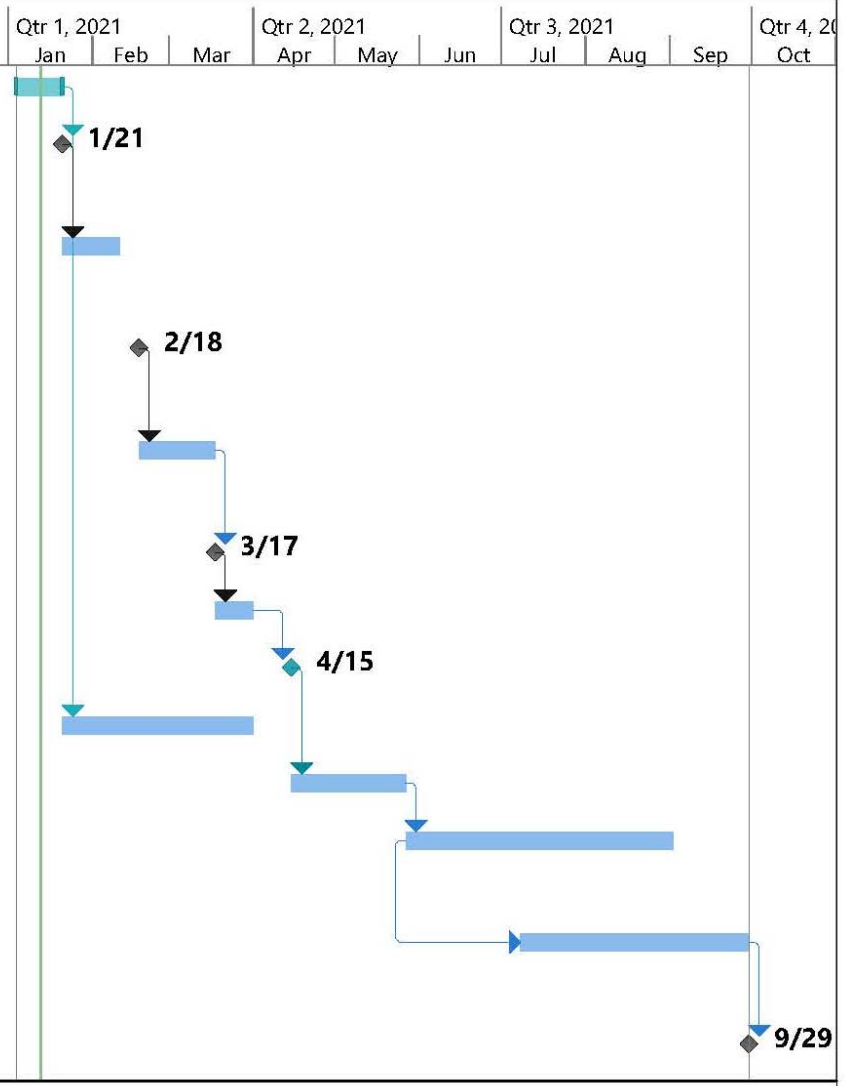


Proposed Monitoring Well Locations

ID	Task Mode	Task Name	Duration	Start	Finish	Timeline											
						Dec	Qtr 1, 2021			Qtr 2, 2021			Qtr 3, 2021			Qtr 4, 2021	
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	
1		Preliminary Bid Review	13 days	Mon 1/4/21	Wed 1/20/21												
2		Board Review of Prelim Bids	0 days	Thu 1/21/21	Thu 1/21/21												
3		Prepare Bid Specifications	15 days	Thu 1/21/21	Wed 2/10/21												
4		Board Approval of Specifications	0 days	Thu 2/18/21	Thu 2/18/21												
5		Contractor Bid Preparation	20 days	Thu 2/18/21	Wed 3/17/21												
6		Bids Due	0 days	Wed 3/17/21	Wed 3/17/21												
7		Bid Evaluation	10 days	Thu 3/18/21	Wed 3/31/21												
8		Contractor Selection	0 days	Thu 4/15/21	Thu 4/15/21												
9		Easements	50 days	Thu 1/21/21	Wed 3/31/21												
10		Permitting	30 days	Thu 4/15/21	Wed 5/26/21												
11		Well Installation, Development, Sampling	70 days	Thu 5/27/21	Wed 9/1/21												
12		Well Completion Reports	60 days	Thu 7/8/21	Wed 9/29/21												
13		End of Project	0 days	Wed 9/29/21	Wed 9/29/21												

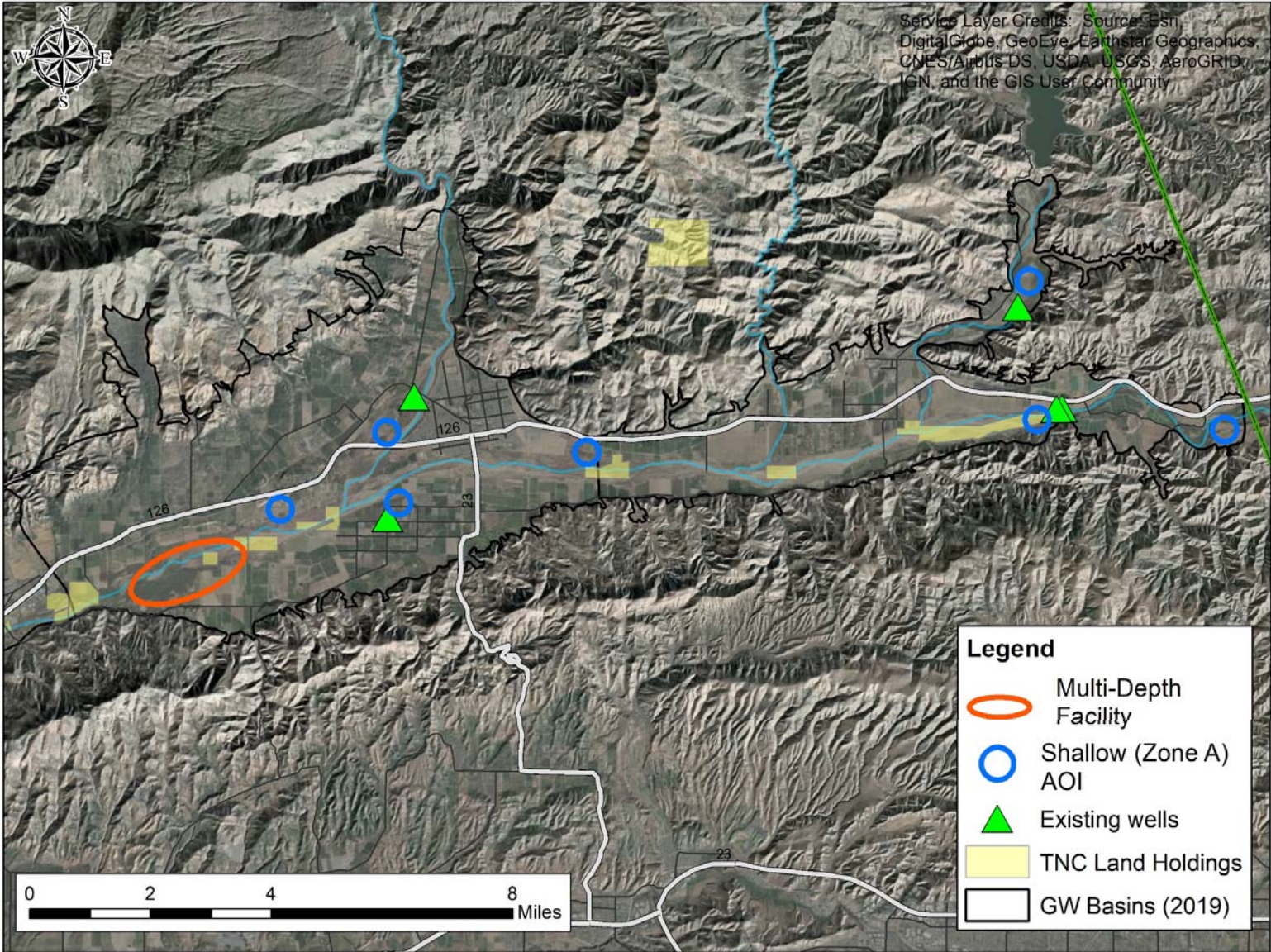


Item 4B - Monitoring Well Program

- Possible Well Sites
- Preliminary Contractor Bids
- Tentative Number of Wells to Install
- Project Schedule



DBS&A
Daniel B. Stephens & Associates, Inc.

