Pecan Production 101: Fertility and Water Use

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Leaf Tissue Results

	Desired Range	Mean	% Low	% High	Sample Range
Leaf N	2.5-3.3%	2.77%	3	0	2.58-3.09
Leaf P	0.12-0.3%	0.14%	0	0	0.13-0.18
Leaf K[1]	1.25-2.5%	1.26%	45	0	1.04-1.50
Leaf Ca	1.0-1.5%	1.84%	0	48	1.37-2.36
Leaf Mg[2]	0.35-0.6%	0.53%	7	0	0.32-0.66
Leaf S	0.25-0.5%	0.24%	3	0	0.22-0.28
Leaf Fe	50-300ppm	71.7ppm	0	0	50-142
Leaf Zn	50-100ppm	125ppm	7	34	41-292
Leaf B	50-100ppm	84ppm	0	20	50-146
Leaf Cu	6-30ppm	9.8ppm	0	0	6-14
Leaf Mn	100-800ppm	562ppm	0	21	190-1251
Leaf Ni	?	2.5ppm	?	?	1-11

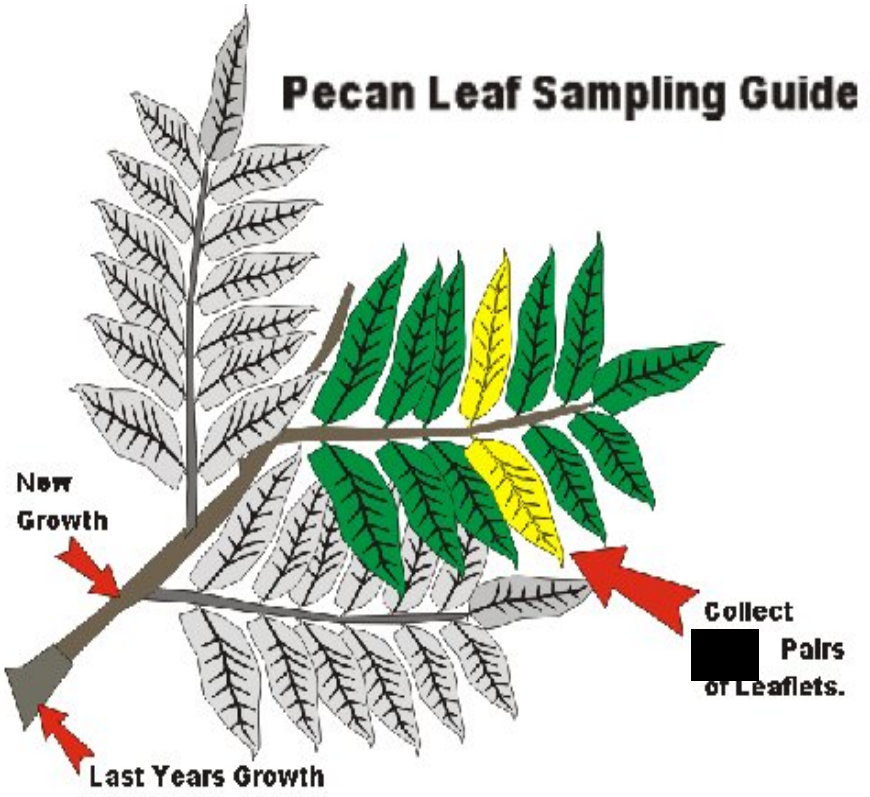
[1]Leaf K recommendations of 0.7-2.5 are adequate for “off” crops, but often inadequate for “on” crops. This is relative to the amount of Leaf N.

Soil Sample Results

	Desired Range (lbs/A)	Mean (lbs/A)	% Low	% High	Sample Range (lbs/A)
Soil P	30-60	98.3	0	90	48-183
Soil K	60-150	153	0	34	94-361
Soil Ca	400-900	988	3	48	192-2241
Soil Mg	90-100	184	7	90	35-436
Soil S	10-50	26.6	3	0	4-41
Soil Fe	12-25	22.6	3	24	8-76
Soil Zn	15-20	25	28	55	3.9-55.3
Soil B	0.5-1.0	0.99	41	14	0.22-6.0
Soil Cu	0.5-1.5	1.1	14	10	0.2-7.2
Soil Mn	15-40	31.9	28	7	13-45
Soil Ni[1]	?	1.26	N/A	N/A	1-7
pH	6.5-7.0	5.96	90	0	5.3-7.0

Leaf Sampling

- Sample trees between July 7th and August 7th.
- Use terminal shoots exposed to the sun.
- Collect leaflets from all sides of the tree.
- Avoid leaflets damaged by insects and diseases.



