# Rolling Bentgrass in the Transition Zone

## *-effects on turfgrass performance*

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System


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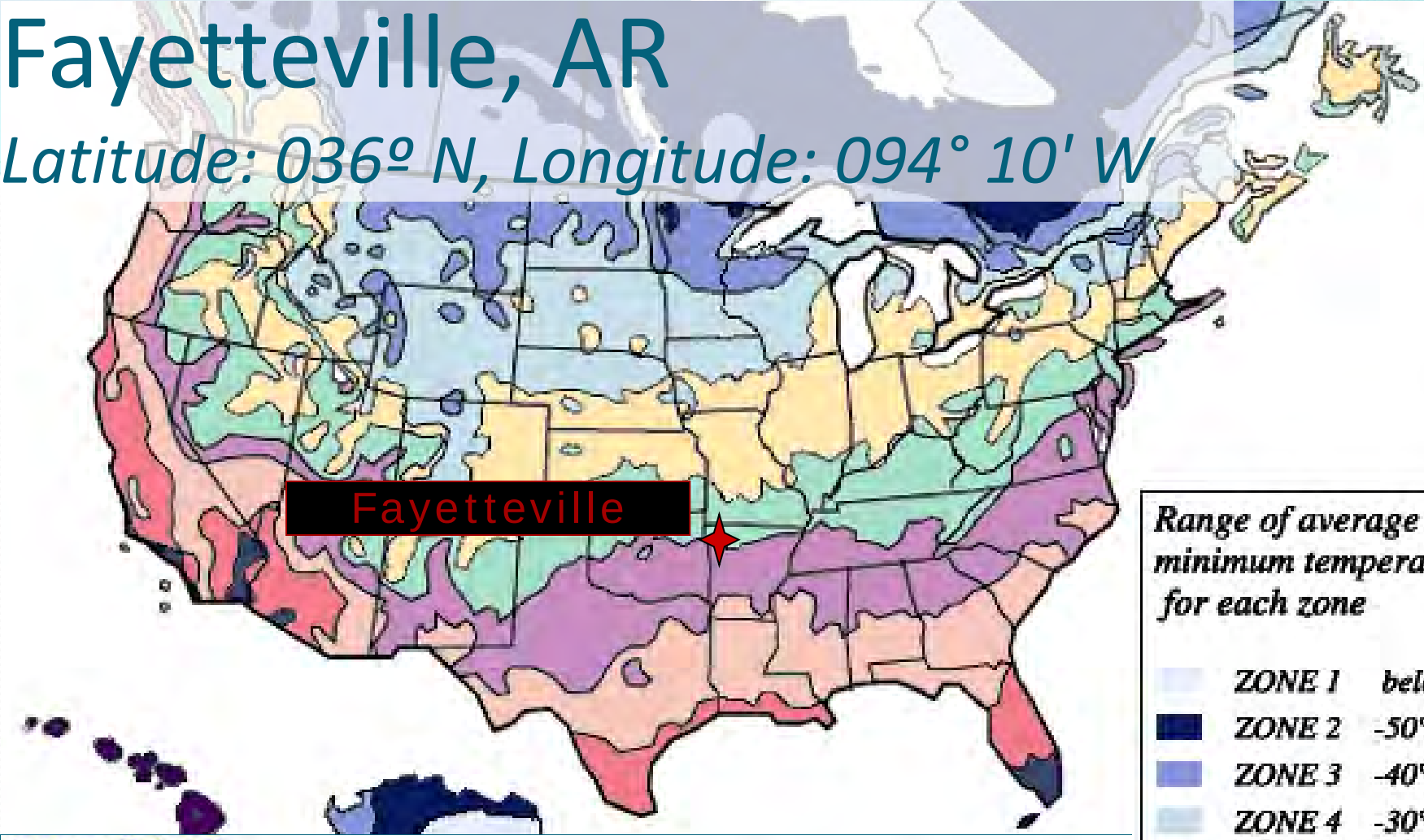
# Fayetteville, AR

*Latitude: 036º N, Longitude: 094° 10' W*




*Range of average annual minimum temperatures for each zone*

| | |
|---|---|
| ZONE 1 | below -50°F |
| ZONE 2 | -50° to -40° |
| ZONE 3 | -40° to -30° |
| ZONE 4 | -30° to -20° |
| ZONE 5 | -20° to -10° |
| ZONE 6 | -10° to 0° |
| ZONE 7 | 0° to 10° |
| ZONE 8 | 10° to 20° |
| ZONE 9 | 20° to 30° |
| ZONE 10 | 30° to 40° |
| ZONE 11 | above40° |

## Average Rainfall

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 64.8 | 66.9 | 85.6 | 119.7 | 141.0 | 122.8 | 84.5 | 92.9 | 107.4 | 93.8 | 84.3 | 73.8 | 1138.7 |
| inches | 2.6 | 2.6 | 3.4 | 4.7 | 5.6 | 4.8 | 3.3 | 3.7 | 4.2 | 3.7 | 3.3 | 2.9 | 44.8 |

## Average Maximum Temperature

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| °C | 7.1 | 9.7 | 14.8 | 20.5 | 24.4 | 28.6 | 31.8 | 31.2 | 27.0 | 21.7 | 14.7 | 9.2 | 20.1 |
| °F | 44.8 | 49.5 | 58.6 | 68.9 | 75.9 | 83.5 | 89.2 | 88.2 | 80.6 | 71.1 | 58.5 | 48.6 | 68.2 |

# Effects on Quality in the Transition Zone

# Experimental Area

- University of Arkansas Agriculture Research and Extension Center (Fayetteville, AR)
- 6-yr old USGA green
- ‘L-93’ creeping bentgrass (*Agrostis stolonifera*)
- Typical golf course maintenance
- 24 plots, each 5.0 by 18.0 ft

# Materials and Methods

## *Treatments*

| Treatment no. | Mowing height (in) | Mowing frequency (d/wk) | Rolling frequency (d/wk) | Treatment ID |
|---|---|---|---|---|
| 1 | 1/8 | 6 | 0 | 1/8 |
| 2 | 1/8 | 6 | 3 | 1/8 + R(3x) |
| 3 | 1/8 | 6 | 6 | 1/8 + R(6x) |
| 4 | 1/8 | 3 | 3 | 1/8(3x) + R(3x) |
| 5 | 1/8 | 3 | 6 | 1/8(3x) + R(6x) |
| 6 | 5/32 | 6 | 0 | 5/32 |
| 7 | 5/32 | 6 | 3 | 5/32 + R(3x) |
| 8 | 5/32 | 6 | 6 | 5/32 + R(6x) |

# Materials and Methods

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| 3 | 1/8 | 6 | 6 | 1/8 + R(6x) |
| 4 | 1/8 | 3 | 3 | 1/8(3x) + R(3x) |
| 5 | 1/8 | 3 | 6 | 1/8(3x) + R(6x) |
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# Materials and Methods

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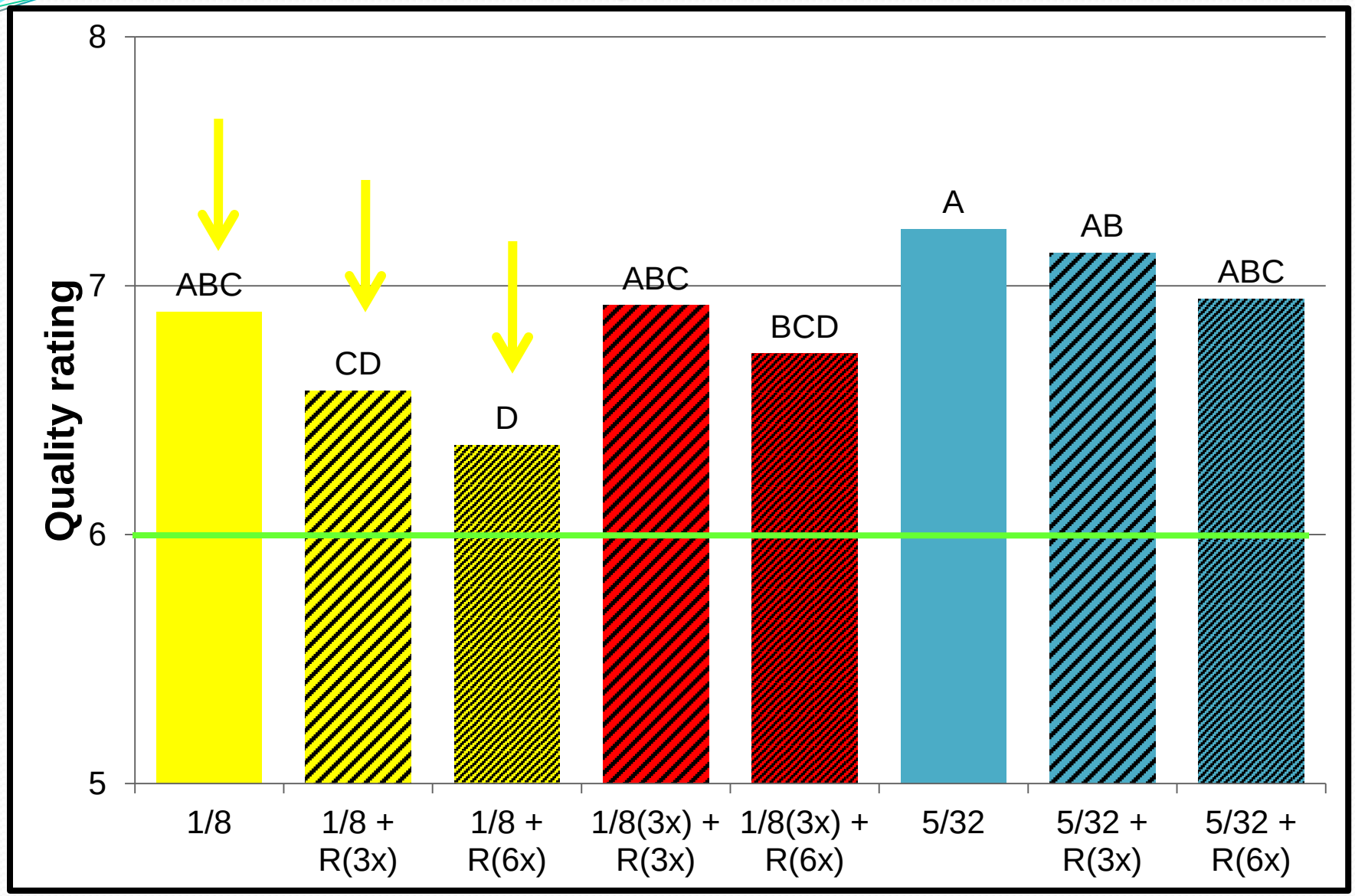
| 8 | 5/32 | 6 | 6 | 5/32 + R(6x) |

