WM869 Results: Effect of N Rate on Nitrate-N Loading

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Nitrate Leaching from Newly Sodded Turf

- Floratam and Empire were planted as sod and nitrogen treatments applied same day
- Half of the plots received 2nd nitrogen application 30 days after planting
- N applied as water soluble urea 2 irrigation regimes

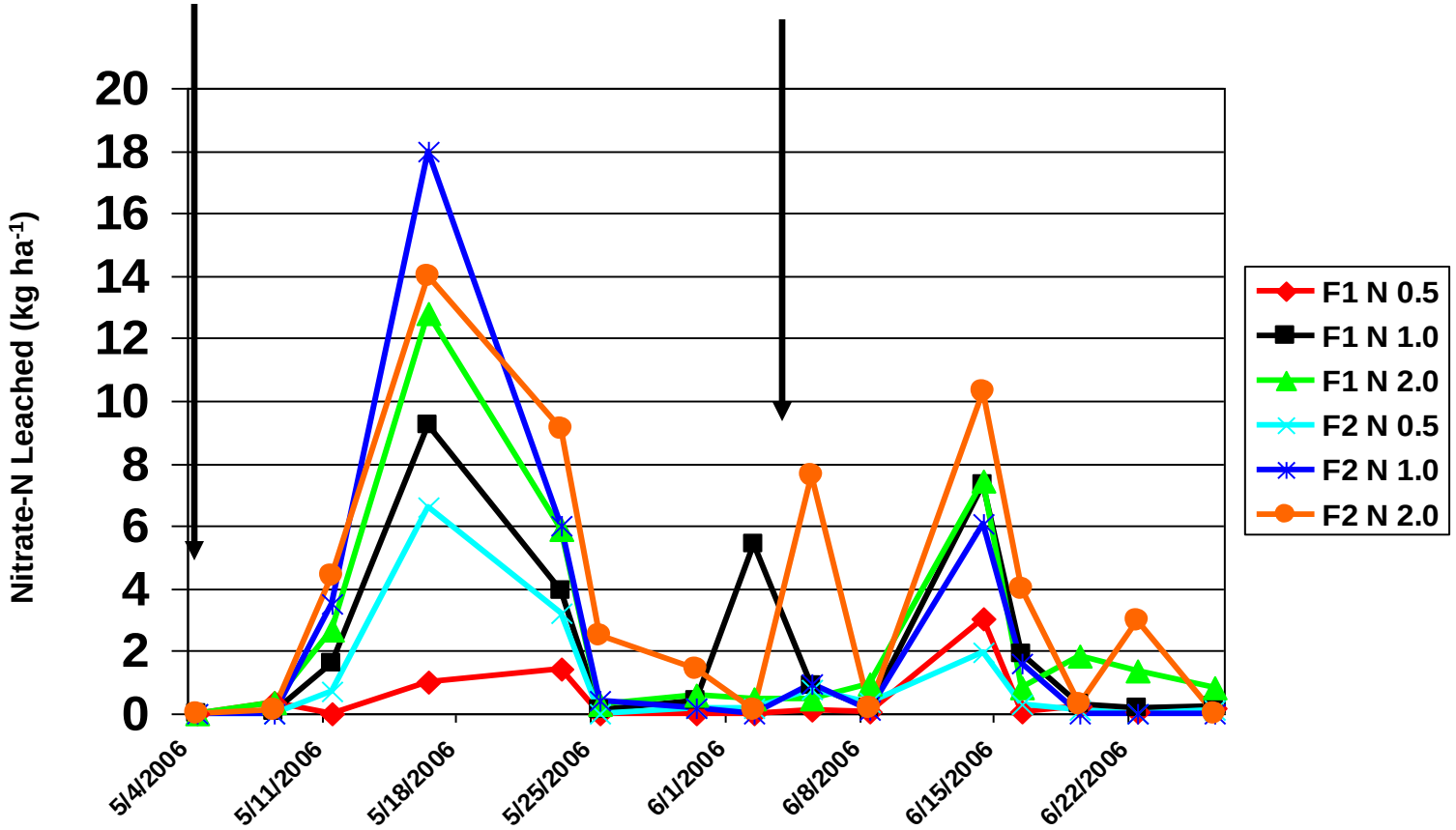
Treatments

	N Rate	Frequency
1.	0.5 lb N	DOP
2.	1.0 lb N	DOP
3.	2.0 lb N	DOP
4.	0.5 lb N	DOP + 30 DAP
5.	1.0 lb N	DOP + 30 DAP
6.	2.0 lb N	DOP + 30 DAP

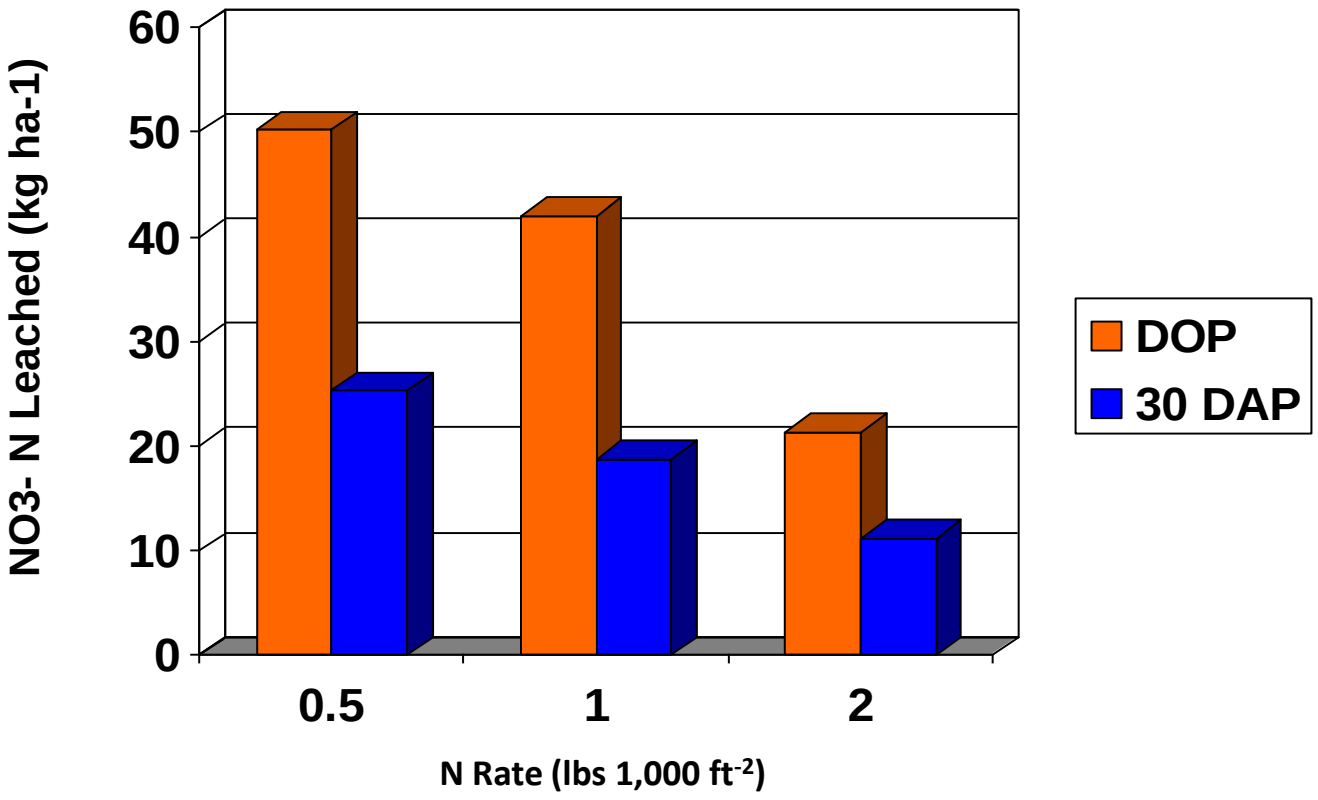
Nitrate-N Leached Over 60 Day Study Period

