

# What really drives plant health?

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# Turfgrass cultural practices

## Primary

- Mowing
- Fertilization
- Irrigation



# Turfgrass cultural practices



## Secondary

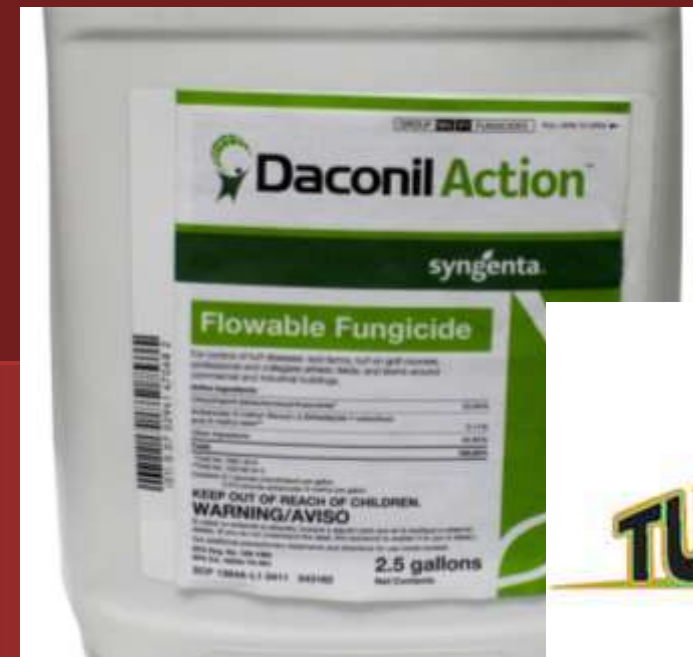
- Pesticides
- Biostimulants
- Cultivation
- Surfactants
- Etc.



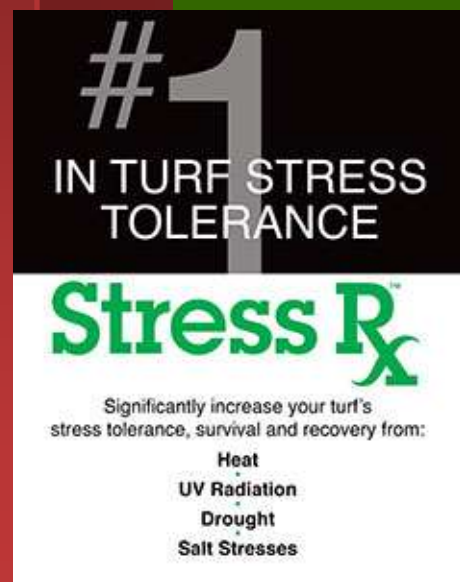


# What are the primary driving forces of “plant health”?

- Water ✓✓✓✓
- Nutrients ✓✓✓✓
- Light ✓✓✓
- Favorable temperatures ✓
- CO<sub>2</sub> – no control over



