Crop Load Management of Young Vines

UC ANR Foothill Grape Day
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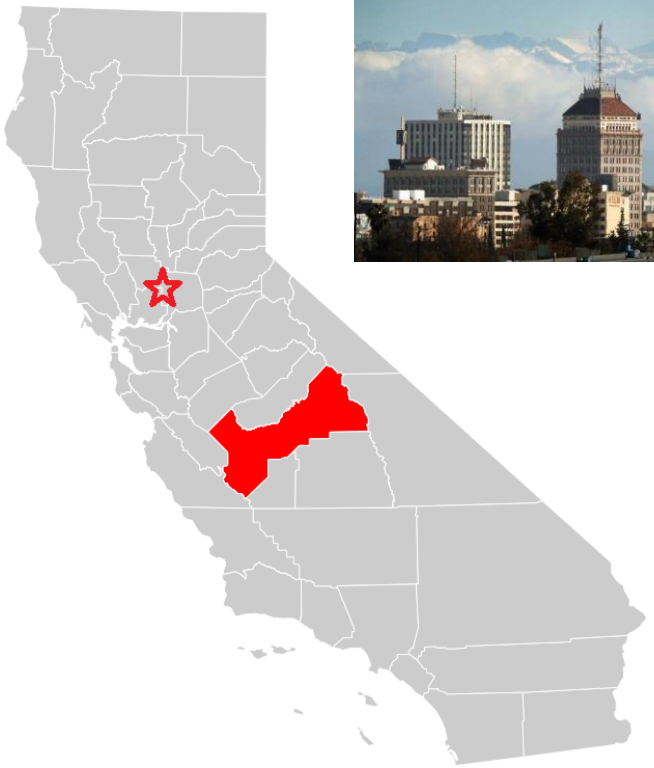
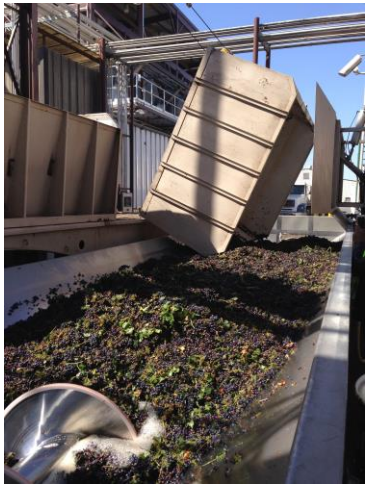
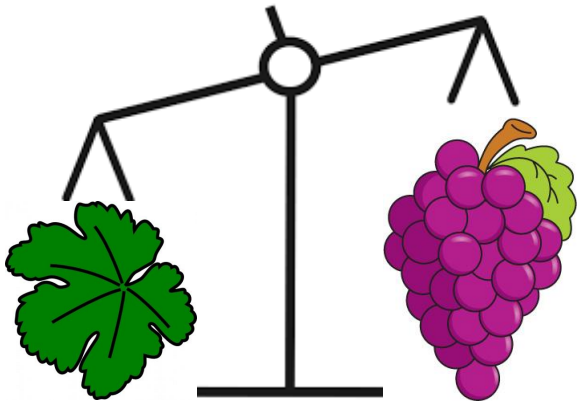
Thanks for Having Me Here!





What is Crop Load?

- **Crop load (Ravaz Index) is the ratio between fruit yield and canopy size (pruning weight).**
- **Crop load** is one of the indicators of **vine balance**
- **Vine balance**
  - ✓ Pruning weight per canopy length
  - ✓ Crop load (Ravaz Index)
  - ✓ Leaf area/fruit ratio
  - ✓ Point quadrant
  - ✓ …

