

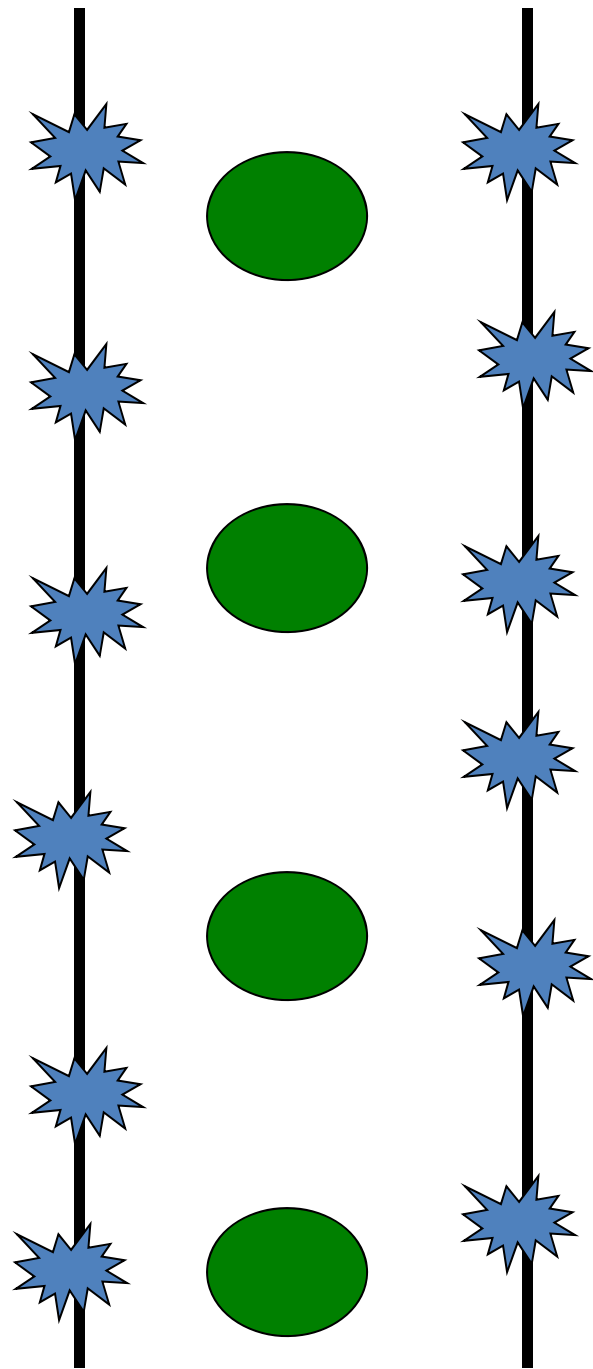
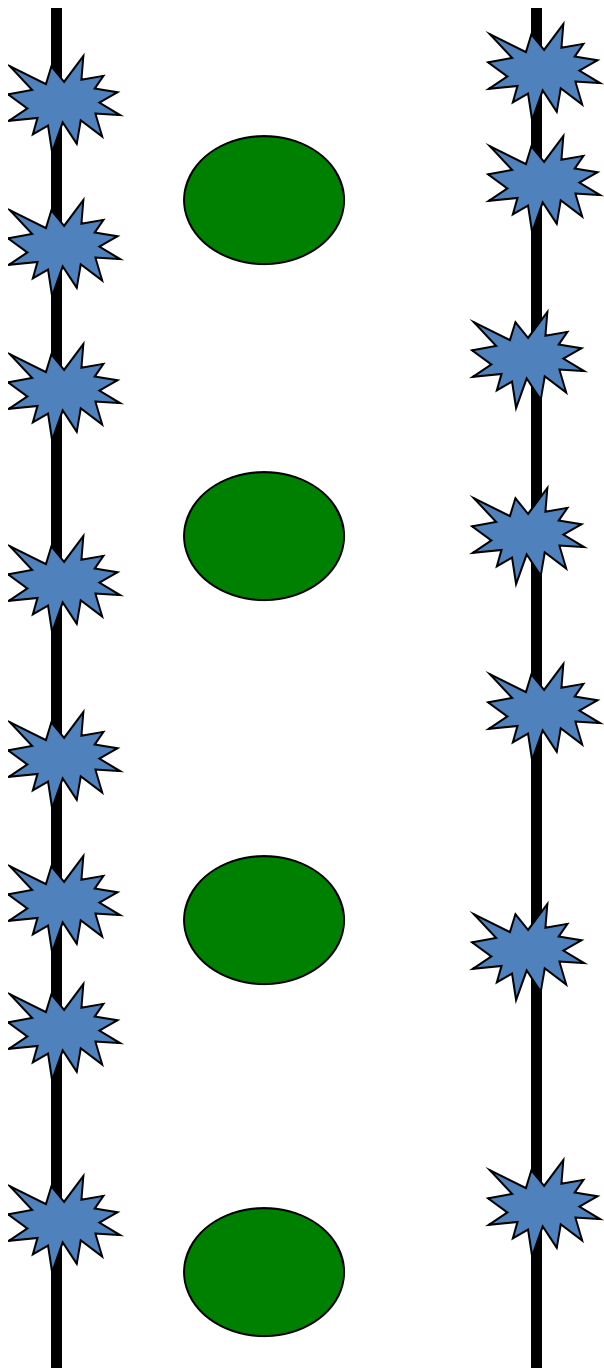


