Oregon Wine Research Institute

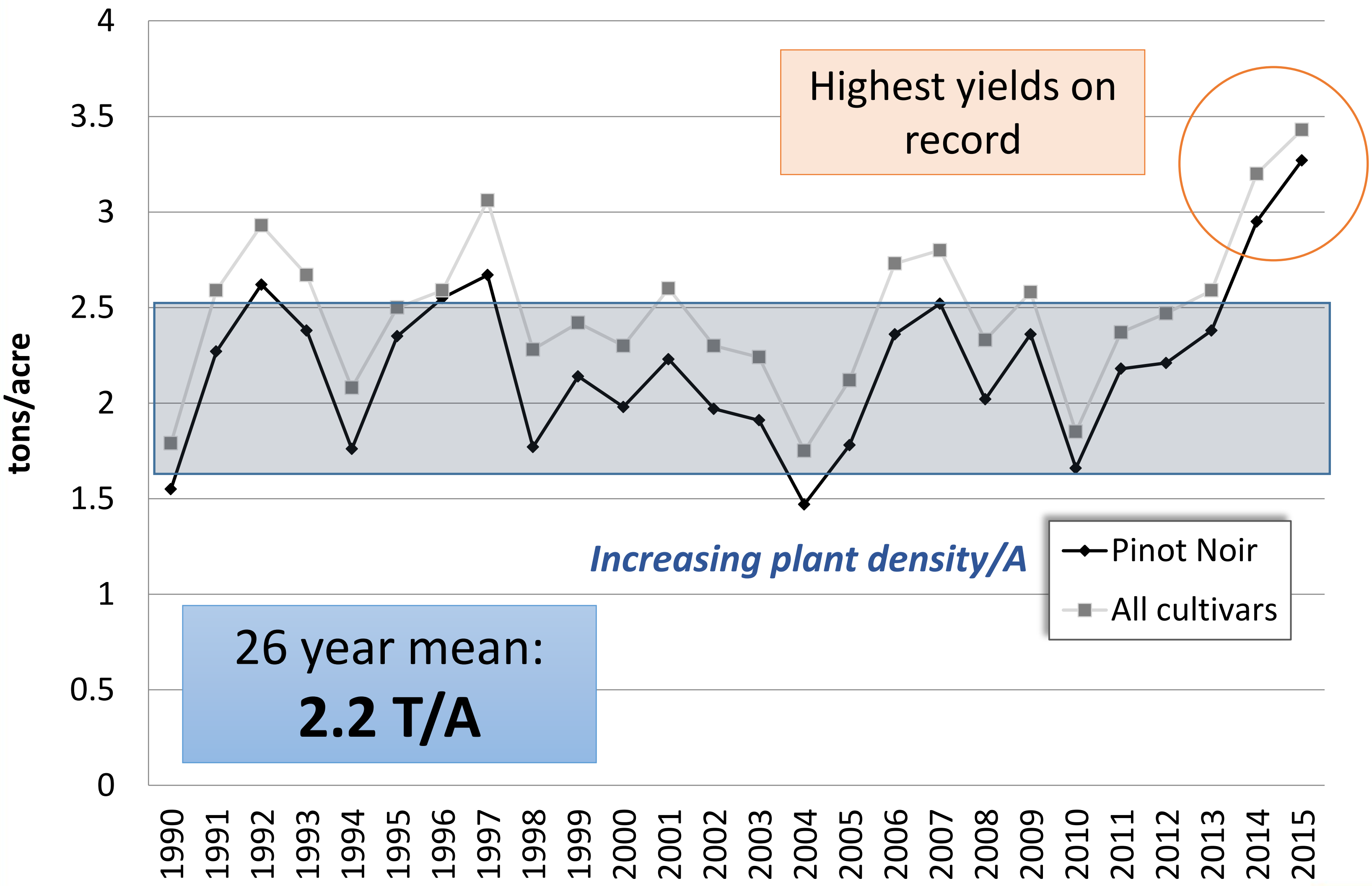
February 22, 2017
Oregon Wine Symposium, Portland, OR

The Low Down on High Yields: Challenging Yield-Quality Standards for Oregon Pinot Noir

Dr. Patty Skinkis, **Viticulture Extension Specialist & Associate Professor, OSU**

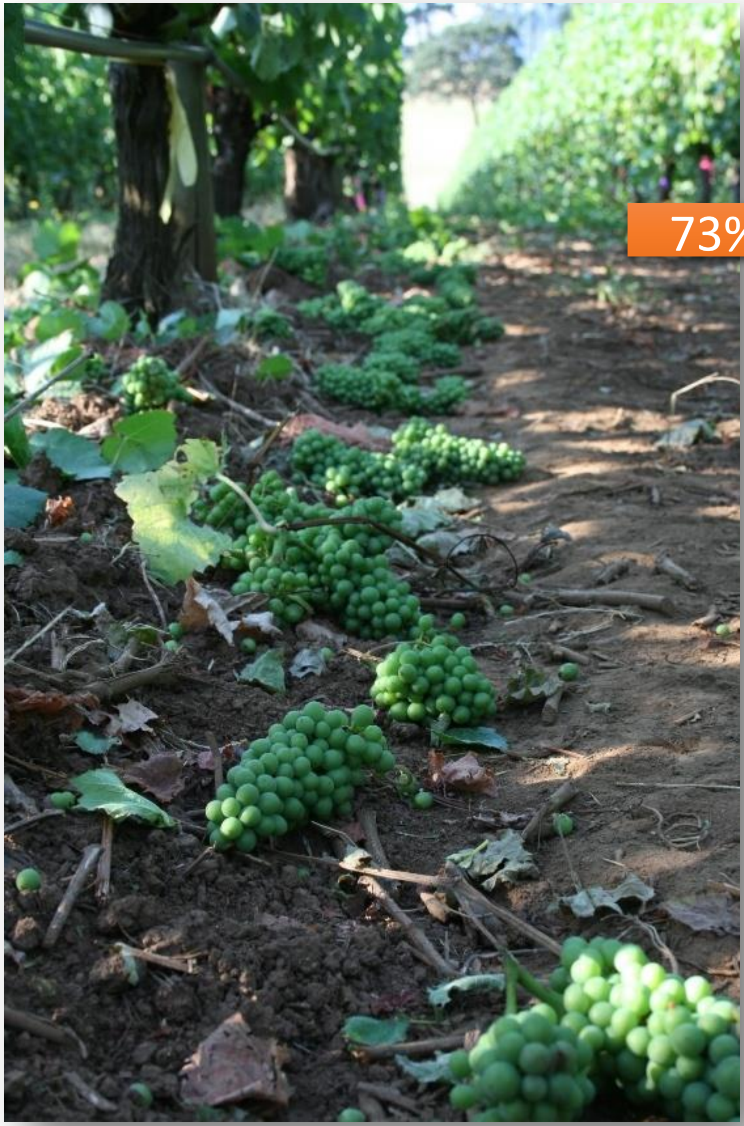


Harvest Yields 1990-2015



USDA-NASS 1990-2012, SOURCE 2012-2016

Yield Management of Pinot noir



- **Reasons for cluster thinning**
  - Hasten ripening
  - Increase fruit quality
  - Decrease *Botrytis*
  - Sustain vine health/balance
  - Target inventory
- Yield reduction: 25 to 50%
- Cost: $700-800/A

73%

89% conduct cluster thinning
67% target 2 to 2.75 T/A

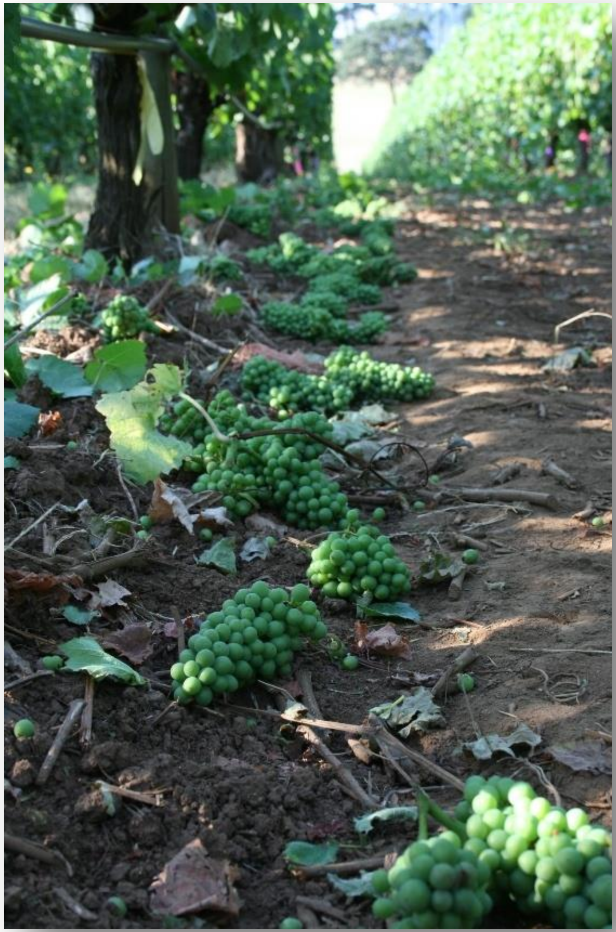
Uzes & Skinkis, J. of Extension 2016

Oregon State University

Statewide Crop Load Project 2012-2021

Patty Skinkis, James Osborne, Elizabeth Tomasino, Paul Schreiner, Katie McLaughlin

Can we better manage yields?

