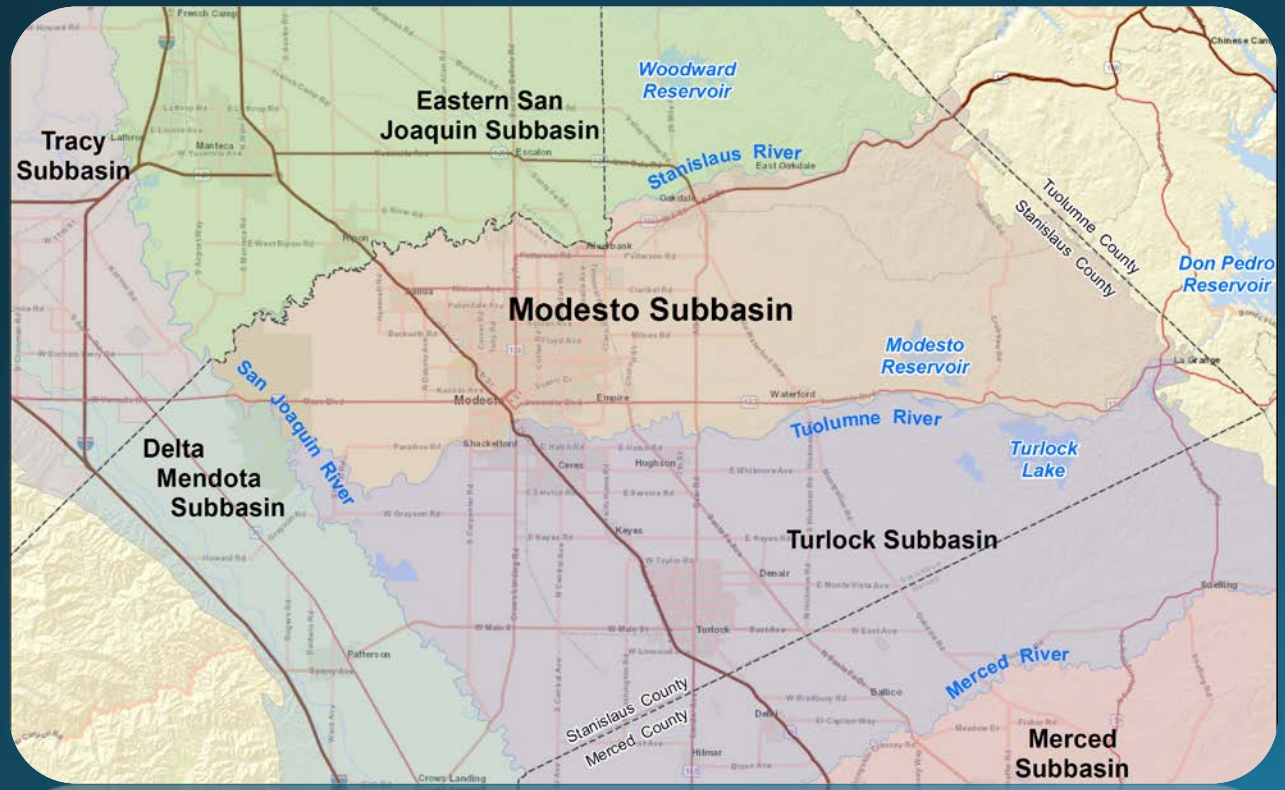
STRGBA Groundwater Sustainability Agency
Tuolumne Groundwater Sustainability Agency

Modesto Subbasin Groundwater Sustainability Plan (GSP) Technical Workshop No. 1

April 10, 2019



Presentation Outline

- Workshop Objectives
- GSP Process and Timeline
- Technical Analyses and Sustainability Indicators
- Plan Area Section of the GSP
- Basin Setting Section of the GSP
  - Hydrogeologic Conceptual Model (HCM)
  - Groundwater Conditions
- Next Steps

