

# Crop per Drop: Why is Arizona #1?

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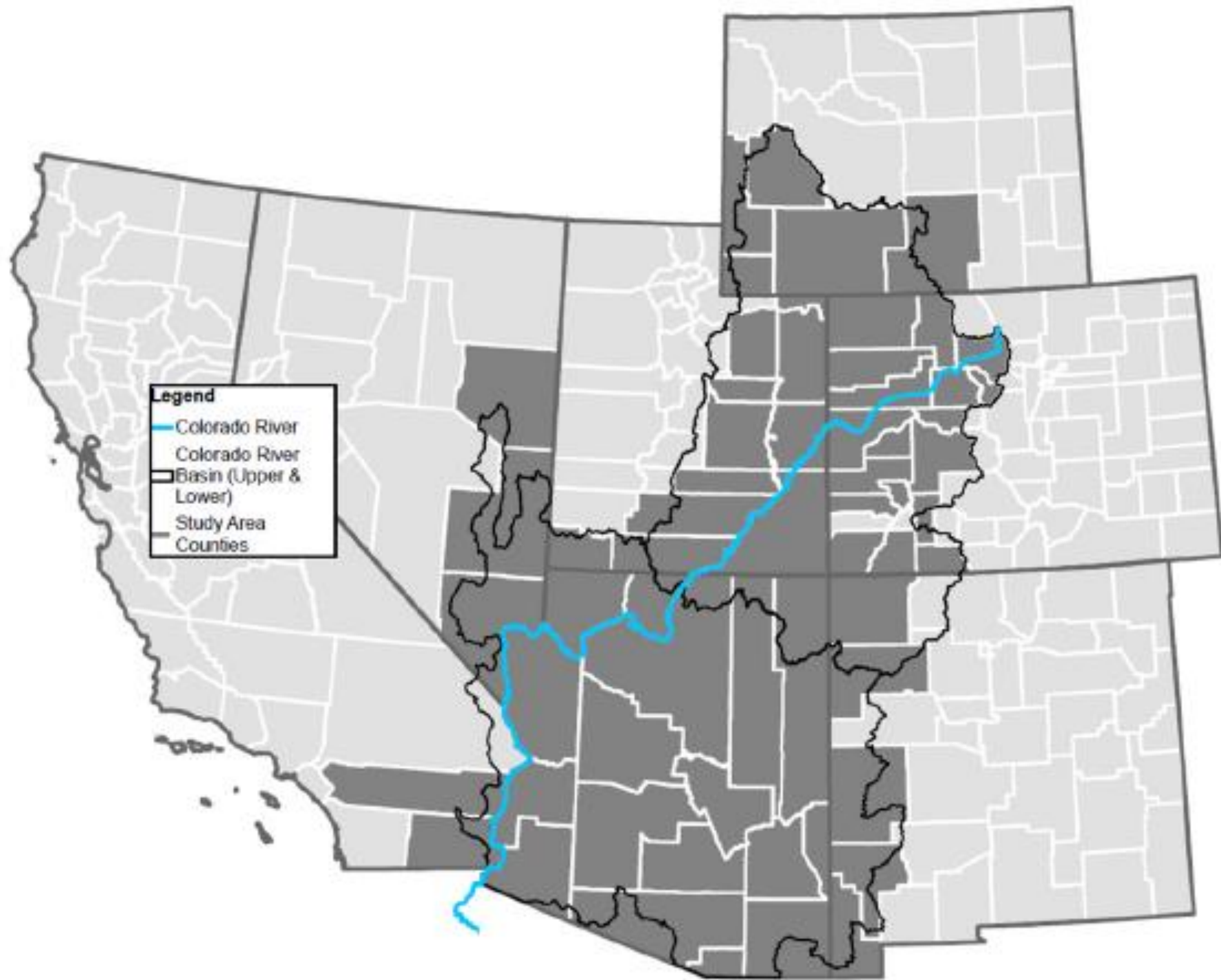
## New Work on Water Productivity

- Frisvold, G., & Duval, D. Agricultural Water Footprints and Productivity in the Colorado River Basin. *Hydrology* **2024**, 11, 5.  
<https://www.mdpi.com/2306-5338/11/1/5>
- Frisvold, G. , & Atla, J. Agricultural Economic Water Productivity Differences across Counties in the Colorado River Basin. *Hydrology* **2024**, 11, 8.  
<https://www.mdpi.com/2306-5338/11/8/125>

