

## APRIL, 2015, AFTER CLEARING THE AISLES



## HOW TALL SHOULD THE TREES BE?

- ✦ 80% of 10' (3m) should be about 8' (2.4m)

## AS FOR ON-CYCLE TREES VS. OFF-CYCLE TREES

- ✘ Recently Claudio Hernandez and Felipe Brunet gave an excellent talk in California on pruning high density trees
- ✘ In Chile, “On-cycle” have: heavy flowering, high yield the following year, small fruit size, limited development of spring shoots, sun damage, poor growth in summer, low flowering in the next year
- ✘ These can be pruned in the early spring to reduce some of the flowers

- ✘ In Chile, “Off-cycle” trees have poor flowering, high yield this year, but low yield (for the following year), with large fruit, increased spring shoots, high vigor of summer shoots, increased intensity of flowering in the following year
- ✘ It is good to summer prune these trees to reduce the intensity of flowering in the following year

## SUMMARY OF CHILEAN PRUNING

- ✘ High flowering year, prune out some flowers to create less fruit set, but larger size 48 fruit
- ✘ Low flowering year, prune out some summer flush to reduce the flowering in the following spring
- ✘ This will stabilize the crop with larger fruit size every year, gets rid of the on-crop, off-crop cycle

## HIGH DENSITY: GROWER MUST BE CONVINCED

1. Pruning should be done every year
2. Grower must accept loss of some fruit to contribute good fruit quality
3. Prune early in On-cycle year (early spring)
4. Prune late in Off-cycle year (summer prune)
5. Height control
6. Do not reduce canopy more than 30%

Hernandez and Brunet

## QUESTIONS TO BE ANSWERED

- ✘ Can you afford the cost of the trees initially?
- ✘ What is the cost of the labor for pruning?
- ✘ Is the labor available?
- ✘ What is the yield potential?

## IN OUR CURRENT HIGH DENSITY TRIAL

- ✘ At 2.5 years in the ground:
- ✘ Hass harvested March, 2015
- ✘ Zutano harvested January, 2015
- ✘ Hass at 387 trees/acre, 34.2 lbs/tree =13,246 lbs/ac
- ✘ Zutano at 48 trees/acre, 33.7 lbs/tree =1,615 lbs/ac
- ✘ Industry average yield (Hass) for last six years =6,455 lbs/ac

**OTHER SPACING OPTIONS  
7' X7' BEING TRIED BY REUBEN HOFSHI AND  
ALEX GONZALEZ, PERSEA TREE NURSERY**



**STEVE HOWERZYL, ESCONDIDO**



**GREG MANGUS AND JULIO TOMAS, FALLBROOK**



**JIM BROWN, TEMECULA  
CREATING A 10 X 10 IN AN OLDER GROVE**



## SUGGESTIONS FROM JIM BROWN TO CREATE HEALTHY TREES

- ✘ Phosphorus acid 0-60-0 applied at 1 tsp/gallon in tank adjusted to pH 4.5
- ✘ Seaweed spray “Aqua Sap” applied at 10 oz/acre in 100 gallons (has a natural cytokinin that increases cell division)
  - + Budbreak
  - + Cauliflower stage
  - + Fruit ½ inch diameter

## LOW DENSITY

Jaime Serrato and his son Ricardo are doing a low density, removing every other tree



Pruning at 18' every other year

Trees tend to grow sideways and fill in the space



### USE CLONAL ROOTSTOCKS

### CREATING A CLONAL ROOTSTOCK

- ✘ Zutano seed planted
- ✘ Dusa grafted onto Zutano, pot placement
- ✘ In the dark for 10 days to etiolate
- ✘ Rooting hormone, mix placed around lower Dusa for rooting
- ✘ Hass grafted onto Dusa





**MICRO-CLONE ON DUSA ROOTSTOCK**  
**PERSEA TREE NURSERY, FALLBROOK**



64 Micro Clones being carried to planting site.  
Significant savings when planting since many  
more can be carried by a more diverse workforce.