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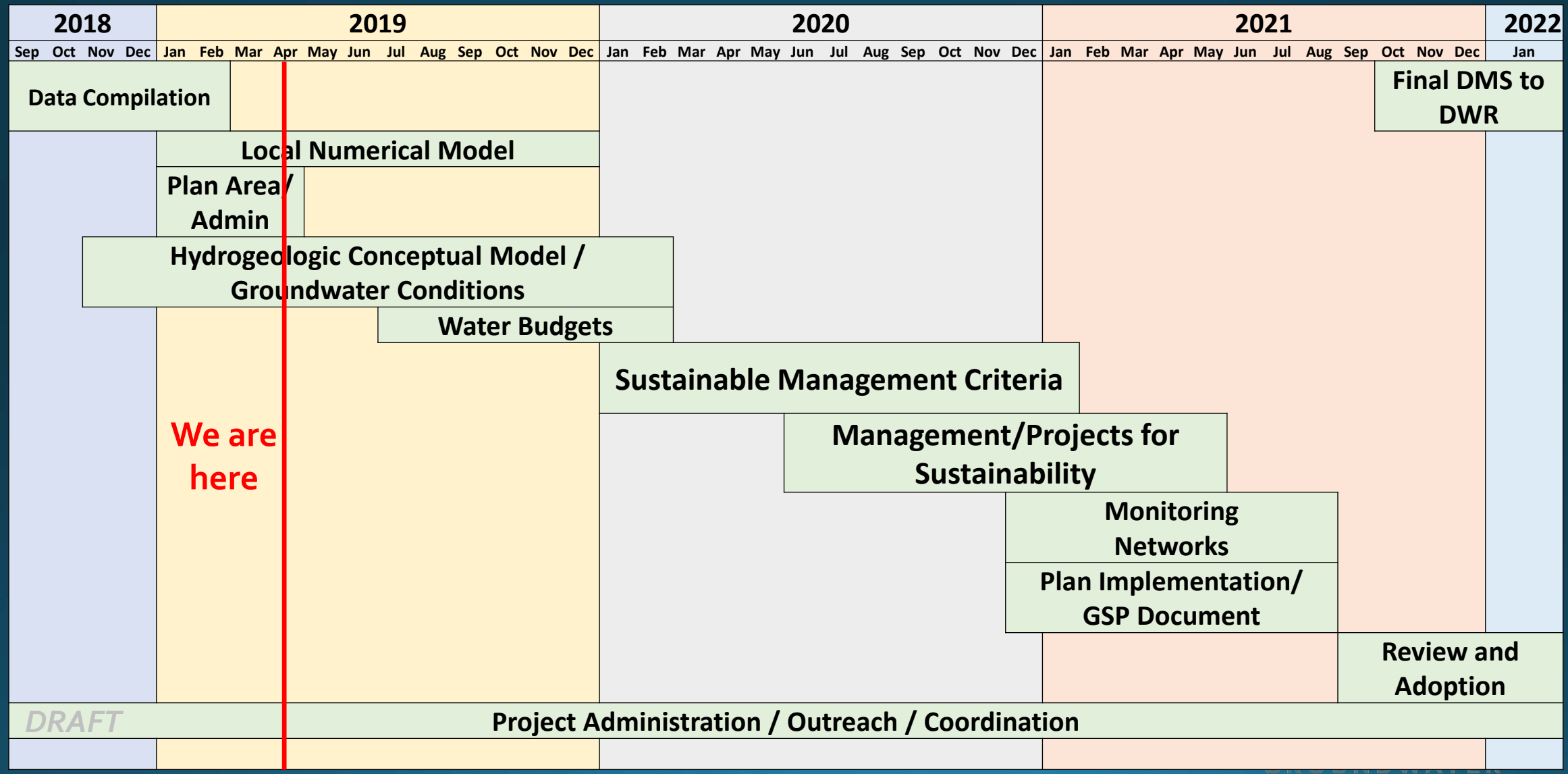
TAC Workshop Objectives

- Provide an update on technical work to date using **draft work products**
- Allow TAC members to consider **how the technical work informs the GSP**
- Provide an opportunity for the TAC and stakeholders to **suggest data or other considerations** to incorporate into the analysis
- Provide information that the **TAC/GSA members can discuss and share with community stakeholders**