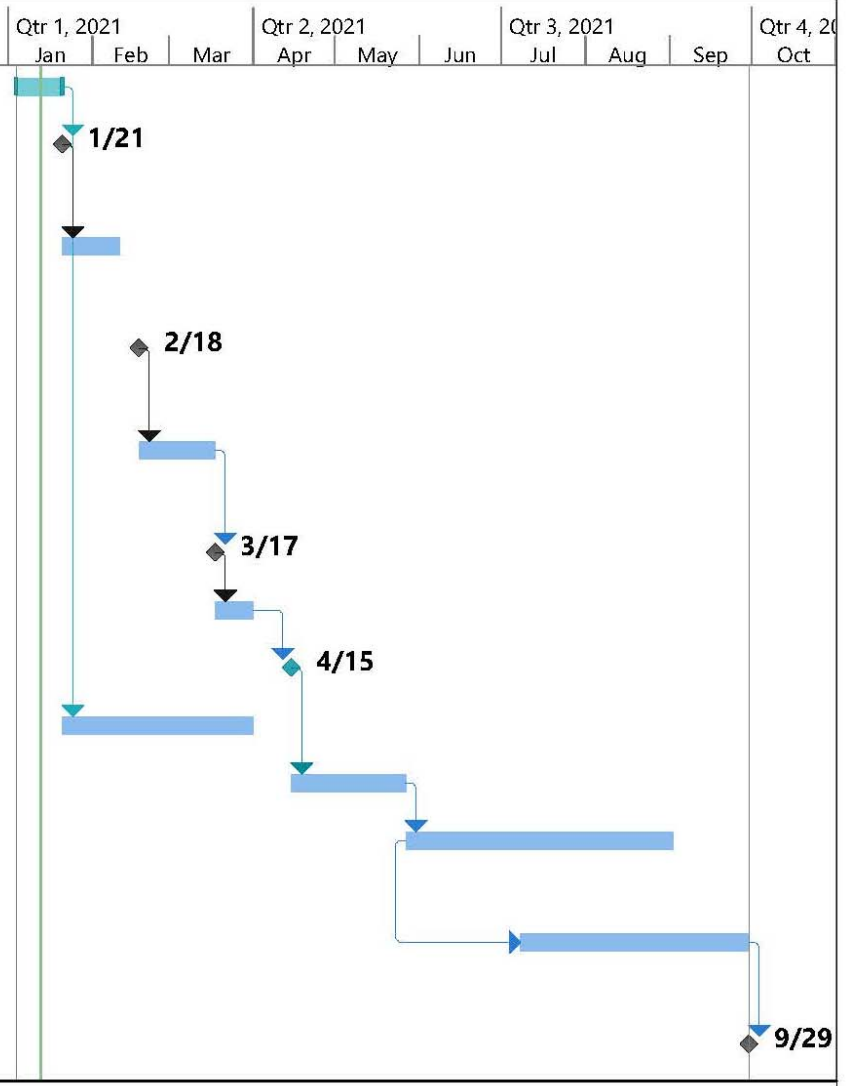


Proposed Monitoring Well Locations

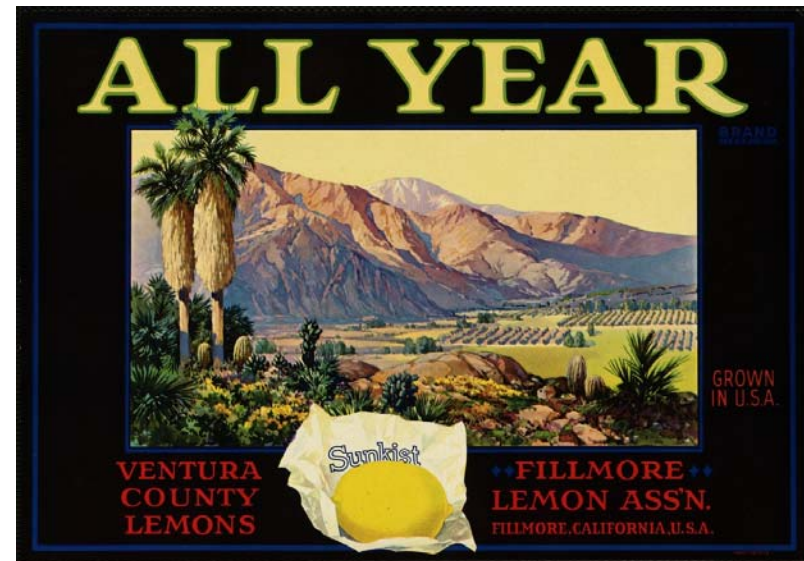
SUMMARY OF ESTIMATED MONITORING WELL COSTS (X \$1,000)



ID	Task Mode	Task Name	Duration	Start	Finish	Timeline											
						Dec	Qtr 1, 2021			Qtr 2, 2021			Qtr 3, 2021			Qtr 4, 2021	
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct		
1		Preliminary Bid Review	13 days	Mon 1/4/21	Wed 1/20/21												
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12		Well Completion Reports	60 days	Thu 7/8/21	Wed 9/29/21												
13		End of Project	0 days	Wed 9/29/21	Wed 9/29/21												



Questions?



Item 4C - Sustainable Management Criteria

- **Climate Change - 2070 Scenario**
- **SW Depletion from GW Pumping - Stream Flow Cross Over Analyses**

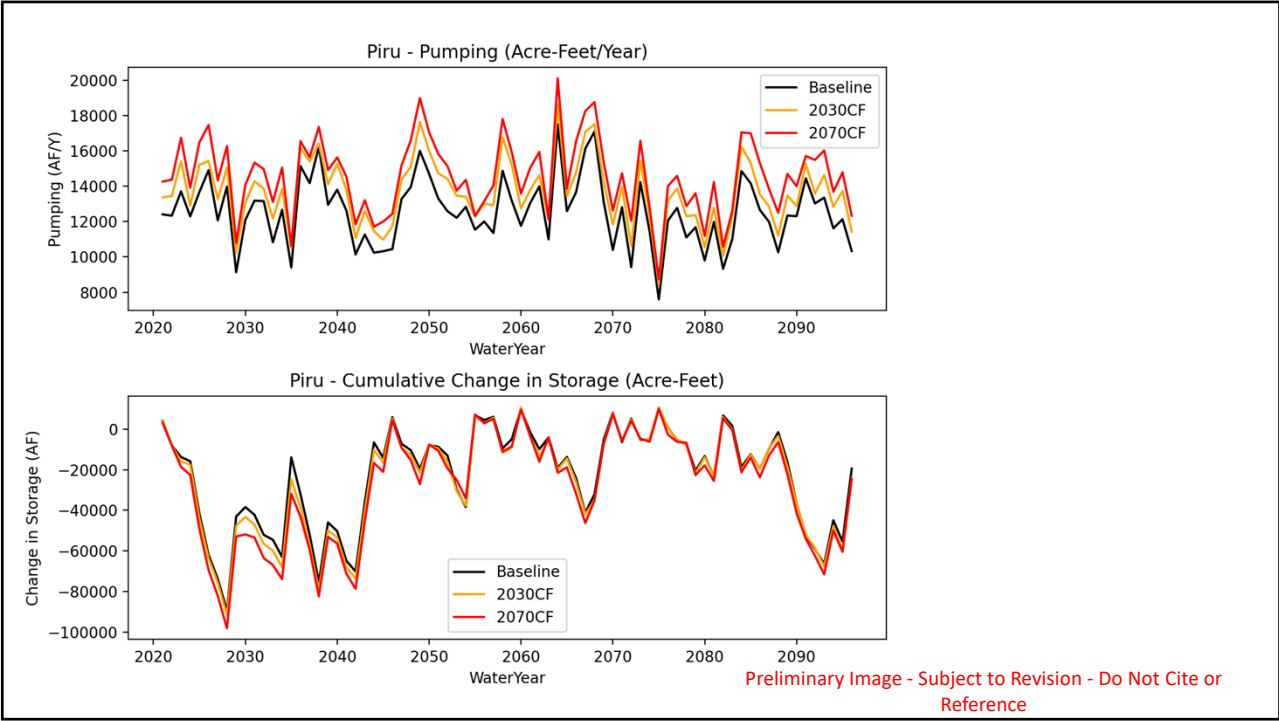
These images are PRELIMINARY and will be updated or revised prior to the Jan 21, 2021 meeting

Preliminary Image - Subject to Revision - Do Not Cite or Reference

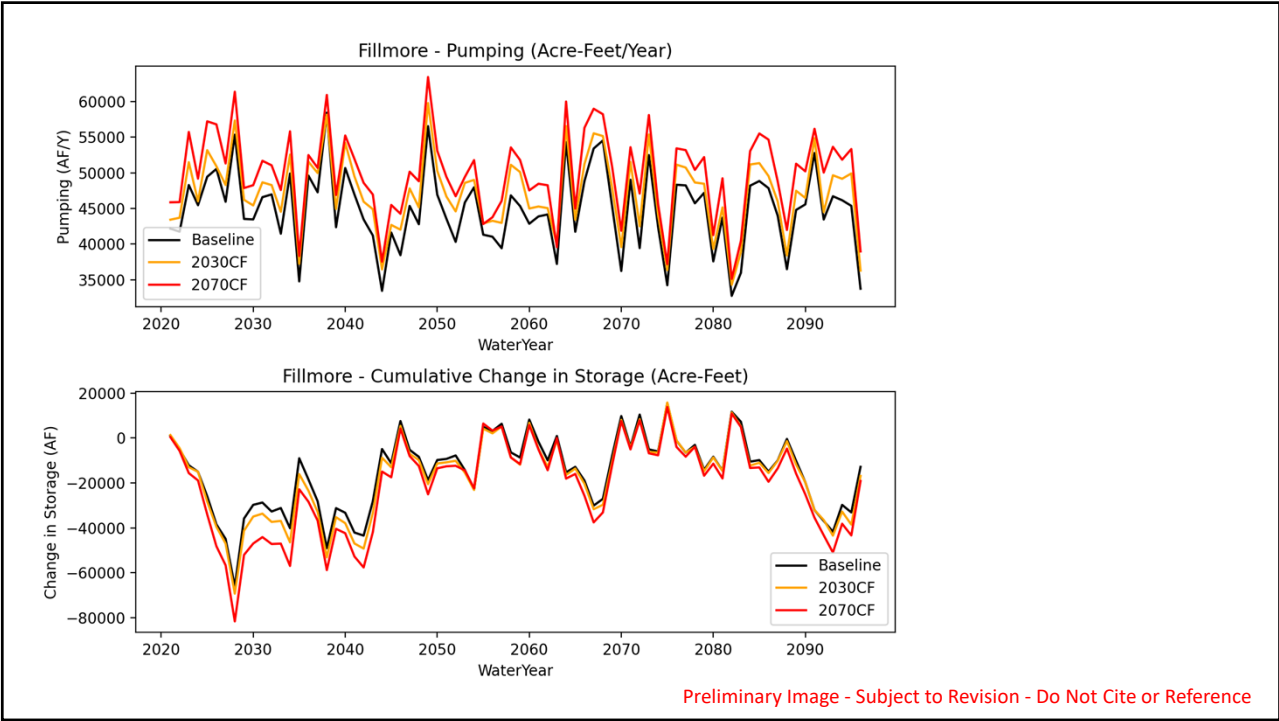


Scenario	Average Pumping (Acre-Feet/Year)	
	Fillmore	Piru
Historical	46,800	11,400
Baseline	44,800	12,600
2030CF	47,200	13,600
2070CF	49,800	14,600

Preliminary Image - Subject to Revision - Do Not Cite or Reference



Preliminary Image - Subject to Revision - Do Not Cite or Reference



Preliminary Image - Subject to Revision - Do Not Cite or Reference

Water Level - Stream Flow Cross Over Analyses

Results of the analyses done by United:

- cross over relationship between WLs and SW flow; and
- impact of pumping on SW flow

