

# Vine Selection

Rootstock and Scion Considerations

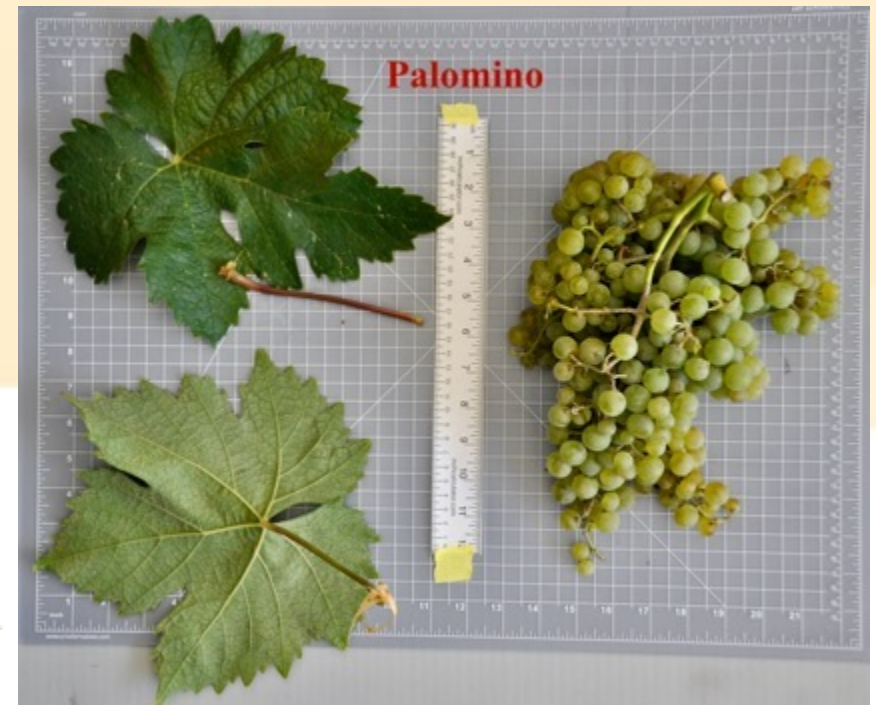
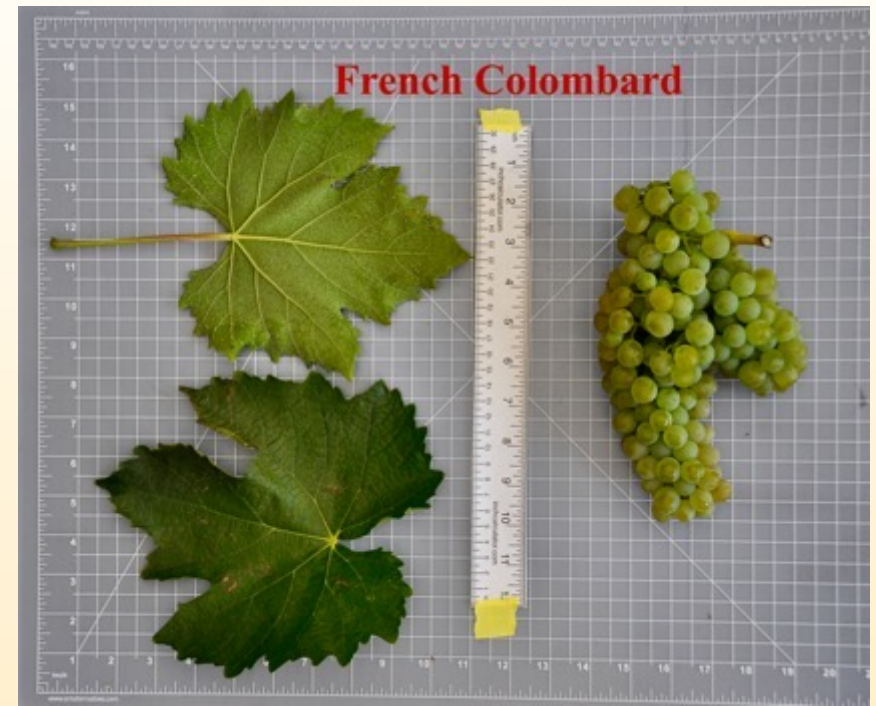
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North Coast