Modesto Subbasin GSP Timeline



GSP Overview

Data Compilation / Data Management System

Institutional Setting – Water Supply / Plan Area

Hydrogeologic Conceptual Model / Groundwater

Water Budget (Current and Historical)

Technical Components

Today's Workshop

Sustainability Goals and Criteria

Policy Components

Management Scenarios Projected Water Budget

Monitoring Networks Plan Development

Management / Plan Components

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Sustainability Indicators

Chronic Lowering of Water Levels

Reduction of Groundwater Storage

Degradation of Water Quality

Land subsidence affecting land use

Depletion of Interconnected Surface Water affecting beneficial use

If a sustainability indicator is determined to be significant and unreasonable , then it is an Undesirable Result

Sustainability Indicator Analysis

Rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin

Sustainable yield, calculated based on historical trends, water year type, and projected water use in the basin

Number of supply wells, volume of water, or location of an isocontour exceeding constituents of concern, considering state and federal standards

Rate and extent of subsidence that interferes with surface land use supported by identification of land/property interests affected or likely to be affected.

Depletion that has adverse impacts on beneficial use of surface water supported by the location, quantity, and timing of depletions; assumes use of a numerical model or equally effective method or tool.

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Considerations for Modesto Subbasin

Consider beneficial uses of wells; problems during the recent drought? Historic low levels?

Develop operational range of storage, with an emergency supply

Title 22, basin plan, GAMA, GeoTracker, CV-Salts/ILP, naturally-occurring constituents; City of Modesto WQ project

Subsidence may not currently interfere with land uses in Modesto Subbasin; evaluate texture data for future susceptibility?

Interconnected Surface Water and Groundwater Dependent Ecosystems (GDEs) –gaining and losing reaches on rivers from the model; support with other analyses (e.g., temperature data)

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Metrics and Minimum Thresholds to Define Undesirable Results

Minimum water level at representative monitoring points

Volume of supply in storage; water levels as a proxy

Poor water quality spatially or at depth. Possible water levels as a proxy?

Land subsidence – water levels as a proxy

GDEs downstream? Possible water levels as a proxy?

Highlights the need for a robust water level monitoring network

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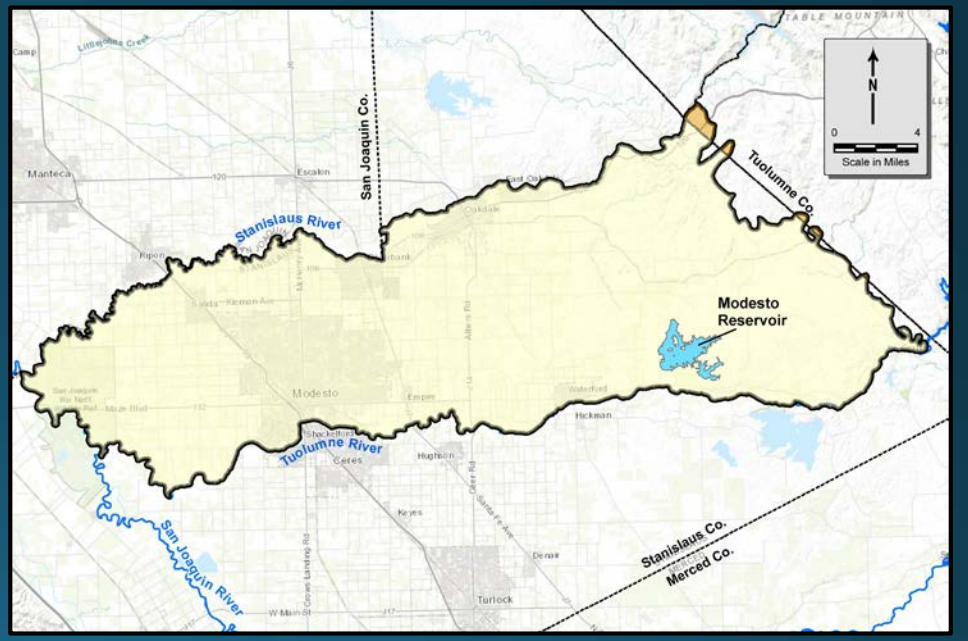
Plan Area
GSP Requirements

What are the Institutional and Water Supply Conditions?

