

GCSAA Survey - 2002

Which of the following is the most common complaint about golf course conditions from players? (Rank top 3)

	1st Choice	2nd Choice	3rd Choice
The greens are too fast	6.6%	7.4%	7.5%
The greens are too slow	37.2%	17.8%	14.5%
The rough is too thick/too tall	17.6%	24.7%	21.8%
Bunker sand is too soft or not raked	11.2%	22.5%	23.2%
Trees are in poor condition	.5%	2%	3.7%
Un-repaired ball marks	24.6%	22.6%	22.6%
Don't Know/ No Answer	2.4%	1%	4.4%

The GCSAA 2002 Golf Leadership Survey, a real-time, computerized, opinion poll conducted at GCSAA's conference and show in Orlando, examined the opinions of 800 superintendents on trends in golf and golf course management. The survey is designed to position the golf course superintendent as an expert in trends affecting the golf industry.

Topic Outline

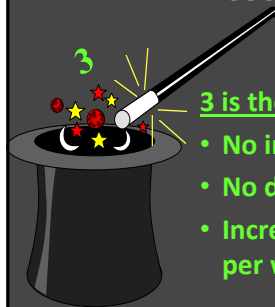
- i. Brief history of greens rolling
- ii. Use rolling to adjust mowing practices
- iii. Intense rolling programs
- iv. Economics of rolling
- v. Current rolling research

Greens Rolling

- Rolling greens is not a new concept
 - Over 100 yrs old
 - Abandoned in the 1920's due to compaction concerns (Piper and Oakley, 1921)
 - Made a come-back in increased demand for
 - However, little research



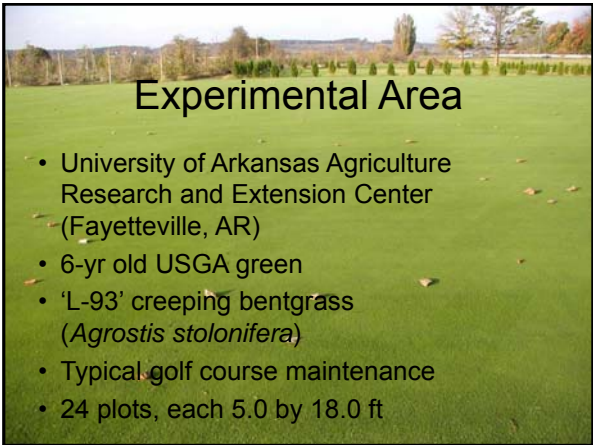
Summary of Rolling Research 1990 – 2005:



3 is the Magic Frequency

- No increase in bulk density
- No decrease in turf quality
- Increase green speeds 6 days per week

Can you increase mowing height or decrease mowing frequency with regular rolling?



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 *Treatments*

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Materials and Methods *Treatments*

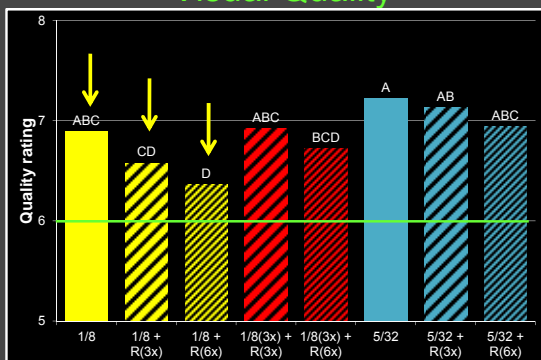
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Materials and Methods Treatments

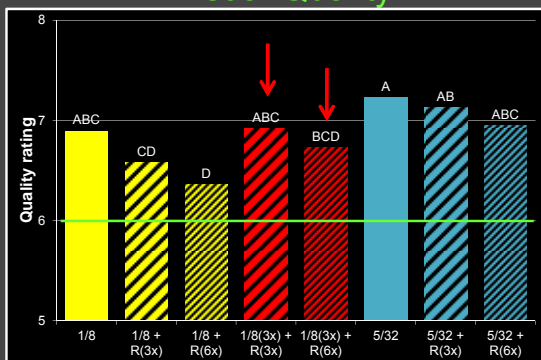
- Mowing: Toro Greensmaster 1000
- Rolling: Tru-Turf (RS48-11C) greens roller

