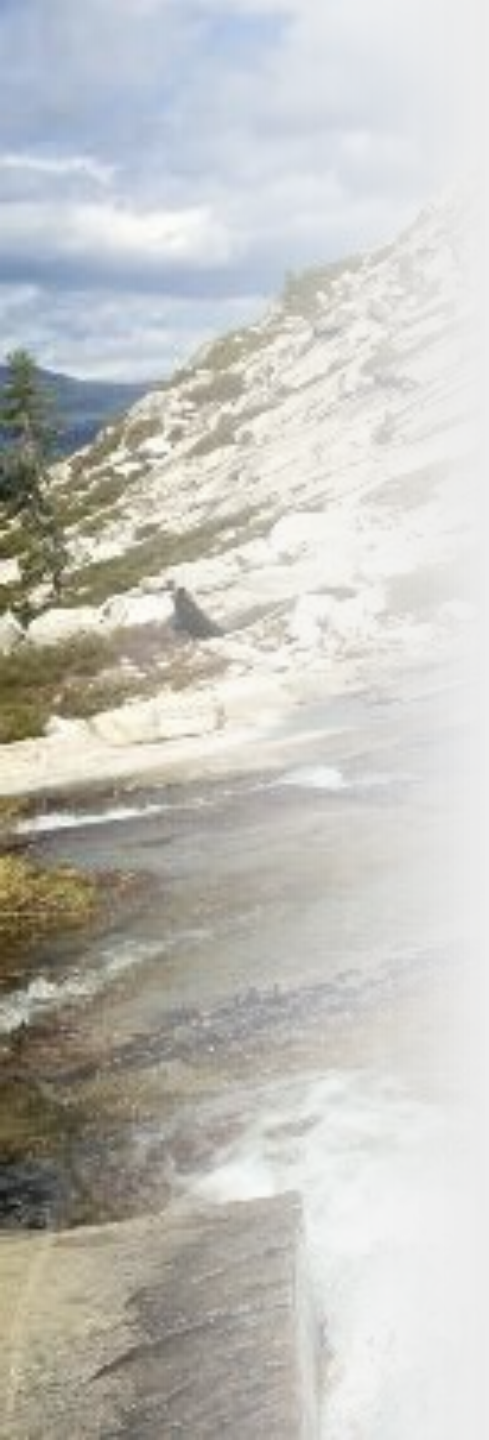

Effects of Drought on Water Utility Finances

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May 20, 2025

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CIWR Programs

Students and Fellows

CIWR student employees and fellows support projects and programs in water resources

Climate Smart Agriculture Team

Community Education Specialists, located in 10 counties across California

Nitrogen and Irrigation Initiative Team

Staff Research Associates located in Central Coast and Central Valley

Purpose and Motivation of Study

How has drought affected water utility finances in California?

Do observed relationships vary by utility characteristics such as size, population, climate, and income?

Utility finances are not well incorporated into water systems research

Are water systems prepared for future drought?

Drought in California

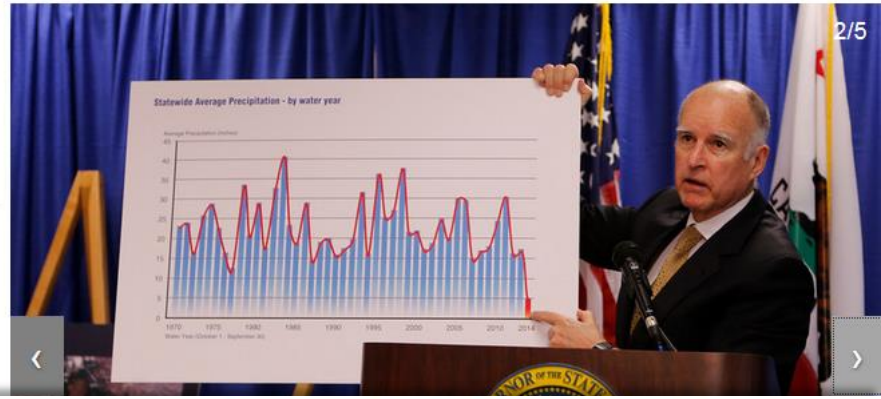
Brown declares California drought emergency