# Materials and Methods

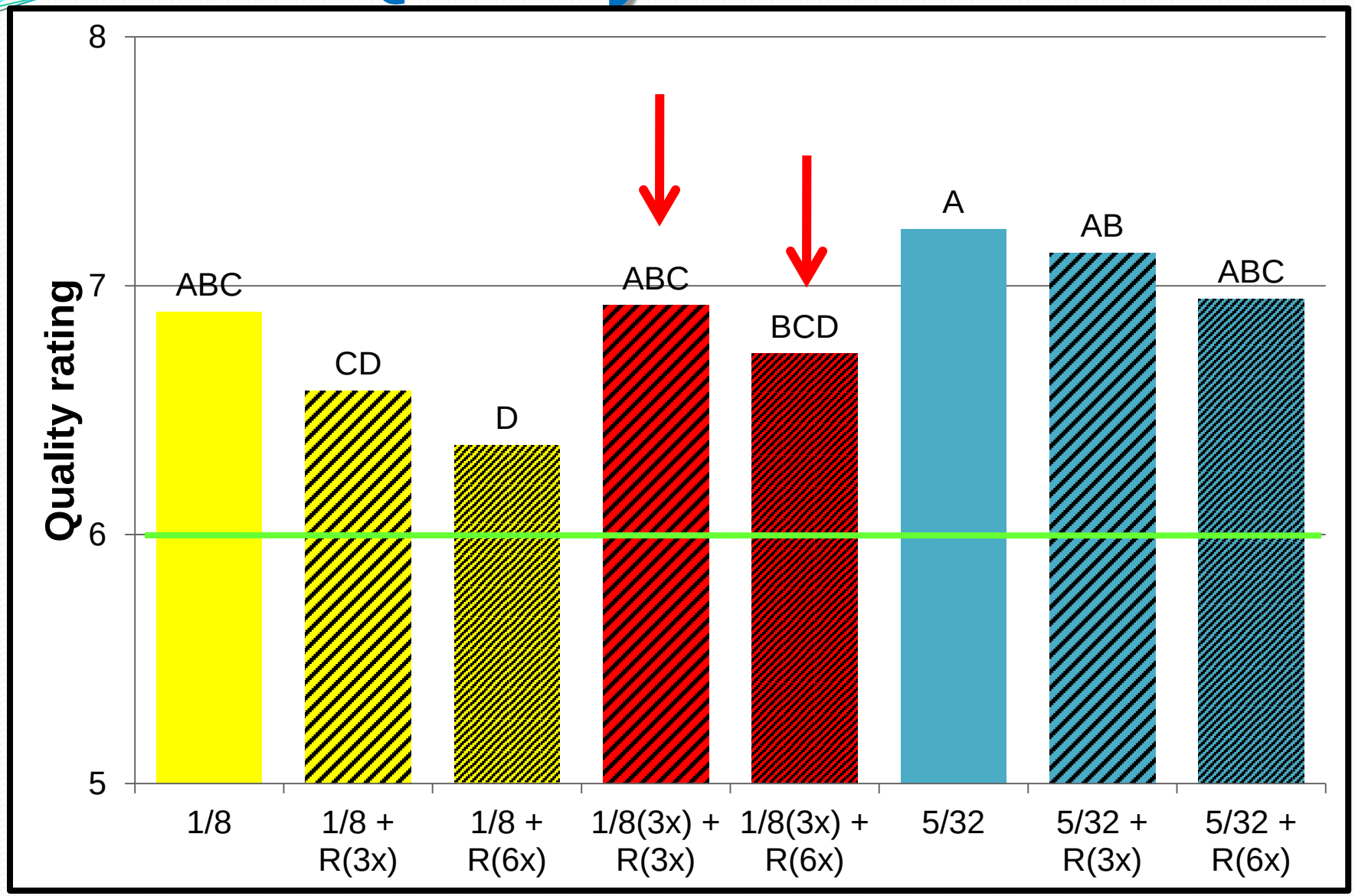
## *Treatments*

- Mowing: Toro Greensmaster 1000
- Rolling: Tru-Turf (RS48-11C) greens roller

# Visual Quality



# Visual Quality



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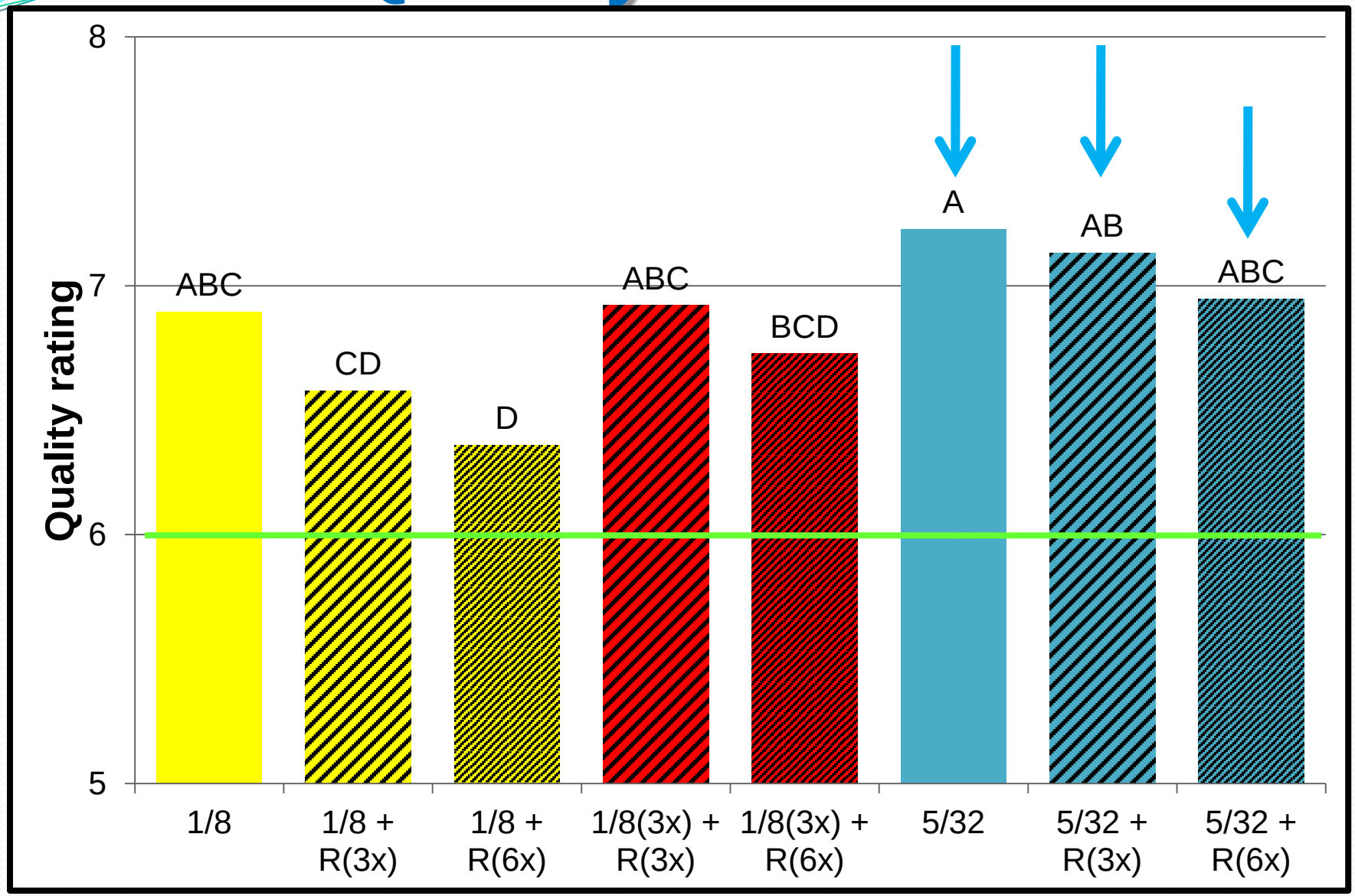
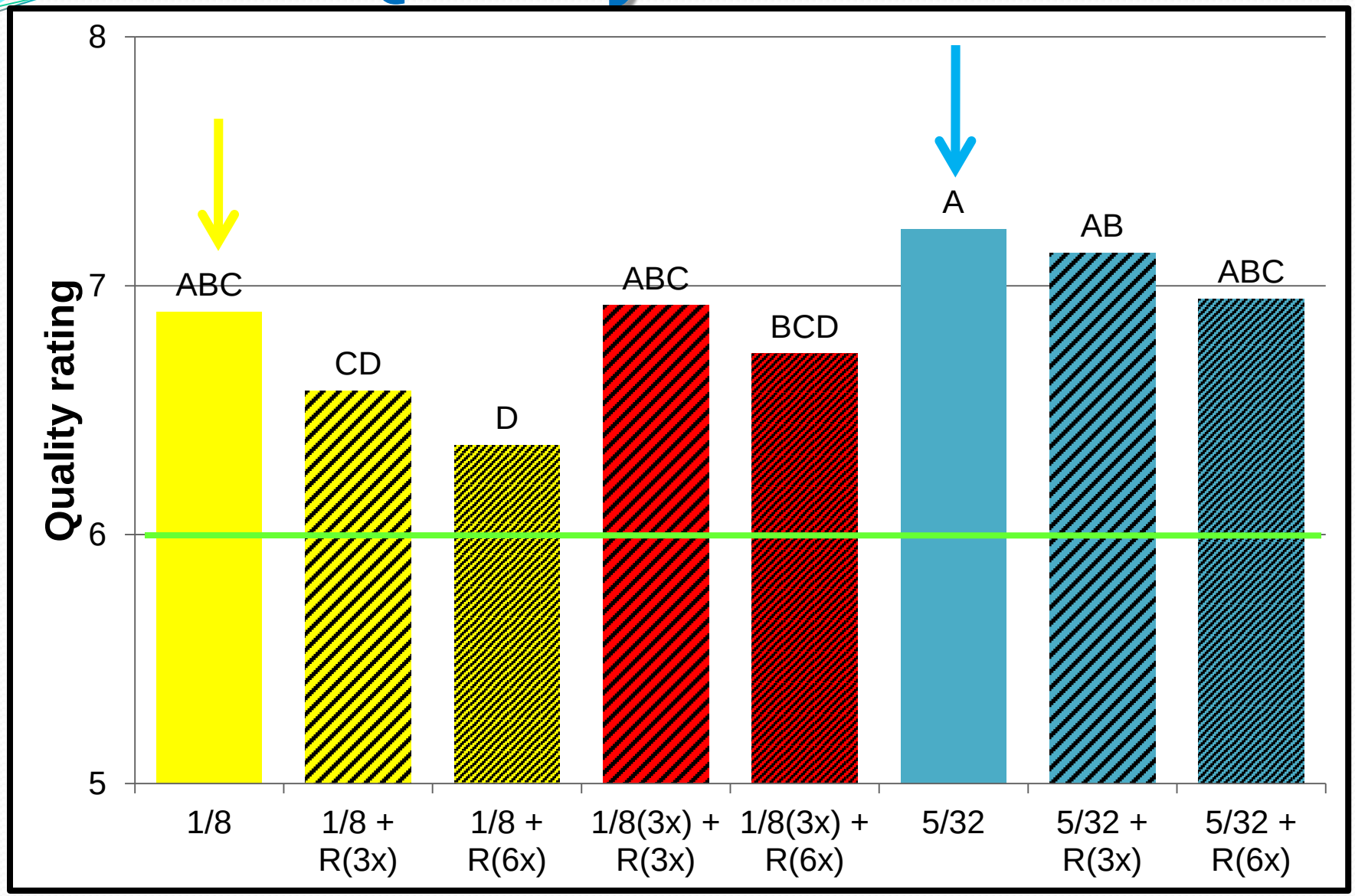