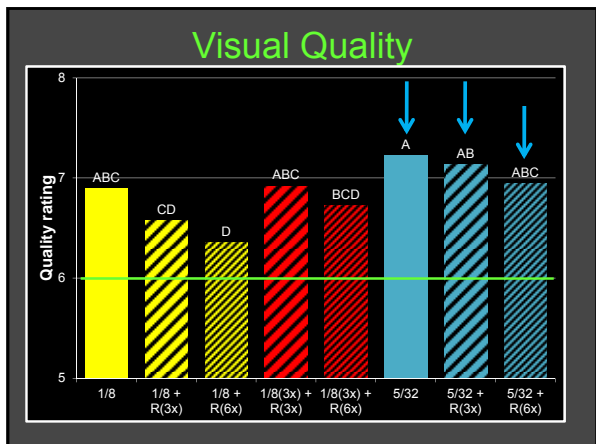


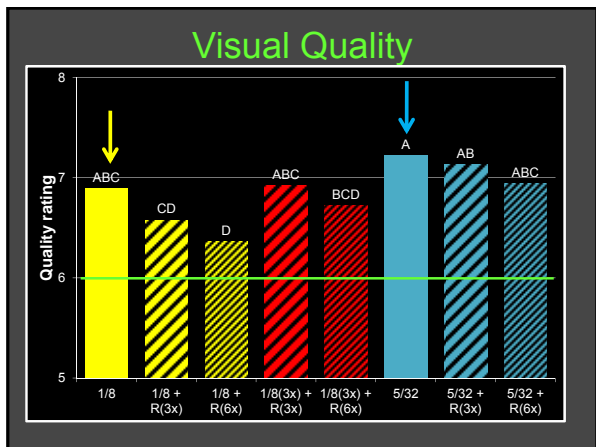
Visual Quality

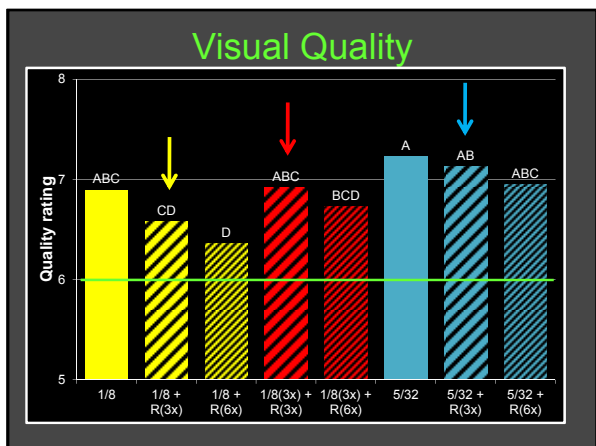


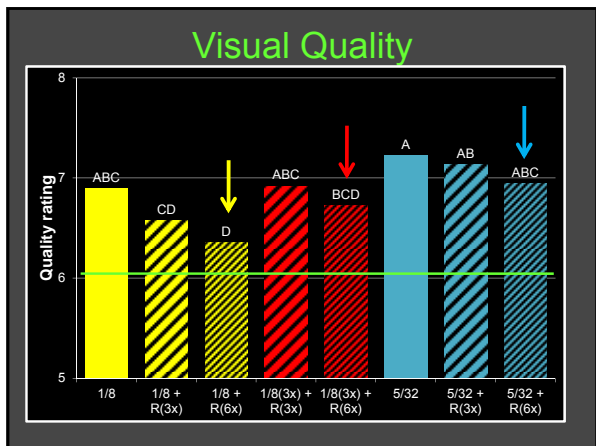
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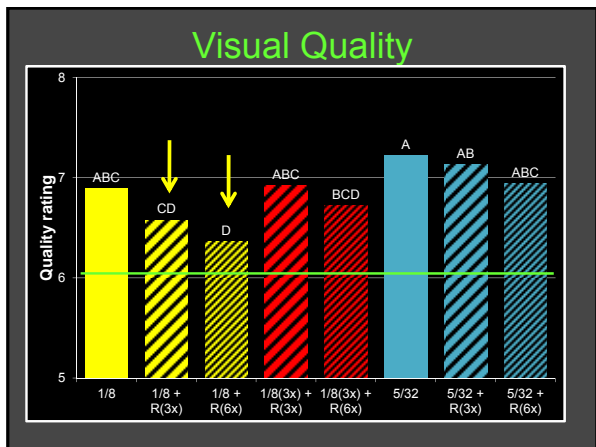




