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**SEMINAR**  
— SERIES —

# Pruning and Girdling Methods in High Density Orchards

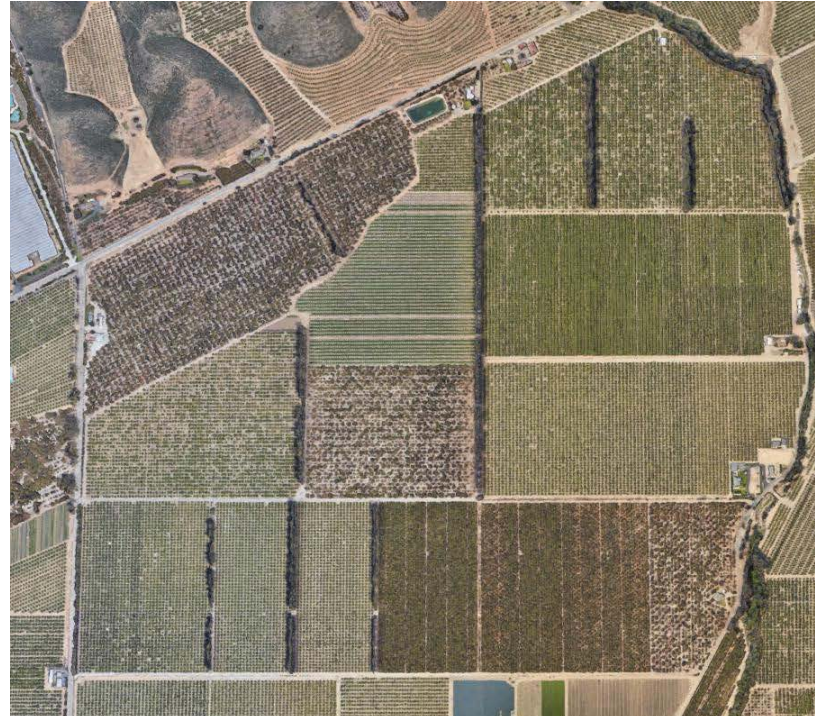
**PAUL NURRE** | **ORO DEL NORTE RANCH, SOMIS CA**  
RANCH FOREMAN



# Ranch Details

109 acres of varying age, density, and rootstock

- 40 acres low density Hass x Duke 7, 1979
  - (20' x 40' + interplants ~ 20' x 20' = 109 trees/acre)
- 10 acres low density Hass x Duke 6, 1970
  - (20' x 40' + interplants = 20' x 20' = 109 trees/acre)
- 37 acres high density Hass x Dusa, 2006-2008
  - 12' x 15' = 242 trees/acre
- 22 acres medium density Hass x Duke 7, 2013
  - 12' x 22' = 165 trees/acre



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# Challenge Facing Avocado Growers



- The Hass Avocado (as well as many other Avocado varieties) tends to prefer a bi-annual, alternate bearing pattern of fruit production
- Example
  - Year 1: Large Bloom leads to good set of fruit, thus reducing the ability of the tree to produce sufficient foliage for the following year's bloom
  - Year 2: Good Harvest of Year 1 bloom/fruit, but due to limited canopy growth previous year, bloom is weak
  - Year 3: Weak Bloom from Year 2 leads to limited harvest, and now the trees, unrestricted by new fruit load, produce abundant Canopy and will be ready for another strong bloom
- **SUMMARY:** A balance must be struck between set fruit AND new foliage production to ensure consistent production.



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# Why We Need to Seek Even Production



## High Production Tends to Produce Low Price Per Pound

### •Even Production:

•2013: 12,000 x \$0.87= \$10,440

•2014: 12,000 x \$1.12 = \$13,440

24,000 lbs                  \$23,880

### •Alternate Production

•2013: 18,000 x \$0.87= \$15,660

•2014: 6,000 x \$1.12 = \$6,720

24,000 lbs                  \$22,380

\$1,500 x 20 acre Ranch = \$30,000 over 2 years

Year	Bearing Acres	Volume (millions of pounds)	Crop Value (\$)	Price Per Pound (¢)	Average Dollars Per Bearing Acre (\$)	Average Pounds Per Bearing Acre
2011	57,532	302.5	\$460,209,682	152.1	\$7,999	5,258
2012	59,629	462.3	\$381,852,467	82.6	\$6,404	7,753
2013	57,838	500.2	\$435,023,142	87	\$7,521	8,648
2014	57,219	297.5	\$333,216,563	112	\$5,823	5,199
2015	51,478	279	\$303,160,400	108.6	\$5,889	5,420
2016	51,902	401.4	\$412,332,493	102.7	\$7,944	7,733