Preliminary Image - Subject to Revision - Do Not Cite or Reference

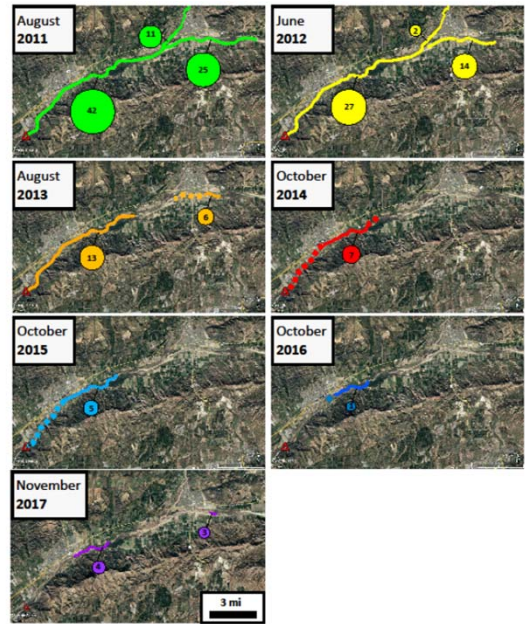
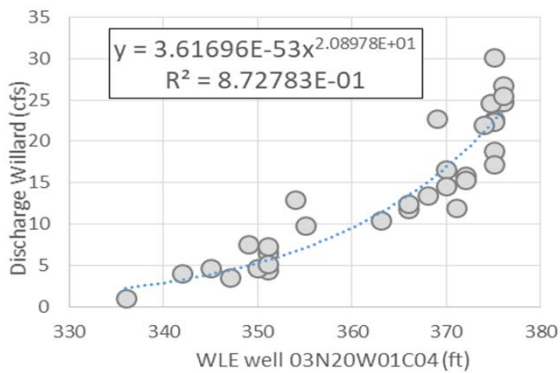


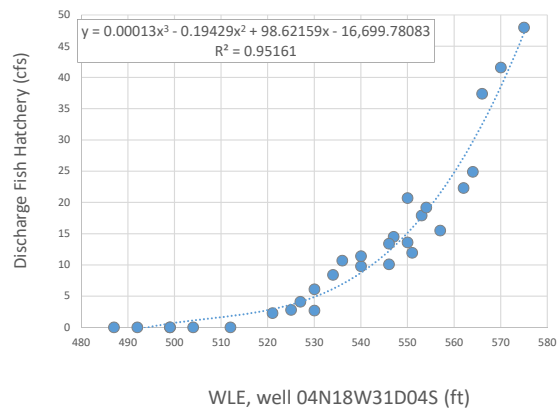
Figure 5.2-2. Length of wetted areas (colored lines) in the lower Santa Clara River, upstream of the Freeman Diversion (indicated by red triangle). Reaches where the end of the wetted area is uncertain are indicated by dotted lines. Flow rates (cfs) are indicated in circles, scaled according to magnitude.

Water Level - Stream Flow Cross Over Analyses

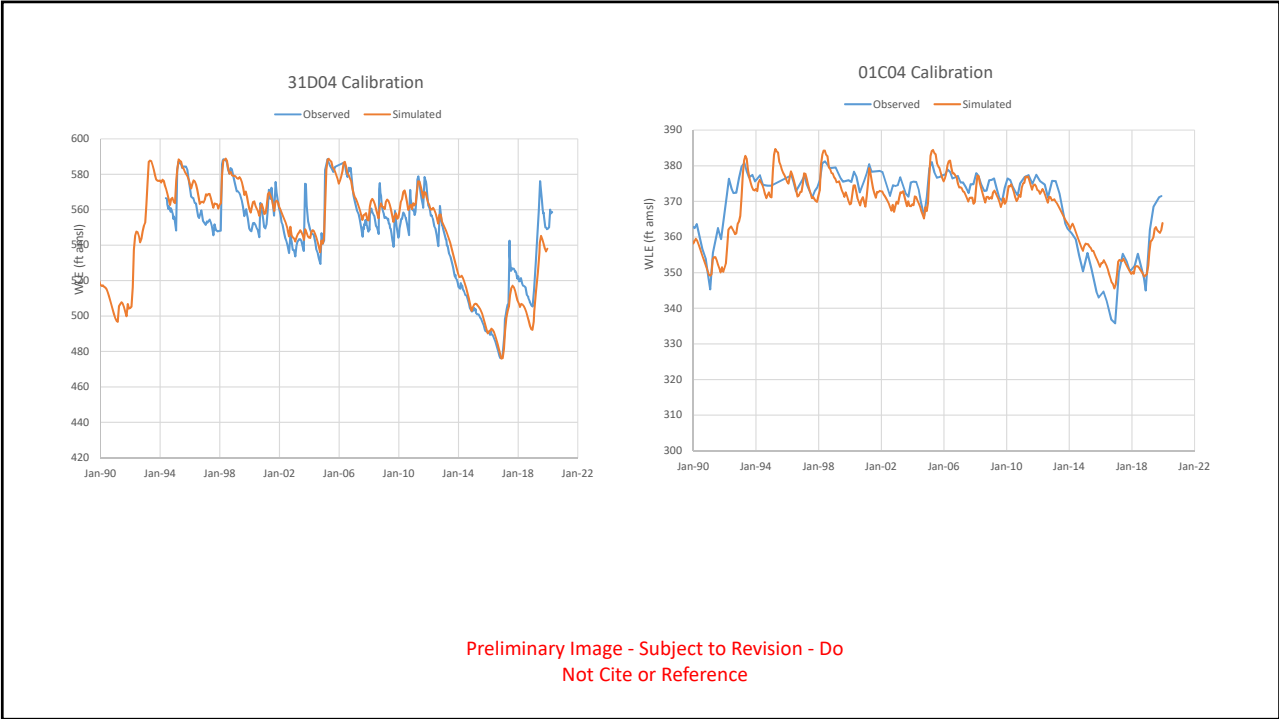
Willard Road



Fish Hatchery



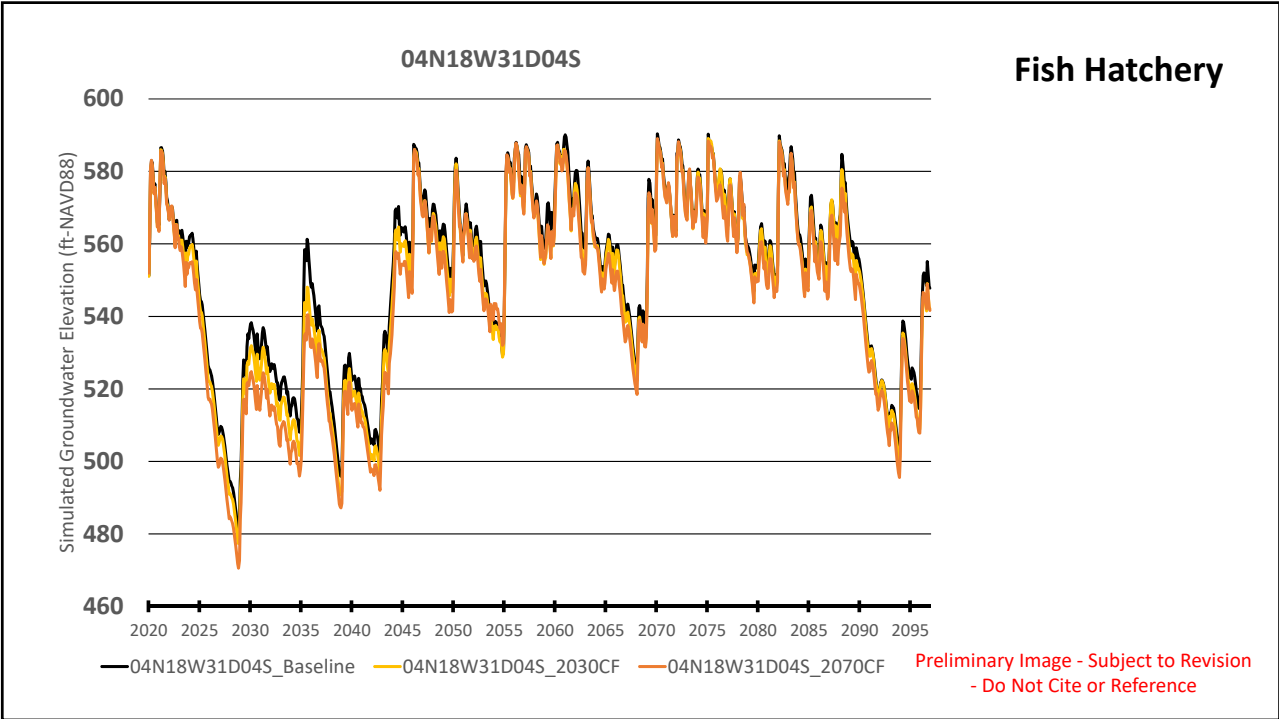
Preliminary Image - Subject to Revision - Do Not Cite or Reference

