



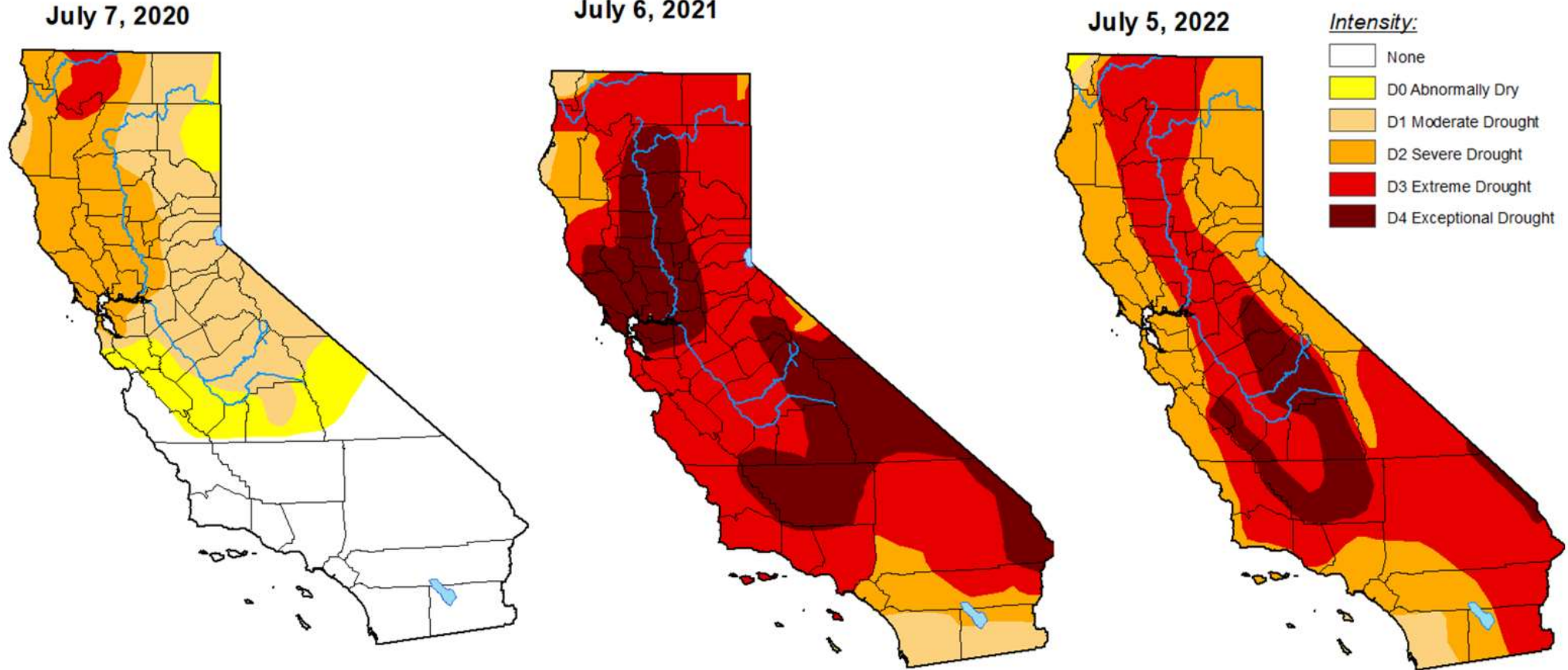
Drought and Groundwater Regulation: Impacts for Irrigated Agriculture in California

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Drought in California



Source: <https://droughtmonitor.unl.edu/>

Economic Impacts of 2020-22 Drought on California Agriculture

Medellin-Azuara et al. (2022):