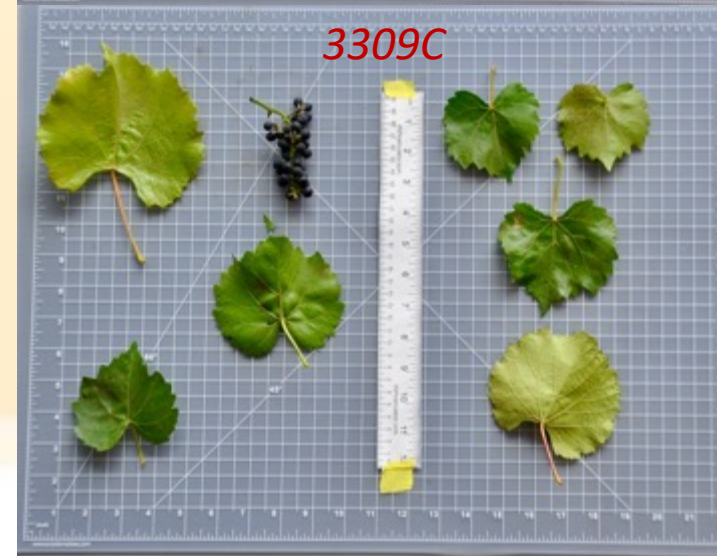
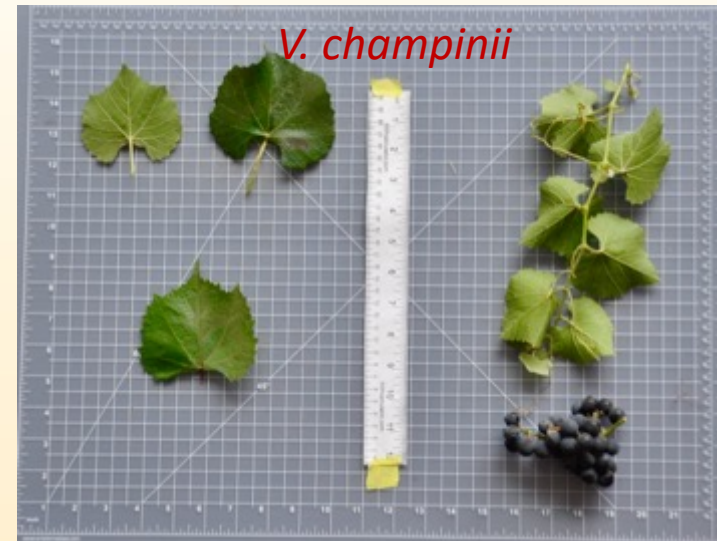
# Scion Cultivars

- Foundation Plant Services offers over 400 wine grape cultivars
- Estimated number of wine grape cultivars worldwide  
5,000 – 15,000 varieties
- Many options, each have their strengths and weaknesses



# Rootstock Cultivars

- Foundation Plant Services offers at least 55 grapevines labelled as *rootstock cultivars*
- However, there are at least 79 accepted species of plants in the family *Vitaceae*
- Most of our production rootstocks come from just a handful of these



# Rootstock ~ Scion Combinations

- Specific combinations of a rootstock and scion have been shown to have unique attributes compared with other combinations with the same scion <sup>1,2</sup>
- Just from FPS stock that implies over 22,000 unique combinations and potential interactions



# Option Paralysis

**CHEESEBURGER** 1.85

**HAMBURGER** 1.60

**FRENCH FRIES** 1.09

**SHAKES** 1.60  
Chocolate  
Strawberry  
Vanilla

AMERICAN DINERS				BEEF				VEGETABLES			
	Price	in Bowl	in Plate		Price	in Bowl	in Plate		Price	in Bowl	in Plate
A. 1. Fried Half Chicken	2.85	4.29	4.99	8. # 70. Spicy Mala Beef	4.99	6.99		8. # 109. Mixed Vegetable Tray	5.99		
A. 2. Fried Chicken Wings (4)	2.99	4.29	4.99	9. # 80. Beef w. Broccoli	4.99	6.99		9. # 110. Mixed Vegetable in Garlic Sauce	5.99		
A. 3. Fried Pork Chops or Chicken Nuggets	3.99	4.99	4.99	10. # 81. Pepper Steak w. Onions	4.99	6.99		10. # 111. Eggplant w. Garlic Sauce	5.99		
A. 4. 8-B-C Square Ribs Tip	3.99	4.99	5.19	11. # 82. Beef w. Chinese Veg.	4.99	6.99		11. # 112. Broccoli in Garlic Sauce	5.99		
A. 5. Fries Fun or Fried Scallops	3.99	4.99	5.19	12. # 83. Beef w. Oyster Sauce	4.99	6.99		12. # 113. Broccoli w. Tofu	5.99		
A. 6. Fried Baby Shrimp (21)	4.99	5.99	5.99	13. # 84. Beef w. Mushrooms	4.99	6.99		13. # 114. Stir Fry String Beans	5.99		
A. 7. French Fries	(9oz) 1.25 (5.3) 2.35			14. # 85. Beef w. Scallops	4.99	6.99		14. # 115. Beef & Shrimp	5.99		
A. 8. Beaufit 10z	2.30			15. # 86. Beef w. String Beans	4.99	6.99		15. # 116. Beef, Cauli or Home Style	5.99		
				16. # 87. Beef w. Snow Peas	4.99	6.99		16. # 117. Ma Po Tofu	5.99		
				17. # 88. Beef w. Broccoli	4.99	6.99					
				18. # 89. Beef w. Broccoli	4.99	6.99					
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*“It’s not about choosing the right cultivar;  
it’s about not selecting the wrong one”*