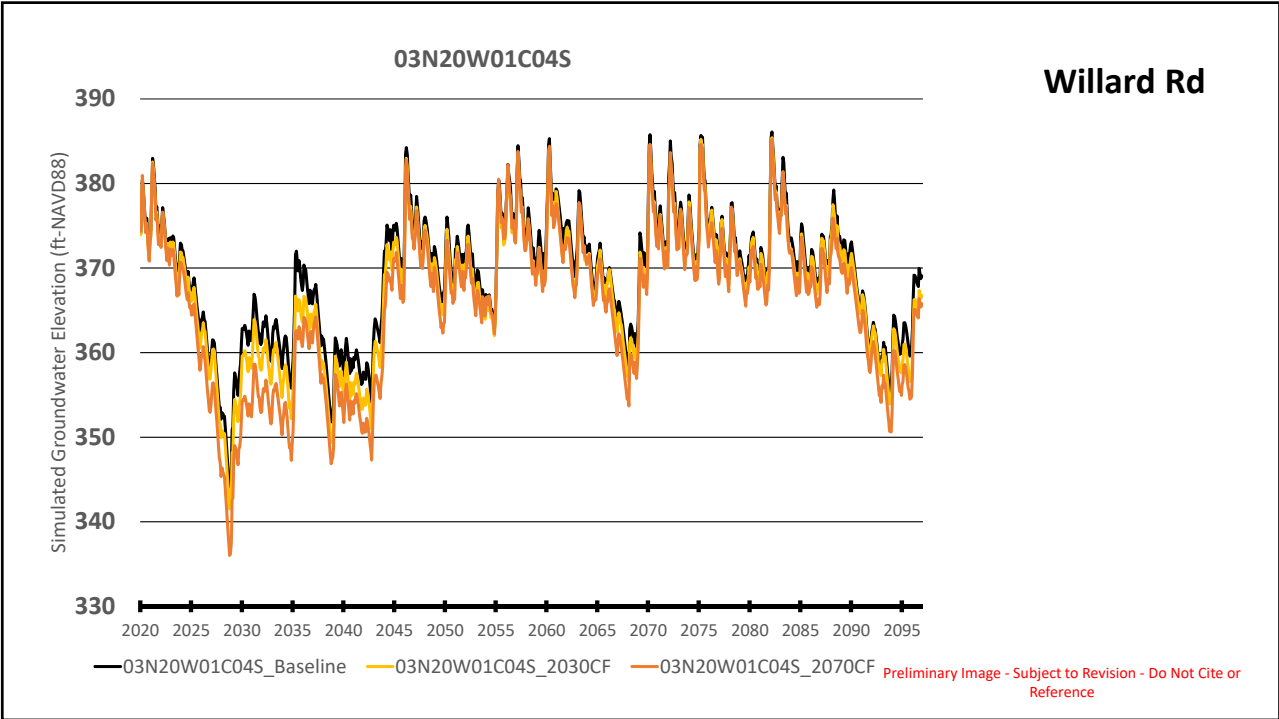
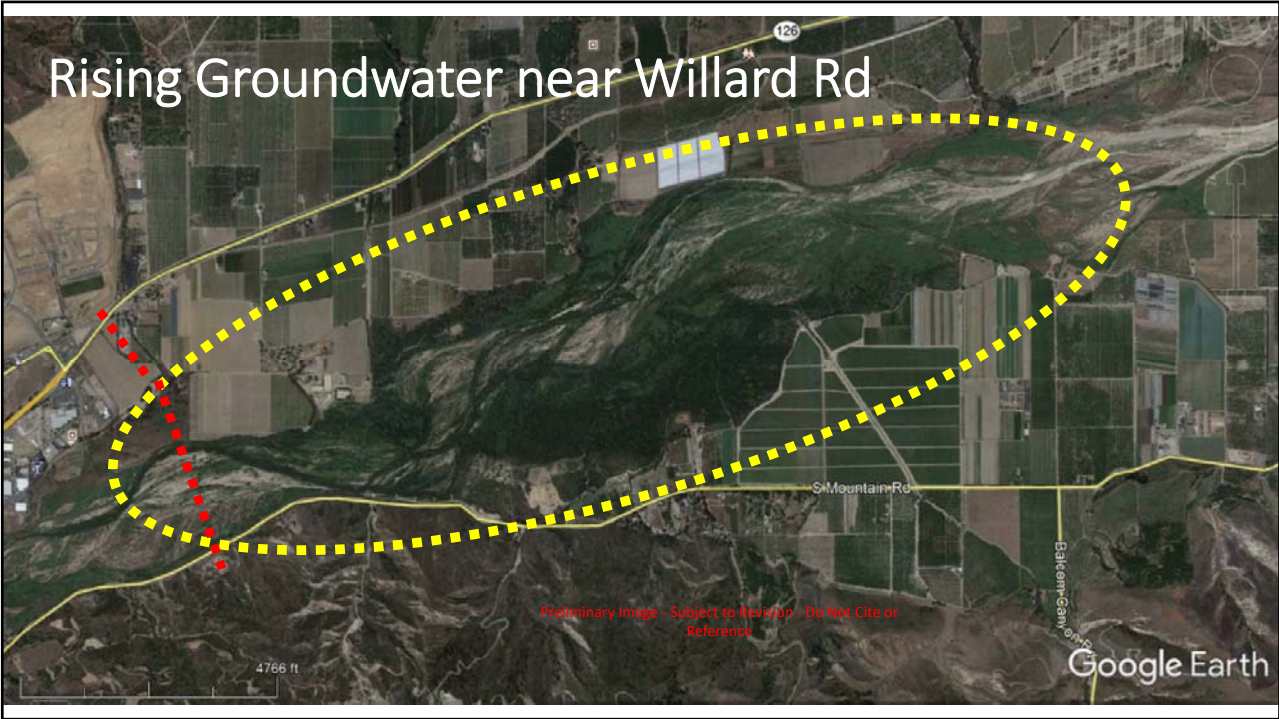


- **Important GDEs at basin boundaries**
- ~29 vegetation communities - cottonwoods & willows
- Special status animal species - Three-spine stickleback, western pond turtle, Least Bell's Vireo, Southwestern Willow Flycatcher, Bank Swallow
- ~4 Special status plants

The image is an aerial photograph of a basin area. Two yellow dashed circles highlight specific locations: one labeled 'Willard Rd' in the lower-left quadrant and another labeled 'Fish Hatchery' in the lower-right quadrant. The map shows a mix of brown, green, and grey terrain, with roads and some buildings visible. A red dot marks the location of 'Fillmore' in the upper-middle section. Various roads are labeled, including 'W. Lefferts Rd', 'Bansdale Ave', 'S. Mountain Rd', and 'S. Mountain Rd'. Highway markers for 150, 125, and 25 are also present.

Preliminary Image - Subject to Revision - Do Not Cite or Reference





Questions?



Sensitivity of Groundwater-Dependent Riparian Woodlands to Water Table Declines

Christopher Kibler

University of California, Santa Barbara

January 21, 2021

DRAFT

1

Introduction

- Riparian woodlands are important vegetation communities
 - Serve as habitat for sensitive animal species
 - Promote plant biodiversity
 - Regulate water and sediment fluxes in floodplains
- Riparian woodlands are groundwater-dependent ecosystems
 - Root systems 0-3 m
 - Draw water from the alluvial water table
 - Exceptionally vulnerable to water stress if water table declines
- Prolonged water stress leads to plant mortality

2



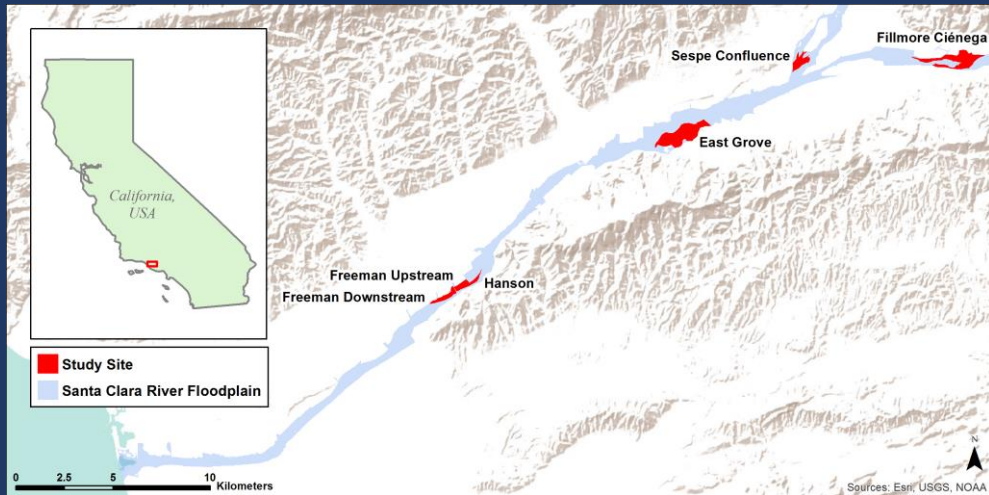
3

Research Questions

1. What are the general trends of tree health in the Santa Clara River floodplain during the 2012-2019 California drought?
2. How strong is the relationship between changes in groundwater and changes in land cover in riparian woodlands?
3. Are there critical thresholds where water table declines cause stress and mortality in the riparian woodlands?

4

Lower Santa Clara River



Introduction | Motivation | Research Questions | **Methods** | Results | Discussion

5

5

Groundwater

- For each study site, identified a well that indicated water table trends in the shallow aquifer
- The shallow aquifer is where trees access their water
- Calculated change in groundwater elevation compared to June 2011 baseline
- 2010-2011 was a wet winter, 2012-2019 drought conditions

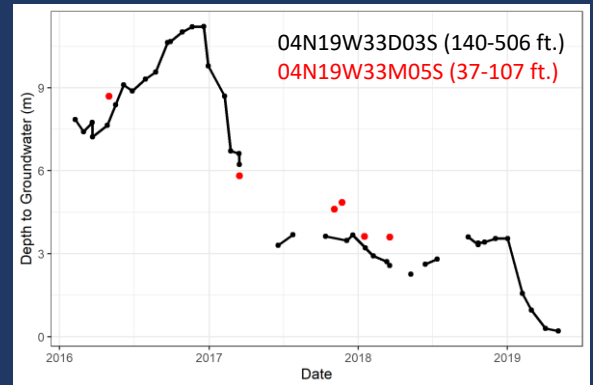
Introduction | Motivation | Research Questions | **Methods** | Results | Discussion

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Groundwater

- Selected shallow wells with complete time series when possible
- Otherwise, benchmarked deeper wells against shallow wells with limited data
- Fillmore Cienega: 04N19W33D03S
- Sespe Confluence: 03N20W02A01S
- East Grove: 03N21W12B02S



Introduction | Motivation | Research Questions | **Methods** | Results | Discussion

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Remote Sensing

- Remote sensing is the analysis of satellite and aerial imagery
- Landsat satellite imagery acquired in June from 2011 to 2016
- 30-meter pixels
- Calculated change in land cover compared to 2011 baseline
- Analyzed the relationship between change in groundwater elevation and change in land cover
- Pooled observations across sites and years (n = 24 site-years)

Introduction | Motivation | Research Questions | **Methods** | Results | Discussion

8

8

Remote Sensing

Green vegetation fraction:

- Percent land cover of healthy green plants

Non-photosynthetic vegetation fraction:

- Percent land cover of dead and woody plant material

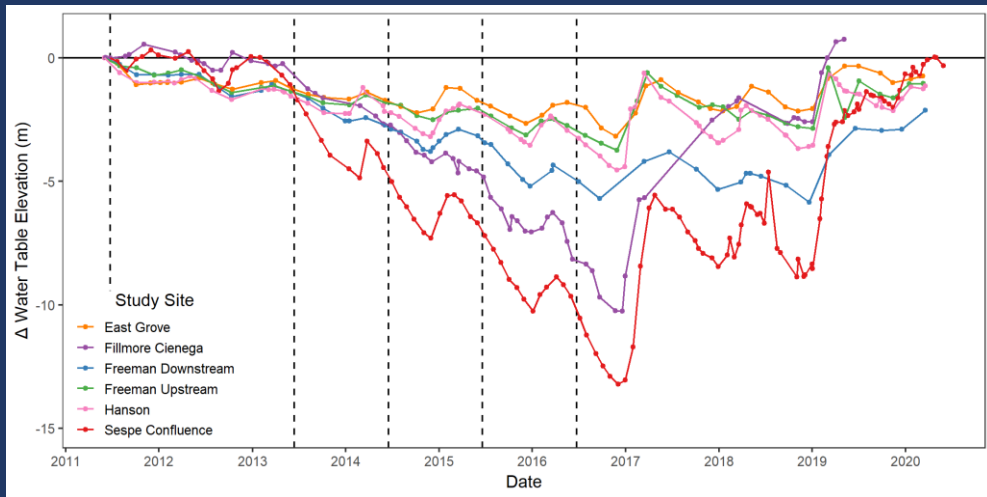
Soil fraction:

- Percent land cover of soil

$$\mathbf{GV + NPV + Soil = 100\%}$$

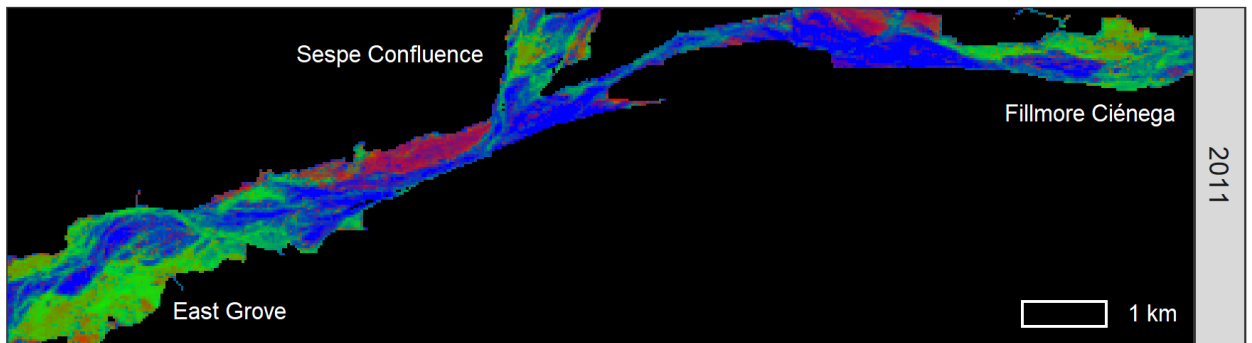
Results

Results



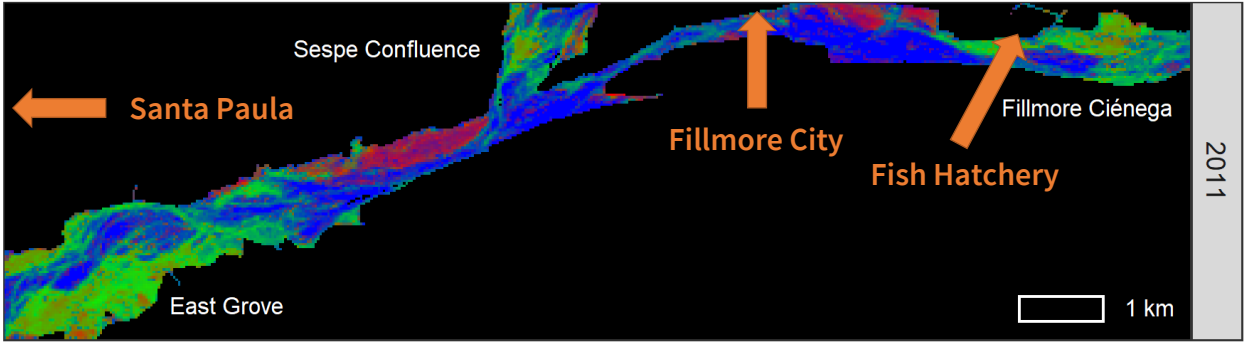
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Results: Fillmore Basin



12

Results: Fillmore Basin



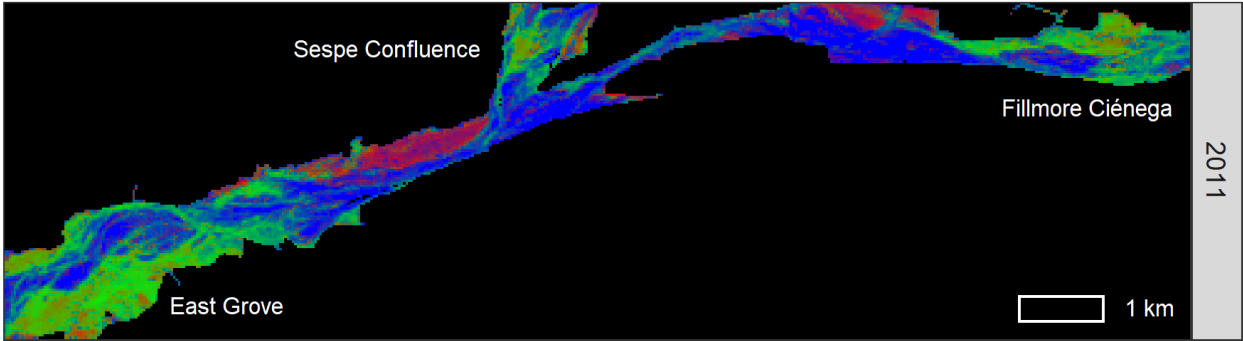
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Results: Fillmore Basin



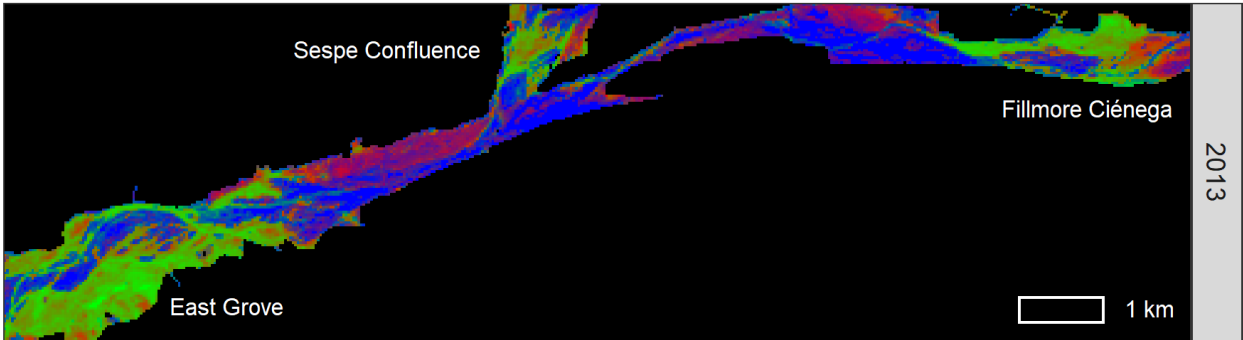
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Results: Fillmore Basin



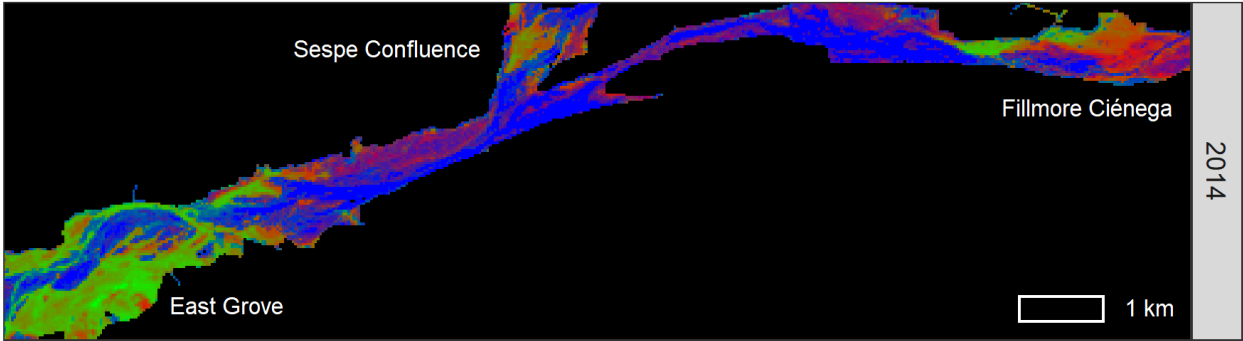
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Results: Fillmore Basin



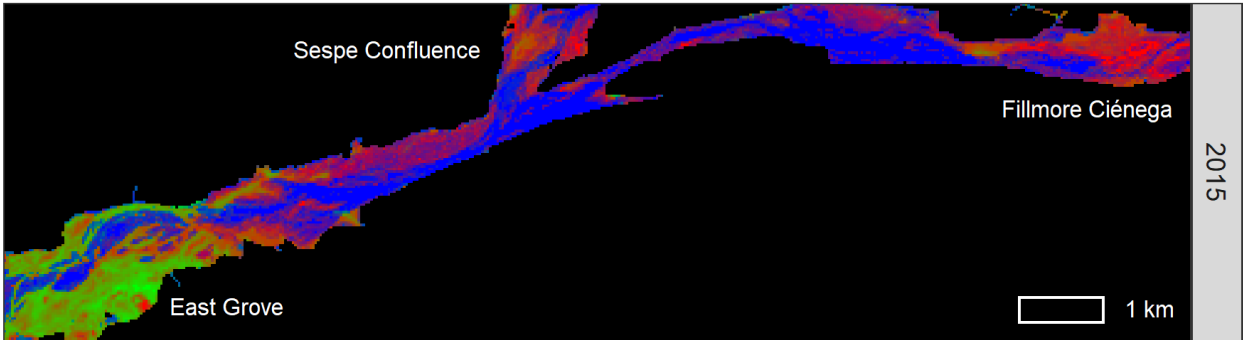
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Results: Fillmore Basin



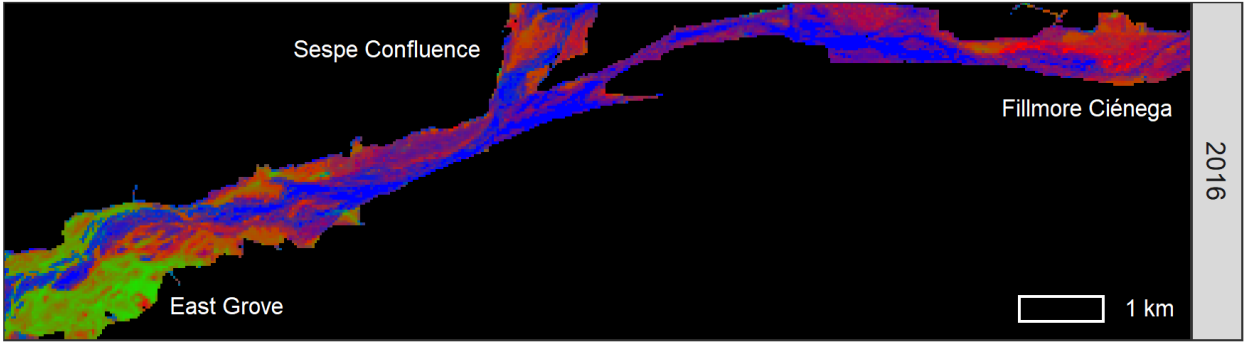
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Results: Fillmore Basin