- Agencies and Jurisdictional Boundaries
- Existing Land Use
- Water Sources and Use
- Water Resources Monitoring
- Water Resources Management Programs
- Land Use Planning Elements



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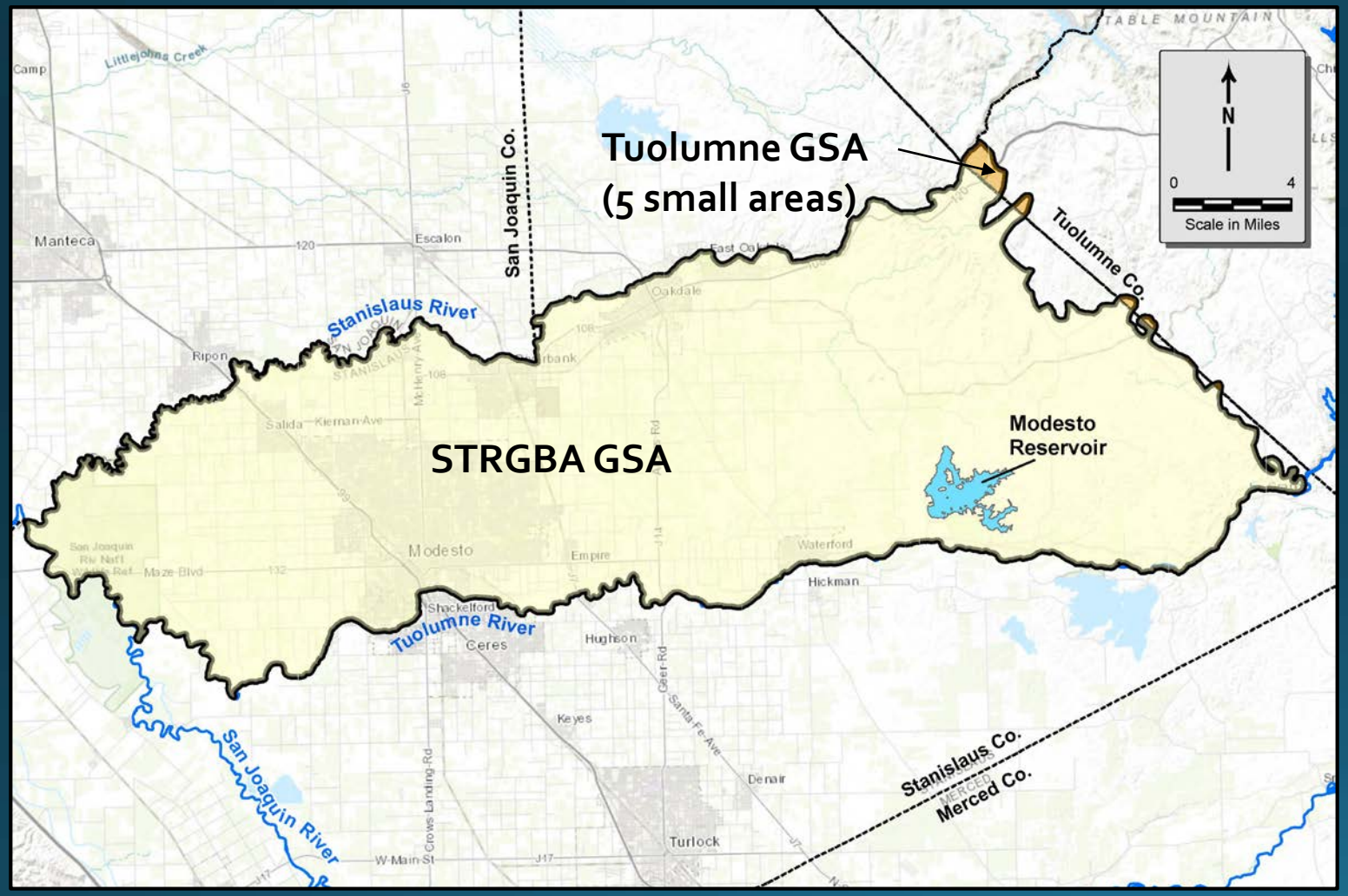
Agencies and Jurisdictional Boundaries



