Agroeconomics and Drought Extremes

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Yolo County Water Awareness Forum

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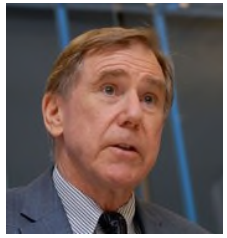

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Precipitation

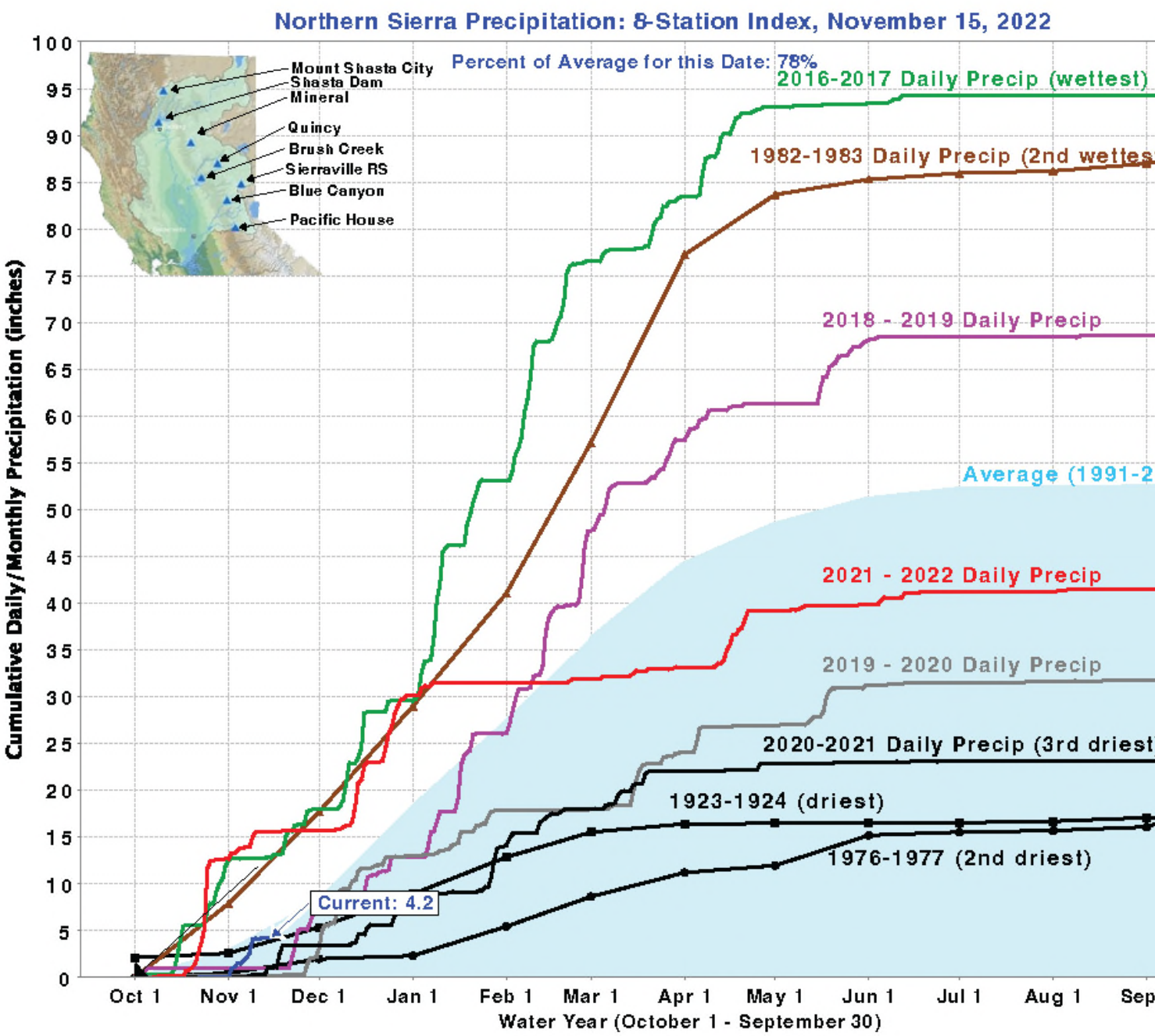
andful of atmospheric rivers can
ke the difference between year
es

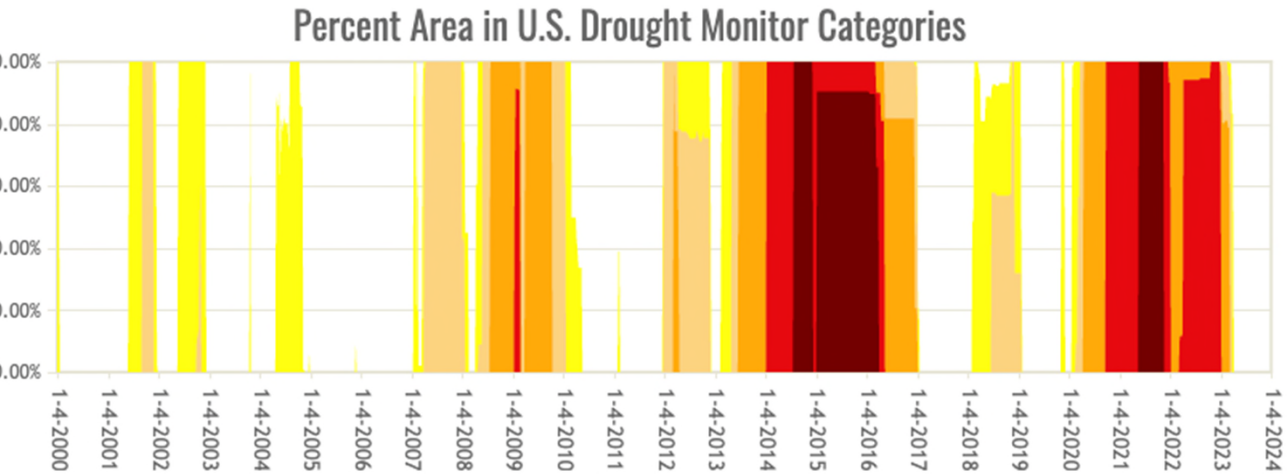
rthern Sierra provides most water
outflows and exports

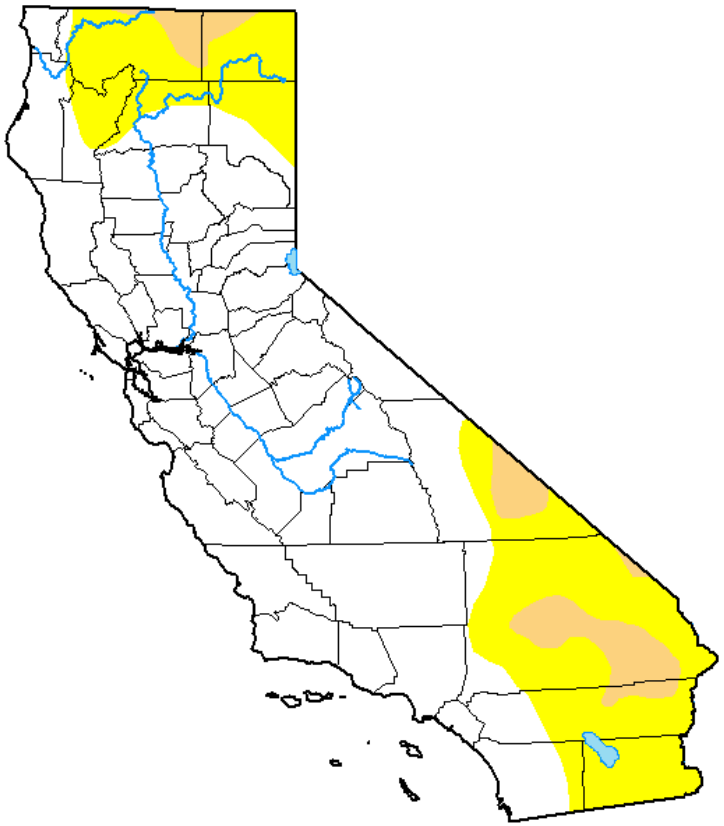
t three years below average (2C-
3rd driest)