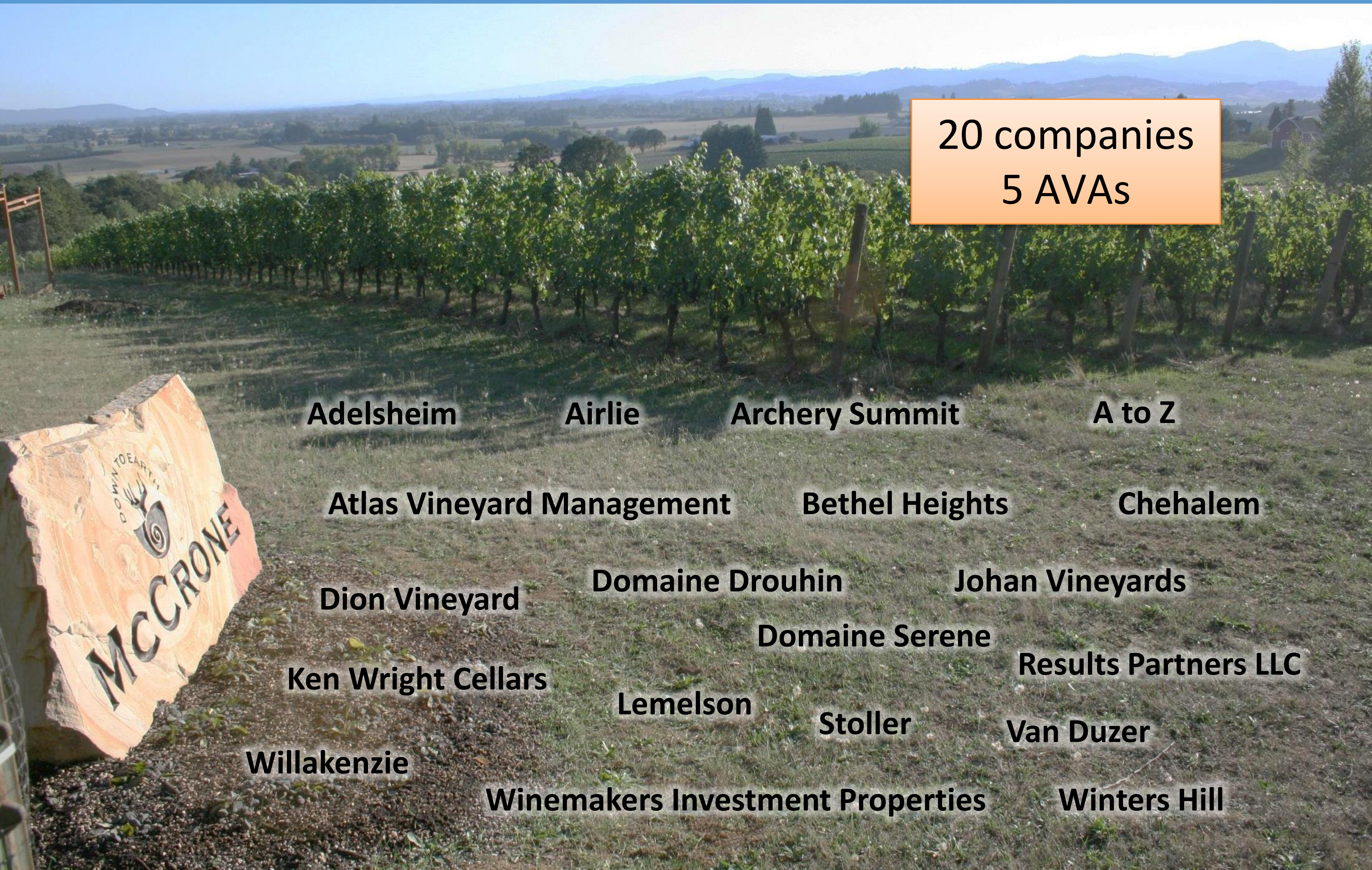


Objectives

1. Engage industry directly in research
2. Understand **crop level**, **site characteristics**, and **vintage variation** on vine health, fruit/wine quality
3. Define **metrics** for yield management to balance quality with market price and production economics

Oregon State UNIVERSITY

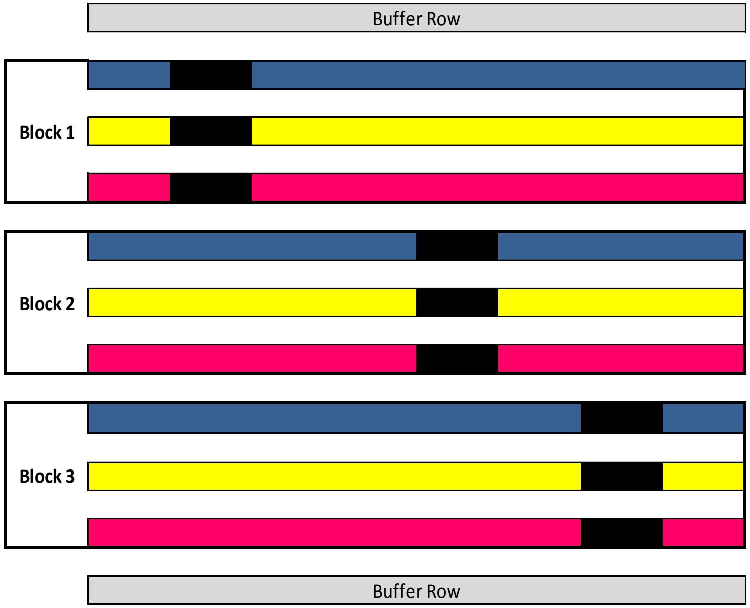
Industry Collaborators 2012-2016



20 companies
5 AVAs

Adelsheim
Airlie
Archery Summit
A to Z
Atlas Vineyard Management
Bethel Heights
Chehalem
Dion Vineyard
Domaine Drouhin
Johan Vineyards
Domaine Serene
Results Partners LLC
Ken Wright Cellars
Lemelson
Stoller
Van Duzer
Willakenzie
Winemakers Investment Properties
Winters Hill

Experimental Design



Randomized Complete Block Design (RCBD)

- 2 or more crop levels
- 3 replicates
- 1-3 acre blocks
- Protocols for data collection
- 10-vine sections for data collection

Clusters/ Shoot	Thinning pattern
0.5	1-0-1-0
1	1-1-1-1
1.5	1-2-1-2
2	2-2-2-2
No thinning	-

Vineyard Data Collection

Fruitfulness (inflorescences/shoot)

Lag phase - cluster counts, weights

Véraison - Mineral Nutrient Sampling (macro- and micros)

Harvest - yield, fruit composition, wine production

Winter - Dormant pruning weights

Cluster thinning

PRECISION AGRI LAB
Know Your Numbers

ETS LABORATORIES

Air temp
GDD

Phenology Reports

Oregon State University

Yield & Fruit Composition

- **Ripeness**
  - Brix
  - pH
  - TA
- **Nutrients**
  - Potassium
  - YAN (ammonia, AAA)
- **Color**
  - Total Anthocyanin
  - Polymeric Anthocyanin
- **Phenolics/ Indicators**
  - Catechin
  - Tannin
  - Quercetin

Oregon State University

Summary statistics report – one site, one year…

ANOVA 2015	VINEYARD 6810			
Treatments:	1 cluster/shoot	50% of Full Crop	No Thin	p-value*
fruitfulness (# inflorescences/shoot)	1.3	1.3	1.3	0.9268
fruitfulness # Shoots/vine	34	34	37	0.7966
fruitfulness clusters/vine	44	43	46	0.7897
pre-thinning - # clusters/vine	58	56	58	0.5904
yield (kg/vine)	**2.07 ab**	**1.48 b**	**2.92 a**	**0.0326**
yield (kg/m)	**0.57 ab**	**0.41 b**	**0.80 a**	-
yield (lb/ft)	**0.38 ab**	**0.27 b**	**0.54 a**	-
harvest - # clusters/vine	**29 b**	**25 b**	**43 a**	**0.0180**
harvest - cluster wt (g)	72	59	67	0.0794, KW
dormant shoots/vine	42	41	43	0.3581
pruning weight				0.1791
pruning weight				-
pruning weight				-
cane weight (g				0.2236
Ravaz (yield/pr				0.0918
Partridge				0.0891
TSS (°Brix)				0.2288
pH				0.1209
TA (g/L)				0.2948
malate (g/L)	2.61	2.45	2.56	0.3196
tartrate (g/L)	7.2	7.0	6.6	0.6593
glucose + fructose (g/L)	251	265	264	0.2309
ammonia N (mg/L)	37	42	38	0.7955
alpha amino acid N (mg/L)	71	83	61	0.1546
YAN (mg/L)	102	118	92	0.3396
K (mg/L)	1763	1920	1993	0.0578
catechin (mg/L)	153	116	125	0.5042
quercetin glycosides (mg/L)	91	87	43	0.3527
tannin (mg/L)	653	525	541	0.1766
polymeric anthocyanins (mg/L)	10	10	10	0.1654
total anthocyanins (mg/L)	**1116 a**	**979 b**	**968 b**	**0.0080**
catechin/tannin Index	0.24	0.22	0.23	0.7566