Soil Sampling

- Useful for pH and toxicities
- Late Fall/Winter
- Sample uniform area
- 1 pint/sample (15-20 cores) over large area
- Sample to 8” depth

Nitrogen

- N absorption by roots is driven by demand
- Demand is regulated by growth of leaves or fruit, and production of proteins.
- Flowers may be aborted if leaf N is deficient the previous summer

Nitrogen

- Leaf Concentration: 2.5-3.3%
- 10 lbs N/100 lbs expected crop
- Shoot growth should be 8-12”

Nitrogen

- In well managed, irrigated orchard soils, applied N can move more readily and leach out of the effective root zone before it is taken up by the tree.
- Initial spring N used by developing foliage comes from storage pools within the tree.
- N demand will be greatest for “on” trees bearing a heavy crop load, since expanding leaves, shoots, and fruit create the greatest demand.

Nitrogen

- General Recommendation:
  - 50-75 lbs N applied mid-late April
  - Examine Crop in June/July
  - “On Year”---50-75 lbs applied at end of August/1st Sept.
  - “Off Year”---0 lbs applied late season

    OR

  IF NO AUGUST APPLICATION
  - 75 lbs N in March/April (March after “on year”)
  - 25-75 lbs in May/June

- Most of the N taken up during the kernel-fill stage will supply the N storage pool needed for early spring growth.
- Timing of fertilizer application for non-irrigated or run-down orchards will be different

Nitrogen

Dry-Land /Neglected Orchards

- 75 lbs N in March
- 25-50 lbs in late May

Young trees

- **Year 1:** ***1 lb 10-10-10 fertilizer*** **distributed in a 25 sq. ft. area around the tree (apply in June if growth is good; *2-4' terminal growth*)**

- **Year 2:** ***1 lb of 10-10-10 fertilizer in March and May.*** **Do not place fertilizer within 12 inches of the trunk**

- **1 lb zinc sulfate per tree for the first three years following planting.**

Nitrogen

- *Fertilizing on a per tree basis*
  - Mature trees
    - **1 lb amm. Nitrate/inch of trunk diameter in late March before bud break (Max 8 lbs). Water in promptly**
    - **If lawn is concern, bore holes in ground and pour in, then water area**

or

- **4 pounds of 10-10-10 for each inch of trunk diameter** (measure 4 1/2 feet above soil level) up to 25 lbs/tree. This fertilizer should be applied **in late March before bud break**. Zinc needs are best determined by analysis of leaf samples taken in late July or early August. (Max 2 lbs/tree)

25 lbs 10-10-10/tree in 25 X 25 ft area = 290 lbs N/acre

N-Fertilizer Application in Orchards

- Broadcast
  - Inefficient and expensive
- Band
  - Apply material to active root zone
  - Cheaper
- Fertigation
  - Total rate (75-100 lbs/A) should be split over 3-4 applications (at 14 to 30 day intervals)
  - 28-0-0, UAN, Potassium Nitrate, Urea
  - Watch pH
  - $CaNO_3$

Clover as a Source of Nitrogen

- Crimson – 100 lbs N/A
  - 15-18 lbs/A drilled
  - 20-30 lbs/A broadcast
  - Plant immed. after harvest
  - ‘Dixie’
- ‘Durana’ White Clover--100 lbs N/A
  - 2-3 lbs/A seeding rate
  - Increase broadcast rate by 25%
  - Perennial
- Allow clover to re-seed
- Need to keep adequate soil K levels

N Credit for Legumes

- Crimson Clover
  - Year 1 = Replaces 30 lbs N/Acre
    - On Year = 150 lbs N-30 lbs N = 120 lbs N/Acre
    - Off YEAR= 50 lbs – 30 lbs = 20 lbs N/Acre
  - After 3 Years = Replaces 75-150 lbs N/Acre
    - On Year = 150 lbs N – 100 lbs N = 50 lbs N/Acre
    - Off Year = No additional N required