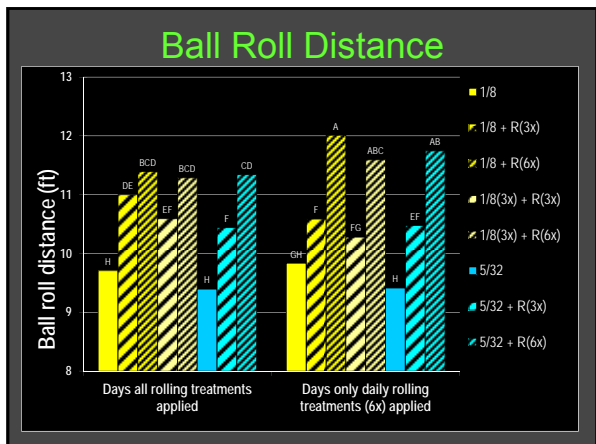




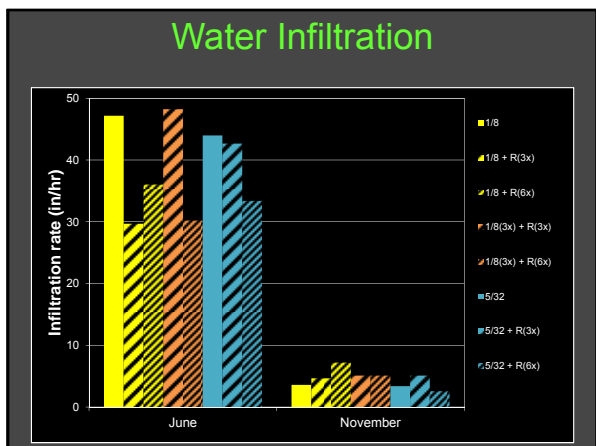










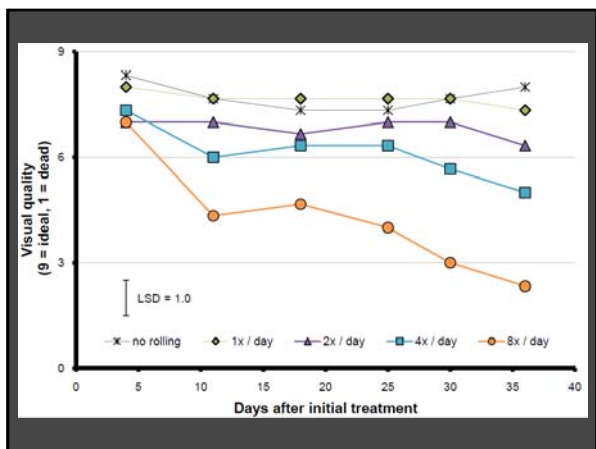


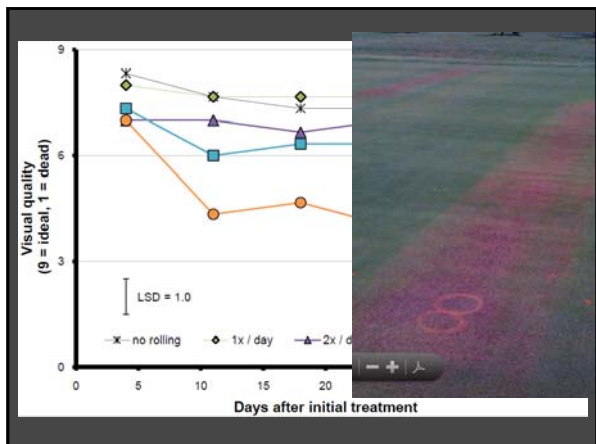
So, how often can you roll without significant turf decline?

