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OWRI Grape Day  
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# OPTIMIZING IRRIGATION INITIATION IN OREGON VINEYARDS



**Oregon State University**  
Southern Oregon Research  
and Extension Center

# When should you turn on the water?

- Initiating irrigation schedule is a critical annual mgmt. decision.
- Significant impacts on current *and* next year's crop.
- Delays have important trade-offs that are goal-dependent.



# (Way too early) Conclusion

After one year, stem water potential (SWP) initiation thresholds:

To optimize...	SWP	Parameter gain	Yield loss
Yield	$\geq -7$ bar	--	--
Brix	-10 bar	+0.2°	-7%
Total wine anthocyanins	-12 bar	+13%	-15%

# Materials and **METHODS**



# Irrigation initiation experiment

Site locations in the Rogue Valley

## Eagle Point

### Legend

- Cities
- 📍 Experimental sites
- 🏛️ SOREC

## Jacksonville

## Ashland

Google Earth

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10 mi





# Vineyard description and management

Site	Elevation (ft.)	Clone	Year planted	Pruning	Mgmt.	Soil Texture Class	Available Water Supply (in.)
Eagle Point	1,495	Pommard	2017	Cane	Conv.	loam- gravelly clay loam	2.98
Jacksonville	1,675	Pommard	2014	Spur	Conv.	gravelly silt loam	5.76
Ashland	2,059	Wadenswil	2012	Cane	Organic	silty clay loam	5.62

\*All sites planted on 7 x 4 ft. spacing and used 3309C rootstock

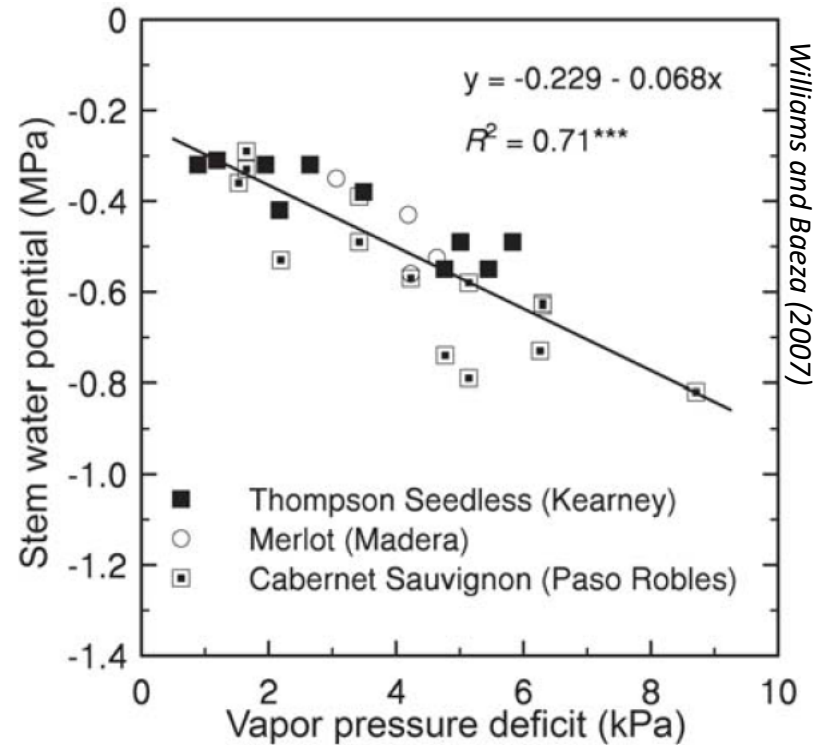


# Soil pics





# Irrigation treatments



**Figure 3** The relationship between stem water potential ( $\Psi_{\text{stem}}$ ) measured on three grapevine cultivars and vapor pressure deficit (VPD) at the time of measurement. Other information is as given in Figure 1 ( $n = 28$ ).



