Delayed pruning Chardonnay

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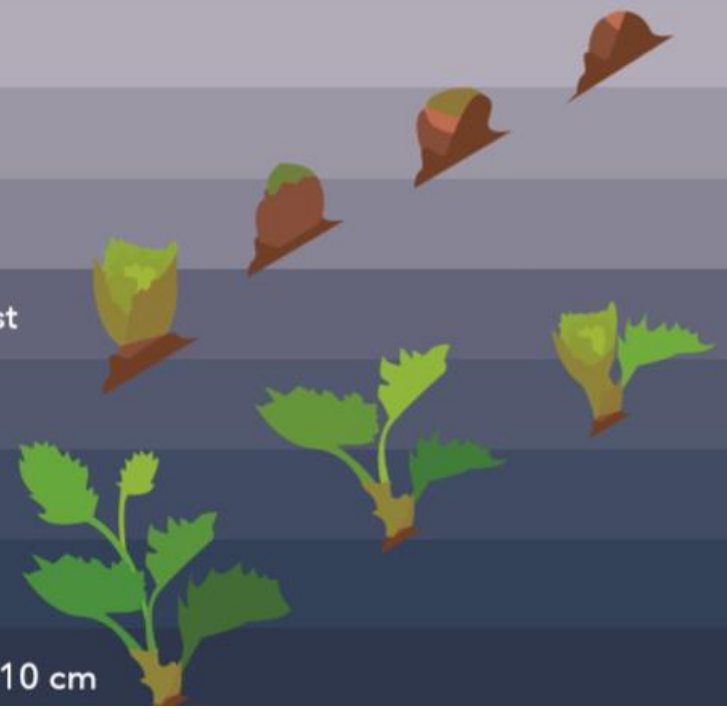
UNIVERSITY OF GEORGIA EXTENSION

Frost is a perennial threat to vineyard crop potential in Georgia (and many other regions).

- Primary buds often break before the final frost date…
- Green tissue is susceptible to frost injury…
- Crop potential is reduced when primary shoot is killed
  - 30% of full crop in some cultivars

Major stages	E-L number	All stages
	1	Winter bud
	2	Bud scales opening
	3	Wooly bud ± green showing
4 Budburst	4	Budburst; leaf tips visible
	7	First leaf separated from shoot tip
	9	2 to 3 leaves separated; shoots 2-4 cm long
	11	4 leaves separated
12 Shoots 10 cm	12	5 leaves separated; shoots about 10 cm long; inflorescence clear



Why are we concerned with frost injury?

- Farming is a business
  - Money
  - Enterprise sustainability

  - PRIMARY BUD YIELD: 3.5 TONS PER ACRE

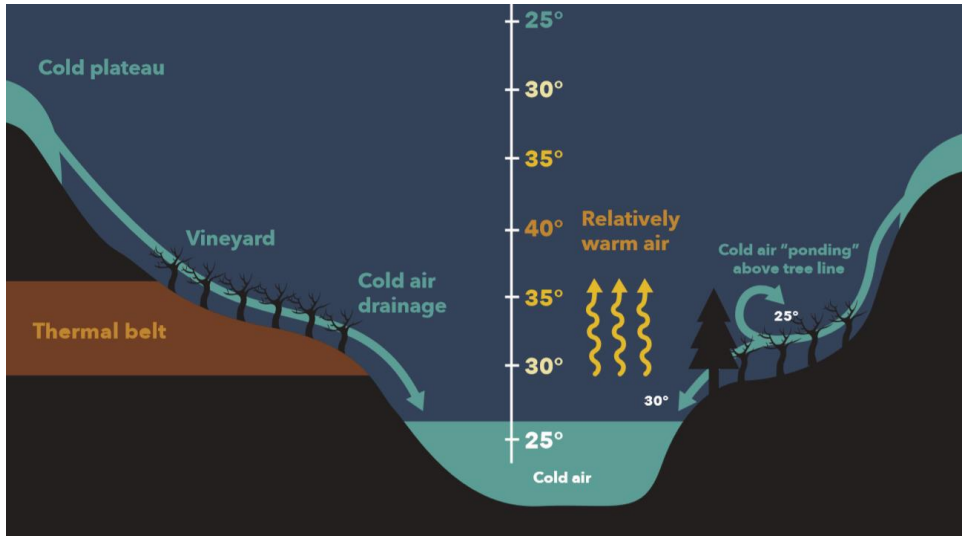
  --- FROST KILL ---

  - SECONDARY BUD YIELD (30% of primary): 1.1 TONS PER ACRE

  - Losses in revenue could exceed $25,000 PER ACRE!
    - Based on wine sales at $20/bottle