Effect of Clover on Organic Matter and N

Sample Site	Nitrate-N	Organic Matter
4” Sod	3.78	1.34
8” Sod	4.18	1.66
4” Sod+Clover	13.95	2.32
8” Sod + Clover	10.75	2.90

Orangeburg Loamy Sand

Problem Weeds in Orchards Utilizing Clover

- Rye-grass
  - Poast Plus = 16 oz./ acre

- Wild Turnip
- Wild Geranium

- Sandea (Halosulfuron-methyl)
  - Excellent on wild turnips (pre and post-emergence)
  - Good activity on wild geranium
  - Good control of rye-grass
  - Potential Problems:
    - Cost = $15/acre @ 0.5 oz/acre
    - Delayed clover development; possible effect on seed viability
- Basagran
  - Cost = $16/acre @ 2 pints/acre
  - Problems: For use only on Non-Bearing Pecans

Wild turnip must be treated up to a weed height of 3”

Best results on geranium will be achieved when weeds are small

Heavier the Infestation, earlier the treatment

Yet To Be Determined:

- 2,4-DB-amine
  - used for the control of many annual and perennial broad-leaved weeds in alfalfa, peanuts, soybeans
  - Labeled for clover
- Timing and rates

Uses 5% Roundup solution (1.25 gal.25 gal water)

Cost per acre varies with weed density

Chicken Litter

- Have sample analyzed
- Typically:

	N	60 lbs/A
	P	60 lbs/A
	K	40 lbs/A
	Ca	30 lbs/A
	Zn	0.6 lbs/A
	Cu	0.6 lbs/A

  Nutrients are organically bound
- 60% (36 lbs N/ton) is available for crop uptake during the season.

- Use BROILER litter and NOT LAYER litter
  - Ca/Mg

~30% of growers use chicken litter
40% of those who do not, would use it if supply was available

Chicken Litter

- 1 ton/A of poultry litter -- February
- 1 ton applied - May
- “On Year” -Additional 50-80 lbs N/A applied as synthetic fertilizer in late August or split between early August and early September

Potassium (K)