s year close to average

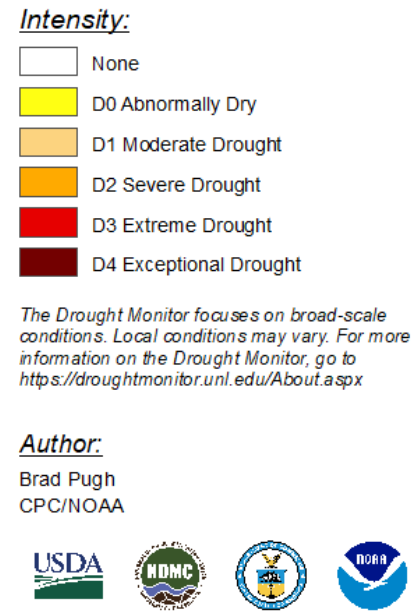
rce:http://cdec.water.ca.gov

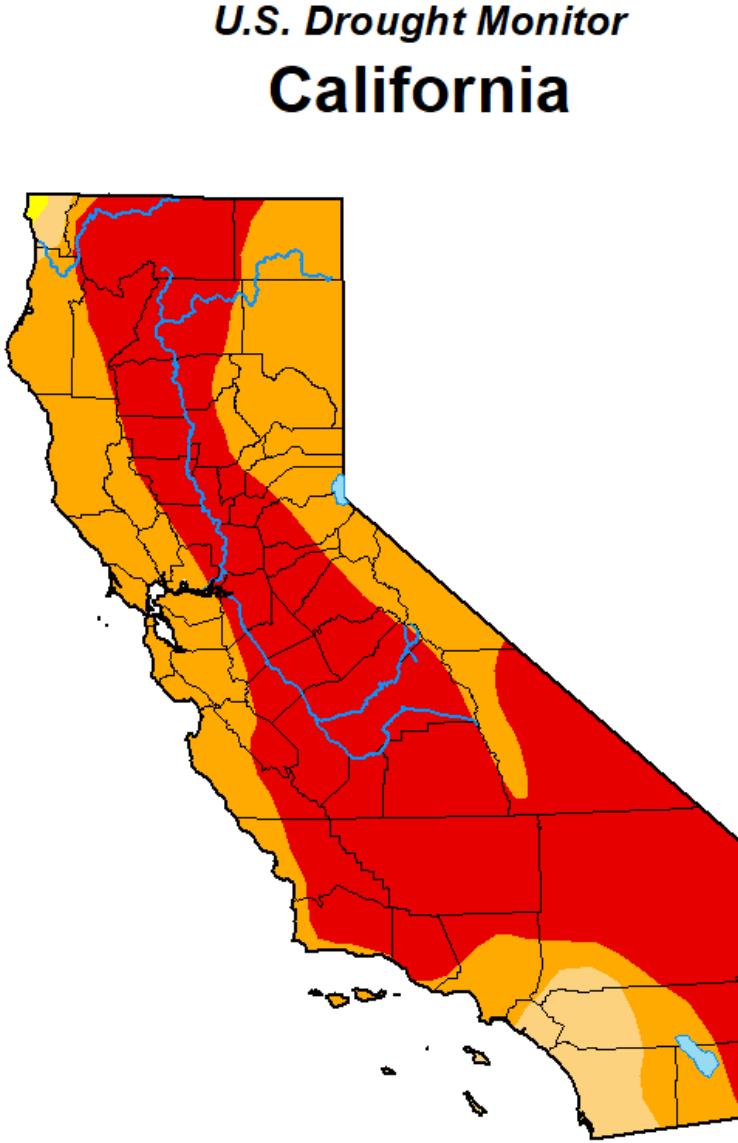






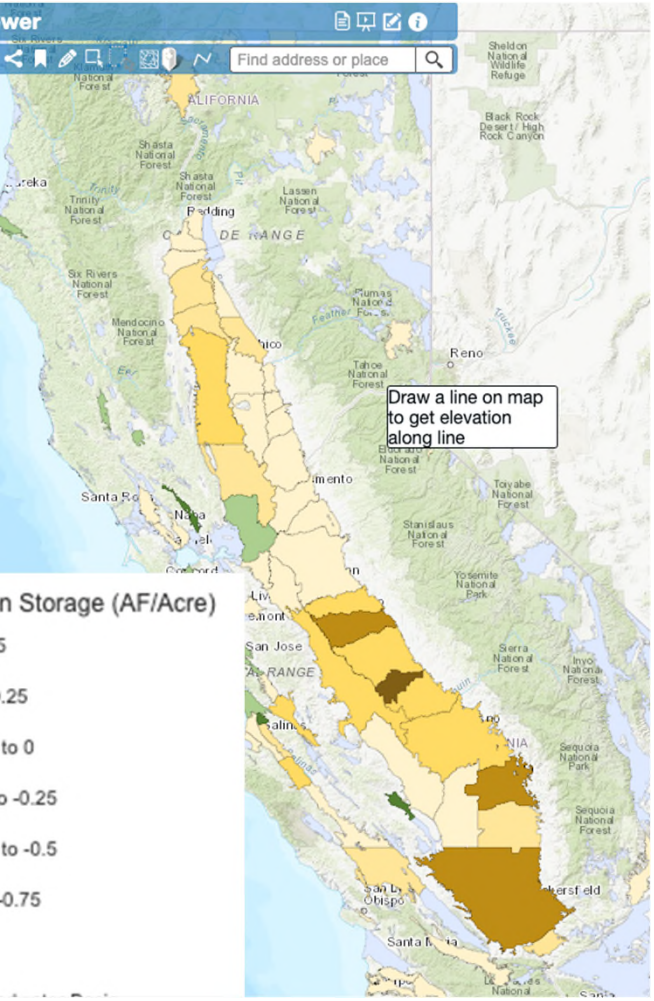
Yolo

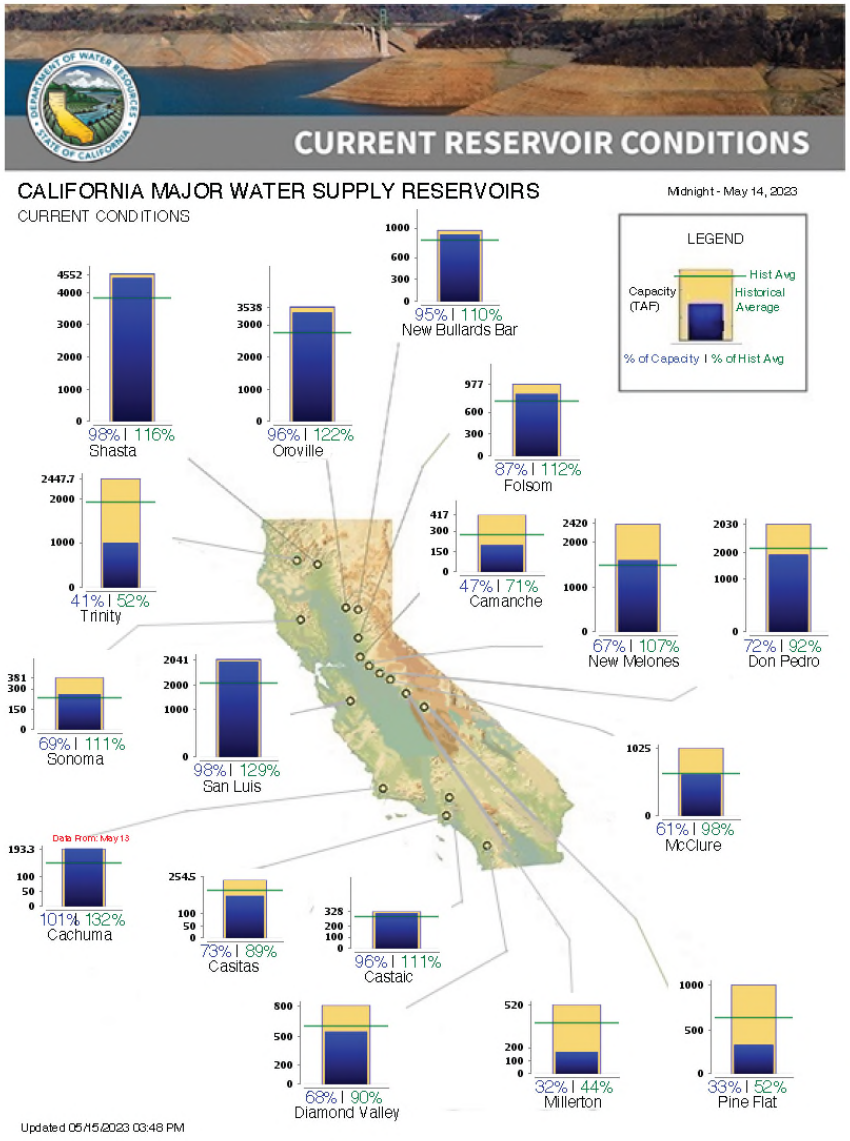


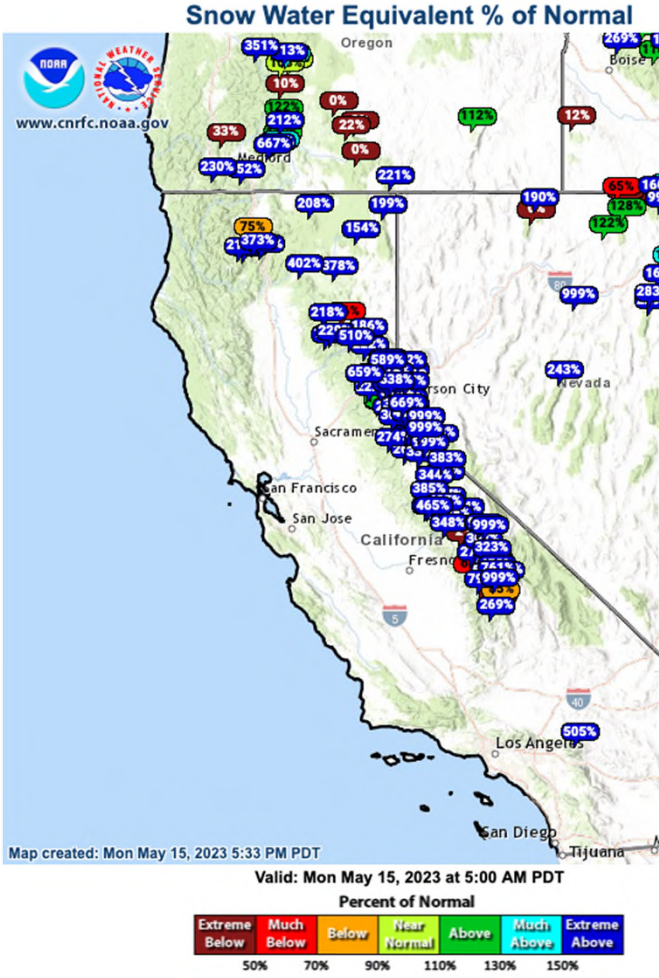


Source: US Drought Monitor