Ways to reduce frost threat

- Site selection
  - Radiation frost
  - Bud break delay
    - Plant close to large bodies of water
- Active methods
  - Wind machines
    - Air mixing
    - 10 to 12 acres
    - 1 to 3 °F



Cultivar selection

- Cultivar selection
  - ***Bud break date***
  - ***Secondary bud fruitfulness***
    - *Hybrids > vinifera*

Cultivar	Time of budburst (in days)*
Chenin Blanc, Chardonnay	0
Gewürztraminer, Viognier	1
Pinot Blanc	2
Pinot Gris, Pinot Noir, Merlot	3
Petite Verdot, Tannat	5
Riesling, Cabernet Franc, Semillon	6
Grenache, Muscat Ottonel	7
Sauvignon Blanc, Syrah, Tempranillo	8
Carignan, Marsanne	10
Counoise	13
Cabernet Sauvignon, Mourvedre	14

Cultural methods

- ***AFTER** site, cultivars have been chosen*:
  - Spraying oils and cryoprotectants
    - Mixed results
  - Herbicide vs. non-herbicide under trellis
    - Nothing to keep heat retained
  - *Delayed pruning*

Assumptions about delayed pruning

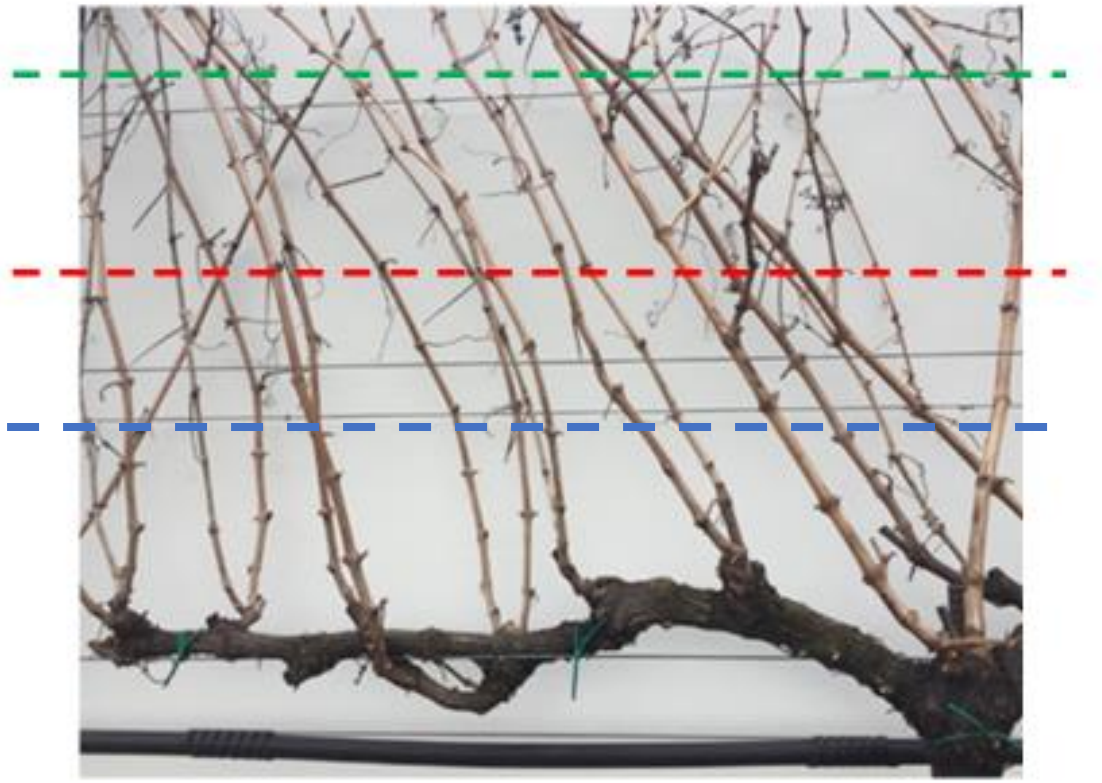
- We do not know the *optimal**
  - bud number to retain per spur
  - time to make the final prune