- Andy Walker

# Plant Selection

# Pick the site or the vine?

- Have to start somewhere
- If you have a specific cultivar in mind, then pick the site to match it
- If you have a specific location in mind, then pick the cultivar instead



# Scion choices

Factors to consider:

1. Economic minimums
2. Target yields
3. Target market
4. Prevalent pests/diseases
5. Trellising/training

# Scion Choices – Economic Minimums

- \$/acre to install a vineyard doesn't change much by the variety you choose
- May limit the options of scions that are feasible to recuperate installation costs in a timely manner

Cultivar	Region	Year	Price/ton
Cabernet Sauvignon	3	2022	\$2970
Zinfandel	3	2022	\$3345
Pinot noir	3	2022	\$3708

*CA Crush Report (2022)*

# Scion Choices

## *Economic Minimums*

- Revenue must exceed management costs and loan payments
- Cultivar matters for \$/ton
- Yields will also vary by cultivar



# Scion Choices - Yields

- Different cultivars have different expected yields
- This is often based on differences in individual cluster weights
- Wine grape shoots usually have two clusters regardless of variety:
  - 1x cluster (by weight)
  - 0.75x cluster (by weight)



# Scion Choice - Yields

- Average cluster weight varies by cultivar significantly
- Cluster count usually does not

Cultivar	Clusters/shoot	Average Cluster Weight
Cabernet Sauvignon	2	0.25 lbs/cluster
Zinfandel	2	0.65 lbs/cluster
Pinot noir	2	0.27 lbs/cluster

*These values represent estimates from several sources*

# Scion Choice – Yields (Let's do maths!)

Cultivar	Clusters / shoot	Shoots/ft <sub>cordon</sub>	Cordon Length	Average Cluster Weight	Yield/Vine (lbs)
Cabernet Sauvignon	2	4	5 ft	0.25	10 lbs/vine
Zinfandel	2	4	5 ft	0.65	26 lbs/vine
Pinot noir	2	4	5 ft	0.27	10.6 lbs/vine

# Scion Choice – Yields (Let's do maths!)

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Cabernet Sauvignon	2	X	4	X	5 ft	X	0.25	≈	10 lbs/vine
Zinfandel	2	X	4	X	5 ft	X	0.65	≈	26 lbs/vine
Pinot noir	2	X	4	X	5 ft	X	0.27	≈	10.6 lbs/vine

# Scion Choice – Economics & Yields

Cultivar	Yield/Vine (lbs)	Vines/Acre	Tons / lb	\$/ton	Revenue/Acre
Cabernet Sauvignon	10 lbs/vine	1244	0.0005 tons/lb	\$2970	\$18,473/acre
Zinfandel	26 lbs/vine	1244	0.0005 tons/lb	\$3345	\$54,095/acre
Pinot noir	10.6 lbs/vine	1244	0.0005 tons/lb	\$3708	\$24,447/acre