ater in Storage



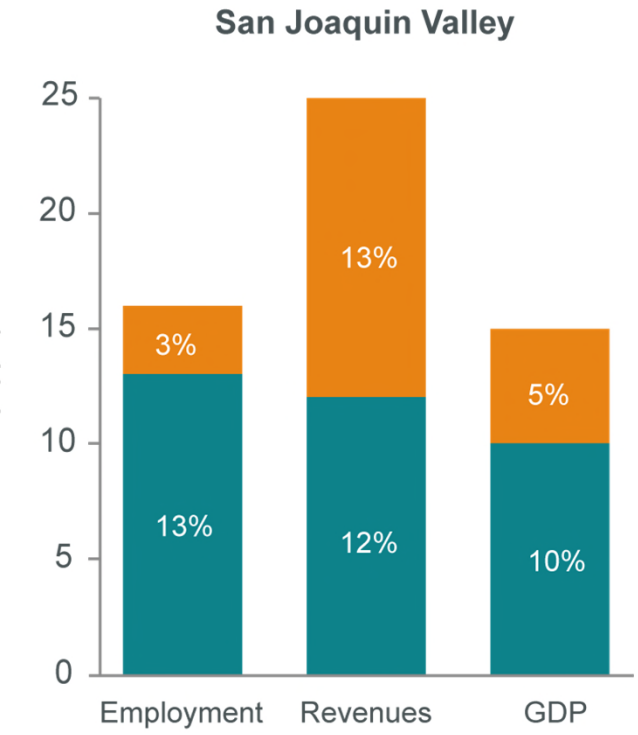


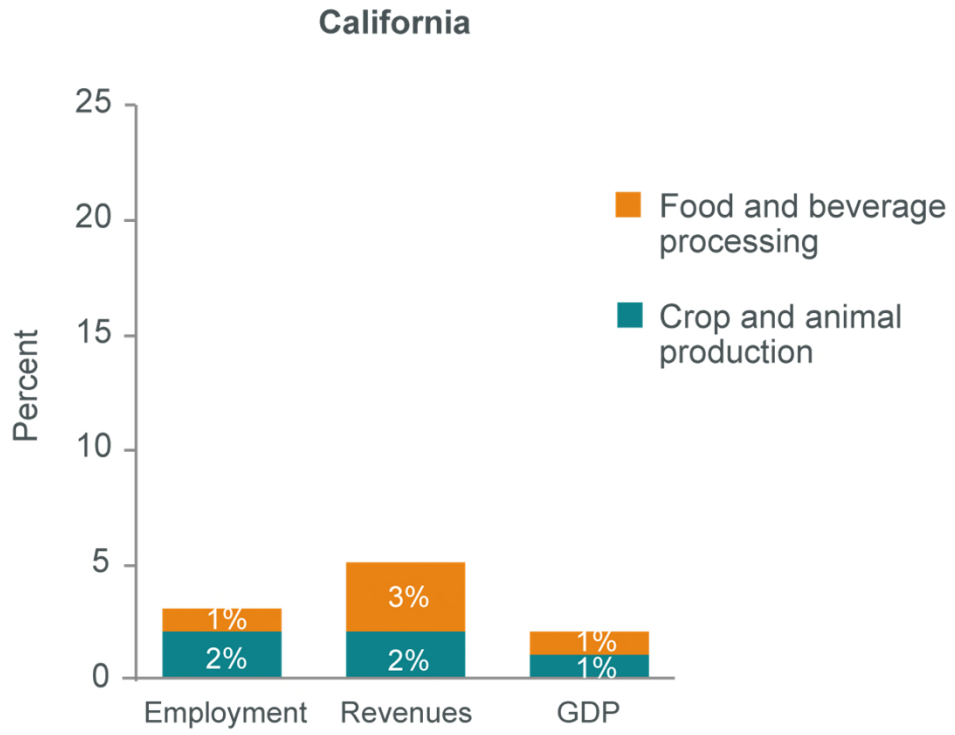


Fuente: CDEC y DWR

Agriculture's share of the economy

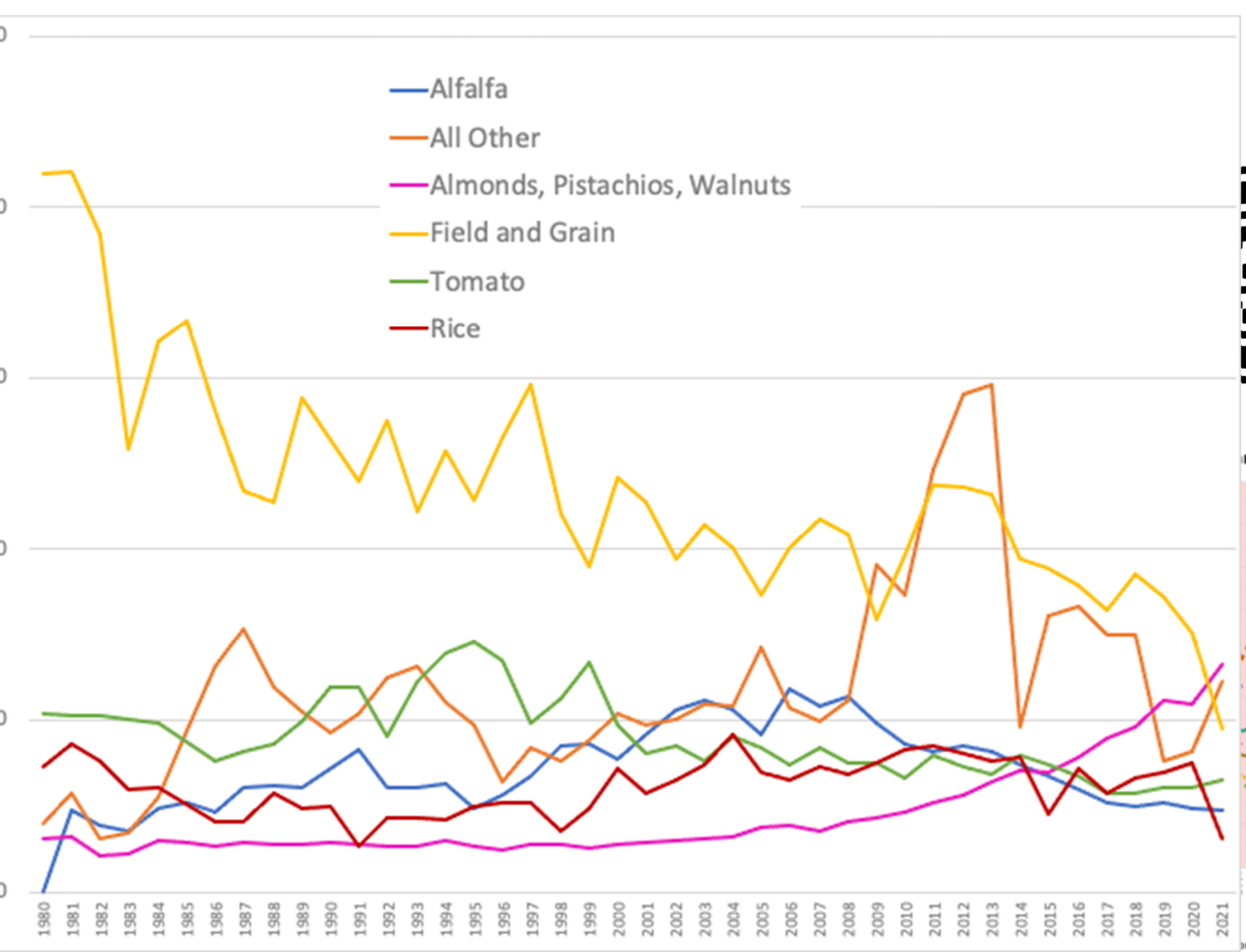
Yolo	Crop and Animal	Processing
Employment	2%	2%
Revenues	3%	6%
GDP	2%	3%