	Total NO_3-N Leached (kg N ha^{-1})			
	Empire		Floratam	
Source of Variation	Yr 1	Yr 2	Yr 1	Yr 2
Nitrogen Treatment (NT)	NS	NS	**	NS
Irrigation (IR)	NS	NS	NS	NS
NT * IR	NS	NS	NS	NS

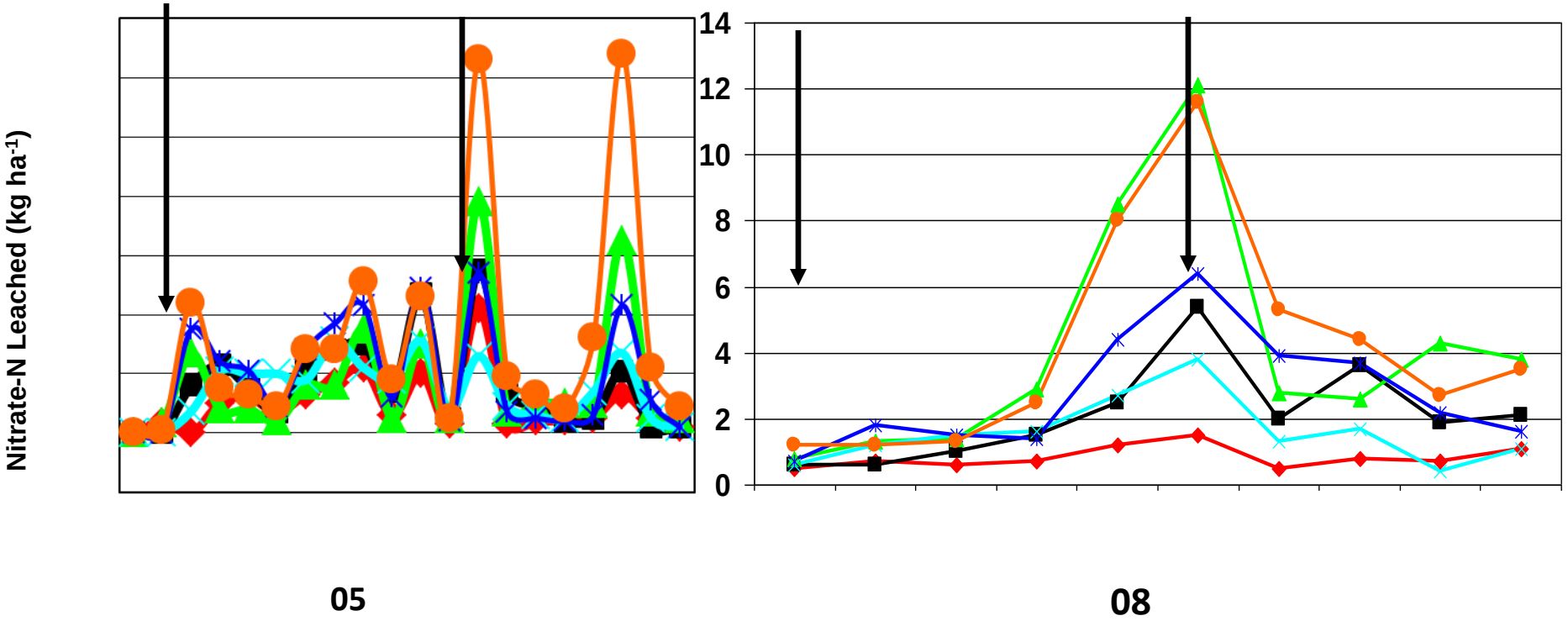
NO_3-N Leached From Newly Sodded Floratam



Percent of Applied N Leached From Newly Sodded Floratam



NO_3-N Leached From Empire



Conclusions

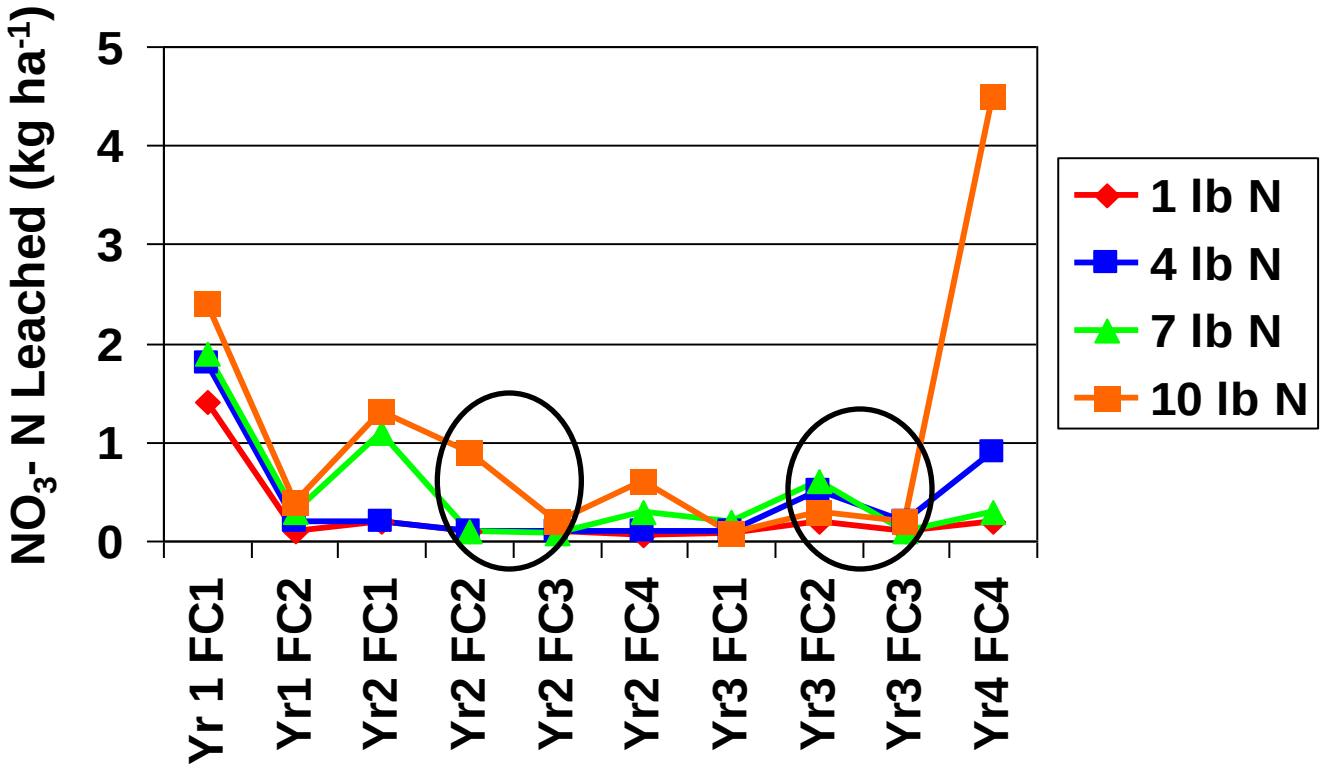
- Important to note that these rates of leaching are MUCH higher than from established turf
- Do not fertilize newly planted sod for 30-60 days after planting
- Without an established root system, more N likely to leach
- Turf quality and establishment time not compromised by lack of fertilization
- Sod typically fertilized prior to harvest