# Fertigation & Irrigation of Pecans

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- Fertilizer & Irrigation are 2 of the most important inputs for pecan production, yet they are often managed inappropriately



# Fertilizer Application Method

## Effect on Leaf N (30 yr old 'Stuart')

Treatment	Leaf N 2008	Leaf N 2009	Leaf N 2010 (%)	Leaf N 2011	Leaf N 2012
<b>Simulated Injection</b> 28-0-0-5	2.98a	2.94a	2.73a	2.55a	2.69a
<b>Broadcast Band</b> Ammon. Nitrate	2.89ab	2.80a	2.52b	2.46ab	2.57a
<b>Broadcast</b> Ammon. Nitrate	2.85b	2.89a	2.60b	2.46ab	2.64a
<b>Liquid N Herbicide Sprayer</b> 28-0-0-5	2.80b	2.96a	2.42c	2.37b	2.52ab
<b>Control</b>	---	2.84a	2.42c	2.34c	2.37b

**2008-2011 N rate for all treatments = 70 lbs/treated acre**

**2012 N rate = 125 lbs/acre**

Funded by GACCP

# Fertilizer Application Method

## Effect on Yield (30 yr old 'Stuart')

Treatment	Yield 2008 (lbs/tree)	Yield 2009 (lbs/tree)	Yield 2010 (lbs/tree)	Yield 2011 (lbs/tree)	Yield 2012 Average (lbs/tree)
<b>Simulated Injection</b> 28-0-0-5	129.6a	128a	134a	4.97b	193a
<b>Broadcast Band</b> Ammon. Nitrate	107.8a	144a	98b	10.9ab	166a
<b>Broadcast</b> Ammon. Nitrate	107.5a	176a	105ab	27.5a	148a
<b>Liquid N Herbicide</b> <b>Sprayer</b> 28-0-0-5	152.9a	115a	124ab	2.38b	151a
<b>Untreated Control</b>	---	152a	86b	0c	77b