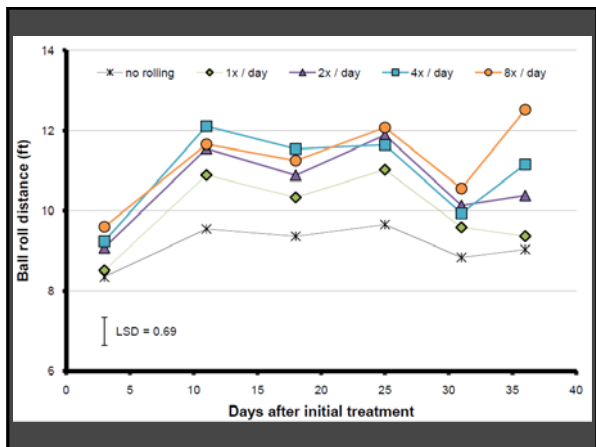
High-Frequency Rolling Study *Materials and Methods*

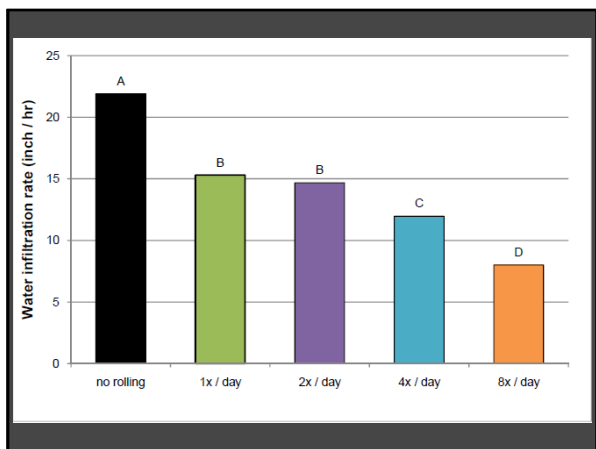
- 4 rolling treatments
 - 2 times per day
 - 4 times per day
 - 6 times per day
 - 8 times per day
- Each treatment was performed 6 times per week for 6 weeks
- Rolling treatments were applied using a Tru-Turf roller











How does alternating mowing and rolling affect the budget?

Economics of Mowing and Rolling Study

- Survey data collected from Tennessee golf courses to determine economic parameters
- Parameters included number of holes, putting green area, mowing times, mechanical maintenance
- Partial budgeting analysis used to determine costs based on 216 day mowing season

Daily Mowing

Parameter/cost item	Walking		Triplex	
	Public	Private	Public	Private
a. Mowings year ⁻¹	216	216	216	216
b. Average putting green area (ft ²)	140746	176704	140746	176704
c. Average wage hour ⁻¹ (\$)	\$8.21	\$8.92	\$8.21	\$8.92
Equipment cost of mower(s) ^f				
d. Cost mower ² ft ⁻²	\$8.59x10 ⁻⁵	\$8.59x10 ⁻⁵	\$5.97x10 ⁻⁵	\$5.97x10 ⁻⁵
e. Number of mowers mowing ⁻¹	5	5	2	1
f. Cost mowing ⁻¹ (b ² d ² e)	\$60.46	\$75.90	\$16.79	\$10.54
g. Equipment cost year ⁻¹ (a*f)	\$13,058.77	\$16,395.14	\$3,627.55	\$2,277.17
Mowing labor cost				
h. Mowing time	2.3	3.5	2.8	2.7
i. Labor cost mowing ⁻¹ (c*e*h)	\$92.36	\$156.78	\$45.16	\$24.32
j. Mowing labor cost year ⁻¹ (i*a)	\$19,950.30	\$33,863.71	\$9,753.48	\$5,252.56
Maintenance labor cost				
k. Maintenance time week ⁻¹ (h)	10.0	12.1	3.3	7.9
l. Maintenance cost week ⁻¹ (k*c)	\$82.10	\$108.29	\$27.09	\$70.11
m. Maintenance cost year ⁻¹ (l*weeks)	\$3,284.00	\$4,331.55	\$1,083.72	\$2,804.45
Total costs				
n. Total cost year ⁻¹ (g+j+m)	\$36,293.07	\$54,590.40	\$14,464.75	\$10,334.18
o. Total cost ft ⁻² of putting green (n/b)	\$0.26	\$0.31	\$0.10	\$0.06

