically target this pest unless you have had problems in the past.









# Shipping - How to Take the Sample?

- Take pictures of symptoms and email to [turfpath@missouri.edu](mailto:turfpath@missouri.edu)
- 1-2 Plugs per sample (each suspected problem)
- Depth - only down to root zone, shake off excess soil
- Wrap bottom in aluminum foil to stabilize; pack rest of box with newspaper or packing material; no plastic bags
- Ship overnight for best results.
- Cost: Homeowner \$15, LCO \$25, Golf \$50



# Where To Take the Sample?

- For larger, patchy or ring symptoms that are larger than the cup cutter, this is a critical aspect to obtaining a good diagnosis
- Too far in the middle of the patch has the least amount activity of the true pathogen, and much more from opportunistic pathogens
- Like mowing, use the 1/3rd rule: 1/3rd healthy turf, and 2/3rd symptomatic turf





MIZZOU TURF PATHOLOGY

# Thank you for your attention.

From: Lee Miller <millerger@MISSOURI.EDU>  
Subject: Mizzou Disease Update - 8/20/12  
Date: August 20, 2012 3:38:10 PM CDT  
To: Turfpath Listserve  
Reply-To: Lee Miller <millerger@MISSOURI.EDU>

Hide  
1 Duplicate



Hello everyone,

I hope you are enjoying these mild temperatures as much as I am. We still need a lot of rain here in mid Missouri, but 50 degree lows in August are welcome any time. As one turf professional put it, "there should be no sweaters now, you need to thoroughly relish this August chill".

Very few samples have come in to the diagnostic clinic over the past two weeks, presumably due to the respite in temperatures. Recovery/renovation time is very close at hand for drought damaged turf; it's important to assess the damage first with a water test before giving up and renovating completely.

To read more, [click here](#)

Or copy and paste this link into your browser:  
[http://turfpath.missouri.edu/reports/update08\\_20\\_12.htm](http://turfpath.missouri.edu/reports/update08_20_12.htm)

Have a good week, Lee

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<<http://turfpath.missouri.edu/unsubscribe.cfm>>



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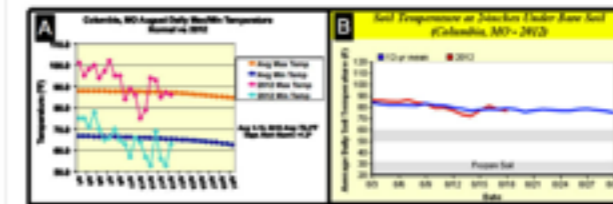
Download Article Reader

## Update (8/20/2012)

Weather is Mild, \$ Spot Running Wild

[Printable Version \[PDF\]](#)

### Weather



#### Temperatures turn mild.

A. High temperatures have finally subsided in the last ten days.  
B. Milder temperatures have also resulted in a break for cool season turfgrass roots. Soil temperatures are at or below normal for the first time since mid June.

Temperatures have finally returned to below or even below normal levels over the last 10 days. Fifty degree lows and eighty degree highs have been a nice "natural fungicide" for warm season, summer stress type diseases. This has provided a much needed break for cool season turfgrasses that were taking a heavy hit due to the one-two high temperature/low rainfall punch of the summer's pressure cooker. Forecasted temperatures look to break back into the low 90's later this week, but thankfully don't look to get back into the low 100's that seemed to be the norm for much of July and early August. Unfortunately, turf and ornamental recovery will need water supplied by human intervention, as our 10 day forecast doesn't show any chance for precipitation to break our current drought situation. According to the drought monitor released 8/16, 20% of the state's area is in an "exceptional" drought (highest level), and 85% of the state is in at least an "extreme" drought (2nd highest). Kansas, Oklahoma, and Nebraska join Missouri in having near or over 80% of their land area in these top two highest drought categories (Kansas is closest). In Columbia, Missouri, we are in the driest May 1 - Aug 19 period ever since 1880, with only 4.71" recorded at the airport (previous driest 1911 5.12"). This is 12.38" in the hole, or 306, 167 gallons of missing precipitation over an acre of land.



Disease Reports  
Turf Diagnostics  
Join our Email List  
Contact

Download Article Reader



08/20/12: Milder temperatures have dollar spot ready to surge on irrigated cool season turfgrasses.

## Welcome to Mizzou Turfgrass Pathology

Disease Reports will be posted throughout the 2012 season detailing current weather conditions, turf disease outbreaks, and suggestions for control.

Join our Email List to be notified when disease reports are posted.

The Mizzou Turf Diagnostics Lab provides identification of turf problems and suggests management practices to aid recovery. Click on the Turf Diagnostics link to access the submission form and instructions for submitting a sample.

[www.turfpath.missouri.edu](http://www.turfpath.missouri.edu)