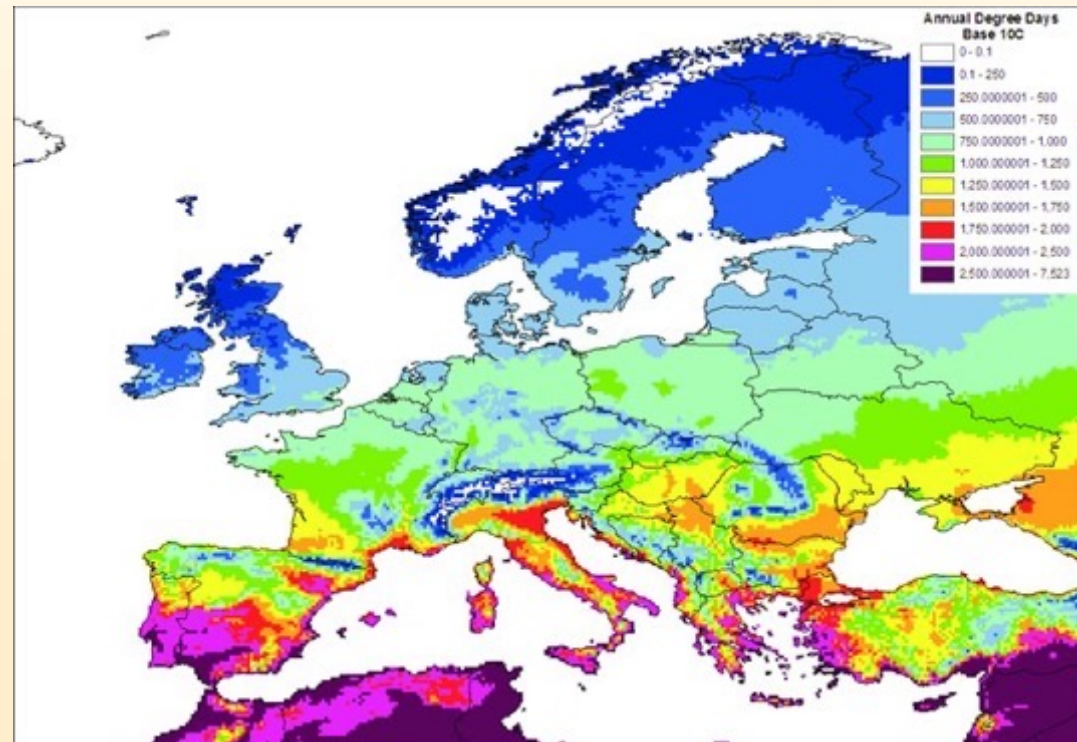
# Climatic Origins

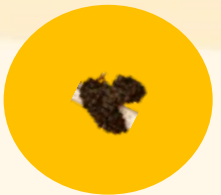
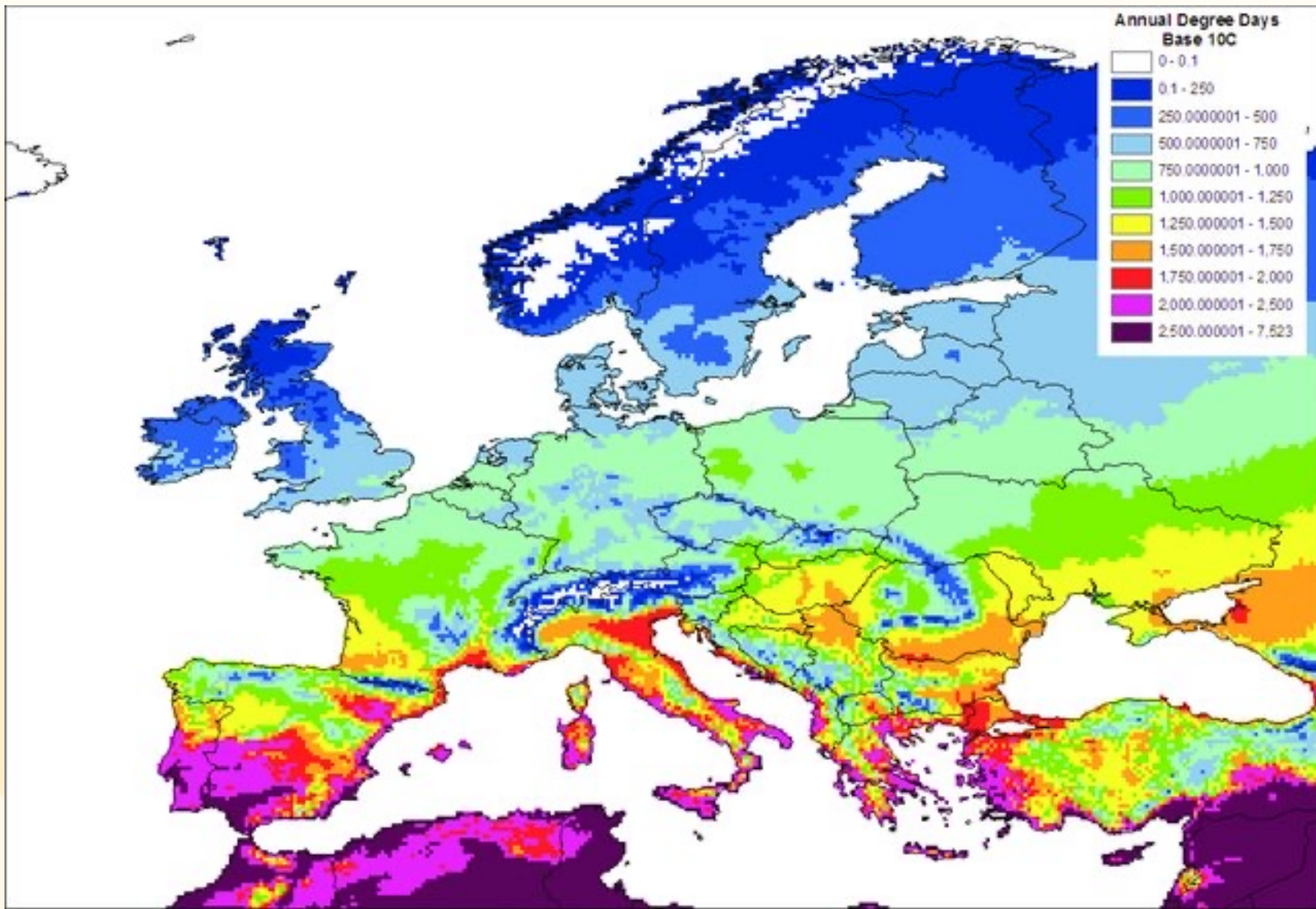
Where did the scions originate from?