By Josh Richman and Paul Rogers

Staff writers

POSTED: 01/17/2014 09:09:42 AM PST | UPDATED: 3 MONTHS AGO

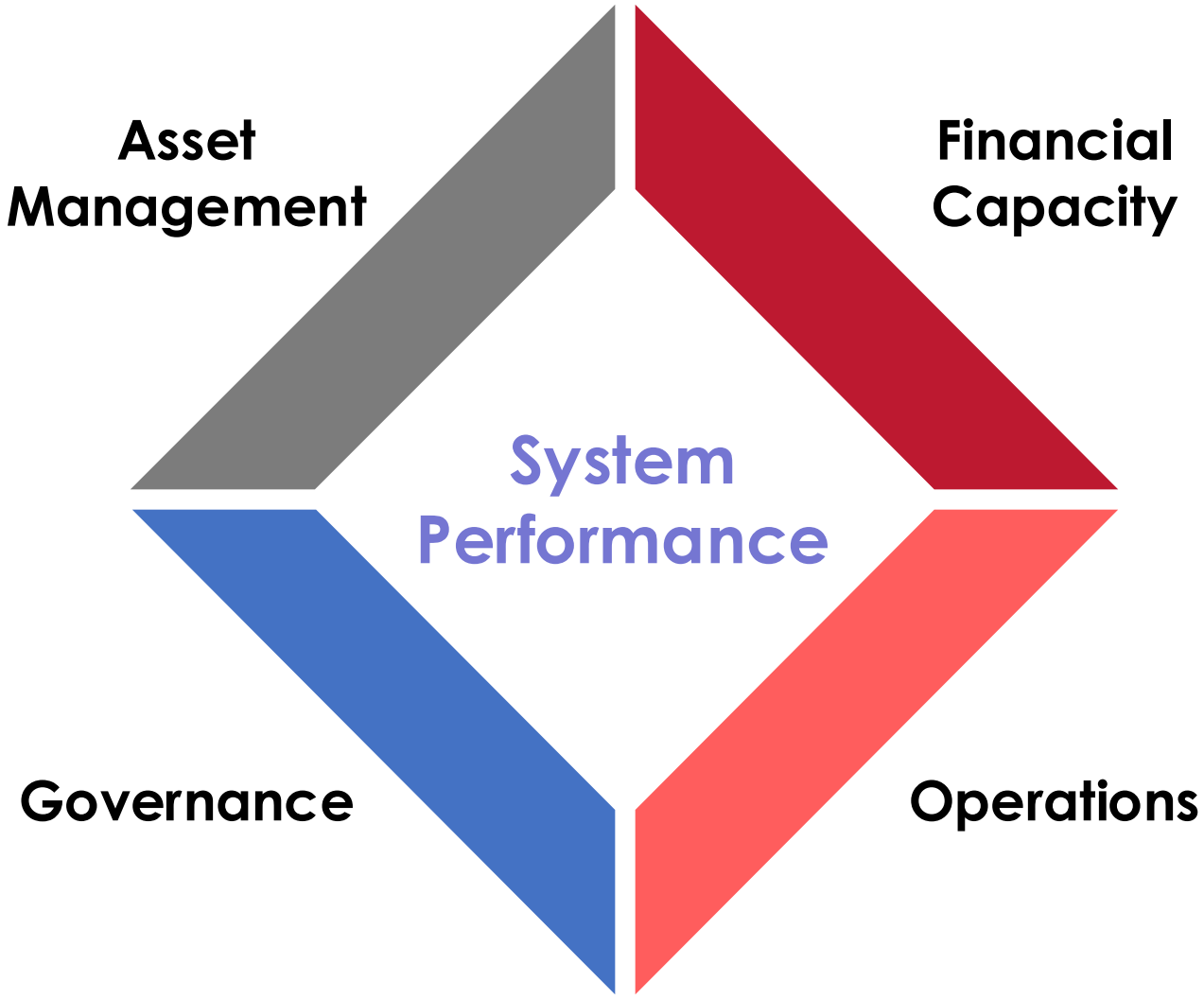
126 COMMENTS



For first time in 15 years, drought hits 100% of California

Comments 8 Email Share 578 Tweet 93 Like 485 +1 35

Key Factors in Water System Performance



Source: EFC at Sacramento State (2019-2022)