## Different Productivity Measures

- Physical output (tons, bushels, etc.) / AF
- Economic Water Productivity (\$ sales / AF)
- Water Footprint (AF/ \$ of sales)
- Cash rent premiums for irrigated cropland

# Study Area



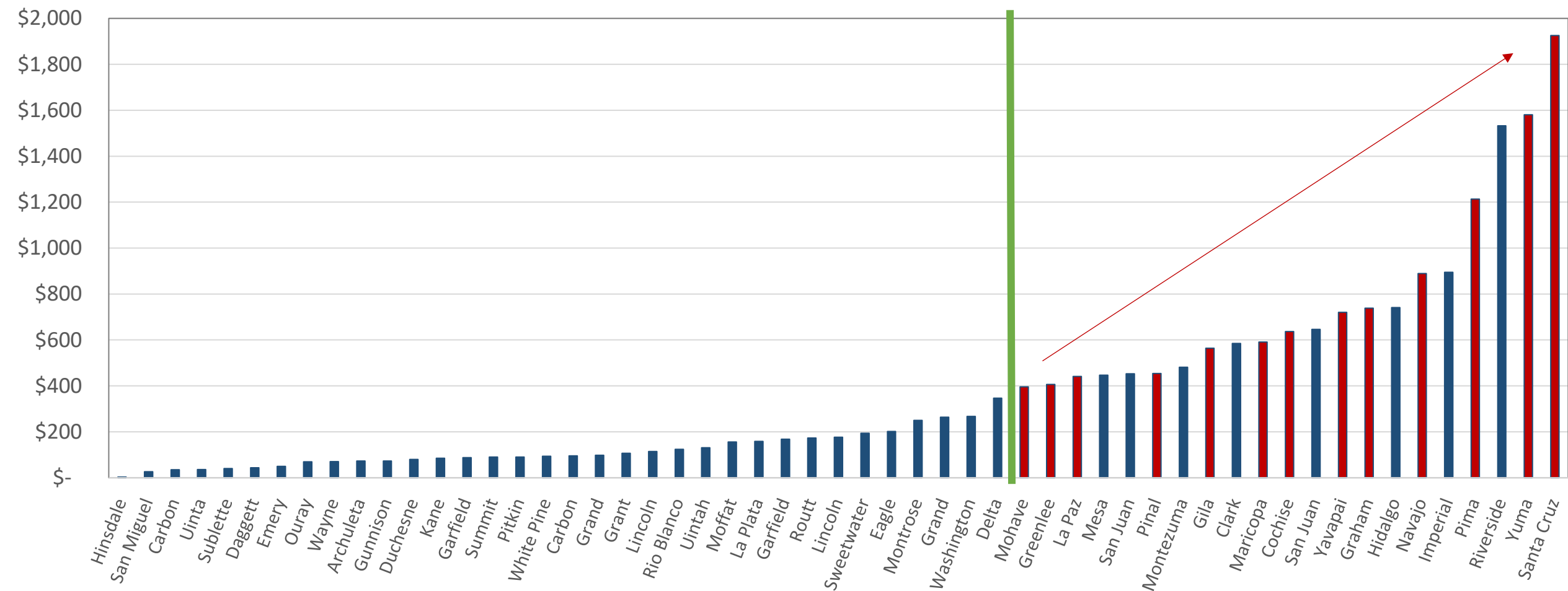
## The What: High Variation in Economic Water Productivity (EWP) across Colorado River Basin Counties [EWP = crop sales / AF of water consumed]

	Border Counties	Other Lower Basin Counties	Upper Basin Counties
EWP (\$ of Crop Sales / AF)	\$ 1,033	\$ 729	\$ 168

