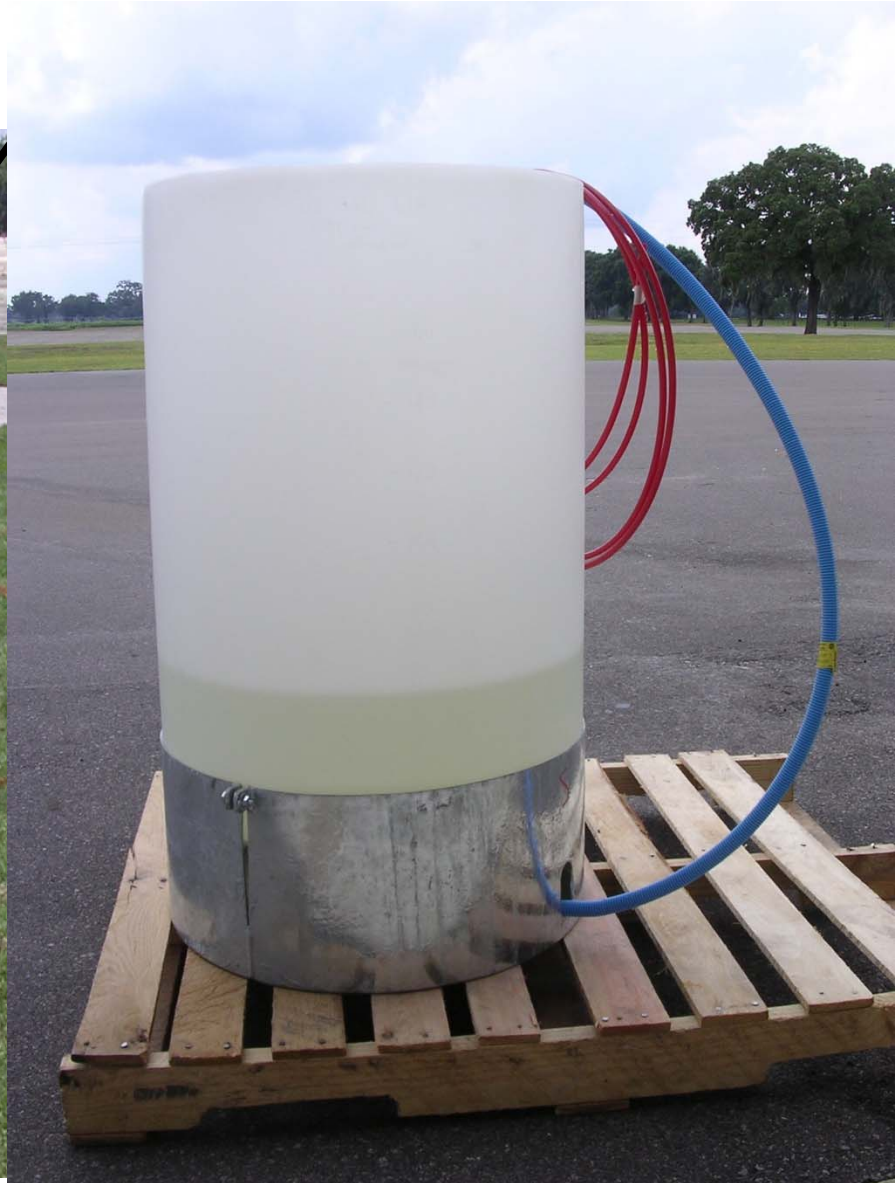


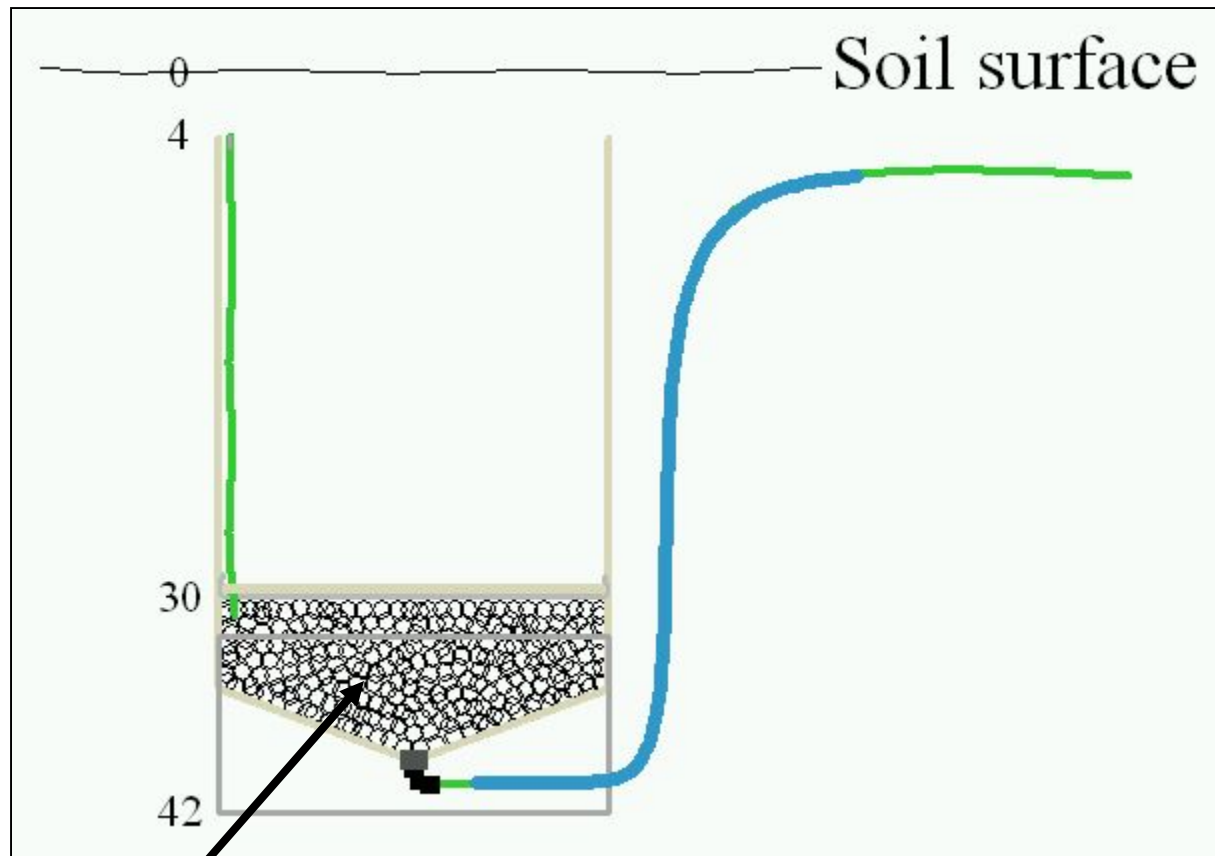
# Nitrate Leaching From Turf Fertilization- A Summary of FDEP- Funded Research

Laurie E. Trenholm, Ph.D.  
Urban Turfgrass BMP Specialist  
UF-IFAS



## Lysimeters





As nitrate percolates downward through the column, it collects in reservoir filled with gravel. At bottom of lysimeter is a portal for tubing that runs to collection device aboveground. To collect leachate, a vacuum pump is attached to the tubing and water evacuated from base. A sub-sample is collected for analysis.