Strunk et al. Univ. Tennessee

Alternating Mowing with Rolling

Parameter/cost item	Walking		Triplex	
	Public	Private	Public	Private
a. Mowings year ⁻¹	108	108	108	108
b. Rollings year ⁻¹	108	108	108	108
c. Average Putting Green Area (ft²) ^a	140746	176704	140746	176704
d. Average wage hour ⁻¹ (\$) (Equipment cost of rollers) ^b	\$8.21	\$8.92	\$8.21	\$8.92
e. Cost roller ² ft ⁻²	\$1.90x10 ⁻⁵	\$1.90x10 ⁻⁵	\$1.90x10 ⁻⁵	\$1.90x10 ⁻⁵
f. Number of rollers used rolling ⁻¹	1	2	1	2
g. Cost rolling ³ (c* ^a *f)	\$3.21	\$5.03	\$3.21	\$5.03
h. Equipment cost year ⁻¹ (b* ^c)	\$346.38	\$543.59	\$346.38	\$543.59
Mowing labor cost				
i. Mowing time	2.25	3.52	2.63	3.12
j. Labor cost mowing ³ (c* ^a *e* ^h)	\$92.36	\$156.78	\$45.16	\$24.32
k. Mowing labor cost year ⁻¹ (i* ^a)	\$9,975.15	\$16,391.85	\$4,876.74	\$2,626.28
Rolling labor cost				
l. Rolling time	3.63	3.25	3.63	3.25
m. Labor cost rolling ³ (d* ^f *g)	\$35.80	\$43.55	\$35.80	\$43.55
n. Rolling labor cost year ⁻¹ (l* ^a)	\$3,865.92	\$4,703.12	\$3,865.92	\$4,703.12
Maintenance labor cost				
o. Maintenance hours week ⁻¹	5	6.07	1.65	3.93
p. Maintenance cost week ⁻¹ (* ^d)	\$41.05	\$54.14	\$13.55	\$35.06
q. Maintenance cost year ⁻¹ (t* ^{week})	\$1,642.00	\$2,165.78	\$541.86	\$1,402.22
Total costs				
r. Total costs year ⁻¹ (h+i+m+n+q)	\$22,358.83	\$32,541.91	\$11,444.67	\$10,413.80
s. Total cost ft² (b/c)	\$0.16	\$0.18	\$0.08	\$0.06

Strunk et al. Univ. Tennessee

Mowing vs. Alternating Mowing with Rolling

	Walking		Triplex	
	Public	Private	Public	Private
Daily mowing	\$ 36,293	\$ 54,590	\$ 14,464	\$ 10,334
Alternating Mowing and Rolling	\$ 22,358	\$ 32,541	\$ 11,444	\$ 10,413
Savings	\$ 13,934	\$ 22,048	\$ 3,020	\$ (79)

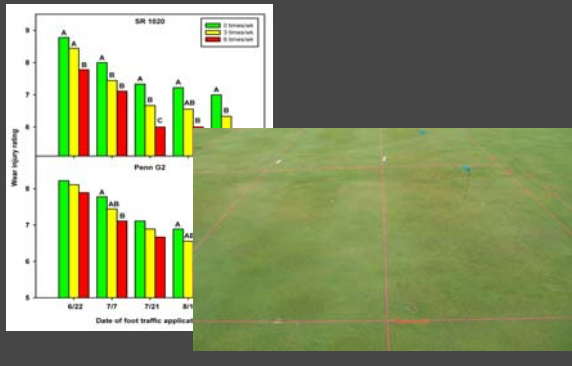
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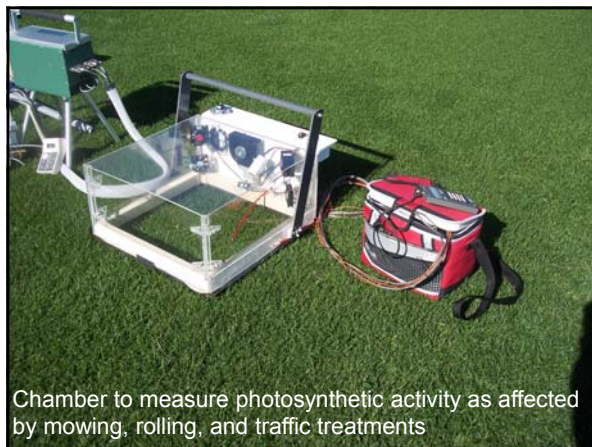
Current Rolling Research