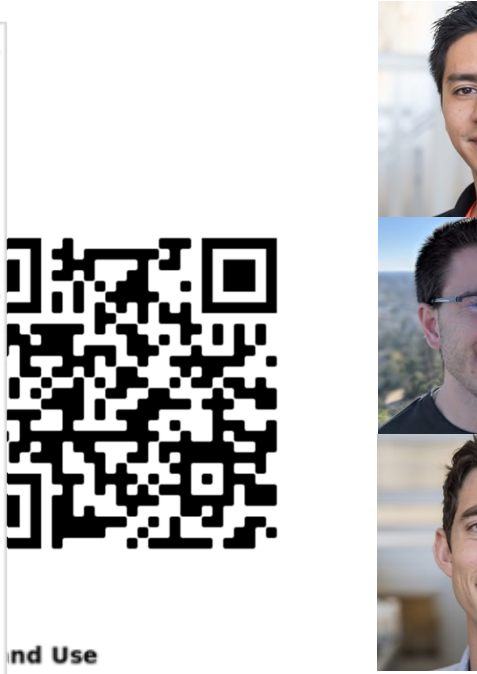


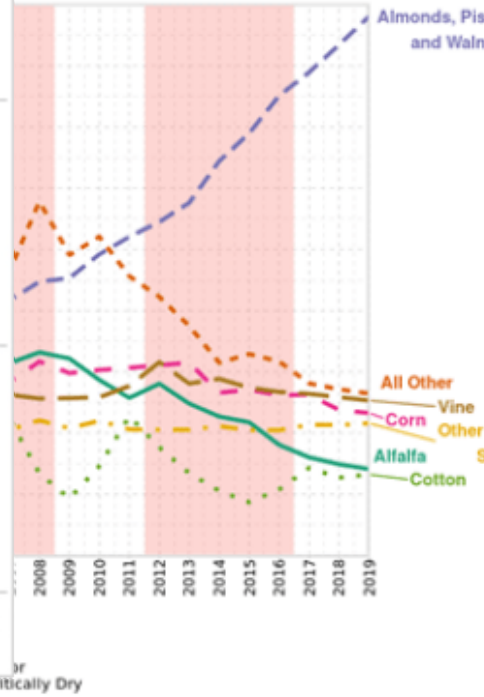


Source: IMPLAN 20

Hanak et al. 2017







020-2022 Drought Assessment Approach

omparison to pre-drought conditions, 019 baseline land use

istorical water use portfolio 2002-016 from Department of Water esources and Bureau of Reclamation

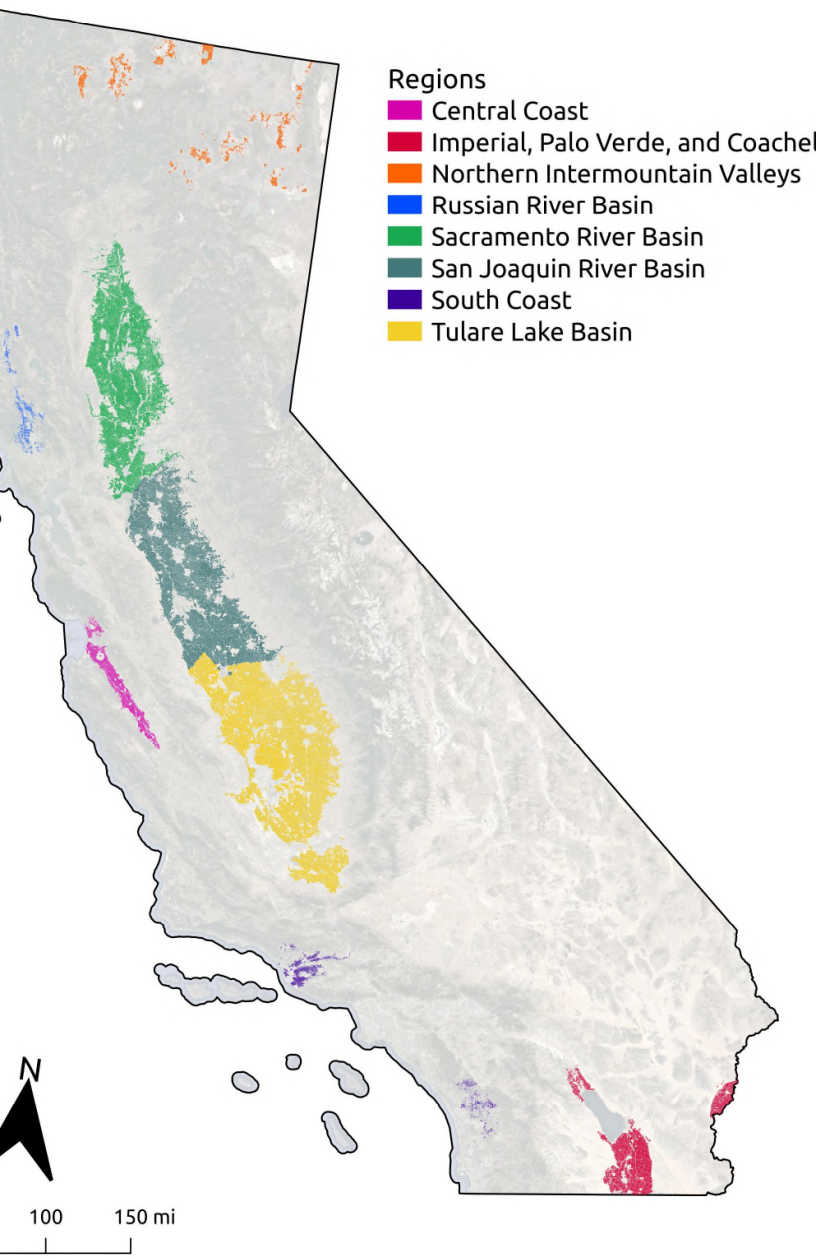
nnouncements of **Allocations**

- State Water Project
- Central Valley Project
- Curtailments Water Resources Control Board

nterviews with Irrigation Districts

ctual Evapotranspiration measures rom SSEBop remote sensing model John Abatzoglou, Nick Santos UCM)

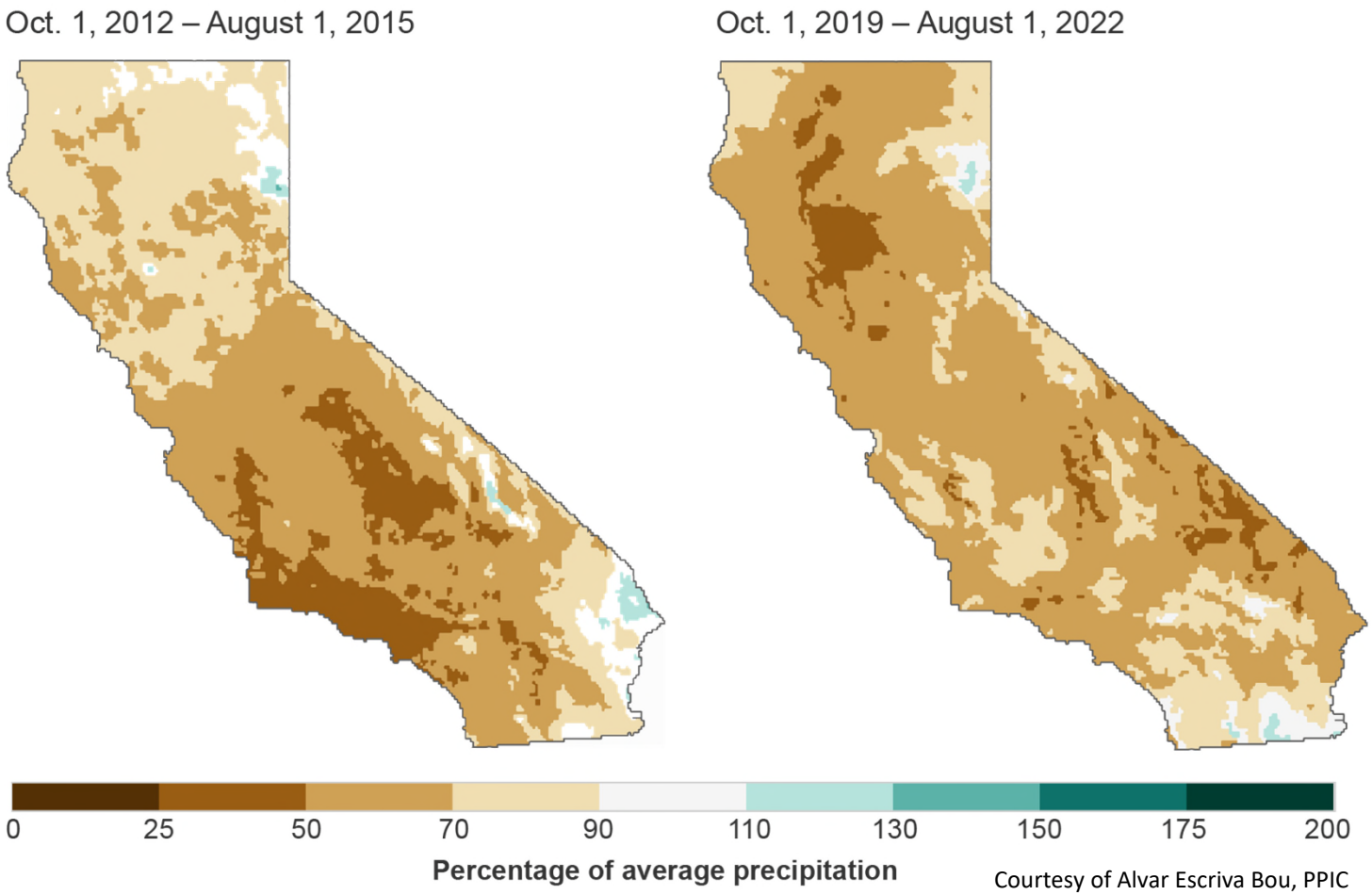
Lake Mendocino: Photo Credit DWR



Drought Assessment Spatial Coverage

- Northern intermountain
- Russian River Basin
- Sacramento River Basin
- San Joaquin River Basin
- Tulare Lake Basin
- Central Coast
- South Coast
- Colorado River