# Research Projects

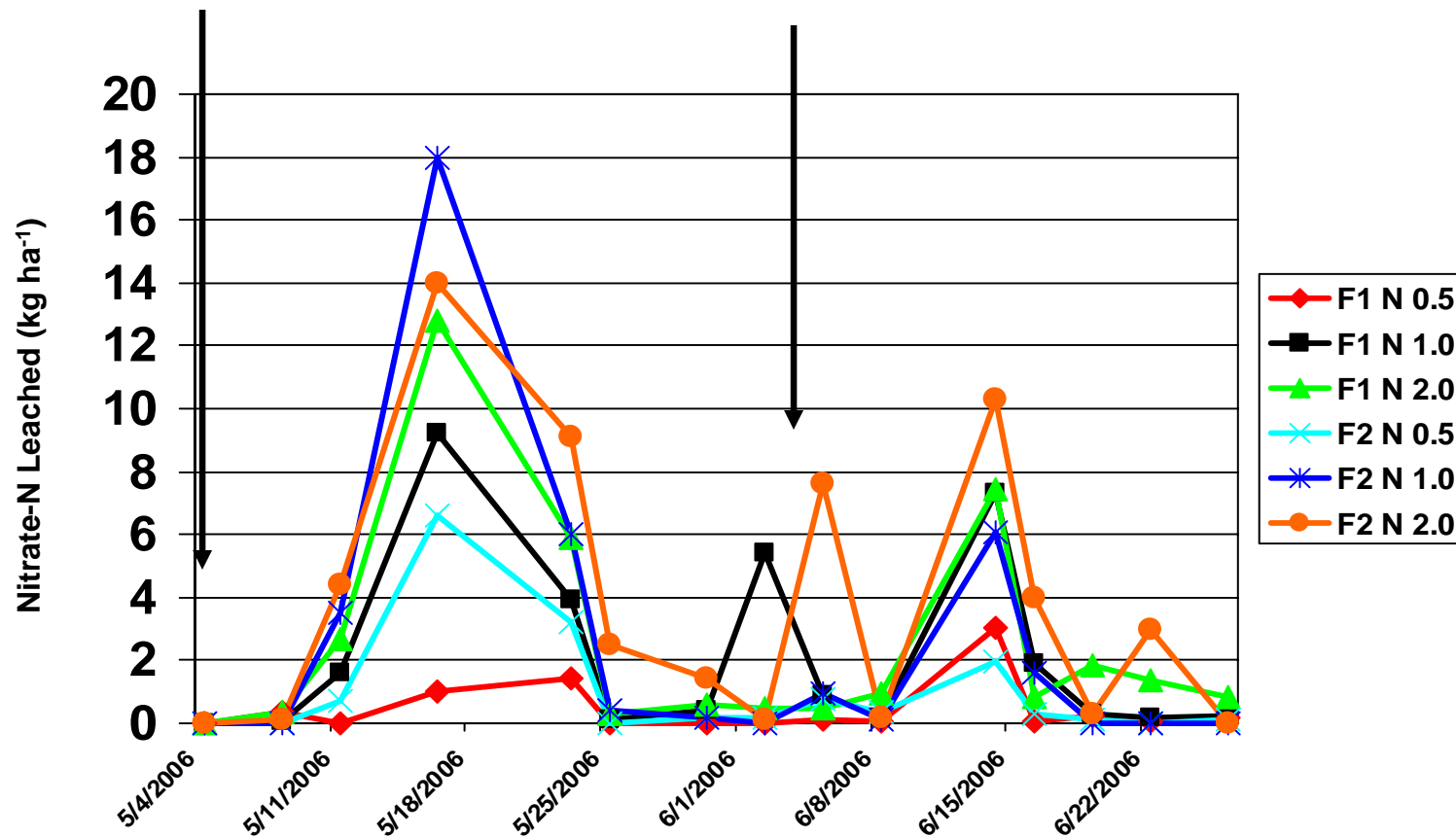
1. Nitrate Leaching from Newly Sodded Turf
2. Nitrate Leaching Due to N Rate
3. Nitrate Leaching Due to N Source
4. Nitrate Leaching in Winter Months
5. Phosphorus Leaching
6. Nitrate Leaching Due to Mowing Height
7. Nitrate Leaching Due to Clipping Management

# Nitrate Leaching from Newly Sodded Turf

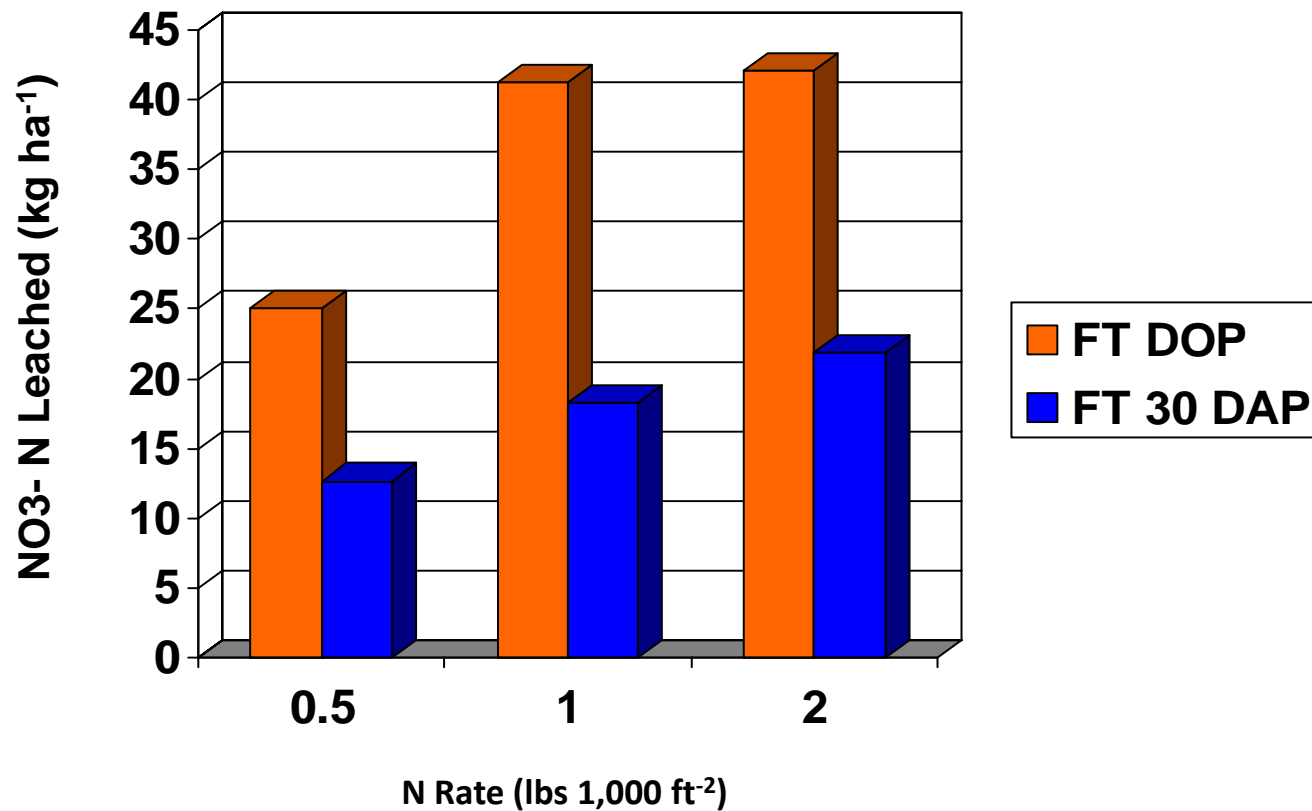
- Floratam St. Augustinegrass and Empire zoysiagrass were planted as sod and nitrogen treatments applied same day
- Half of the plots received 2<sup>nd</sup> nitrogen application 30 days after planting
- N applied as non-coated, quick-release urea granules
- 3 N rates: 0.5, 1.0, 2.0 lbs 1,000 ft<sup>-2</sup>
- 2 irrigation regimes