Nitrate Leaching Due to N Rate

- 3-yr study 2005-2007
- Established Floratam and Empire
- N applied in 4 applications throughout the year at rates of 1, 4, 7, or 10 lbs N 1,000 ft^{-2}
- N applied as water soluble urea
- 2 irrigation regimes (1” @ 1x wkly, 0.5” @ 2x wkly)

Source of Variation	Cumulative NO_3-N Leached	Cumulative NO_3-N Leached
	kg ha^{-1}	kg ha^{-1}
	2006	2007
NR	**	***
Grass	***	***
IR	NS	*
NR*Grass	NS	***
NR*IR	*	***
Grass*IR	NS	NS
NR*Grass*IR	NS	*

Nitrogen Rate Study - Nitrate-N Leaching from Floratam



Nitrogen applied as 100% soluble urea

Trenholm et al. 2009

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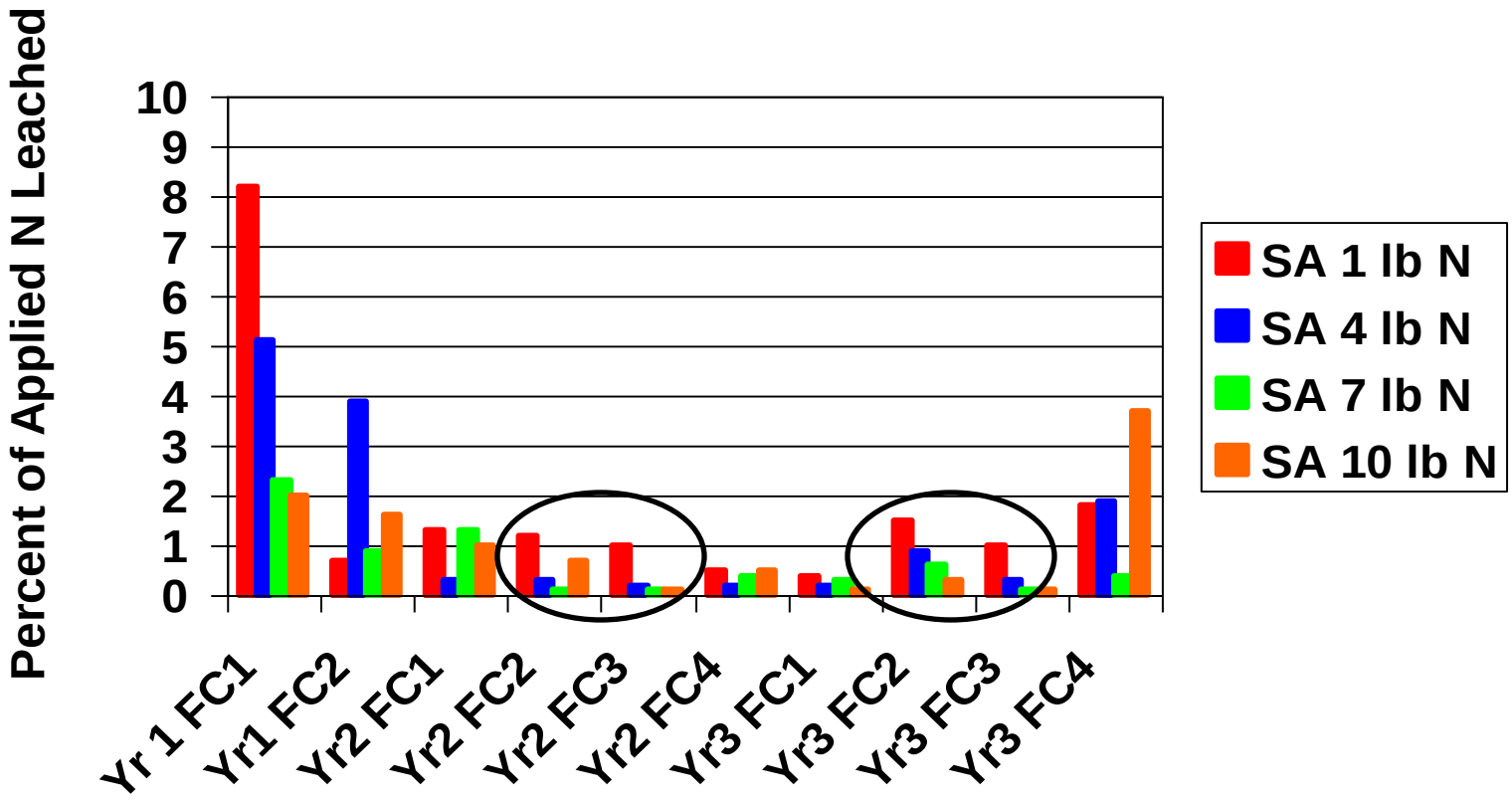
Nitrogen Rate Study -Percent of Applied N Leached from Floratam