- Subbasin ~245,250 acres
- STRGBA GSA (99.5% of Plan Area)
- Tuolumne GSA (0.5% of Plan Area: ~1,000 acres)

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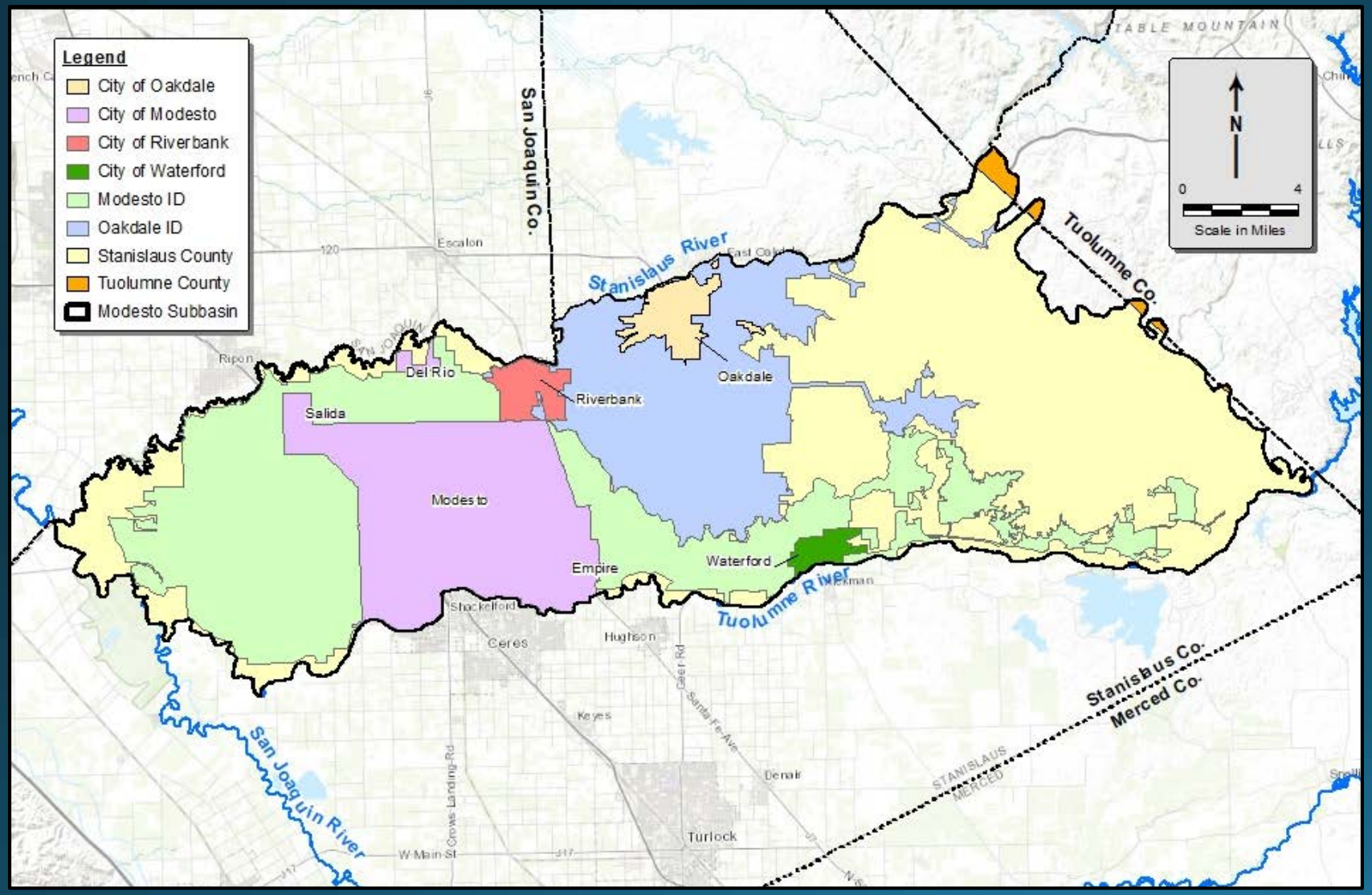
Agencies and Jurisdictional Boundaries