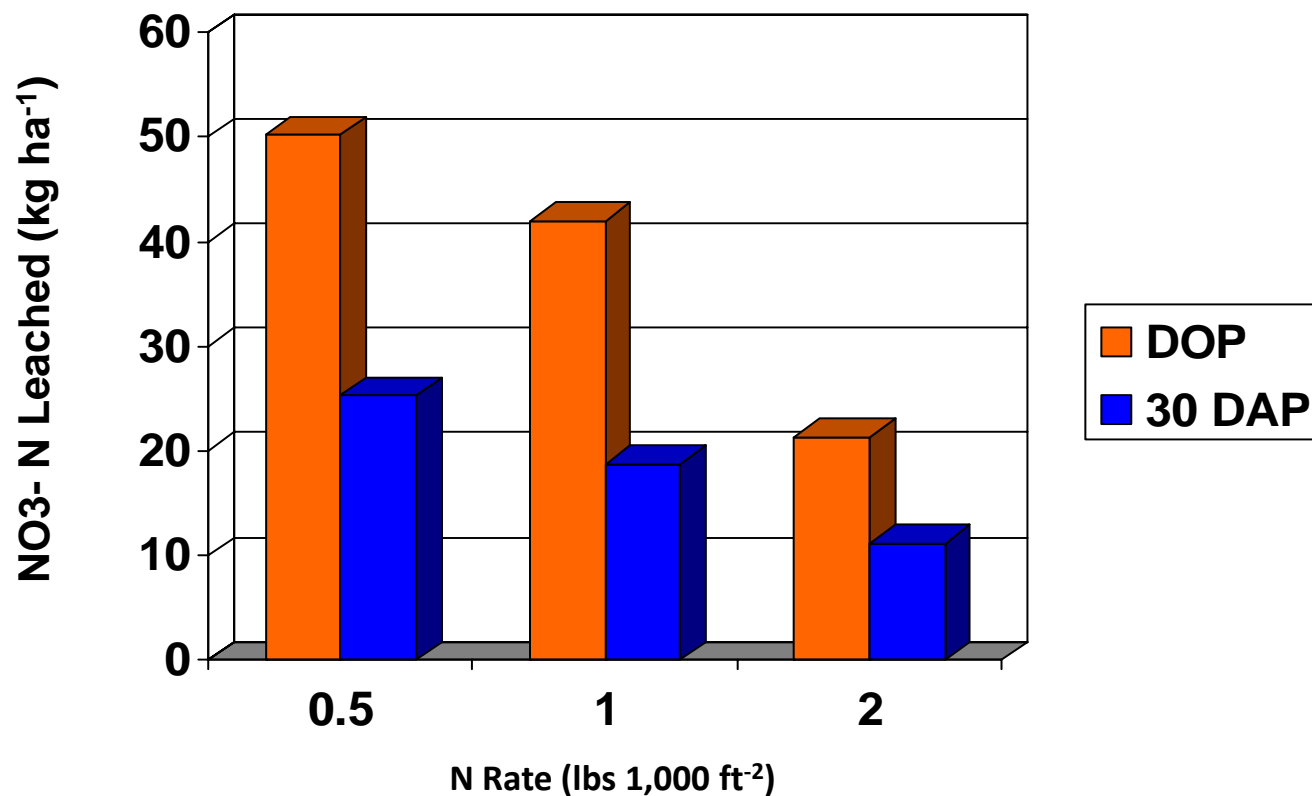
# NO<sub>3</sub>-N Leached From Newly Sodded Floratam