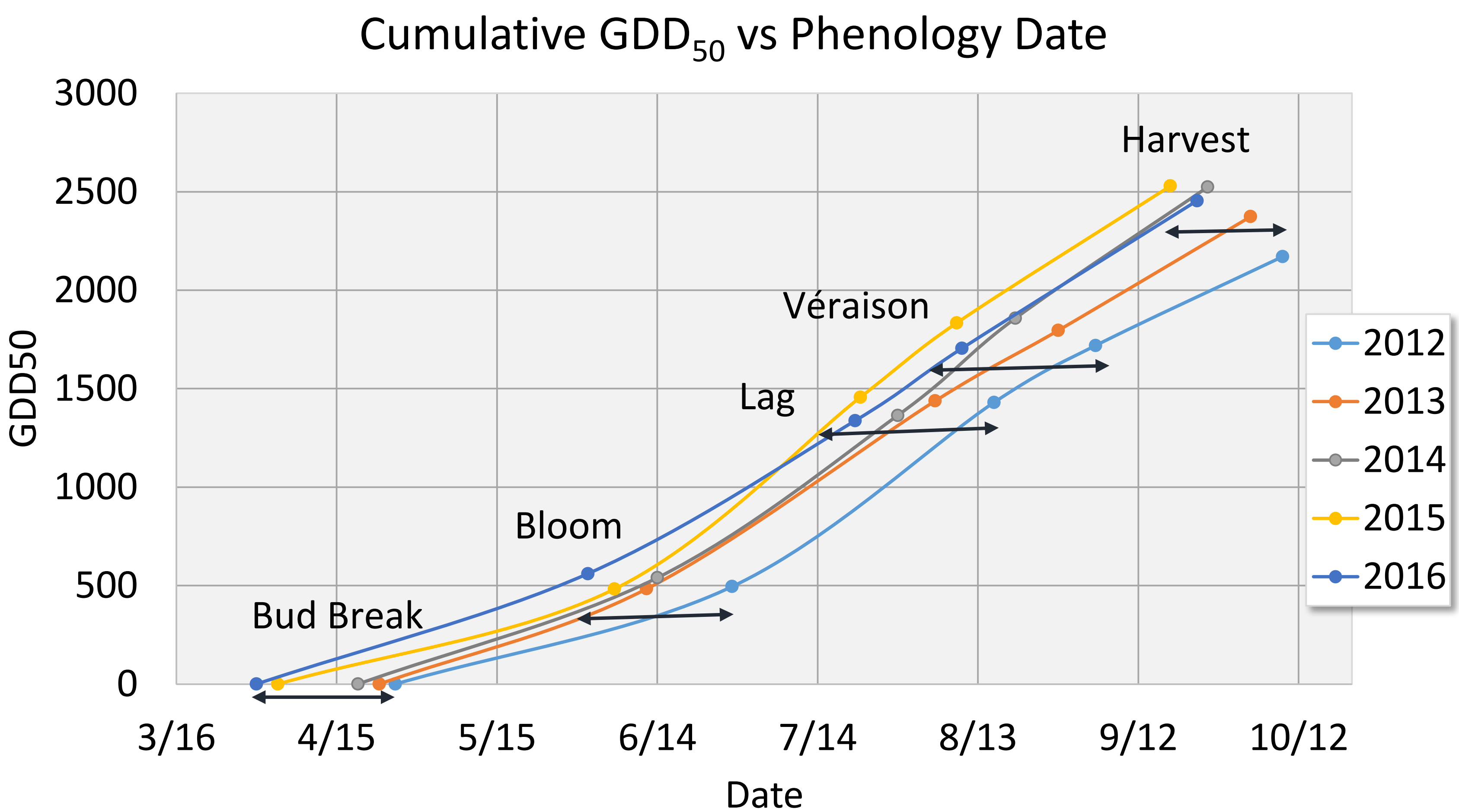
Cumulative Results:
all years
all sites

p-value indicates statistical significance or difference in means
If $p<0.05$, then means are different

How do the means differ?
Means separation procedures used…
Tukey Honestly Significant Difference (HSD) test.

Different letters mean that treatments are different.

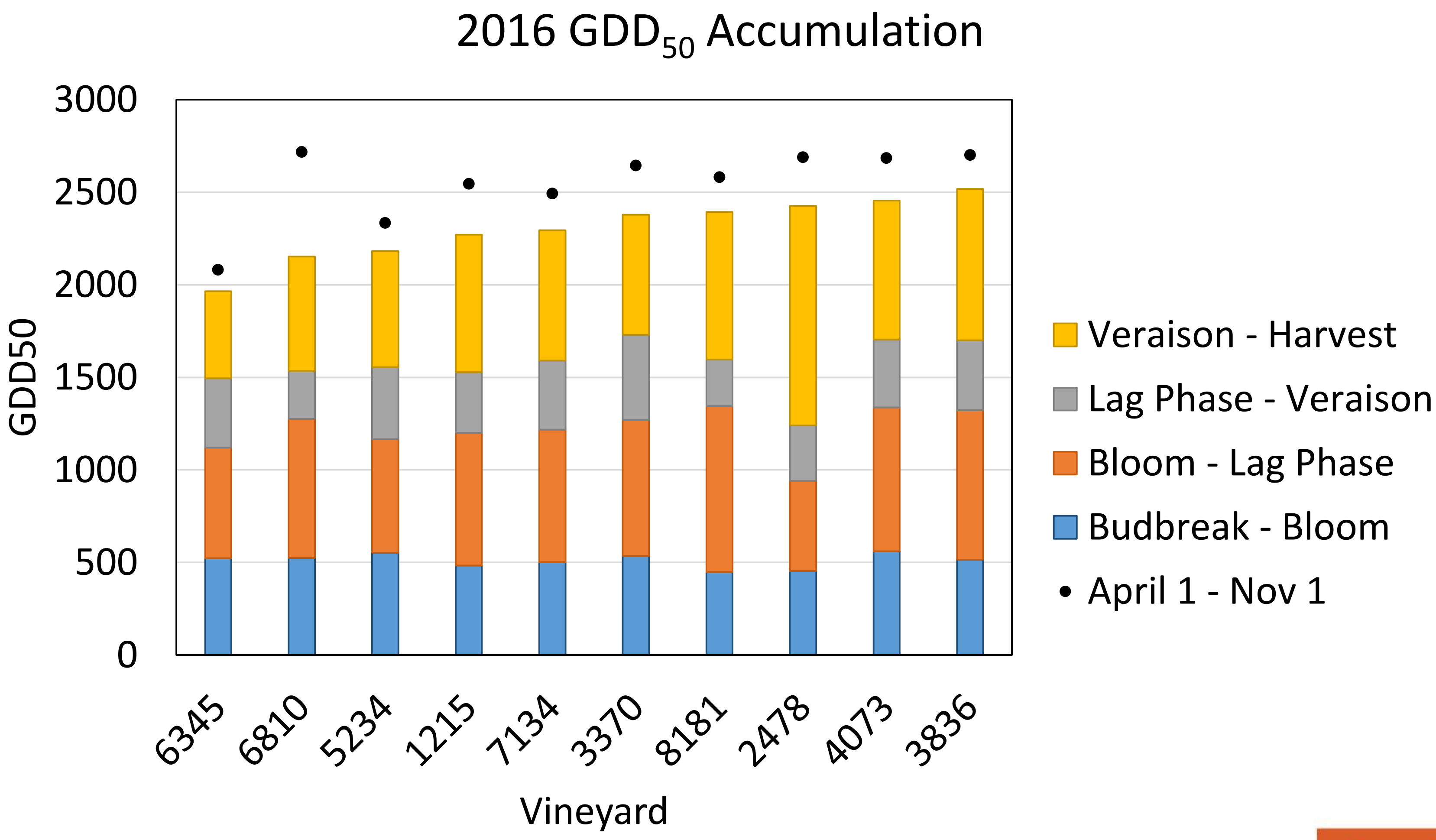
Seasonal Heat Units & Phenology



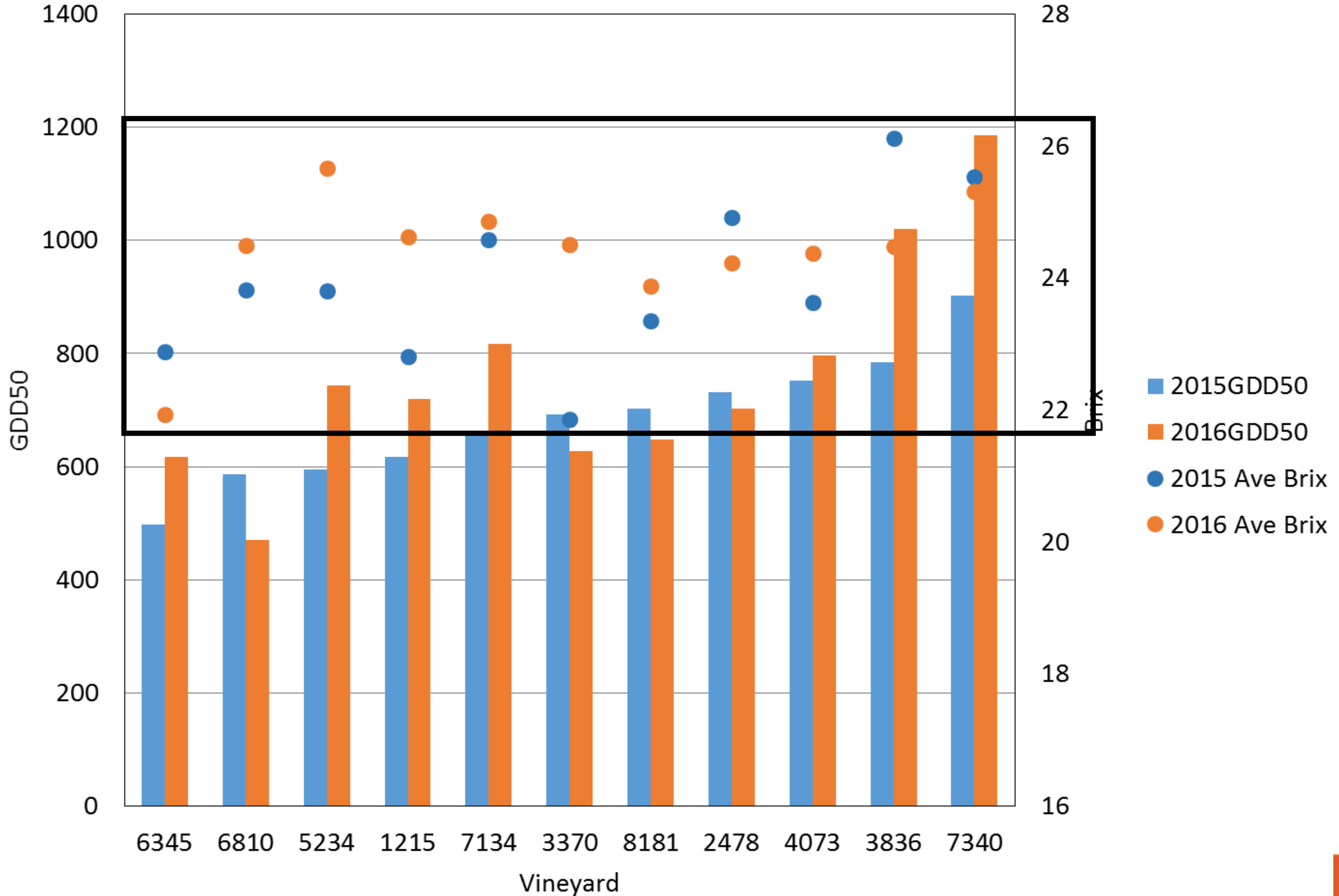
Air temperatures from Agrimet - Aurora, OR