## Secondary forces – plant health products





**We know light is often a limiting factor for “plant health”?**

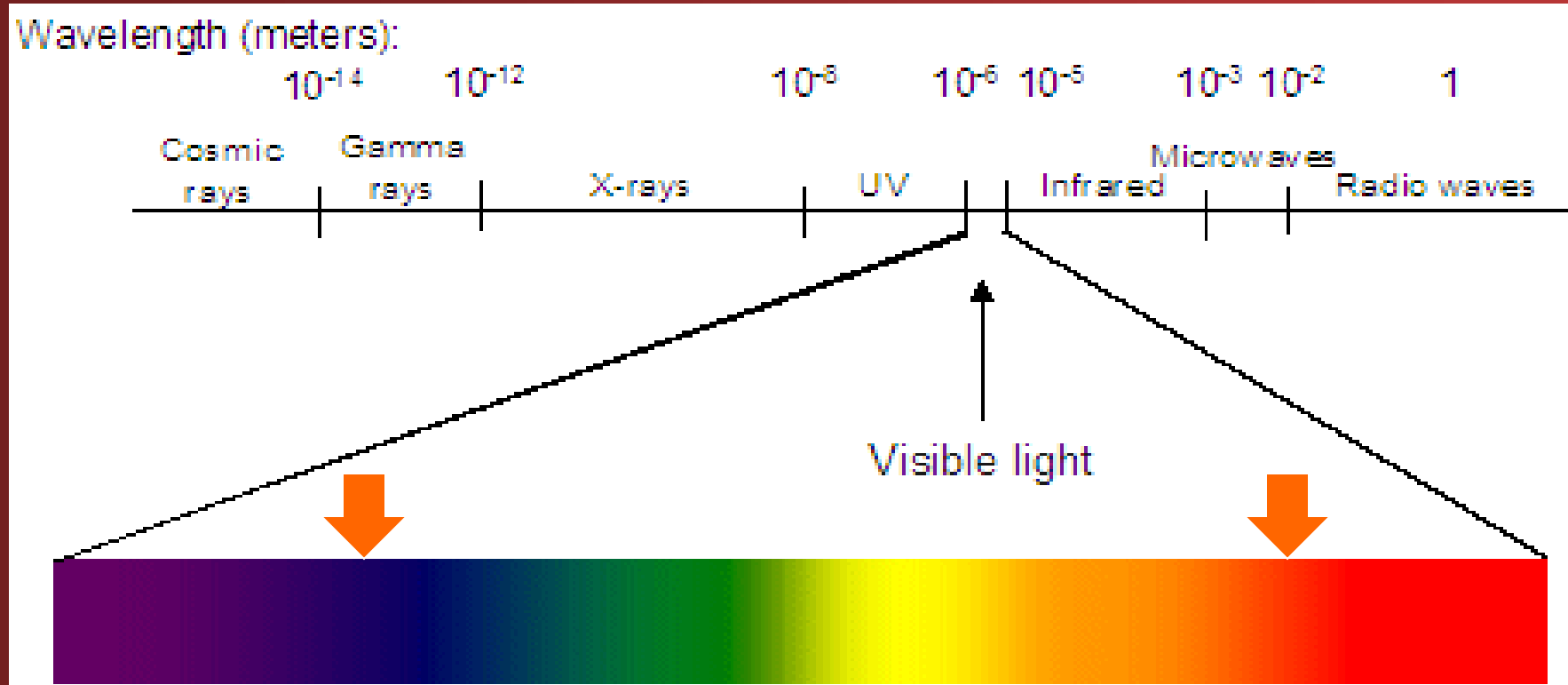




# Do I have enough light to grow bermudagrass or zoysiagrass or ???

- I get morning sun and afternoon shade
- This spot gets 3 or 4 hours of sun per day
- It is shade from a tree – probably around 40% shade

# Light from the sun comes in different lengths and energy levels



Light that plants need for photosynthesis is in the red and blue parts of the visible spectrum



# Light measurement

# Daily light integral

- Defined as the total photosynthetically active radiation (PAR) that the plant receives over 1 day
- Measured in mol of PAR radiation
- Will take into account all factors that can reduce light



# Irradiation measurement using a PAR sensor



- More cost-effective today (~\$200)
- Measures light in the 400-700 nm range and reports in  $\mu\text{mol} / \text{m}^2 / \text{sec}$
- Will give a true reading of the effects of shade on plant productivity

# Mini-weather station with PAR sensor (~\$600)

- same technology as the hand-held sensor, but has data logging capabilities
- will record light striking the turf over a full day (or several days) and allow DLI to be calculated from the data.