# Cumulative Nitrate Leaching From Newly Sodded Floratam

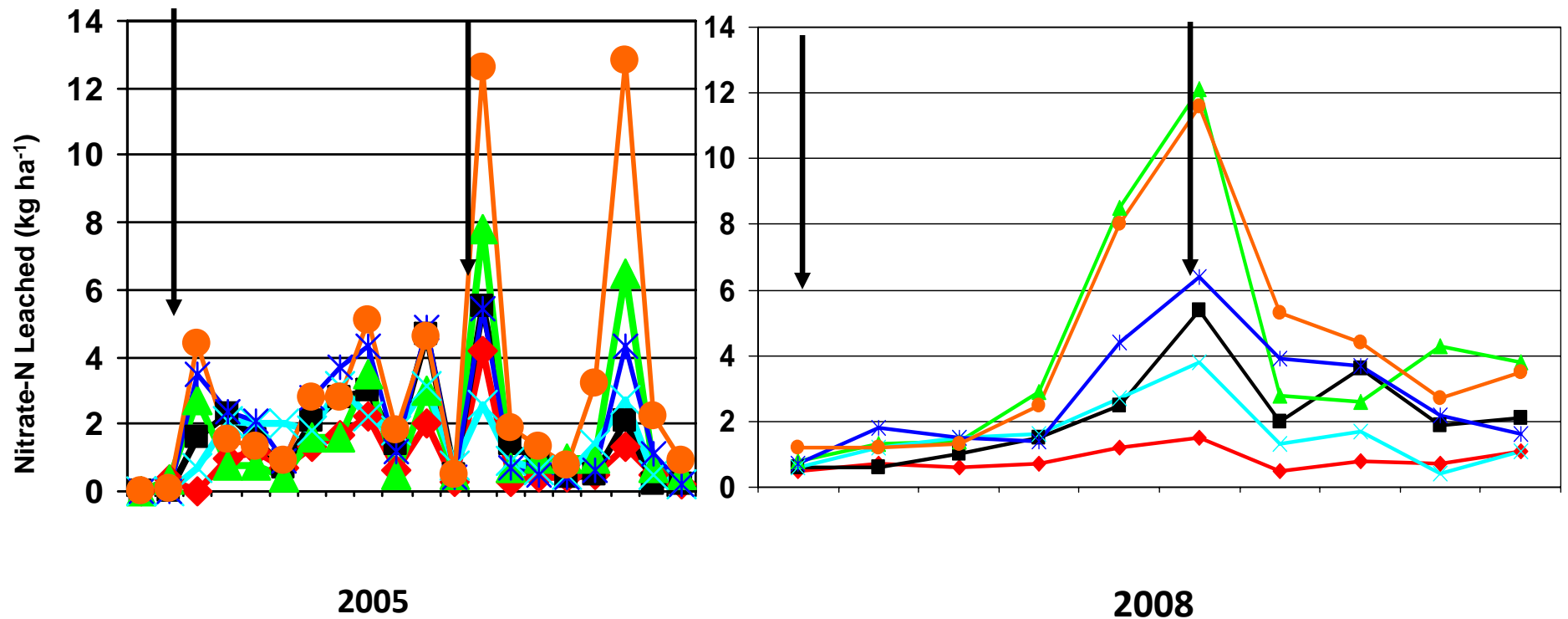


# Percent of Applied N Leached From Newly Sodded Floratam





# NO<sub>3</sub>-N Leached From Newly Sodded Empire



# Conclusions

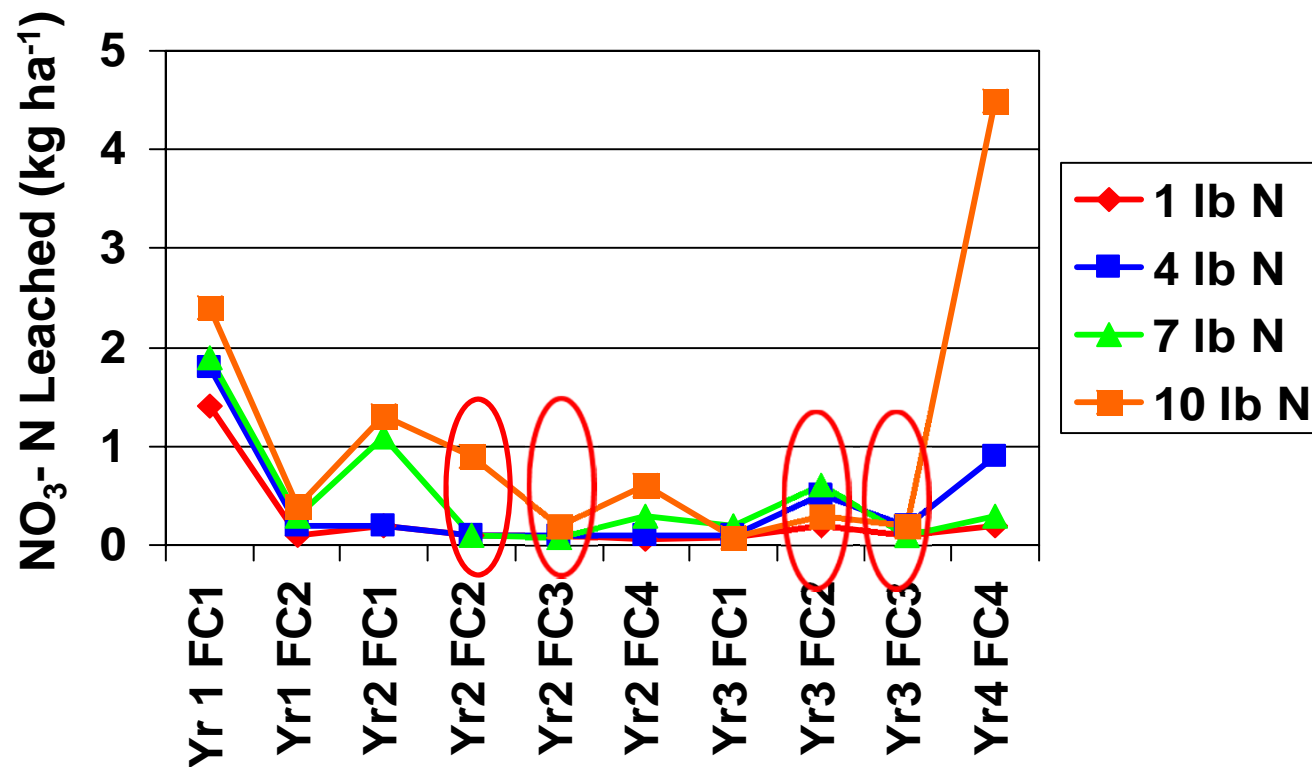
- Important to note that these rates of leaching are **MUCH** higher than from established turf
- Do not fertilize newly planted sod for 30-60 days after planting
- Without an established root system, more N likely to leach
- Turf quality and establishment time generally not compromised by lack of fertilization
- While not compared statistically, leaching load was similar between both grasses for the 60-day period following sodding

# 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<sup>-2</sup>
- Actual rates per application: 0.25, 1, 1.75, 2.5 N 1,000 ft<sup>-2</sup>
- Currently recommended N rate for QRN is no more than 0.5 lbs N 1,000 ft<sup>-2</sup>
- N applied as quick-release urea dissolved in water and applied through sprayer

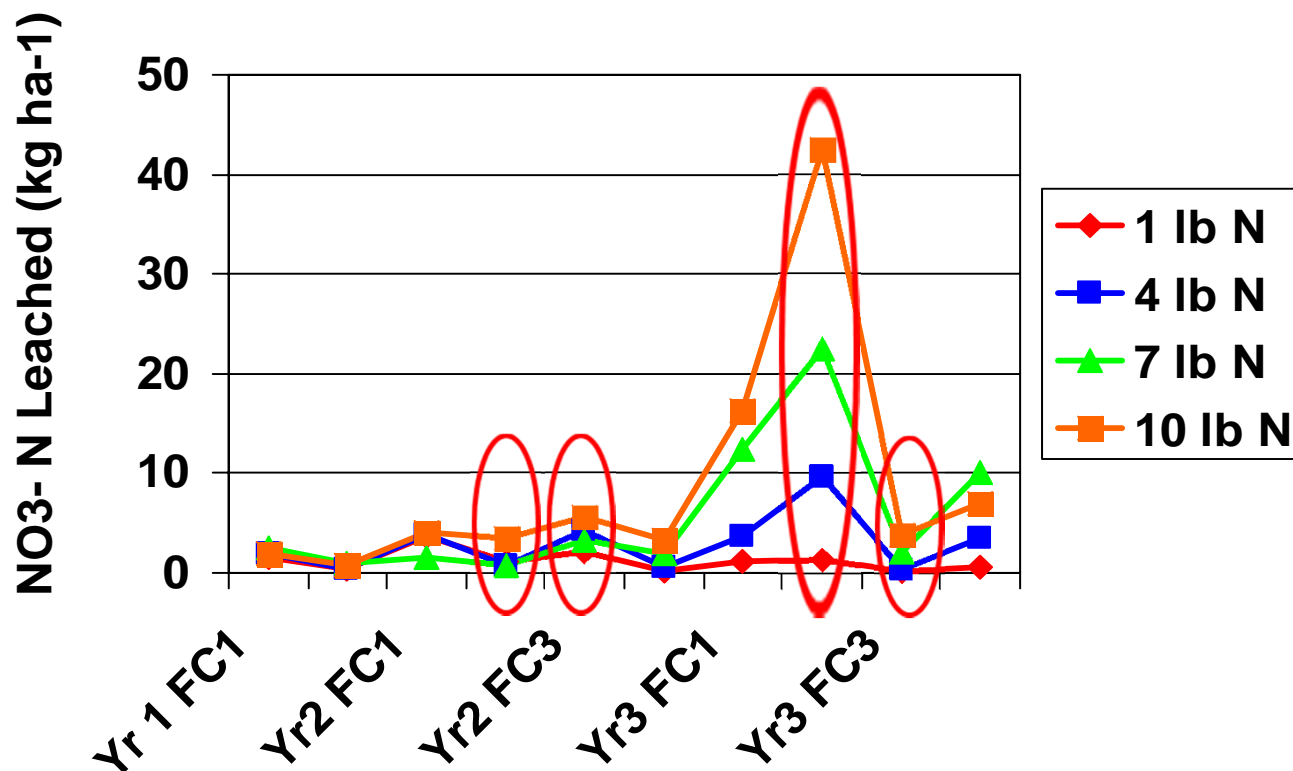
Source of Variation	Cumulative NO <sub>3</sub> -N Leached		
	----- kg ha <sup>-1</sup> -----		
	2005	2006	2007
NR	NS	**	***
Grass	NS	***	***
IR	NS	NS	*
NR*Grass	NS	NS	***
NR*IR	NS	*	***
Grass*IR	NS	NS	NS
NR*Grass*IR	NS	NS	*