# Visual Quality



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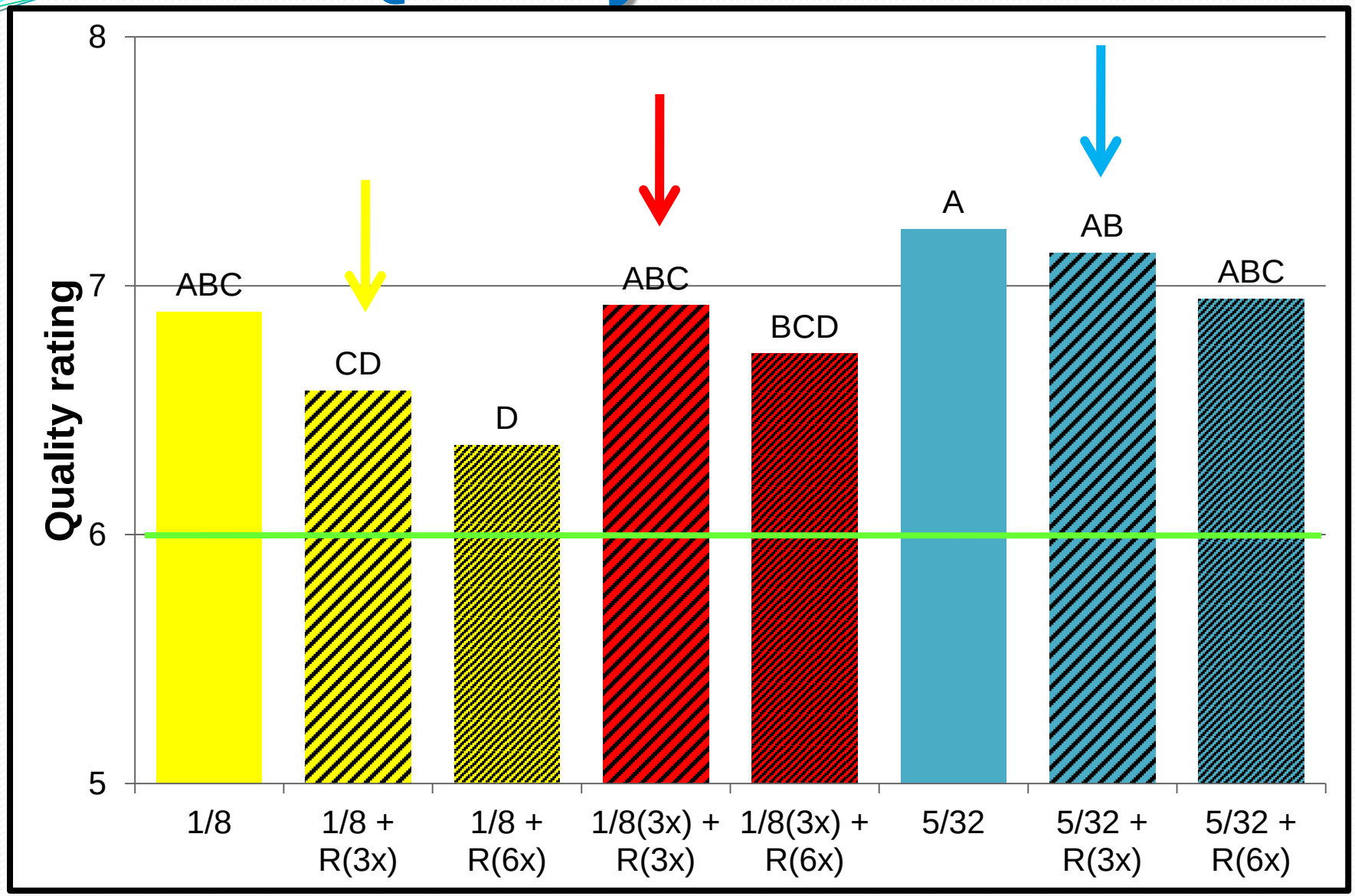

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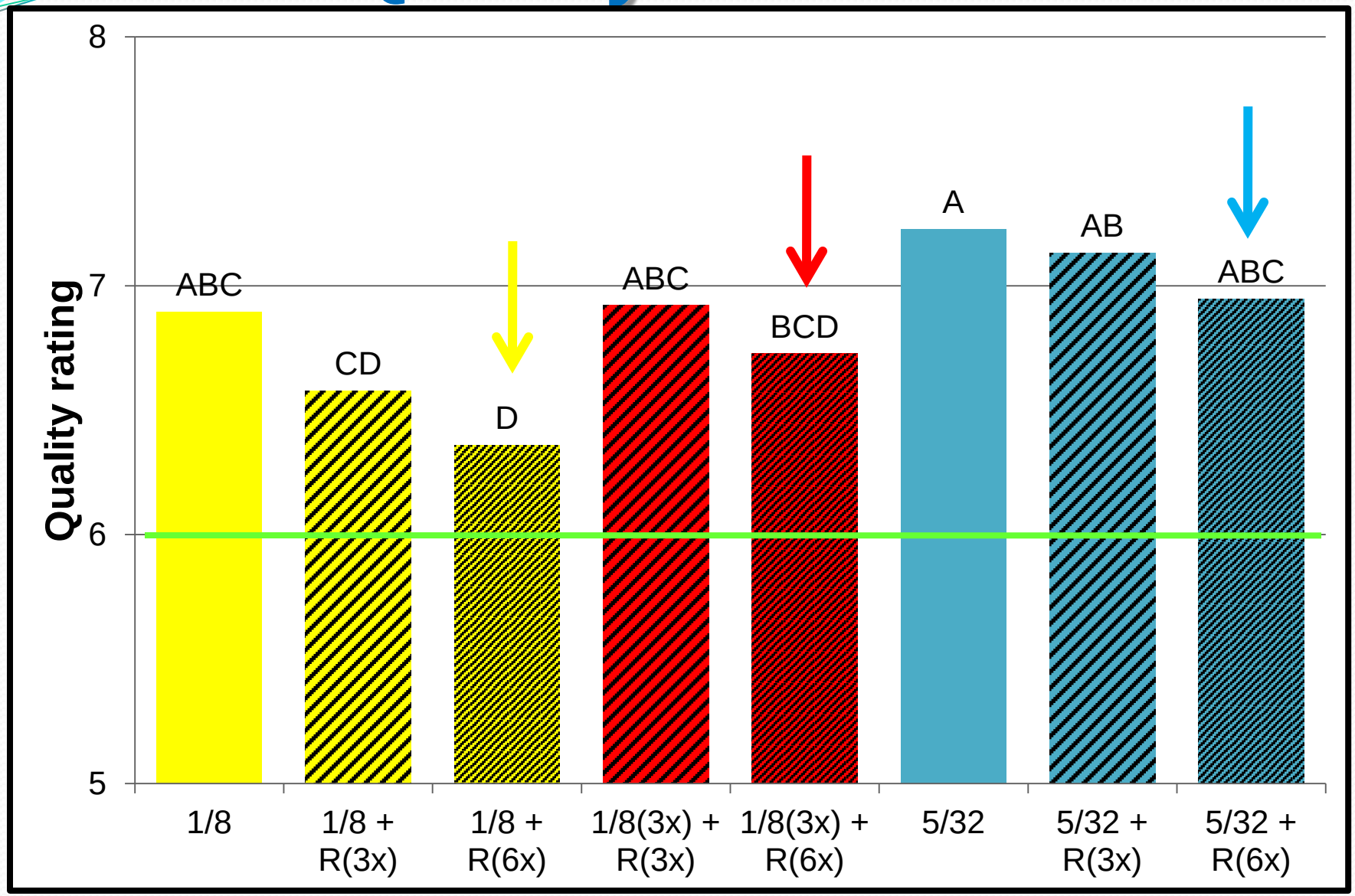
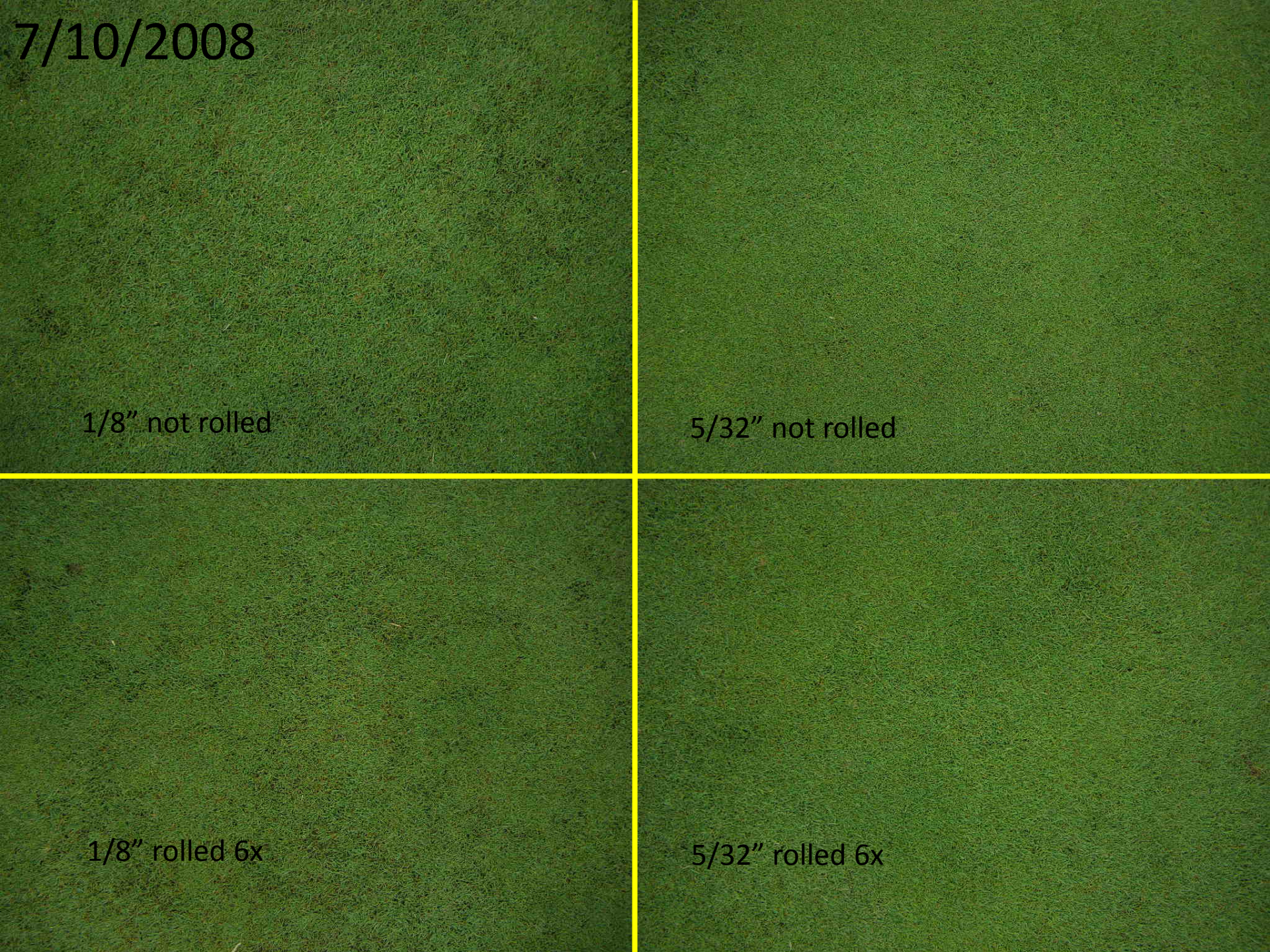
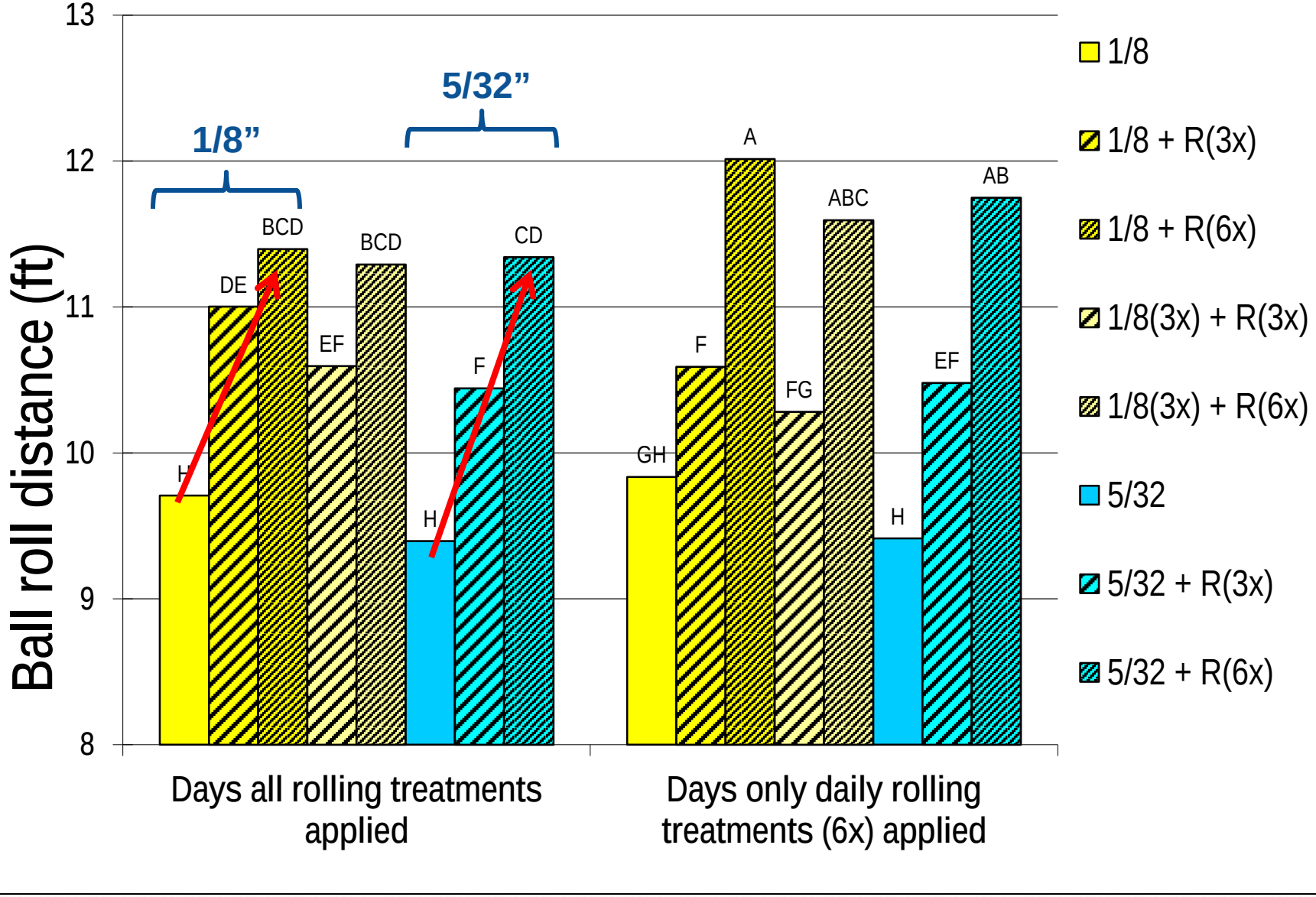