Some Simple Water System Financial Metrics

$$\textbf{Adjusted Operating Ratio} = \frac{Operating\ Revenues}{Operating\ Expenses + Depreciation}$$

Where depreciation is the accrued reduction in the value of assets over time

$$\textbf{Coverage Ratio} = \frac{Total\ Revenue - NonDebt\ Expenses}{Debt\ Payments}$$

$$\textbf{Days of Cash on Hand} = \frac{Unrestricted\ Cash}{Operating\ Expenses\ per\ Day}$$

Source: EFC at Sacramento State (2019-2022)

Early Analysis: Investigating Trends

Water Utility Financial Analysis

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources
California Institute for Water Resources

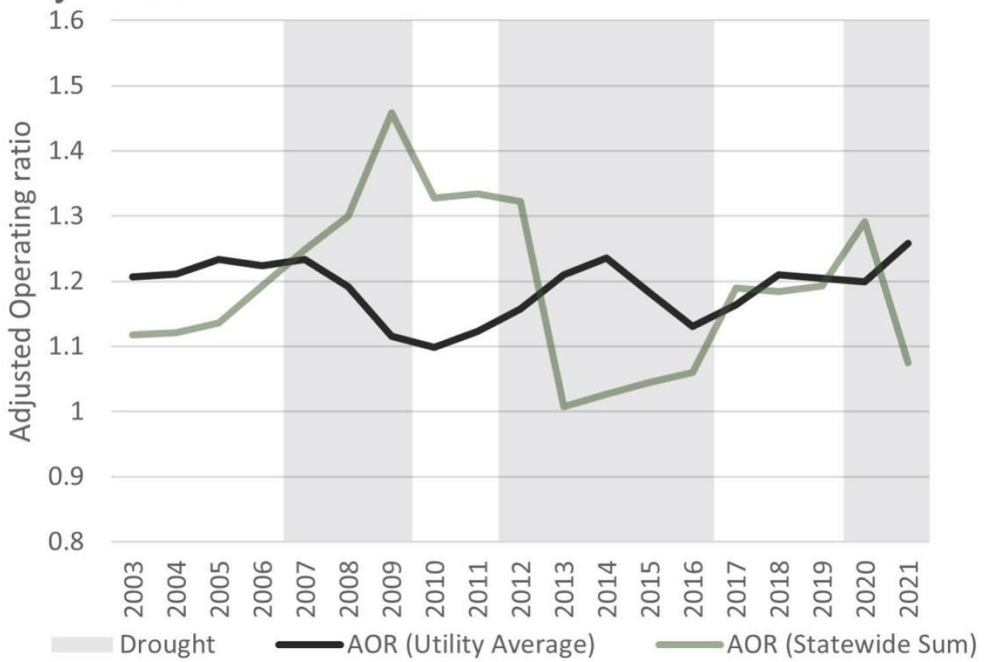
Goal: Examine the effects of drought on water utility finances.

$$\text{Adjusted Operating Ratio (AOR)} = \frac{\text{Operating Revenues}}{\text{(Operating Expenses + Depreciation)}}$$

AOR (Utility Average): Annual mean value of utility-specific annual adjusted operating ratios (n = 270)

AOR (Statewide Sum): Annual value of the adjusted operating ratio when summing revenues and expenses of all utilities