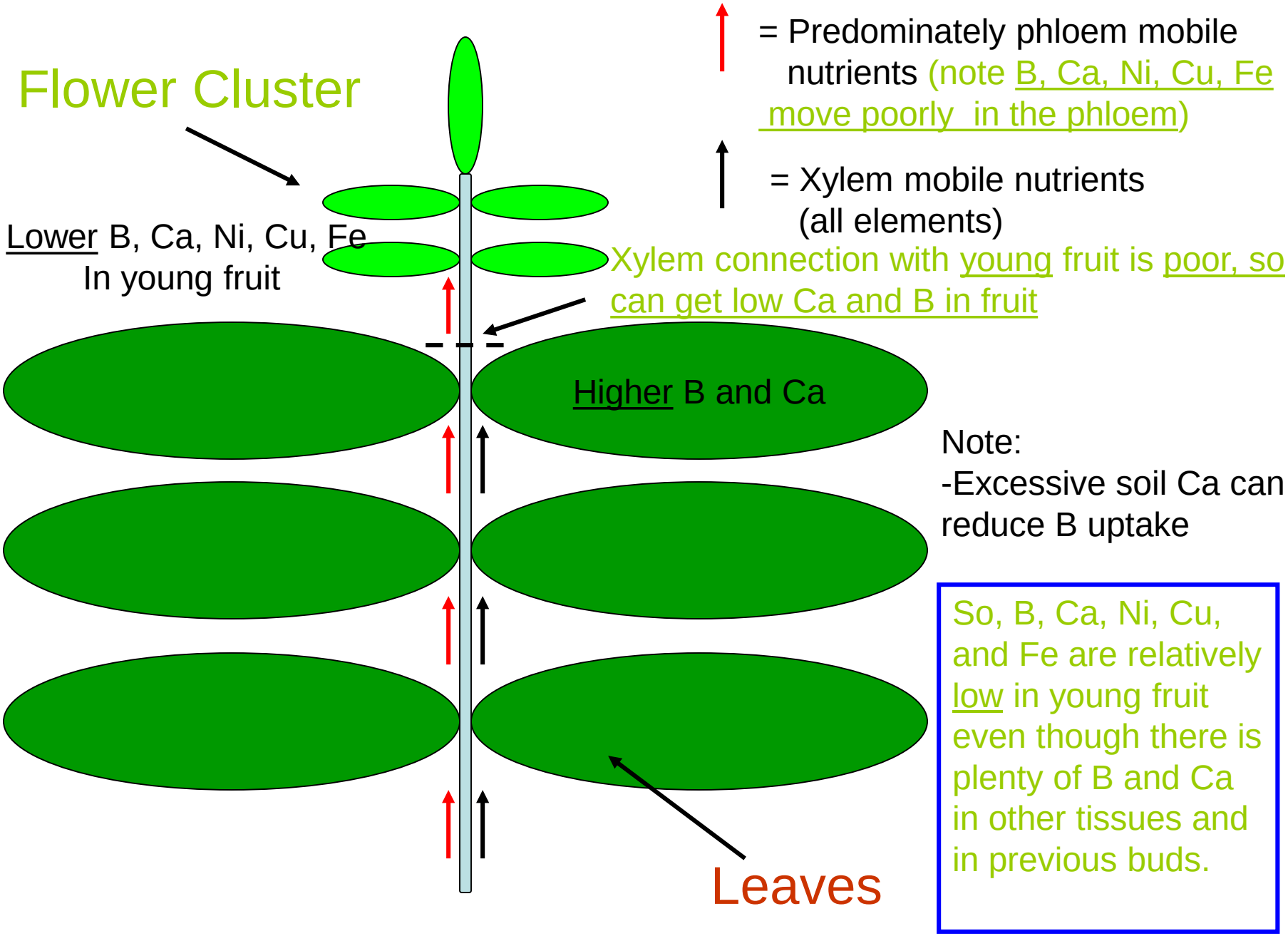
- K is transported to nuts at leaf's expense
- 50-100 lbs K applied in February/March
- During "on" year apply additional 30 lbs K in mid to late August
- 1.25-2.5 ppm in leaf analysis
- Manage N/K ratio to 2:1
- Manage Mg---(No Dolomitic lime above .45% Mg)
- Deficiency most common on Desirable and Schley