**7' X 7', 888 TREES/ACRE**



**SUN SHADE ON SOUTHWEST SIDE**



## BROKAW NURSERY, VENTURA



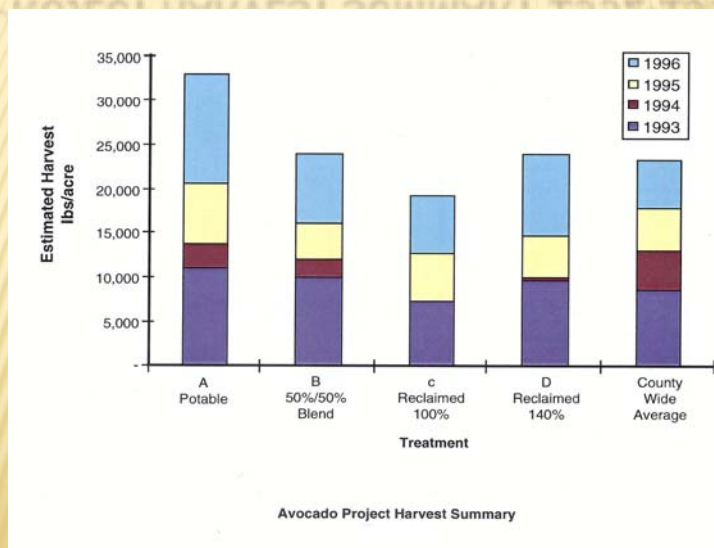
## OTHER NURSERIES SELLING CLONAL ROOTSTOCKS

- ✘ C and M Nursery, Nipomo
- ✘ Maddock Nursery, Fallbrook



**RECLAIMED WATER IN THE FUTURE?**

**ESCONDIDO RECLAIMED WATER  
 PROJECT HARVEST SUMMARY 1992-1996**



### **DURING THE COURSE OF THIS STUDY**

- ✘ Reclaimed water averaged 946 ppm (EC = 1.46) and chloride averaged 262 ppm
- ✘ District water averaged 453 ppm (EC = 0.70) and chloride averaged 76 ppm

### **RECLAIMED WATER IN ESCONDIDO**

- ✘ In 2011 Escondido was faced with spending at least \$300 million to expand the ocean outfall for waste water, and extend in farther out into the ocean
- ✘ EGAP (Escondido Growers for Ag Preservation) was formed to propose, rather than spend this money, re-route in back around Escondido to provide water for growers at a good quality and price
- ✘ Salts will be removed at a reverse osmosis plant and sent to the ocean

## RECLAIMED WATER, ESCONDIDO

- ✘ Within the City of Escondido there are 400 avocado growers with 3,300 acres
- ✘ From 2005 to 2011 40% of acreage was lost
- ✘ This new project is scheduled to come on line in 2016
  - + Phase 1      1000 acres
  - + Phase 2      1000 acres
  - + Water tertiary treated with reverse osmosis to acceptable levels of salinity