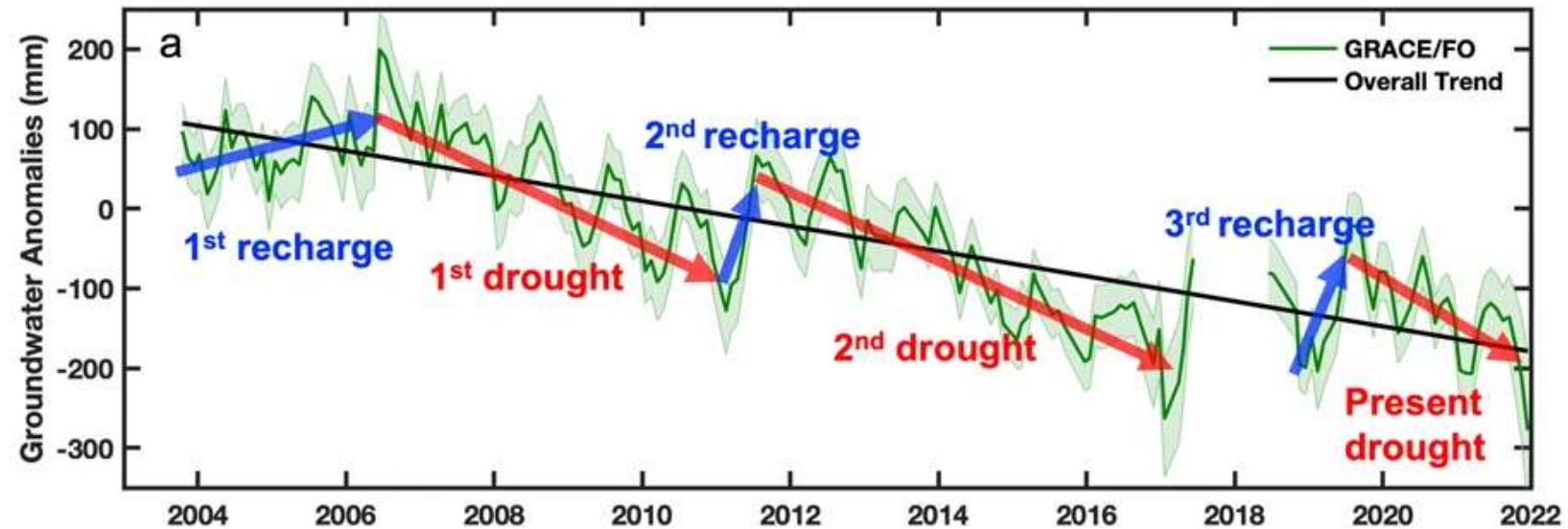
- Compared to 2019, statewide irrigated crops dropped by 563,000 acres in 2021 (7.4%) and by 752,000 acres in 2022 (nearly 10%).
- Crop revenue losses estimated at \$1.3 billion in 2021 and \$1.7 billion in 2022.
- Corn silage and alfalfa hay often see greatest cutbacks.



Groundwater as a buffer

Fig. 3: Groundwater storage variations in California's Central Valley.

From: [Groundwater depletion in California's Central Valley accelerates during megadrought](#)