This impacts their tolerance for heat (and other stressors)

- Rootstocks  $\neq$  Phylloxera
- Vinifera roots = Phylloxera

Think about how your climate matches up with the original climate of the scion





# Scion Choices – Target Market

- Selling goals
  1. High volume ; lower price (volume)
  2. High volume ; make wine (volume – wine)
  3. Low volume ; higher price (boutique)
  4. Low volume ; make wine (boutique – wine)
- Simplified way to look at the options
- There's everything in between here and growers don't have to settle in a single category
- Target yields and \$/ton will change based on your target market

# Scion Choice – Pests/Diseases

- If there are expected pests/diseases, then you may want a scion that is less impacted by that pest
- Botrytis bunch rot is a great example
  - Denser clusters (i.e., Pinot noir)
    - = more rot risk
  - Looser clusters (i.e., Cabernet Sauv)
    - = better air flow and spray penetration



# Scion Choice – Pests/Diseases

- Now there are scions developed to be resistant to diseases like:
  1. Pierce's Disease
  2. Powdery Mildew



PD-resistant *Caminante blanc* and *Camminare noir* from the Walker Lab at UC Davis

# Scion Choice

## Trellising and Training

- Often you will decide on a trellis based on the scion cultivar you chose
- Size of the trellis should follow vigor of the cultivar
  - Quadrilateral system  $\approx$  Sauv blanc
- However, if you have a trellis in mind, the cultivar should be well matched in vigor to the trellis design



# Scion Choice – Vine Balance



# Rootstock Choice

Factors to consider:

1. Soil properties
2. Scion vigor
3. Availability and graftability at nursery
4. Water Availability
5. Pests/Diseases





# Species for Rootstocks

Hundreds of 'wild' grapes that are considered *Rootstock material*

Most rootstocks are offspring of the 'BIG 3'

1. *Vitis rupestris* – St. George
2. *Vitis riparia* – Gloire
3. *Vitis berlandieri* – (doesn't have a fancy name)

# *Vitis riparia* ('Gloire')

Found from the Rocky Mountains to Atlantic Coast (Canada to Texas)

Discovered in **riparian habitats** (next to rivers/streams)

Prefers **alluvial soils** or soils that evolved from flood events

First used in French hybrids of wild grapes x *V. vinifera*



# *Vitis rupestris* ('St. George')

Found between Texas and Tennessee

Discovered in **riparian habitats** (rocky, dry creek beds)

- This is a different soil type than those where *V. riparia* is found

Prefers **rocky/gravelly soils** or soils with plenty of dry periods

First used by-itself as 'St. George'