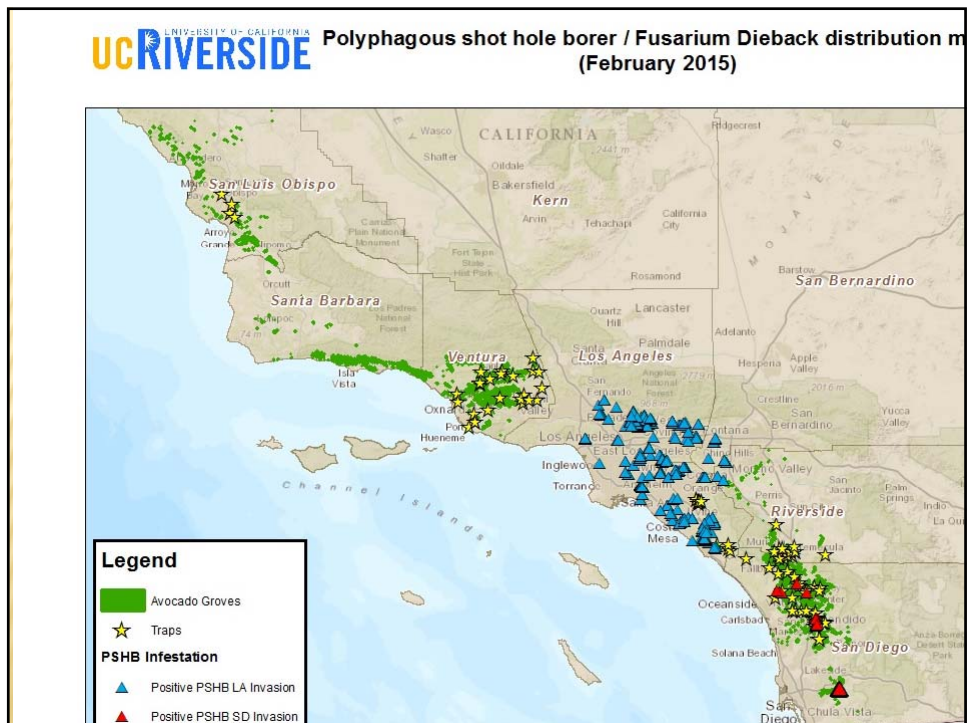
## REFERENCE

- ✘ Melben, Ken. 2015. EGAP holds the line, avoids ag water rate increases. From the Grove Spring 2015, 5(1):30.
- ✘ Growers are negotiating a price which they hope will be 1/3 less than the current \$1100/acre ft =hopefully \$725/acre ft



### POLYPHAGOUS SHOTHOLE BORER

What a pain in the neck!





## MANAGEMENT

- ✘ Don't move firewood around!
- ✘ Remove trees and chip to smaller than 1"
- ✘ Sterilize pruning tools to avoid spreading the fungus
- ✘ Solarize wood piles?
- ✘ Remove castor beans from around grove
- ✘ Traps being deployed in groves around known infested areas (CAC program and UCR research)
  
- ✘ Systemic chemicals are probably poor because the xylem is probably plugged up, but this is being investigated



## CASTOR BEAN



## SOLARIZING





### LET'S GROW GOOD TREES

You can't make a profit from lousy trees, no matter what the spacing is like

### THINGS YOU HAVE TO DO AND YOU HAVE TO DO ALL OF THEM!

- ✗ Monitor soil moisture, tensiometers, WaterMarks, other devices
- ✗ Calculate irrigation requirement, use the Irrigation Calculator on [avocadosource.com](http://avocadosource.com)
- ✗ Bees, 3-4 hives/acre
- ✗ Leaf analysis
- ✗ Fertilize correctly, see following slides
- ✗ Use liquid fertilizer injection into irrigation lines
- ✗ Root rot, use clonal rootstocks
- ✗ Leach salts at least once a month in the summer

## MORE THINGS YOU HAVE TO DO

- ✘ Harvest early
- ✘ Prune early
- ✘ Phosphorous acid twice a year through the irrigation system 1 gal/acre
- ✘ Don't farm sick trees, cap the sprinklers, replant with root rot-resistant clonal rootstocks
- ✘ If you trunk inject, use 0-28-25 instead of 0-60-0 (due to excessive trunk damage)