- California Avocado Commission



# Why We Need to Seek Even Production



## High Production Tends to Produce Low Price Per Pound

- Even Production:
    - 2011: 12,000 x \$1.52 = \$18,240
    - 2012: 12,000 x \$0.826 = \$9,912
    - 24,000 lbs                      \$28,152
  - Alternate Production
    - 2011: 10,000 x \$1.52 = \$15,200
    - 2012: 14,000 x \$0.826 = \$11,564
    - 24,000 lbs                      \$26,764
- \$1,388 x 20 acre Ranch = \$27,760 over 2 years

Year	Bearing Acres	Volume (millions of pounds)	Crop Value (\$)	Price Per Pound (¢)	Average Dollars Per Bearing Acre (\$)	Average Pounds Per Bearing Acre
2011	57,532	302.5	\$460,209,682	152.1	\$7,999	5,258
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- California Avocado Commission



# Our Ranch Philosophy



- Alternate bearing is the natural physiology of the avocado tree
- Utilize that knowledge and manipulate it on a per-tree level
- Reduce, and optimally eliminate, alternate bearing on a block-wide or ranch wide-scale
- Divide the canopy roughly 50/50 to achieve a balance between current year bloom and capacity for next year's bloom



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# Girdling → Abundant Bloom and Set



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# Canopy Division = 50/50



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# Canopy Division = 50/50

- Fruit is set so heavily on the girdled limb that almost no new bloom will occur the following spring (this is the goal)



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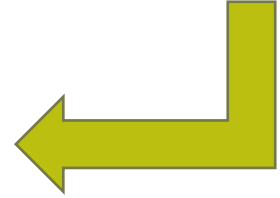
# Two Halves to a Tree: Allow Each Half to Alternate Bear



2016 GIRDLE =  
2017 BLOOM/SET =  
2018 HARVEST



2017 GIRDLE =  
2018 BLOOM/SET =  
2019 HARVEST



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# Methodology



- The Limb bearing fruit HARVESTED in 2017 (summer) will usually be the limb that is GIRDLED in 2017 (fall)
- The sooner the fruit is removed and that limb is pruned, the better
- More time for new foliage to form on the limb that is to be girdled
- Maximize size picking, removing 48 oz fruit as quickly as possible in the growing season



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Optimally, an orchard will consist of  
50% Fruit, 50% "Capacity"



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2019 Harvest

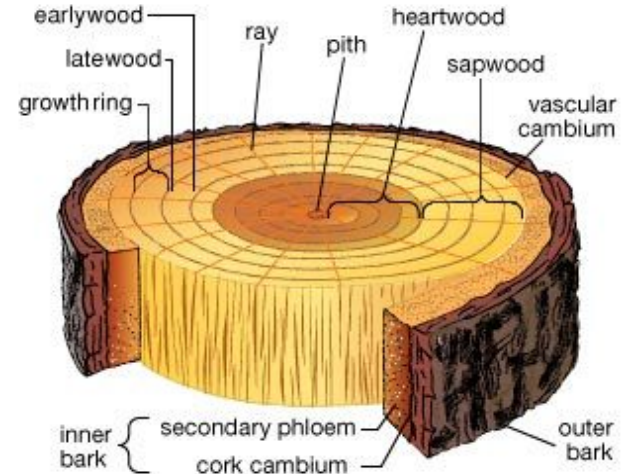


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# Girdling: Tools and Methods



- Larger Trunk/Branch = Larger Saw
- Saw should sever entirely the bark, phloem, and cambium layers, stopping at the sapwood
- The girdler will learn to stop at this layer as it is distinctly harder and resistant to the saw blade
- Our girdling is performed October 15 - November 15
- Coldest areas are girdled first to achieve maximum time for healing of the wound (~ 6 weeks to heal)



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\*This is not an Avocado Tree Cross Section



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# Girdling: Quality Control



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# Girdling: By the Numbers



Girdling Costs, Per Acre, 2013-2016						
	2013	2014	2015	2016	Average	Average
Block	\$/Acre				Per Block	High vs Low Density
A9	\$240	\$208	\$322	\$199	\$242	\$235
A8	\$204	\$137	\$250	\$366	\$239	
A7	\$224	\$234	\$325	\$111	\$223	
A3	\$49	\$81	\$165	\$45	\$85	\$121
A2	\$11	\$100	\$155	\$150	\$104	
A1	\$108	\$102	\$181	\$306	\$174	



Notes: In some cases, costs of girdling in Low Density blocks were lower due to more stressed trees, either due to

full canopy crop load, salinity, and general age-related stress.