Oregon State University

Heat Units & Phenology by Site 2016

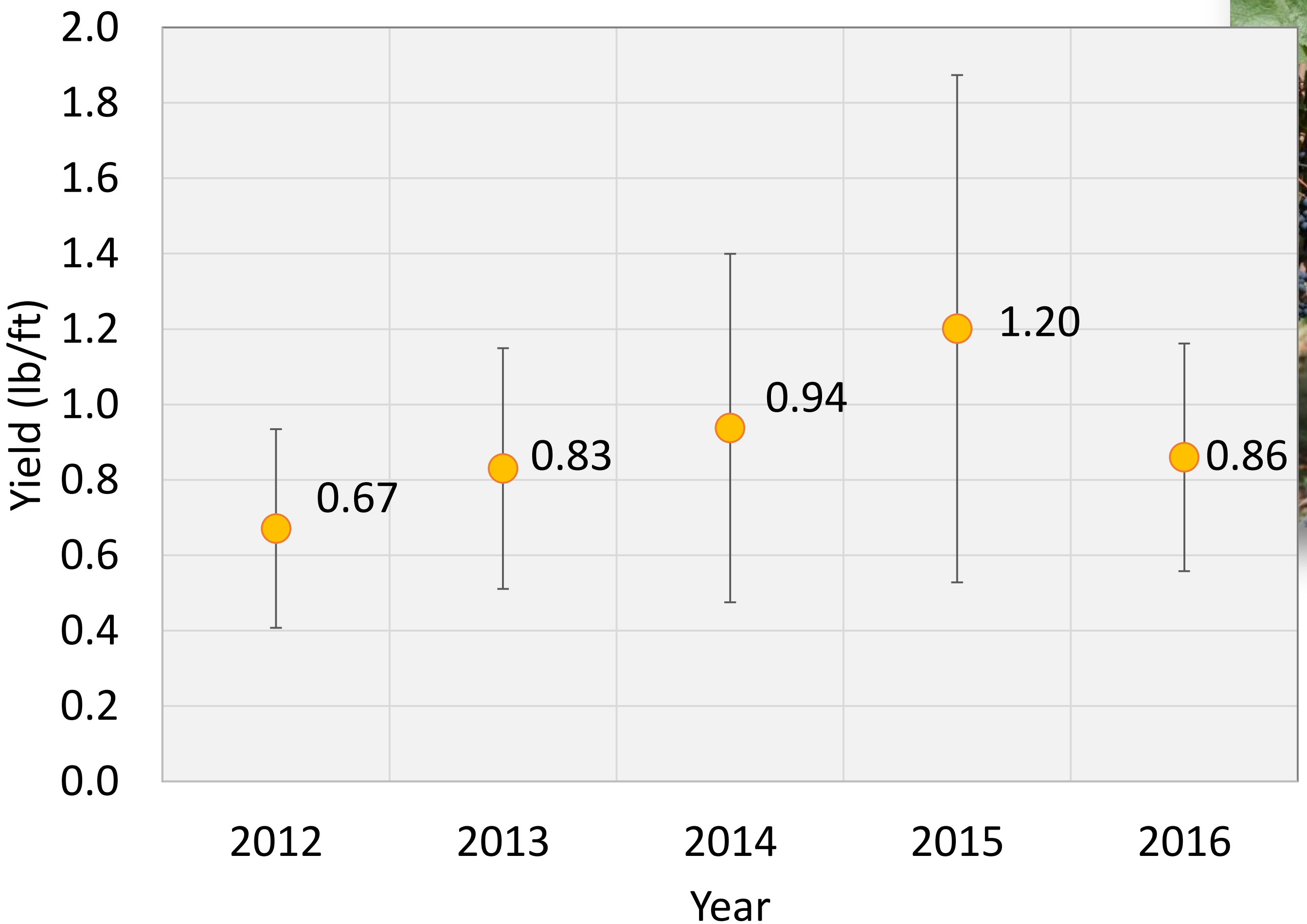


Véraison to Harvest GDD & TSS

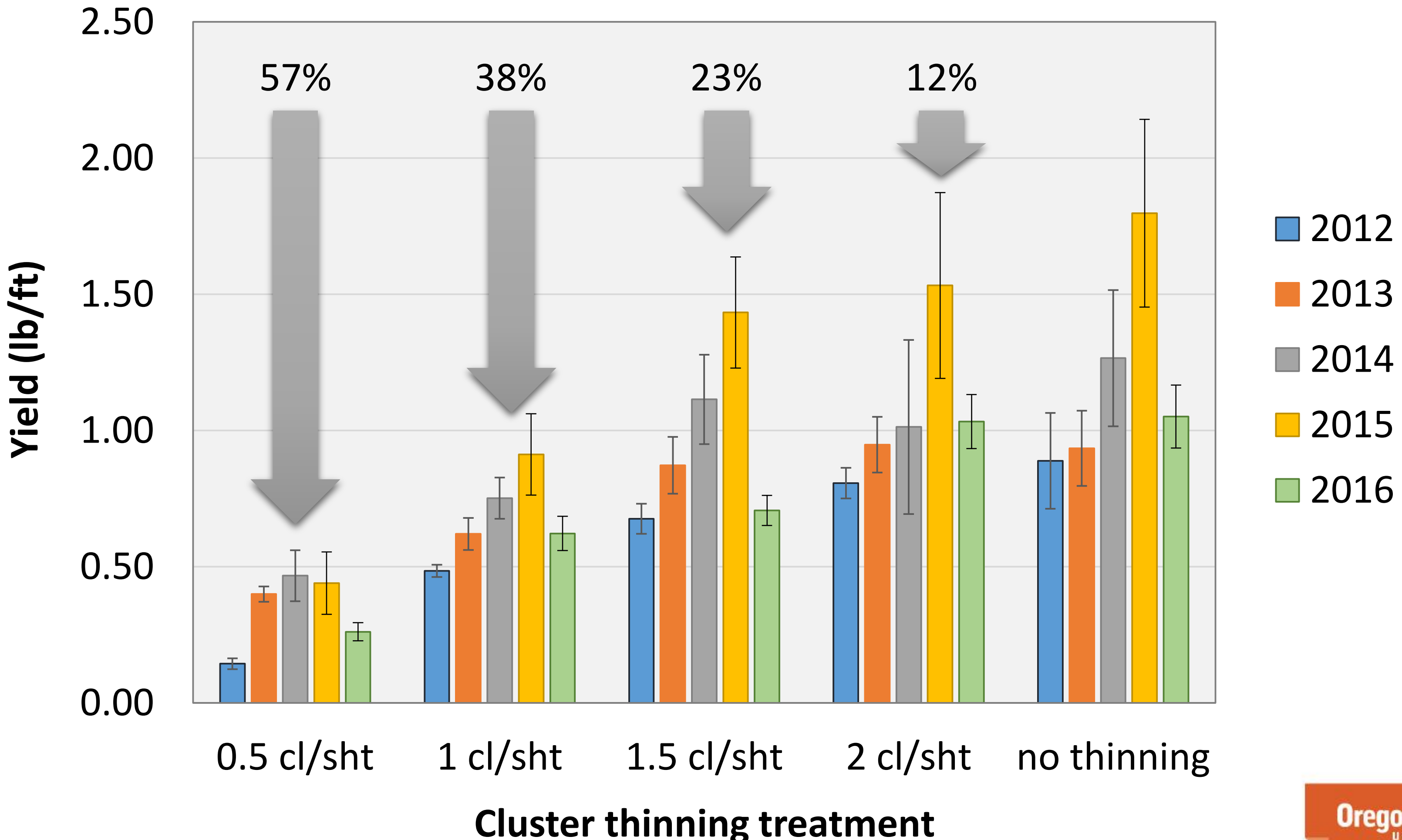


Oregon State University

Yield Variation 2012-2016

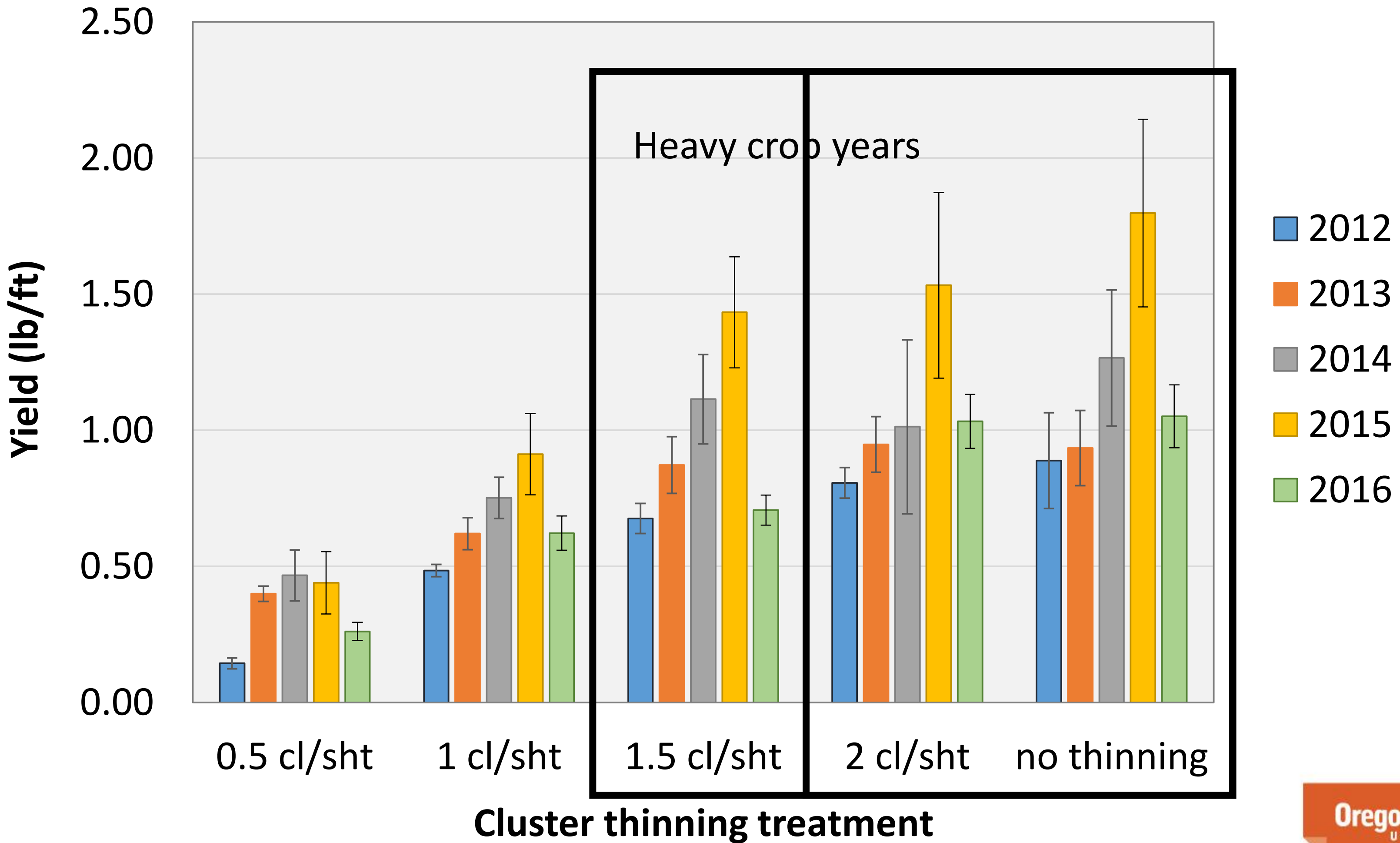


Yield Variation Treatment x Year

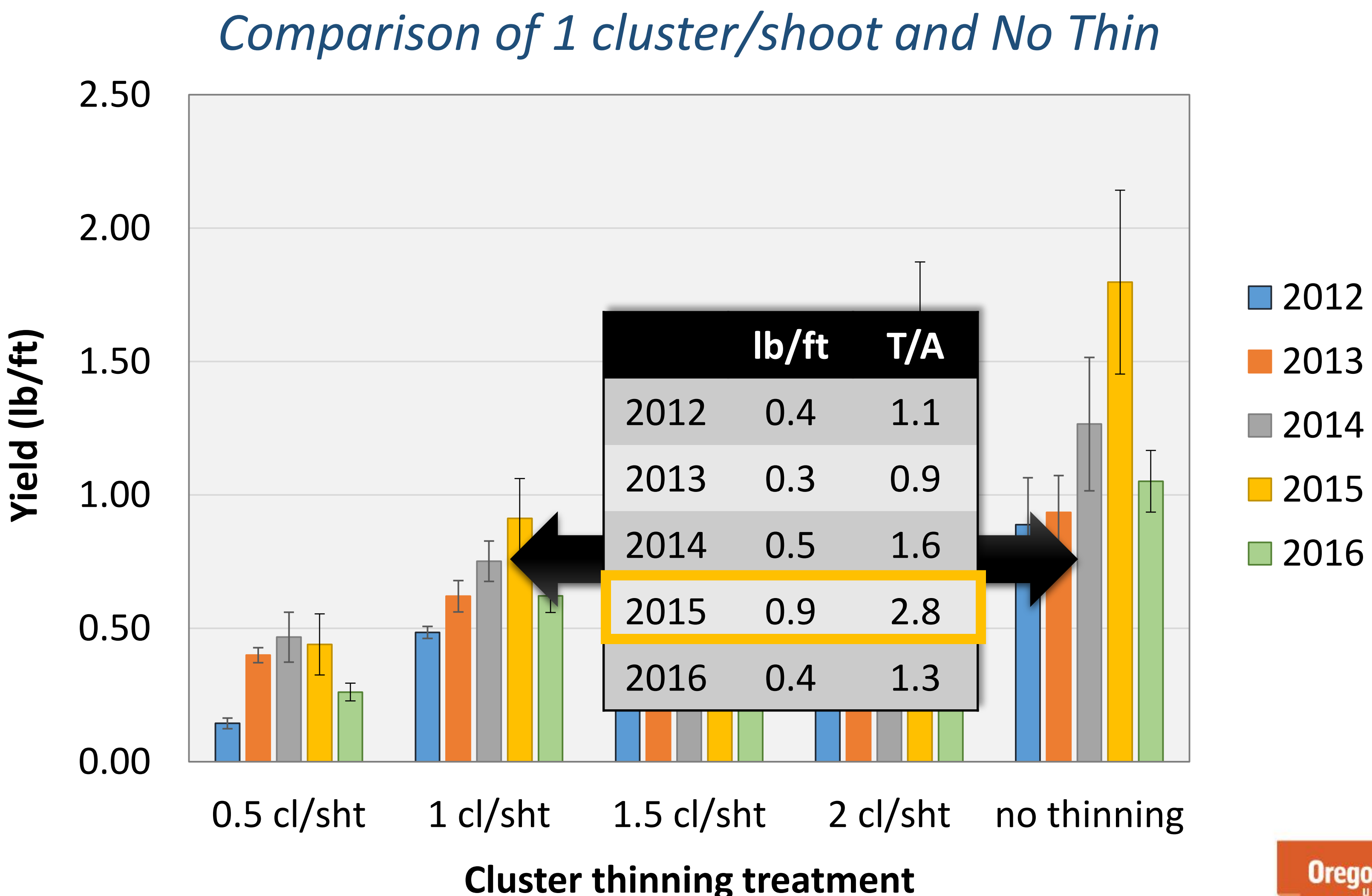


Oregon State University

Yield Variation Treatment x Year



Harvest Yields by Treatment



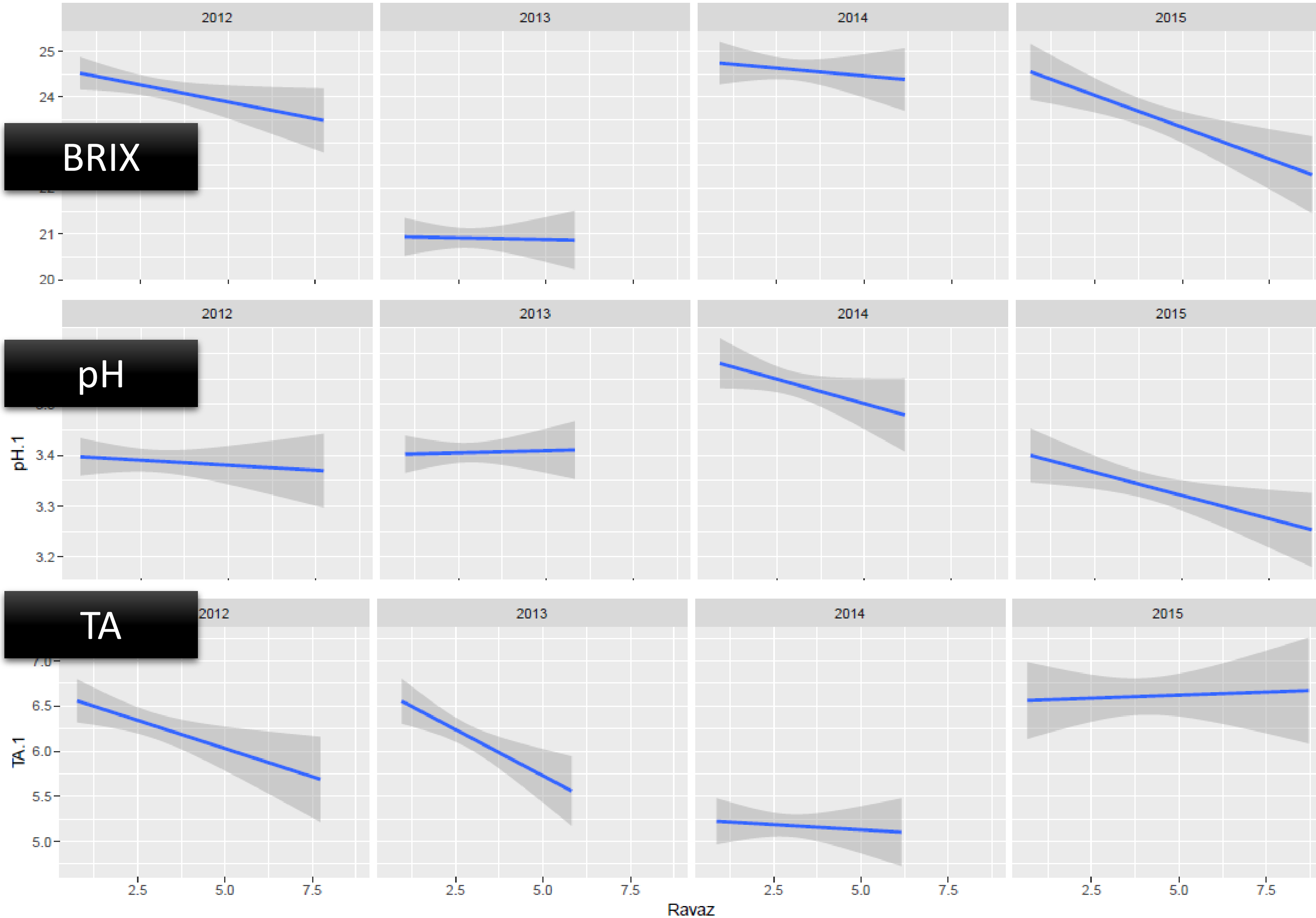
	lb/ft	T/A
2012	0.4	1.1
2013	0.3	0.9
2014	0.5	1.6
2015	0.9	2.8