# Nitrogen Rate Study - Nitrate-N Leaching from Floratam



Nitrogen applied as 100% soluble urea

# Nitrogen Rate Study- Nitrate-N Leaching from Empire



Nitrogen applied as 100% soluble urea



# Conclusions

- As SA matured after first year, nitrate leaching was minimized, regardless of N rate
- Zoysia more prone to increased leaching as applied N increased
  - Greater disease at higher N rates
  - Lack of healthy turf cover, especially early in season
- Highest tendency for increased leaching occurred in spring and fall, not in summer
- Importance of healthy turf in reducing leaching load

# Nitrate Leaching Due to Nitrogen Source

- 8 nitrogen sources applied @ 1 lb N 1,000 ft<sup>-2</sup> 4x yr (consistent with currently recommended rates)
- Established Floratam and Empire
- Study on going through this year

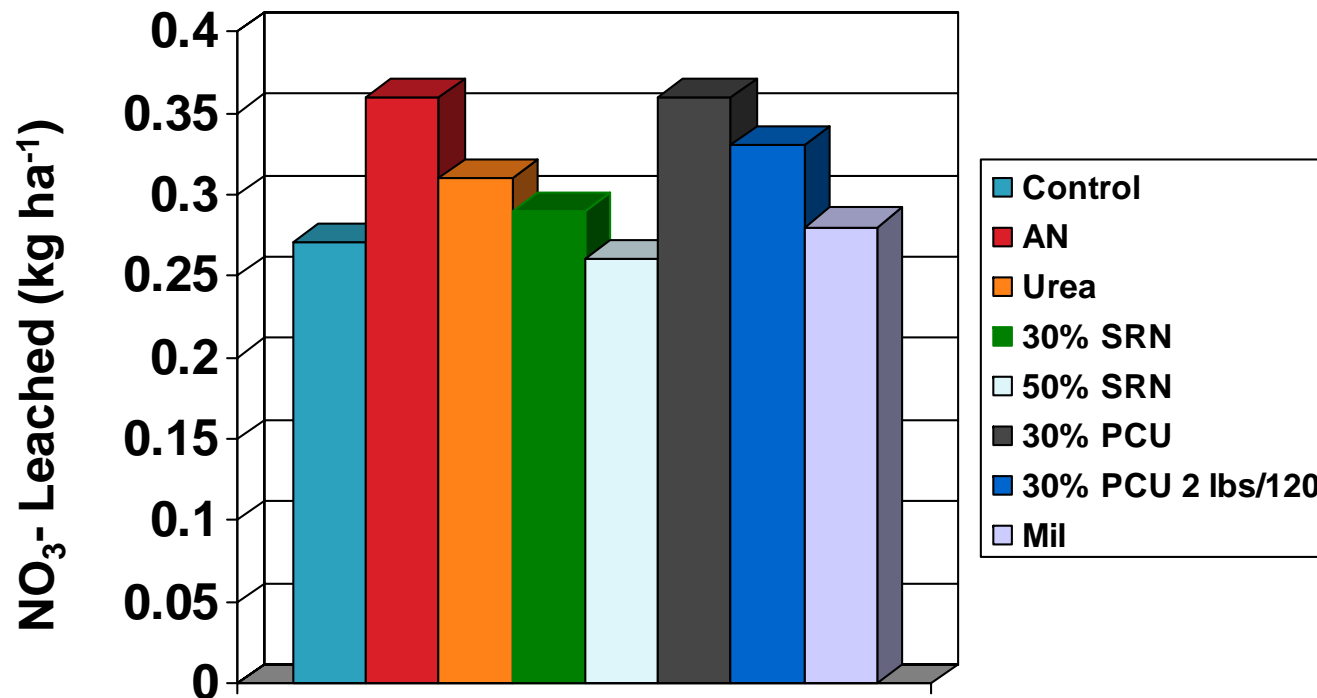


Figure 1 - Leaching columns experiment aspects

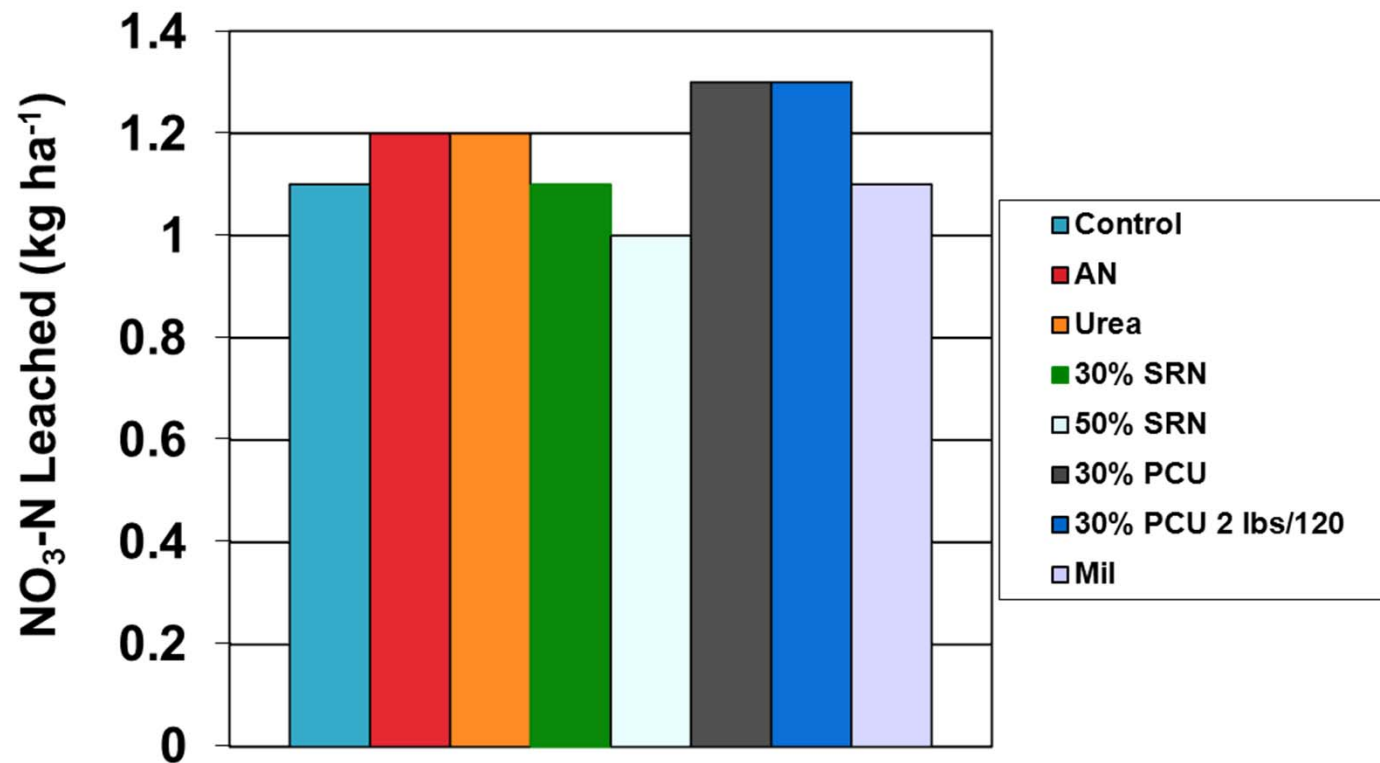
# NO<sub>3</sub>-N Leaching Due to Nitrogen Source