Nitrogen applied as 100% soluble urea

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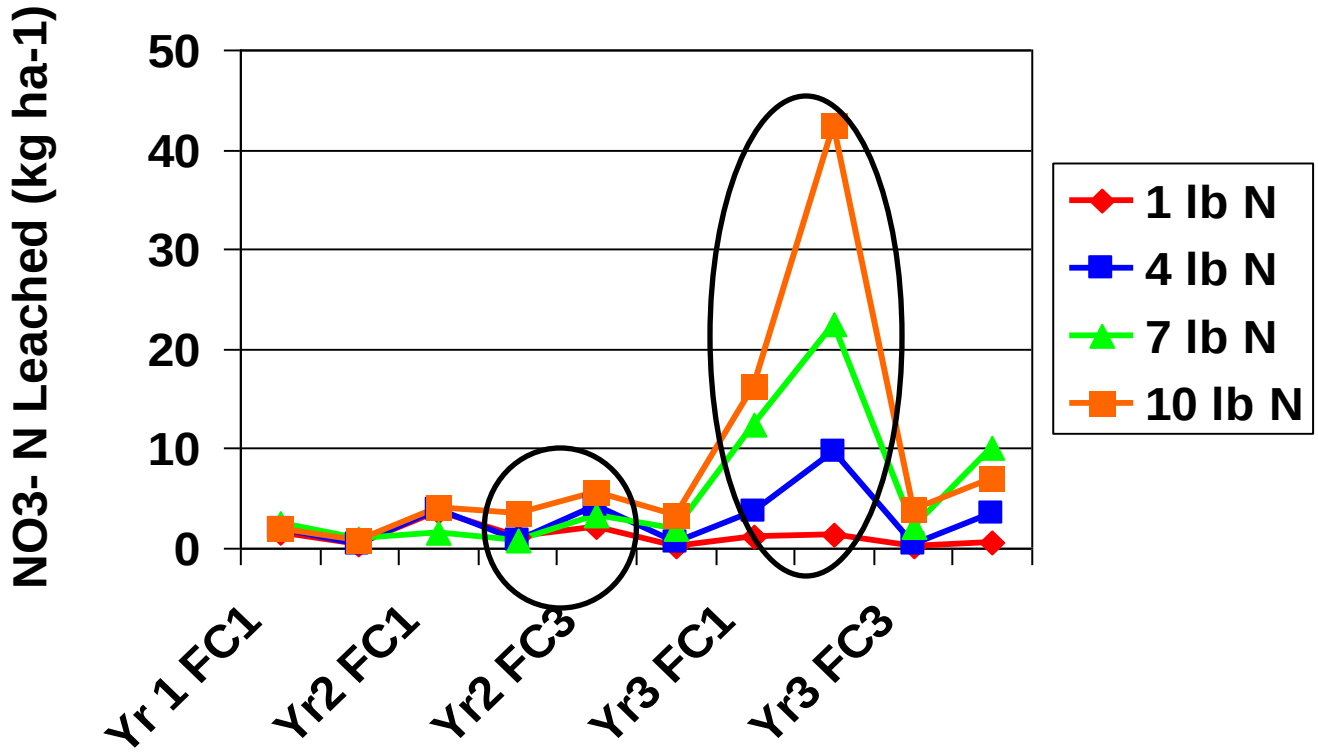
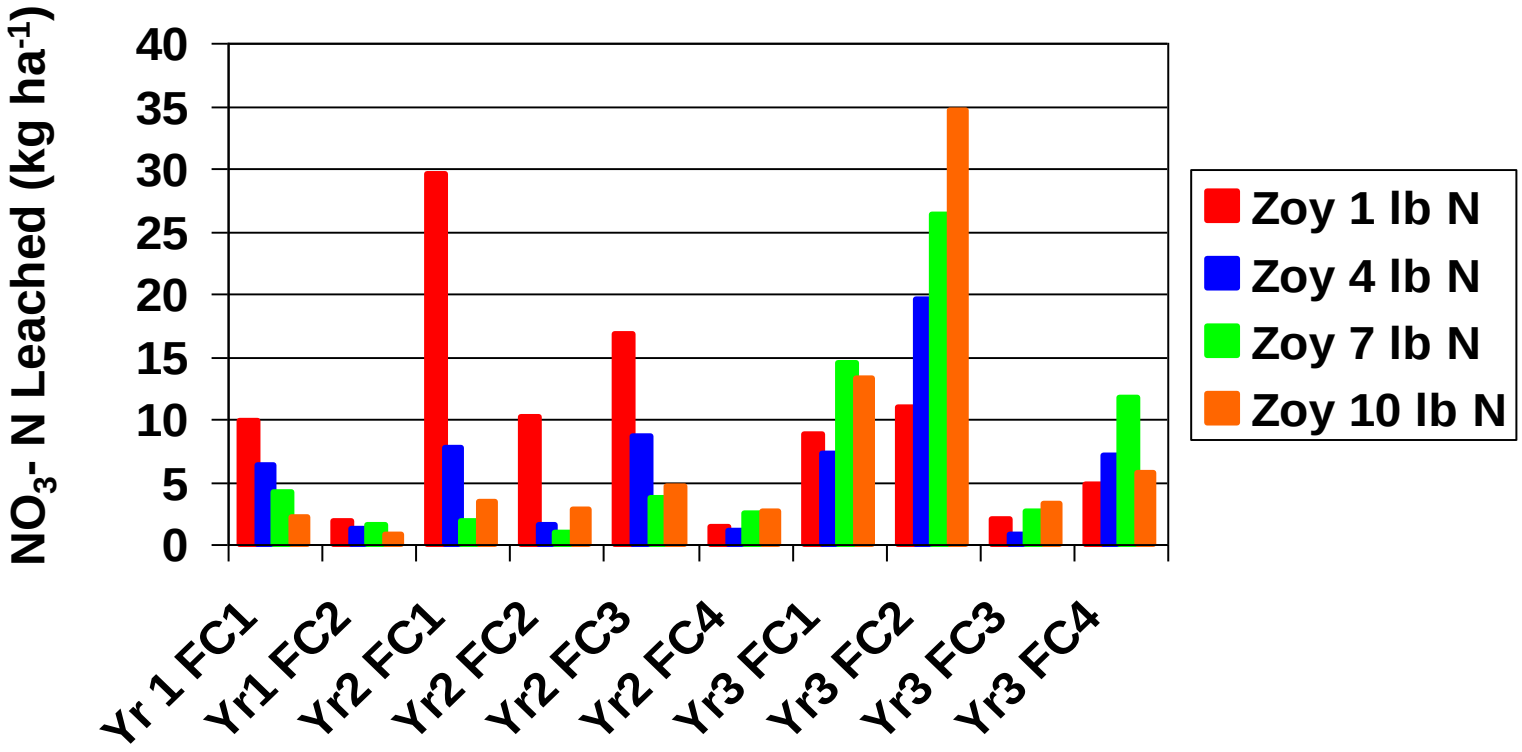
Nitrogen Rate Study- Nitrate-N Leaching from Empire



Nitrogen applied as 100% soluble urea

Trenholm et al. 2009

Nitrogen Rate Study - Percent of Applied N Leached from Empire



Nitrogen applied as 100% soluble urea

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Trenholm et al. 2009

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Conclusions

- A healthy turf cover reduced N leaching loads, even at higher than recommended application rates
- Importance of BMPs in maintaining a healthy turf cover (fertilization, mowing, irrigation)
- Turf should be fertilized during the growing season – many can't do this due to local ordinances
- Highest tendency for increased leaching occurred in spring and fall, not in summer

Conclusions

- Current N recommendations for SA are good
- Zoysia more prone to increased leaching as applied N increased, but less N required than SA to maintain healthy turf cover
  - Greater disease at higher N rates
- Zoysia N recommendations may be revised downwards to reduce disease and potential for greater N losses