2016	0.4	1.3

Oregon State University

Crop Level Differences by Site – Fruit Composition

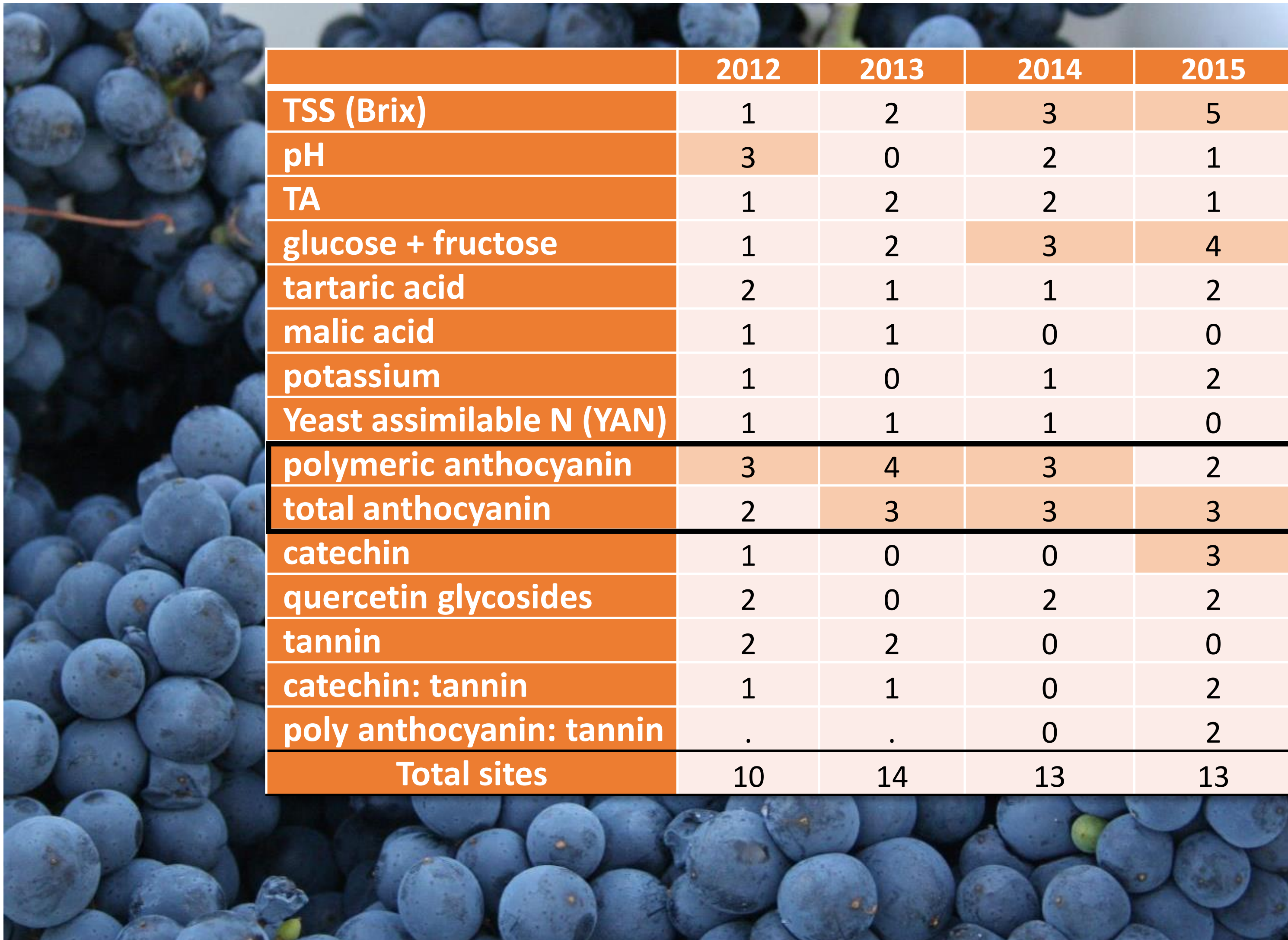
	2012	2013	2014	2015	2016
TSS (Brix)	1	2	3	5	1
pH	3	0	2	1	3
TA	1	2	2	1	3
glucose + fructose	1	2	3	4	1
tartaric acid	2	1	1	2	4
malic acid	1	1	0	0	2
potassium	1	0	1	2	2
Yeast assimilable N (YAN)	1	1	1	0	0
polymeric anthocyanin	3	4	3	2	0
total anthocyanin	2	3	3	3	1
catechin	1	0	0	3	1
quercetin glycosides	2	0	2	2	0
tannin	2	2	0	0	3
catechin: tannin	1	1	0	2	0
poly anthocyanin: tannin	.	.	0	2	1
Total sites	10	14	13	13	11

Crop Load (Yield/PW) and Basic Ripening



State
VERSITY

Crop Level Differences by Site – Fruit Composition



	2012	2013	2014	2015	2016
TSS (Brix)	1	2	3	5	1
pH	3	0	2	1	3
TA	1	2	2	1	3
glucose + fructose	1	2	3	4	1
tartaric acid	2	1	1	2	4
malic acid	1	1	0	0	2
potassium	1	0	1	2	2
Yeast assimilable N (YAN)	1	1	1	0	0
polymeric anthocyanin	3	4	3	2	0
total anthocyanin	2	3	3	3	1
catechin	1	0	0	3	1
quercetin glycosides	2	0	2	2	0
tannin	2	2	0	0	3
catechin: tannin	1	1	0	2	0
poly anthocyanin: tannin	.	.	0	2	1
Total sites	10	14	13	13	11