**Optimal*

delay bud break

maintain crop yield and fruit maturity on retained buds

- We do not know cultivar-specific responses



What has been done?

Petrie et al. 2013 – Australia

Palliotti et al. 2017 – Italy

--- 40% reduction in crop yield with extended delayed pruning….

--- delay in fruit maturation with extremely late pruned treatments

Yield components

	Pruning Date	Harvest Date	Yield (kg/vine)
	26 May	20 Feb	3.9
	4 Aug	20 Feb	3.6
	5 Sept	28 Feb	2.6
2-3 leaves	22 Sept	5 March	3.1
8 leaves	13 Oct	4 April	1.4

		Clusters/ shoot (n)	Yield/vine (kg)	Clusters/ vine (n)
	Treatment (T)			
	SHF	1.09 a	2.80 a	12.2 a
3.9”	LHF	1.06 a	2.18 b	9.7 b
7.8”	VLHF	0.79 b	1.60 c	7.5 c
	Significance[a]	*	**	**

43% reduction in yield

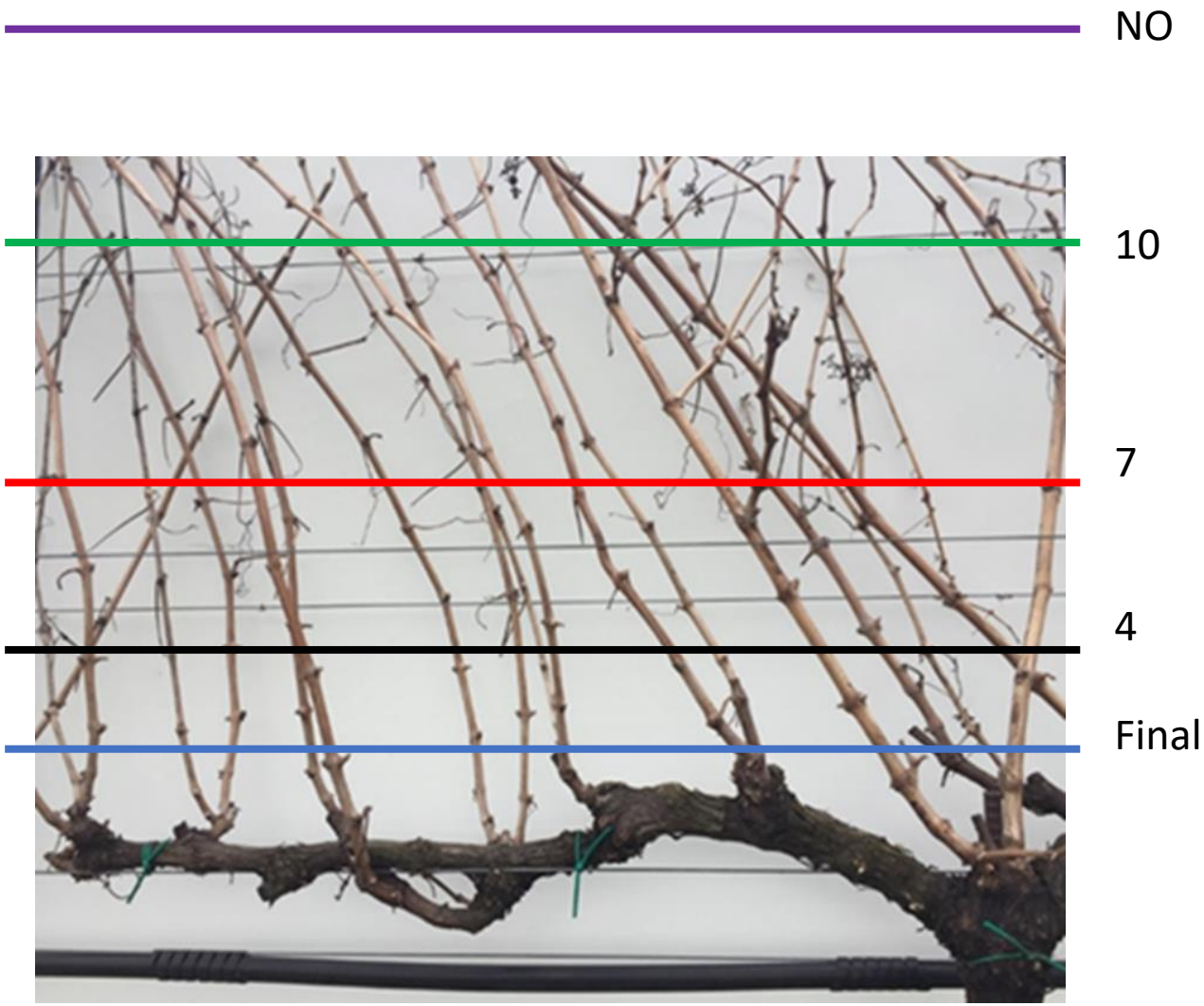
Refining delayed pruning in Chardonnay

- **QUESTIONS:**

- Relative to final pruning…
  - Is there an optimal bud number to target when delayed pruning so that?:
    - Bud break is delayed
    - Fruit maturation is unaffected
    - Crop yield is unaffected

Project design

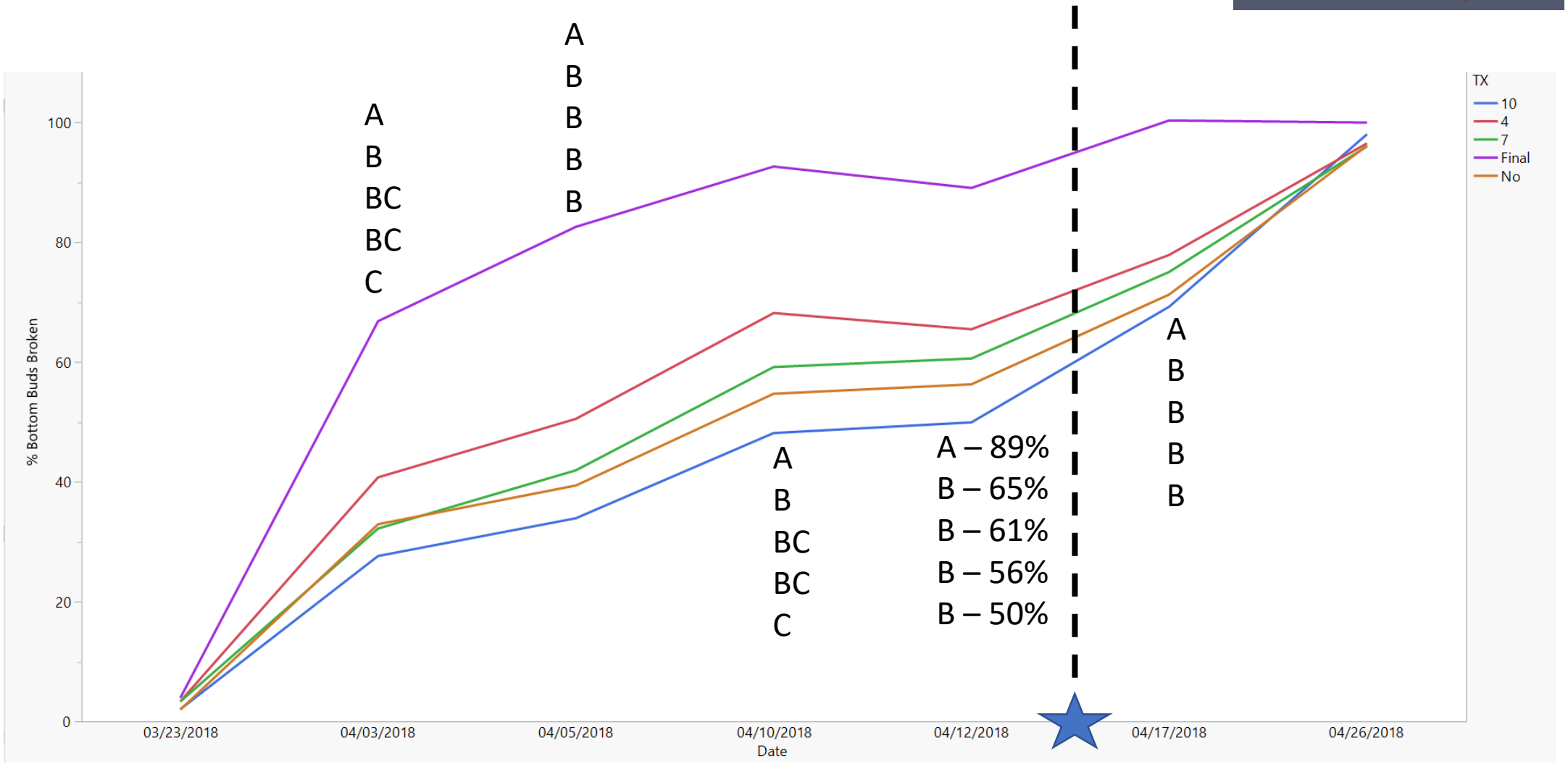
- ***5 treatments:***
- ***Final pruning*** (2-bud spurs)
- ***Delayed pruning*** to:
  - 4-bud canes
  - 7-bud canes
  - 10-bud canes
  - No pruning (2 ft. above catch wire)
    - Make final cut on same date for all delayed treatments