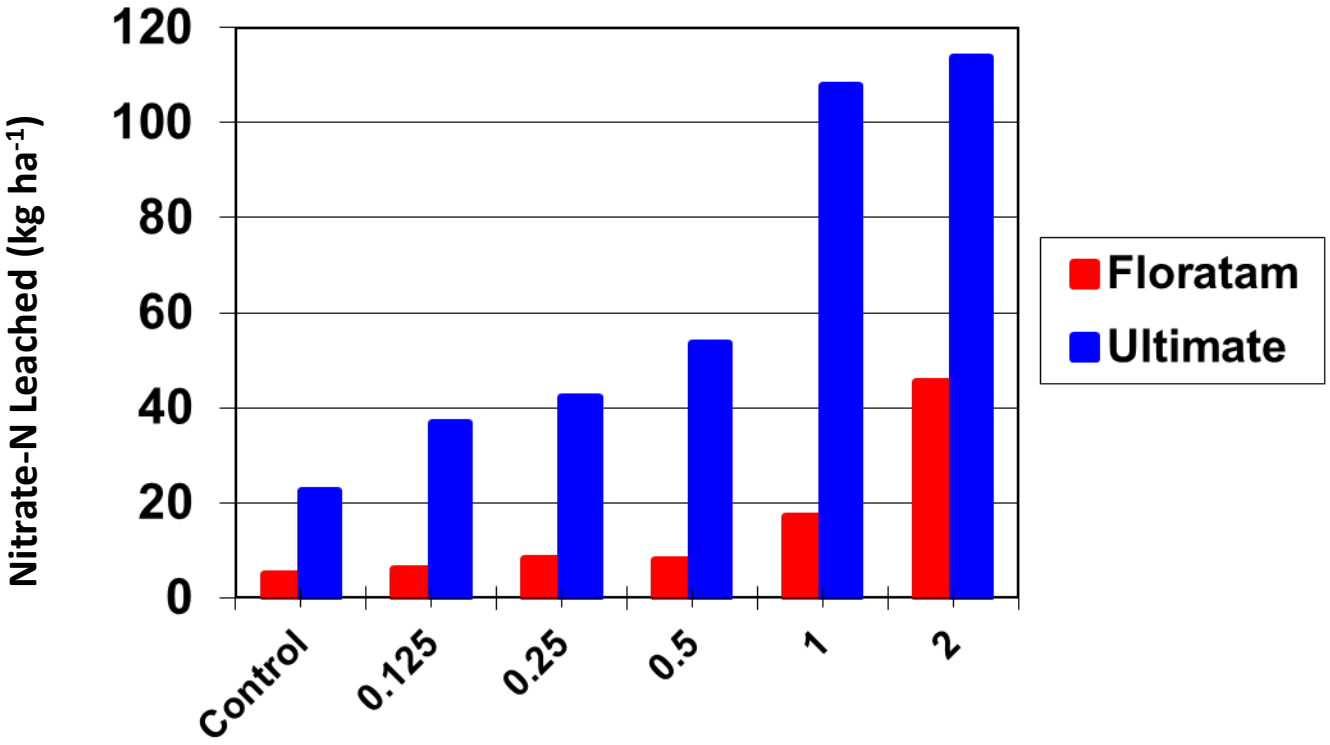
Nitrate Leaching in Winter Months

- Apply N at different rates monthly throughout winter to Floratam and Ultimate zoysiagrass
- Control, .125, .25, .50, 1.0 and 2.0 lbs N 1,000 ft^{-2} mo.
- N applied as water soluble urea

Nitrate Leaching in Winter Months

	Cumulative NO3-N Leached		
	2006-07	2007-08	2008-09
Nitrogen Rate	**	*	*
Grass	***	***	***
NR x Grass	**	NS	**

Nitrate Leaching in Winter Months (Yr 1 Nov-March Cumulative)



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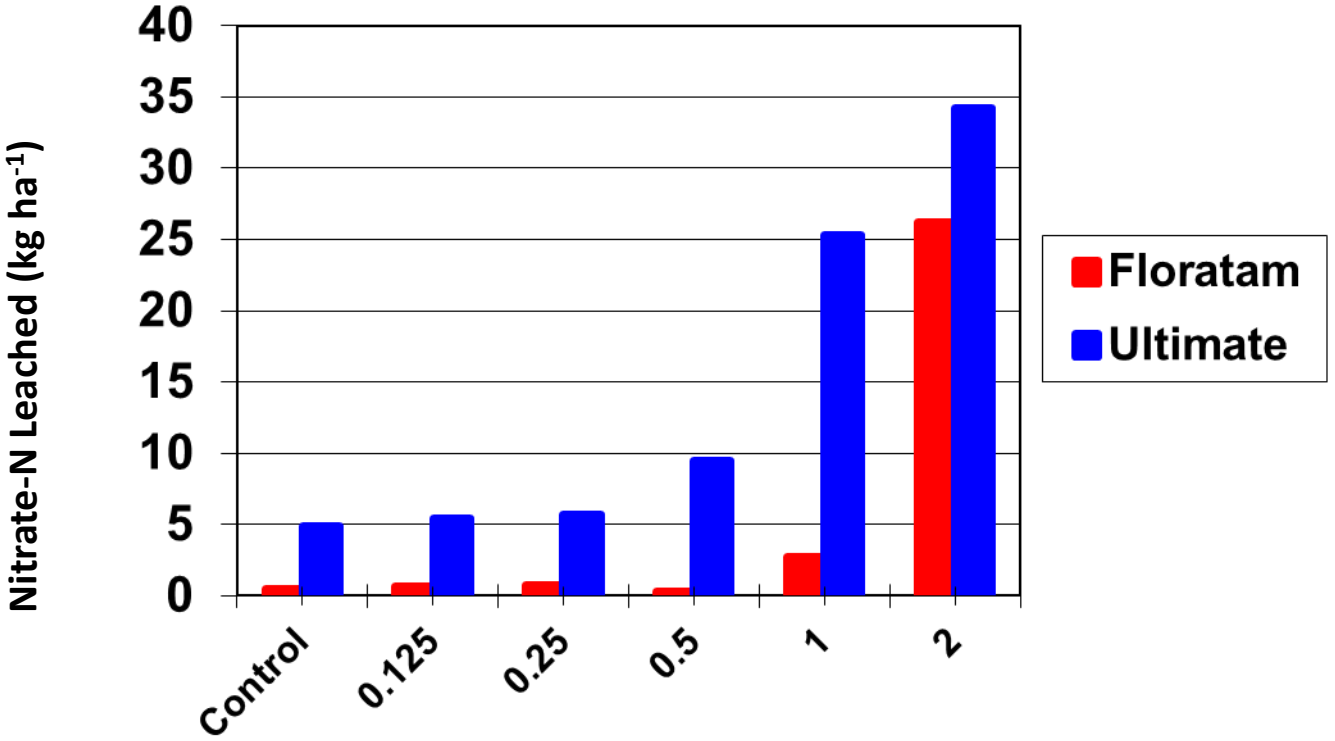
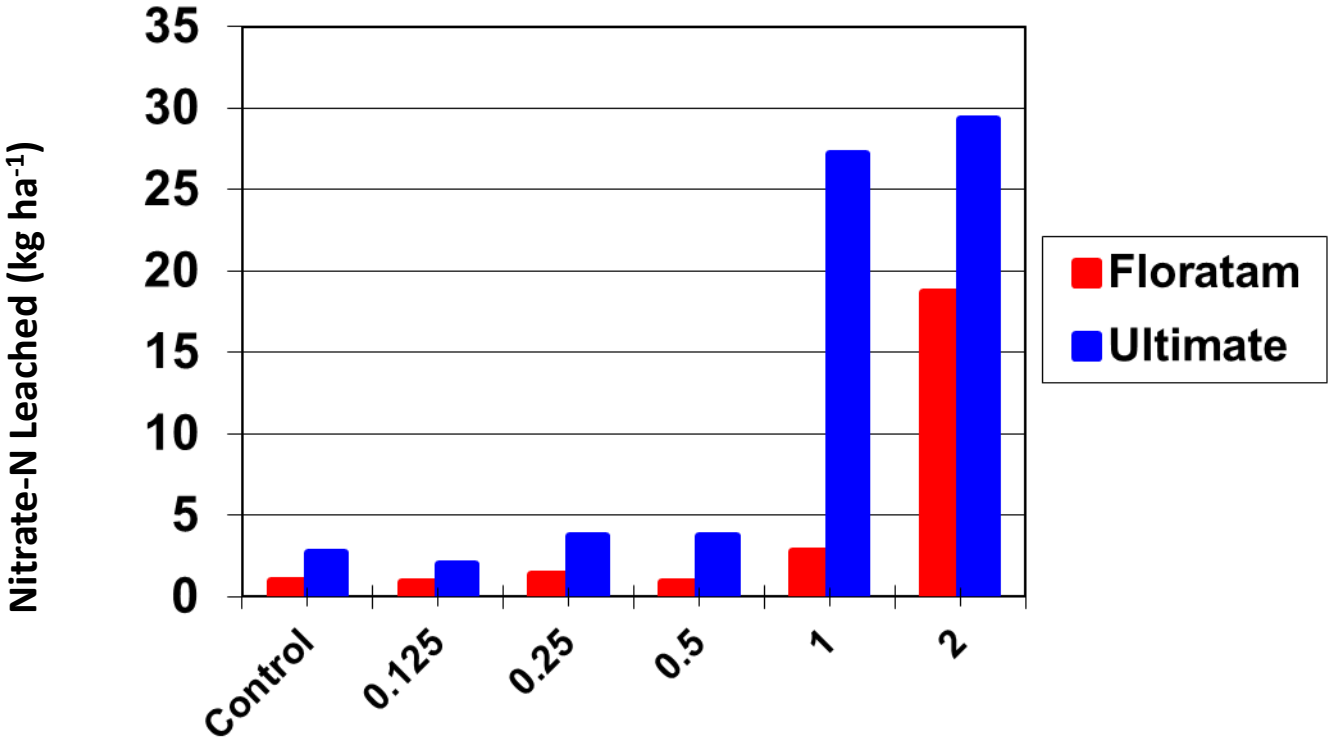
Nitrate Leaching in Winter Months Yr 2 (Dec-Mar Cumulative)