- In case of high density, very close to 100% of trees received a girde
- Girdling costs include painting, an optional step, which is helpful but can be skipped to reduce costs



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# Principles of Pruning

(in order of Importance)



1. LEAVE enough capacity for THIS years girdle/production (ESPECIALLY RELATIVE TO TIMING OF PRUNE!!)
  - DO NOT eliminate capacity that is in limited supply (See Also: #4)
2. Separation of trees In-Row and Between-Row
  - The collision of two trees leads to defoliation, reduced foliage, reduced bee access, reduced sun exposure for bloom
3. Elimination of Crossing Branches
  - Crossing branches promote stunted growth, shade out the interior of the tree, reduce potential for next year's production
4. Prune what you have in EXCESS, considering Bloom vs Capacity Ratio (Goal = 50:50)
  - Excess Bloom = Prune Bloom
  - Excess Foliage = Prune Foliage
5. Control of Height
  - Considered AFTER other criteria. Height is the most negotiable problem
  - Ideal Height = 75-80% of Tree Spacing (12' spacing = 9-10' Pruning)



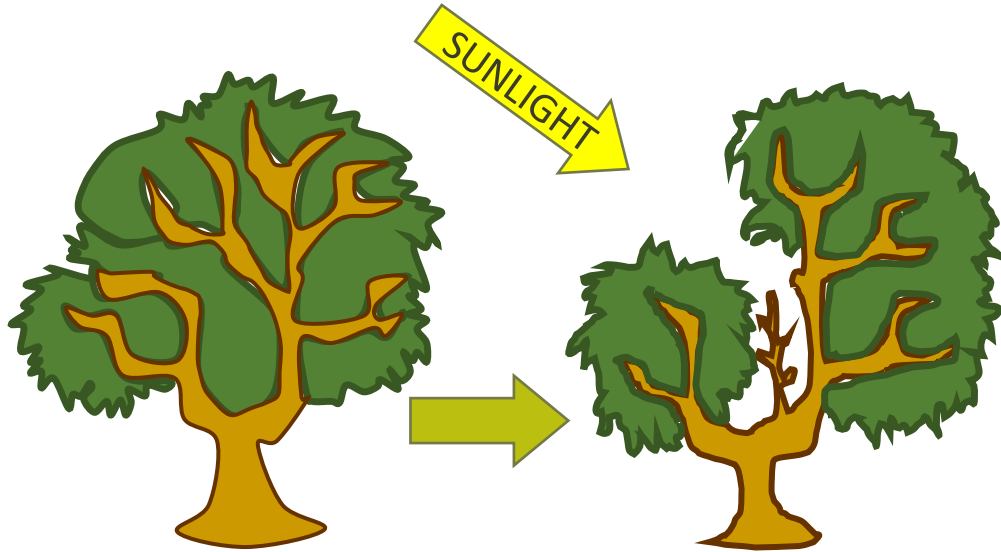
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# Open "Windows" for Low, Future Growth



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# Eliminate crossing branches



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# Production: High Density vs. Low Density



**Pounds Per Acre by Block, 2012-2017**

		2012	2013	2014	2015	2016	2017	AVG	St Dev
Low Density	1	11,089	21,747	7,085	5,765	10,232	6,597	10,419	5936
	2	14,764	16,464	9,408	2,260	12,512	2,015	9,570	6224
	3	19,344	17,672	11,531	8,528	13,263	4,022	12,393	5704
High Density	7	9,535	6,691	20,137	12,672	12,050	14,356	12,573	4572
	8	8,289	5,828	18,758	13,558	13,518	14,700	12,442	4656
	9	6,407	5,257	19,014	11,181	13,566	16,843	12,045	5523

\*Other **IMPORTANT** contributing factors:

- Age of trees
- Degrees of salinity damage
- Rootstock
- High Density in Colder Blocks



Higher Standard Deviation

=

Higher Degree of Alternate Bearing/  
Extreme Highs and Lows



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# Pruning: By the Numbers



Pruning Costs, Per Acre, 2012-2017								
	2012	2013	2014	2015	2016	2017	Average	Average
Block	\$/Acre						Per Block	High vs Low Density
A9	\$479	\$767	\$949	\$746	\$1,778	\$1,162	\$980	\$925
A8	\$143	\$762	\$1,104	\$843	\$1,847	\$1,307	\$1,001	
A7	\$20	\$514	\$1,210	\$549	\$1,594	\$880	\$794	
A3	\$454	\$348	\$387	\$309	\$779	\$380	\$443	\$476
A2	\$300	\$317	\$619	\$464	\$875	\$192	\$461	
A1	\$520	\$414	\$561	\$411	\$860	\$384	\$525	

Note: We are in a “catch-up” phase of pruning in High Density blocks, thus costs may be temporarily inflated. Still, 242 trees/acre requires CONSTANT management: **NOT PRUNING IS NOT AN OPTION.**



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# Closing Thoughts on High Density



- Maximize the ability to harvest sunlight
- Maximize the ability to mine the soil for water and nutrients
- Use the natural tendency of the plant to produce bi-annually
- Pruning and girdling costs are lower per tree but higher per acre higher
- Irrigation costs are similar
- Labor efficiency is higher – less ladders, less walking tree to tree
- Less weed problems



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•Questions and Comments?