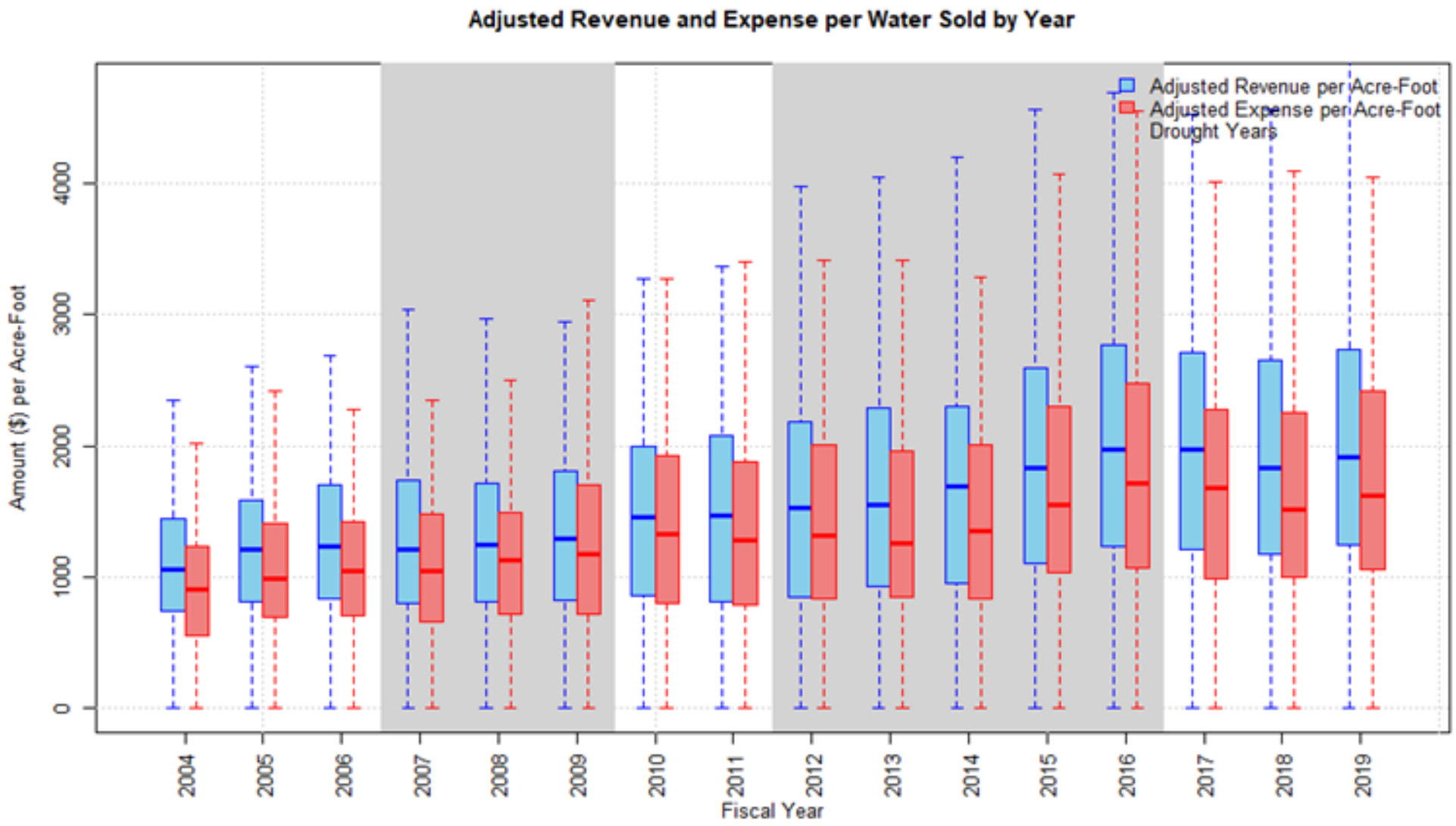
Regression Model: Preliminary models have not yielded statistically significant results comparing drought & AORs