# Easiest way to measure daily light integration

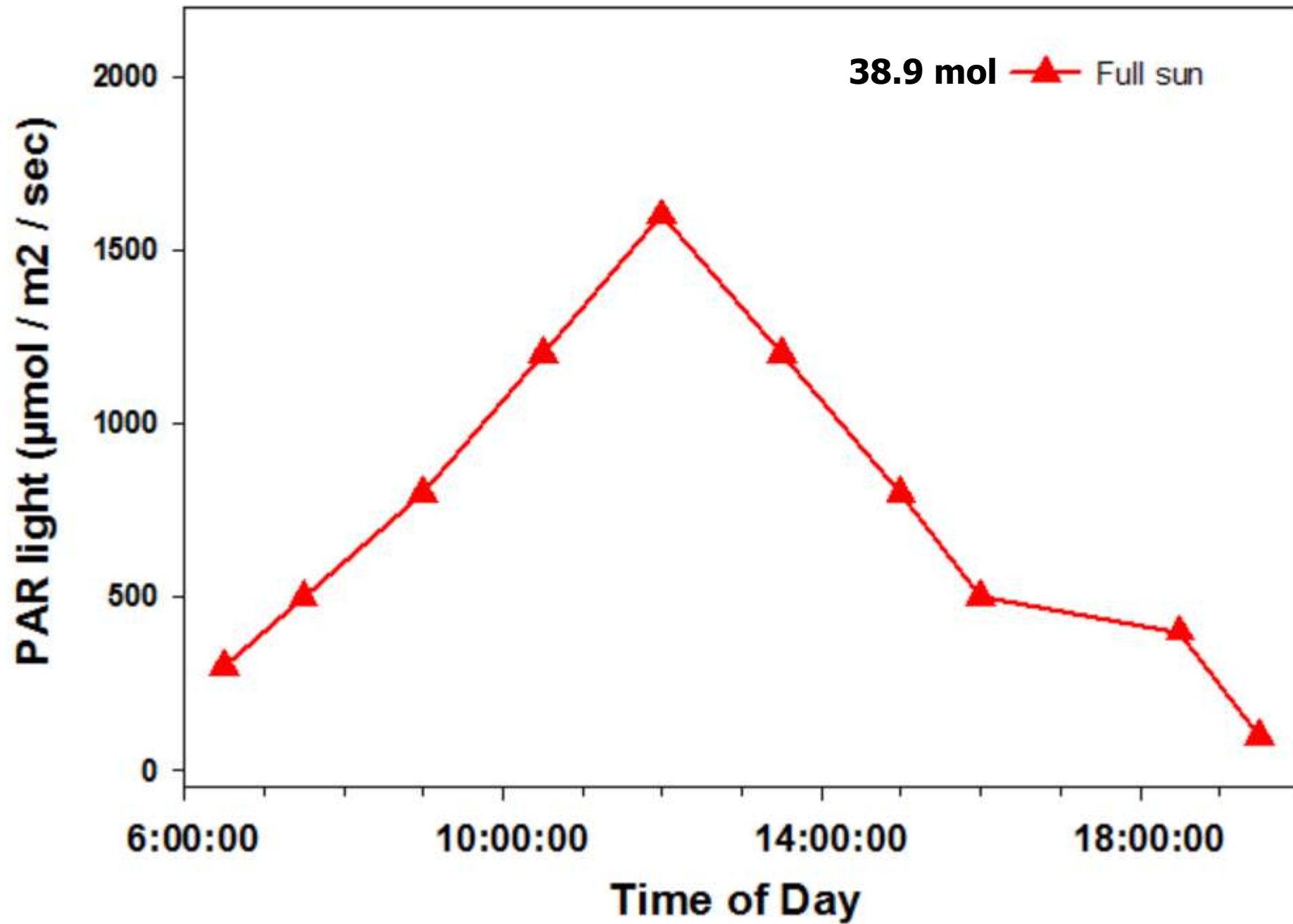


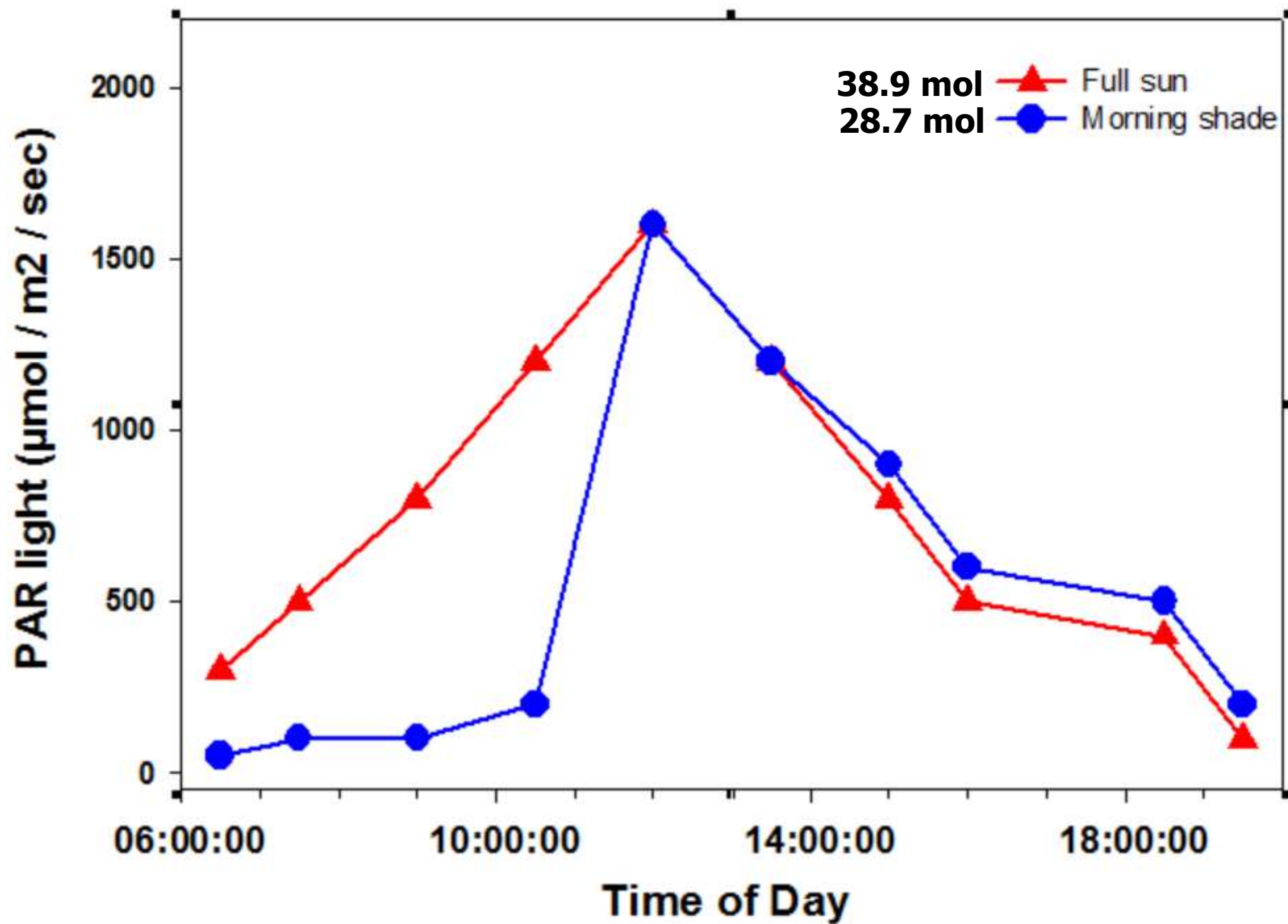
**3-pack - \$170**

# Calculating the DLI using a hand-held sensor

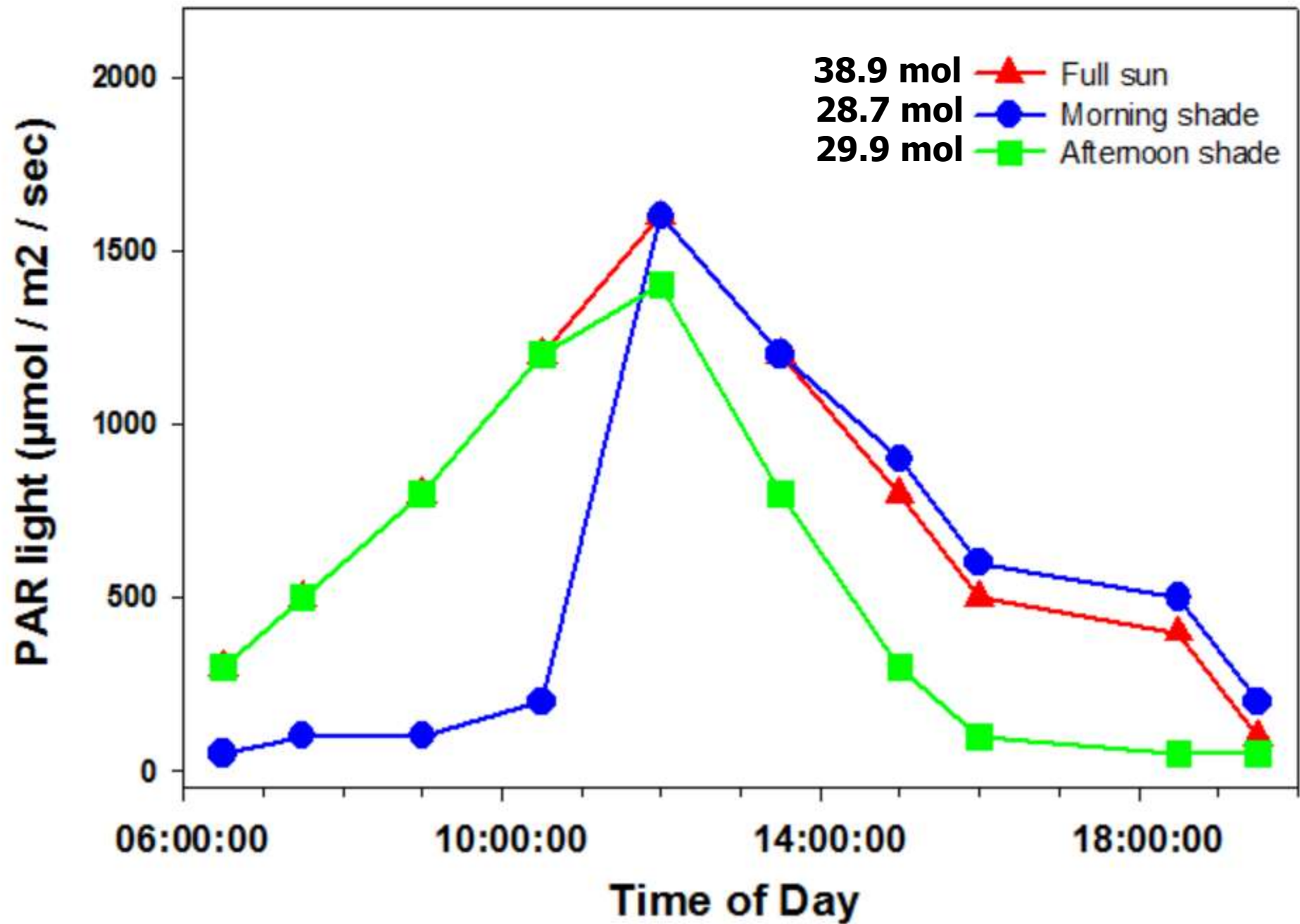
- Take light readings from the same spot(s) throughout the day
- Sum those instant readings over a specific time period