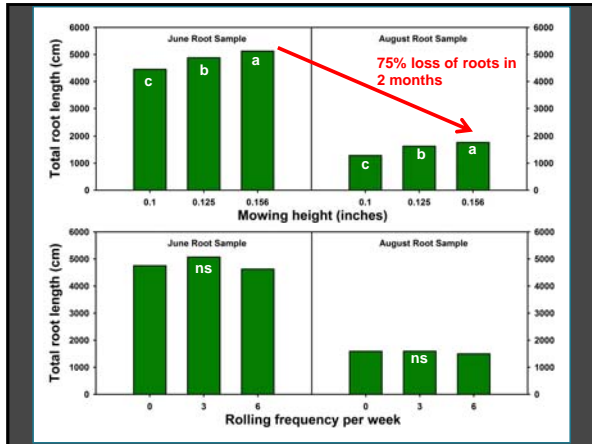
Intense Mowing, Rolling, and Traffic Effects on Turf Physiology

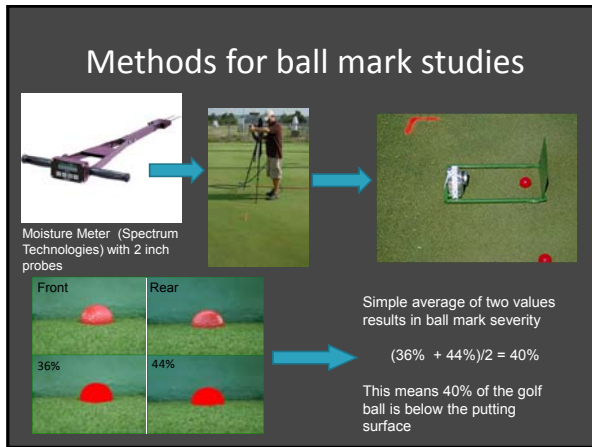


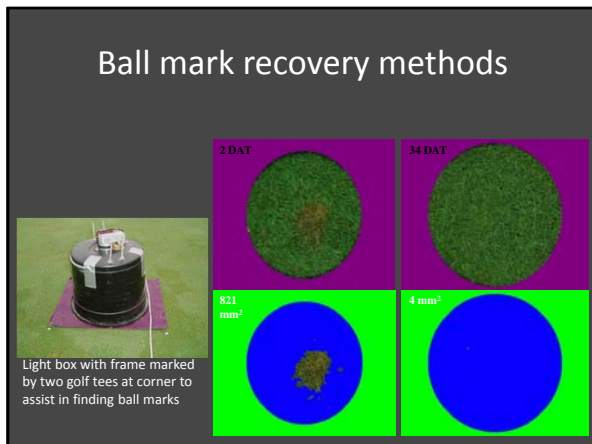
Wear Results – Rolling Frequency





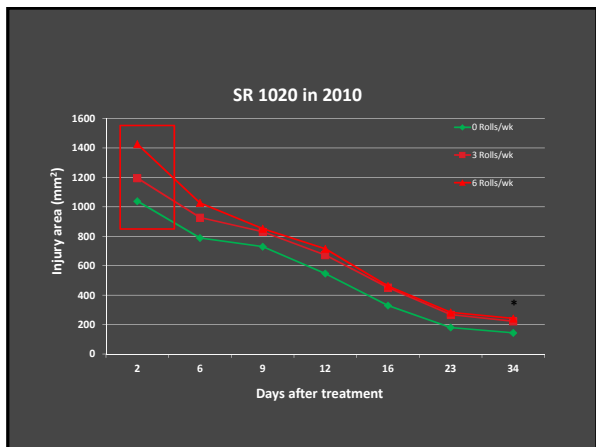


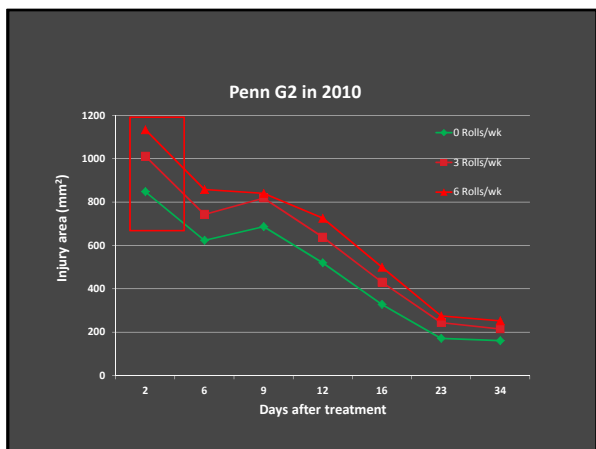


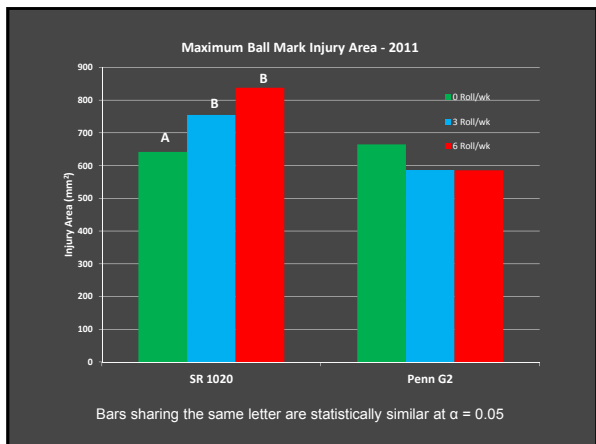


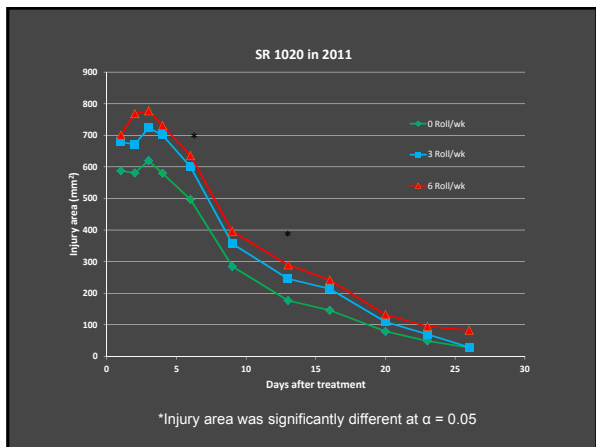
Mowing, rolling, and foot traffic

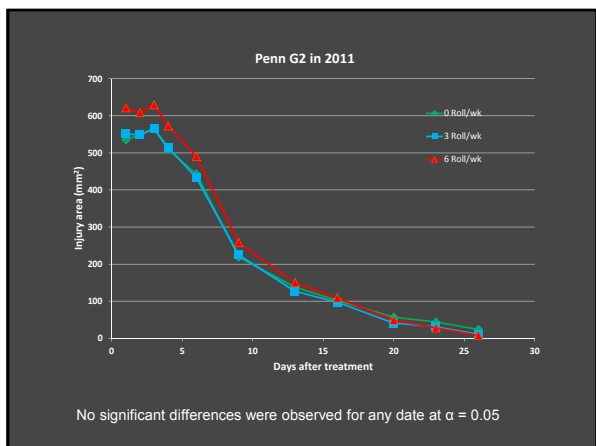
- Ball mark severity
 - No significant differences among treatments in 2010
 - No significant differences among treatments in 2011
 - Observed similar trends both years
 - Increased severity with increased water content
 - Injury area reduced with increased water content







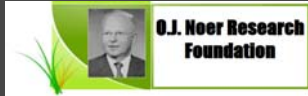




Mowing / Rolling Conclusions

- **Improve summer stress tolerance:**
With regular rolling, mowing height may be increased or mowing frequency decreased with no noticeable changes in green speed
- **Prepare for an event:**
Short-term intensive rolling doesn't negatively affect visual quality or rootzone physical properties
- **Reduce your budget:**
Alternating mowing and rolling will reduce maintenance costs at most facilities
- **Managing ball marks:**
Rolling can produce firmer greens which can increase ball mark injury

Acknowledgments





Thanks –
any questions ??

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