Surviving Weather Extremes of Heat and Humidity

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First advice…
bury the bad memories of 2010
Photo courtesy of Pat Obrien

Turf Diseases

Golf Course Disease Updates
By University Professors

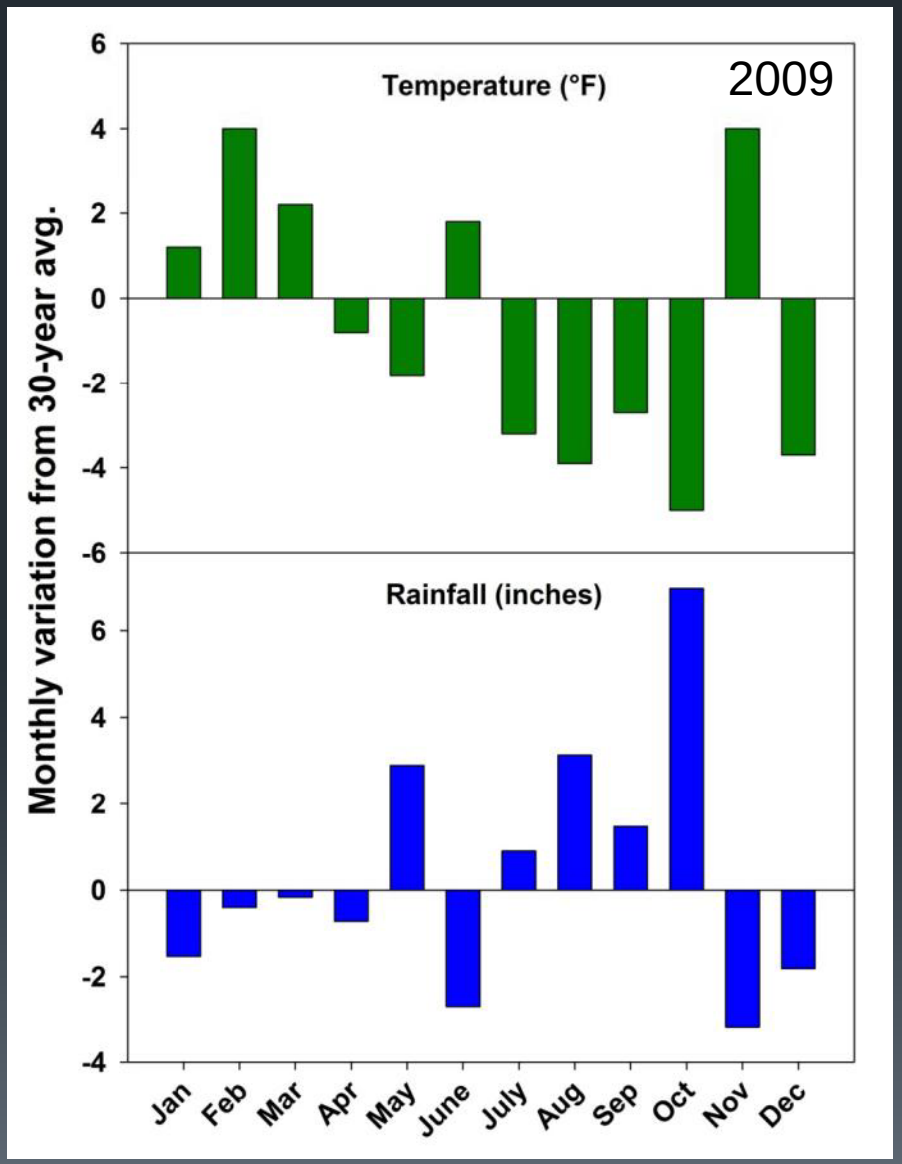
Turf Disease blog posts this past summer:

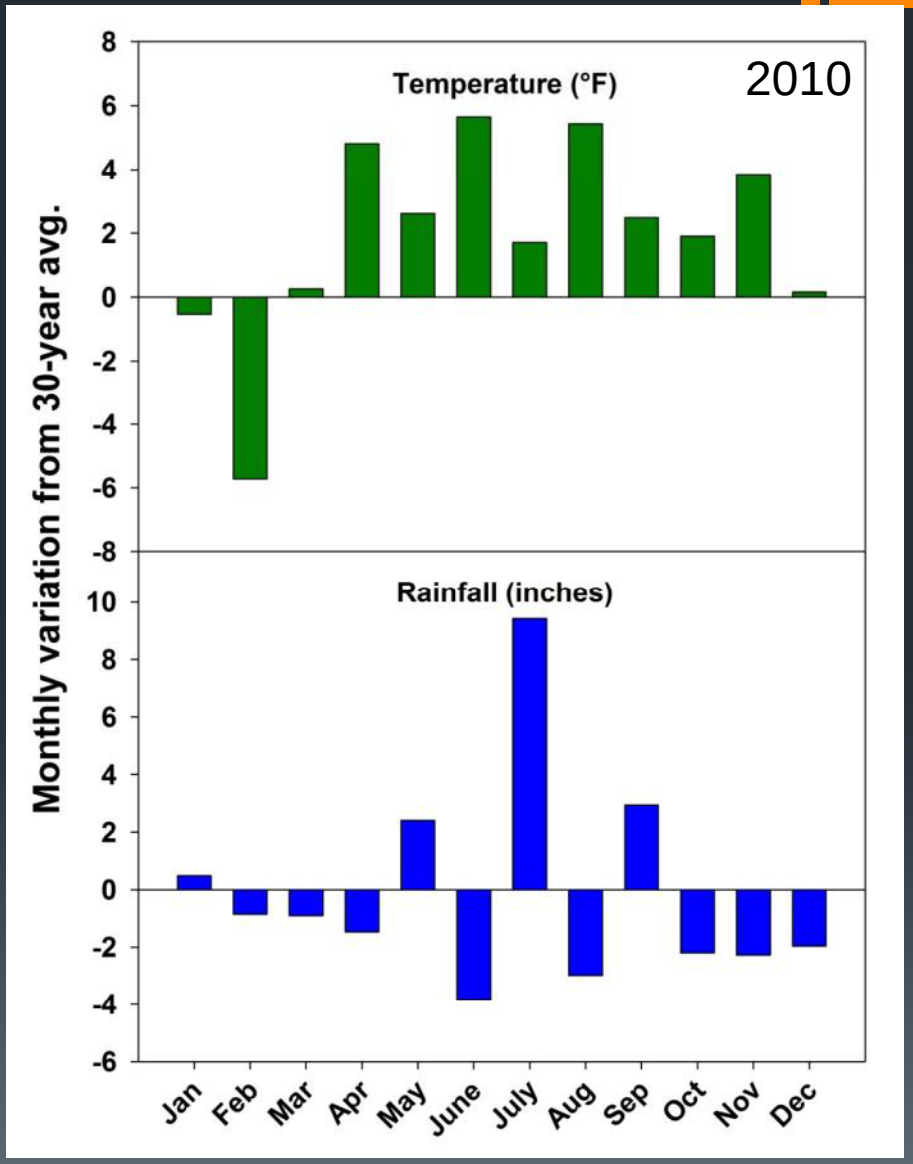
- *Poa annua* takes a dump
  - Jim Kerns
- Heat + Rain = Dead Grass
  - Brandon Horvath
- No wind = Dead grass
  - Lane Tredway
- Heat wreaking havoc on golf courses nationwide
  - John Kaminski and Clark Throssell
- Relentless heat and humidity
  - Megan Kennelly