7/10/2008
1/8” not rolled
5/32” not rolled
1/8” rolled 6x
5/32” rolled 6x

# Ball Roll Distance

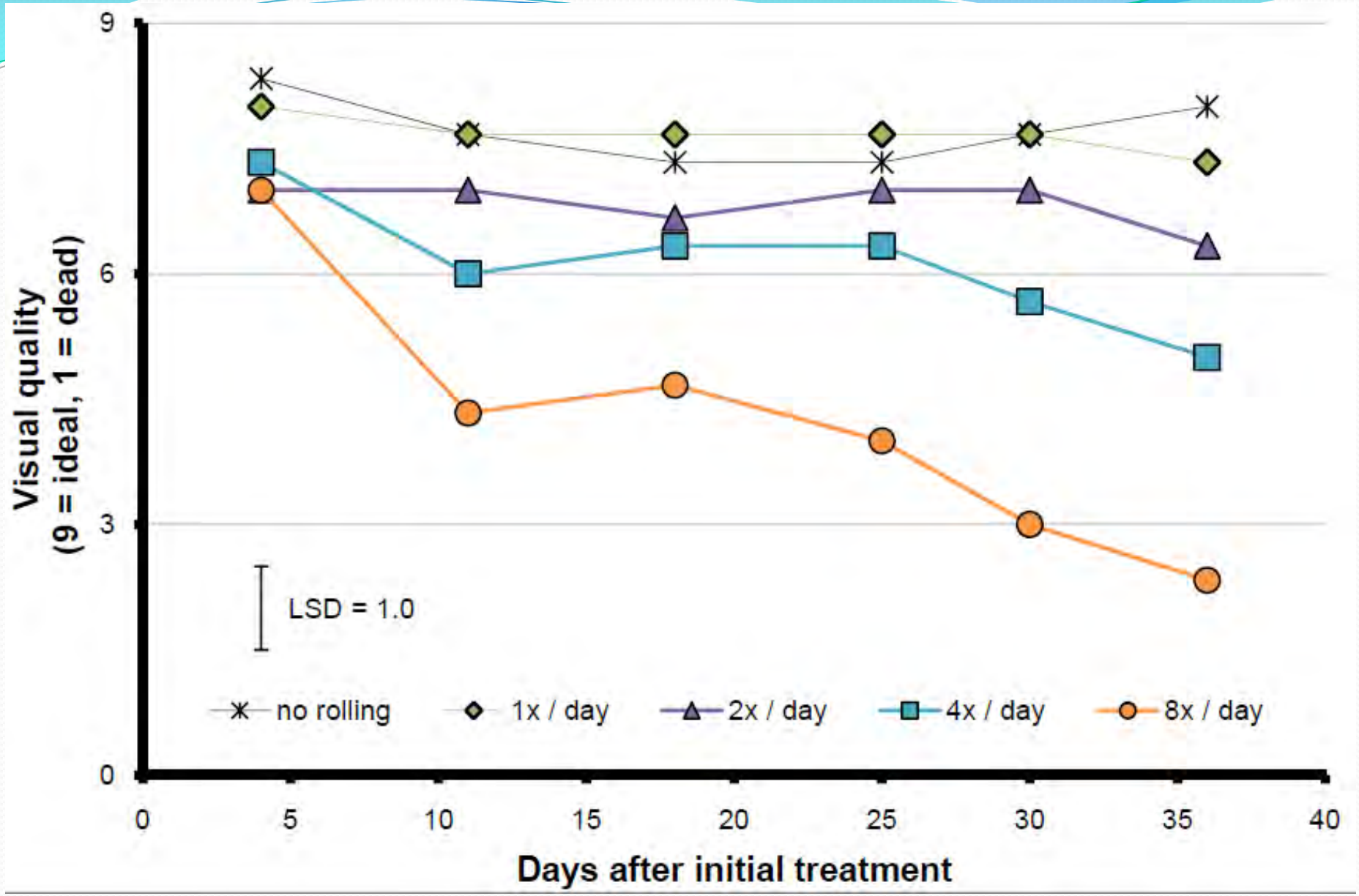


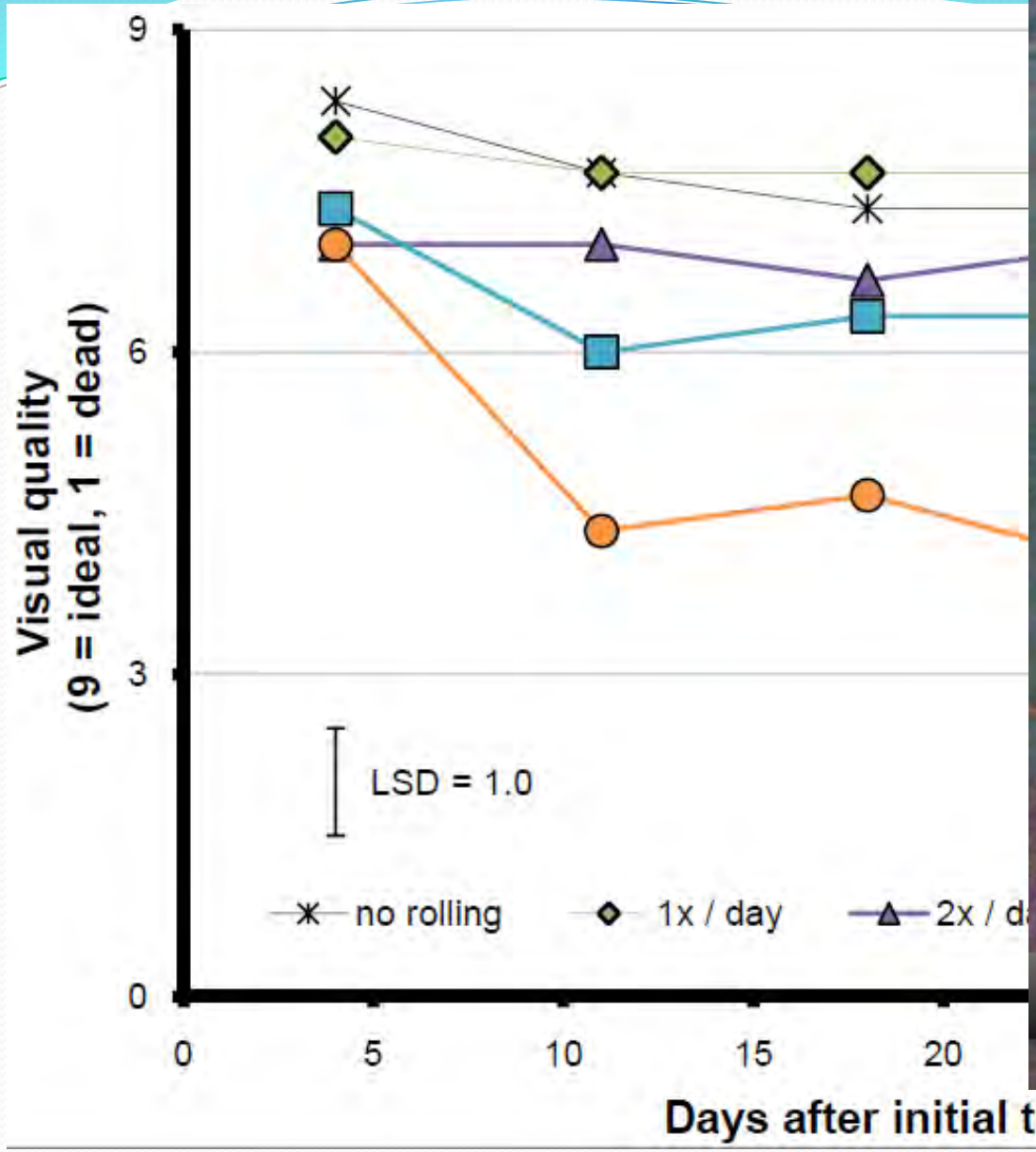
# How frequent is too frequent?