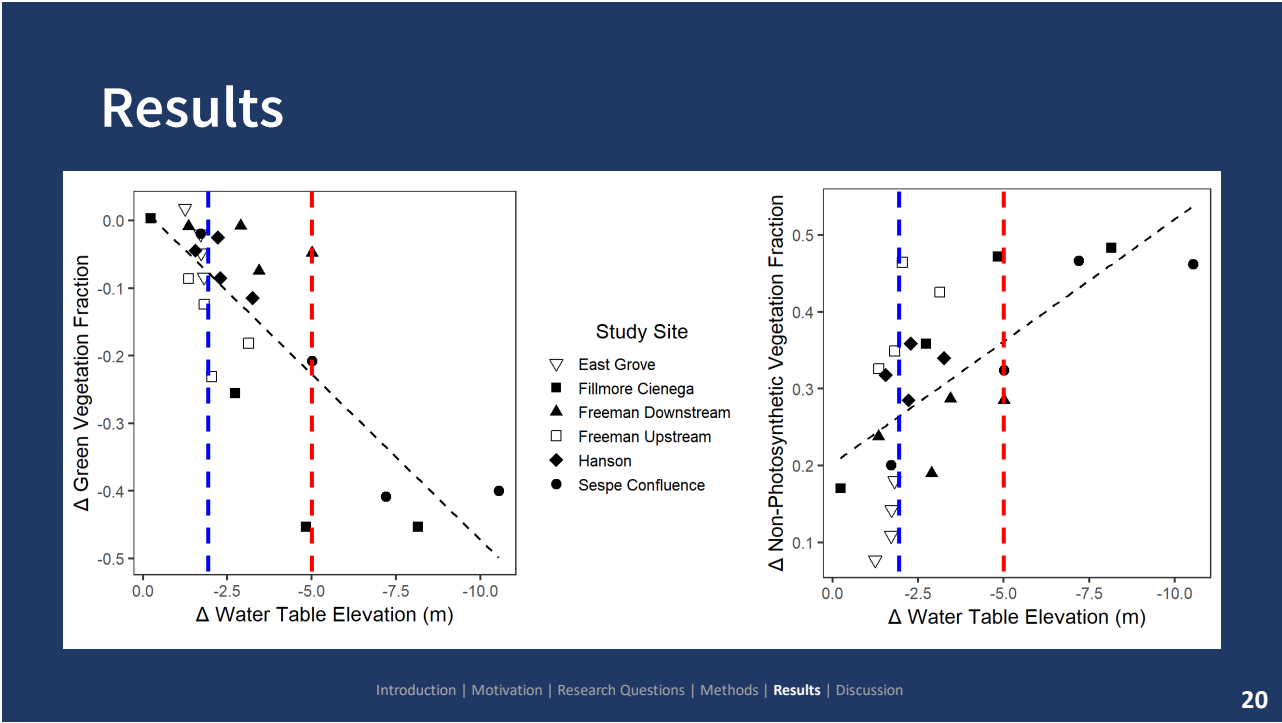


18

Results: Fillmore Basin



19



20

Discussion

- Groundwater declines drove widespread mortality of riparian trees between 2011 and 2016
- Limited impact at sites with <2 m water table decline
- Widespread mortality at sites with >5 m water table decline
- Observed threshold may be related to changes in subsurface water fluxes, and not just tree root systems

Discussion

- Floods and scouring events needed for riparian tree species to regenerate
- Increased prevalence of droughts, decreased prevalence of floods could lead to less natives and more invasives
- Trees might not recover in the same way that they have in the past
- Potential for permanent loss of riparian woodlands

Questions?

Introduction | Motivation | Research Questions | Methods | Results | **Discussion**

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United's 2020 Conservation Release Results

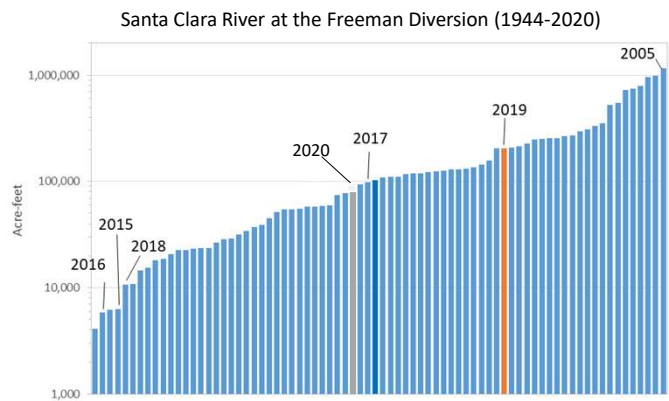
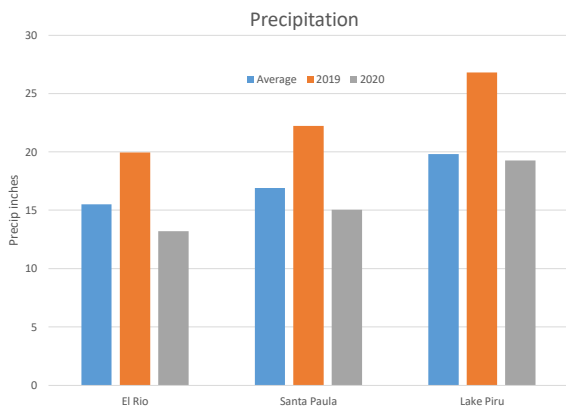
Operations at Santa Felicia Dam
 Current Storage Capacity = 83,200 AF
 (currently 14,800AF)



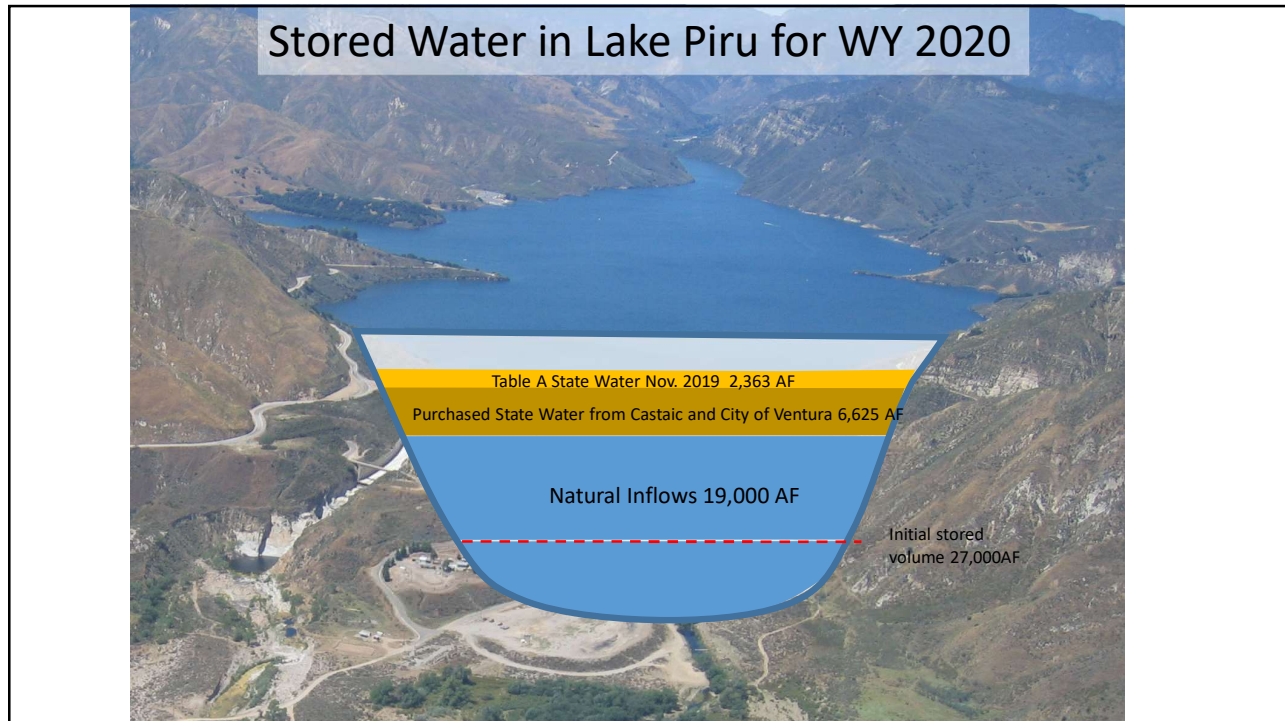
1

Precipitation and Runoff for recent years

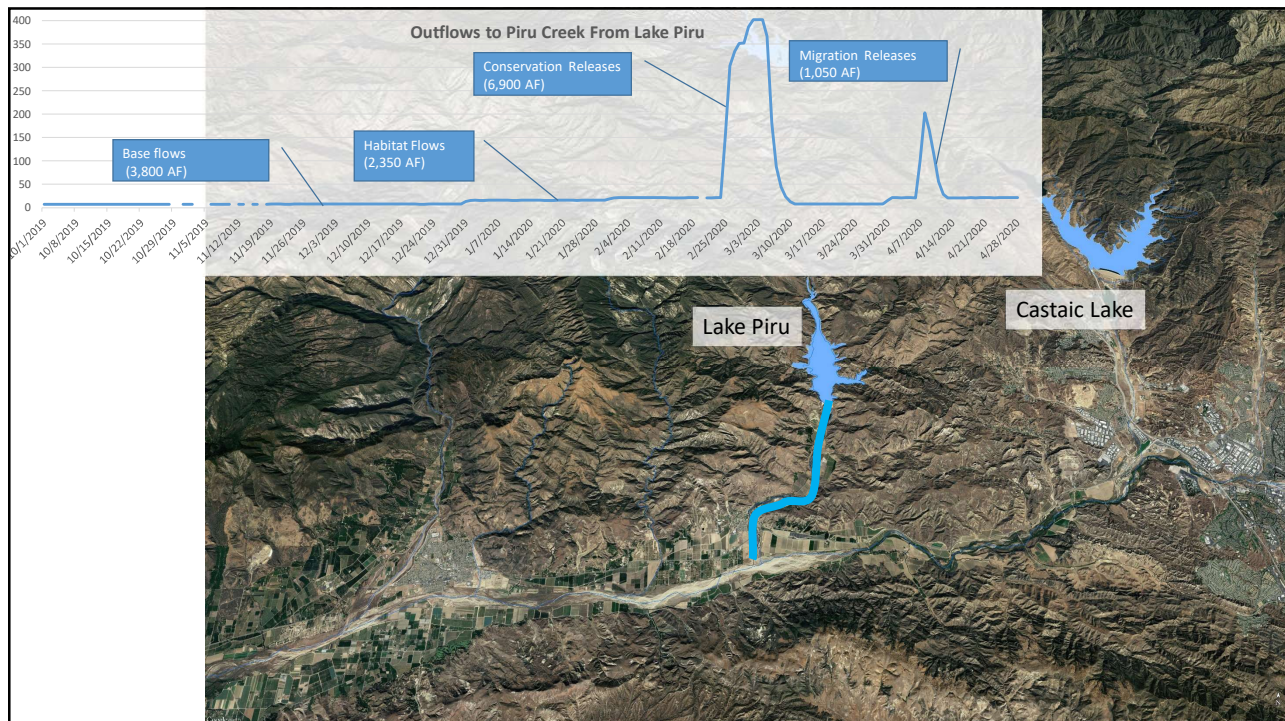
➡ Sufficient water for significant releases