- Sum the totals for the entire day

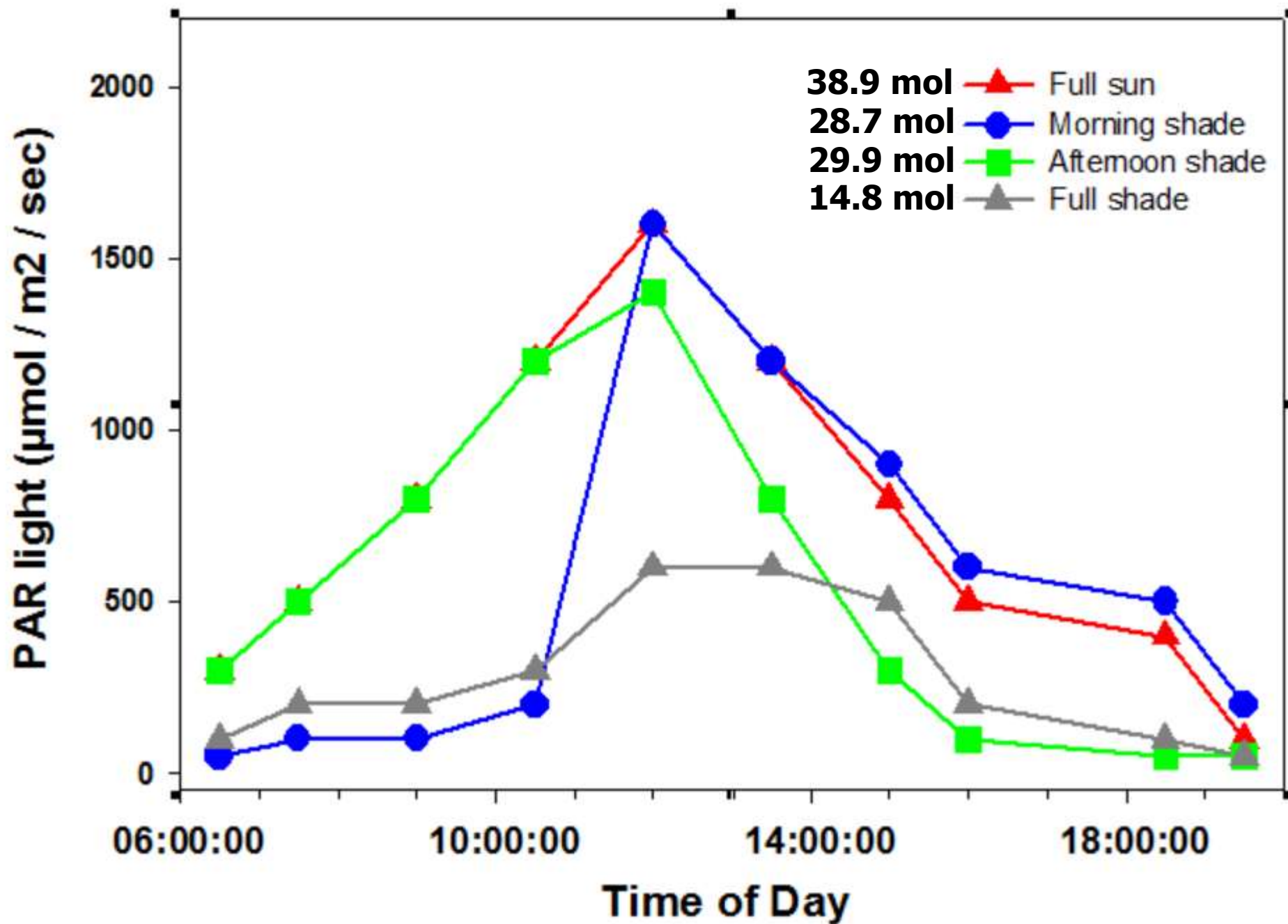














# Now that we have measured DLI for a site, what is next?

- Need to know the MINIMUM DLI for a specific grass species or cultivar
- Will management affect the DLI of the grass used?
- Can we replace the grass or do we need to modify the environment?