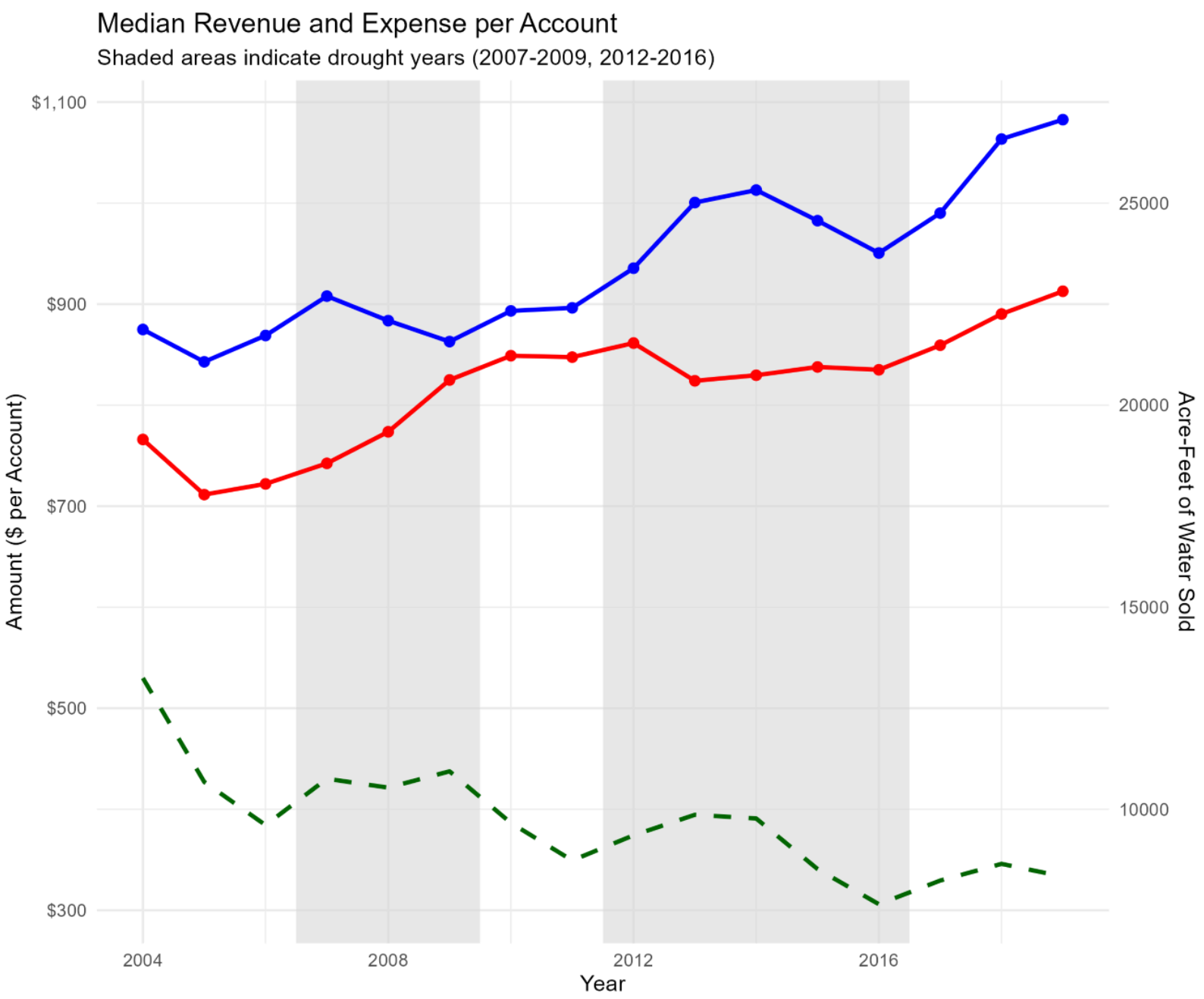
California municipalities report detailed annual financial performance metrics to the State Controller (data available from 2004-2022), which can be combined with water system operations data and evaluated through statistical modeling

Source: Currey (2023), Hauptman et al (in preparation)