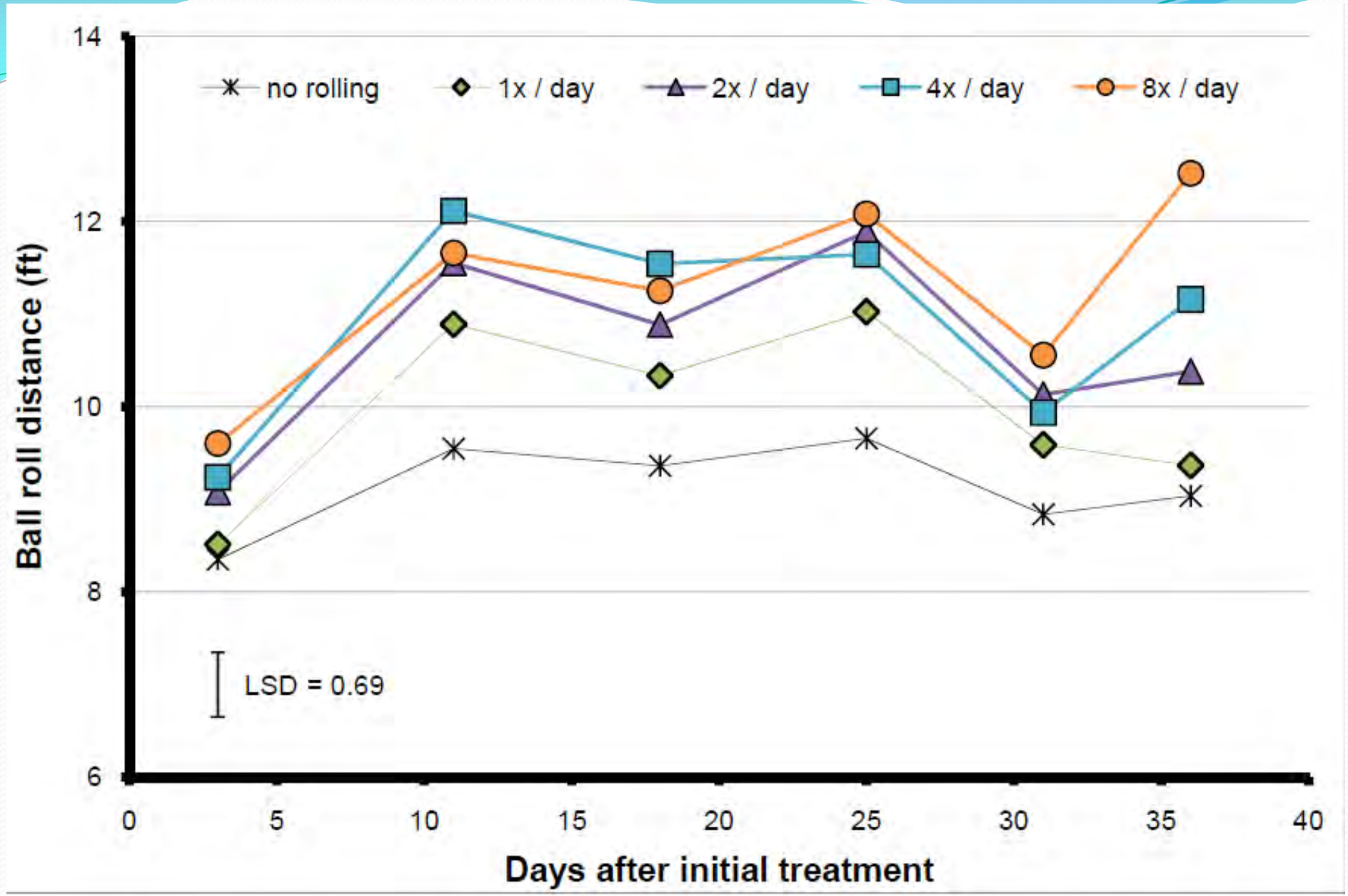
# High-Frequency Rolling Study

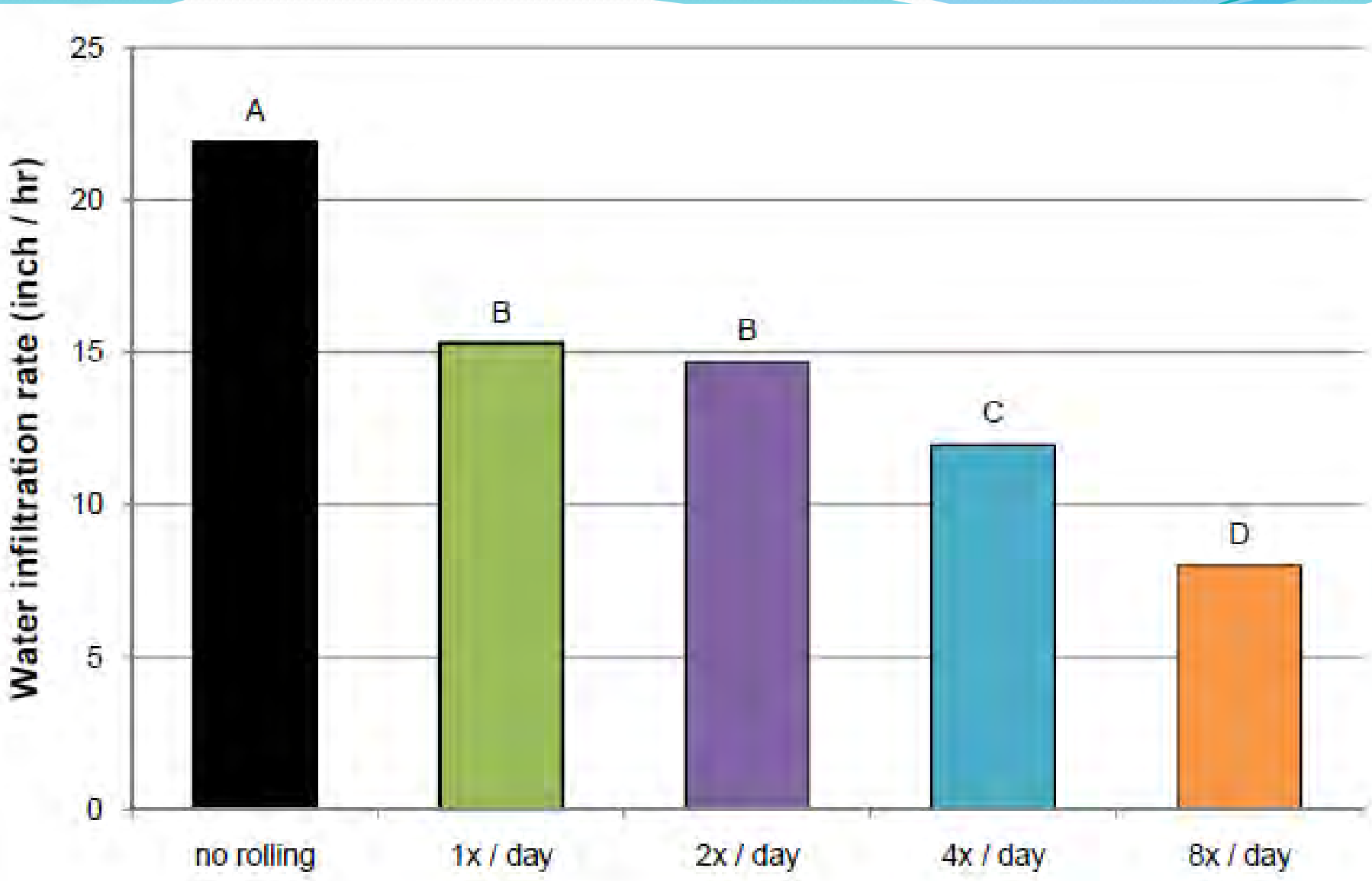
## *Materials and Methods*

- 5 rolling treatments
  - 0, 1, 2, 4, and 8 times / day
- Each treatment was performed 6 times per week for 6 weeks
- Rolling treatments were applied using a Tru-Turf roller


Visual quality
(9 = ideal, 1 = dead)
9
6
3
0
LSD = 1.0
no rolling
1x / day
2x / day
4x / day
8x / day
0
5
10
15
20
25
30
35
40
Days after initial treatment


Visual quality
(9 = ideal, 1 = dead)
9
6
3
0
LSD = 1.0
no rolling
1x / day
0
5
10
15
20
Days after initial treatment


no rolling
1x / day
2x / day
4x / day
8x / day
Ball roll distance (ft)
14
12
10
8
6
LSD = 0.69
0
5
10
15
20
25
30
35
40
Days after initial treatment


Water infiltration rate (inch / hr)
25
20
15
10
5
0
A
B
B
C
D
no rolling
1x / day
2x / day
4x / day
8x / day

# Other Effects of Rolling?

*Interaction with foot traffic & effects on ball mark severity, rooting, photosynthetic efficiency, & carbohydrate storage*

# Physiological effects of low mowing heights, rolling, and foot traffic on creeping bentgrass putting greens

Joey Young


Picture courtesy Ty McClellan, Manager, USGA Green Section Education

# Treatments - Cultivars

Penn G-2

SR 1020

# Treatments - Mowing Height

**Mowing heights**
**2.5, 3.2, or 4.0 mm**
**(0.100, 0.125, or 0.156 inch)**

# Treatments - Rolling Frequency

0 Roll week$^{-1}$

3 Roll week$^{-1}$

6 Roll week$^{-1}$

Mowing height
2.5, 3.2, or 4.0 mm
(0.100, 0.125, or 0.156 inch)