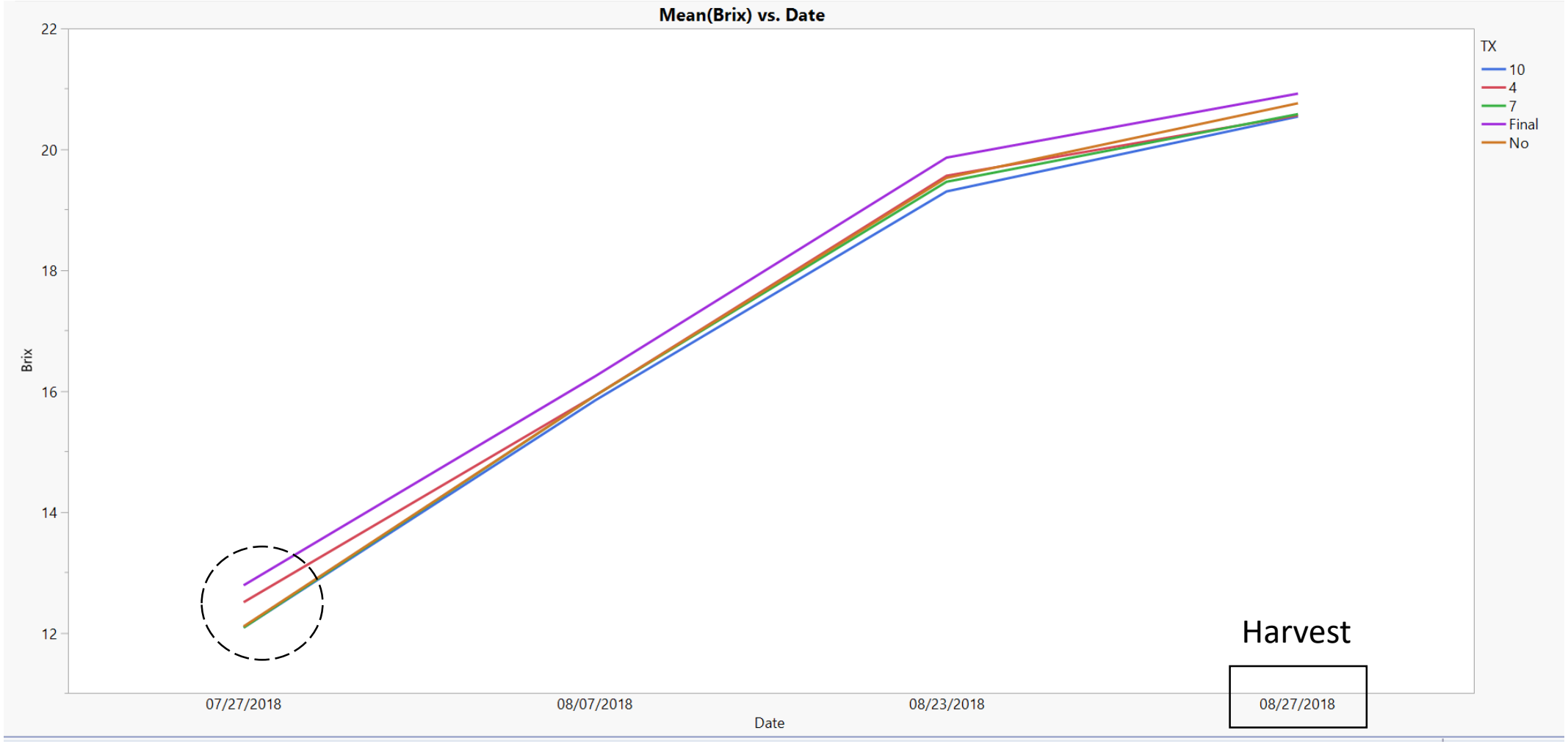
Last frost date in Dahlonega, GA: April 14