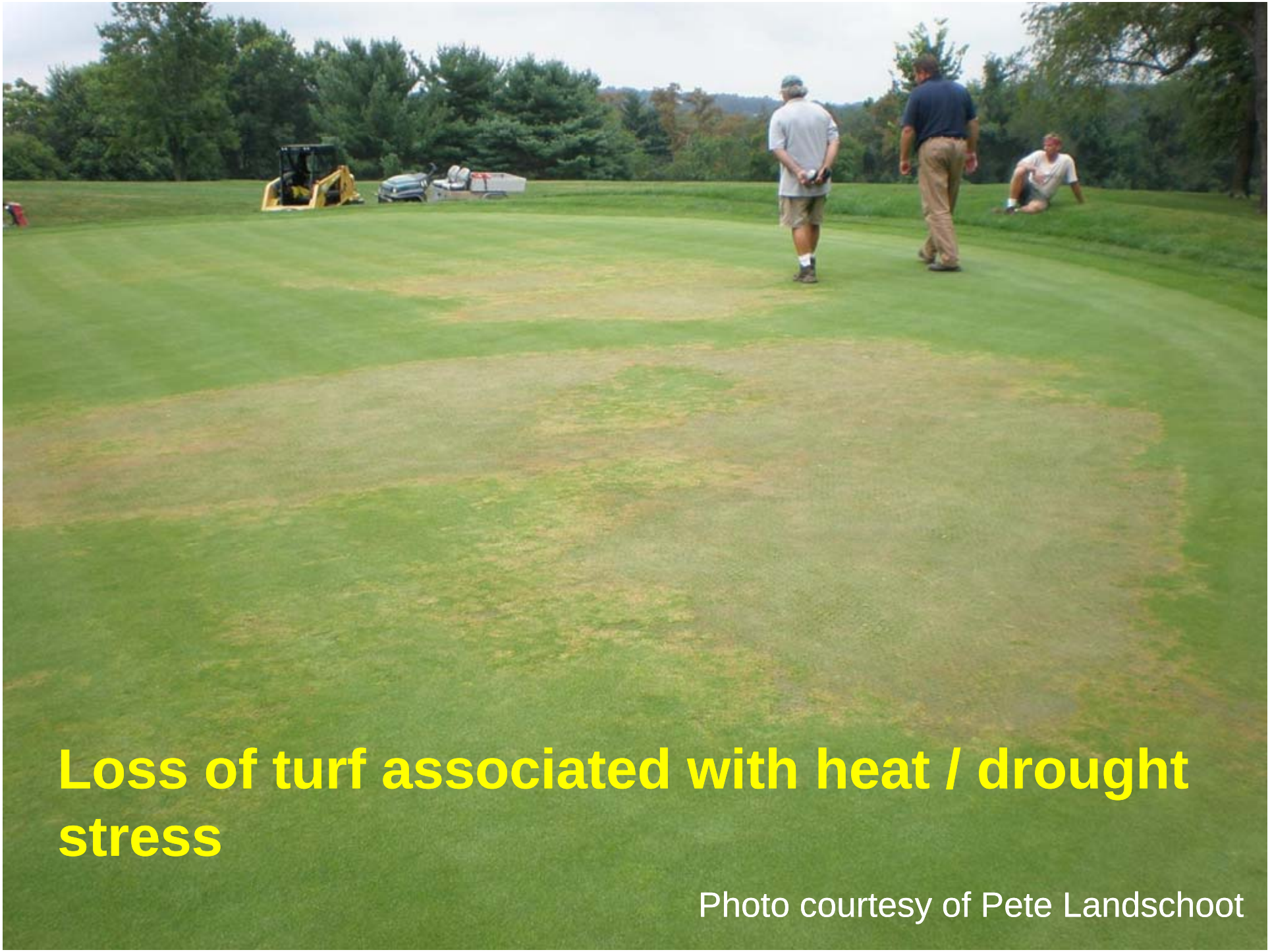
What caused cool-season grass decline/failure in 2010?

- High temperature
- High humidity
- Excessive rain
- Excessive drought
- Poor air flow
- Pathogens
- Intense cultural practices
- Traffic
- Economic issues

Temperature/rainfall variation from 30-yr average







Loss of turf associated with heat / drought stress

Photo courtesy of Pete Landschoot


Poor rooting associated with surface organic matter resulting in drought stress
Photo courtesy of Bud White


Surface organic matter resulting in weak root system and aenarobic layer
Photo courtesy of Brandon Horvath


Tough economy leads to more tri-plex mowing, which caused major traffic problems
Photo courtesy of Pat Obrien


Thin turf leading to algae or moss infestations
Photo courtesy of Brandon Horvath