**AZ counties included**



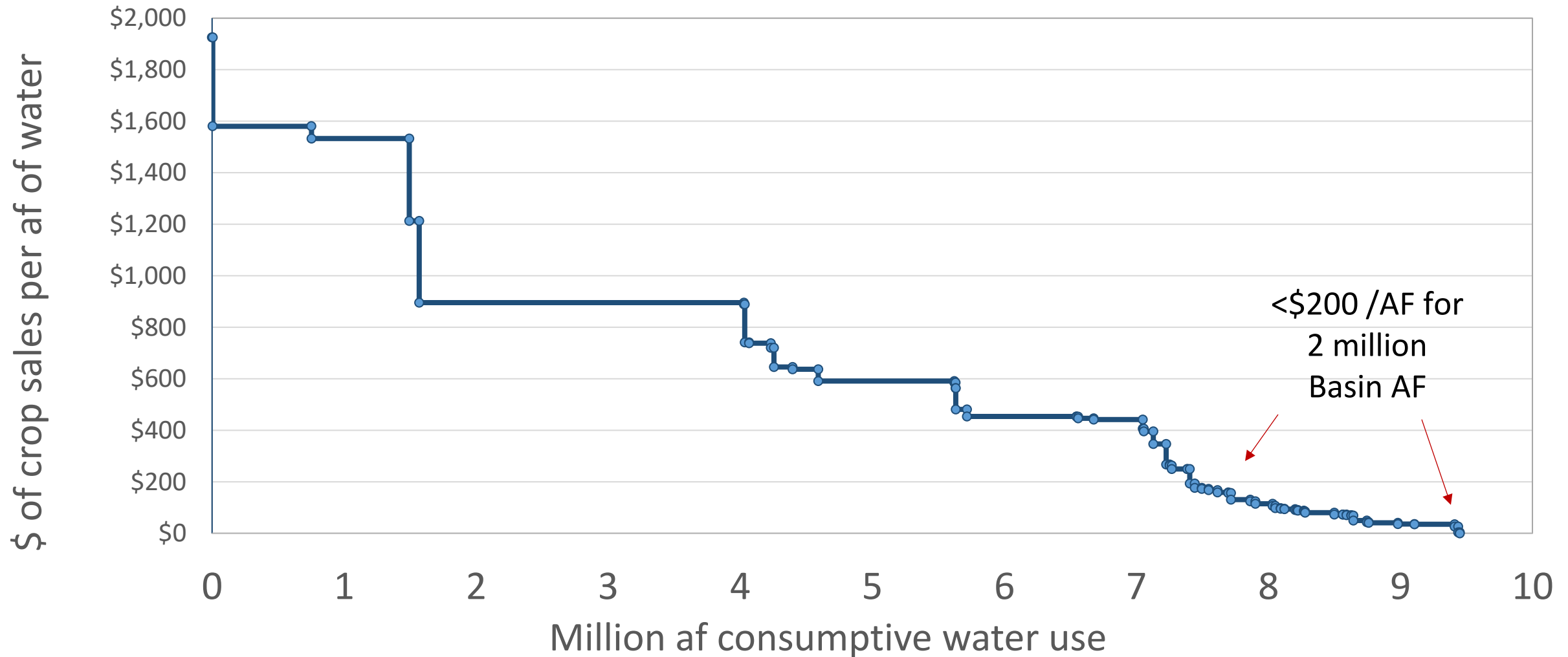
# Basin Counties Ranked by EWP



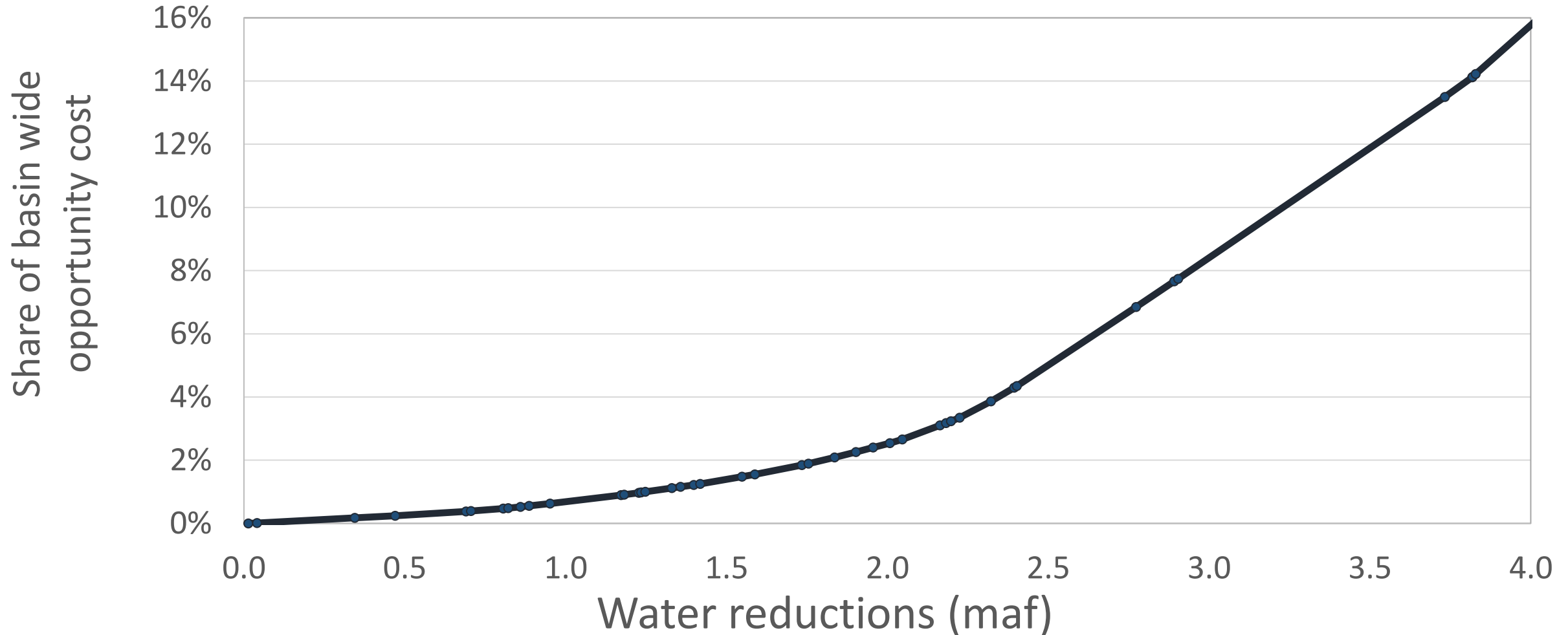
# What is the potential cost in terms of lost crop sales or reallocating water from agriculture?