Zinc

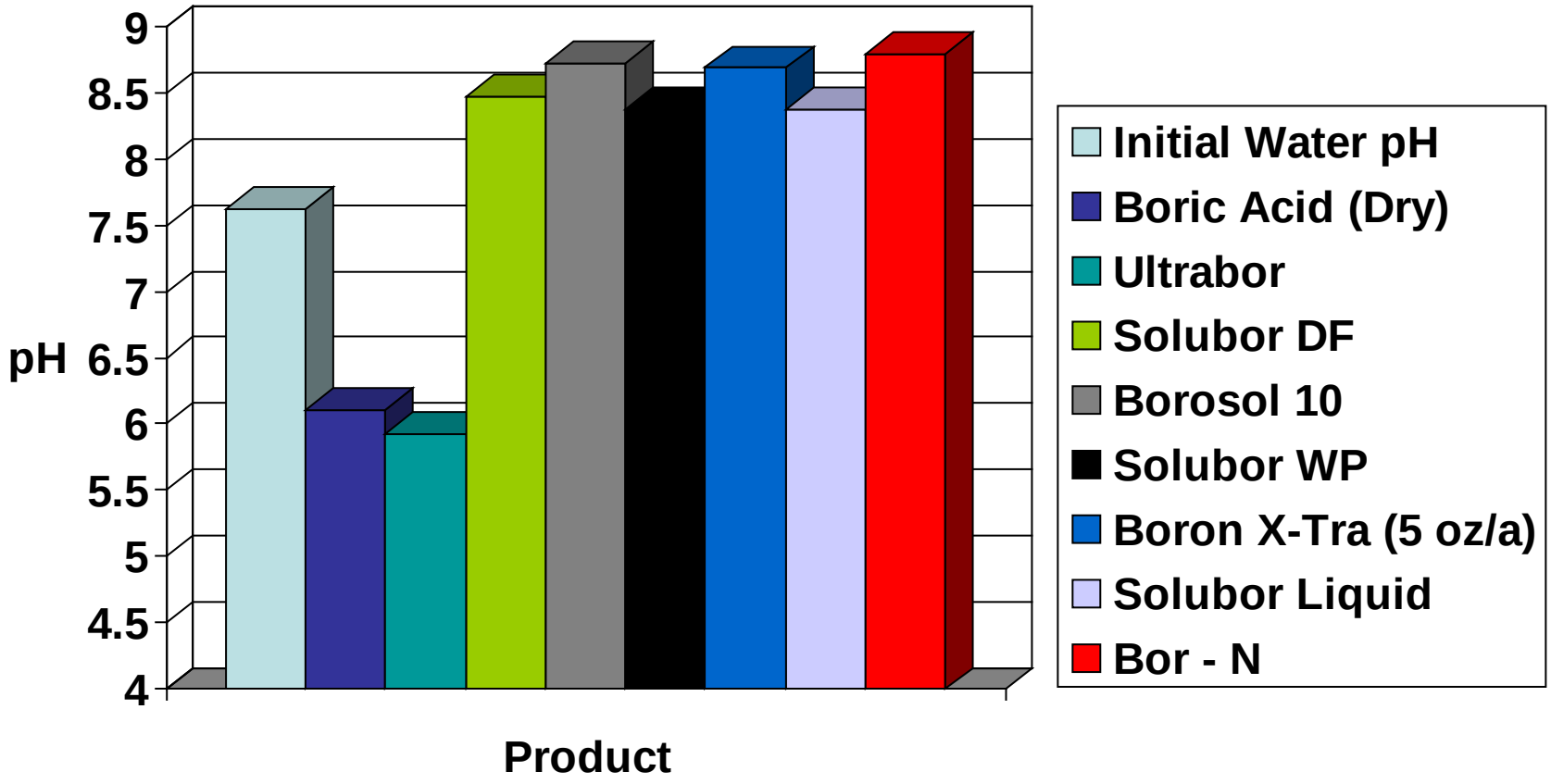
- Necessary for shoot elongation, leaf expansion, and yield
- Apply 50 lbs Zn Sulfate/A when soil Zn is less than 15 lbs/A
- 2 lbs Zinc sulfate + 3 lbs Potassium Nitrate/100 gallons
- Begin 2 wks after bud-break until shoot elongation complete

Boron Recommendations

- Can increase fruit retention and kernel percentage
- 3 pre-pollination applications of B beginning before catkins are mature
- No benefit to making more than 3 applications


Flower Cluster
= Predominately phloem mobile nutrients (note B, Ca, Ni, Cu, Fe move poorly in the phloem)
= Xylem mobile nutrients (all elements)
Lower B, Ca, Ni, Cu, Fe In young fruit
Xylem connection with young fruit is poor, so can get low Ca and B in fruit
Higher B and Ca
Note:
-Excessive soil Ca can reduce B uptake
So, B, Ca, Ni, Cu, and Fe are relatively low in young fruit even though there is plenty of B and Ca in other tissues and in previous buds.
Leaves

Effect of Boron Sources On Spray Water pH



Glenn Harris

Boron and pH

- Most Liquid Sources of Boron (even Boric acid) will raise pH in the tank mix
- Dry formulations of Boric acid tend to lower pH
- Depends on the solvent used

Why is spray-water pH important?

- **Alkaline Hydrolysis – detrimental effect of high pH spray water**
- **Imidacloprid, Organophosphate and carbamate pesticides degrade in pH >7.**

Organophosphates

- **Malathion/Parathion**
- **Lorsban**
- **Diazinon**

Carbamates

- **Sevin**
- **Lannate**

Nickel

- Improves Mouse-ear Symptoms
- Effects of Nickel on N metabolism in pecan:
    - Can influence the efficiency of early spring N conversion and transport within the pecan tree (Bai et al. 2007).
- 2 applications: Early to mid April and again 2-4 weeks later

Pecan Water Use

- Pecans extract most of their water from the upper 32 inches of the soil profile
- Need 60” of water per year
- Pecans can use as much as 350 gal/day
- Greatest demand is during August/September
- Drip/Microjet system capacity should be at least 3600 gallons/acre/day
- Pecan Irrigation systems are designed to be supplemental to rainfall