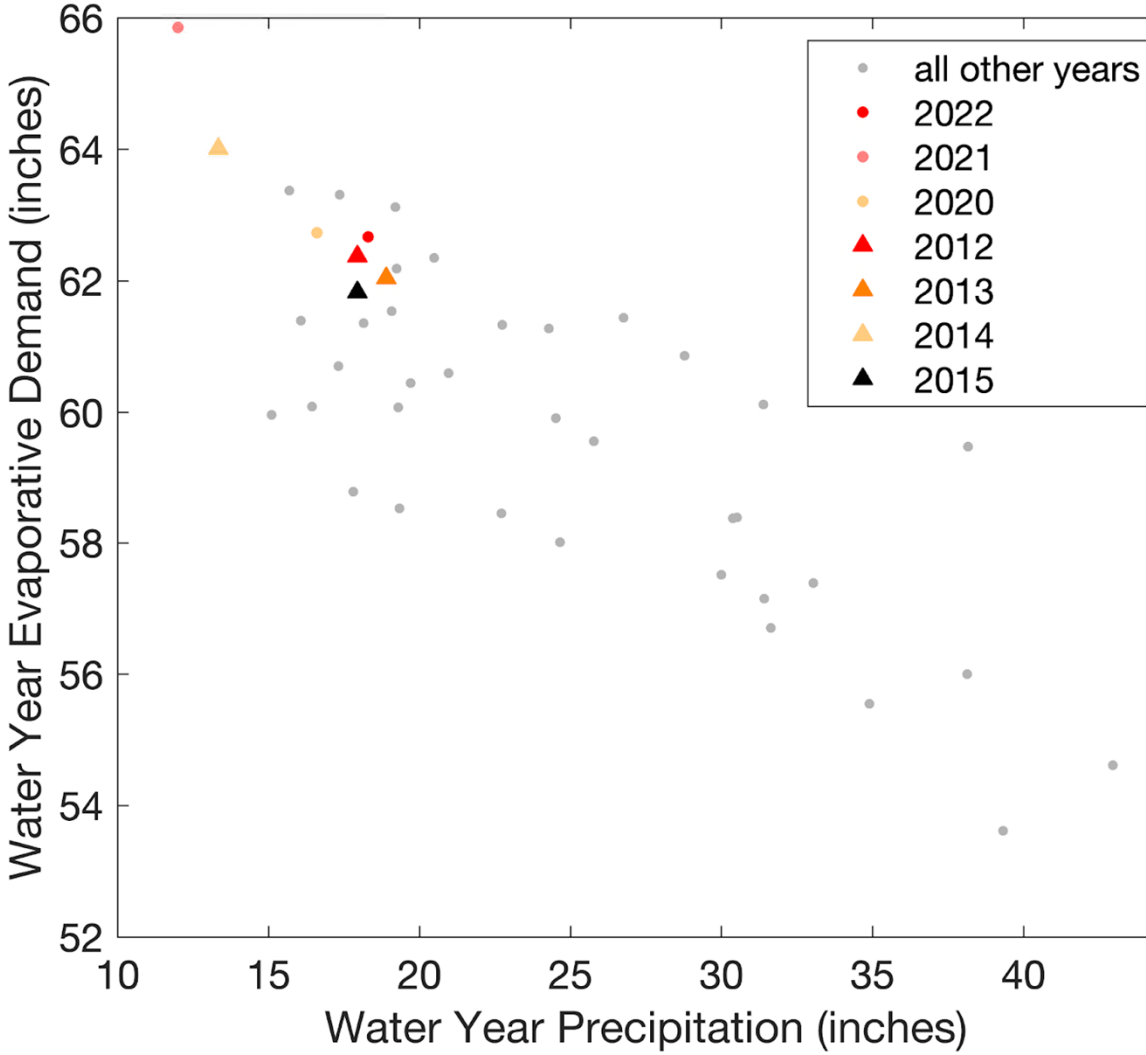
The 2020-2022 drought affected more water abundant regions