- This depends critically on **where** cuts are made
- Cuts to water supplies where EWP is higher entail greater costs in terms foregone sales

# Crop Sales / AF across Colorado Basin



# Percentage of Regional Crop Sales Lost with Water Cutbacks

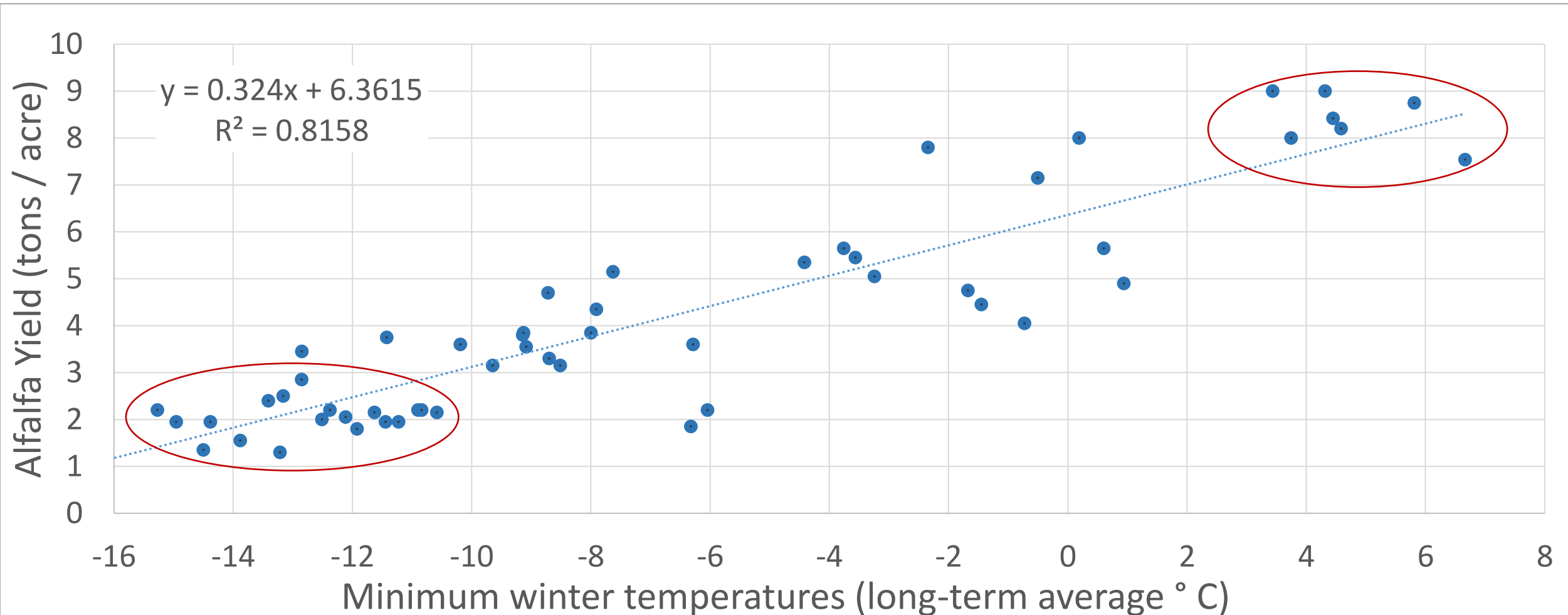




# **The Why: What Drives Differences in EWP across Counties?**

- Climate
  - Warm winters (+)
  - Summer humidity (+)
- Small / remote counties (–)
  - Higher transactions costs
  - Rural broadband & other infrastructure
- Average irrigated acres (–)
  - Land extensive operations include irrigated pasture & lower value crops?