Photo courtesy of Pat Obrien

Were pathogens part of the problem? Apparently…

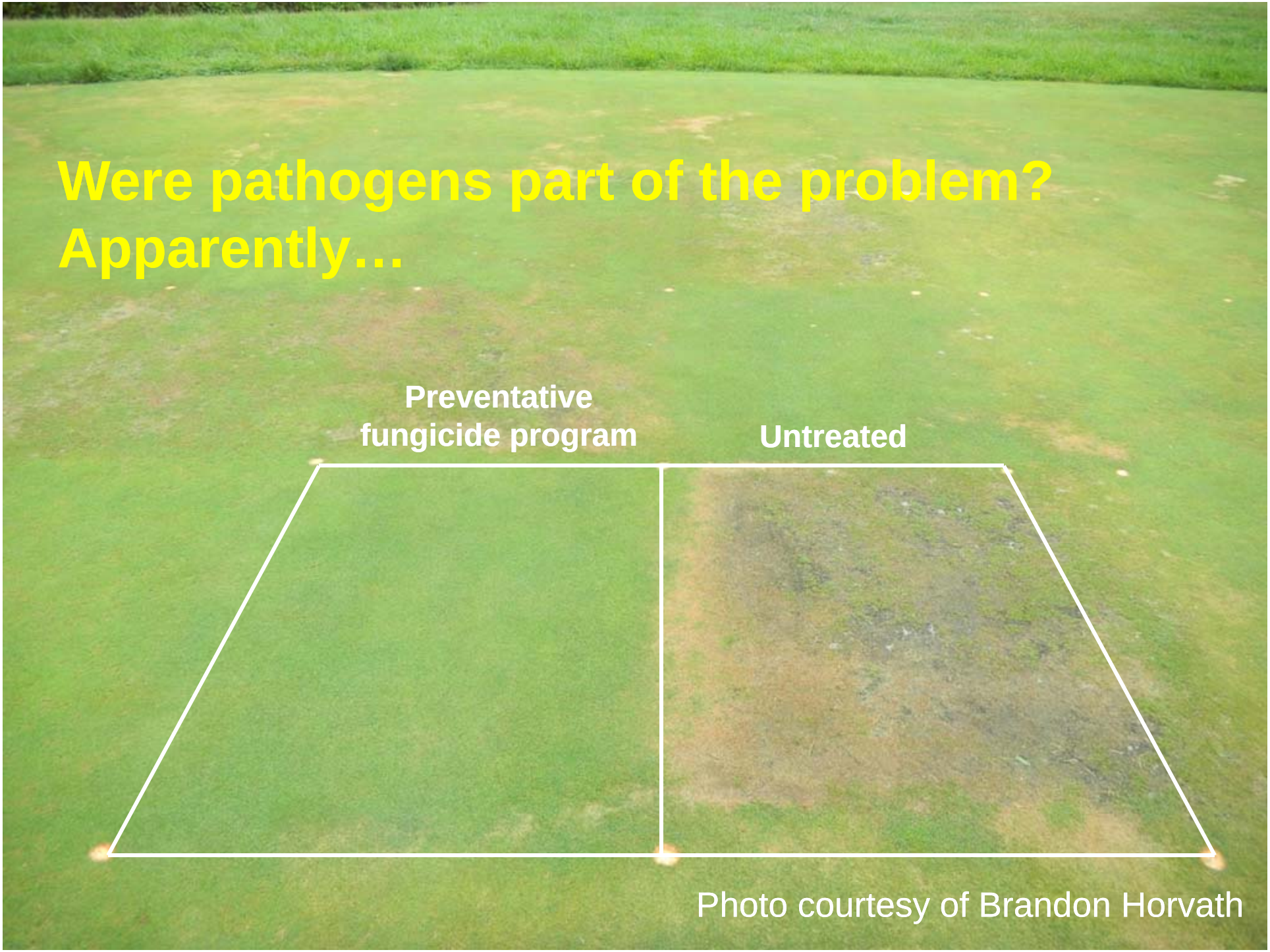


Photo courtesy of Brandon Horvath


Major air-flow issues – that one fan is not going to be enough…
Photo courtesy of Bud White


Wet wilt associated with poor air flow
Photo courtesy of Adam Mueller


Poor air flow – notice the location of the only healthy turf on the green
Photo courtesy of Adam Mueller


Photo courtesy of Pat Obrien


Photo courtesy of Pat Obrien


Photo courtesy of Bud White


Problems were not just localized to putting greens
Photo courtesy of Trey Rogers


Photo courtesy of Trey Rogers

Brown patch and pythium wreck a tall fescue trial at our research facility

July 15, 2010 – brown patch symptoms first show up on tall fescue

July 29, 2010 – 2 weeks later and there is nothing left

There were no silver bullets in 2010 – is there one for 2011?

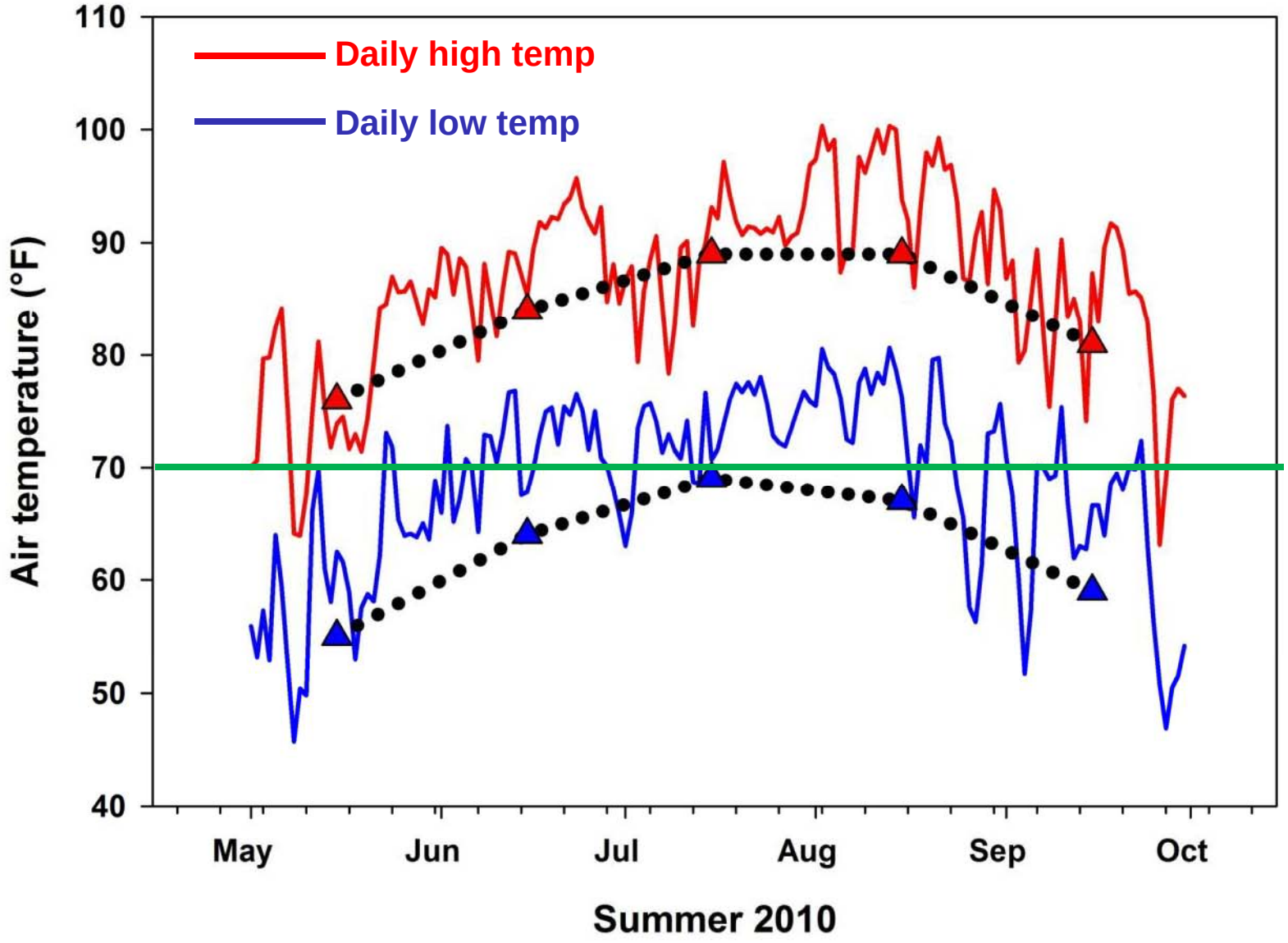
Photo courtesy of Adam Mueller

There were no silver bullets in 2010 – is there one for 2011?