A photograph of a golf green with a white flag in the center. The green is surrounded by a dense forest of trees with autumn foliage in shades of green, yellow, and red. To the left, there is a steep, rocky hillside with exposed roots and some sparse vegetation. The scene is brightly lit, suggesting a sunny day.

**How much light does bermudagrass  
need each day to perform?**



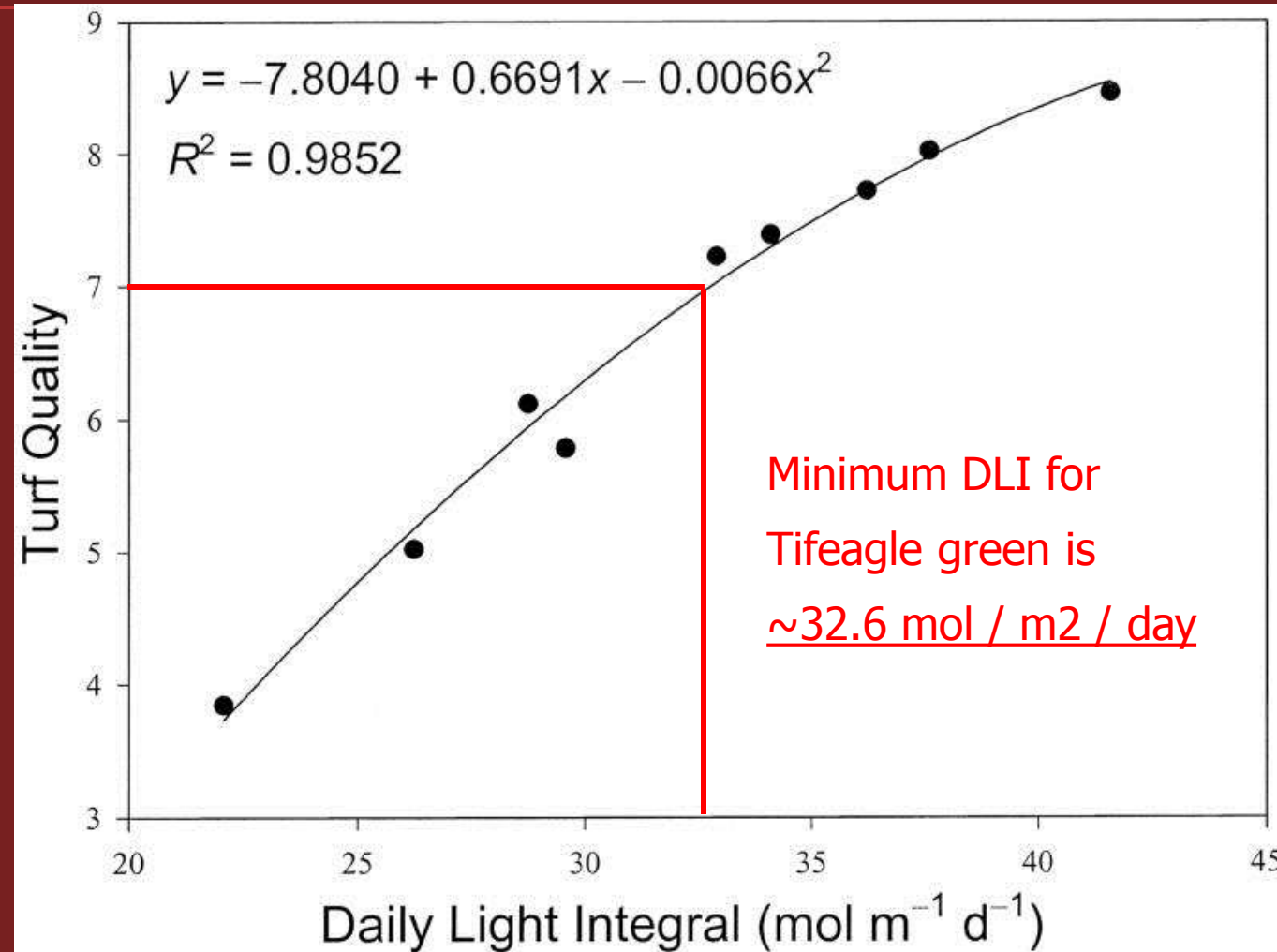
# DLI for a Tifeagle bermudagrass green - Clemson

Morning shade	Afternoon shade	DLI
		2-yr average
		----- mol / m2 / day -----
none	none	41.6
none	low (41% shade)	36.3
none	high (92% shade)	29.6
low (41% shade)	none	37.6
low (41% shade)	low (41% shade)	32.9
low (41% shade)	high (92% shade)	26.2
high (92% shade)	none	34.1
high (92% shade)	low (41% shade)	28.8
high (92% shade)	high (92% shade)	22.1