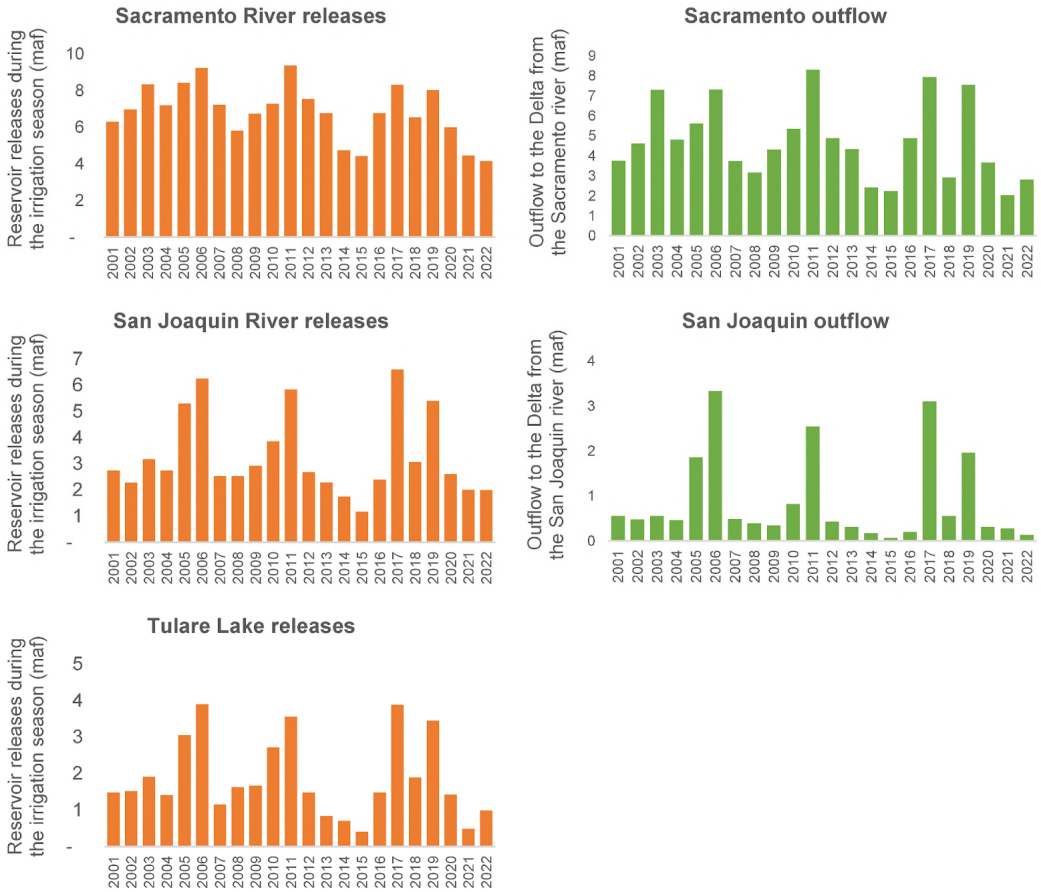
Courtesy of Alvar Escriva Bou, PPIC

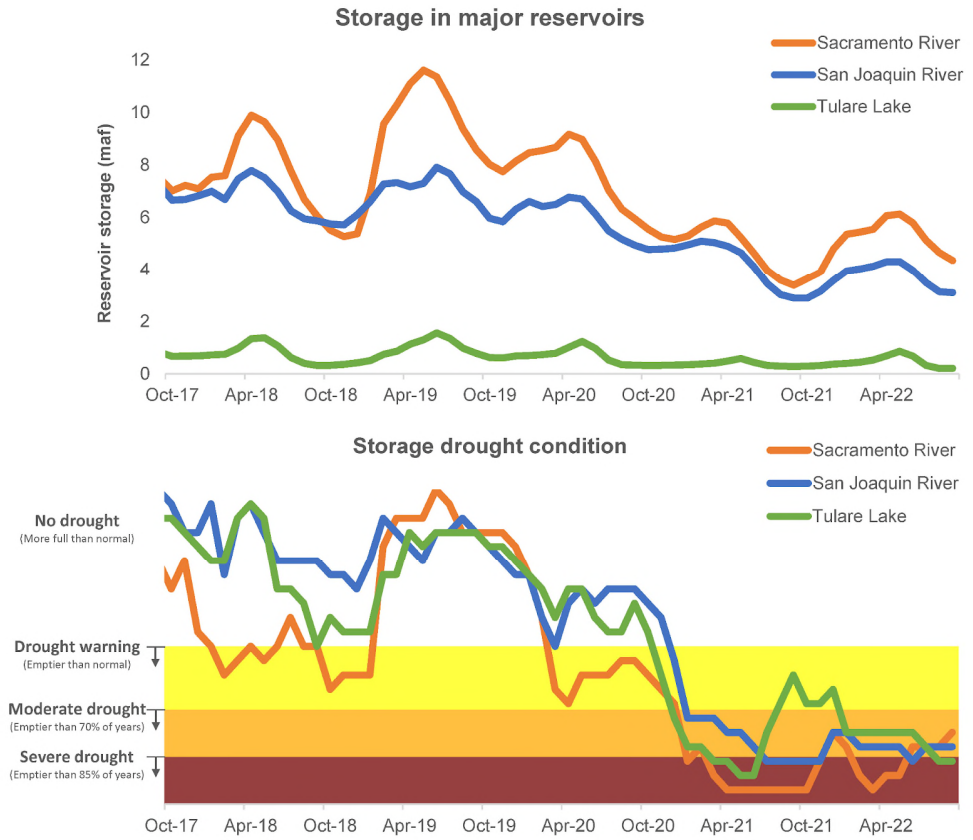
Higher Evaporative Demands Crop Yield Losses to Heat Waves, Stress and Wildfires

- Warmer and dryer
- 2020-2022 the driest three-year period in the instrumental record
- Higher evaporative demands: 3-5 inches compared to late 20th century average
- Russian River, Coastal Agriculture, Northern valleys yield losses
- Moyers et al. (in review) quantified impacts of increased evaporative demand and food production



Increased Reservoir Releases and Improved Storage Drought Conditions in Some Reservoirs in 2022





roundwater Pumping and Water Supply Costs

Comparing 2012-2014 versus current drought 2019-2021

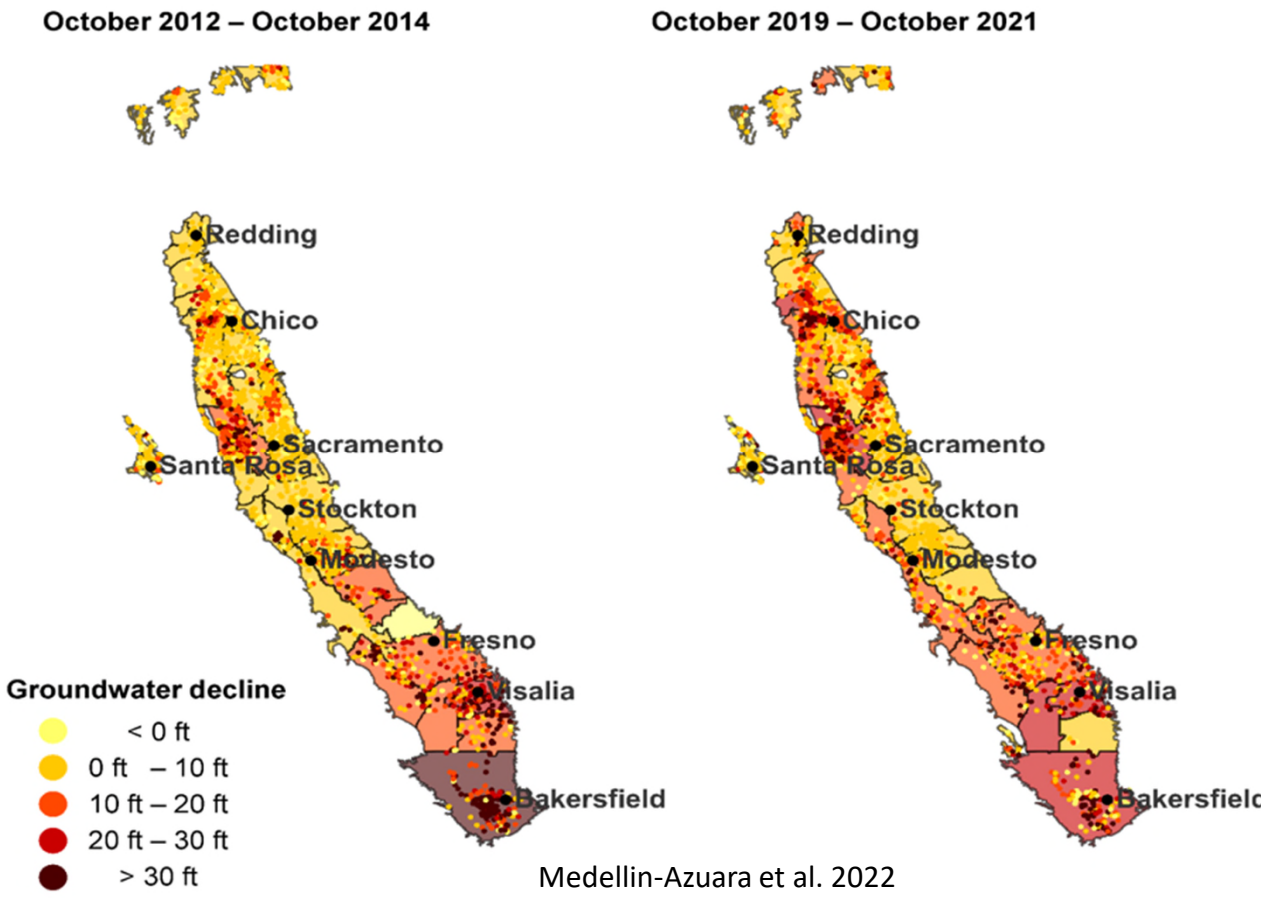
More intense pumping in the Sacramento Valley in this drought compared to prior droughts

Decreased pumping in some areas in the San Joaquin Valley

Estimated increase in pumping costs, $184 million due to lift in 2021 and $123 million in 2022

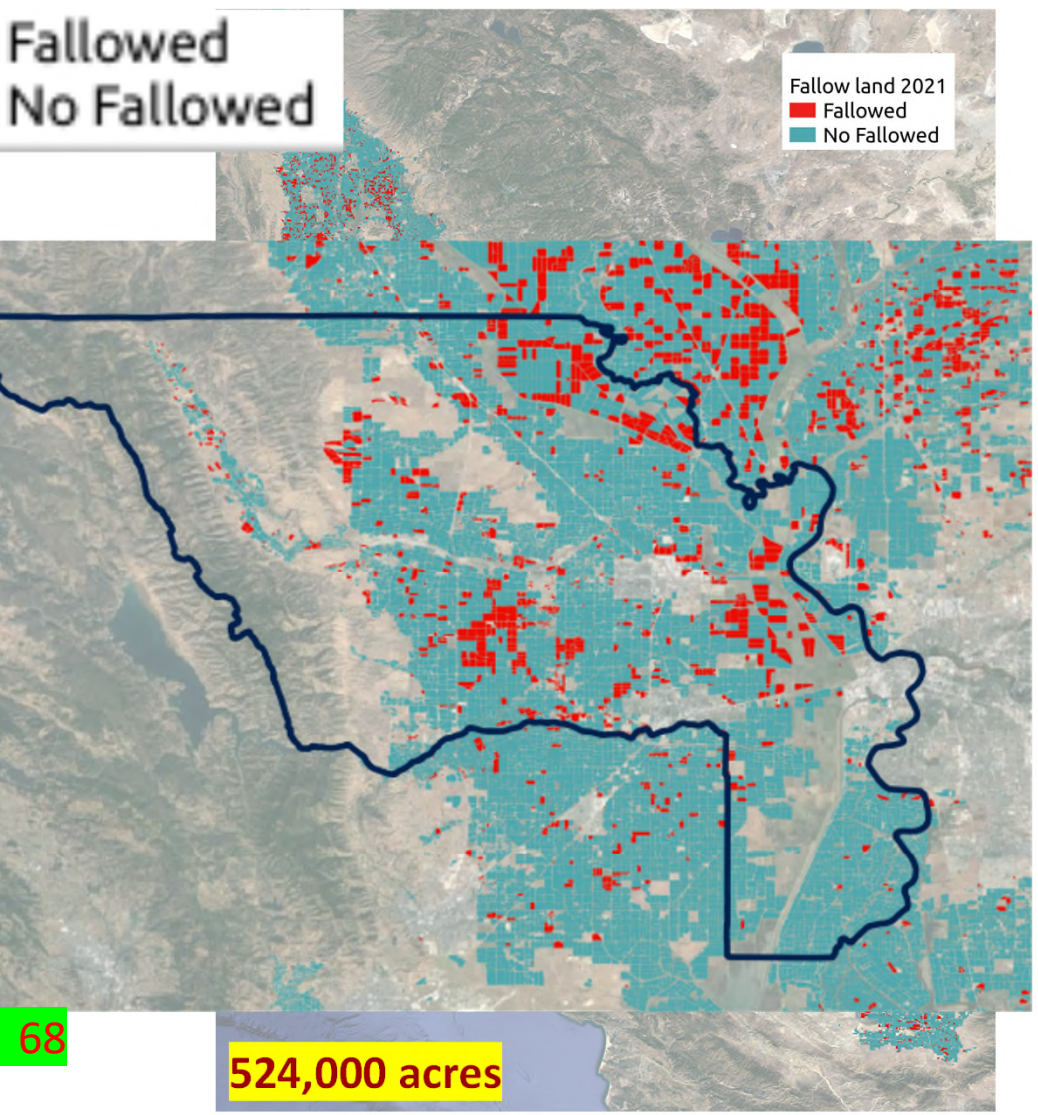
Capital costs of new wells or overhauling can be significant