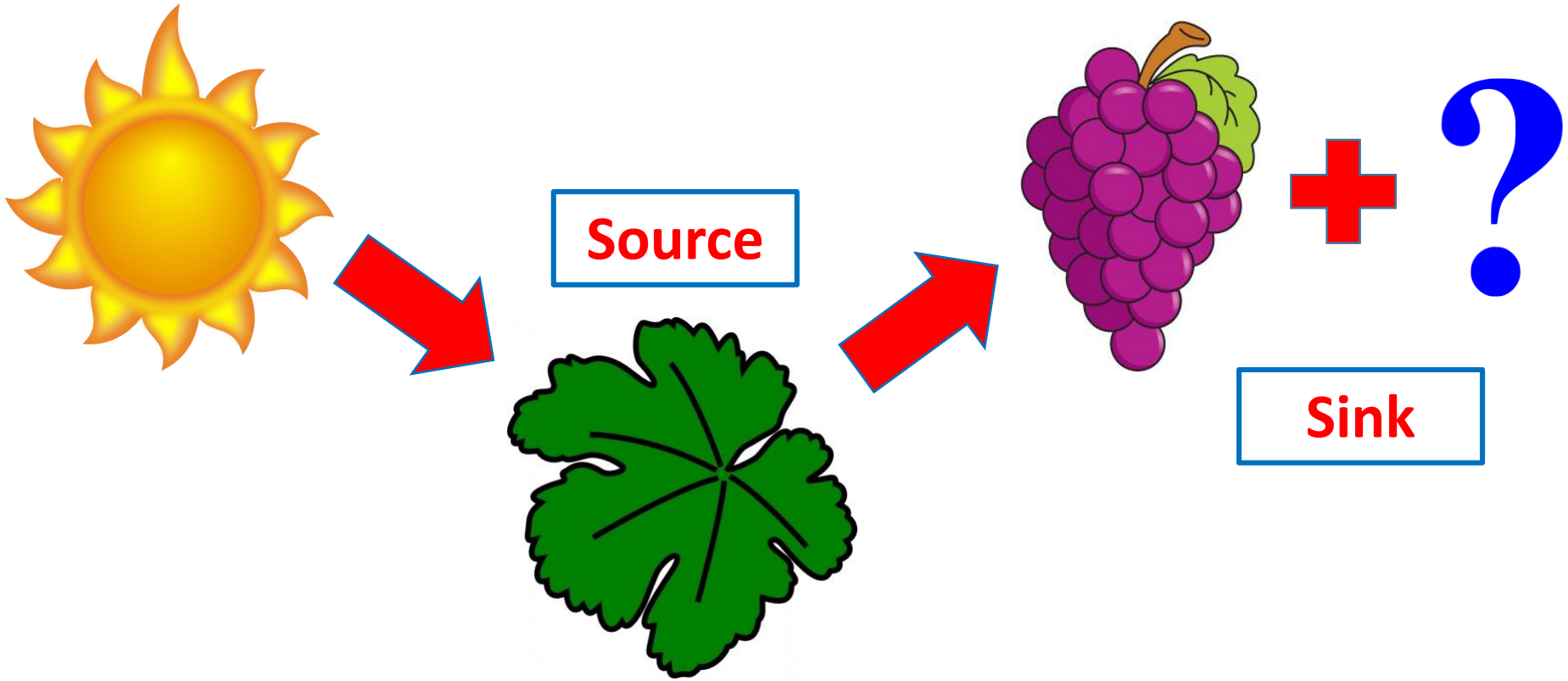


Vine Balance

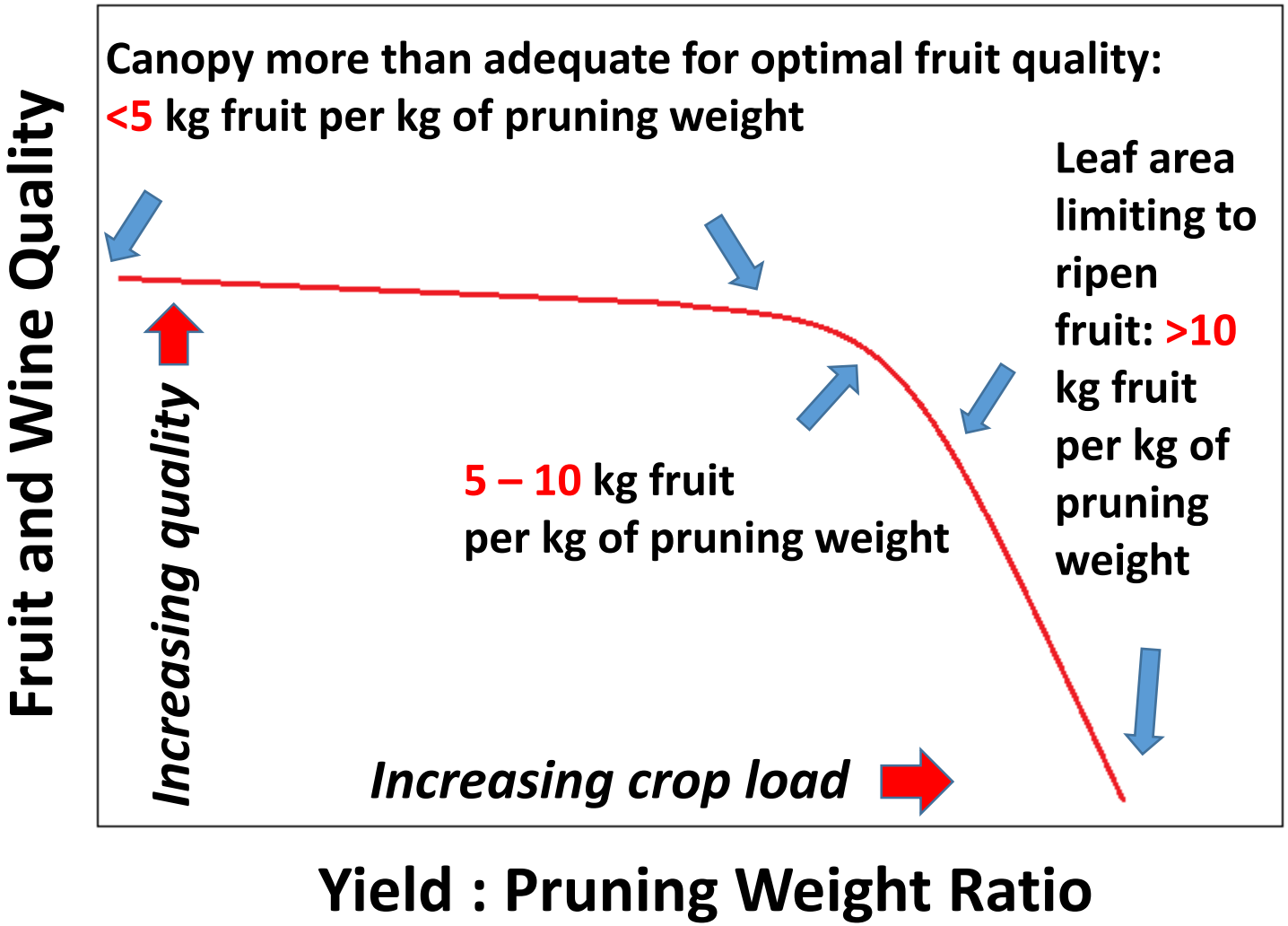
- A vine is in balance when it can bring its fruit to a given **Brix**, with a given summation of **degree days of heat**, which is constant for **a given variety** (Winkler, and Winkler and Williams, 1939)
- **Vine balance**
  - ✓ 0.6 to 1 lbs of pruning weight per foot of canopy length
  - ✓ crop load from 5 to 10
  - ✓ Leaf area/fruit ratio: 0.8 -1.2 m^2/kg: ≈15-18 leaves to ripen 2 clusters per shoot
  - ✓ leaf layer number and percent exposed cluster: 50%-75% clusters visible