- Final prune made:
  - March 9
  - FINAL (for two bud spurs)
  - April 5
  - For all delayed treatments
    - Average basal bud break - 50%

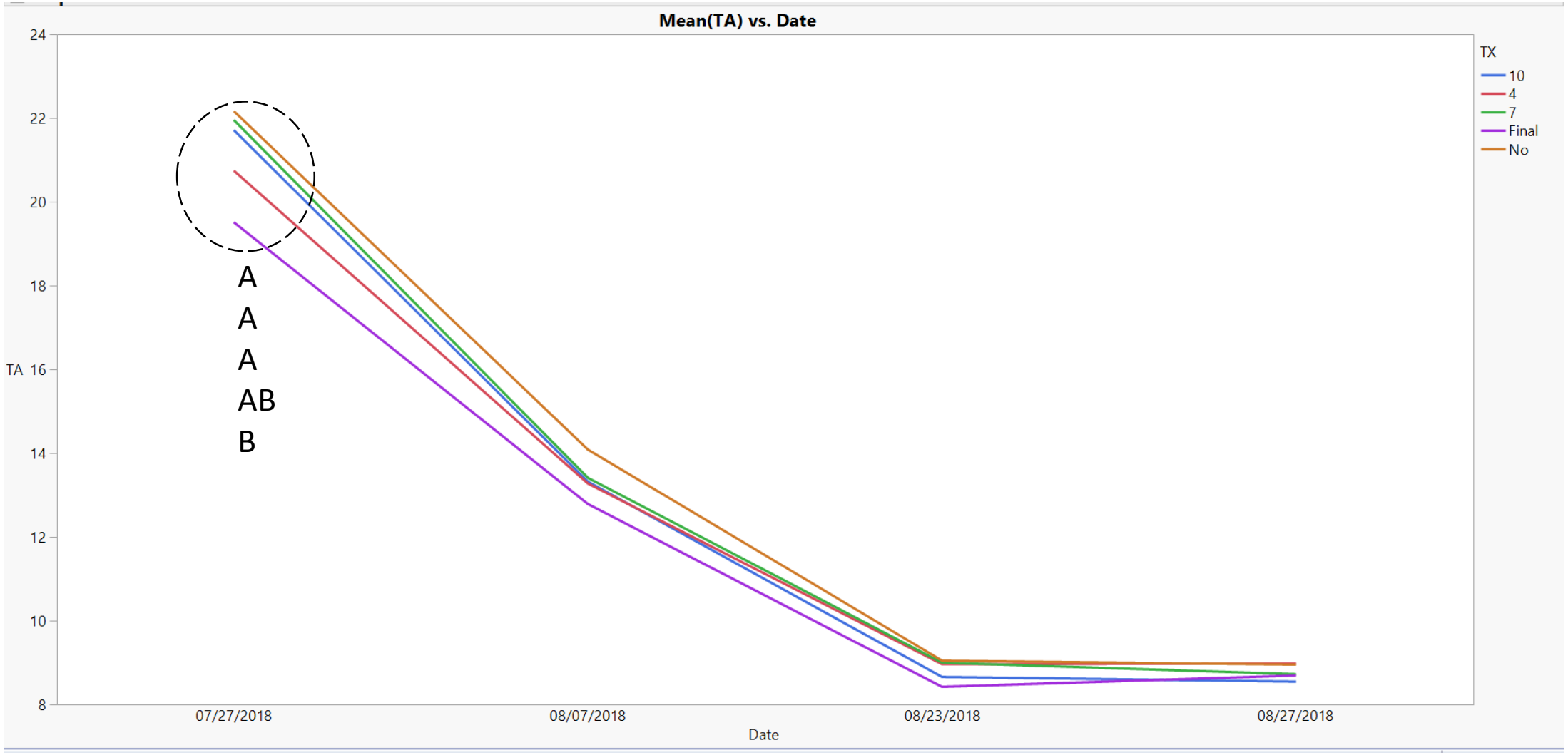
Percent bud break (EL 4) by date



Fruit chemistry over time – sol. Solids (°Brix)



Fruit chemistry over time – titratable acidity (g/L)



Crop yield at harvest