## SICK TREES



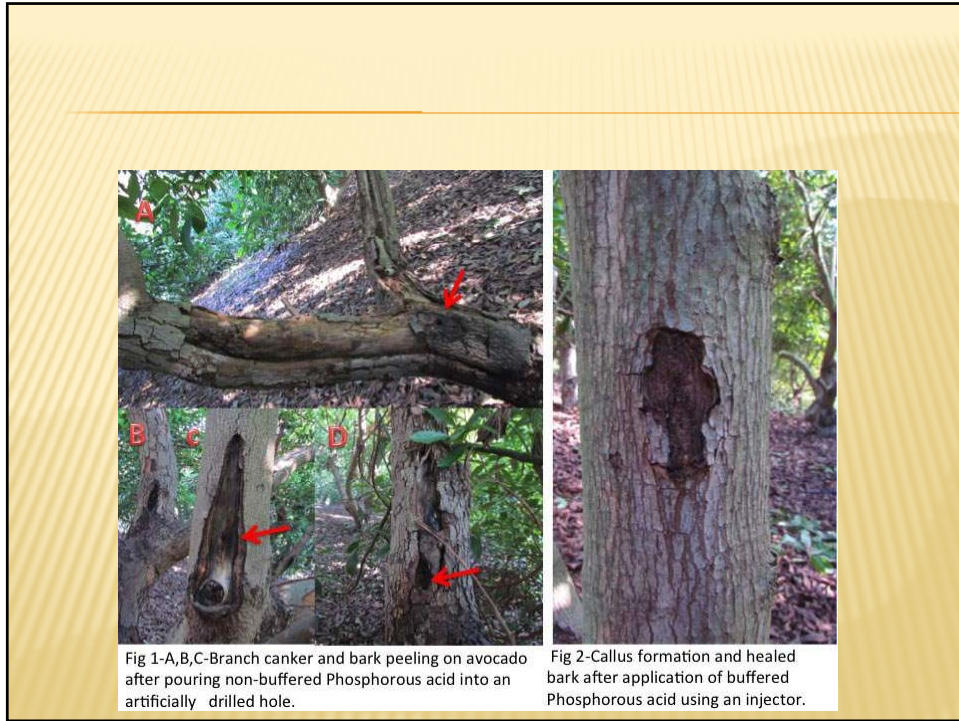
## AND A COUPLE MORE THINGS

- ✘ Join the California Avocado Society
- ✘ Join the Irrigated Lands Group (if you are in San Diego County). Join the Farm Bureau.
- ✘ Attend meetings. **Ask your grove manager to attend meetings.**
- ✘ Have a PCA check your grove for perseia mites, thrips and shothole borer
- ✘ **And Look at your Roots!**

## AVOCADO ROOT ROT

- ✘ Use clonal rootstocks
- ✘ Sanitation! Clean your shovels. Clean your shoes. Check the bottom of incoming bins.
- ✘ Phosphorous acid
- ✘ Check the roots on new trees while they are still in the pots.





## FERTILIZER ISSUES

- ✘ A mature tree on a 20'x20' spacing may need about 1.5 – 2.0 lbs actual N split up about 5-6 applications through the growing season
- ✘ Do not run a long irrigation after you have injected, Why?
- ✘ Do not apply it all at once! This goes right into the ground water
- ✘ We need to reduce contamination of ground water and local streams

## SOME THOUGHTS FROM DR. CAROL LOVATT

- ✘ In California, only a limited number of experiments have been conducted to determine optimal rates of soil applied fertilizers – N,P,K,Fe and Zn
- ✘ All other fertilizer recommendations are based on leaf analysis using optimum ranges borrowed from citrus and, though modified over the years, are not related to any avocado yield parameters

**NITROGEN APPLICATION TIMING**  
**RESEARCH FROM DR CAROL LOVATT, UC RIVERSIDE**

- ✘ Control trees: nitrogen was applied at 1.50 lb actual N/tree/year, (ammonium nitrate) divided into 0.25 lbs in  
late Jan-early Feb.,  
mid April,  
mid June,  
mid July,  
late Aug-early Sept,  
late Oct-early Nov.  
This was considered “a control treatment based on a typical grower application”.
- ✘ Five other Treatments: the same as the control, but there was an extra 0.25 lb applied in each of these months: January, February, April, June, November.