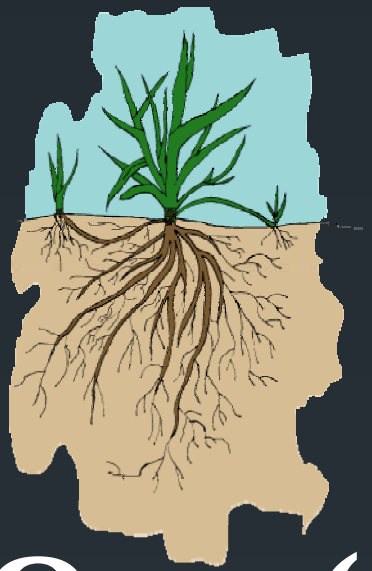
Bermudagrass greens!!

Thursday, Feb. 10, 2011 – Fayetteville AR – all time record low for the state at -18 °F

The root of the problem – extended high temperatures



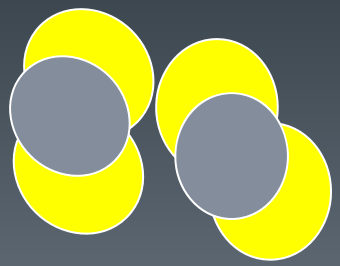
Photosynthesis

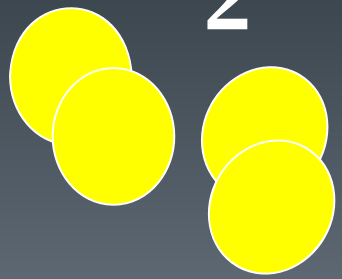


Light Energy

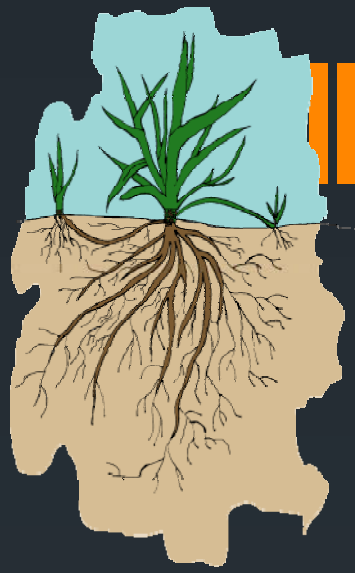
+

$$CO_2 + H_2O \longrightarrow (CH_2O)_n + O_2 + H_2O$$





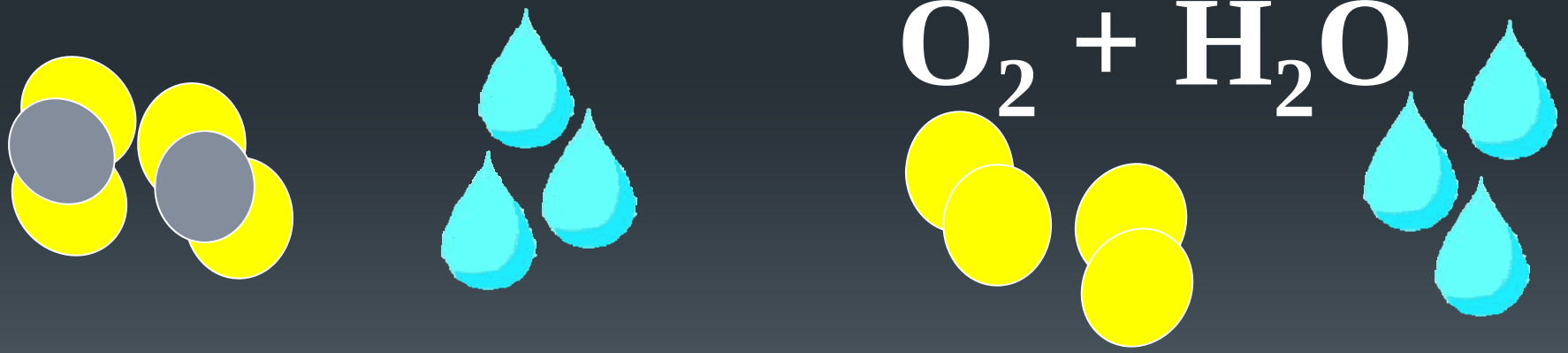