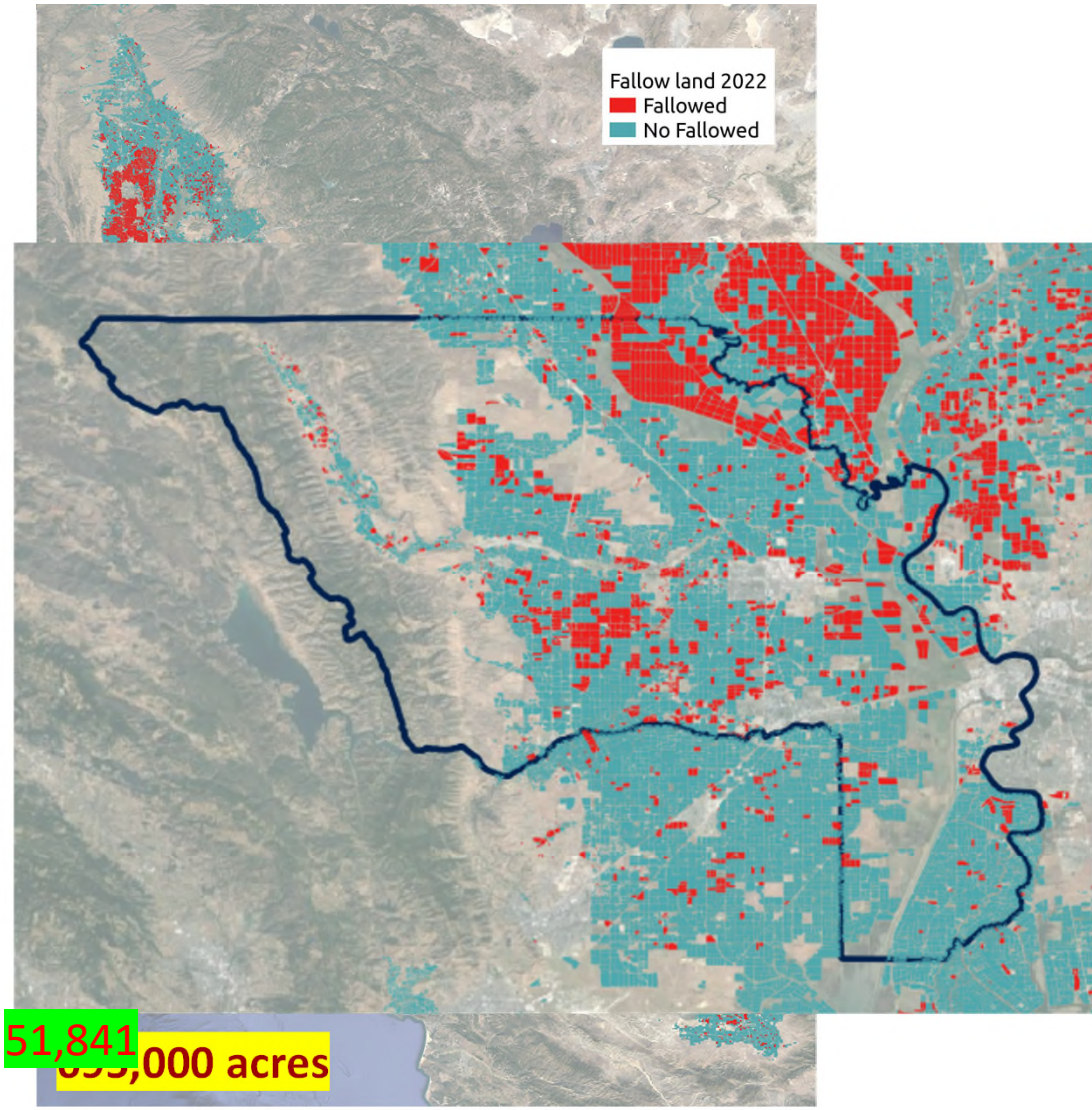
Increased water supply costs in general, surface and groundwater



Medellin-Azuara et al. 2022

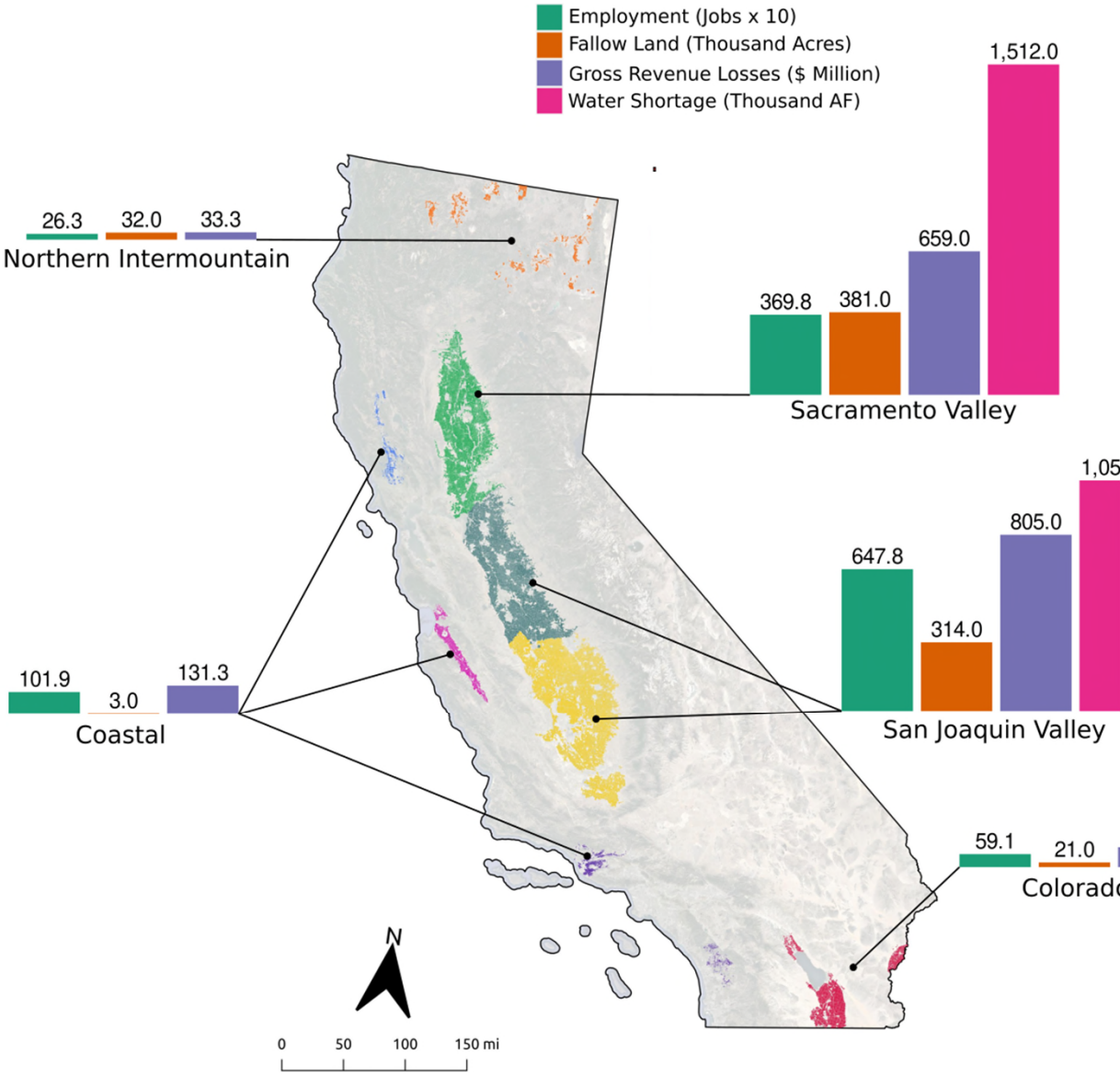
emote Sensing-Based Idle Land in the Central Valley elative to 2019