Bunnell, McCarty et al., 2005



# DLI and turf quality of a Tifeagle green - Clemson



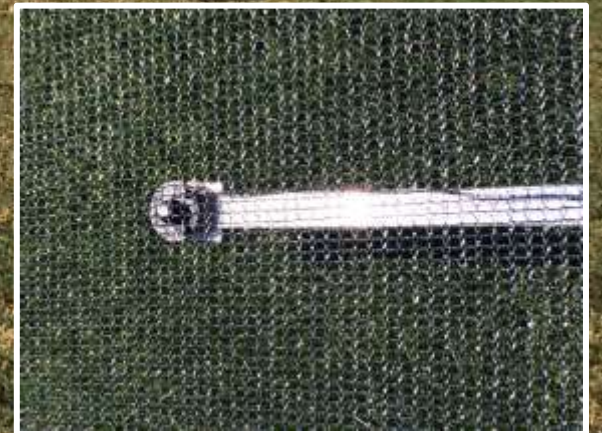
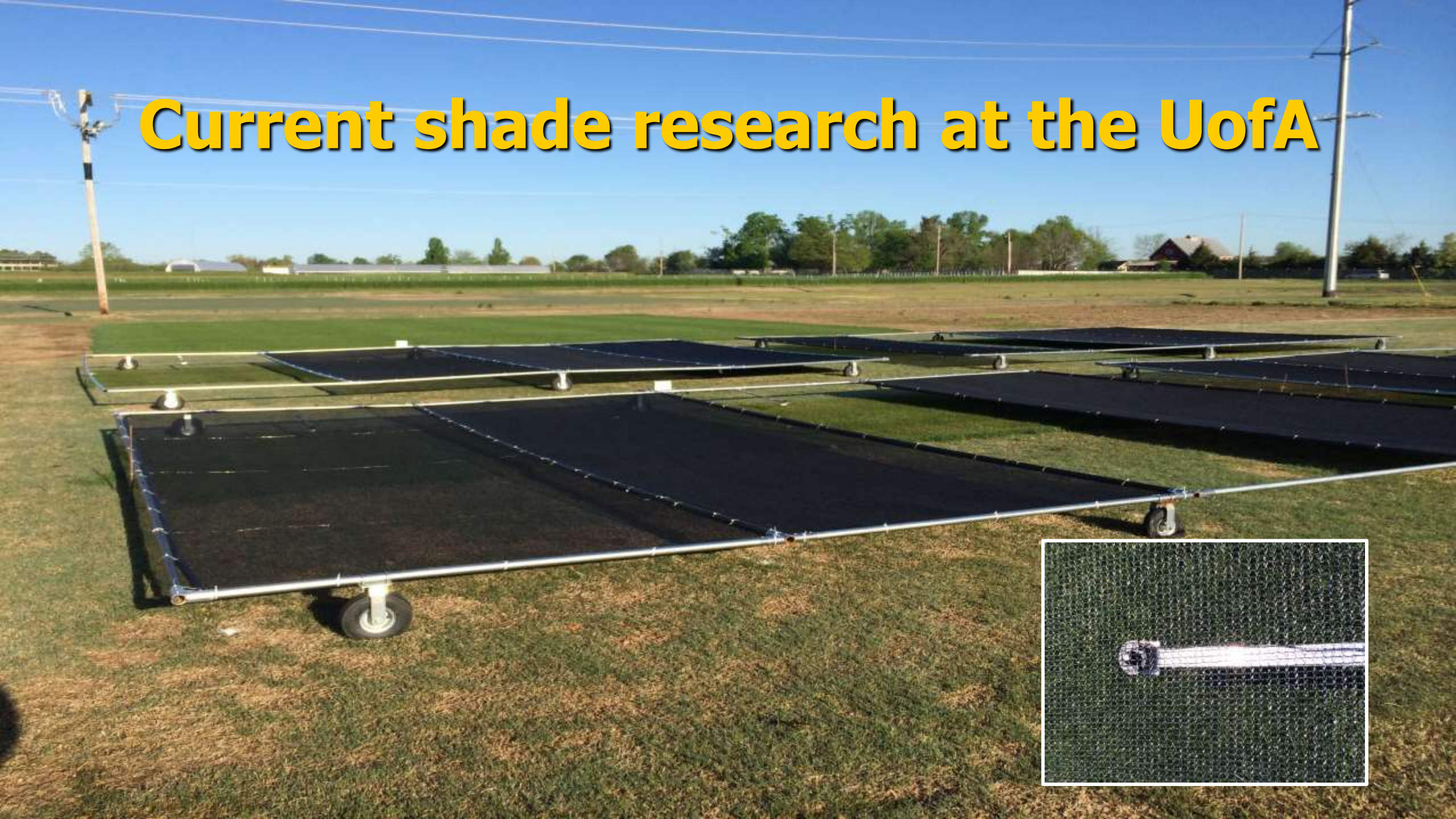
# DLI required to maintain acceptable quality (Kruse – Florida)

Cultivar and species	----- mol / m <sup>2</sup> / day -----	
'Tifway' hybrid bermudagrass	22.4	
'Celebration' common bermudagrass	19.5	} Shade-tolerant
'Tifgrand' hybrid bermudagrass	18.6	
'Palisades' zoysiagrass (japonica)	11.3	
'Diamond' zoysiagrass (matrella)	11.3	
Perennial ryegrass	10.0	

**Maintained at lawn (rough) heights of cut**



# Current shade research at the UofA





	0% shade	30% shade	60% shade	90% shade
Non-overseeded	<b>42.9</b> mol / m <sup>2</sup> / day	<b>26.8</b> mol / m <sup>2</sup> / day	<b>15.6</b> mol / m <sup>2</sup> / day	<b>4.3</b> mol / m <sup>2</sup> / day
overseeded				