# Treatments - Foot Traffic

Foot Traffic

Foot Traffic

Foot Traffic

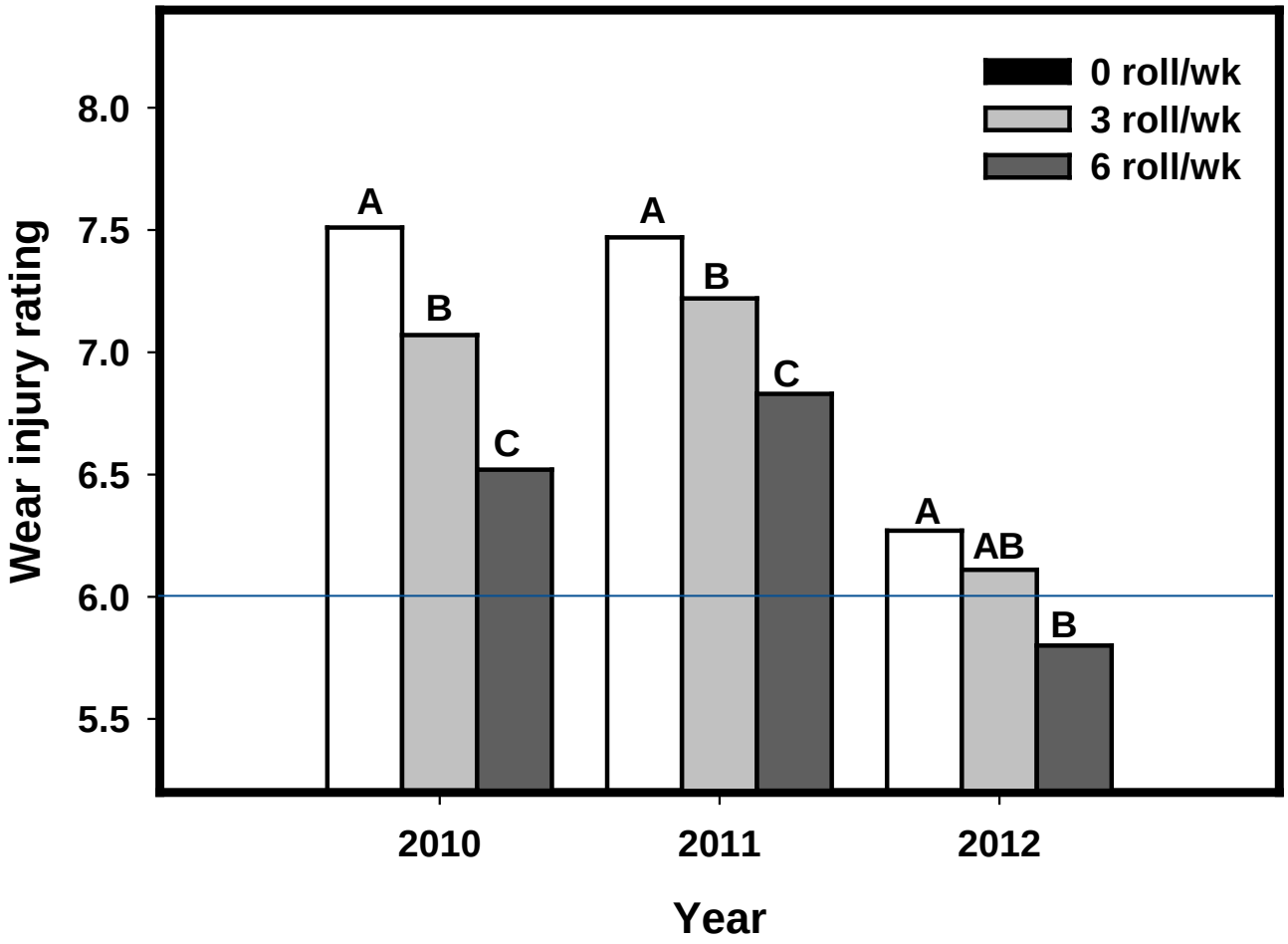
0 Roll week$^{-1}$

3 Roll week$^{-1}$

6 Roll week$^{-1}$

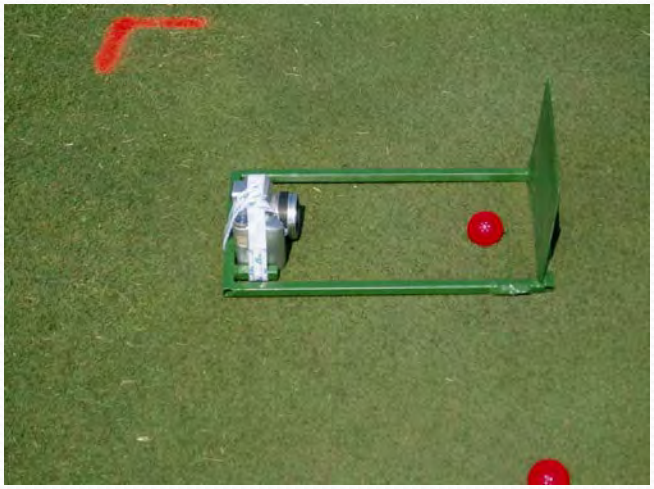
Mowing height
2.5, 3.2, or 4.0 mm
(0.100, 0.125, 0.156 inch)

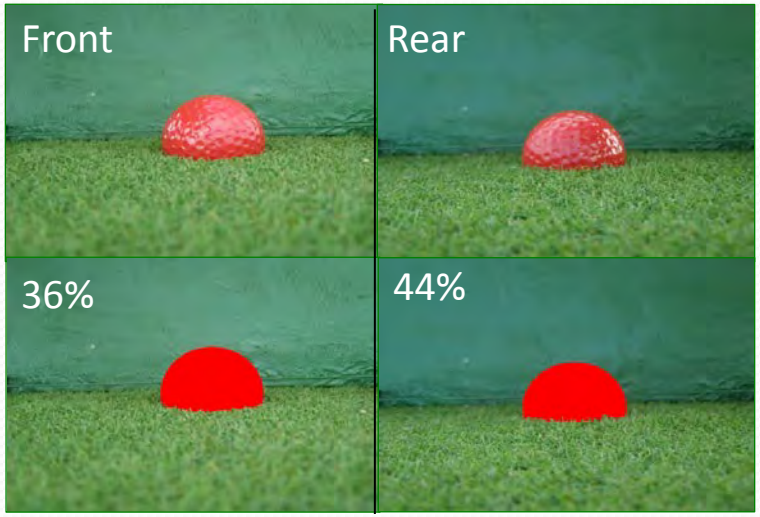
# Rolling frequency effects on foot traffic wear



# Methods for ball mark studies

FieldScout 300 TDR Soil Moisture Meter (Spectrum Technologies) with 3.8 cm (1.5 inch) probes