Pecan Irrigation Schedule

Month		Drip (%cycle)		Sprinkler (inches/A/wk)
April		60		0.5
May		70		.75
June		80		1
July		90		1.25
August		100		1.5
September		100		1.5
October		90		1
November		60		0.5

Pecan Irrigation Systems

- Solid Set
  - Expensive
  - Poor water use efficiency
  - Water large area quickly

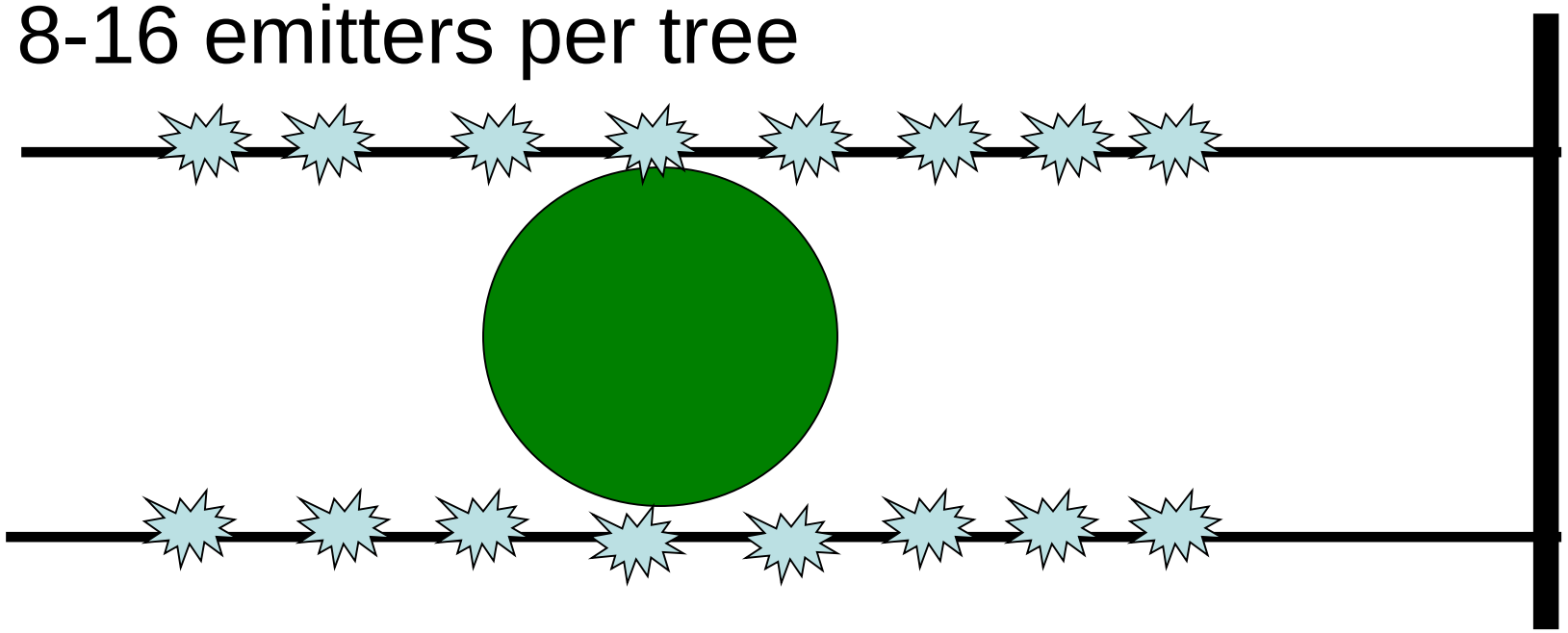
- Sprinklers often in every other middle
- Pump capacity should be at least 75 gpm/A

Pecan Irrigation Systems

- Drip
  - Efficient
  - Wet small area
  - Concentrates roots
  - Compatible with injection of fertilizer and systemics
  - Labor intensive
- May be laid above or below ground
- Full cycle should be no more than 12 hrs

Drip Irrigation

- Lateral lines normally 6-8 ft from tree
- Mature orchards need 2 lateral lines/ tree row (both sides of tree)
- Most emitters used are 2 gph
- 8-16 emitters per tree



Pecan Irrigation Systems

- Microjet
  - Same benefits as drip
  - Larger wetted area
  - Best system for establishment of young trees