Vine Balance

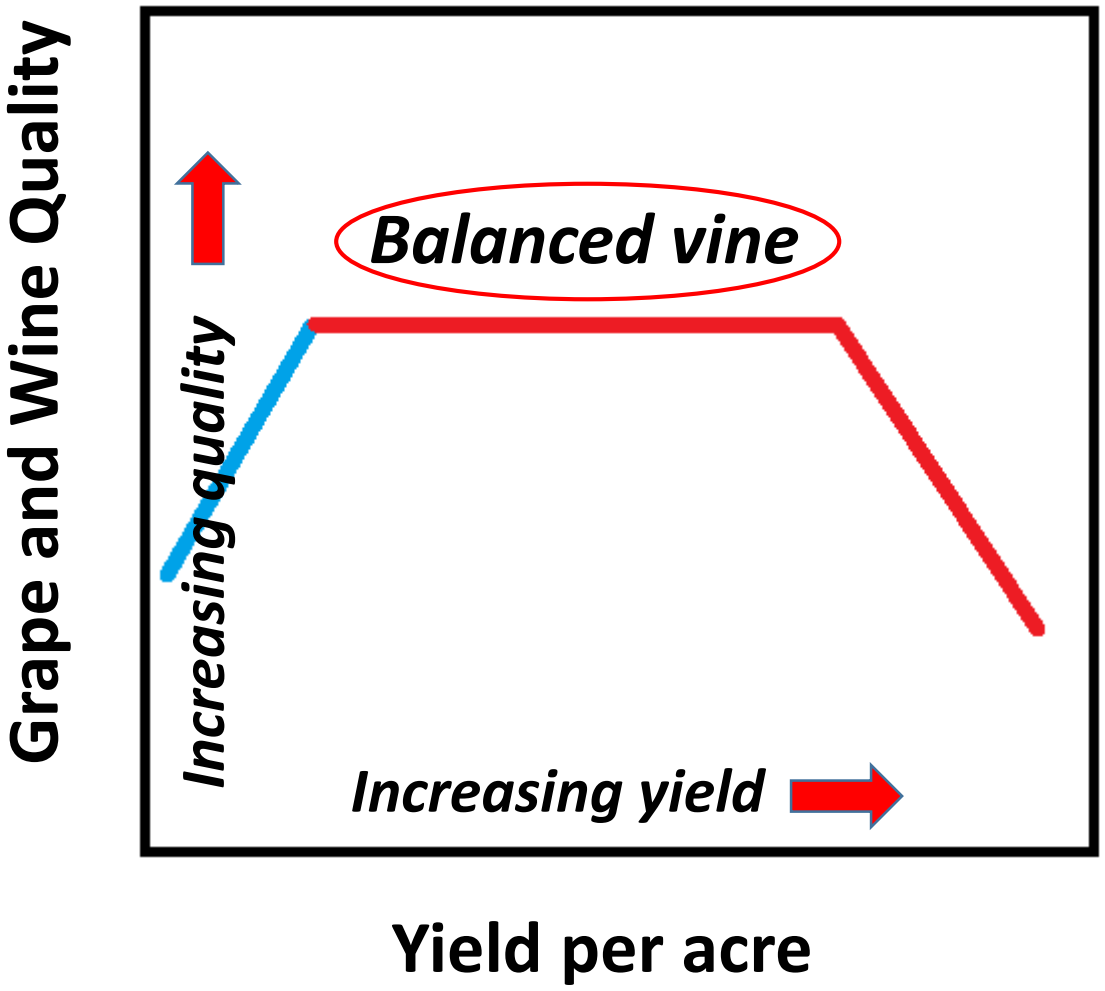
- Adequate exposed leaf area to produce carbohydrate (CHO) to make sugar, acid, color, tannin, flavor… plus the future crop!

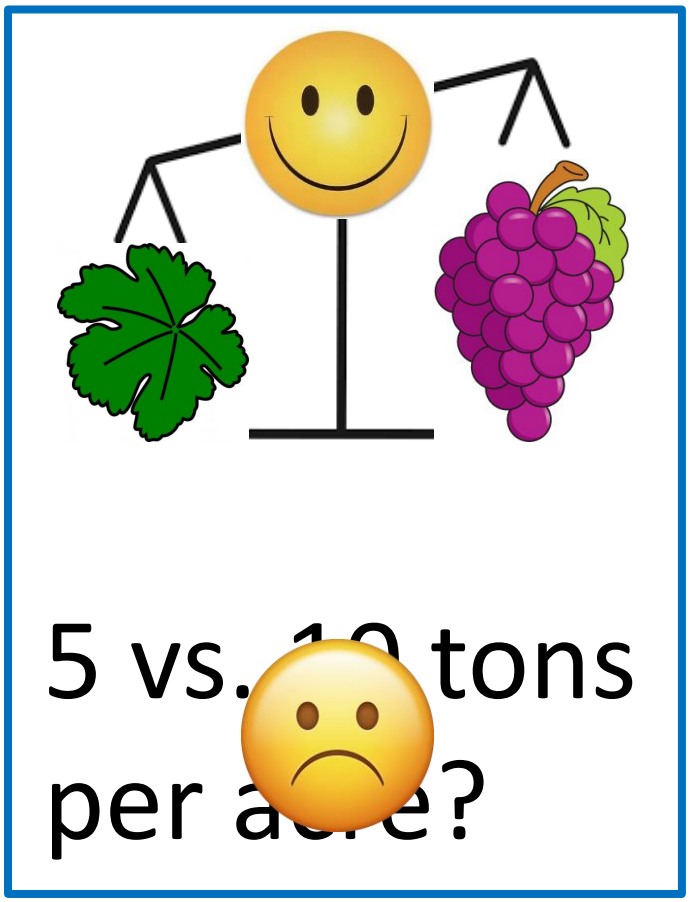


Optimum Crop Load?