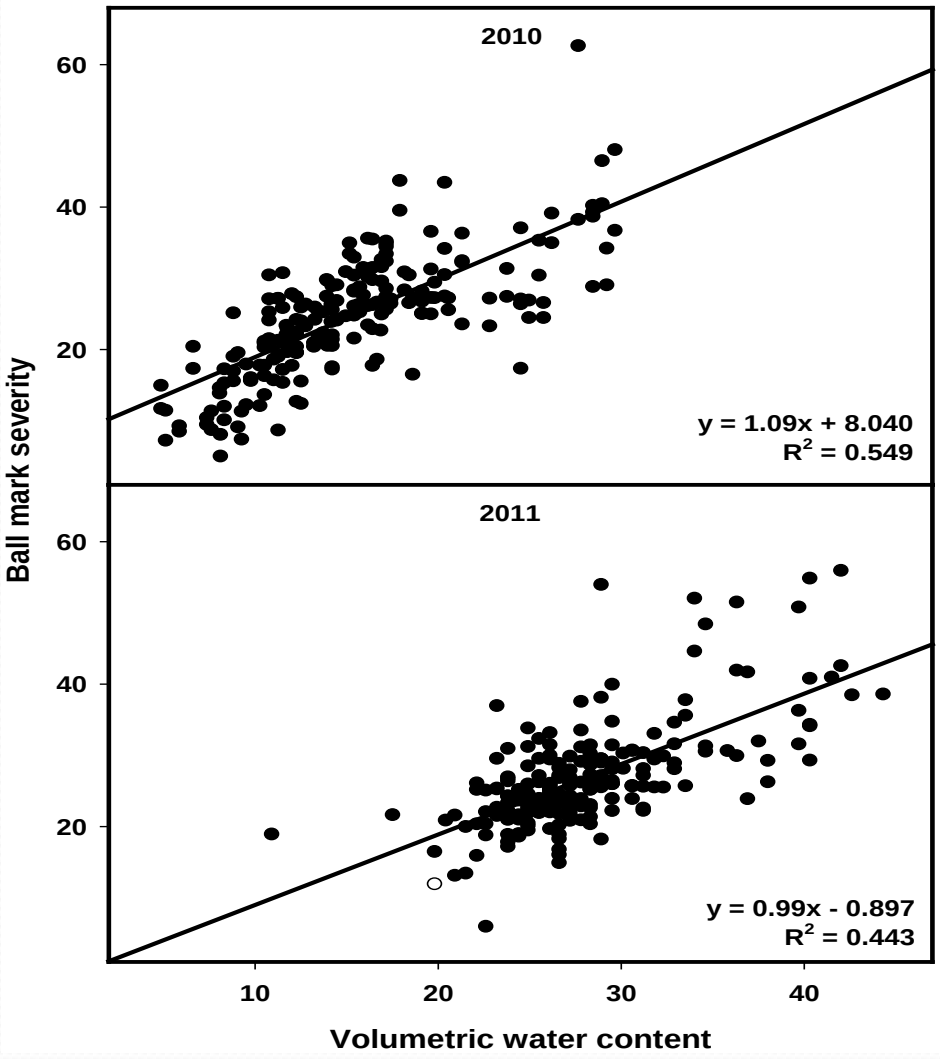



Simple average of two values results in ball mark severity

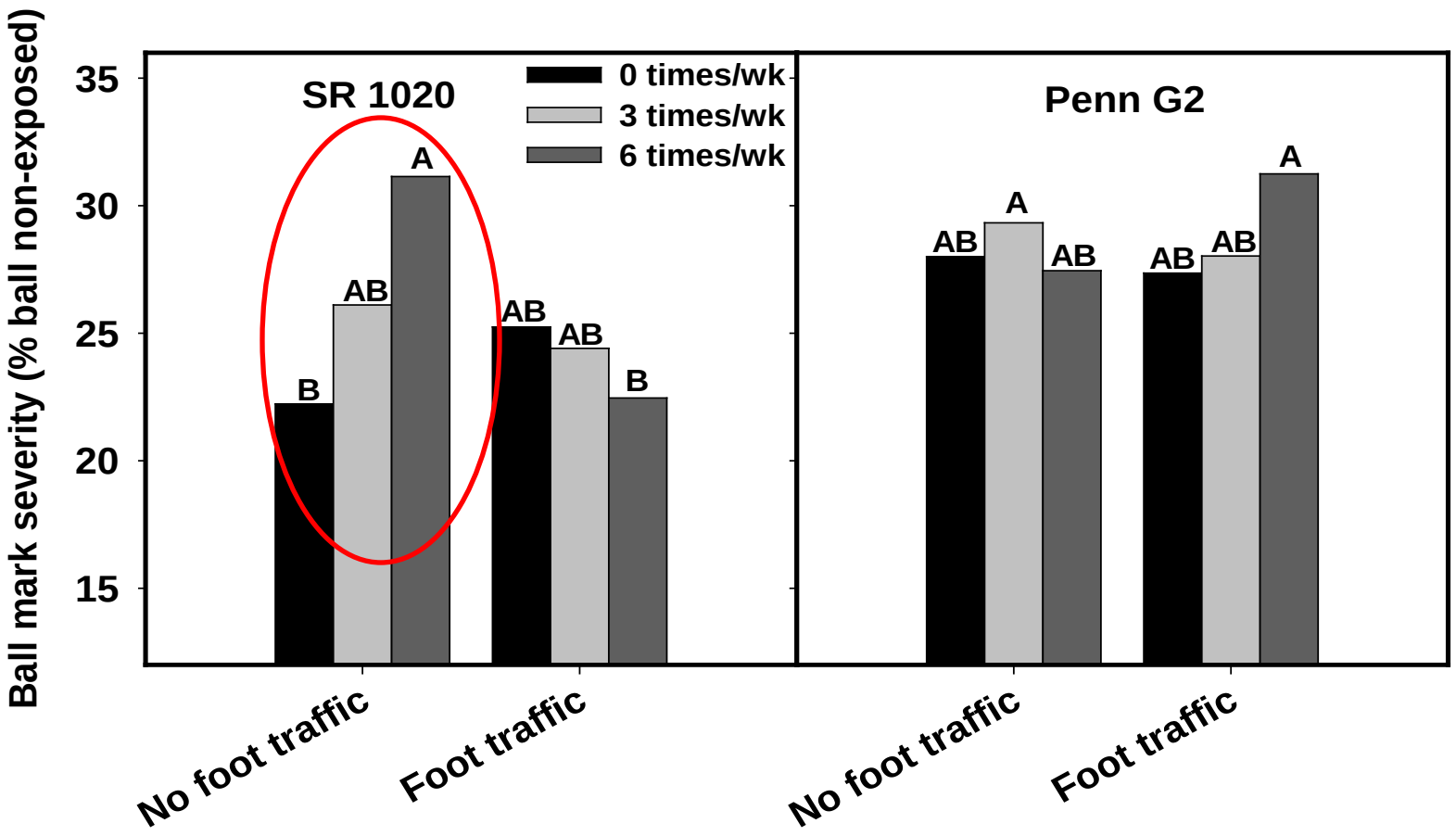
(36% + 44%)/2 = 40%

This means 40% of the golf ball is below the putting surface

# Volumetric water content vs. ball mark severity



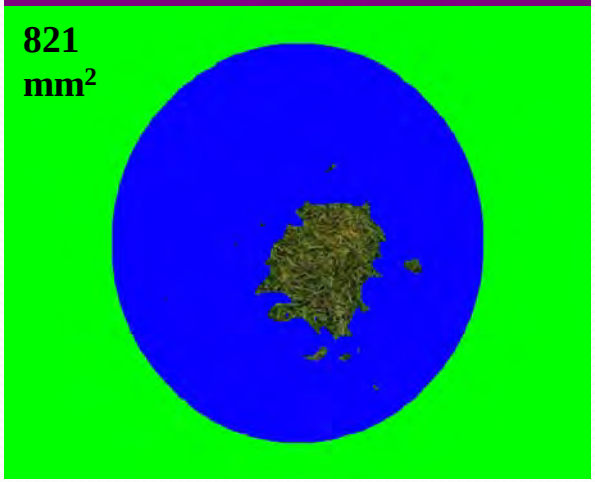
# Cultivar*Roll*Foot in 2011

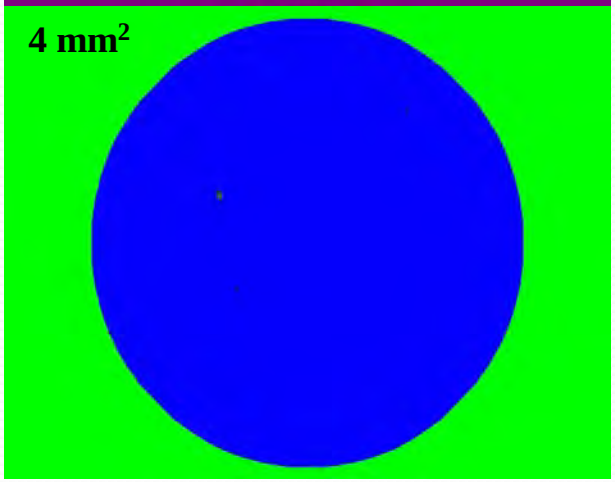


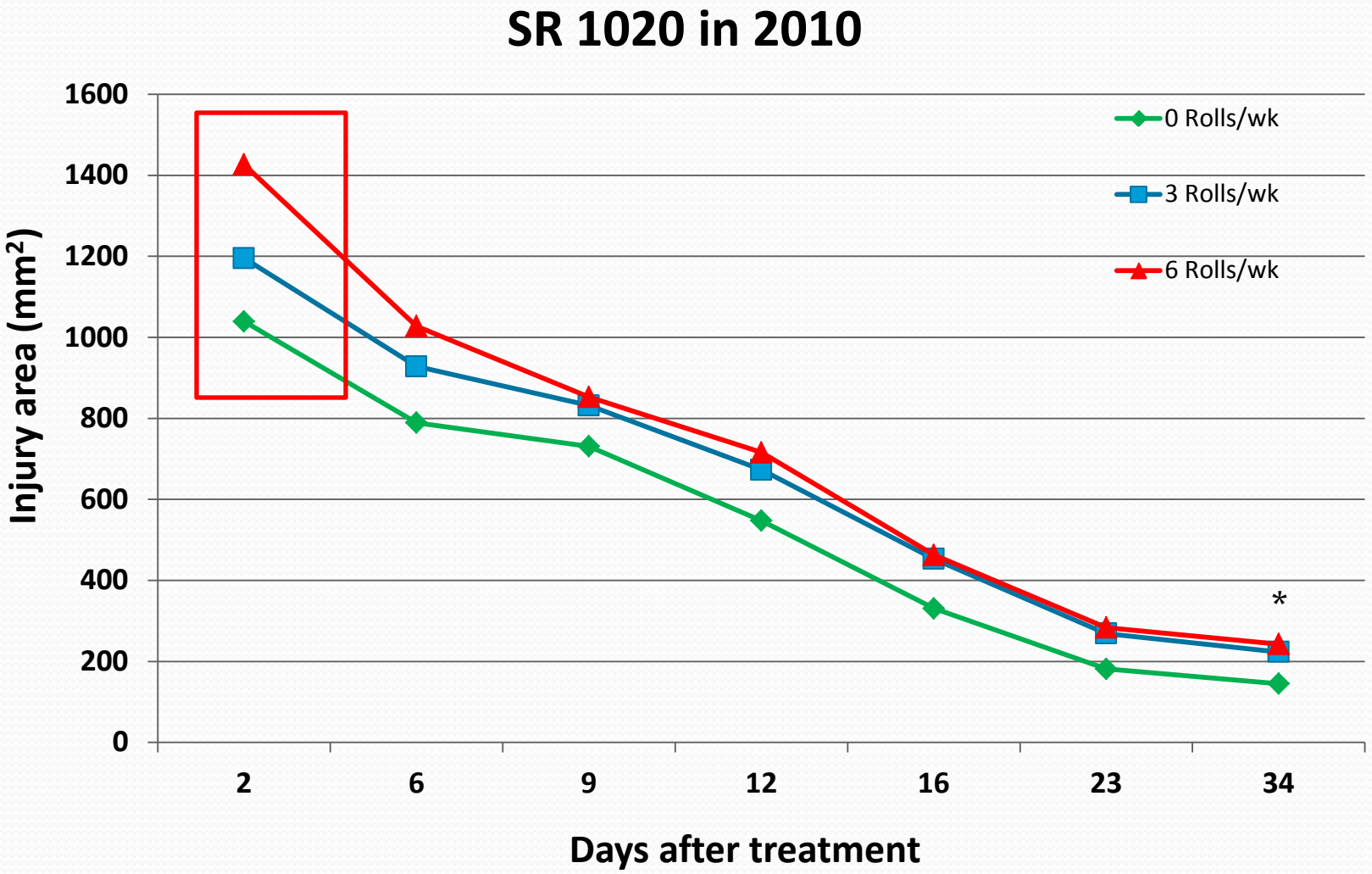
# Ball mark recovery methods

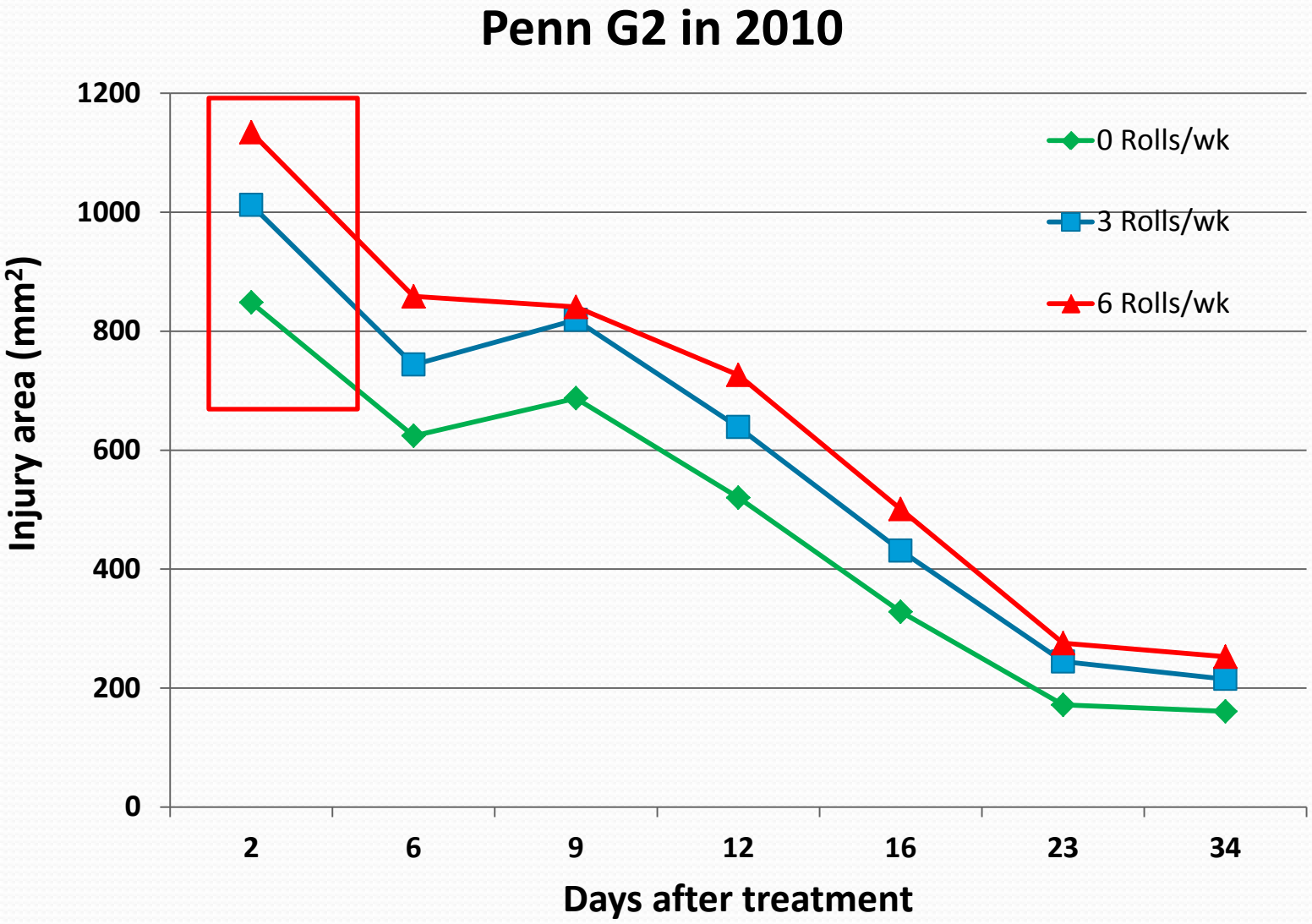
Light box with frame marked by two golf tees at corner to assist in finding ball marks