Calculated from VPD

Measured SWP

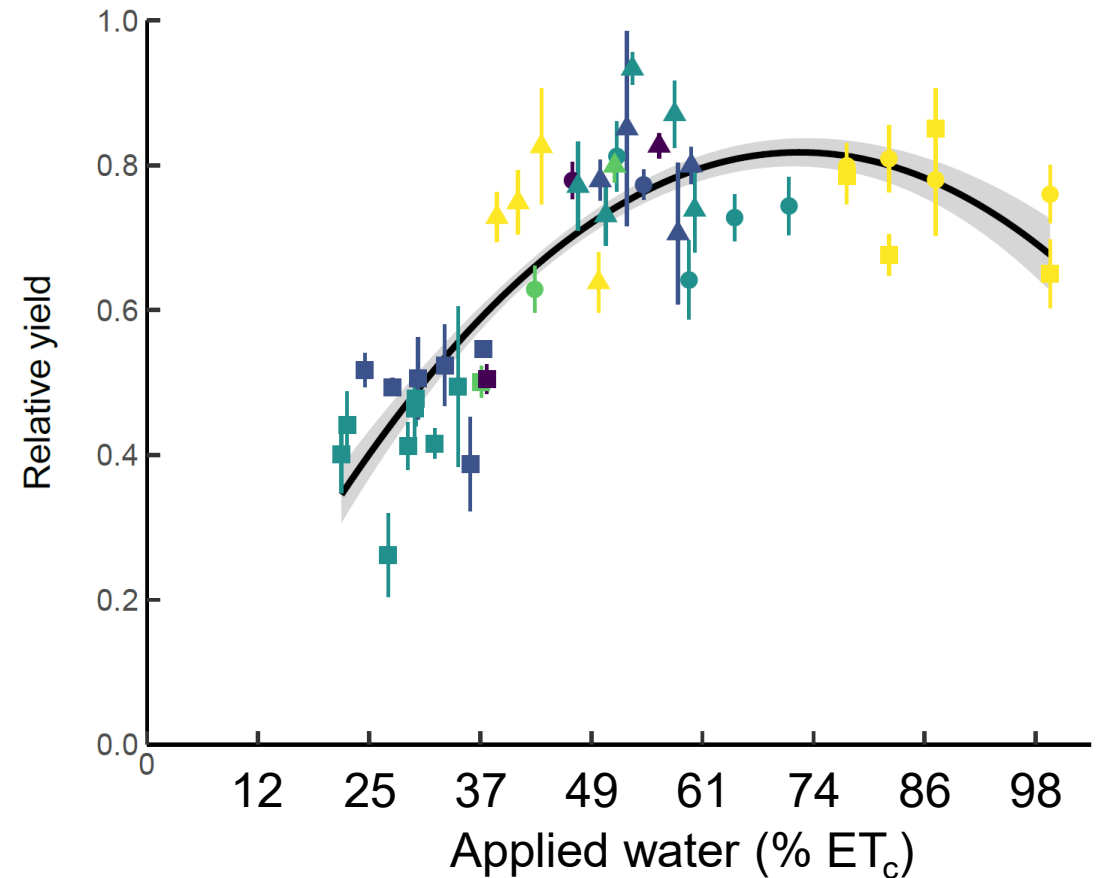
$$SWP_{ns} - SWP_{abs} = \Delta SWP$$



# Irrigation treatments

Treatment	$\Delta$ SWP threshold for irrigation initiation (bar)
T1 (control)	-2
T2	-4
T3	-6
T4	-8
T5	-10

**All plots irrigated at 70% estimated  $ET_c$   
after initiation**



# How treatments were applied





# Measurements

- Seasonal data:
  - Weekly SWP with PMS 615
  - Temp and RH
- Harvest data:
  - Yield components and berry chemistry (Brix/pH/TA)
  - Flavonoids (HPLC)
- Winemaking