Oregon State UNIVERSITY

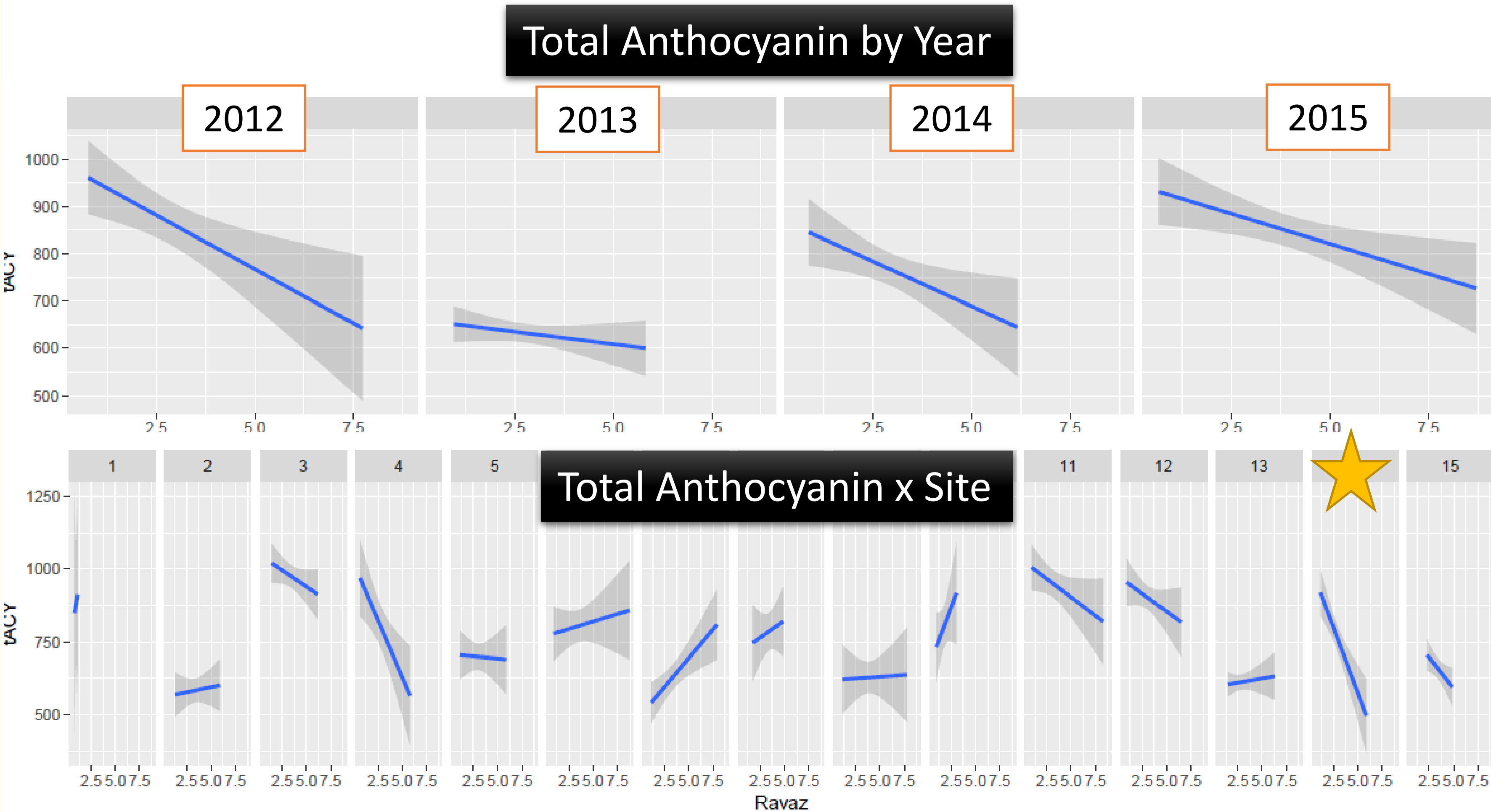
Yield & Anthocyanin 2012-2016

↑ anthocyanin concentration with ↓ yield

- Total Anthocyanin: 10-40% of sites **171 mg/L**
- Polymeric Anthocyanin: 20-42% of sites **2.2 mg/L**
- Higher yielding years = greater impact

3 sites have shown consistent effect for 3 years

Crop load (yield/pruning wt) effect

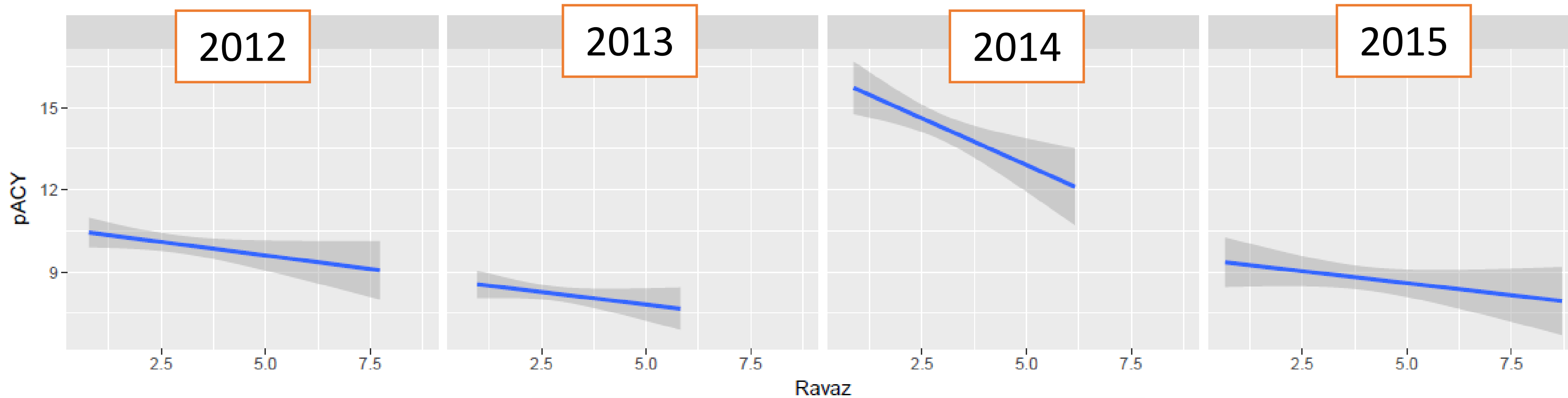


↑ Crop Load = ↑ yield relative to vine size

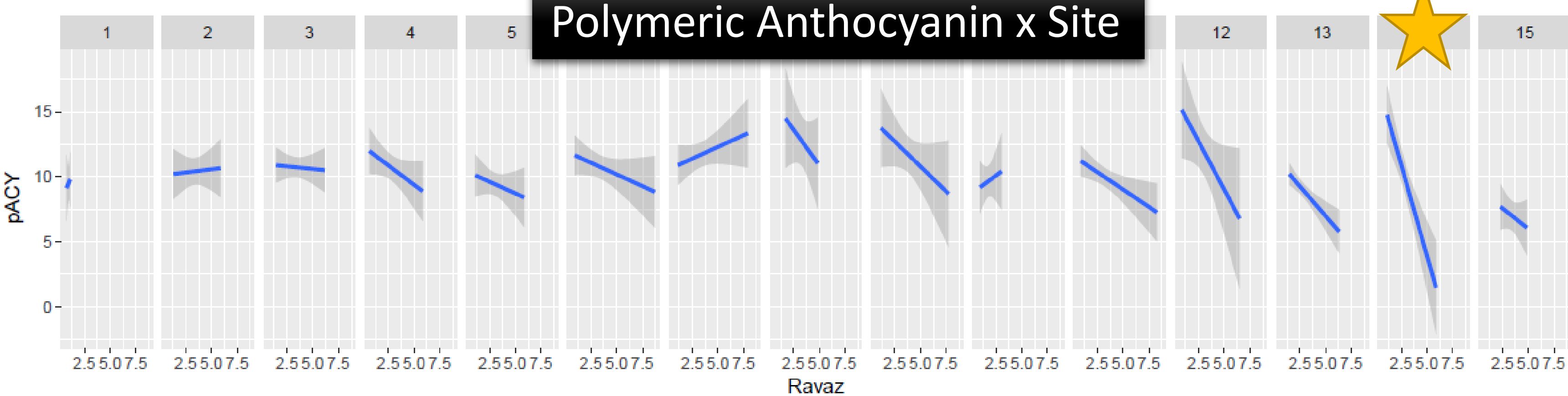
Oregon State University

Crop load (yield/pruning wt) effect

Polymeric Anthocyanin by Year

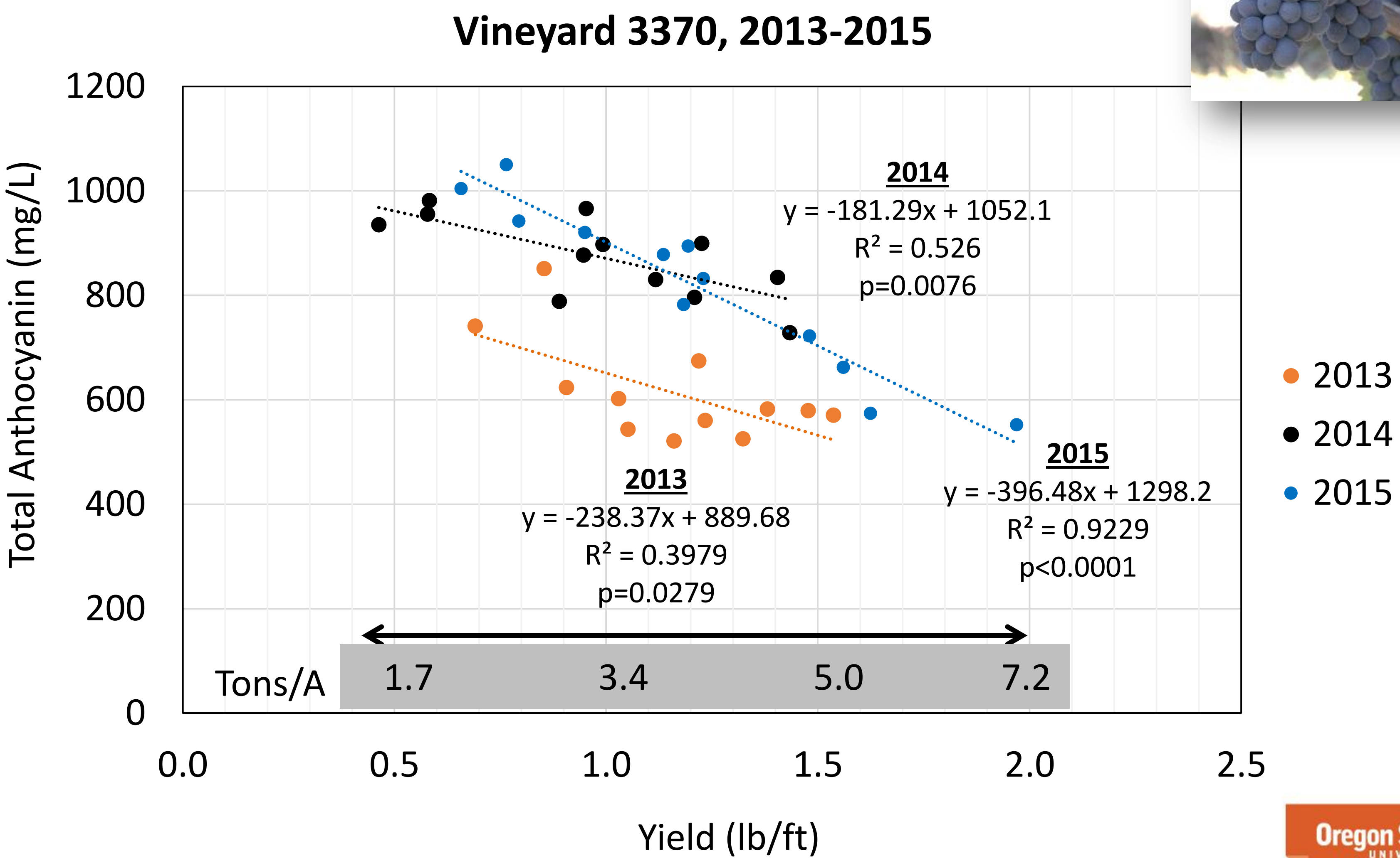


Polymeric Anthocyanin x Site



↑ Crop Load = ↑ yield relative to vine size

Yield & Anthocyanin



Anthocyanin – Physiology or Microclimate?