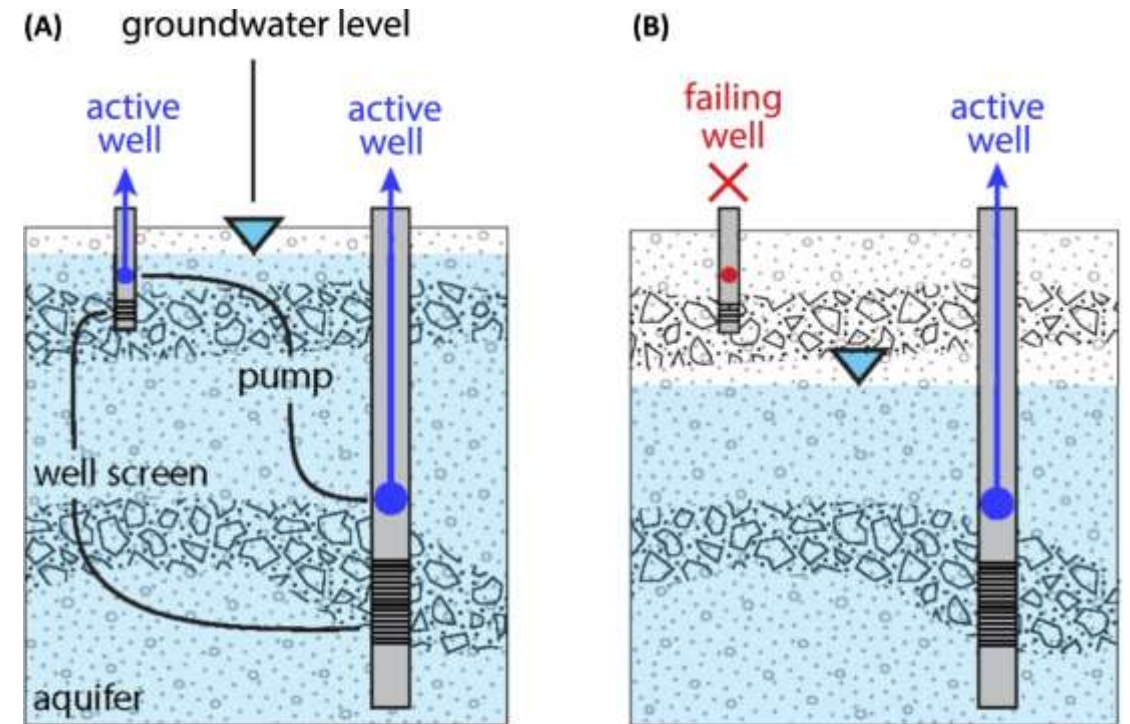


Source: Liu et al. 2022 *Nature Communications*

Impacts of surface water scarcity

Surface water scarcity equal to average scarcity in 2021 (0.7 AF less than average) causes:

- 320 additional new irrigation wells per year, a 32% increase in construction relative to the usual pace.
- groundwater levels to fall by 2 ft more than usual in the same year.
- the share of failed domestic wells to increase by 4pp.



Source: Pauloo et al. 2020 *Environmental Research Letters*

Sustainable Groundwater Management Act (SGMA)