Source of Variation	Total Cumulative NO <sub>3</sub> -N Leached (kg N ha <sup>-1</sup> )	Cumulative % Applied N Leached
Nitrogen Source (N)	***	***
Grass (G)	NS	NS
N x G	***	***

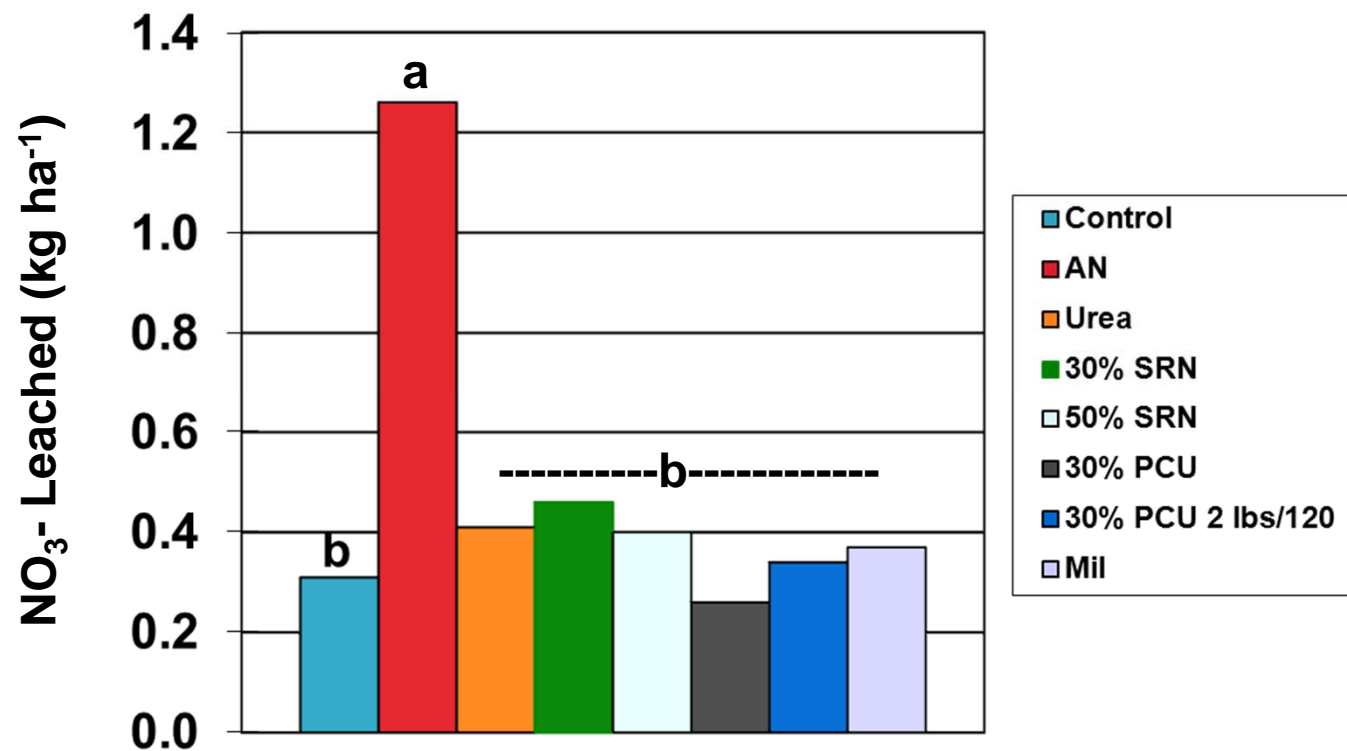
# Nitrogen Source Leaching Study- Annual Load from Floratam 2008