2



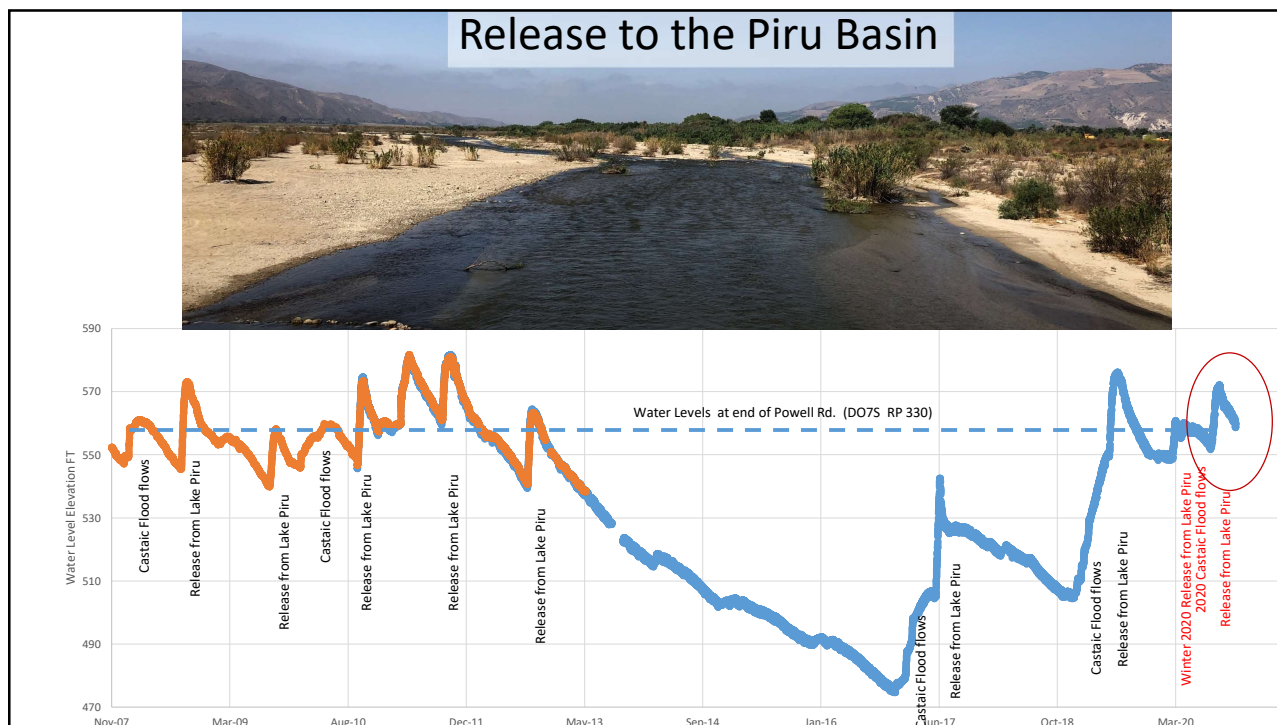
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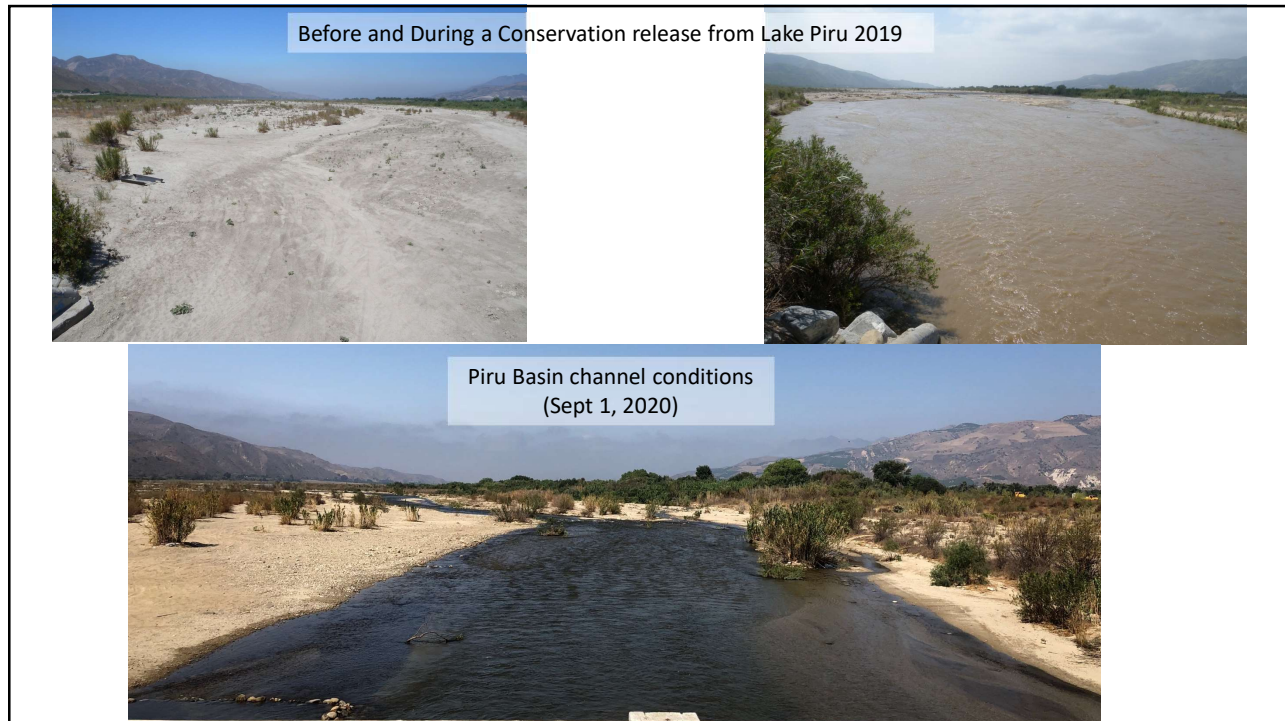
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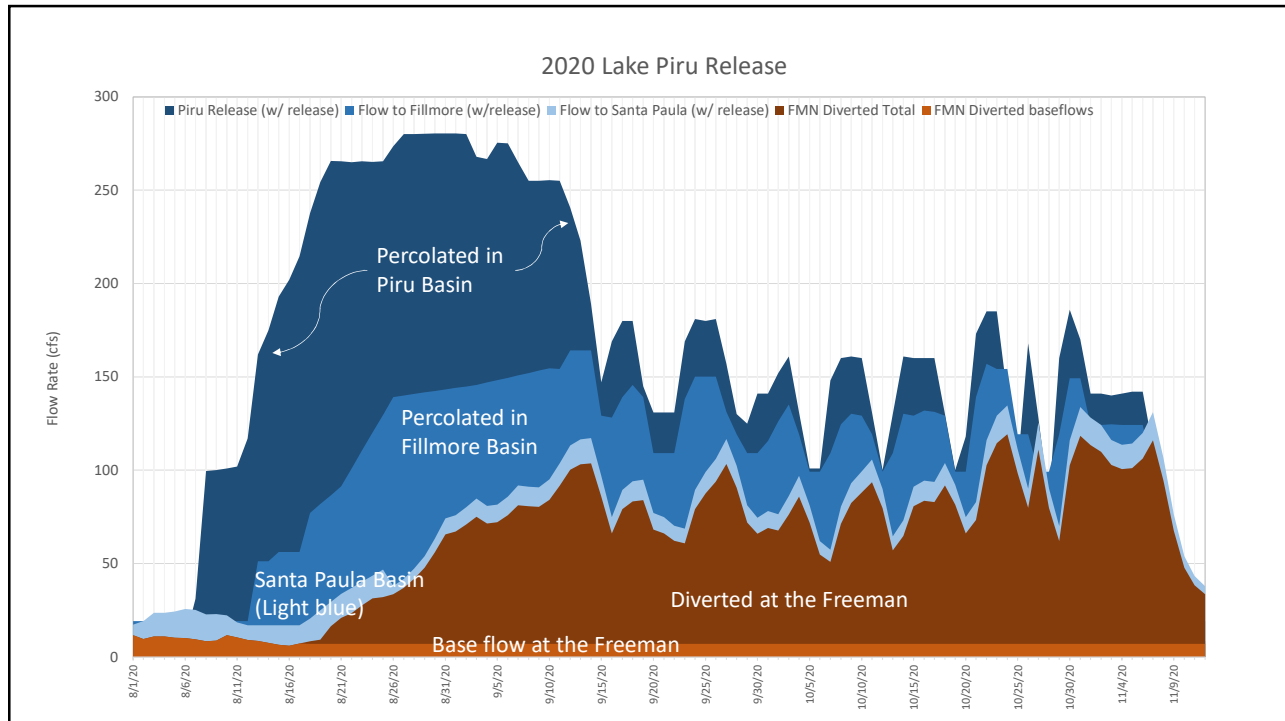
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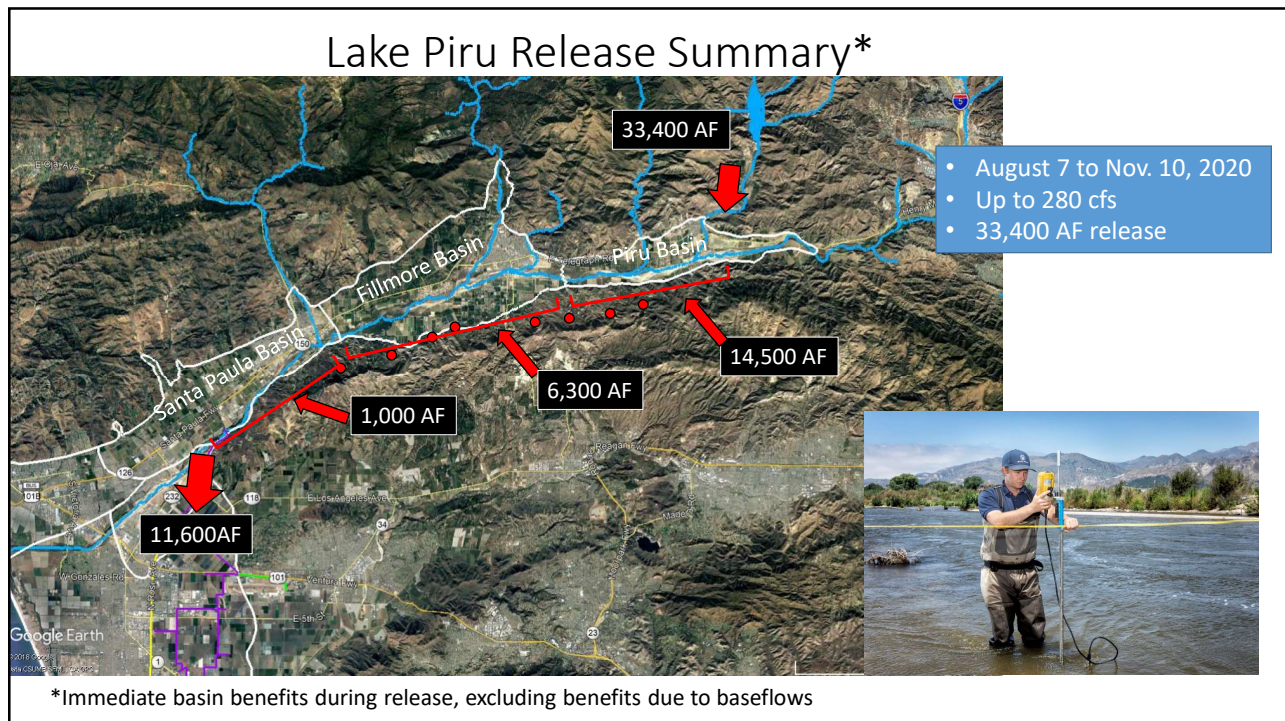