Results: Changes in Revenues and Expenses



Source: Hauptman et al (in preparation)



Results: Changes in Revenues & Expenses per Account

Source: Hauptman et al (in preparation)

Results: Statistical Modeling

Regression modeling shows weak correlations with drought and water utility finances unless controlling for utility-specific factors

- Tested with multivariate linear regression (OLS) models, linear mixed models (fixed and variable effects), and clustering

Adjusted Operating Ratio in a water systems appears to decrease about 2% in drought years

Source: Hauptman et al (in preparation)

Results: Linear Mixed Models

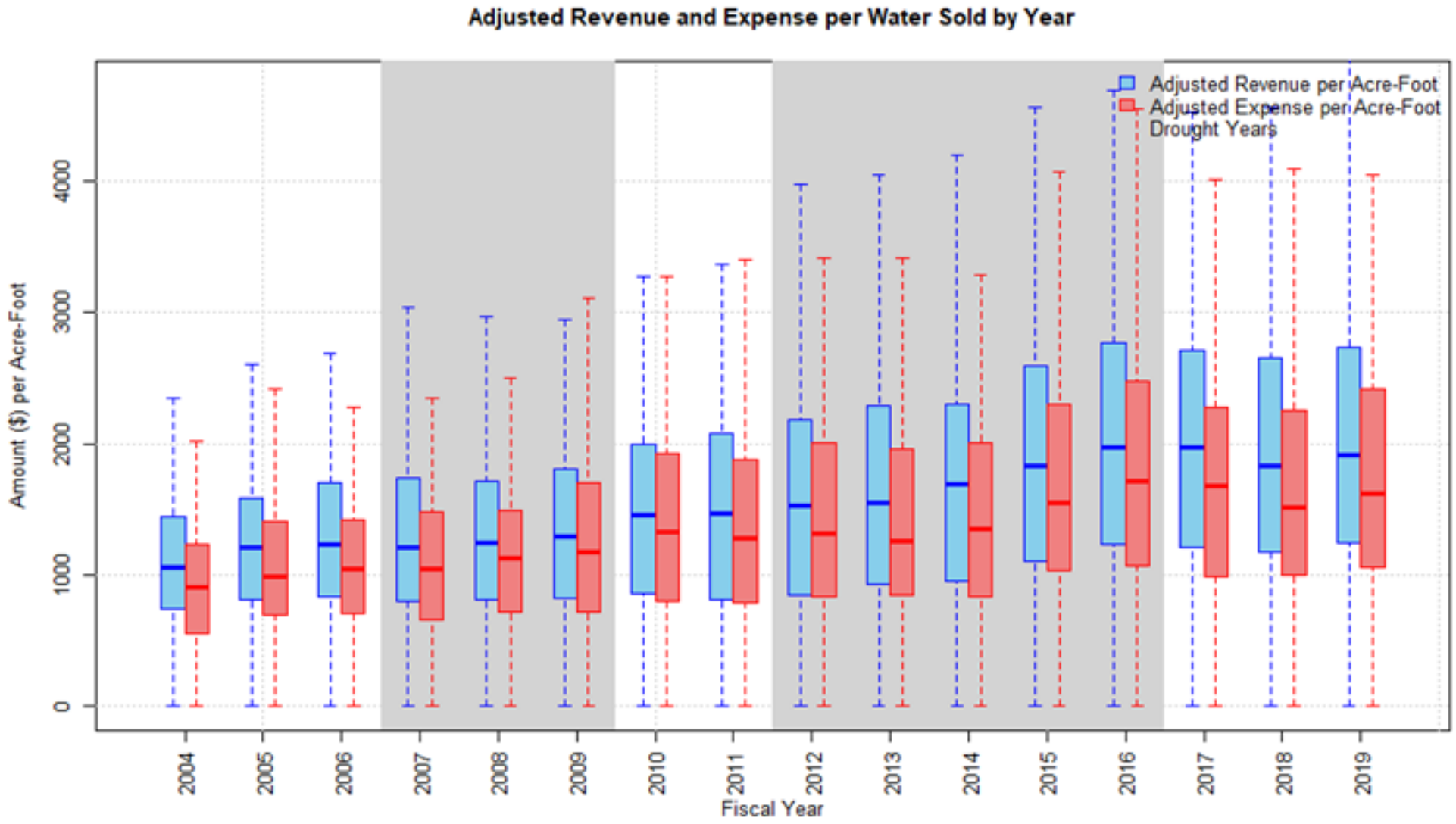
Linear mixed effects models that control for agency variability show modest correlations of drought and adjusted operating ratio, but not revenue or expenses