N Rate, lbs. 1,000 ft^{-2}

2007-08

Nitrate Leaching in Winter Months Yr 3 (Nov-March Cumulative)



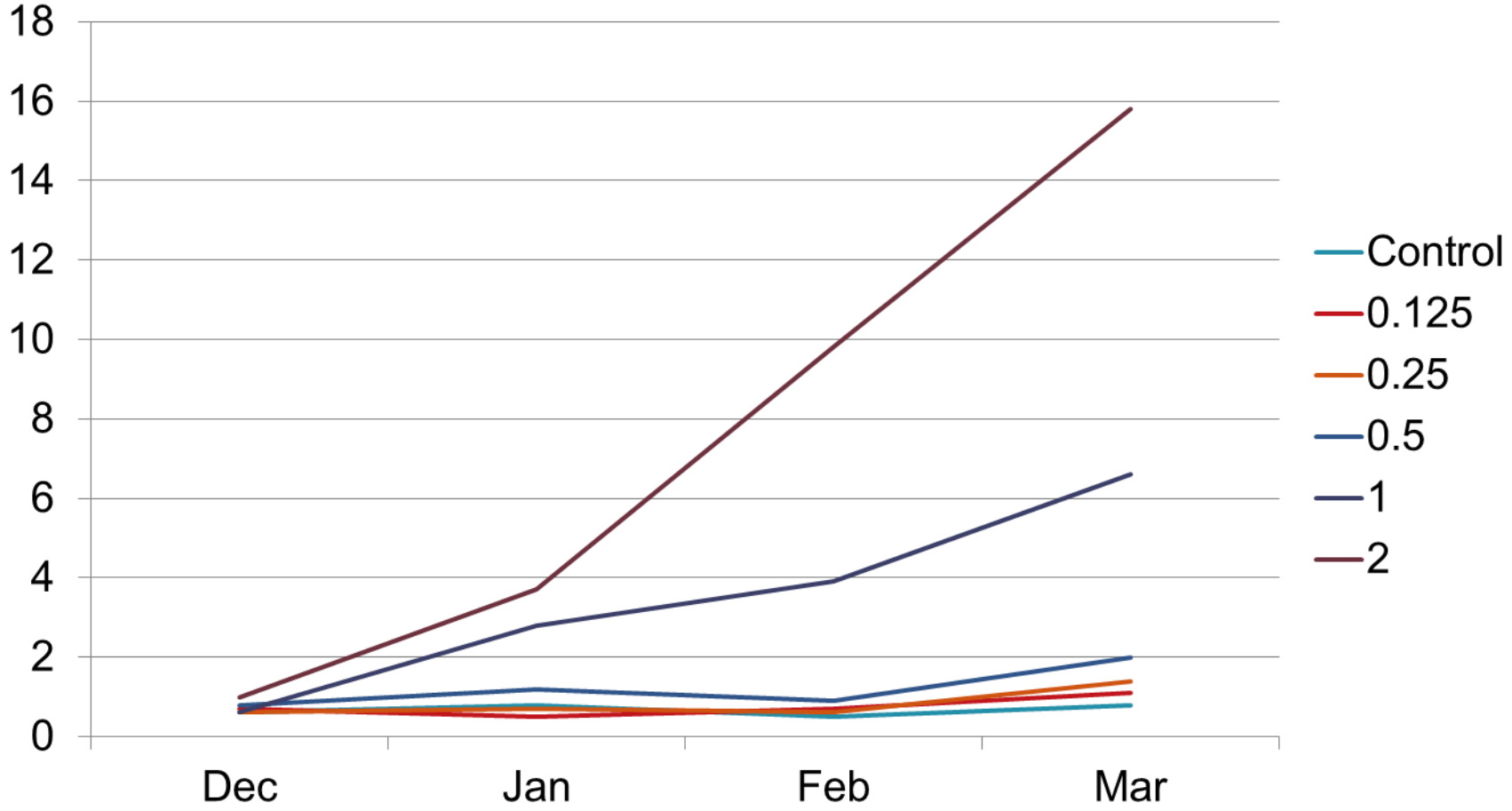
N Rate, lbs. 1,000 ft^{-2}

2008-09

Analysis of Variance by Month

ANOVA by Month	Yr 1	Yr 2	Yr 3
Grass (G)	**	*	*
Nitrogen (N)	***	***	***
Month (M)	***	***	***
G*N	**	NS	**
G*M	***	NS	**
N*M	***	***	***
G*N*M	***	NS	**

NO_3-N Loading By N Rate and Month Yr 2



Conclusions

- While there were few differences in leaching at the lower N rates, these loading rates exceed what occurs during the growing season
- Leaching higher in zoysia and at two highest N rates
- Turf quality/color not improved by fertilization
- Trend towards greater leaching in winter/spring than in fall months
- If additional N applications to be done due to summer bans or contractual obligations, these data suggest they should be done in fall rather than spring