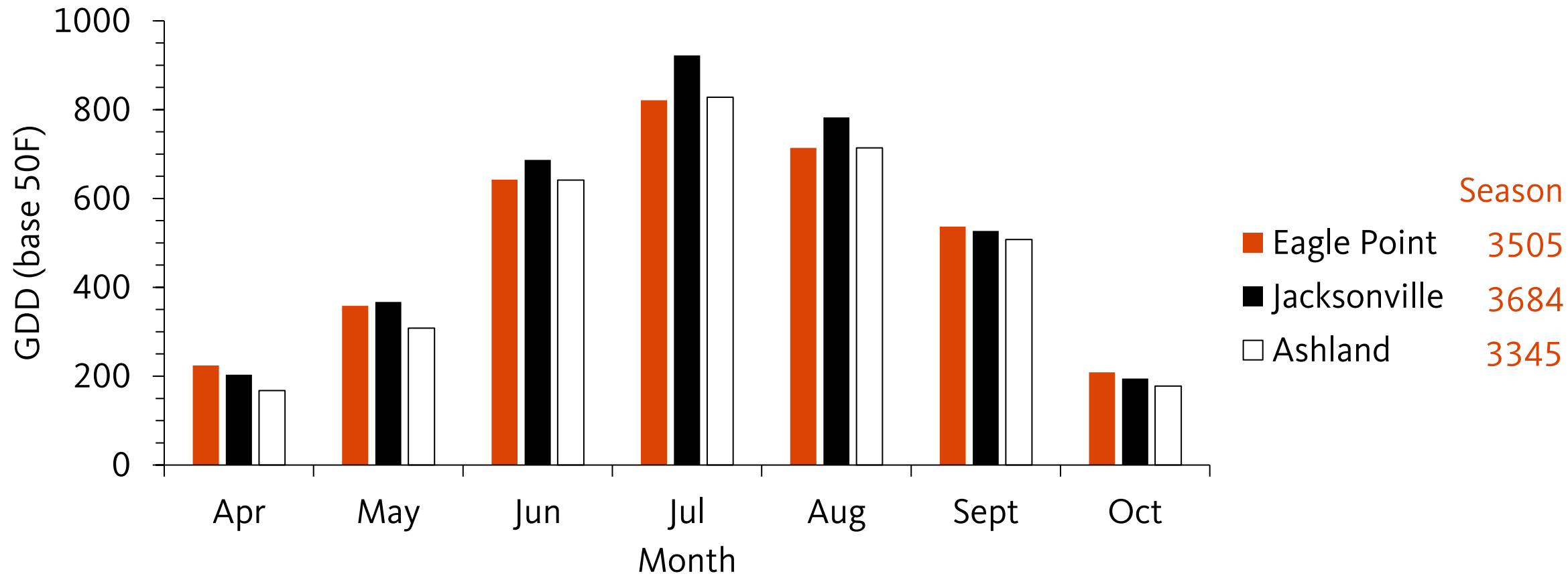


# Results

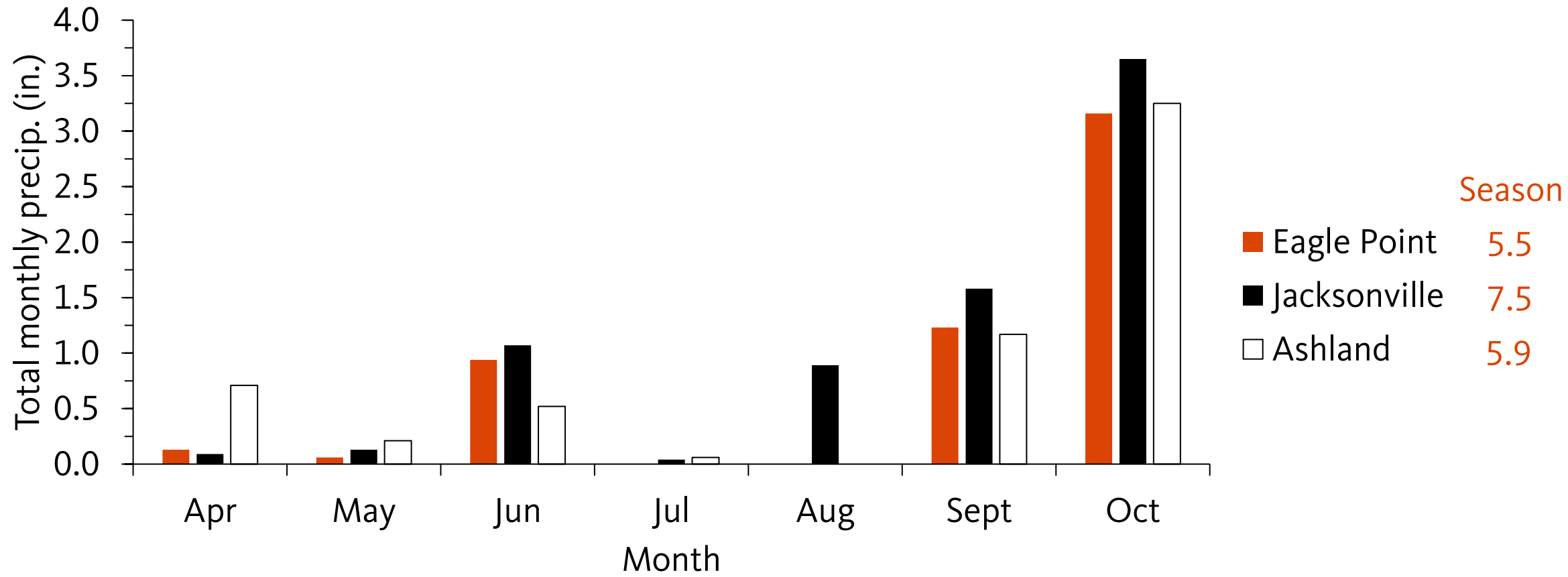
# **ENVIRONMENTAL CONDITIONS**



# Total monthly growing degree days

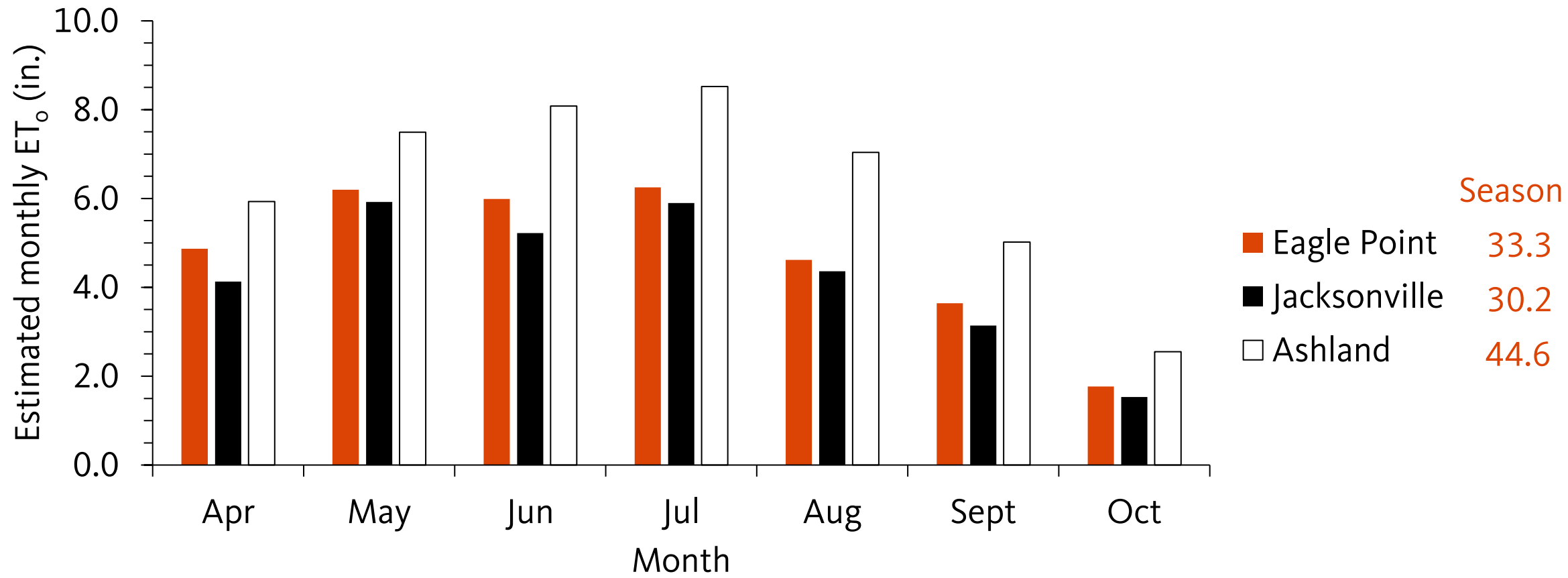


# Total monthly precipitation\*

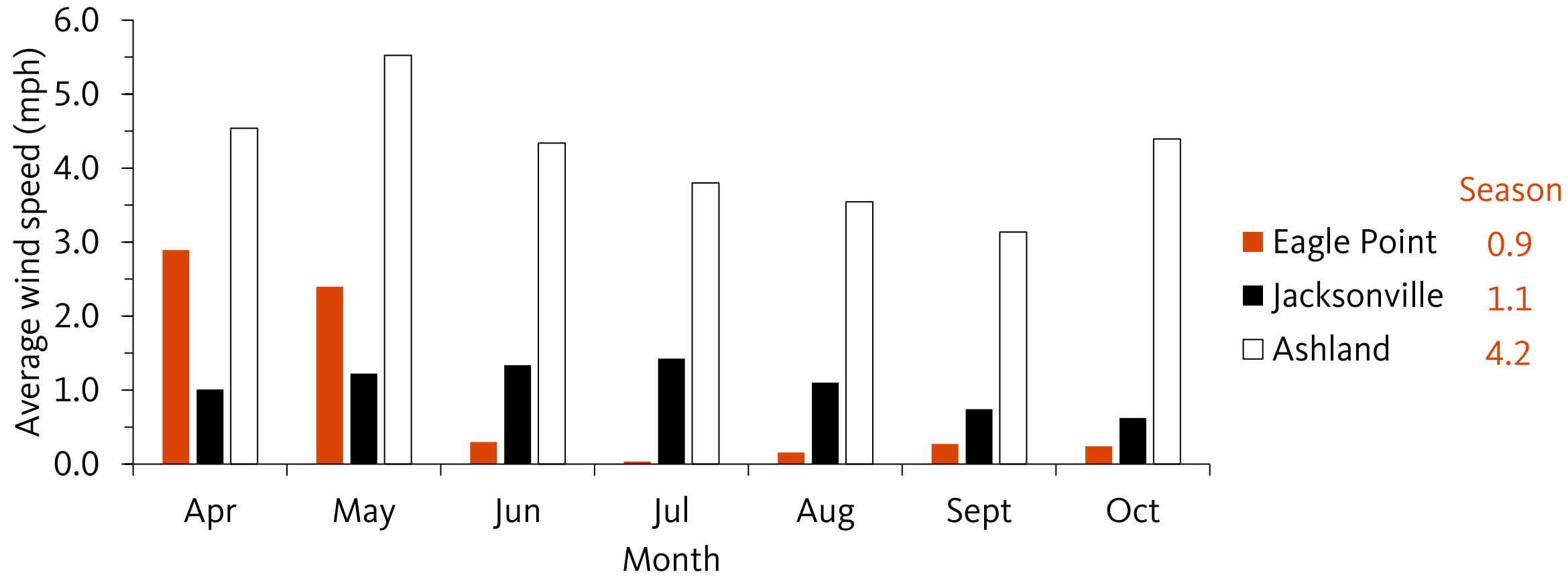