**90% shade – 4.3 mol PAR / day**



**overseeded**

**non-overseeded**

**60% shade – 15.6 mol PAR / day**



**overseeded**

**non-overseeded**

**30% shade – 26.8 mol PAR / day**



**overseeded**

**non-overseeded**

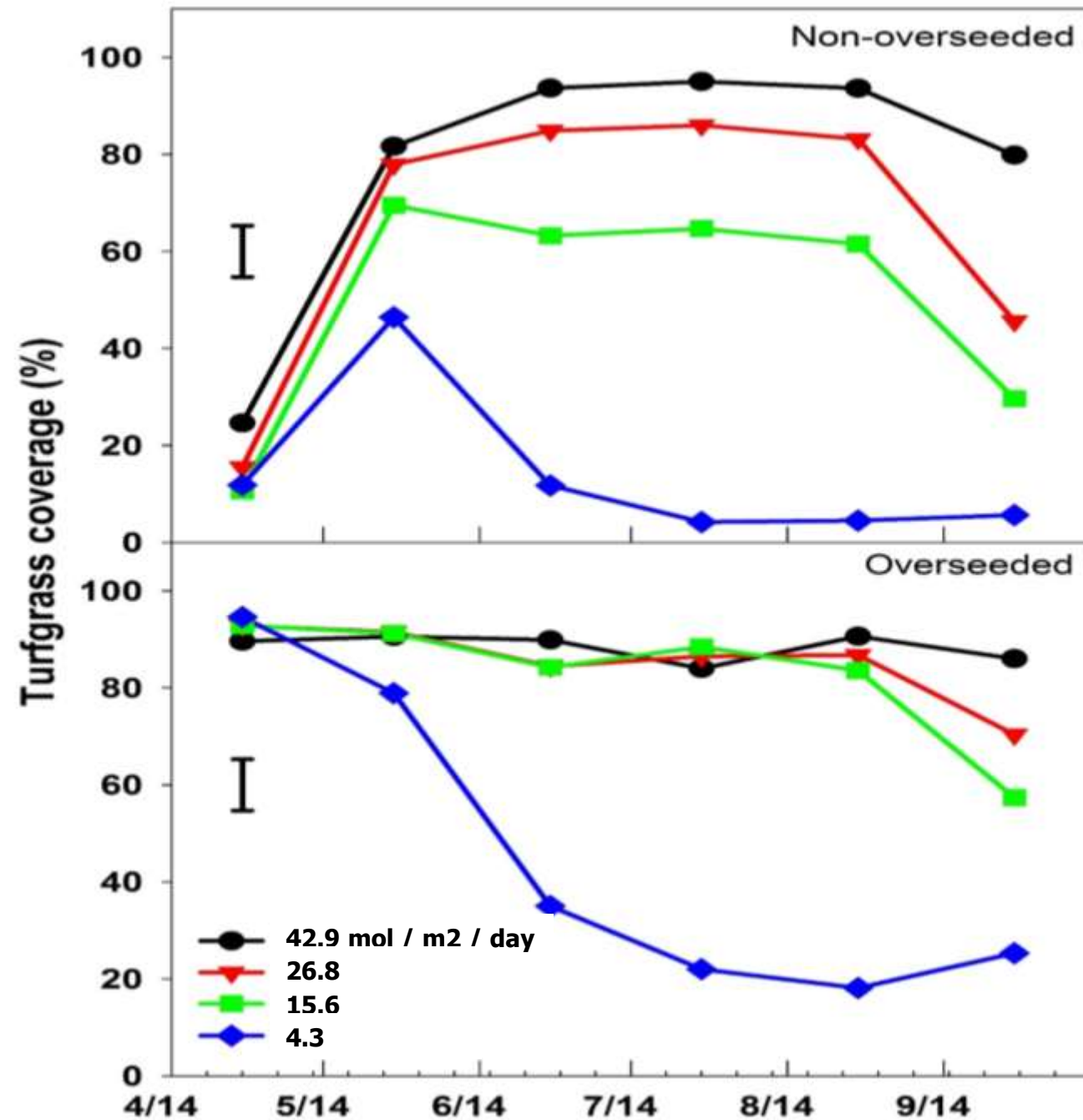
**0% shade – 42.9 mol PAR / day**



**overseeded**

**non-overseeded**







# What is the minimum DLI for bermudagrass?

- **Lawn or rough**
  - 23.0 mol / m<sup>2</sup> / day
- **Fairway or sports turf**
  - 27.0 mol / m<sup>2</sup> / day
- **Greens**
  - 33.0 mol / m<sup>2</sup> / day