	Yield (tons/acre)	% yield reduction (rel. FINAL)	Cluster # per vine	Cluster weight (g)	Berry # per cluster
FINAL	5.4 a	-	45	164	149
4	5.3 ab	3%	44	164	145
7	4.8 ab	12%	44	151	133
10	4.7ab	15%	45	139 (-16%)	127 (-15%)
NO	3.6 b	33%	36 (-20%)	137 (-16%)	121

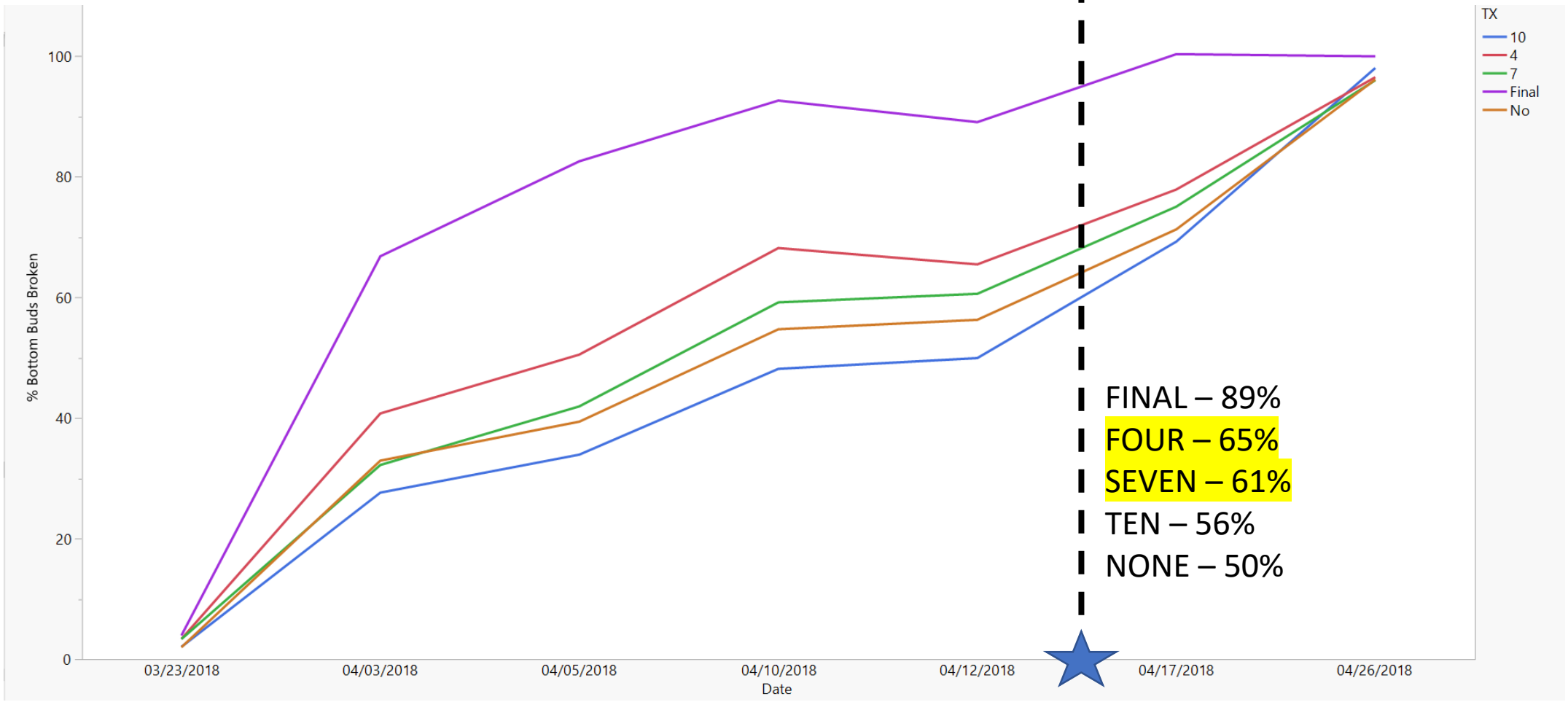
The meat on the bone…
… what does this mean from a fiscal perspective?