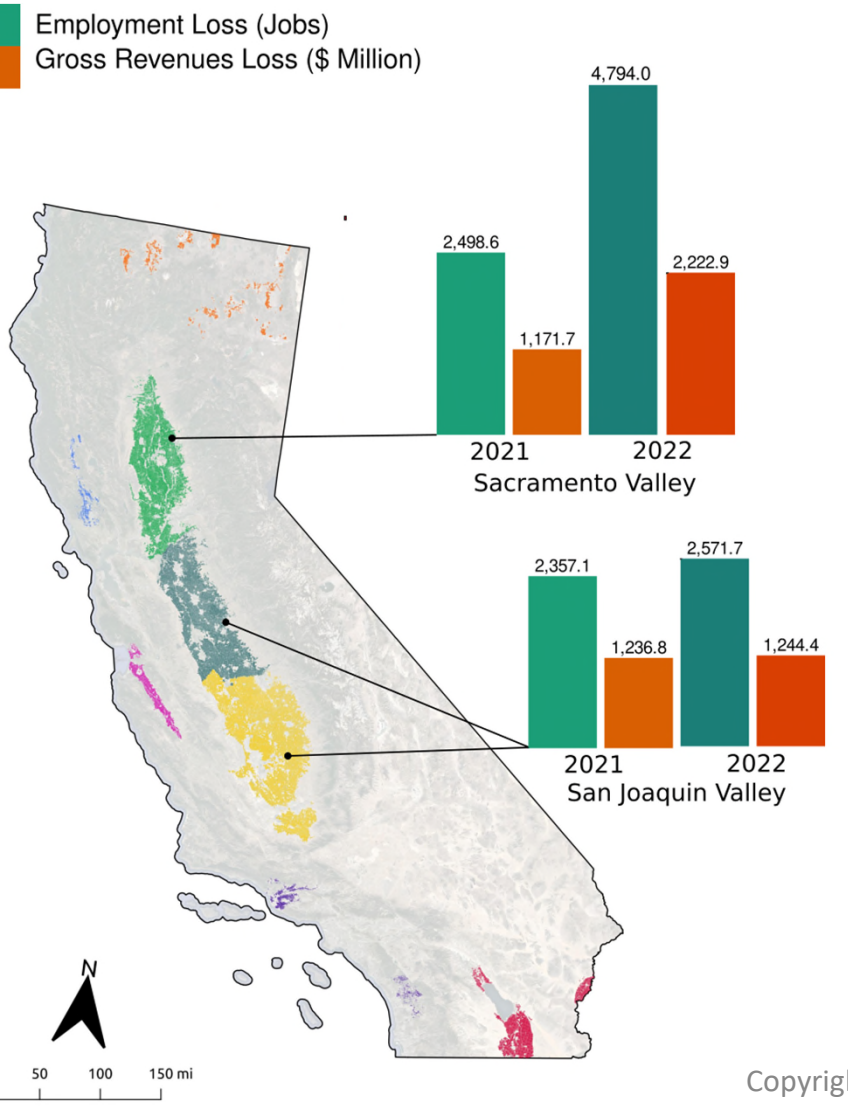


ct of the 2022 Drought on s with respect to 2019

- Net water shortages of 2.6 maf
- Idle land about 752,000 acres (695,000 in the Central Valley)
- Crop revenue losses of roughly $1.7 billion (1.4 billion in the Central Valley)
- About 12,050 jobs lost statewide (10,200 in the Central Valley) in crops
- Extensive rice fallowing in the Sacramento Valley
- Coastal agriculture suffered from yield losses from water stress



Downstream Impacts in the Central Valley Food Processing and Beverages



- Reduction of crop supplies due to droug
- Assuming the same proportion of locally sourced crops and animal products
- Sector size $33 billion in gross revenues 90,000 jobs in the Central Valley
- In 2021 losses $2.3 billion ($0.6 billion value added) and 4,860 jobs
- In 2022 losses of $3.5 billion ($0.85 billi value added) and 7,370 jobs

Summary of Direct Impacts of Drought

	Baseline 2019	2021 Impact	2021 Impact (%)	2022 Impact	2022 Impact (%)
face Water (maf/yr)	13.9	-5.9	-43%	-5.9	-43%
undwater (maf/yr)	8.1	+4.1	+51%	+3.3	+41%
water shortage (maf/yr)		-1.8	-8%	-2.6	-11%
ated land (1000 acres/yr)	7,620	-563	-7%	-752	-10%
eased Pumping Costs illion/yr)		184		123	
p Value Added ($million/yr)	24,050	-810	-3.4%	-1,170	-4.9%
p Gross Revenues ($million/yr)	35,000	-1,323	-3.8%	-1,720	-4.6%
p Employment (jobs)	425,000	-9,880	-2.3%	-12,050	-2.8%
Processing Value Added illion/yr)	10,120	-590	-5.8%	-845	-8.3%
Processing Gross Revenues illion/yr)	33,000	-2,410	-7.3%	-3,467	-10.5%
Processing Employment (jobs)	90,000	-4,856	-5.3%	-7,366	-8.1%

lue added, $1.4 billion and 14,700 jobs in 2021 and 2.0 billion and 19,400 jobs in 202

Insights for California and Yolo County

ate extremes are recurring events and will likely
nsify, and become more frequent and long

lti-purpose projects such as the Yolo Bypass may
rease resilience for our ecosystems and water users

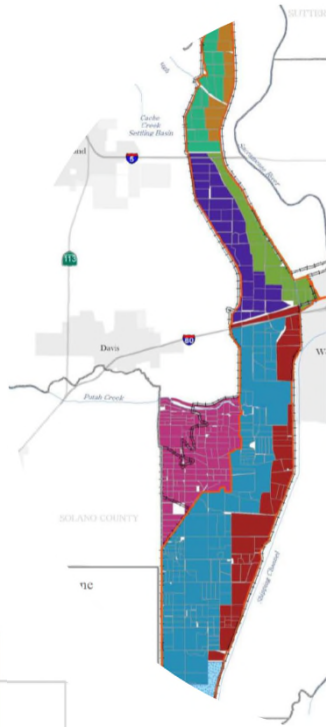
pping decisions are often more responsive to market
ditions than short term water availability

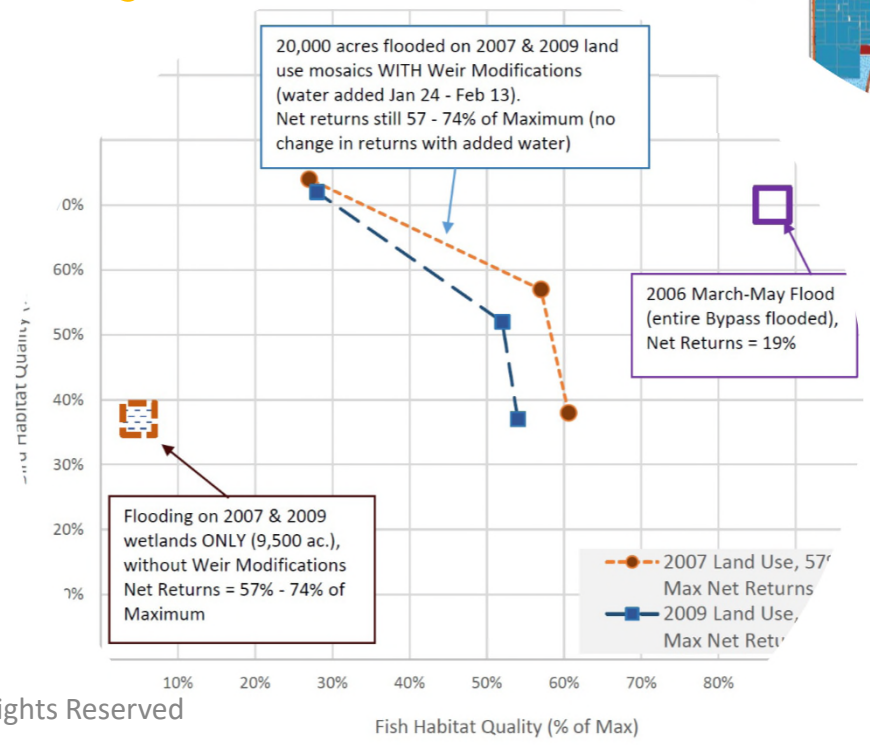
urance provides a layer of protection

ter transfers may decrease overall drought costs yet
l have some localized impacts on idling and
ployment

x crops in the Sacramento Valley provide and less
rdrafted basins can reduce statewide drought costs if
naged wisely

ter transfers and extensive fallowing require safety
s for communities that rely on agriculture and
cessing for a living





Takeaways from California Droughts

- Impacts of drought on agriculture vary widely by region
- Groundwater remains one of the most important buffers against climate extremes
- A *healthy* mix of perennials and annuals can also avoid more costly droughts
- Coastal agricultural droughts are more costly on a per unit of applied water basis
- Droughts force systems thinking

- Downstream sectors to crop and animal products agriculture deserve some attention

Photo credit: DWR

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Thank you!

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tral Valley

ificial Intelligence in
ulture Institute (Viers)

ure Water Future (Viers)

lti-Land Repurposing
on)

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