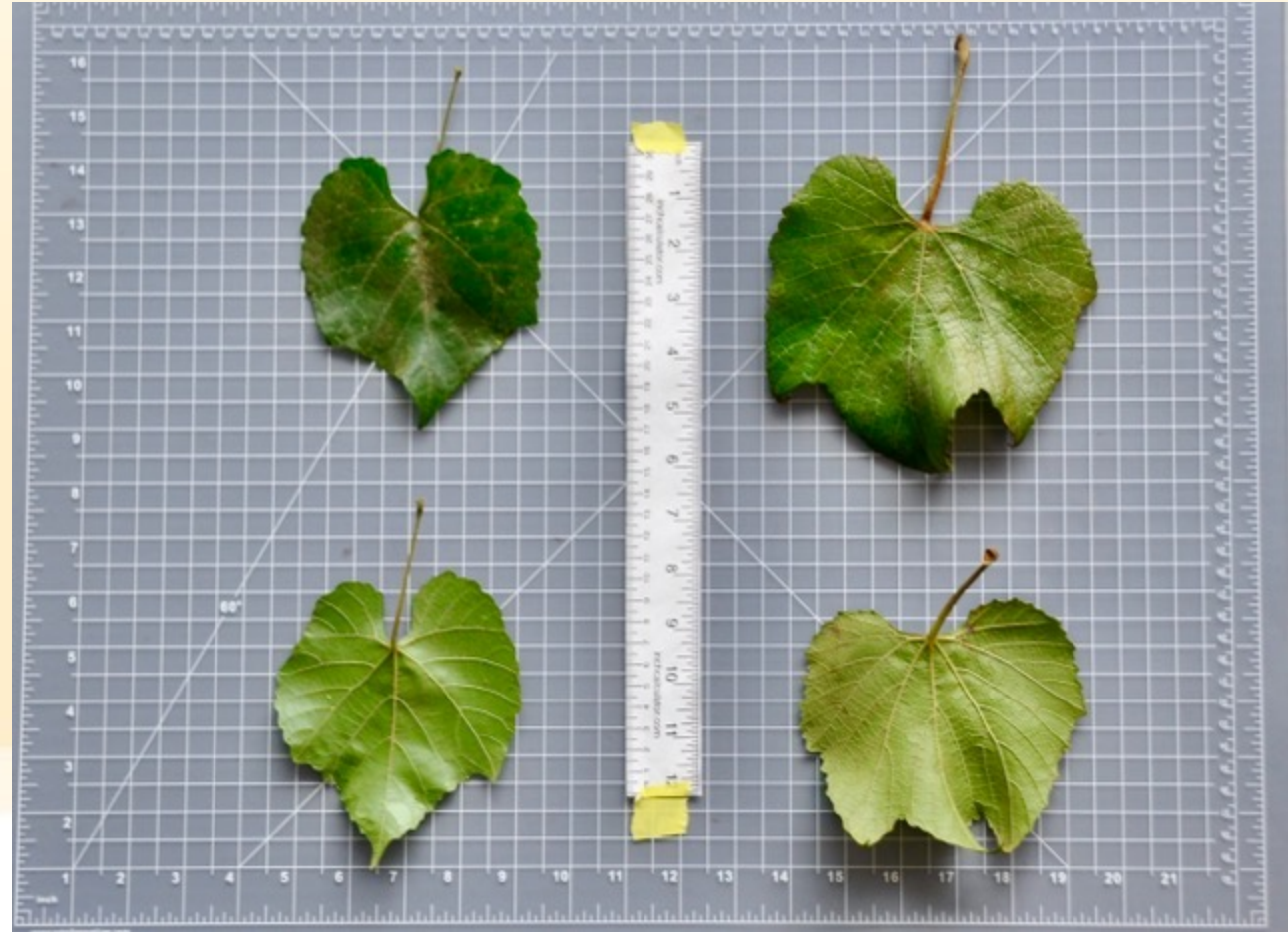
# *Vitis berlandieri*

Found in the mountains of Texas

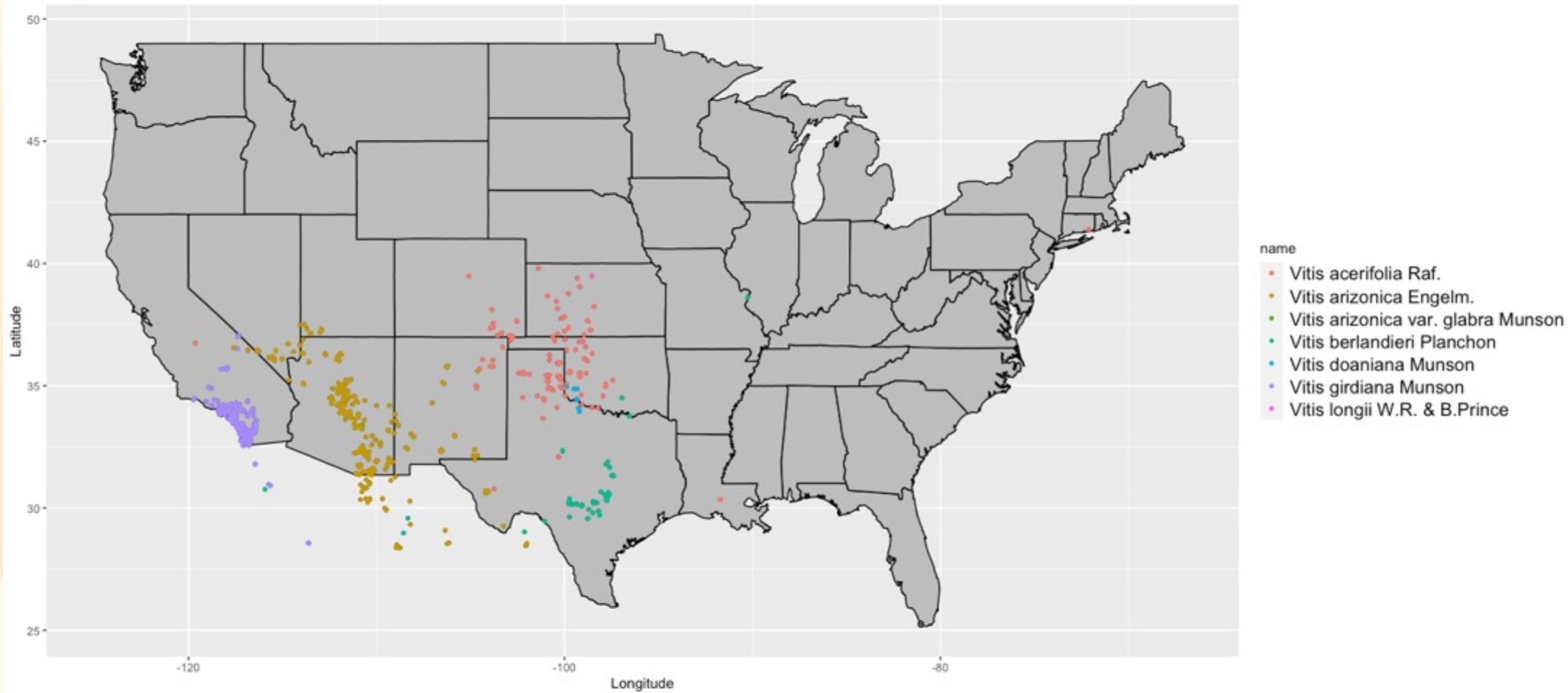
Discovered in dry, limestone soils

Prefers dry soils high in Calcium

First used in French hybrids, similar to  
*V. riparia*



Geographic distributions of collected accessions in the United States



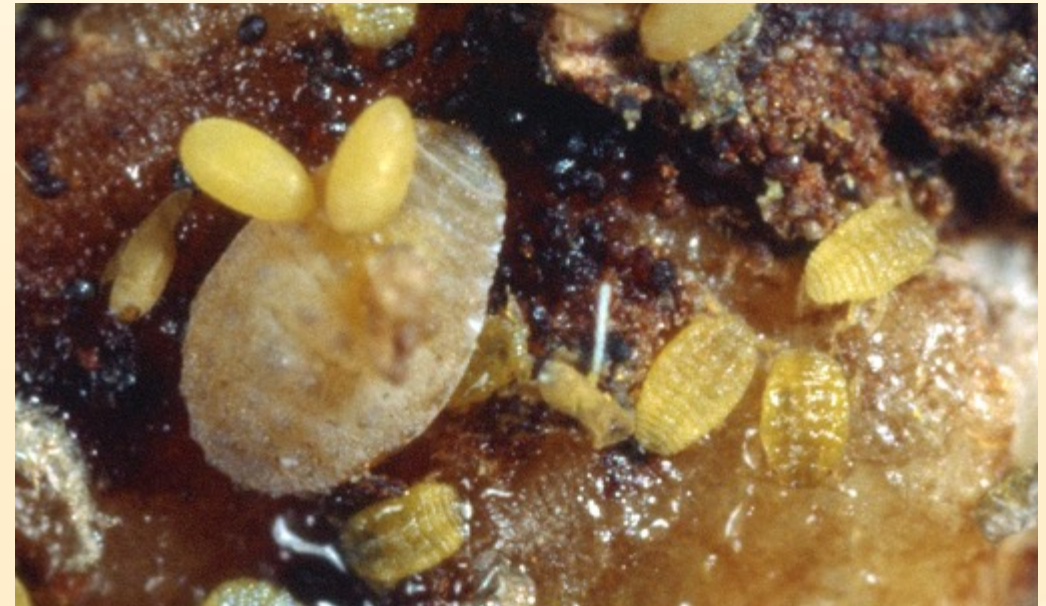
# Rootstocks – Soil and Water Conditions

- Rootstocks are often selected to match a site's soil and water properties
- These may include:
  - Shallow soils
  - Low water holding capacity
  - Low water availability
  - Regular inundation by flooding
  - Etc...



# Rootstocks – Pests and Diseases

- Rootstocks were originally used to combat Grapevine Phylloxera
- Their purposes have expanded and may include:
  - Abiotic stress tolerance
  - Pest feeding tolerance
  - Disease symptom tolerance
  - Vine vigor modifications
  - Etc...



# Rootstocks – GRN Series

- GRN Series specifically designed for nematode tolerance
- Cultivars:
  - GRN-1
  - GRN-2
  - GRN-3
  - GRN-4
  - GRN-5





# Rootstock - Availability

- Some rootstocks are more difficult to root and graft than others
- Often these have *Vitis berlandieri* in their parentage
- Increases the \$/vine and the number of vines the nursery must graft to fulfill your order



# Rootstocks for what?

## Conditions that rootstocks are used to address

Drought (deep roots are better)

Water-logging (shallow roots are better)