# Nitrogen Source Leaching Study- Annual Load from Floratam 2009

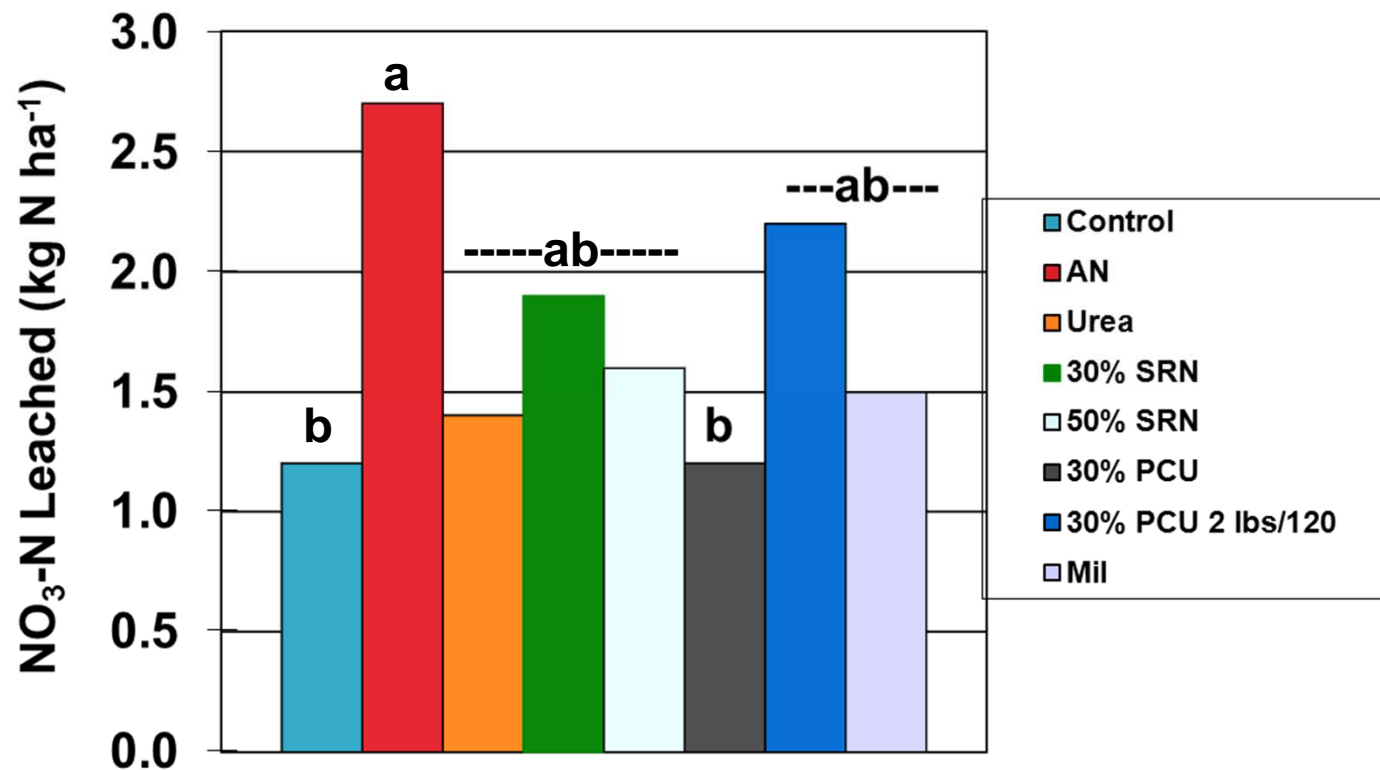


# Nitrogen Source Leaching Study- Annual Load from Empire 2008





# Nitrogen Source Leaching Study- Annual Load from Empire 2009



# Conclusions

- No differences between N sources in Floratam at the rates applied
- Differences in zoysia:
  - AN higher than other sources in 08
  - AN higher than control and 30% PCU in 09
- N source not a key factor in  $\text{NO}_3\text{-N}$  loading from results of this research

# Nitrate Leaching in Winter Months

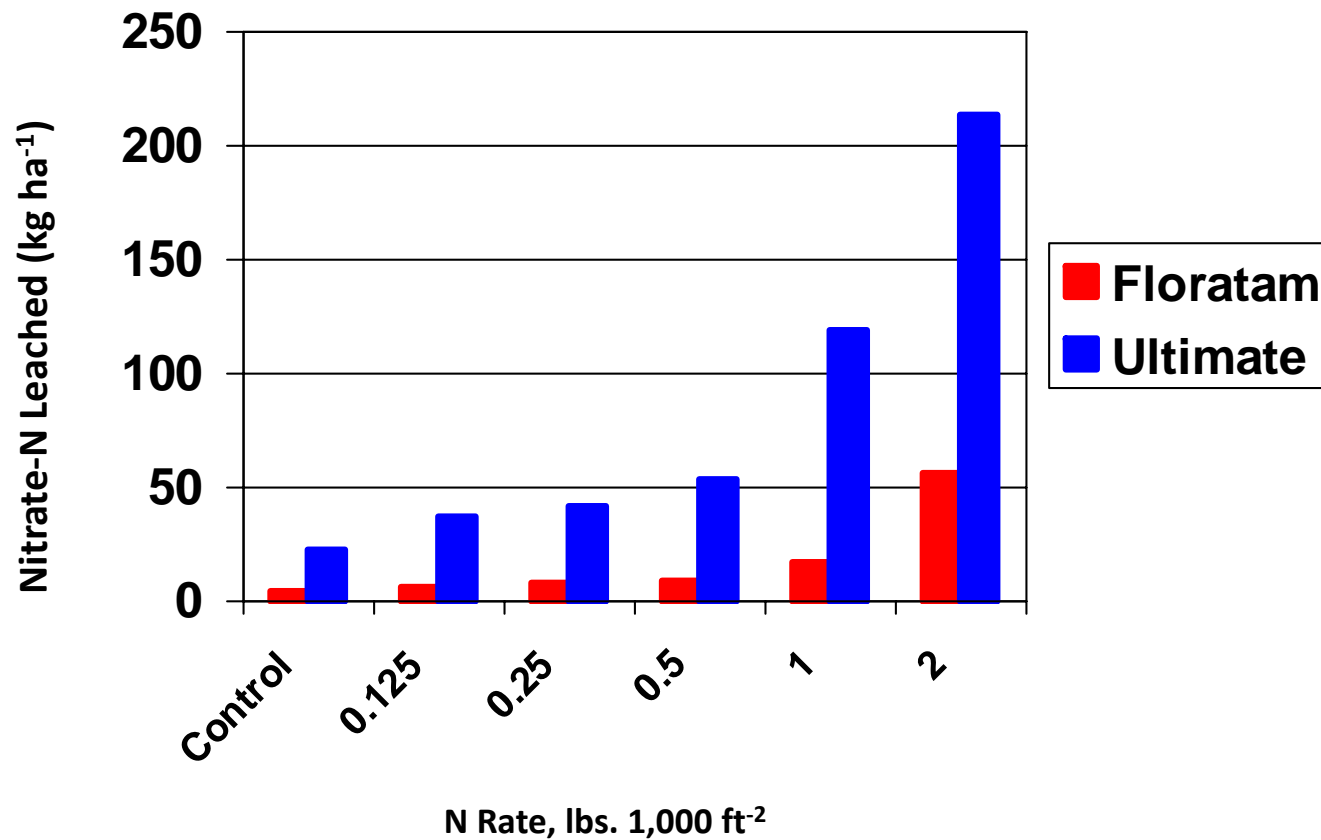
- Apply N at different rates monthly throughout winter to Floratam and Ultimate zoysiagrass
- Control, .125, .25, .50, 1.0 and 2.0 lbs N 1,000 ft<sup>2</sup> mo.
- N applied as non-coated, quick-release urea