Step one
Form
Groundwater
Sustainability
Agency

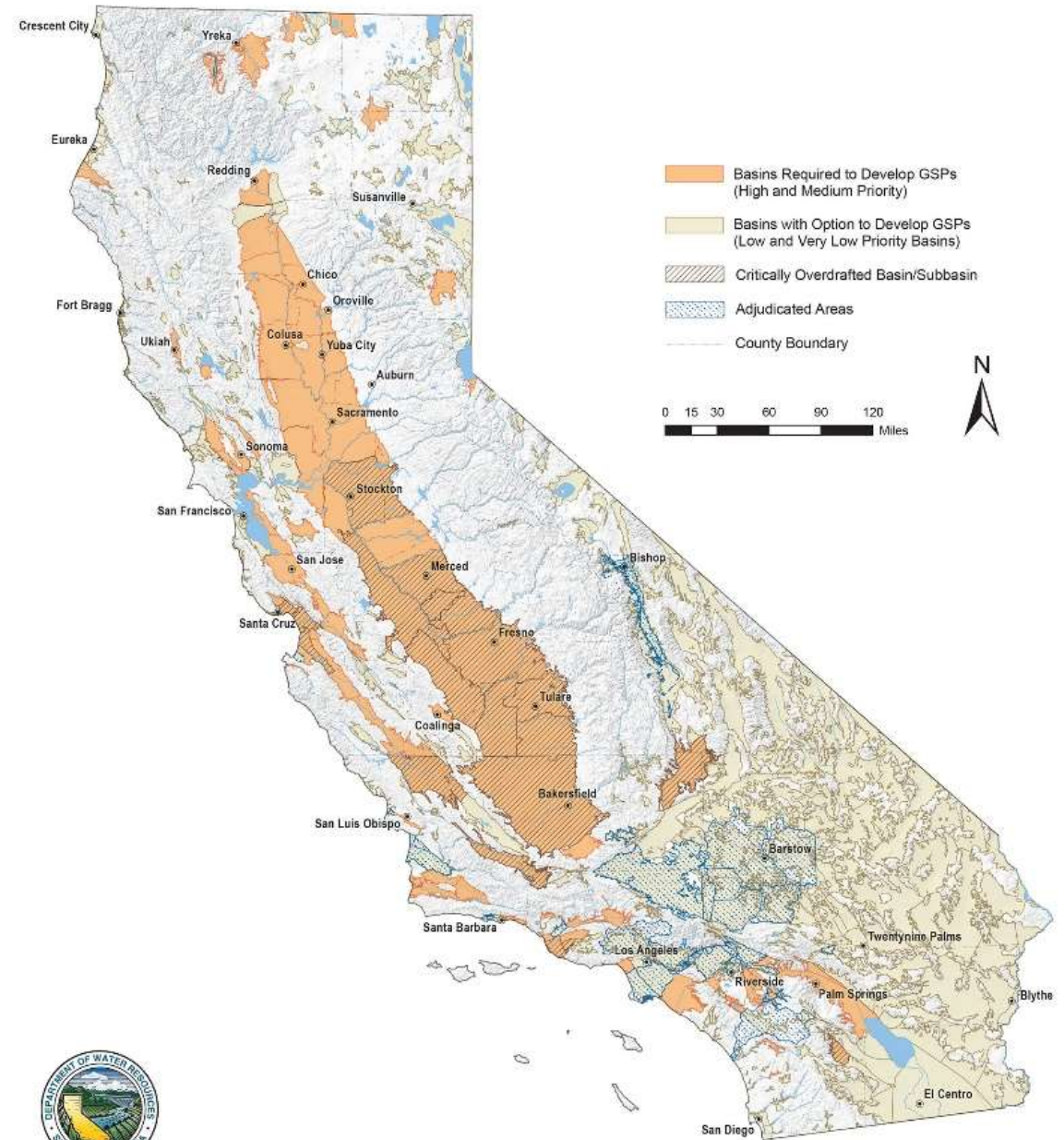
June 30, 2017

Step two
Develop
Groundwater
Sustainability
Plan (GSP)

January 31, 2022

Step three
Achieve
Sustainability

20 years after
GSP adoption



A focus on supply-side approaches

- If you can get more supply, achieve sustainability without making difficult cut-backs.
- New incentive to capture and recharge winter flood flows.
- But adding up across individual plans, more water is being claimed than is available.

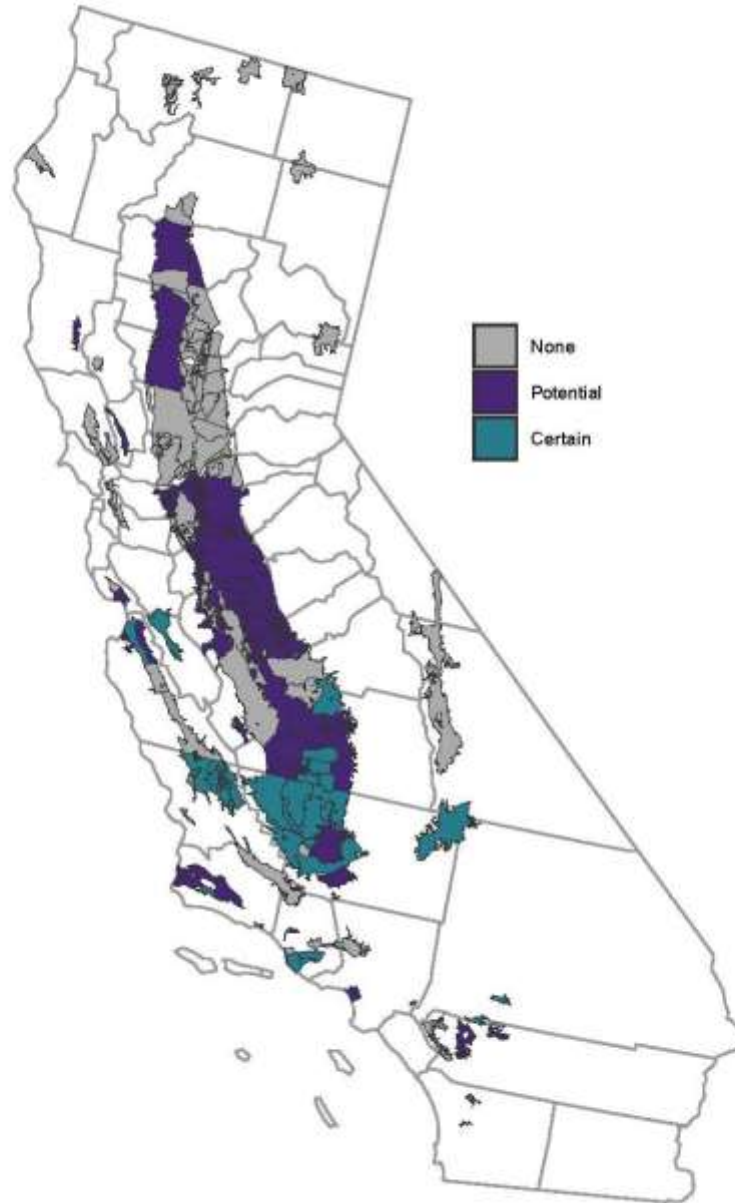




A need for demand-side management

- Demand management is more common in basins with greater overdraft.
- The decisions made about how to manage groundwater will have economic impacts.
- About 60% of the plans mention policies that will increase the cost of extracting groundwater (in some way).