Respiration



Energy

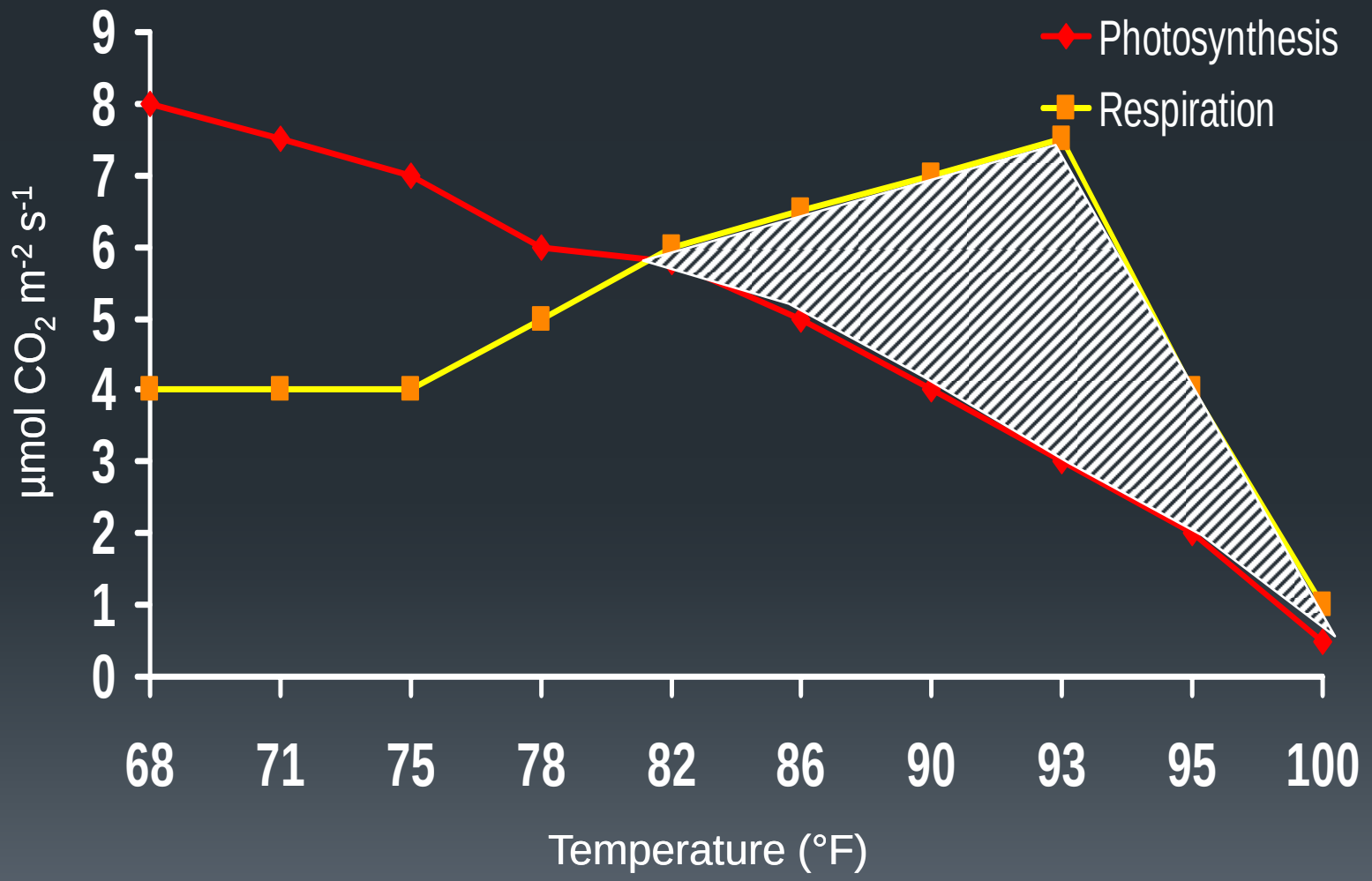
+

$$CO_2 + H_2O \leftarrow (CH_2O)_n + O_2 + H_2O$$

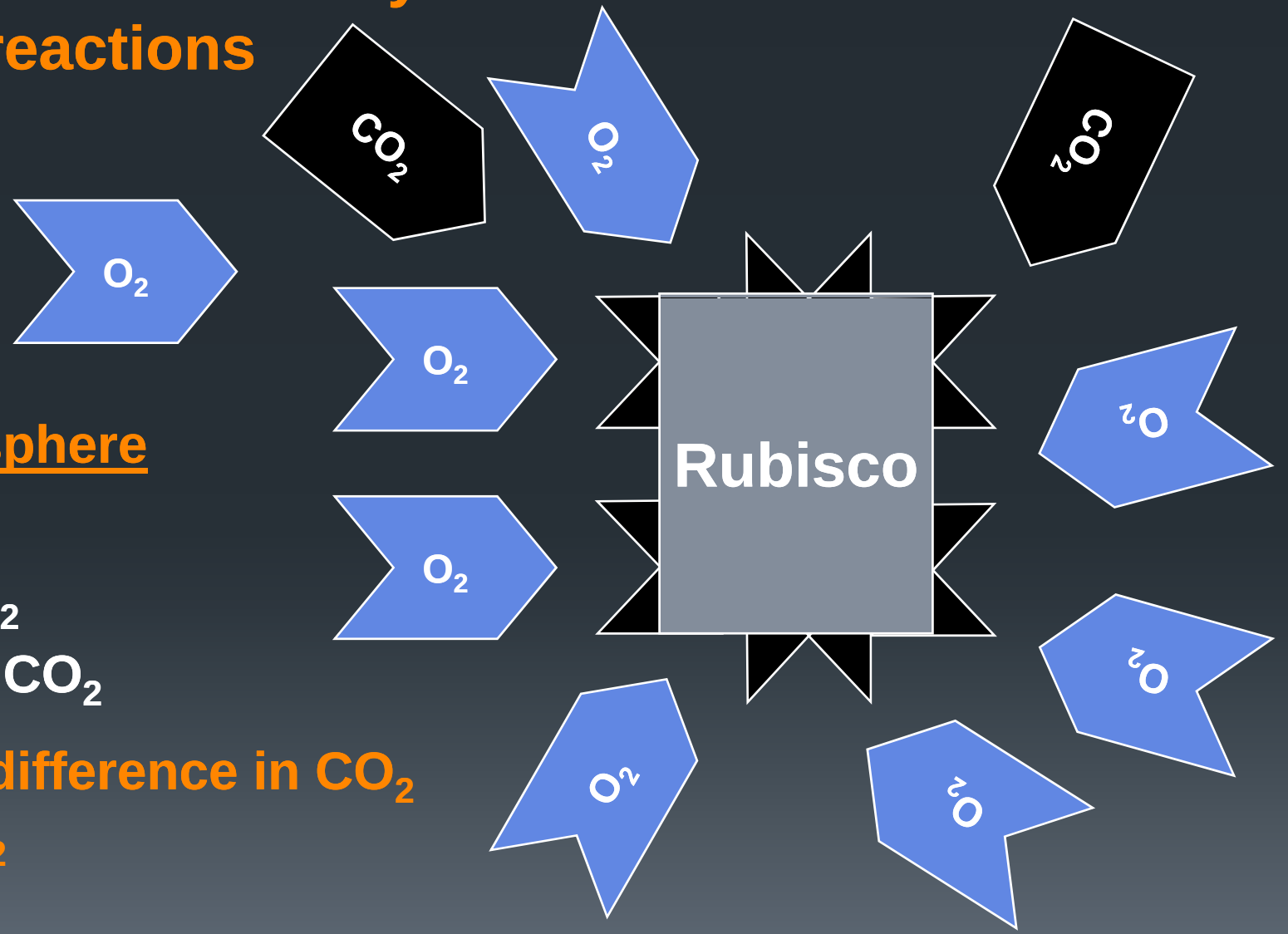


- **Provides energy and metabolites for cellular growth and maintenance.**

Effect of increasing temperature on photosynthesis and respiration of creeping bentgrass



Cool-season grasses have another problem – an inefficient enzyme associated with the dark reactions