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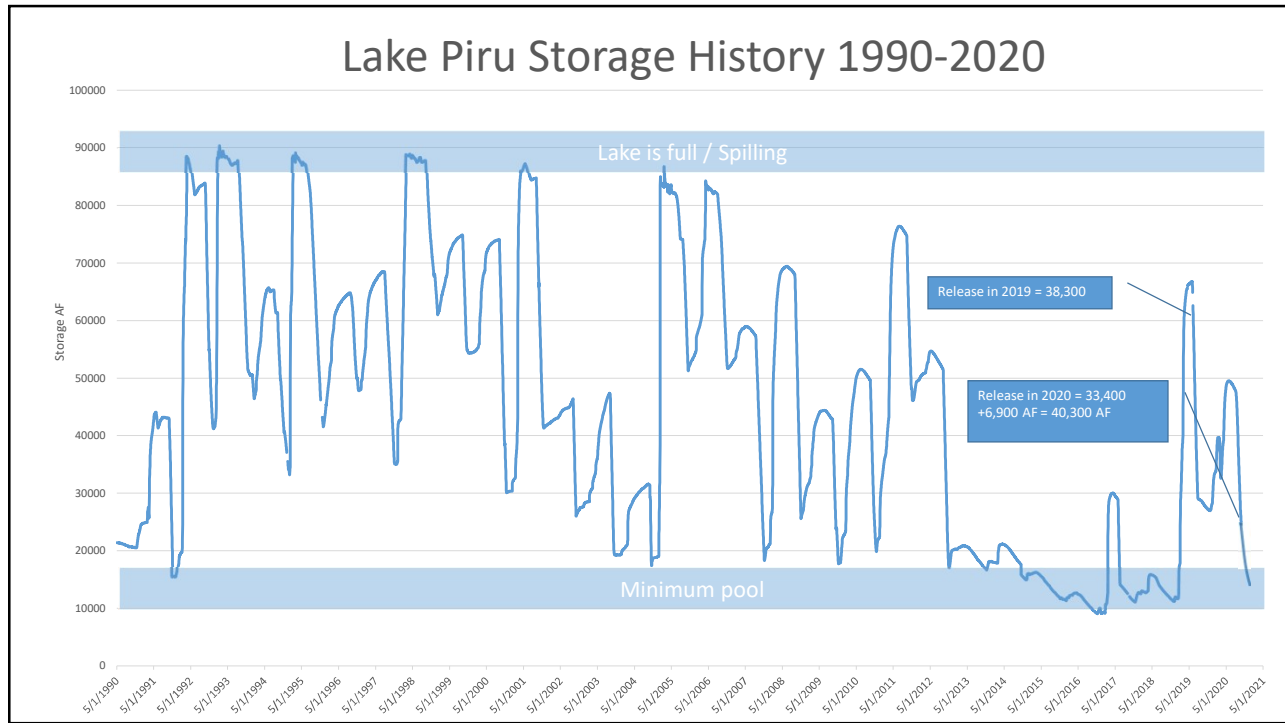
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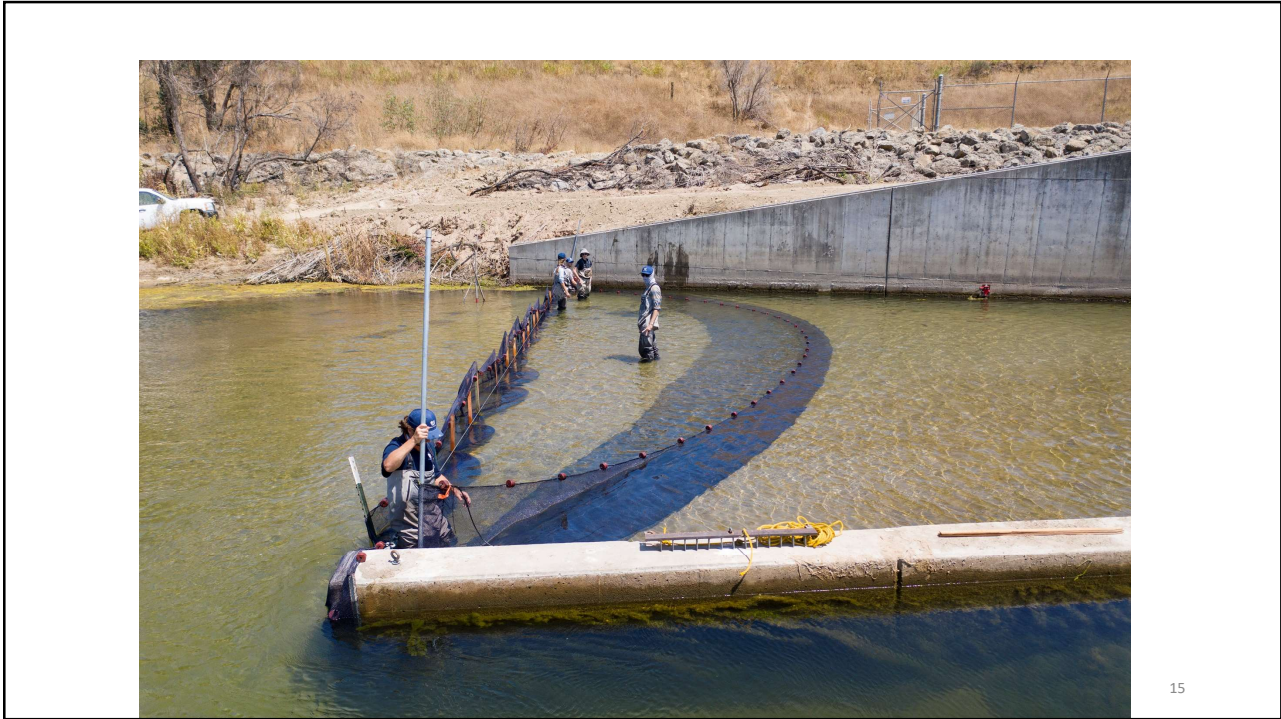
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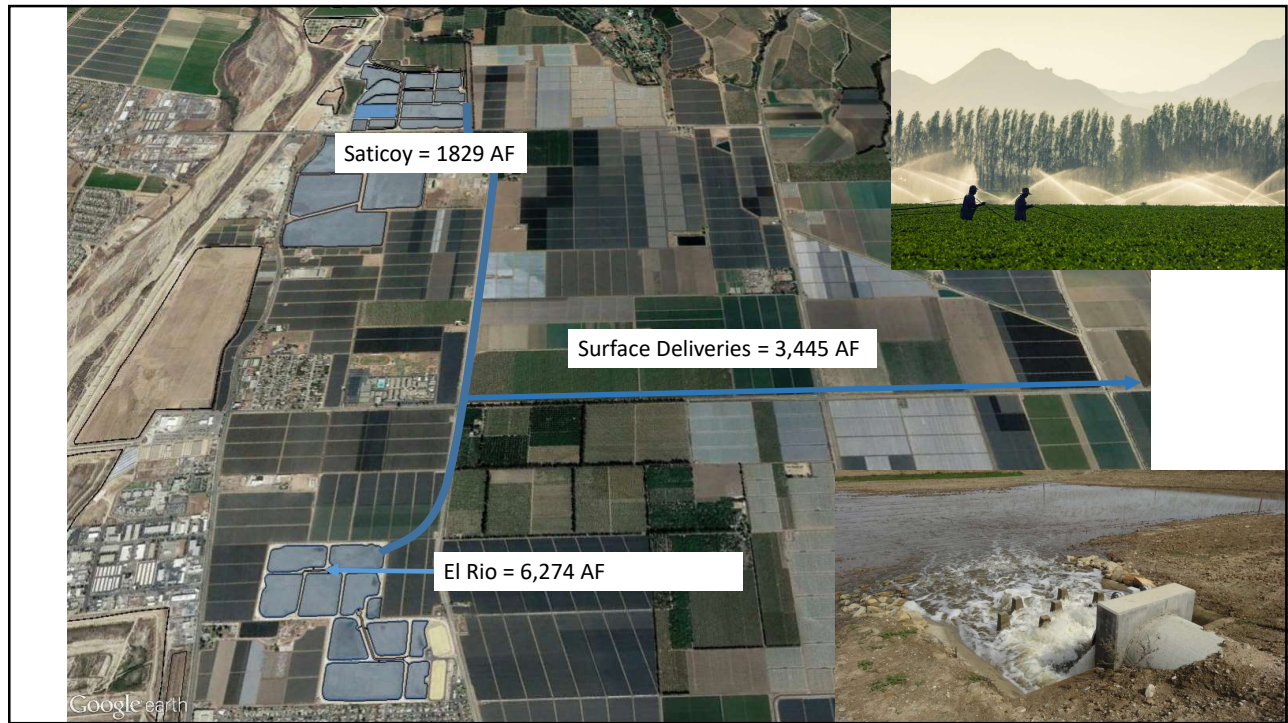
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