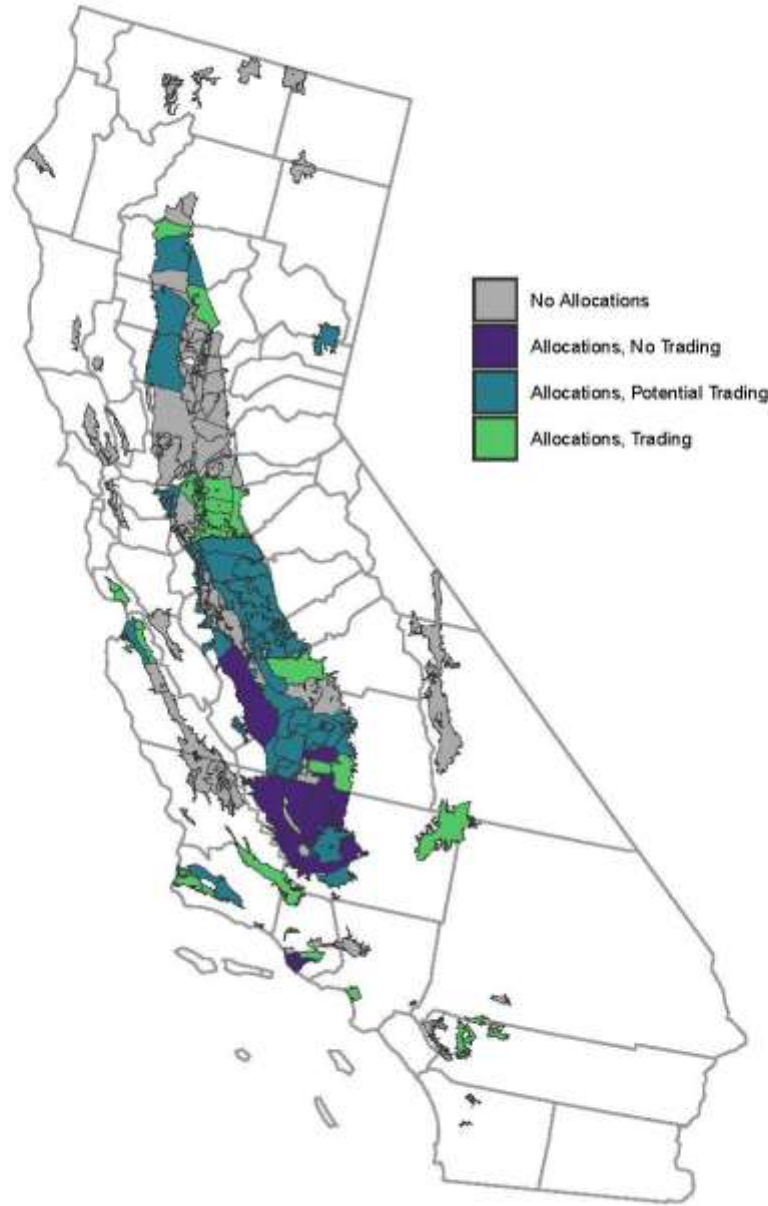
Taxes and Fees are the most common demand-side strategy.



Variation in tax base:
Extraction, irrigated
acreage, total acreage.

Often tiered volumetric
rates, levels yet to be
determined.

Almost half of submitted plans mention setting allocations.



For which 2/3rds of those are considering trade.

SGMA Demand Management Action Database

Please allow a few moments for maps to load.

GSA/Subbasin Finder

Layer
GSAs

GSA
Fox Canyon Groundwater Management Agency
GSA - Oxnard

GSA: Fox Canyon Groundwater Management Agency GSA - Oxnard
Subbasin: SANTA CLARA RIVER VALLEY - OXNARD
Participant in Following GSPs:
Groundwater Sustainability Plan for Oxnard Subbasin



GSP Information

GSP

Groundwater Sustainability Plan for Oxnard Subbasin

GSP Selected: Groundwater Sustainability Plan for Oxnard Subbasin

GSP Status: Approved

GSAs in GSP:

Fox Canyon Groundwater Management Agency GSA - Oxnard

[SGMA Portal Link](#)

Allocations [Definition](#)

Does GSP Introduce Allocations: Yes
What Will Determine Allocations: Historic
Does GSP Allow Trading: Yes
Additional Details (Allocation):
Already implemented for the Oxnard Basin as of 2019; implementing ordinance is copied as Appendix A-4 in GSP p. 573
Additional Details (Trading): p 551:
Participants are able to submit anonymous bids and offers to an