**2008-2011 N rate for all treatments = 70 lbs/treated acre**

**2012 N rate = 125 lbs/acre**

Funded by GACCP

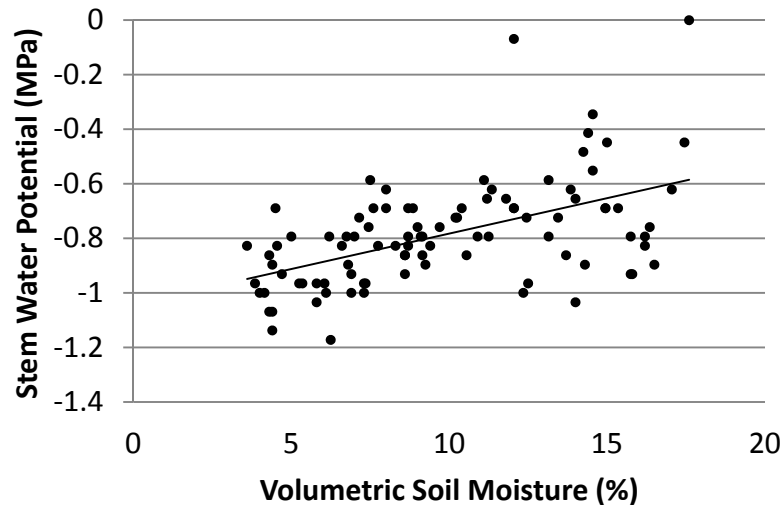
# Enhancing Irrigation Efficiency

	<u>Gallons of water applied/tree</u>	
April	6750	(225 gal/day) 62.5%
May	7905	(255 gal/day)
June	8550	(285 gal/day)
July	10,230	(330 gal/day)
August	11,160	(360 gal/day)
September	10,800	(360 gal/day)
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Total	55,395	
Average Per Day	303	

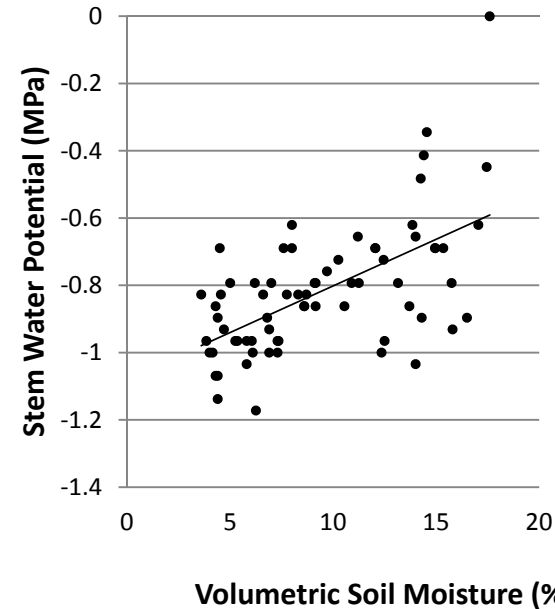
# Enhancing Irrigation Efficiency

		<b>New</b>		<b>Old</b>		
April	17%	<b>1800</b>	<b>(60 gal/day)</b>	6750	(225 gal/day)	62.5%
May	26%	<b>2880</b>	<b>(93 gal/day)</b>	7905	(255 gal/day)	
June	33%	<b>3600</b>	<b>(120 gal/day)</b>	8550	(285 gal/day)	
July	40%	<b>4500</b>	<b>(145 gal/day)</b>	10,230	(330 gal/day)	
August	100%	<b>11,160</b>	<b>(360 gal/day)</b>	11,160	(360 gal/day)	
September		<b>10,800</b>	<b>(360 gal/day)</b>	10,800	(360 gal/day)	
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Total		34740		55,395		
Average Per Day		189		303		