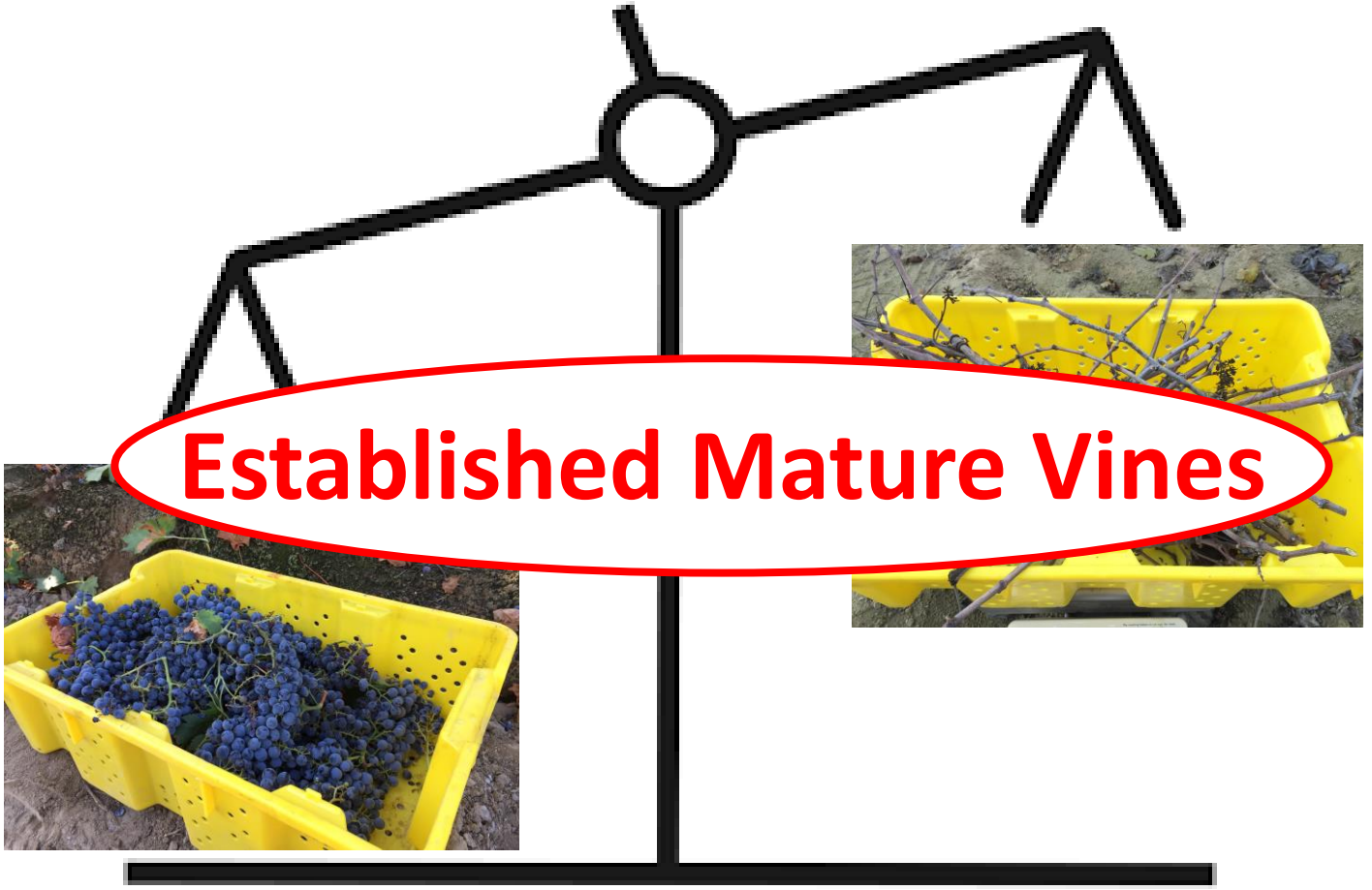


Yield vs. Fruit Quality





Optimal Crop Load: 5-10



Ways To Manage Crop Load

- **Pruning**
  a. Less labor intensive than cluster thinning
  b. Rough regulator of yield
- **Shoot thinning**
  a. Less labor intensive than cluster thinning
  b. Efficient way to regulate yield
- **Cluster thinning**
  a. Timing: 1)pre-bloom; 2)pre-veraison; 3)post-veraison
  b. Labor intensive
  c. Proven method to reduce yield
  d. The most potential to specifically adjust crop load

Ways To Manage Crop Load

Crop load on Young Vines?

- **First crop on the 2nd leaf?**

1st leaf

2nd leaf

Crop load works on Young Vines?

- **Young vines needs more resources to build the vine structure and crop the yield.**
  - ✓ **Variety: Pinot** vs. **Colombard**
  - ✓ **Clone:** vigorous vs. weak
  - ✓ **Rootstock: Freedom** vs. **3309C**
  - ✓ **Trellis: quadrilateral** vs. **bilateral**
  - ✓ **Pruning: cane** vs. **spur**
  - ✓ **Water: more**
  - ✓ **Fertilizer: more**

Cluster Thin vs. No Cluster Thin

- 1st leaf (2015)
- 2nd leaf (2016)
- 3rd leaf (2017)
- …

cluster thin pre-bloom

Cluster Thin vs. No Cluster Thin

- Cluster thin to different number per shoot
  - ✓ 0%
  - ✓ 25%
  - ✓ 50%
  - ✓ 100%

Viticultural Practices

- Irrigation
  - ✓ 2016: 1.34 acre-foot
  - ✓ 2017: 1.65 acre-foot
- Bloom petiole analysis in 2016 and 2017

Year	NO3-N (ppm)	P (%)	K (%)	Mg (%)	Zn (ppm)	Mn (ppm)	B (ppm)	Na (%)
2016	1480	0.21	2.8	0.88	65	45	41	0.03
2017	3429	0.12	3.5	0.88	64	28	33	0.01
Guide	>350*	>0.1	>1.0	>0.2	>15	20-2000	25-80	<0.5

*Christensen 2000, Raisin Production Manual, UC ANR

Visual Overcropping?