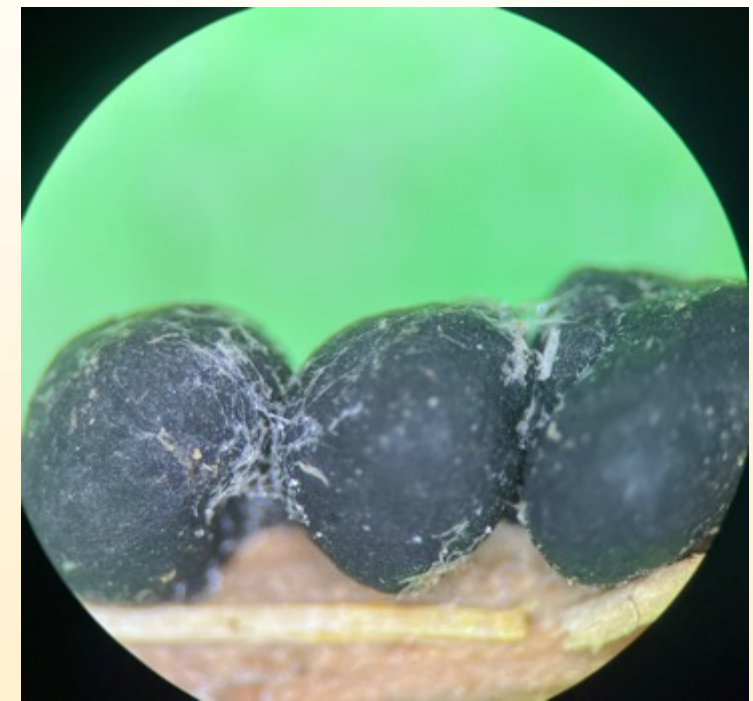
Soil-borne pests (i.e., Nematodes, Phylloxera)

Diseases (i.e., Fanleaf virus, root rot)

Poor soils (you want a high vigor rootstock)

Really good soils (you want a low vigor rootstock...usually)

Excessive soil lime ( $\text{CaCO}_3$  – Calcium Carbonate)



# Rootstock Choice - Stressors

## Drought tolerant rootstocks

### Desired characteristics:

- Vigorous
- Deep rooting
- Good root development

### Examples:

- 140 Ruggeri
- Ramsey (Salt Creek)
- St. George

## Pest-feeding tolerant rootstocks

### • Desired characteristics:

- Vigorous
- Can continue growing roots if damaged
- Can tolerate high pest populations

### • Examples:

- Any rootstock (Phylloxera feeding)
- GRN series or 039-16 (Nematodes)

**140 Ru**



**140 Ru – deep rooted**

**101-14 mgt**



**101-14 mgt – shallow rooted**

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it’s about not selecting the wrong one”*

- Andy Walker

# When we all ‘Picked the Wrong One’

## AXR #1

- Introduced by Lloyd Lider in 1960s
- Concluded that AXR #1 was a ‘dream rootstock’ and was suited to many conditions while maintaining yield
- AXR #1 was planted everywhere (in America)
- Eventually... “It is understood that in very dry, shallow soils and in areas where phylloxera can be serious they (AXR#1) may do poorly or even fail.”



*AXR #1 in Anderson Valley in Spring*

# When we all 'Picked the Wrong One'

## AXR #1

- Prior to introduction in United States, AXR #1 failed in multiple other countries.
- The timeframe for failure was between 15-20 years after planting
- Symptoms of Phylloxera damage were always apparent at the 15-year timepoint
- Almost all of it has been replaced now



*AXR #1 in Anderson Valley in Winter*

*Image from  
Sunridge Nurseries*



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Agriculture and Natural Resources

Cooperative Extension



# Rootstock ~ Scion Considerations

# Combination Effects

- Rootstock and scion interactions can impact many aspects of vine physiology:
  1. Vigor and annual growth
  2. Yields
  3. Xylem vessel diameters <sup>3</sup>
  4. Must composition <sup>4</sup>
  5. Cold hardiness <sup>5</sup>
  6. Etc...

# Combination Effects

- The most approachable rootstock~scion interaction effect may be control of scion vigor
- Many growers use ‘devigorating’ rootstocks to reduce canopy sizes for highly vigorous cultivars
- e.g., 420A is considered devigorating

# Where to start – Vine selection

- Start with economics
  - How many tons/acre do you need?
  - What are the markets for a variety?
  - What \$/ton range is possible?
- Select options for scion cultivars that have potential to meet those economic thresholds
  - What are your goals?
  - High or low yields?
  - Low or high prices? (by average)

# Where to start – Vine selection

- What can the climate/site support?
  - Seasonal heat accumulation on site
  - Water availability
  - Soil potential for vigor
- Reduce your scion options
  - What meets your prior requirements?
- Decide from the list based on the rootstock you choose

# Where to start – Vine selection

- Rootstock choices
  - Rootstock should help your scion reach your goals of yields and vigor
  - Typically, choose rootstock to be inversely vigorous to the potential of your soils
  - Some choices match site conditions
    - i.e., drought tolerance, inundation, soil-borne pests, diseases



Thank You

# Sources

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