# Results

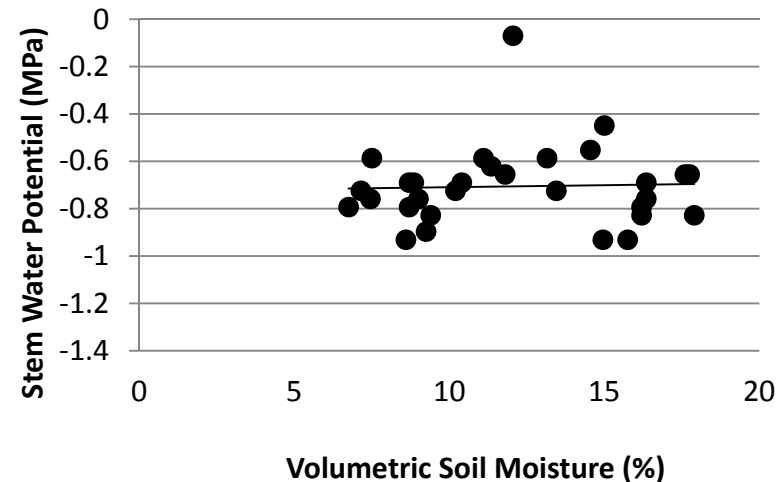


Relationship between stem water potential ( $\psi$ ) of non-irrigated pecan trees and volumetric soil moisture on Tifton loamy sand ( $y=0.0259x-1.0421$ ,  $R^2=0.28$ ).



Relationship between stem water potential ( $\psi$ ) of non-irrigated pecan trees and volumetric soil moisture on Tifton loamy sand from April-July 2012 ( $y=0.0277x-1.079$ ,  $R^2=0.35$ ).

- Water Stress on pecan occurred at about -0.78 MPa using the pressure chamber to measure stem water potential
- Regression analysis suggests that irrigation scheduling for mature pecan trees may be needed when volumetric water content reaches 10-11% on Tifton loamy sand
- Pecan trees may undergo water stress due to crop demand during the kernel filling stage regardless of soil moisture



Relationship between stem water potential ( $\psi$ ) of non-irrigated pecan trees and volumetric soil moisture on Tifton loamy sand from August-September 2012 ( $y=0.0017x+0.7263$ ,  $R^2=0.0014$ ).



# Results & Conclusions

2012 Treatment	Stem water potential	Yield (kg/tree)	Nuts/lb	% Kernel	Shoot Length cm
Old Schedule	-0.67a	36a	50.2a	46.5a	10.7a
Reduced	-0.67a	28a	47b	46.5a	8.9b
Non-Irrigated	-0.78b	21b	50.4a	44.8a	7.9b

2013 Treatment	Stem water potential	Yield (kg/tree)	Nuts/lb	% Kernel	Shoot Length cm
Old Schedule	-0.59a	39.2a	45a	47.7a	13.3a
Reduced	-0.59a	46.6a	45a	48.1a	12.8a
Non-Irrigated	-0.62a	43.2a	45a	46.2a	10.6a

2014 Treatment	Stem water potential	Yield (kg/tree)	Nuts/lb	% Kernel	Shoot Length cm
Old Schedule	-0.83a	16a	56a	51.6a	12.7a
Reduced	-0.81a	12a	50a	49.0a	12.7a
Non-Irrigated	-1.10a	3b	61b	52.2a	11.9a

# Conclusions

- The Reduced Irrigation Schedule provides a **38% reduction** in irrigation water use with no significant effect on tree water stress, yield, or quality
- Pecan trees can tolerate moderate early season water stress in the Southeastern U.S. with no effect on yield or quality
- Heavy crop load generates water stress
- Potential remains to further enhance irrigation efficiency for pecans in humid climates

# Fertigation of Young Trees

- Treatments:
  - Fertigation (28%)
  - 10-10-10
  - Urea
  - Control



# Fertigation of Young Trees

1st year trees: 'Cunard' on Norfolk loamy sand

Treatment	Caliper Growth (mm)	Leaf N
Fertigation (6.16 units N/acre)X4	5.4a	2.63a
10-10-10 (1 lb/tree)	6.5a	2.61a
Granular N (0.36 lbs/tree)X4*	7.6a	2.76a
Control (No N applied)	6.7a	2.63a

## Fertilizer N materials;

Fertigation treatments =UAN (28%) (total of 0.84 lbs N per tree)