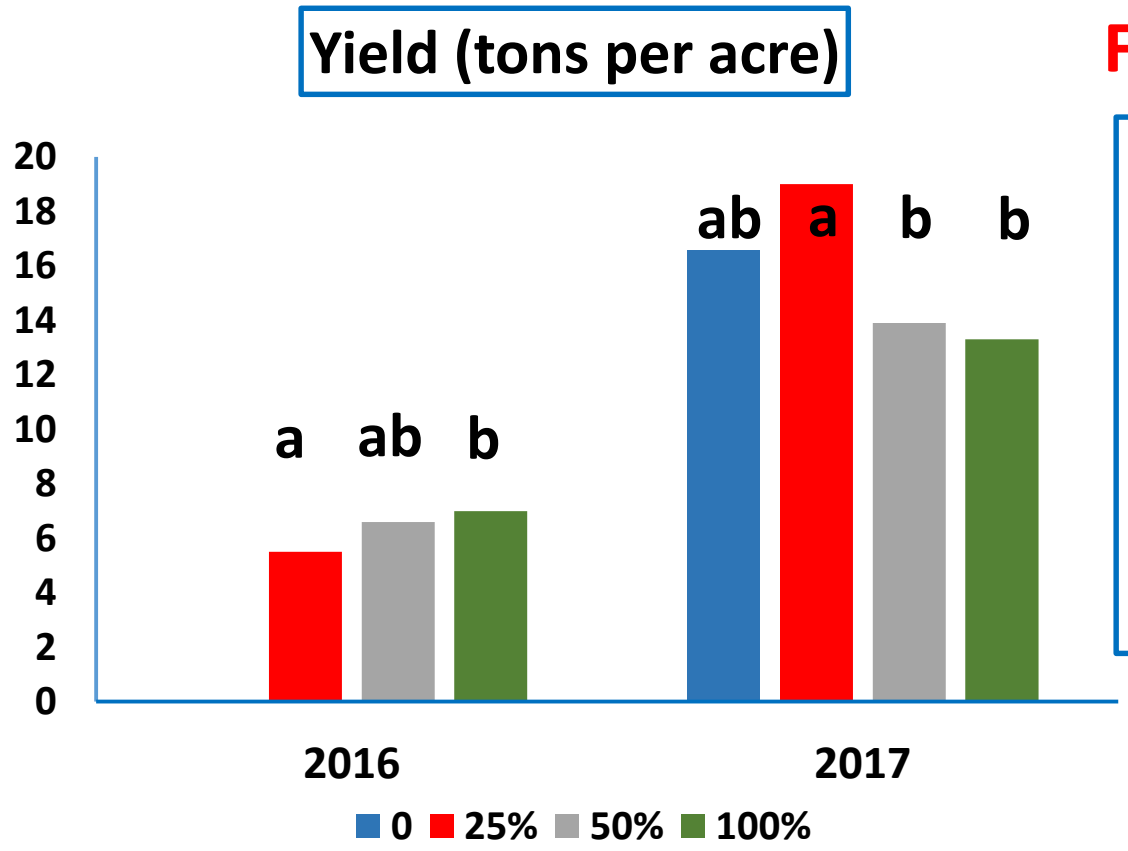
- Canopy size @ veraison in 2016

No cluster thin

Cluster thin

Yield Summary

- Yield (tons/acre)



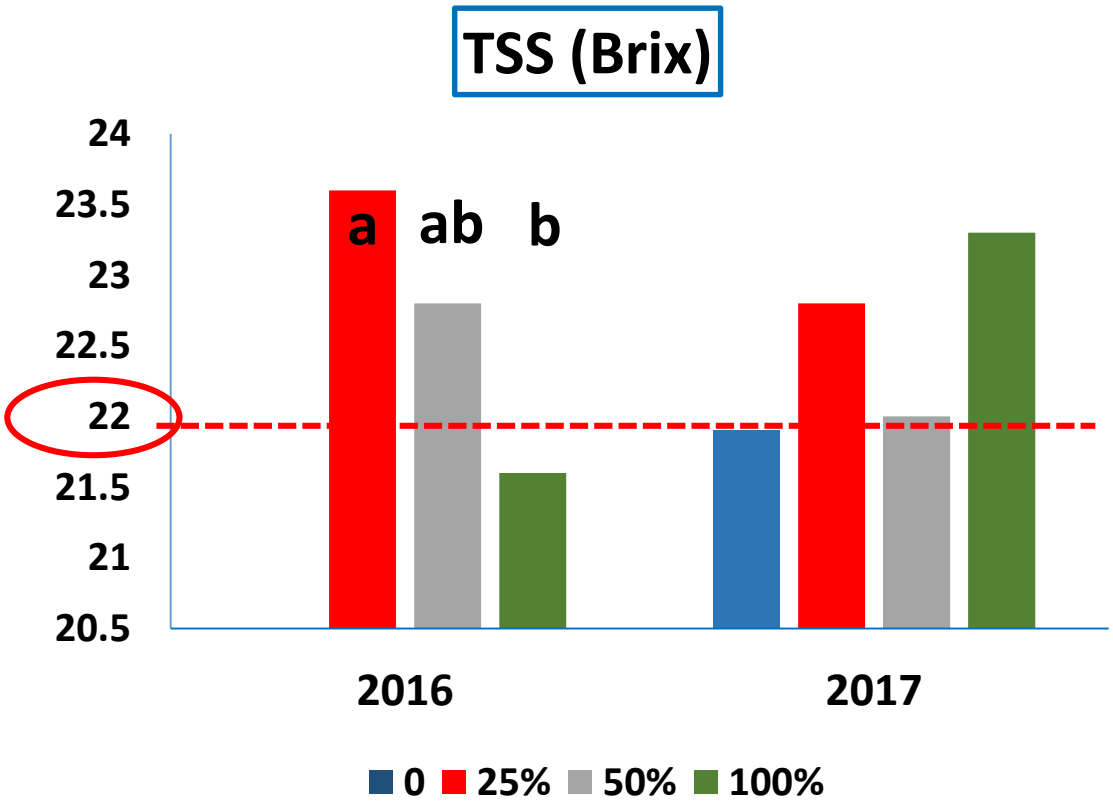
Fresno in 2016 and 2017

Two years' summary:

- 0%: **16.6** tons/acre
- 25%: **24** tons/acre
- 50%: **20.5** tons/acre
- 100%: **20.3** tons/acre