- 4 municipalities and urban communities
- 2 irrigation districts
- Stanislaus County (22% of STRGBA GSA)
- Tuolumne County (0.5% of Subbasin)
- Additional lands have recently been added to OID and the map will be revised for the GSP

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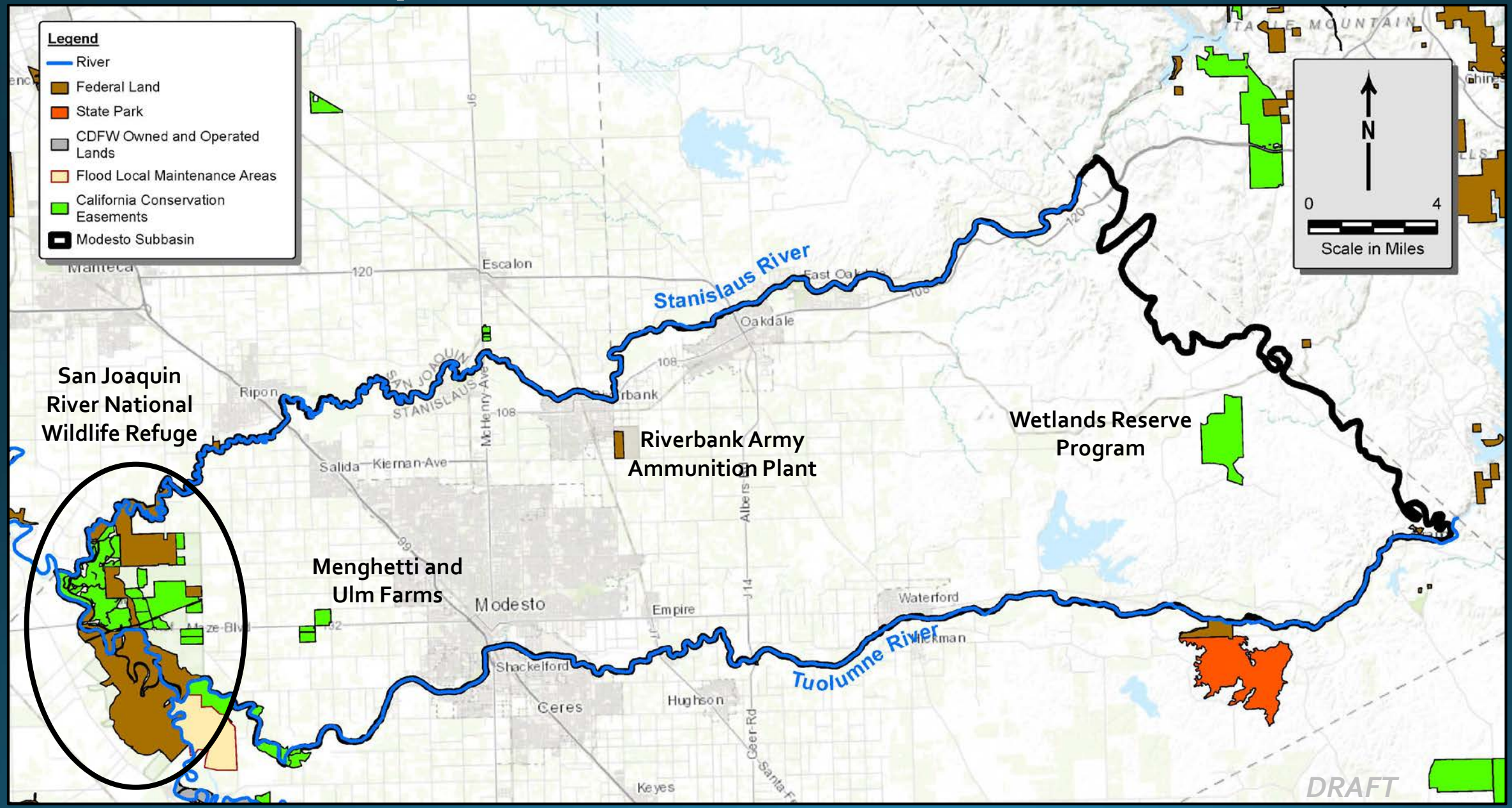
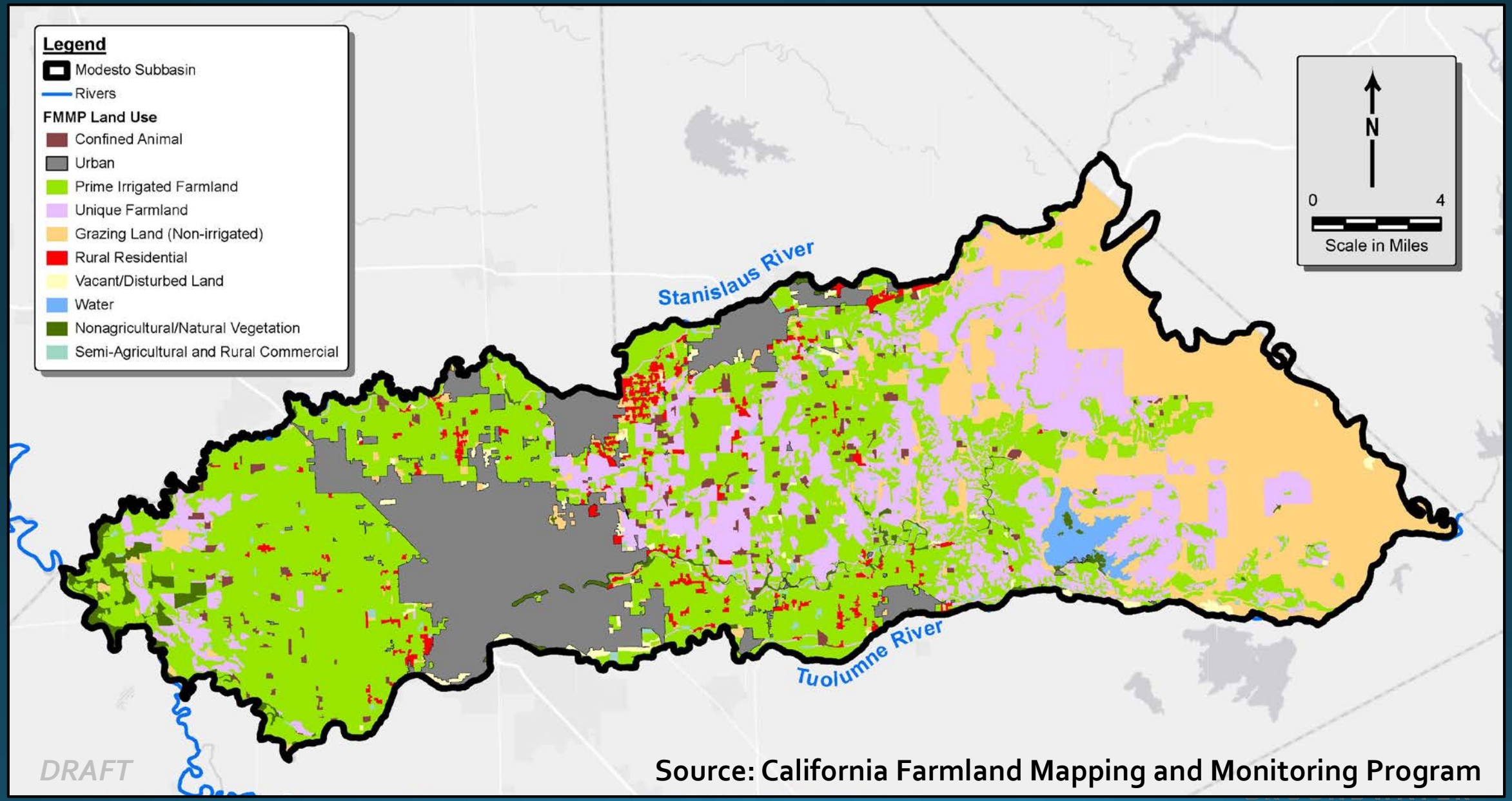
CDFW Lands, Protected Lands and Federal Lands