What other perspective matters in farming/business?

Estimated dollar return *per acre* if NOT frost injured (based on estimated tonnage; 120 gallons per ton; $20 per bottle)	
FINAL	**$66,095**
FOUR	**$64,333**
SEVEN	**$58,164**
TEN	**$56,401**
NONE	**$44,064**

Dollar per acre return potential if frost injured (based on estimated tonnage; 120 gallons per ton; $20 per bottle)	
FINAL	**$24,918**
FOUR	**$35,061**
SEVEN	**$33,328**
TEN	**$34,292**
NONE	**$28,641**

Percent bud break (EL 4) by date



Take home (for now…)

- Implement delayed pruning only in most “eager” cultivars or in most frost-prone blocks
  - Time and resources may not be available to implement in a 20-acre vineyard
- One must know their site’s history:
  - Is the bud break delay afforded worth the risk of crop reduction?
    - If so, then delay prune to 4 to 7 buds

What's next?

- First question (which we have started to answer here):
  - ***How many*** buds need to be retained in order to?:
    - Effectively delay bud break
    - Maintain crop yield
- Second question:
  - ***When*** does the final prune need to be implemented in order to?:
    - Effectively delay bud break
    - Maintain crop yield

Ask questions in other important cultivars

- Chardonnay (*vinifera*)
- Merlot (*vinifera*)
- Chardonel (Hybrid)
- Lomanto (Hybrid)

Factorial design to answer if bud number, or time of final pruning, Has a greater impact on _____, _____, and _____.....

BUD BREAK	2-INCH GROWTH	5-INCH GROWTH
FINAL 7 BUDS 10 BUDS	7 BUDS 10 BUDS FINAL	10 BUDS FINAL 7 BUDS
5-INCH GROWTH	2-INCH GROWTH	BUD BREAK
10 BUDS FINAL 7 BUDS	7 BUDS 10 BUDS FINAL	FINAL 7 BUDS 10 BUDS
BUD BREAK	5-INCH GROWTH	2-INCH GROWTH
FINAL 7 BUDS 10 BUDS	10 BUDS FINAL 7 BUDS	7 BUDS 10 BUDS FINAL

Practical risks associated with delaying pruning “too long”…

- Labor is difficult to come by
  - And retain
- Work load in spring is immense
  - Spraying
  - Shoot thinning
  - Double prune in some blocks, but gamble on others

Thanks so much

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- Three Sisters Vineyards:
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