# Total monthly ET<sub>o</sub>



# Average monthly wind speed

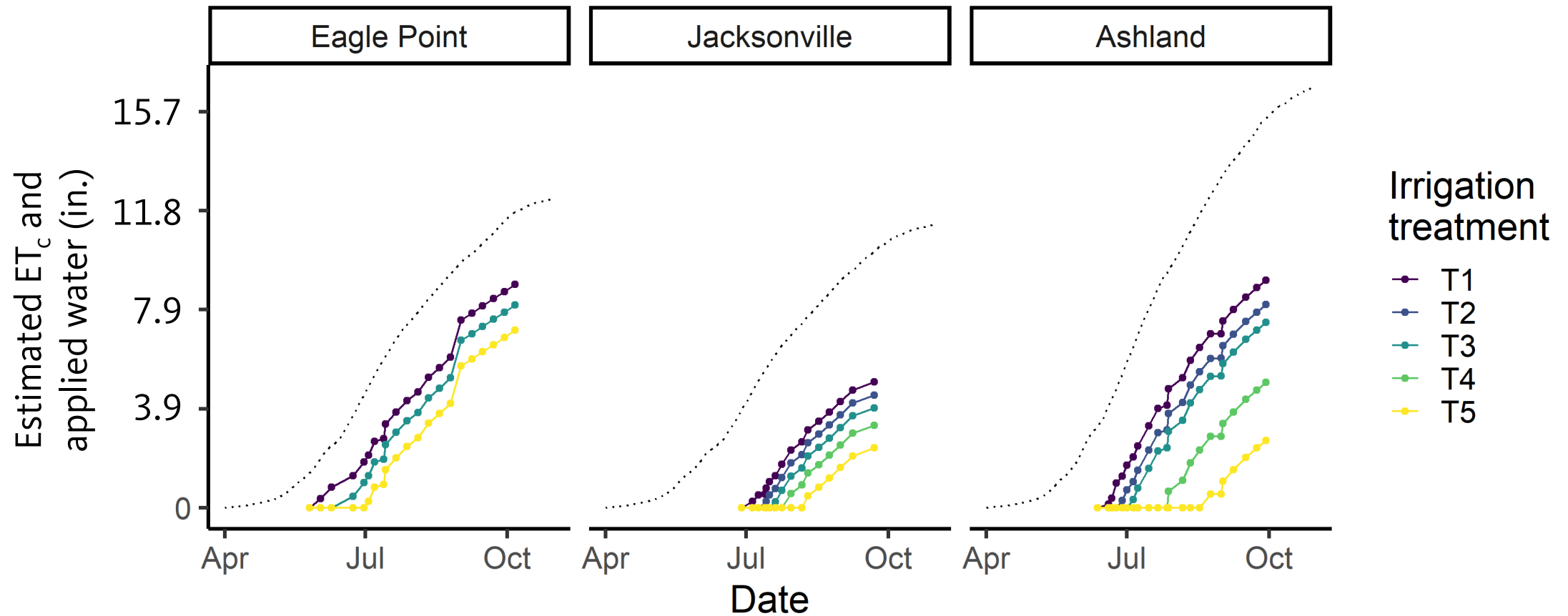




# Results

**INITIATION DATES, APPLIED  
WATER, AND SWP**

# Estimated $ET_c$ and applied water

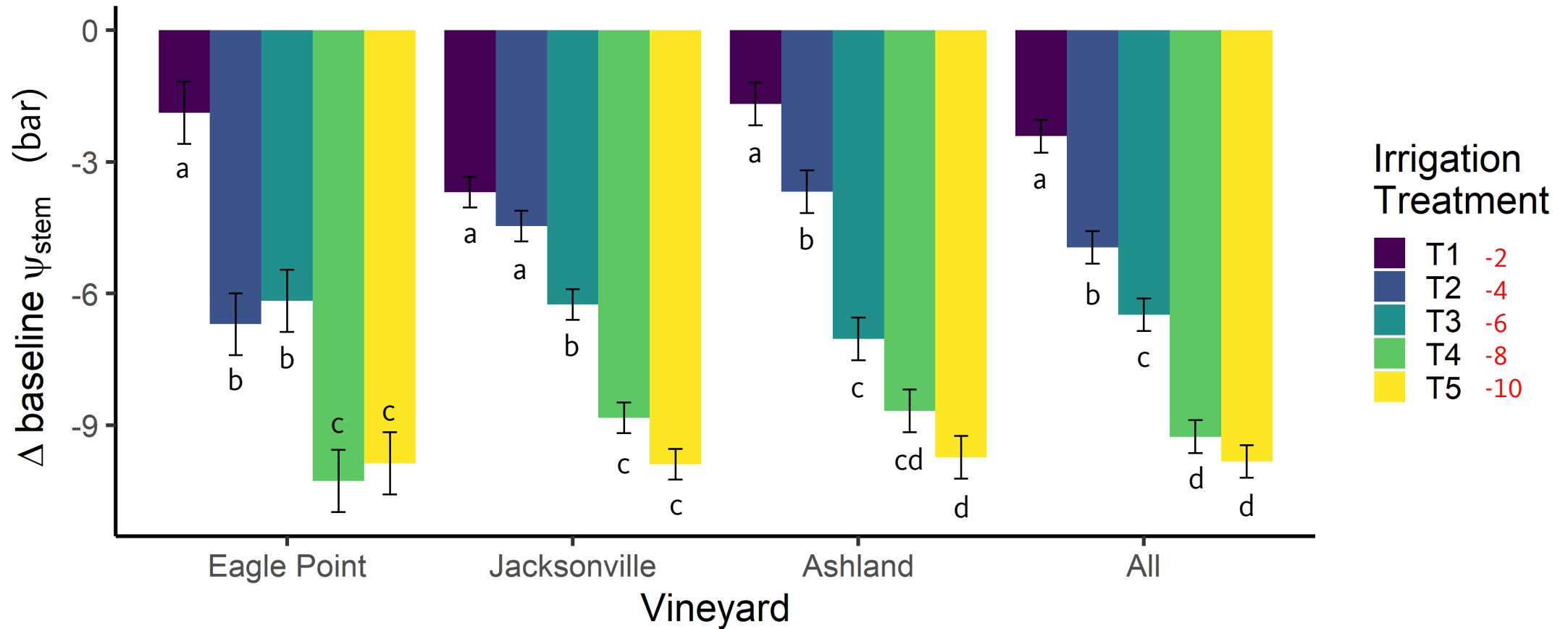




# Initiation dates and total applied water

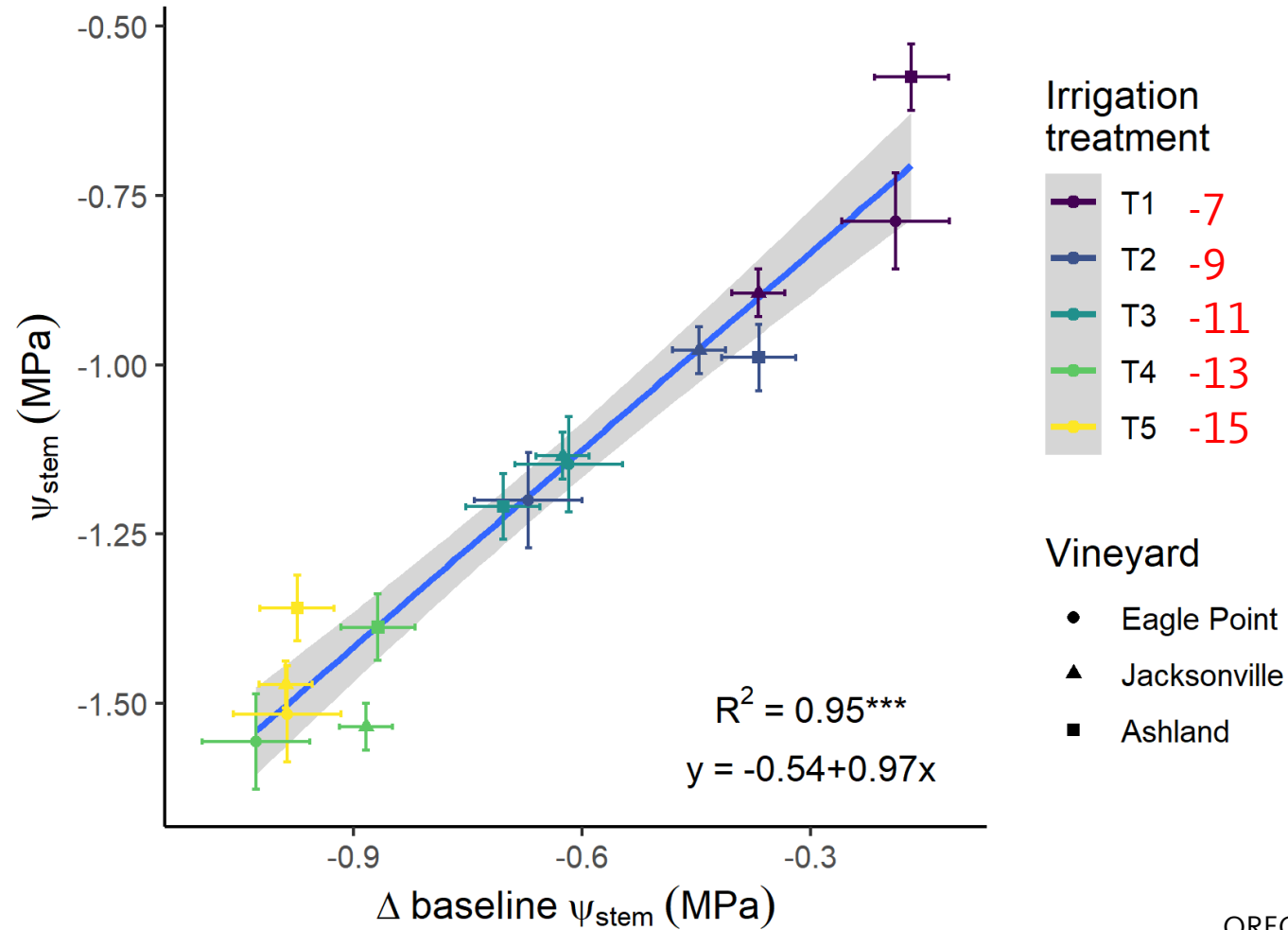
Variable	Irrigation Treatment	Sites		
		Eagle Point	Jacksonville	Ashland
Initiation date	T1	June 1	July 5	June 16
	T2	June 22	July 12	June 27
	T3	June 22	July 19	July 4
	T4	July 3	July 29	July 28
	T5	July 3	Aug. 9	Aug. 23
Applied water (in.)	T1	8.9	5.0	9.1
	T2	8.1	4.5	8.1
	T3	8.1	4.0	7.4
	T4	7.0	3.3	5.0
	T5	7.0	2.4	2.7