- Explanatory variables:
  - Agency fixed effects
  - Drought indicator, Evapotranspiration, Precipitation, and Total Accounts as variable effects

Response variable	Drought Effects Coefficient	p-value	R^2 (marginal/conditional)	Notes
Log(AOR)	–1.9%	0.014	0.0015 / 0.377	Significant — AOR dropped by 1.9% during drought
Log(OR)	-1.5%	0.057	0.0010 / 0.368	Somewhat significant — dropped by 1.5% during drought
Log(Revenue)	-0.5%	0.562	<0.0001 / 0.968	Not significant — no meaningful change during drought
Log(Expense)	+1.0%	0.234	<0.0001 / 0.971	Not significant — no meaningful change during drought
Log(Depreciation)	+3.9%	0.164	0.0002 / 0.746	Not significant — slight upward trend but not significant

Source: Hauptman et al (in preparation)

Rising Costs



Source: Hauptman et al (in preparation)

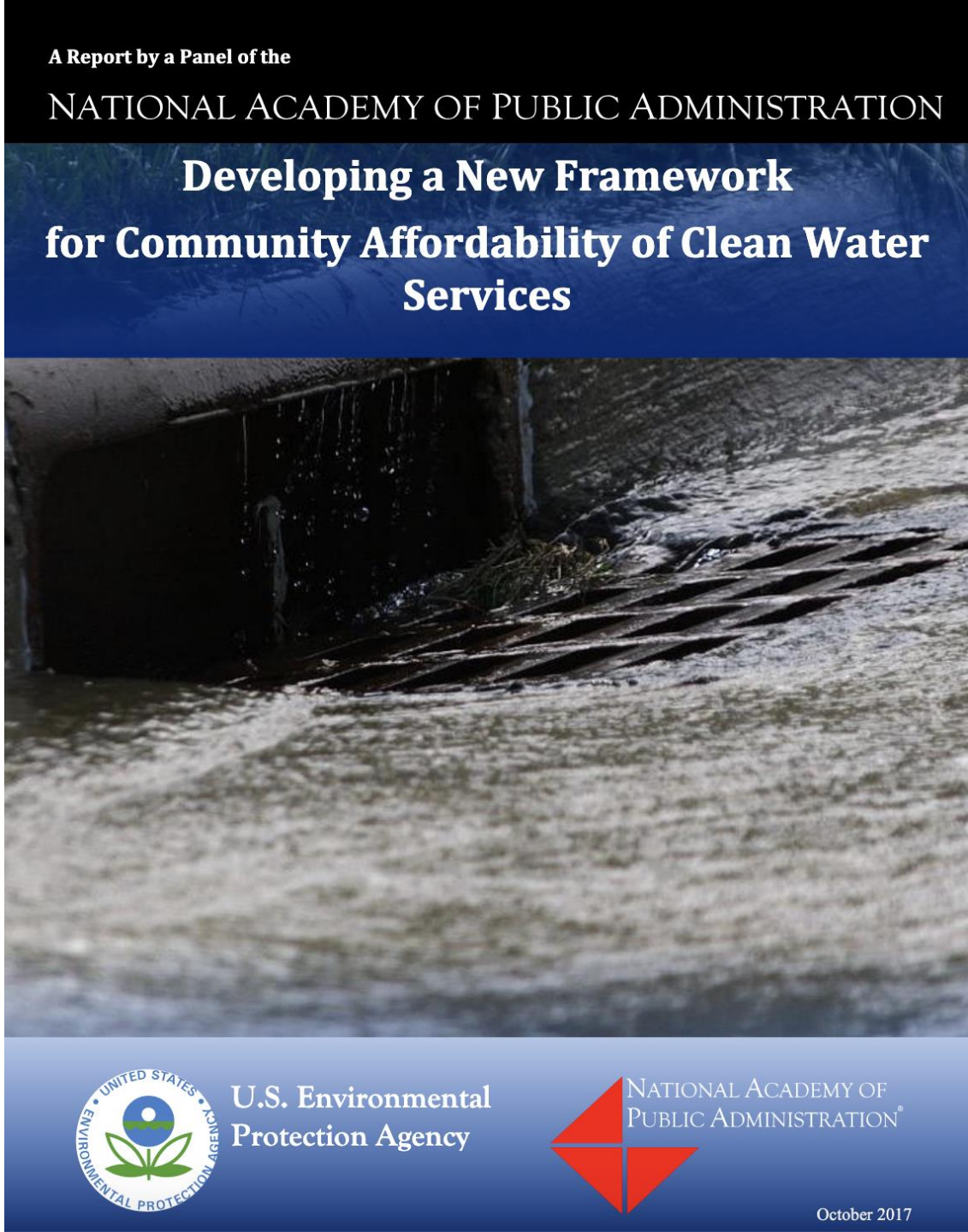
Conclusions

California water utilities have seen increased costs from drought and water scarcity

Drought has affected agency finances, but many have incorporated this into fiscal planning

Agencies are maintaining financial viability by recovering costs from ratepayers