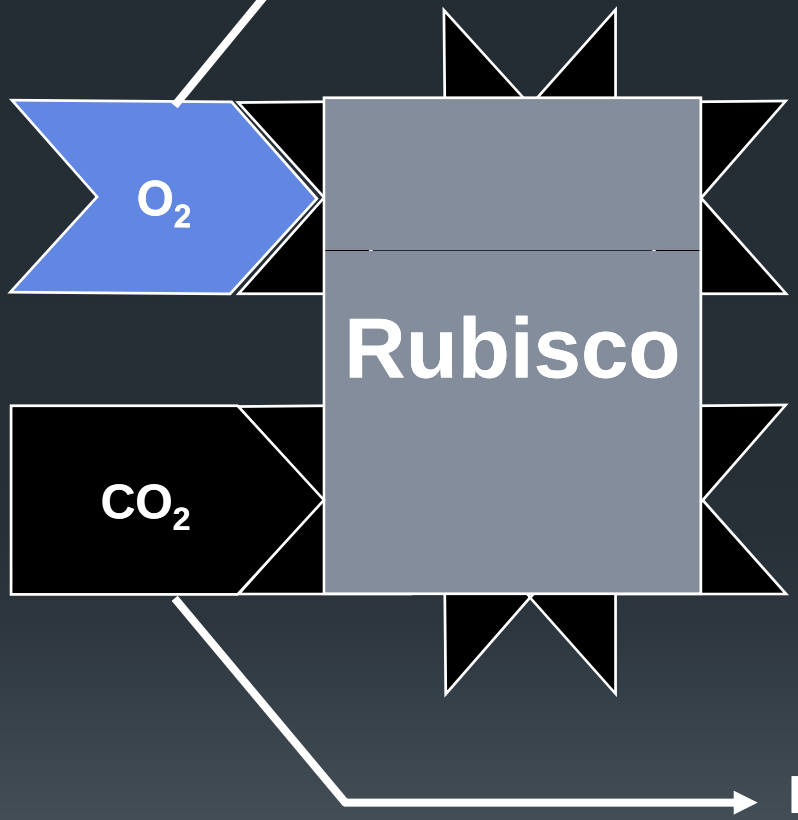
Atmosphere

79% N

21% O_2

0.03% CO_2

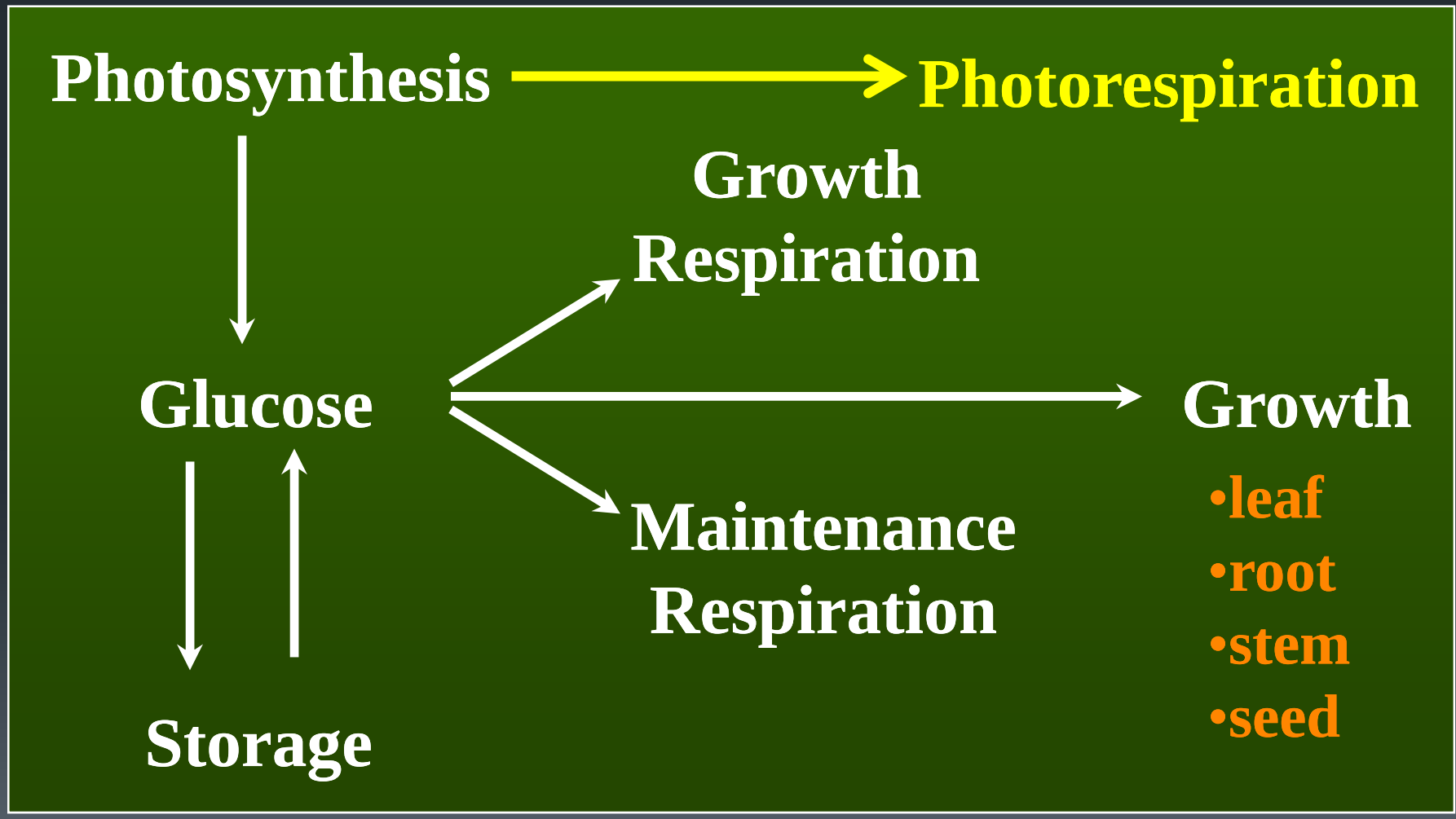
700 x difference in CO_2 and O_2



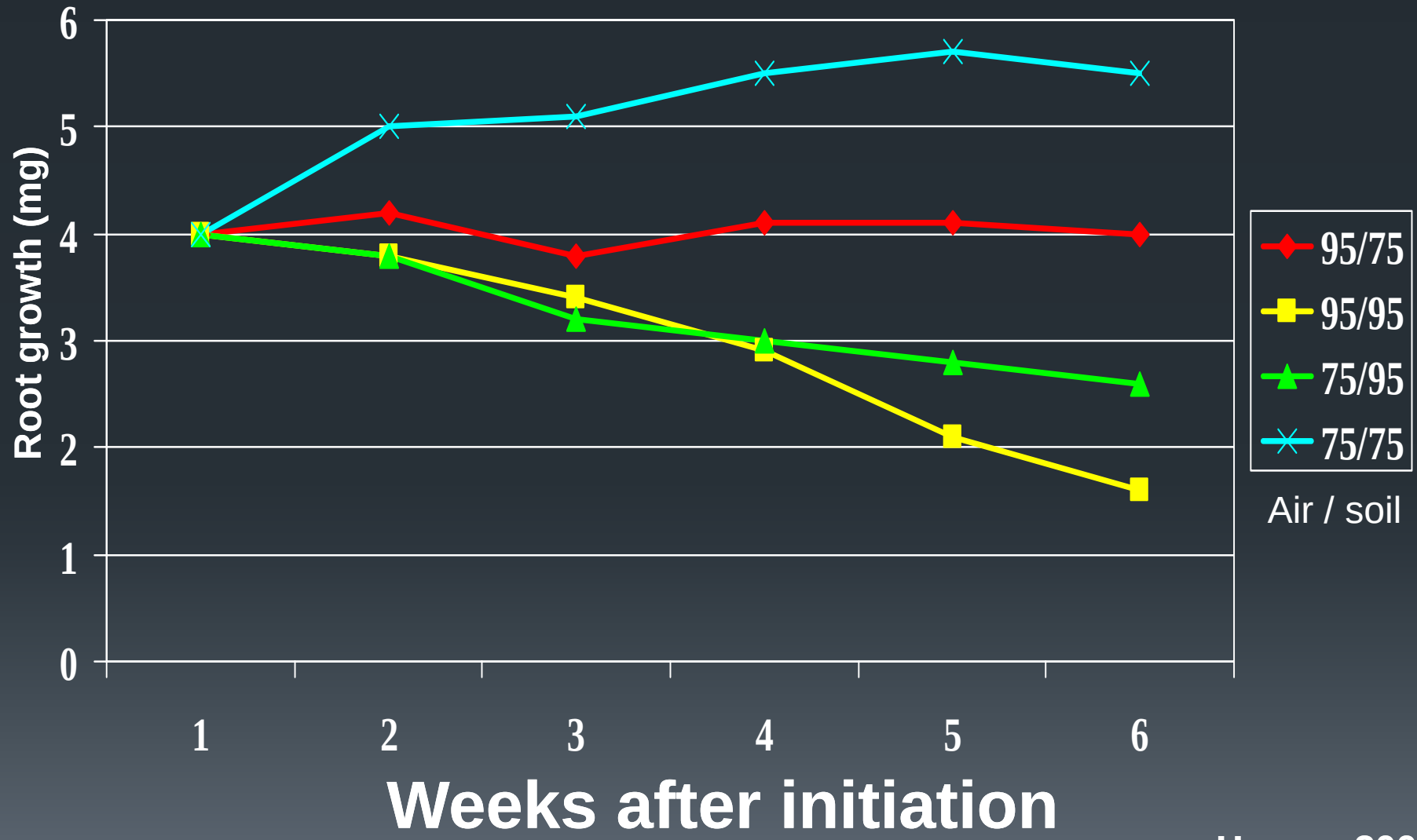
Factors that increase photo-respiration:

- **High temperatures**
- **Drought stress**

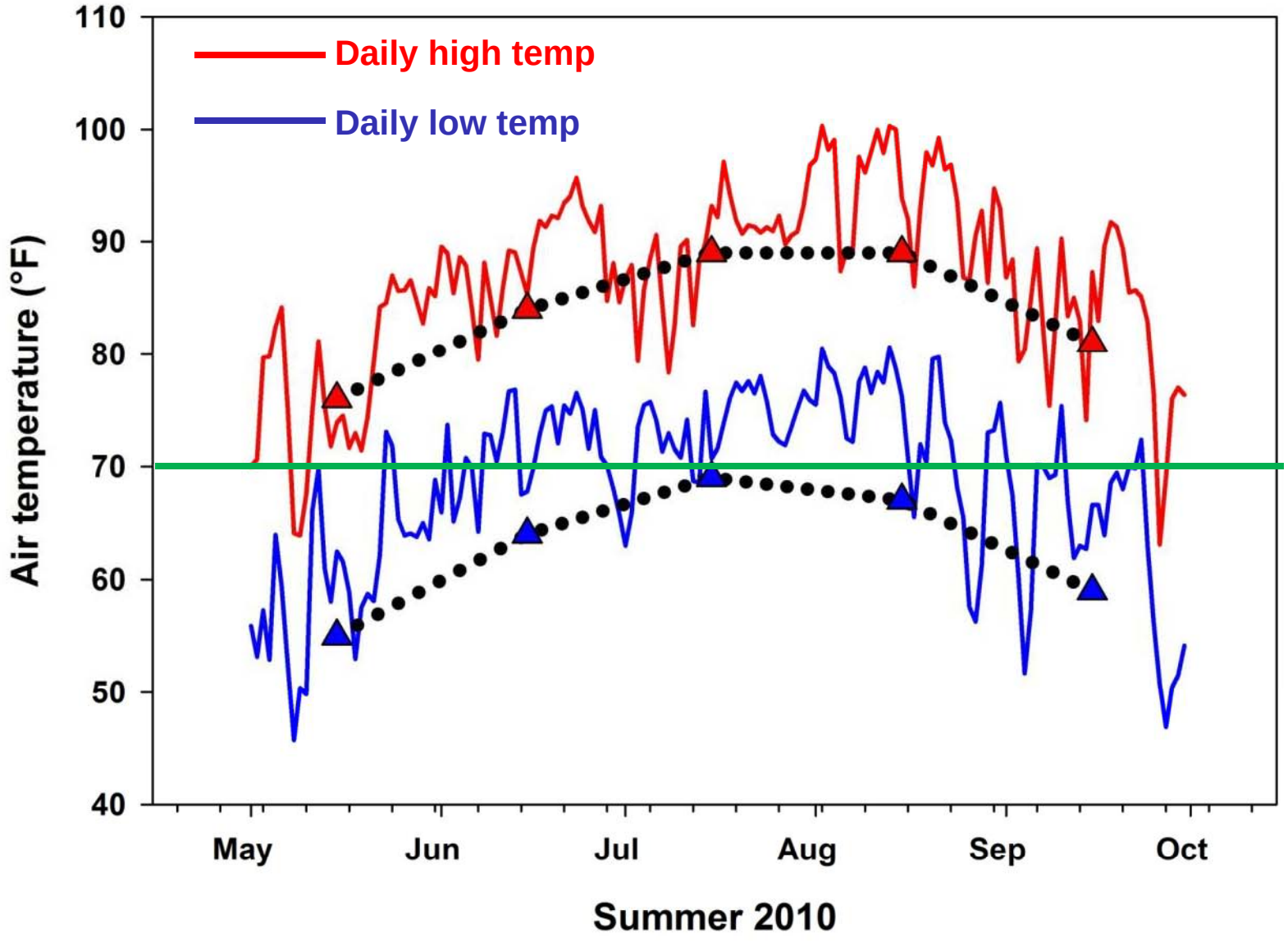
Overall carbon budget of plants



Effects of air vs. soil temperature on root growth of creeping bentgrass



Huang, 2001


Daily high temp
Daily low temp
Air temperature (°F)
110
100
90
80
70
60
50
40
May
Jun
Jul
Aug
Sep
Oct
Summer 2010

What to do when times get this tough?

- A strong foundation is still the key to success
- Air flow and water management are even more critical
- Communication with your management / members should be at an all-time high

Minimize injury from common management practices

Photo courtesy of Bud White

Sustain your fertility program with foliar feeding

Improve your water management through the use of moisture sensors


Good cultivation programs allow bentgrass roots to hang on during the toughest of times

Create air-flow channels for maximum effect


Do whatever it takes to get air moving, including the use of temporary fans
Photo courtesy of Pat Obrien


Photo courtesy of Pat Obrien


More frequent venting of greens with either water-injection or needle tines
Photo courtesy of Pat Obrien

Photo courtesy of Bud White


Water chilled and stored in tank at 38 °F
Desperate times call for desperate measures…
Photo courtesy of Bud White

The desire for faster green speeds has driven superintendents to more aggressive mowing and rolling practices

Mowing, rolling, and foot traffic study objectives

- Better understand the physiological effects of these treatment combinations under summer stress on bentgrass putting greens
  - Measure photosynthetic rates
  - Identify carbohydrates in plants
  - Evaluate root development
- Does increasing mowing heights and rolling greens really result in healthier turf?