# $\Delta$ baseline SWP





# Actual SWP vs. $\Delta$ baseline SWP



# Canopy size at veraison





# Results

## **YIELD, HARVEST CHEMISTRY, AND WINE ANTHOCYANINS**

# Linear reductions in berry size and yield

Variable	Treatment	Sites				
		Eagle Point	Jacksonville	Ashland	All	
Berry weight (g/berry)	T1	0.90	1.15	1.15	1.06	
	T2	0.85	1.05 *	1.08	0.99 *	-6%
	T3	0.85	1.03 **	0.92 ***	0.93 ***	-12%
	T4	0.75 **	0.99 ***	0.83 ***	0.86 ***	-19%
	T5	0.73 ***	0.84 ***	0.77 ***	0.79 ***	-25%
Yield (tons/ac)	T1	5.0	6.5	4.3	5.2	
	T2	4.0	6.1	3.7	4.5 *	-14%
	T3	4.1	5.8	3.8	4.4 *	-15%
	T4	3.5 *	6.0	3.2 **	4.1 ***	-22%
	T5	3.3 *	5.5	2.6 ***	3.7 ***	-28%

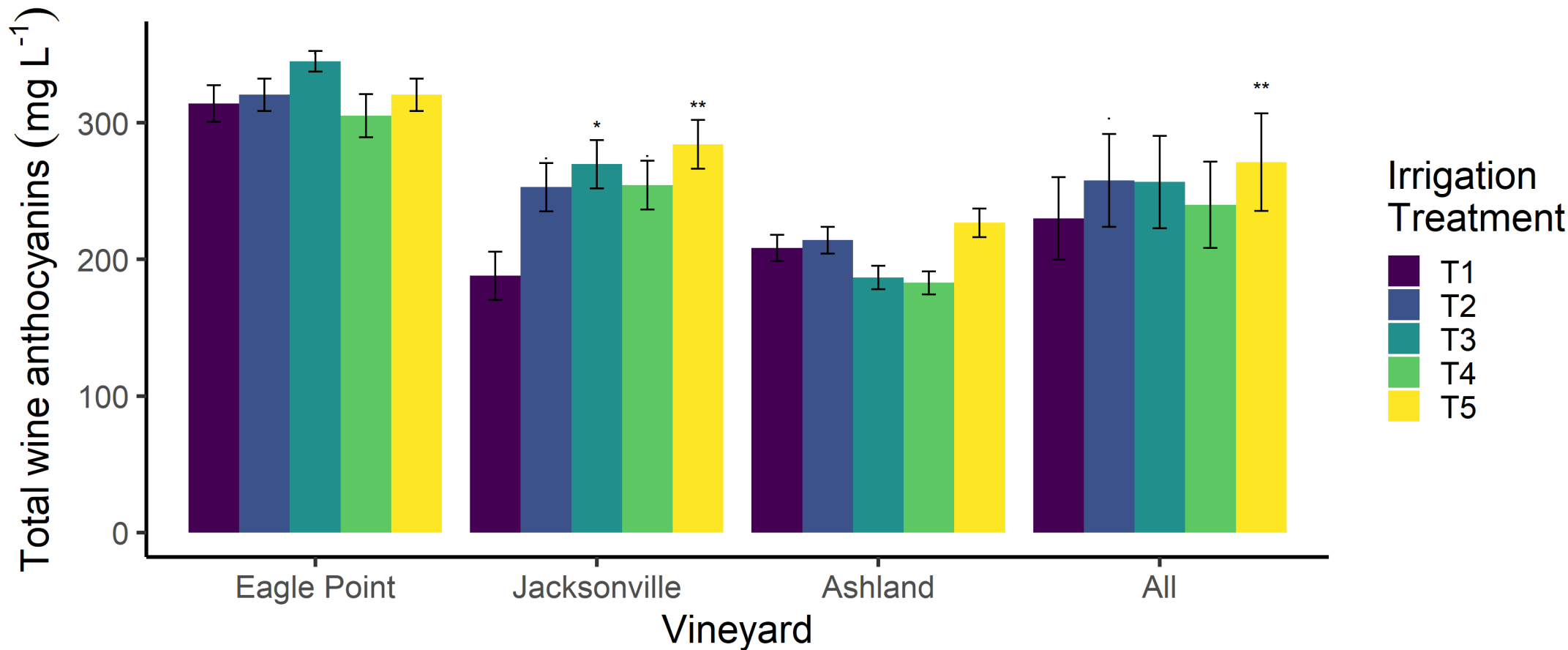
# Fruit chemistry at harvest: sugar

Variable	Treatment	Sites				
		Eagle Point	Jacksonville	Ashland		All
Total soluble solids (Brix)	T1	20.9	25.1	22.3		22.8
	T2	20.8	26.0	22.3		23.0
	T3	21.0	25.8	21.4		22.7
	T4	22.2**	25.0	20.3***		22.7
	T5	21.2	24.8	20.3***		22.1
Total hexose (mg/berry)	T1	187	289	259		240
	T2	176	273	242		230
	T3	180	265*	197***		214**
	T4	165	253**	168***		196***
	T5	155**	207***	165***		176***