- ✘ The best yield occurred when the extra 0.25 lb N was applied in April or November

## FOUR-YEAR TRIAL BY LOVATT

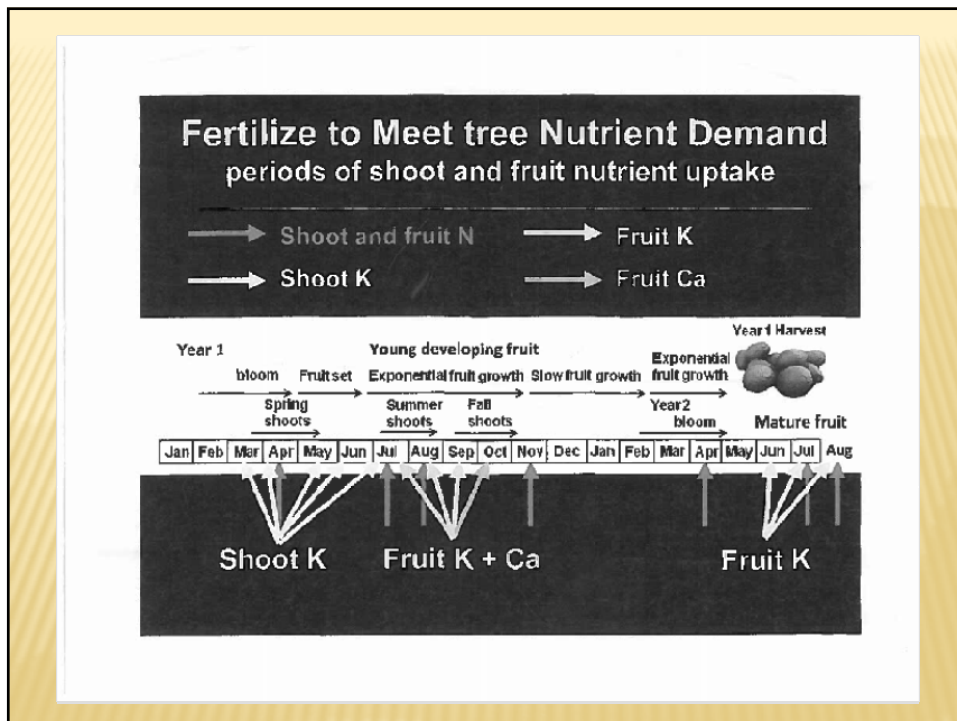
	N applied	average wt/tree of fruit
Control trees (1.50 lbs/year)		128.7lb
Jan	extra 0.25 lb	123.4
Feb	extra 0.25 lb	123.4
April	extra 0.25 lb	<u>158.0</u>
June	extra 0.25 lb	117.0
Nov	extra 0.25 lb	<u>168.3</u>

## SO, WHAT IS HAPPENING IN APRIL AND NOV?

- ✘ April is the time of anthesis, fruit set and initiation of the spring vegetative flush
    - + Anthesis means flowers are fully open and functional
  - ✘ November is the end of fall vegetative flush and beginning of flower initiation within the buds
- Bottom Line: Double N (in this case 0.50 lb actual N) should be applied in these months
- ✘ Lovatt suggested that “timing of fertilizer application may be more important than previously thought by fertilizer researchers”



- ✘ Google the PowerPoint “Fertilizing the Hass Avocado for Maximum Productivity” by Carol Lovatt



## POTASSIUM SUGGESTION

- ✘ Potassium sulfate KTS (0-0-25) 13 gal/ac applied during each month of June, August, October through irrigation system
- ✘ Or, granular Potassium sulfate (0-0-53) 200 lbs/ac applied in June and 200 lbs/ac applied in October

## ZINC SUGGESTION

- ✘ 10 yr-old tree, 5 lbs zinc sulfate surface banded hand-applied every 3-5 years
- Or
- ✘ Liquid zinc sulfate 12% 5.1 gal/100 trees every year
  - ✘ See page 46 in “Avocado Production Book 2, Cultural Care”

## **ONE LAST THOUGHT**

- ✘ There is a yield loss of 12% for every 35.5 ppm chloride in irrigation water
- ✘ All growers, especially organic growers, should be leaching!
- ✘ And, measure your chloride levels in well water (often)

## **THANK YOU!**



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