Golf ball launcher


Photosynthesis chamber

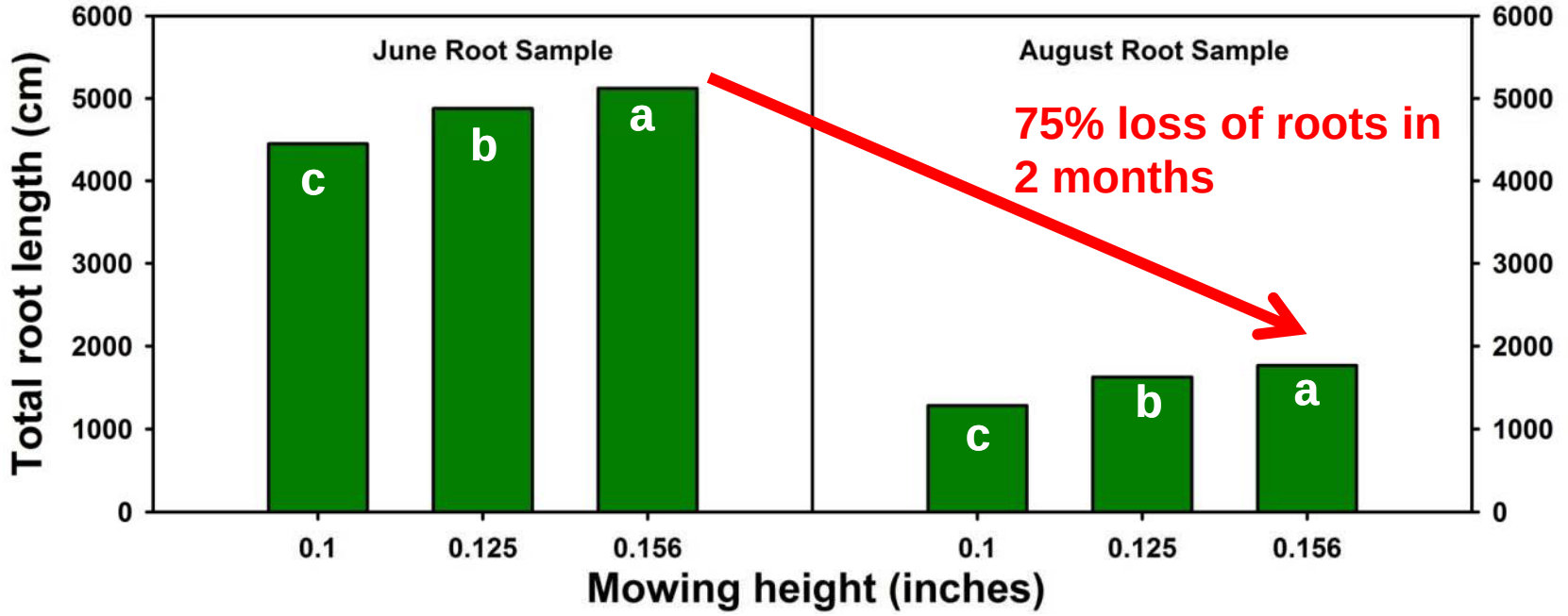
Mowing and rolling treatments

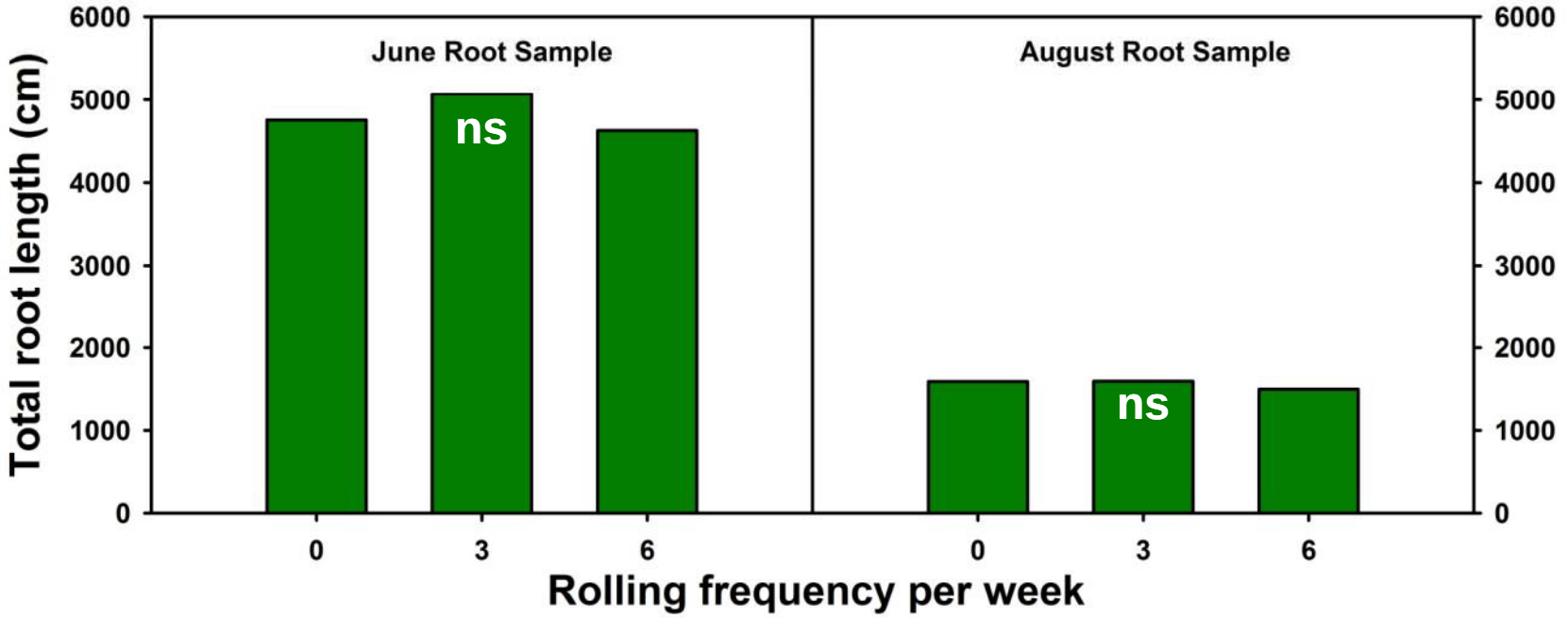
Mowing 6 days/wk with a Toro Flex-21 Walk-behind mower

- **0.100 inch**
- **0.125 inch**
- **0.156 inch**

Rolling treatments applied with a Tru-Turf Roller

- **0 times/wk**
- **3 times/wk**
- **6 times/wk**


June Root Sample
August Root Sample
75% loss of roots in 2 months
Total root length (cm)
6000
5000
4000
3000
2000
1000
0
c
b
a
c
b
a
0.1
0.125
0.156
Mowing height (inches)


June Root Sample
August Root Sample
Total root length (cm)
6000
5000
4000
3000
2000
1000
0
ns
ns
0
3
6
Rolling frequency per week

Thanks –
any questions ??

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