Fruit Chemistry Summary

- Total soluble solids (Brix)



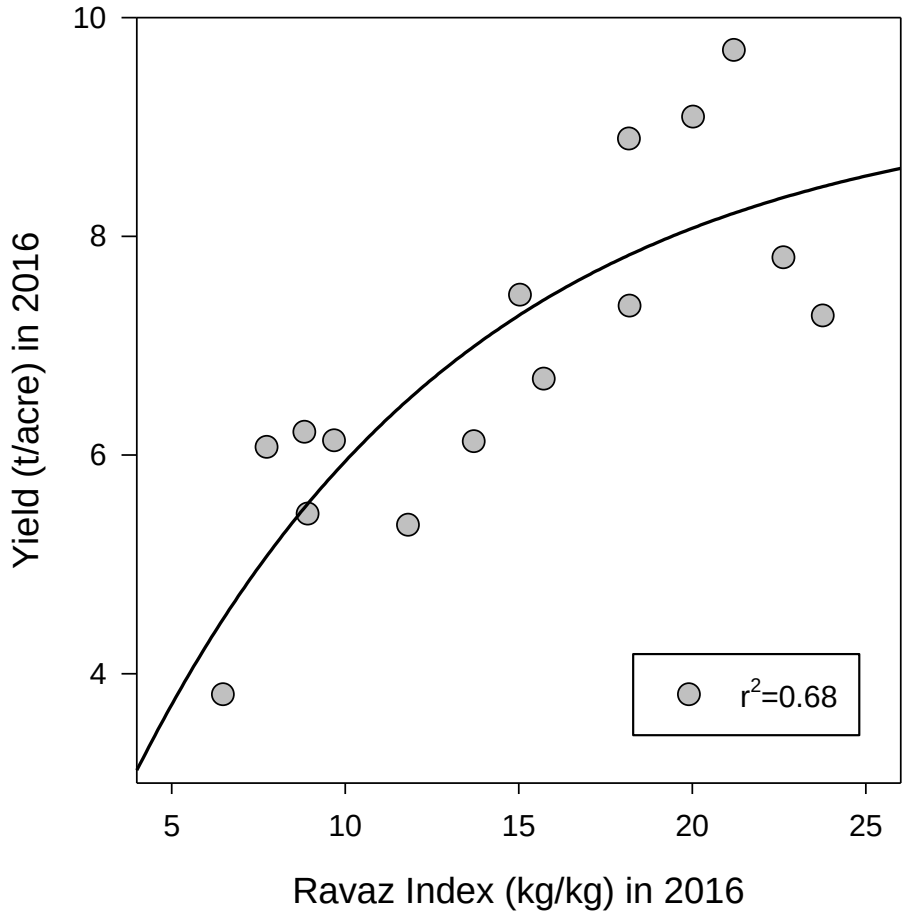
Fresno in 2016 and 2017

Two years' summary:

- Different in 2016
- Similar in 2017

Yield vs. Crop Load

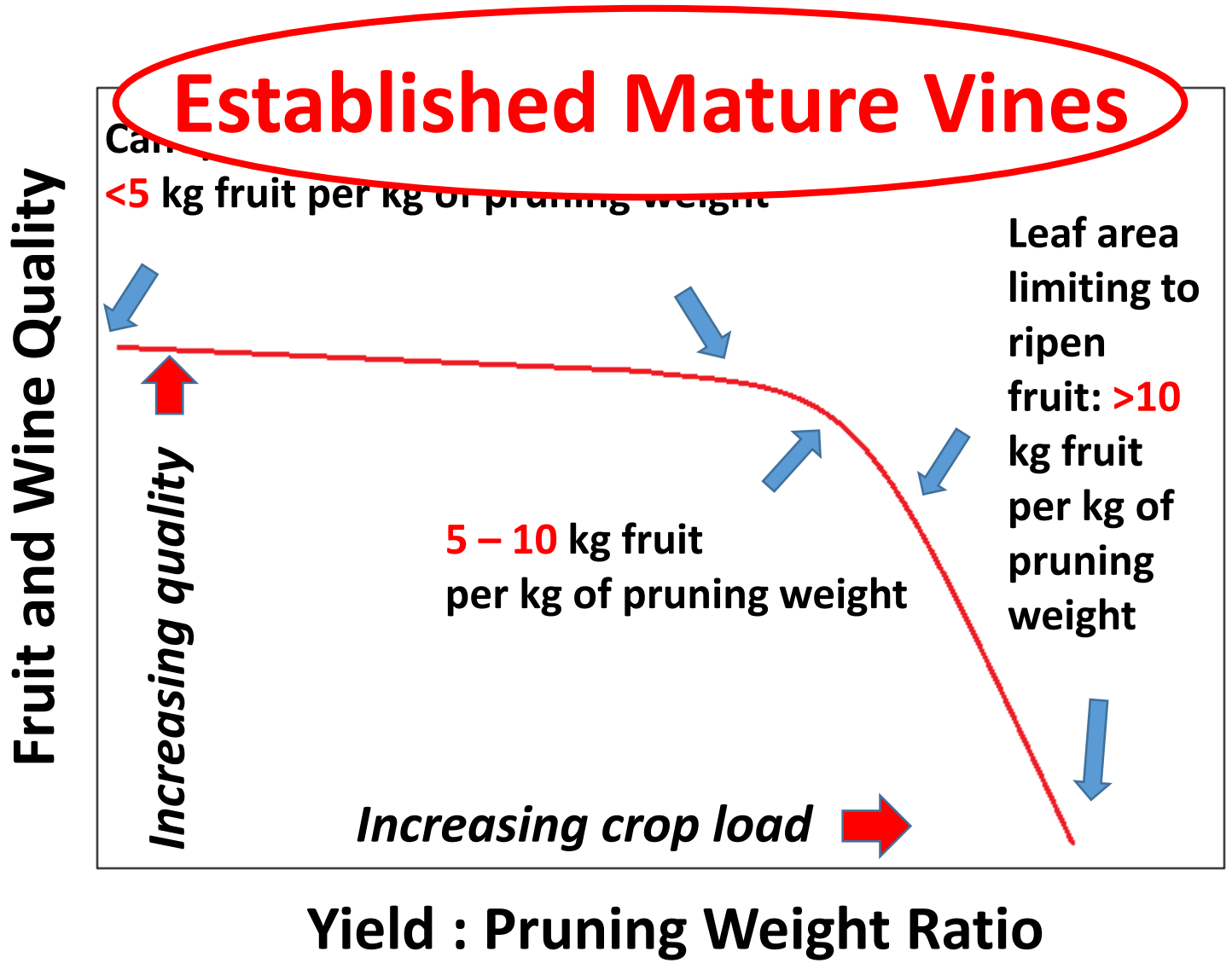
- Yield (tons/acre) and Crop Load (Ravaz Index)