Taxes/Fees [Definition](#)

Does GSP Introduce Taxes/Fees: Yes
What Will Determine Tax/Fee Base: Extra
Rate Structure of Tax/Fee: Tiered
Additional Details: Charges for pumping in excess of allocation

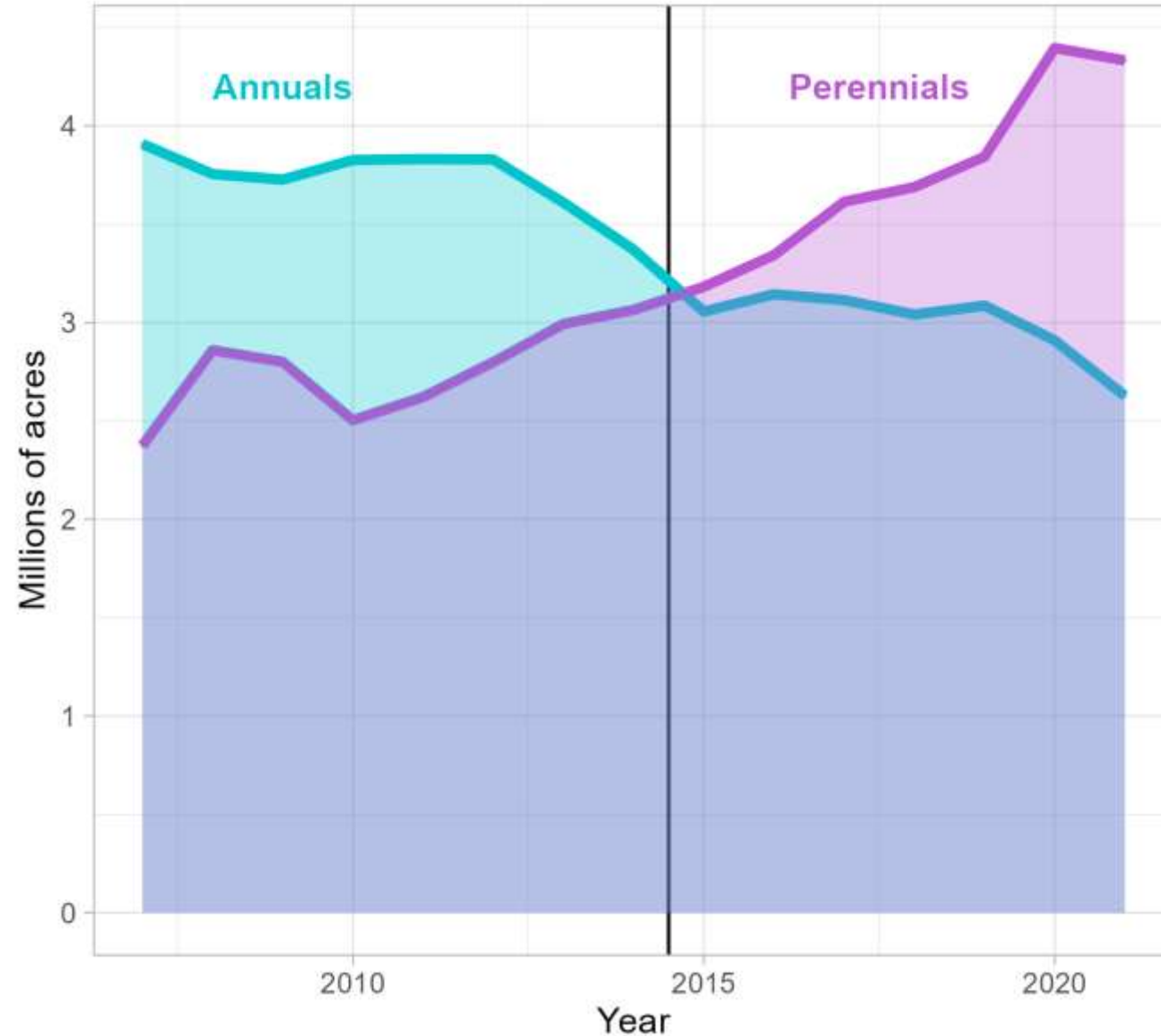
Pumping Restrictions [Definition](#)