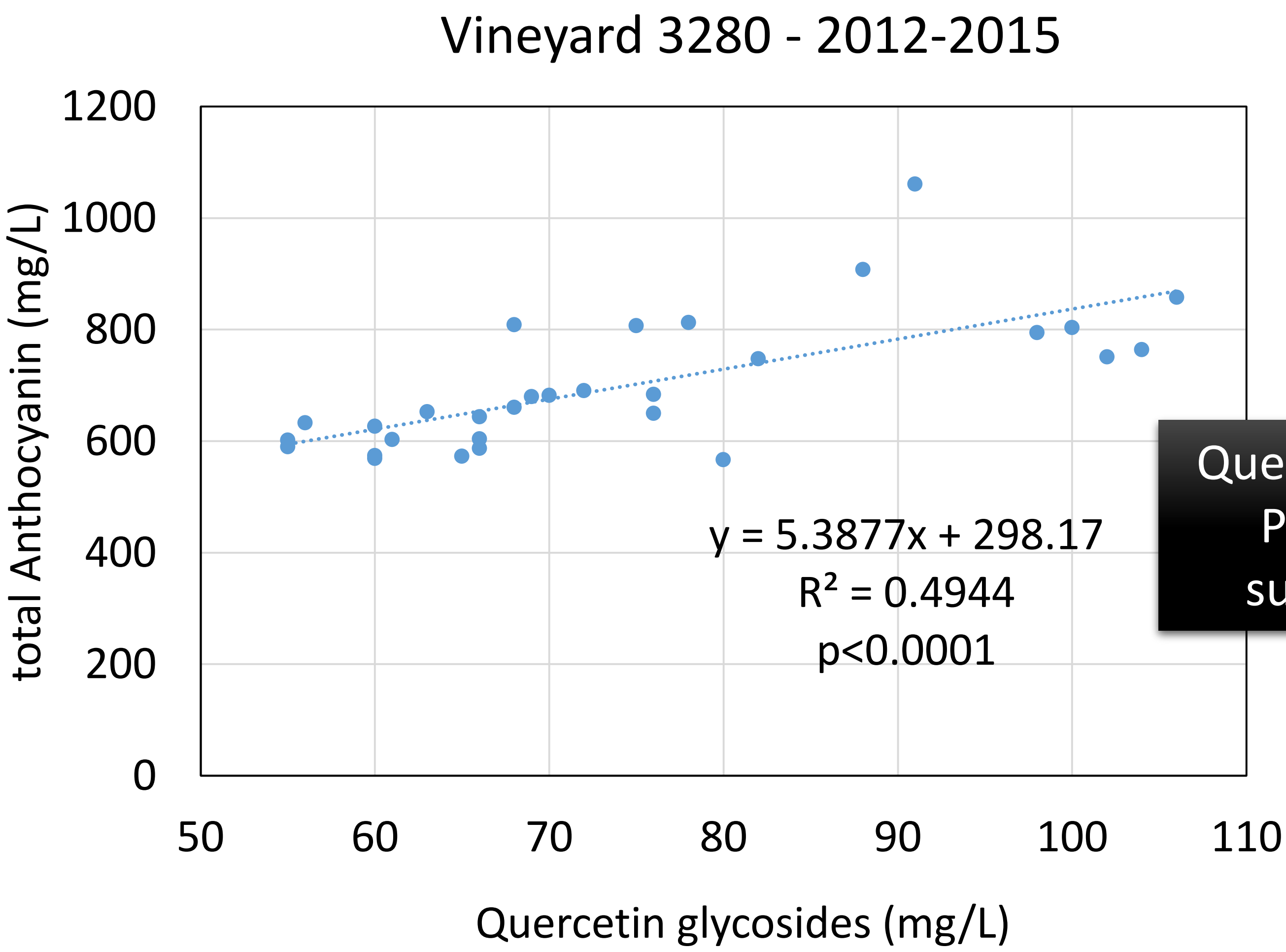
Overlapping clusters

- Full crop > thinned
- High yield years, big clusters

Cluster zone leaf removal

- Full crop – less removal with fewer labor passes

Anthocyanin – Physiology or Microclimate?



Leaf removal effect?

Quercetin increases in Pinot noir under sunlight exposure

Summary

- Site and year impacts “quality” > yield
- Greater yield-quality potential than expected (full crop not best)
- <u>Lowest</u> yield not a guarantee for quality
- Impacts on vine size, nutrient status may be minor or take many years
- Cluster thinning effects may not be related to source limitations (canopy)
- Anthocyanin effect only in high yield years suggests microclimate effect
- Further statistical analyses underway…

Continued Work…

- Vine balance effects (source-sink)
- Microclimate effects
- Whole system analysis
  - Vineyard
  - Winery
  - Economics

Decision making

- Develop dynamic metrics…
  - Vine size/balance
  - Nutrition
  - Production goals
  - Site characteristics
  - Vintage variation and prediction

Oregon State UNIVERSITY

Continued Work: Wine Quality Impact

- OWRI Winemaker Panel
- **NEW:** In-house wine evaluation
  - Individual vs group
  - Comparative quality rank
  - Preference
  - Fate of production

Oregon State University

Wine Tasting

1. Chehalem Wines – 2014

Cultivar	Clone	Rootstock	AVA	Planted	Vines/A
Pinot noir	Pommard	3309 C	Ribbon Ridge	2005	2062

2. Ken Wright Cellars – 2014

Cultivar	Clone	Rootstock	AVA	Planted	Vines/A
Pinot noir	Pommard	3309 C	Eola Amity	2001	806

3. Adelsheim Vineyard

Cultivar	Clone	Rootstock	AVA	Planted	Vines/A
Pinot noir	Wadenswil	3309 C	Chehalem Mountain	1997	1245

Oregon State UNIVERSITY

Crop Levels Revealed…

Label	Company	Vintage	Crop Level	Yield (lb/ft)
1A	Chehalem	2014	3.25 T/A	0.92
1B	Chehalem	2014	2.5 T/A	1.27
2A	Ken Wright Cellars	2014	1 cluster/shoot	0.81
2B	Ken Wright Cellars	2014	No thinning	1.51
3A	Adelsheim	2015	1.5 cluster/shoot	1.99
3B	Adelsheim	2015	1 cluster/shoot	1.59

Acknowledgements

Funding:

Oregon Wine Research Institute

Oregon Wine Board

Industry collaborators

Skinkis Lab Members *(present & past)*

Amelia Doyle

Michael Kennedy

Justin Litwin

Alejandra Navarrete

Alison Reeve

Miranda Ulmer

Questions?

Patty Skinkis, Ph.D.
Department of Horticulture
Oregon Wine Research Institute
Oregon State University
Patricia.Skinkis@oregonstate.edu
http://owri.oregonstate.edu

Oregon State University

Oregon Wine Research Institute

Grape Day, April 6, 2017

Oregon State University Campus, Corvallis

Management of Trunk Disease, Grapevine Viruses and Fungicide Resistance

Management of Grapevine trunk diseases: a difficult but not impossible task- *José Ramón Úrbez-Torres, Pacific Agri-food Research Centre, British Columbia*

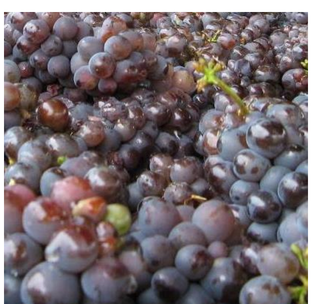
Red Blotch in Oregon- *Vaughn Walton, OSU*

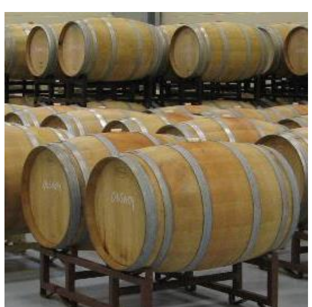
Grapevine Leafroll Disease Impact- *Laurent Deluc, OSU*

Grape Powdery Mildew Management: An Integrated Approach- *Brent Warneke, OSU*

Effects of Red Blotch on Wine Quality- *Anita Oberholster, UC Davis*

Interactive Poster Session featuring more of the latest research and information!





For more information and registration: http://owri.oregonstate.edu