- Being on the US – Mexico Border
  - Labor availability

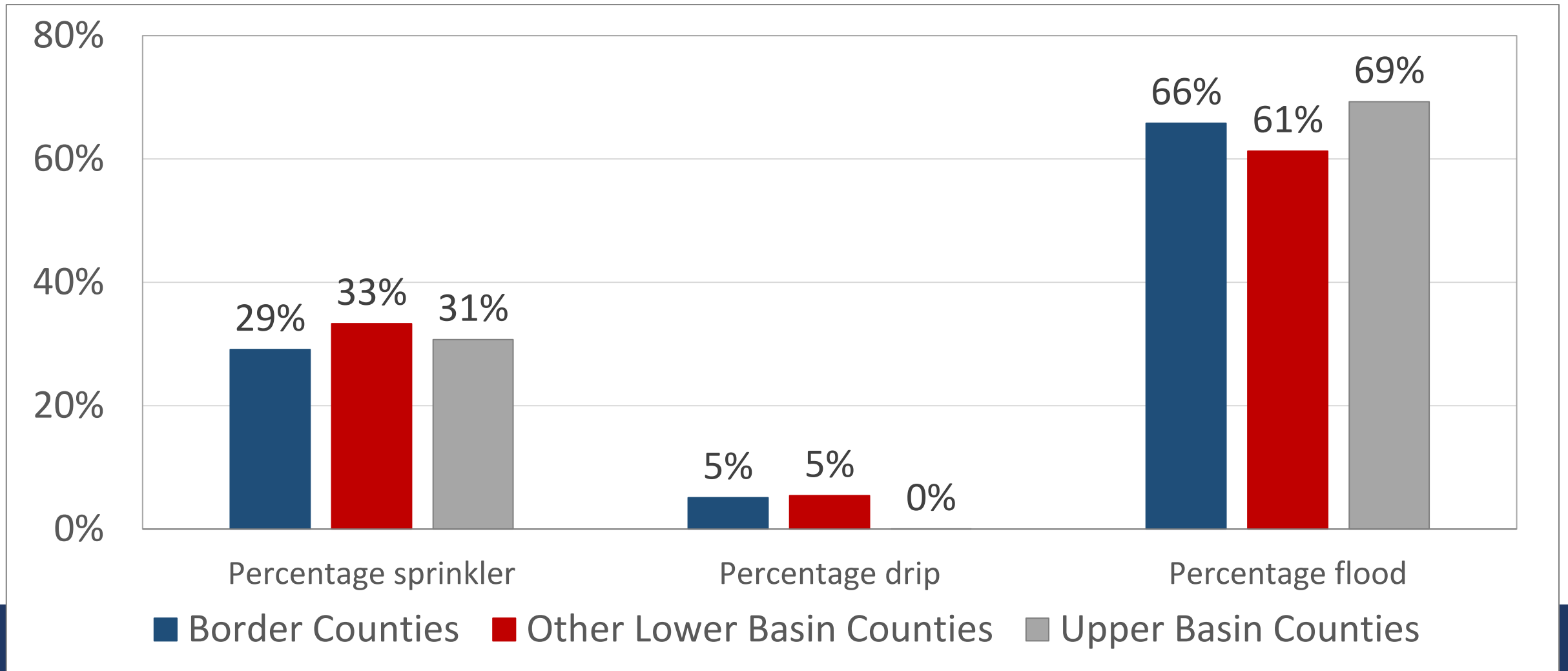
# Alfalfa Yields Grow with Winter Temperatures



# Adoption of Improved Irrigation Systems Does Not Account for Inter-County Differences in EWP

- Why not?
- Possible explanations
  - Gravity flow irrigation has been optimized to reduce efficiency differences
  - Advantages of sprinkler systems reduced in extremely hot & arid conditions
  - **There's just not that much variation in adoption rates across counties**
- This says nothing about role of irrigation technologies within counties or over time