Does GSP Introduce Pumping Restrictio

Efficiency Incentives [Definition](#)

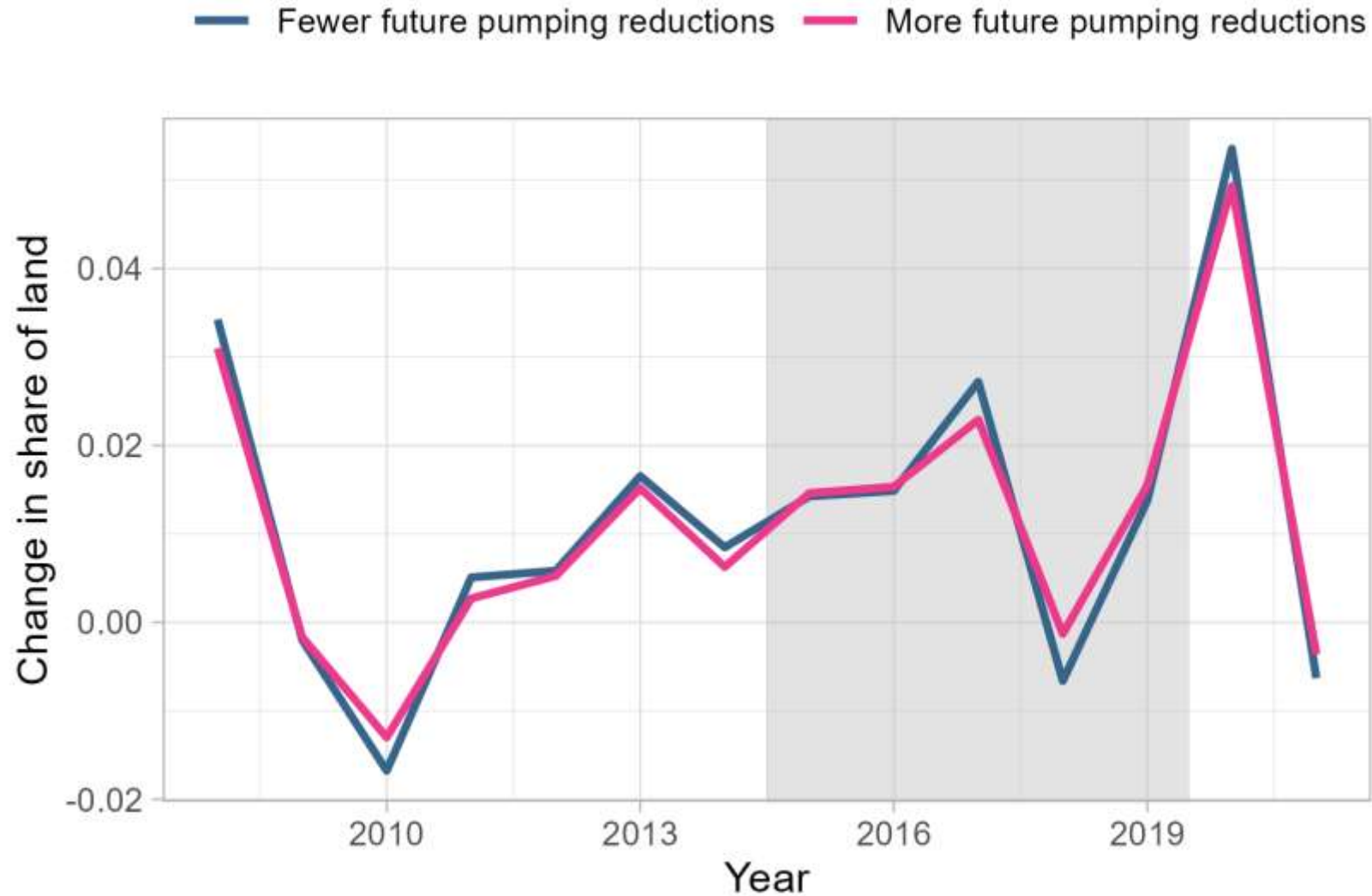
Does GSP Introduce Efficiency Incentiv
Additional Details: Temporary land fallowing program via leases, targeting parcels susceptible to seawater intrusion