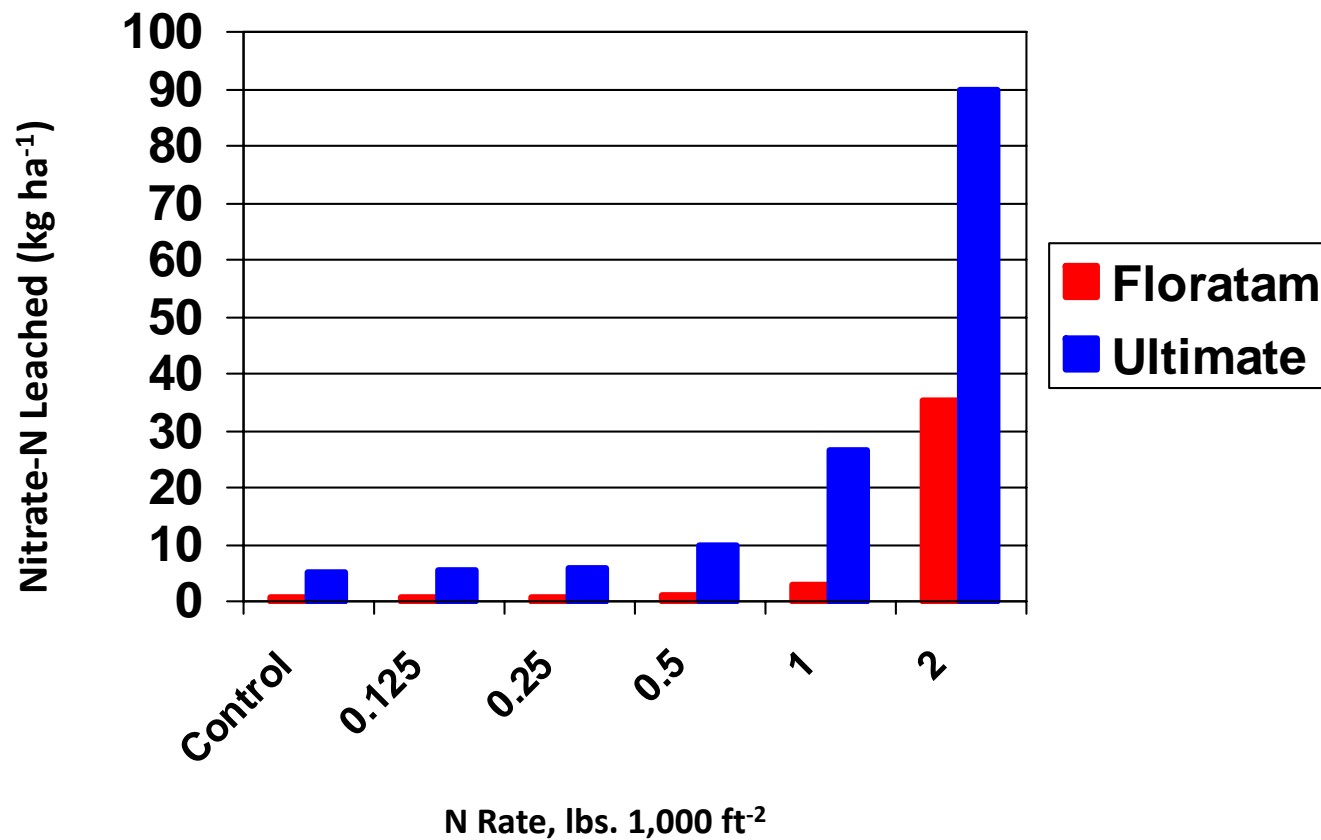
# Nitrate Leaching in Winter Months

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

# Cumulative Nitrate Leaching in Winter Months

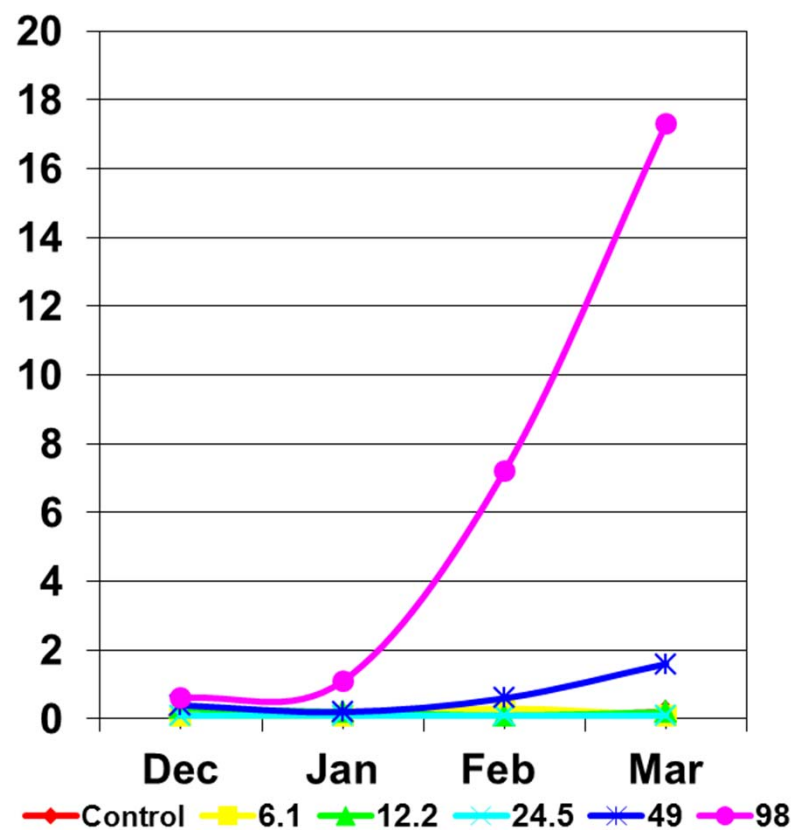


# Cumulative Nitrate Leaching in Winter Months

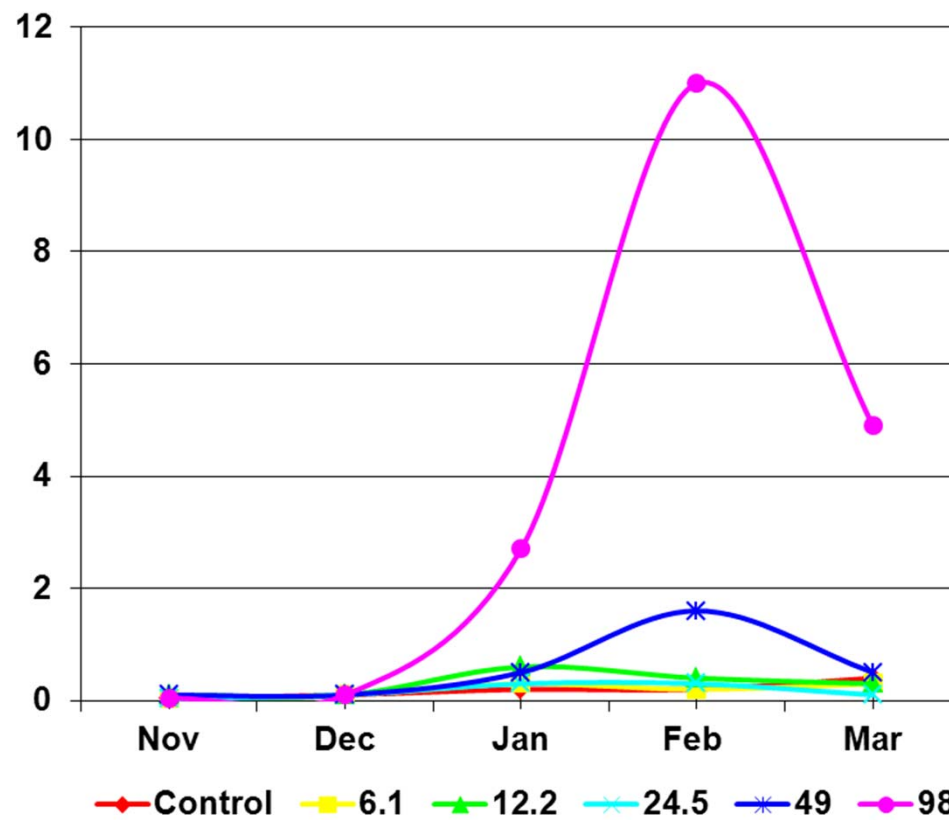




## Winter Leaching By Month from St. Augustinegrass



2006-07



2007-08

# Conclusions

- While there were few differences in leaching at the lower N rates,  $\text{NO}_3\text{-N}$  leached far exceeded leaching that which occurs during the growing season
- We should not fertilize dormant grass in north Florida –what about central Florida?
- Greatest leaching load occurred in winter/spring vs. fall months

# Overall Conclusions

- Importance of healthy turf to provide cover
- Leaching from SA in particular not affected by N rate or N source when turf is healthy
- Zoysia more affected by higher N rates, but at the recommended N rates for this grass (less than for SA), leaching load minimized
- Timing bans would be better focused on winter/early spring fertilization than summer to reduce potential N loading

**We thank the Florida Department of  
Environmental Protection for funding  
this research**