System affordability is stable, but community affordability is an increasing challenge



Thank You


Rio Hondo Spreading Grounds, Los Angeles, CA
Source: E. Porse

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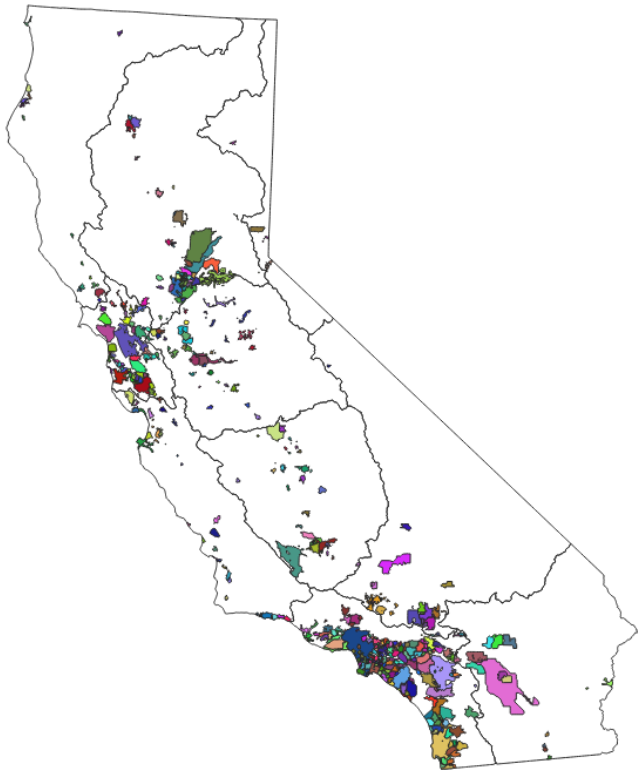
Drought in California

California has experienced five periods of significant drought since 1976

- 2018 legislation: Established a new water use efficiency framework for urban areas with demand targets
  - ~400 suppliers, 95% of population

Both financial sustainability and water availability are critical for water systems



Source: E. Porse

Motivation

Utility finances are a significant driver of decision-making, but not well incorporated into water systems research

As drought risk increases, are water agencies in California prepared?

Data Sources and Methods

California municipalities report annual financial data to the State Controller

- Data available from 2004-2022

Combine this with water use data and develop statistical modeling to evaluate trends over time