Crop Load in 2016:

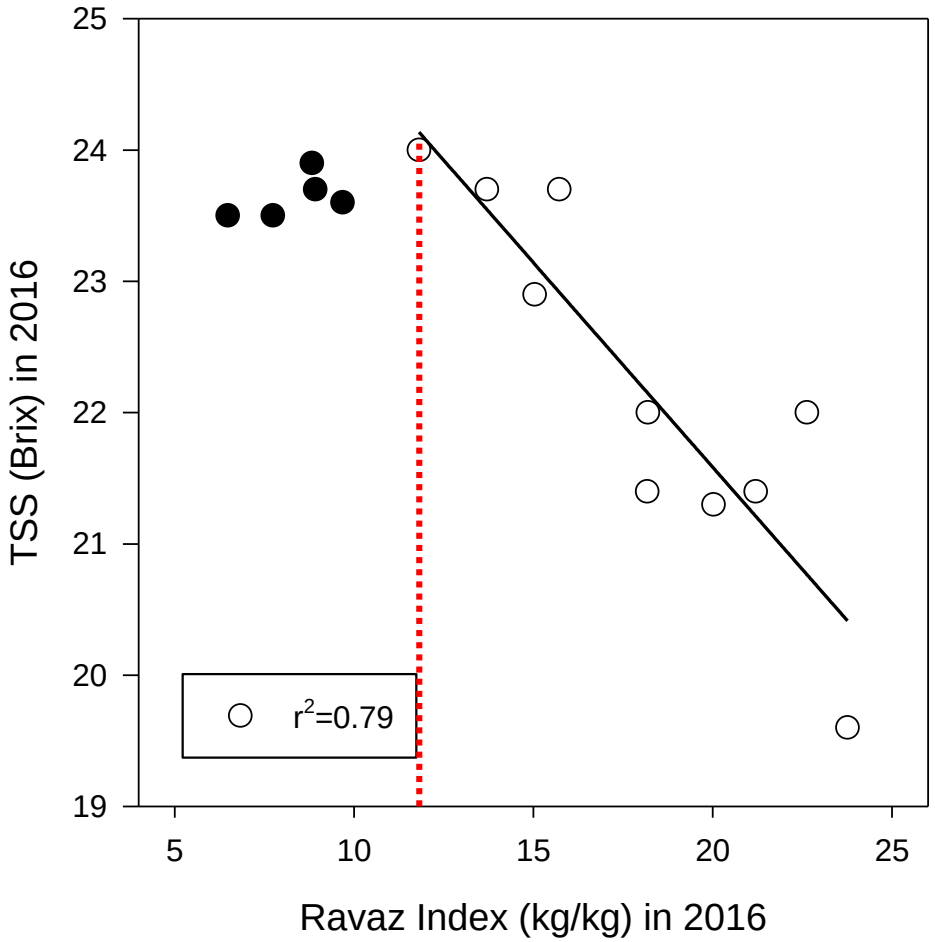
- 0%: NA
- 25%: **8.3**
- 50%: **16.1**
- 100%: **19.9**

Impact of Crop Load on Fruit Quality



Crop Load works on Young Vines?

- Crop load (>10) impacts Brix in 2016



Crop Load works on Young Vines?