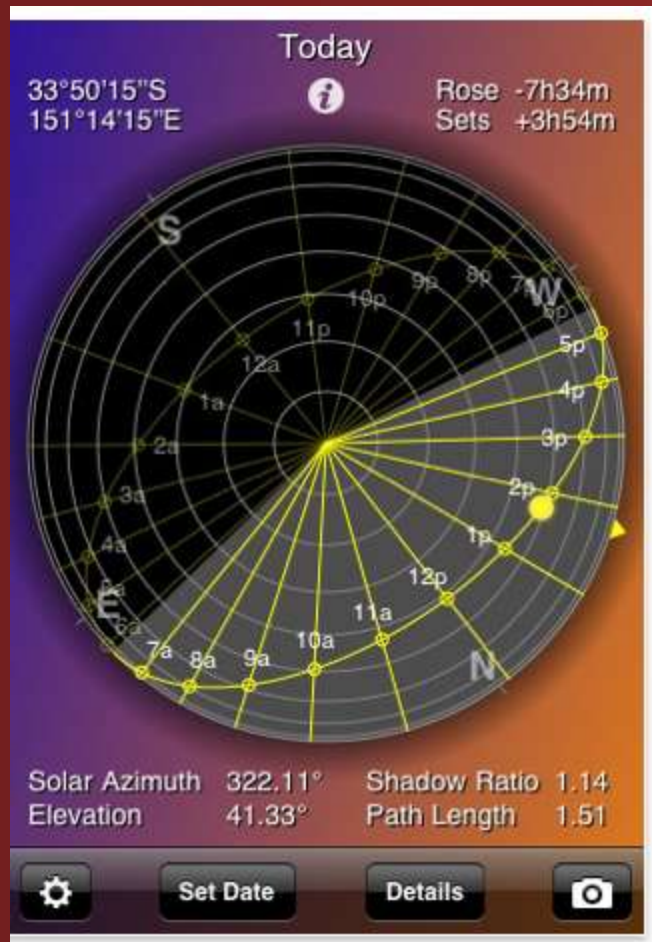
# What is the minimum DLI for bentgrass or other cool-season grasses?

- **Just not sure at this point**
  - **Kruse – perennial ryegrass rough**
    - 10.0 mol
  - **Richardson – perennial ryegrass (1.0 inch)**
    - 15 mol
  - **Bell – creeping bentgrass (green)**
    - ~20 mol
  - **Steinke and Stier – at ~ 8 mol (0.5 inch mow)**
    - Poa supina > bent > Ky bluegrass



\$2.99 Buy App

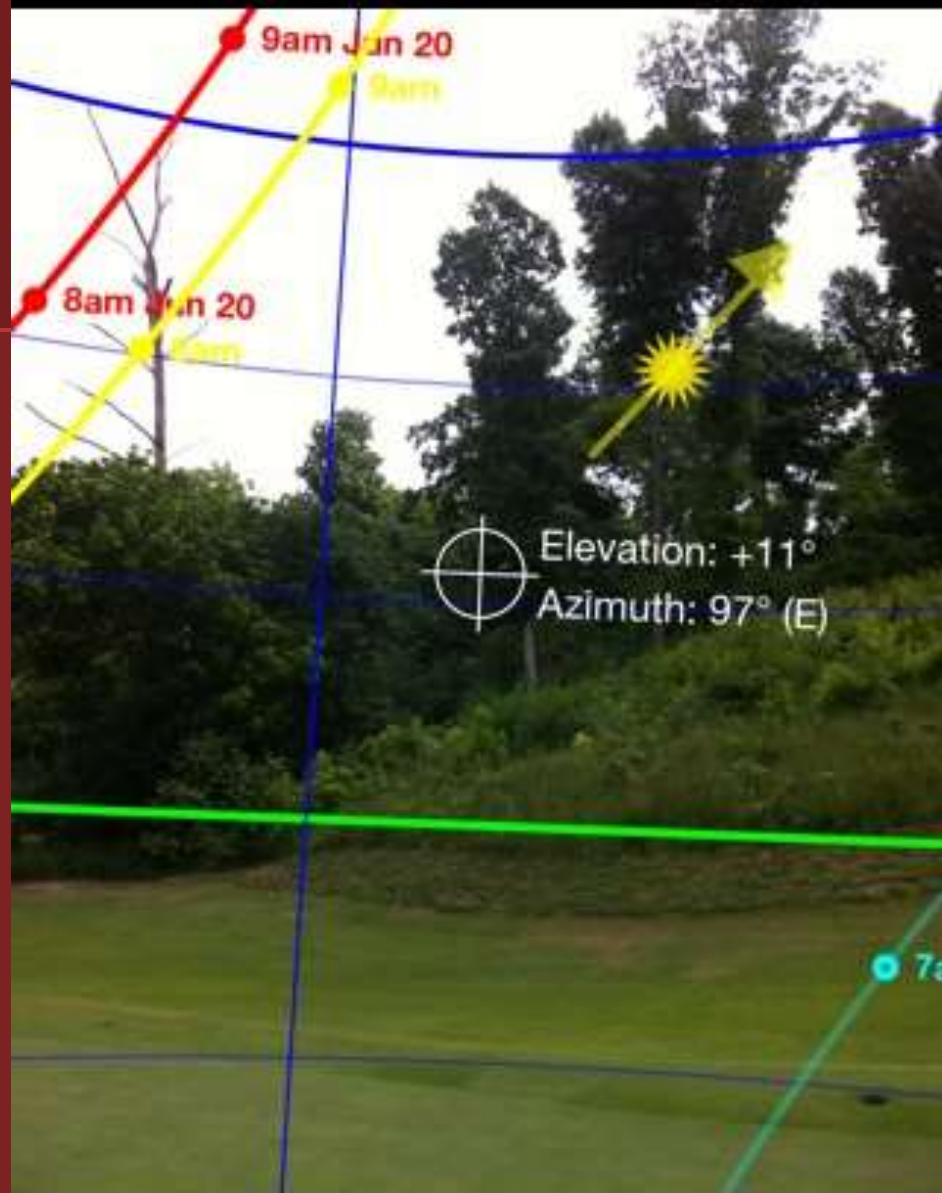
# Sun Seeker



- Uses the GPS locator of the phone
- Provides a site-specific display of sun patterns for each hour of the day
- Can also generate patterns for future dates



# Sun Seeker



Monday 14 May 2012, 12:30 pm  
36°08'N 094°11'W

# Summary points

- Light is a primary driving force of plant health
- Magic potions may prolong the agony but are not a long-term solution
- Data is your friend!!
- Communication that includes data can lead to positive changes in plant health



**Thanks –  
any questions ??**

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