+0.2  
-0.1  
-0.1  
-0.7



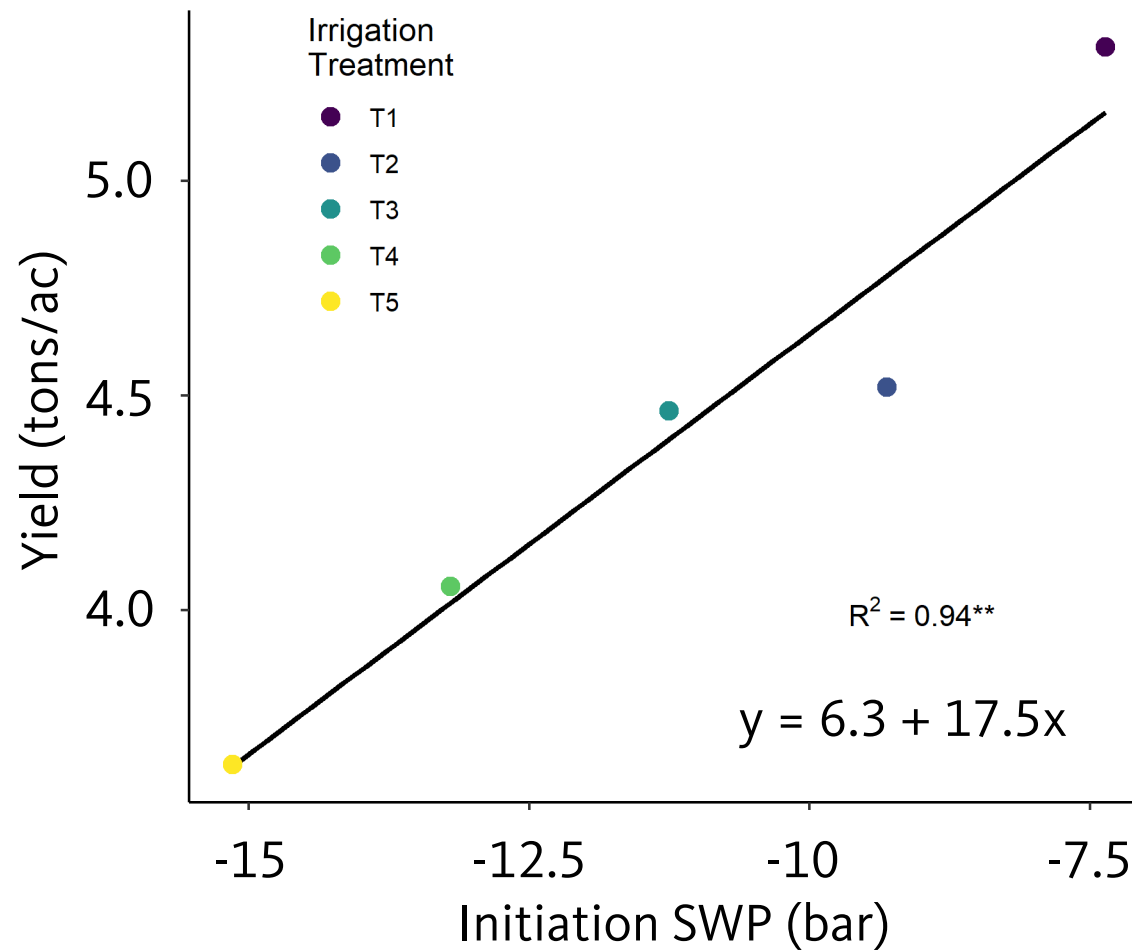
# Wine anthocyanins



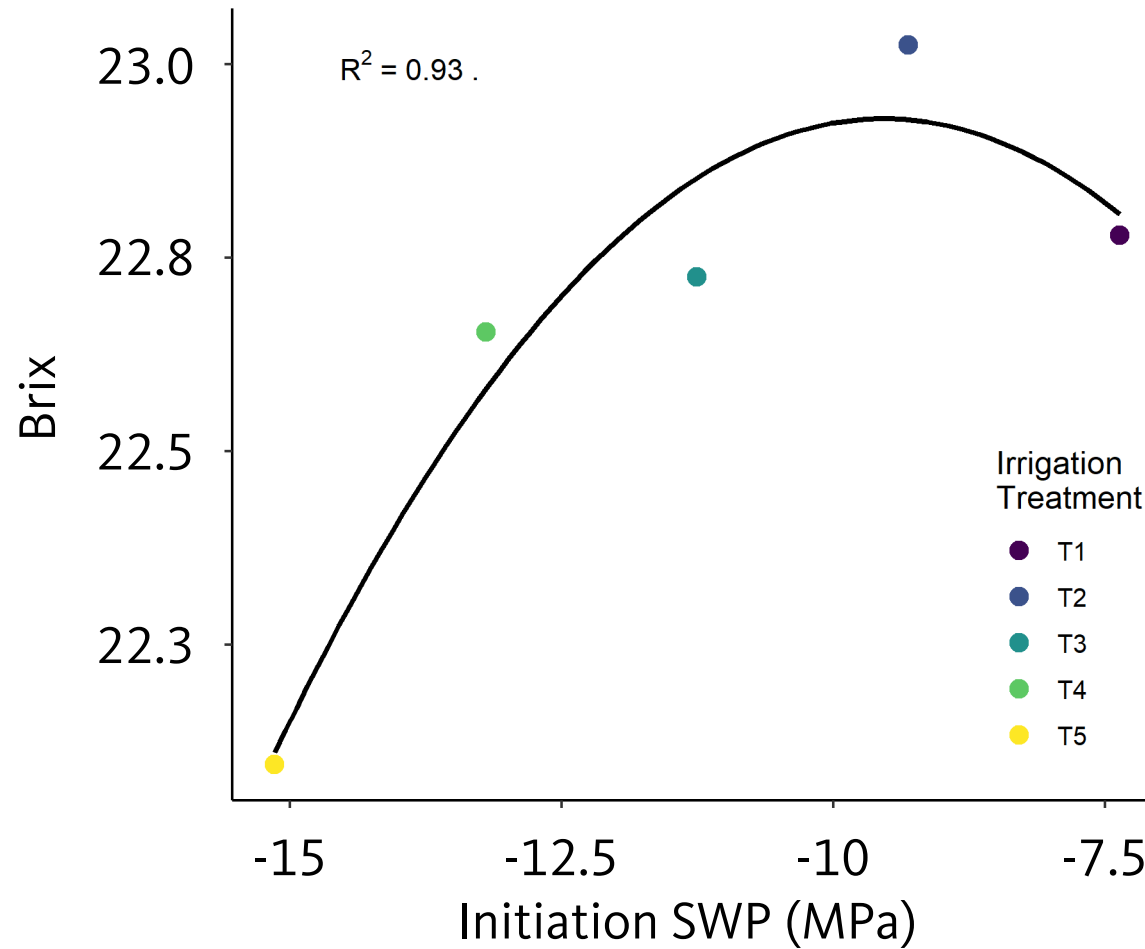
# Results

## **OPTIMIZING INITIATION**

# Optimizing for yield

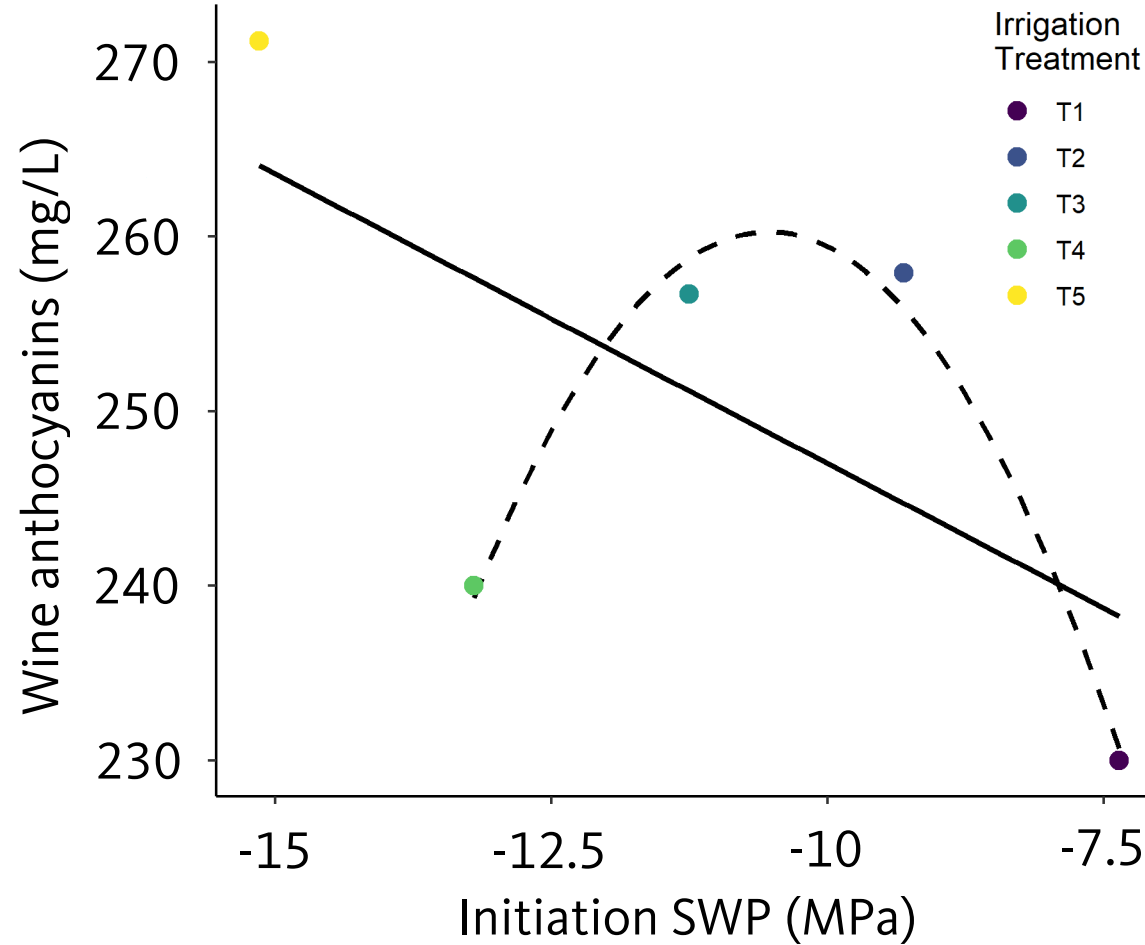


# Optimizing for Brix





# Optimizing for wine anthocyanins



# Summary and **PRELIMINARY CONCLUSIONS**

# Summary

- Treatments successfully implemented (for the most part) at each site.
- Large differences across sites in dry-down dynamics:
  - Fast and early
  - Fast and late
  - Slow
- Large differences across sites/treatments in applied water amounts:
  - 2.4 to 9.1 in.

# Summary

- **Yield** was **strongly and linearly reduced at each site** with increased delays in irrigation initiation.
- **Brix response** varied somewhat across sites, but on average **was quadratic** with increased delays in irrigation initiation.
- **Wine anthocyanin response** varied strongly across sites – but **was generally quadratic** from T1 to T4, but T5 highest (in 2 of 3 sites).



# (Way too early) Conclusion

After one year, stem water potential (SWP) initiation thresholds:

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# Lingering questions

- Carryover effects?
- *Winemaking introduces variability.* Are fruit flavonoid responses more consistent compared to wines?
- Treatment effects on fruit and wine tannins?





# Acknowledgements

## oregon wine



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