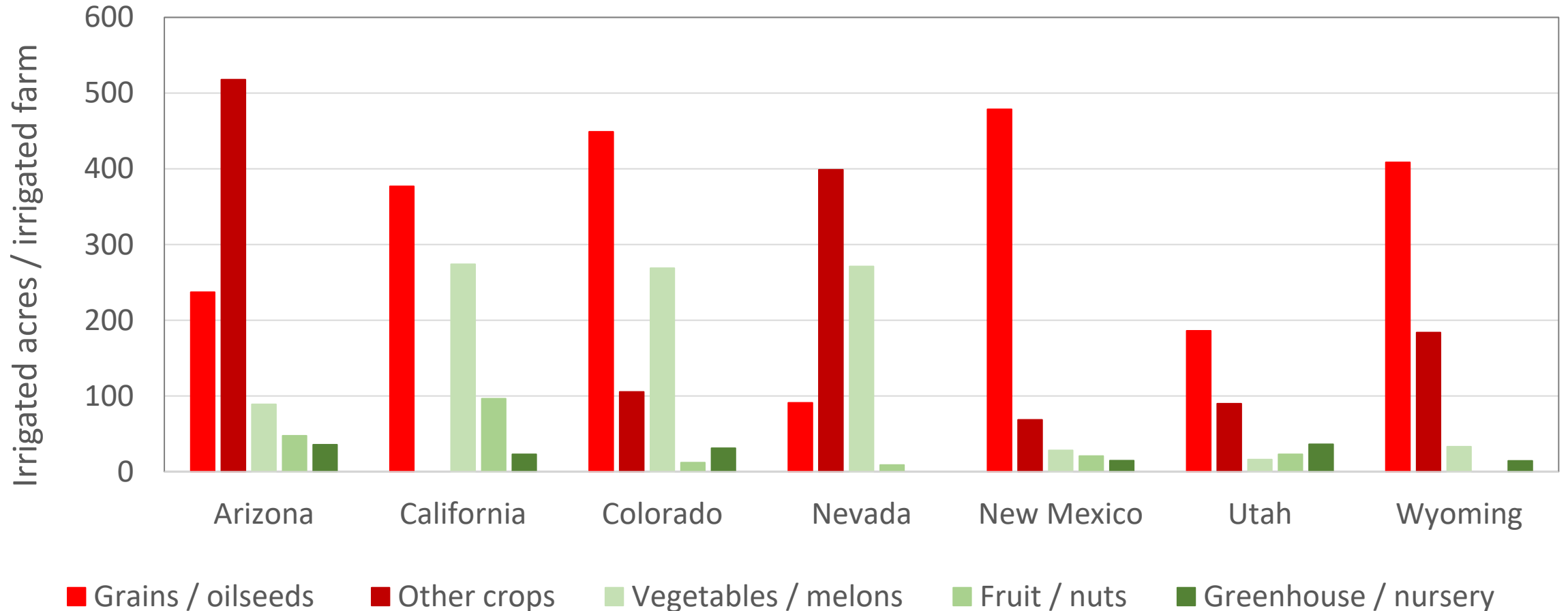
# Little Regional Variation in Irrigation Technology Adoption



# Labor Costs & Farm Specialization

Region	Farms specializing in vegetables / melons, fruits / nuts, and nursery / greenhouse production as a share of all farms	
	Labor costs as a share of production expenses	
Border Counties		
Yuma County	28%	51%
Remaining Border Counties	21%	17%
Other Lower (OL) Basin Counties		
Riverside County	21%	60%
Remaining OL Basin Counties	17%	14%
Upper Basin Counties	15%	7%

# Irrigated acres / farm by crop specialization



# Summing up

- Reallocating water from agriculture in systems with high EWP will have the highest losses in crop revenues
  - Border County EWP 6X greater than Upper Basin EWP
  - Other Lower Basin County EWP 4.3X greater than Upper Basin EWP
  - Counties with the lowest EWP consumed 25% of the Basin's agricultural water (>2.3 million af) to generate 3% of Basin crop revenue
- Warmer climate favors higher-value specialty crop production and enhances alfalfa yields
- Controlling for other factors, being on the Border increased a county's EWP by \$570 / AF
- Sustainability of regional agriculture depends on both water availability & labor availability

# Questions?

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