SGMA coincides with rapid expansion in perennials

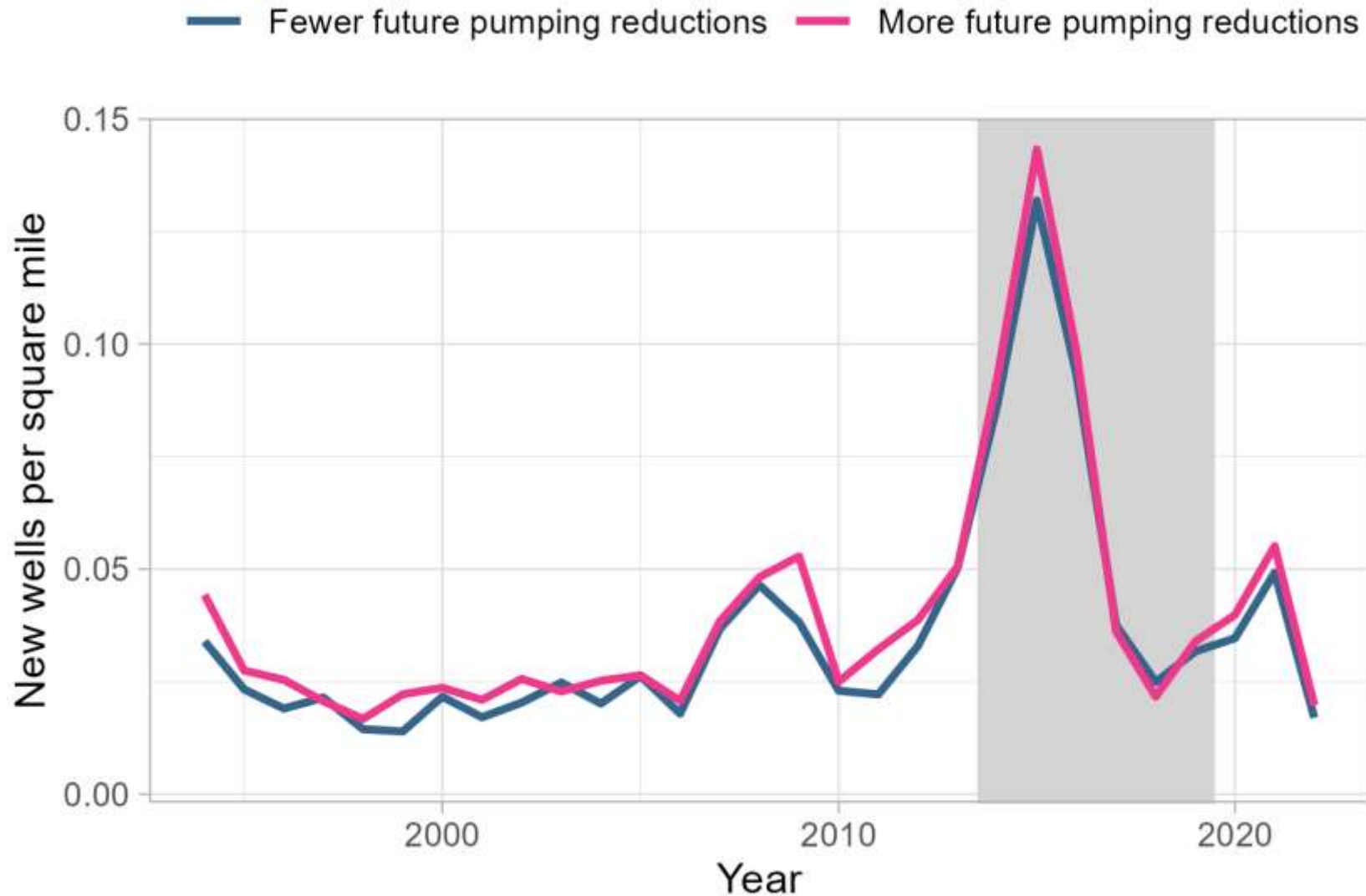


Data from USDA
Cropland Data Layer

Trends in new perennial acreage by overdraft (limiting to parcels within 15km of GSA boundary)



Trends in new wells drilled by overdraft (limiting to parcels within 15km of GSA boundary)



Conclusion

- Droughts and water scarcity are normal but costly.
- The decisions we make about how to manage the resource will carry economic consequences.
- Water was already scarce and difficult to manage, with new groundwater regulation and climate change, there are new challenges.
- But it's still too early to detect effects of SGMA. Data from 2020 and 2021 show no detectable difference in new perennial acreage and well drilling due to SGMA.

Thank you! ebruno@berkeley.edu