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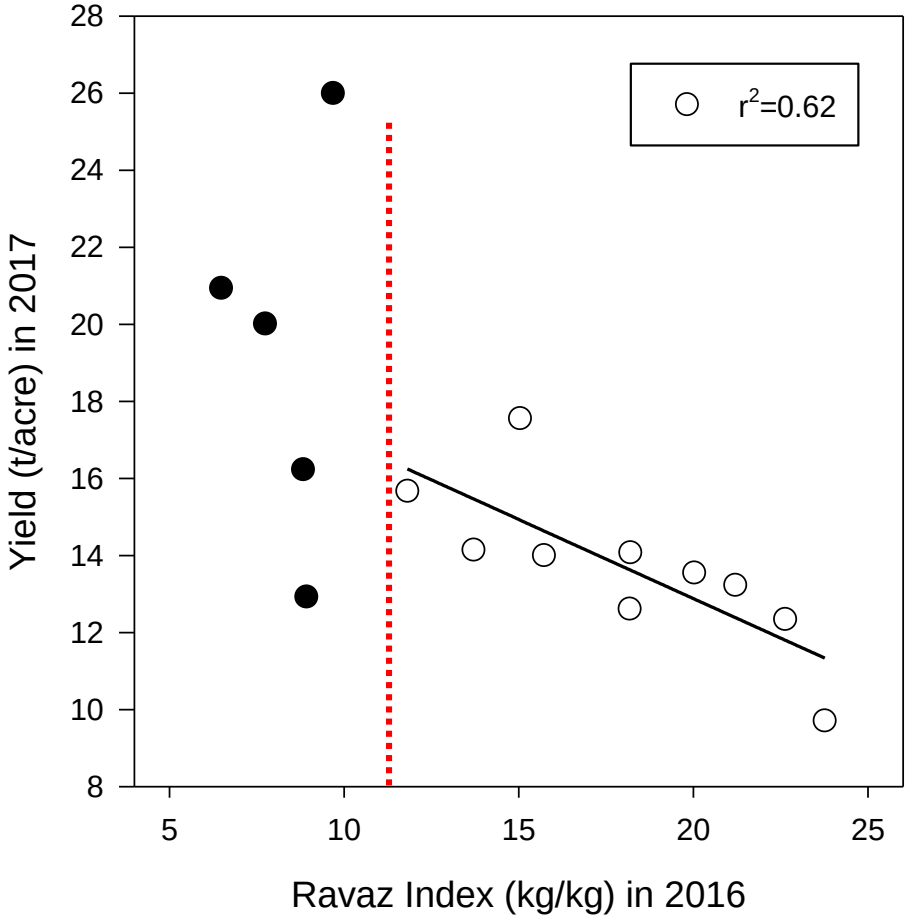
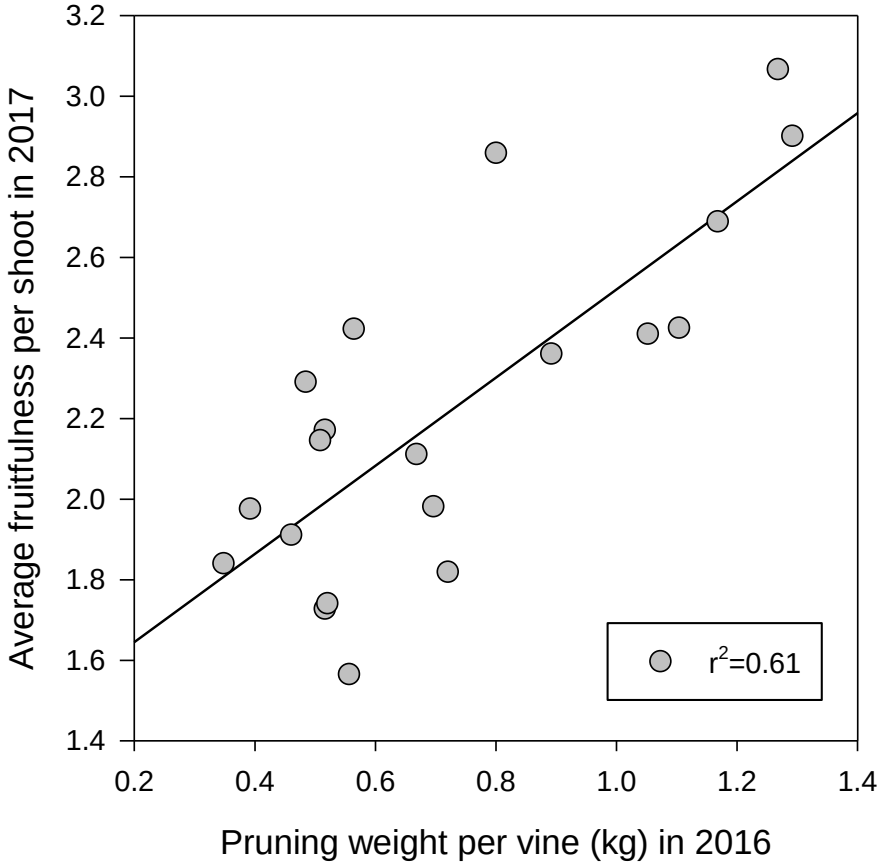
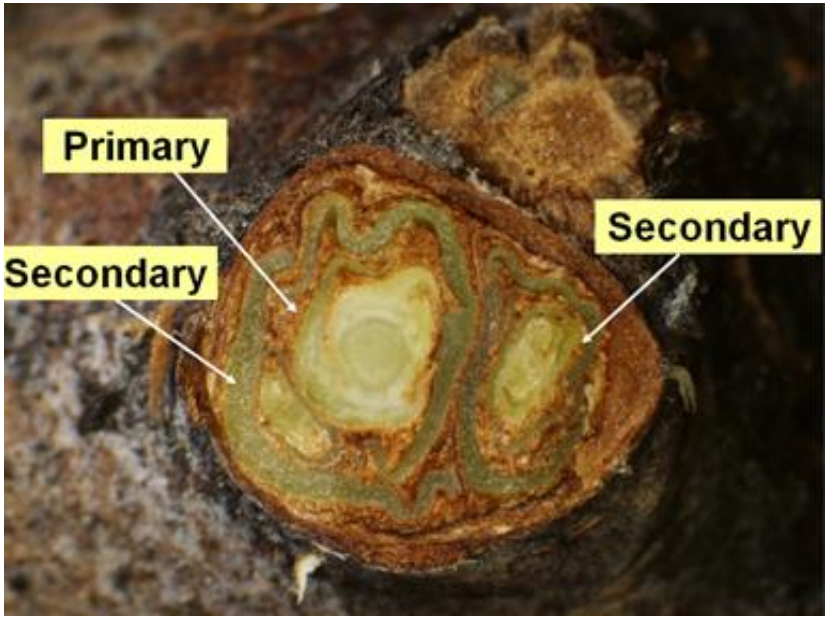


Overcropping on Fruitfulness

- Canopy size in 2016 impacts bud fruitfulness in 2017





Overcropping on Vine Structure

- Loss of spur and cordon, sometimes trunk…
- Increase vine training cost!

Maximize Vineyard Economics

- Two years' summary
  - ✓ Price ≈ $400/ton*
  - ✓ Mechanical harvest ≈ $300/acre*
  - ✓ Cluster thinning pre-bloom ≈ $400/acre*

Treatment	Accumulated yield (tons/acre)	Gross income ($/acre)
0%	16.6	$6,240
25%	**24.0**	**$8,900**
50%	20.5	$7,500
100%	20.3	$7,820

*California Crush Report 2016 and personal communication with industry personnel

Take-home Message

- Vine balance, rather than tons per acre, is more important to achieve maximal viticultural and economic benefits.
- Consider different climate, soils, varieties, rootstocks…, when applying vine balance.
- Young vines need more resources to establish vine structure and produce the crop, and practices should be different on regions.
- Long-term impact needs to be watched.

Acknowledgement

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Questions?