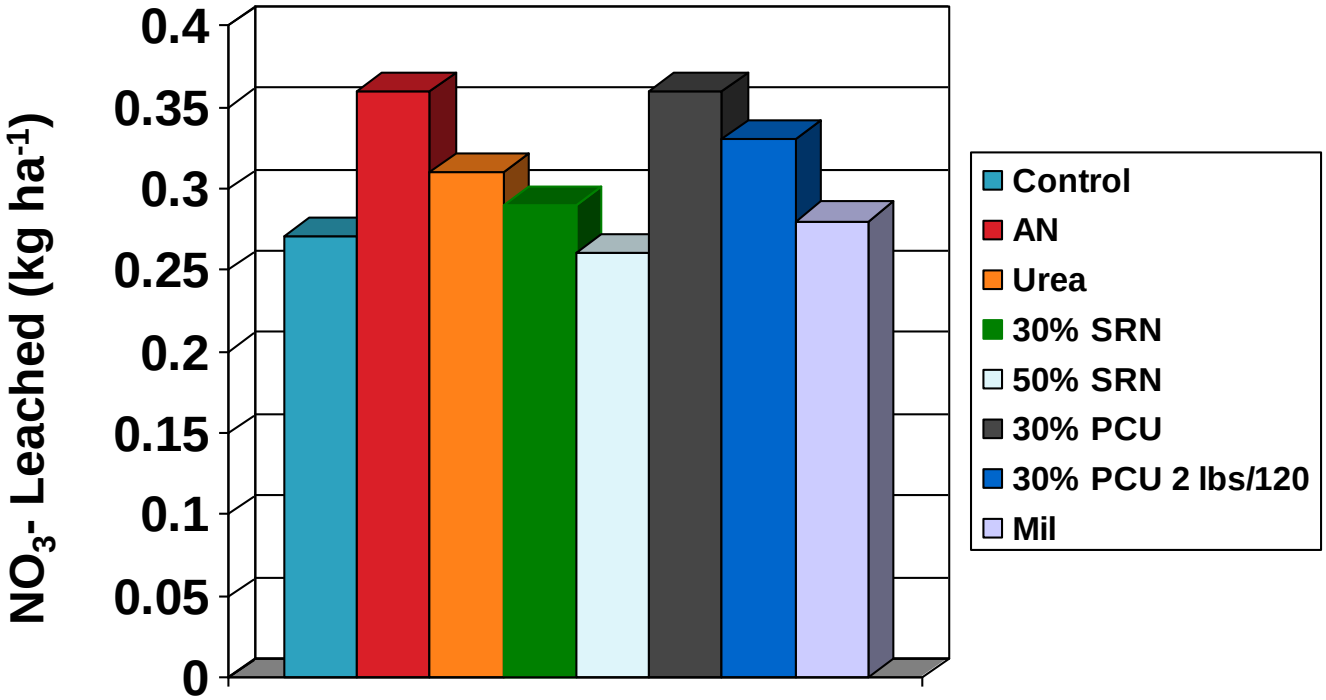
NO_3-N Leaching Due to N Source

2008-2012

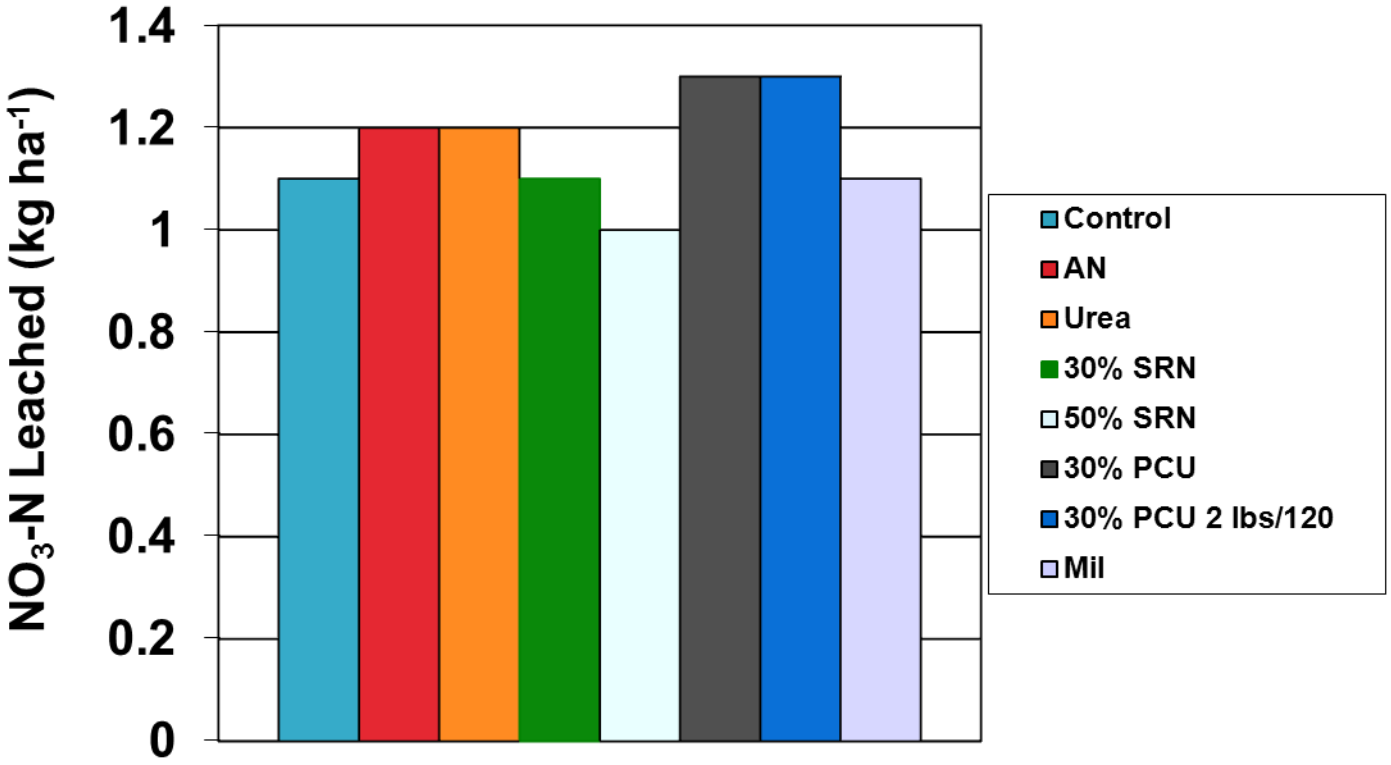
8 Treatments:

- Control
- Ammonium nitrate @ 1 lb N 1,000 ft^{-2} every 60 days
- Urea @ 1 lb N 1,000 ft^{-2} every 60 days
- 30% sulfur coated urea @ 1 lb N 1,000 ft^{-2} every 60 days
- 50% sulfur coated urea @ 1 lb N 1,000 ft^{-2} every 60 days
- 32.8% polymer coated urea @ 1 lb N 1,000 ft^{-2} every 60 days
- 32.8 polymer coated urea @ 2 lb N 1,000 ft^{-2} every 120 days
- Milorganite @ 1 lb N 1,000 ft^{-2} every 60 days