Granular N treatment=Urea (46%) (total of 0.84 lbs N/tree)

All fertigation and granular N treatments received P-K through irrigation system in April via 10.5 gal/acre of 1-6-13

## Fertilizer Application Dates:

10-10-10: May 9

Fertigation & Granular N: May 9; June 28, July 12; August 6

# Fertigation of Young Trees

2nd year trees: 'Cunard' on Norfolk loamy sand

Treatment	Caliper Growth (mm)	Leaf N
Fertigation (6.16 units N/acre)X4	11a	2.88ab
10-10-10 (1 lb/tree)X2	12.9a	3.14a
Granular N (0.36 lbs/tree)X4*	12.1a	3.07a
Control (No N applied)	10.1a	2.70b

## Fertilizer N materials;

Fertigation treatments =UAN (28%) (total of 0.84 lbs N per tree)

Granular N treatment=Urea (46%) (total of 0.84 lbs N/tree)

All fertigation and granular N treatments received P-K through irrigation system in April via 10.5 gal/acre of 1-6-13

## Fertilizer Application Dates:

10-10-10: April 25 & June 29

Fertigation & Granular N: April 25; May 28, June 29, July 29



# Fertigation of Young Trees

2nd year trees: 'Cape Fear' on Red Bay soil

Treatment	Caliper Growth (mm)	Leaf N
Fertigation (12.32 units N/acre) X4	17.4ab	2.72ab
Fertigation (6.16 units N/acre) X4	21.1a	2.74a
10-10-10 (1 lb/tree) X3	19.7ab	2.72ab
Granular N (0.36 lbs/tree)X5	14.8b	2.56bc
Control (No N applied)	16.2ab	2.50c

## Fertilizer N materials:

Fertigation treatments =UAN (28%)

total of 1.68 lbs N/tree and 0.84 lbs N per tree for high and low rates

Granular N treatment=Urea (46%) (total of 0.84 lbs N/tree)

All fertigation and granular N treatments received P-K through irrigation system in April via 10.5 gal/acre of 1-6-13

## Fertilizer Application Dates:

10-10-10: April 23, June 28, July 12

Fertigation : April 23, June 28, July 12, August 6

Granular N: April 23, May 23, June 28, July 12, August 6

# Fertigation of Young Trees

3rd year trees: 'Cape Fear' on Red Bay soil

Treatment	Caliper Growth (mm)	Leaf N
Fertigation (12.32 units N/acre) X4	18.8a	2.90ab
Fertigation (6.16 units N/acre) X4	18.6a	3.17a
10-10-10 (1 lb/tree) X3	19.8a	2.86ab
Granular N (0.36 lbs/tree)X5	17.5a	2.84b
Control (No N applied)	15.5a	2.91ab

## Fertilizer N materials:

Fertigation treatments =UAN (28%)

total of 1.68 lbs N/tree and 0.84 lbs N per tree for high and low rates

Granular N treatment=Urea (46%) (total of 0.84 lbs N/tree)

All fertigation and granular N treatments received P-K through irrigation system in April via 10.5 gal/acre of 1-6-13

## Fertilizer Application Dates:

10-10-10: April 21, May 27, June 18

Fertigation & Granular N : April 25, May 28, June 29, July 29



# Fertigation of Young Trees

- The key to good growth of young pecan trees remains weed control & maintaining good soil moisture
- Fertilizer has no effect on growth of 1<sup>st</sup> year pecan trees
  - Trees still maintain nutrients in storage tissues from nursery
  - If you fertilize, use moderate amount and apply mid-season
- 2<sup>nd</sup> and 3<sup>rd</sup> year pecan trees benefit from moderate amount of N in split applications
  - Fertigation is not magic bullet for growing trees fast but it may be more efficient from a labor standpoint
  - 10-10-10 applied 2-3 times/year provides same results



# Young Tree Irrigation