SR 1020 in 2010
Injury area (mm²)
1600
1400
1200
1000
800
600
400
200
0
2
6
9
12
16
23
34
*
Days after treatment
0 Rolls/wk
3 Rolls/wk
6 Rolls/wk


Penn G2 in 2010
Injury area (mm²)
1200
1000
800
600
400
200
0
2
6
9
12
16
23
34
Days after treatment
0 Rolls/wk
3 Rolls/wk
6 Rolls/wk

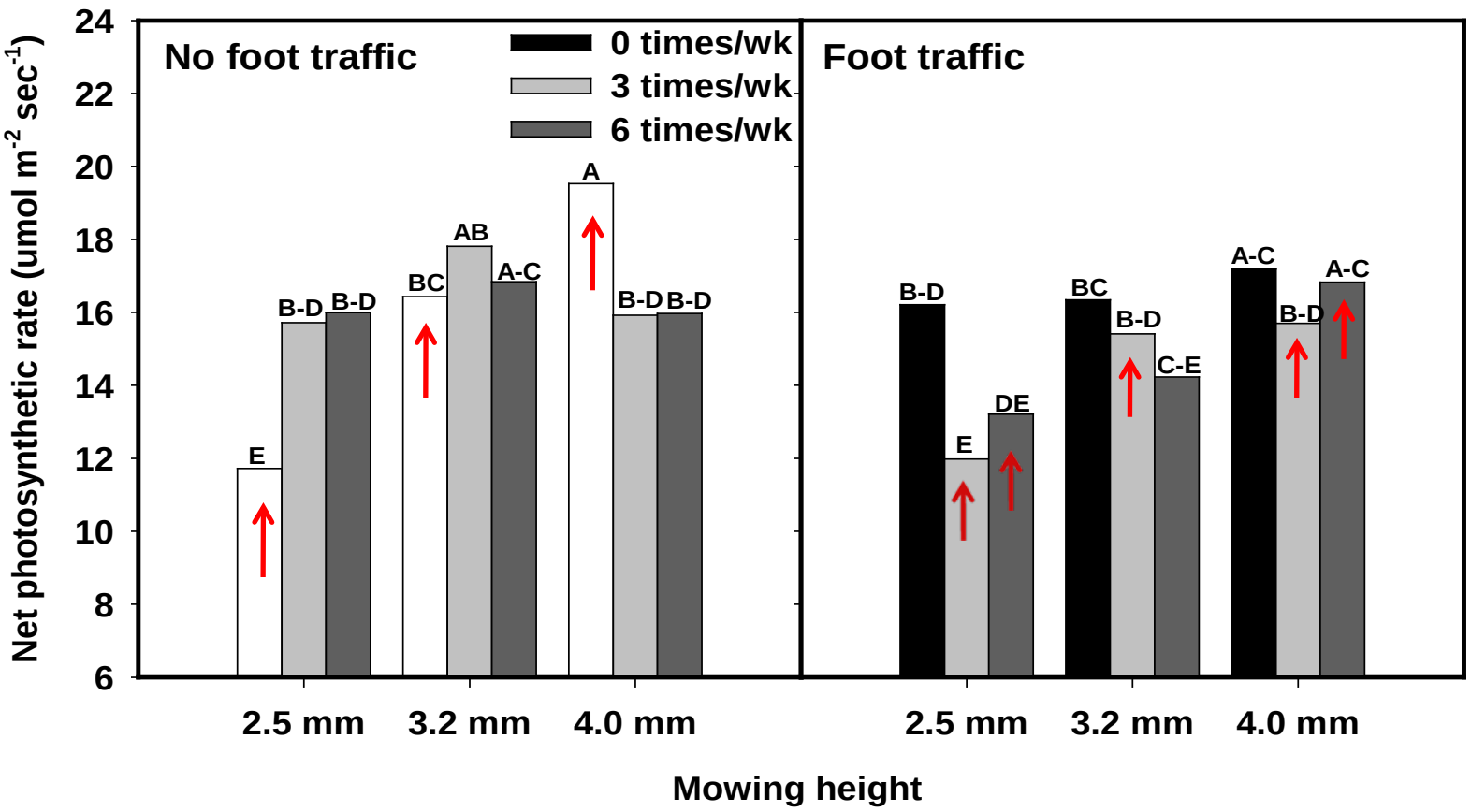
# Photosynthesis chamber

# Photosynthetic measurements

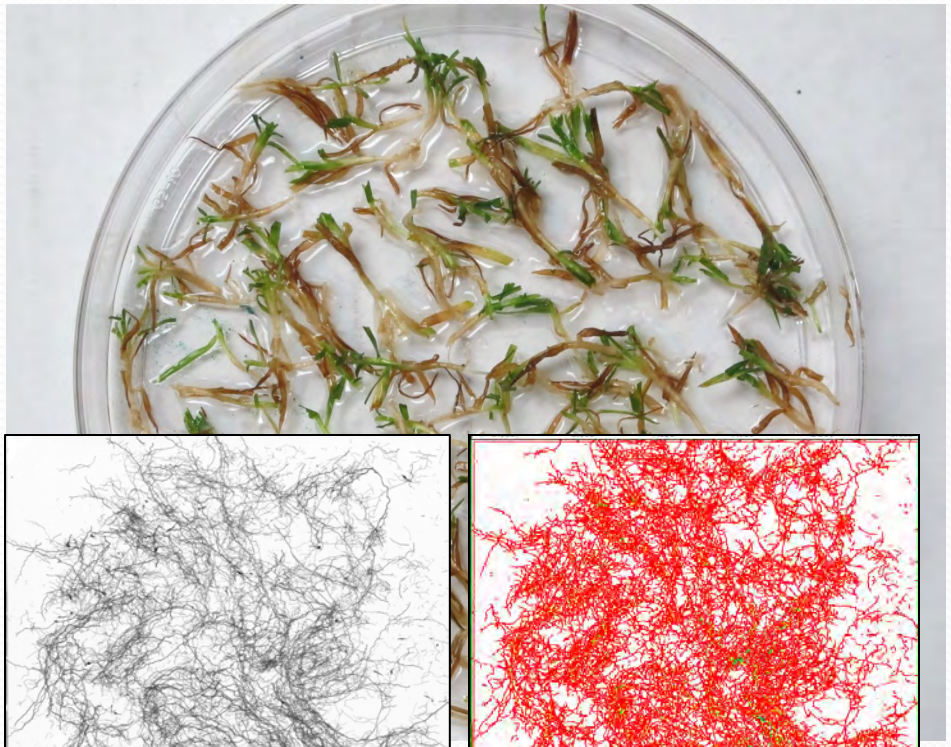
- Full light measurements (Pg)
  - Completely clear day
  - Between 1100 and 1400 hours
- Dark measurements [soil (Rs) + canopy (Rc) respiration]
  - Single measurement
  - Completion of replication
  - Chamber covered with cardboard box
- Net photosynthesis = Pg – (Rs +Rc)

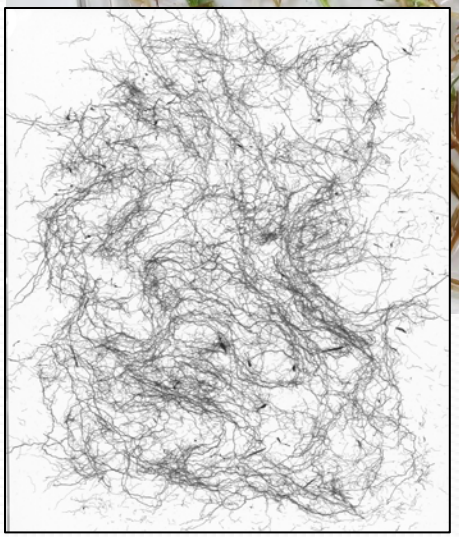
# Mow Ht. / Rolling / Traffic Effects

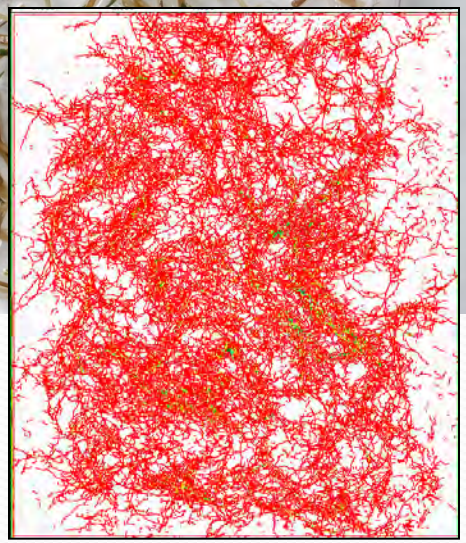
***Penn G2 in 2012***



# Rooting and Carbohydrates







Minimal rolling effects throughout study

Positive effect of higher mowing heights

# What does it all mean?

# Research Implications

- Frequent rolling in transition zone  rarely reduced bentgrass quality/health & positively affected performance
- Raising mowing heights and reducing traffic is important during high environmental stress
  - Change hole locations regularly
  - Alter common walk-on areas
  - Implement target rolling
- Raising mowing heights may create slight advantages physiologically

# Thank you. Questions?

UofA
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