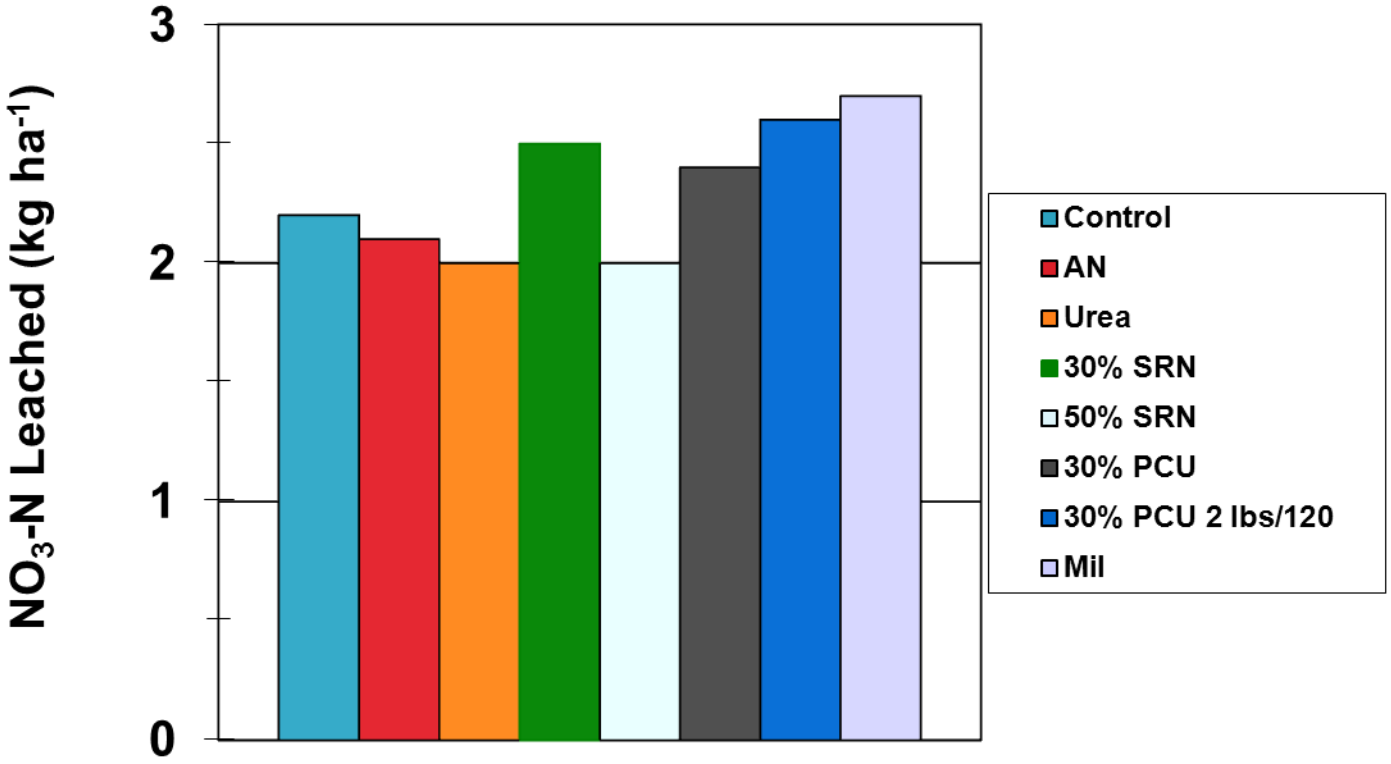
Nitrogen Source Leaching Study- Annual Load from Floratam 2008



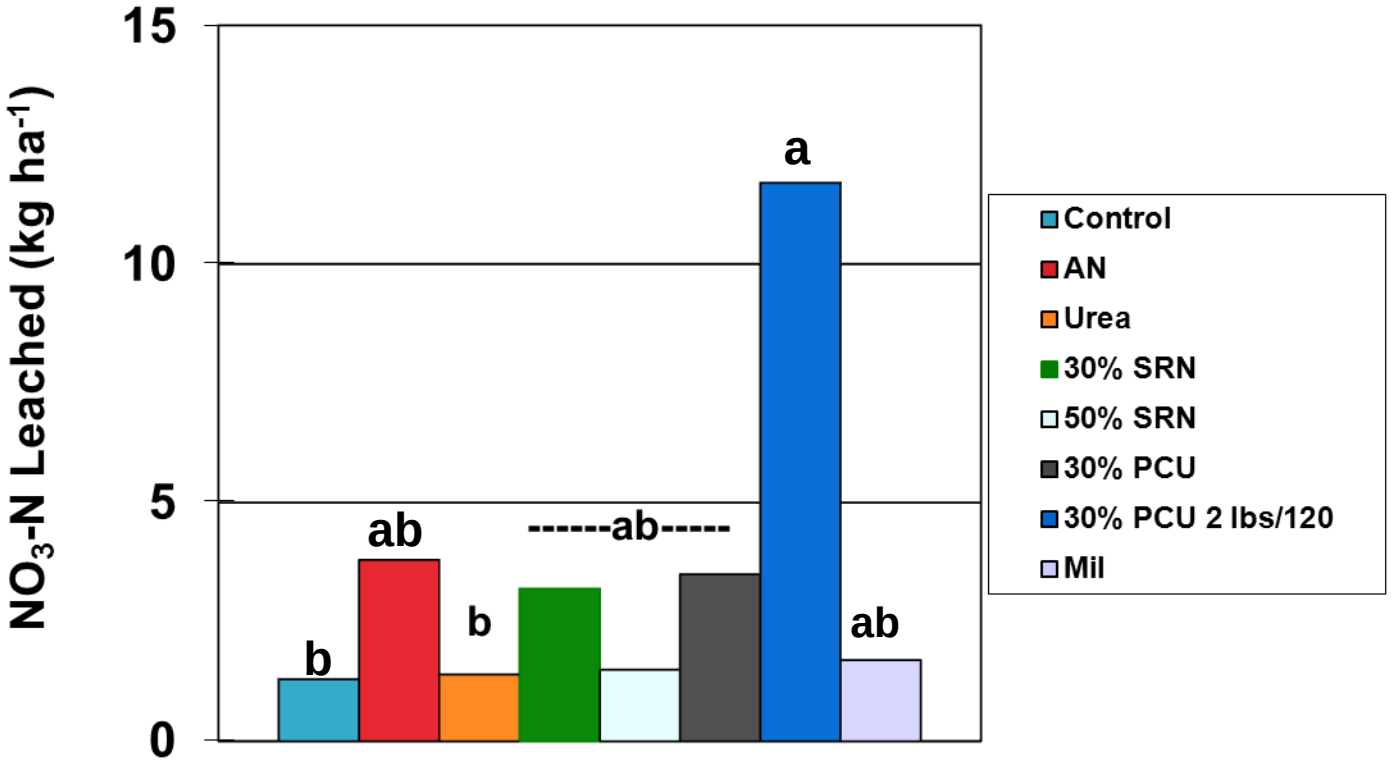
Nitrogen Source Leaching Study- Annual Load from Floratam 2009



Nitrogen Source Leaching Study- Annual Load from Floratam 2010



Nitrogen Source Leaching Study- Annual Load from Floratam 2011



Conclusions

- No differences between N sources in Floratam at the rates applied in 3 of 4 years
- Soluble vs. controlled release was not typically an issue in leaching in this research
- Can we raise the Urban Turf Rule to allow a 2 lb application of CRF?

Overall Message

- Maintenance of healthy turf important to reducing nitrate leaching losses
  - Commercial operators are BMP trained, which covers all cultural aspects of lawn care
  - Homeowners???
- A healthy turf can take up the recommended IFAS application rates with minimal leaching loss
- N source not as important when turf healthy and fertilizer applied correctly
- Fertilizer application timing should coincide with the growing season

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