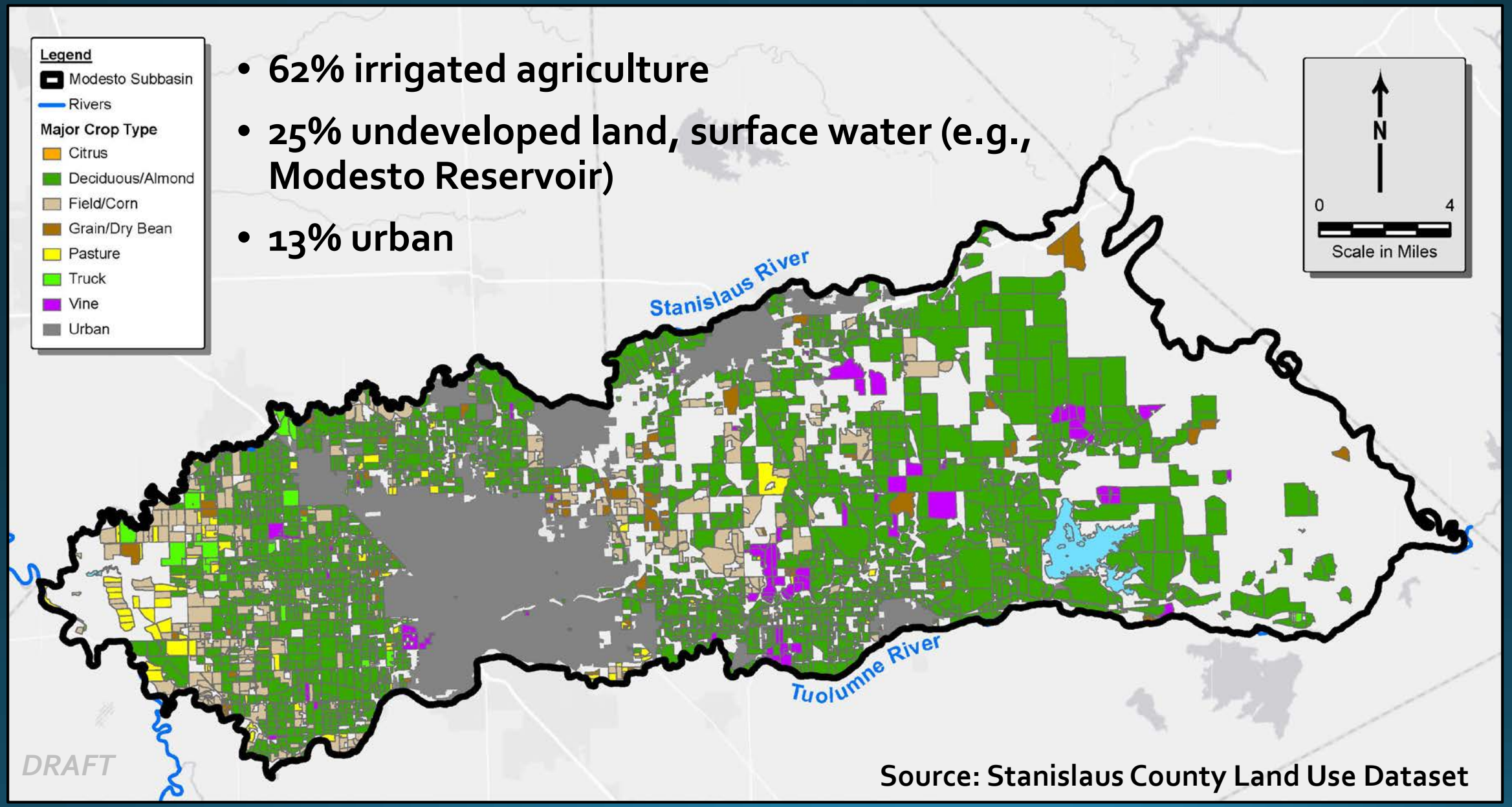


Prime Farmland FMMP Land Uses (2016)

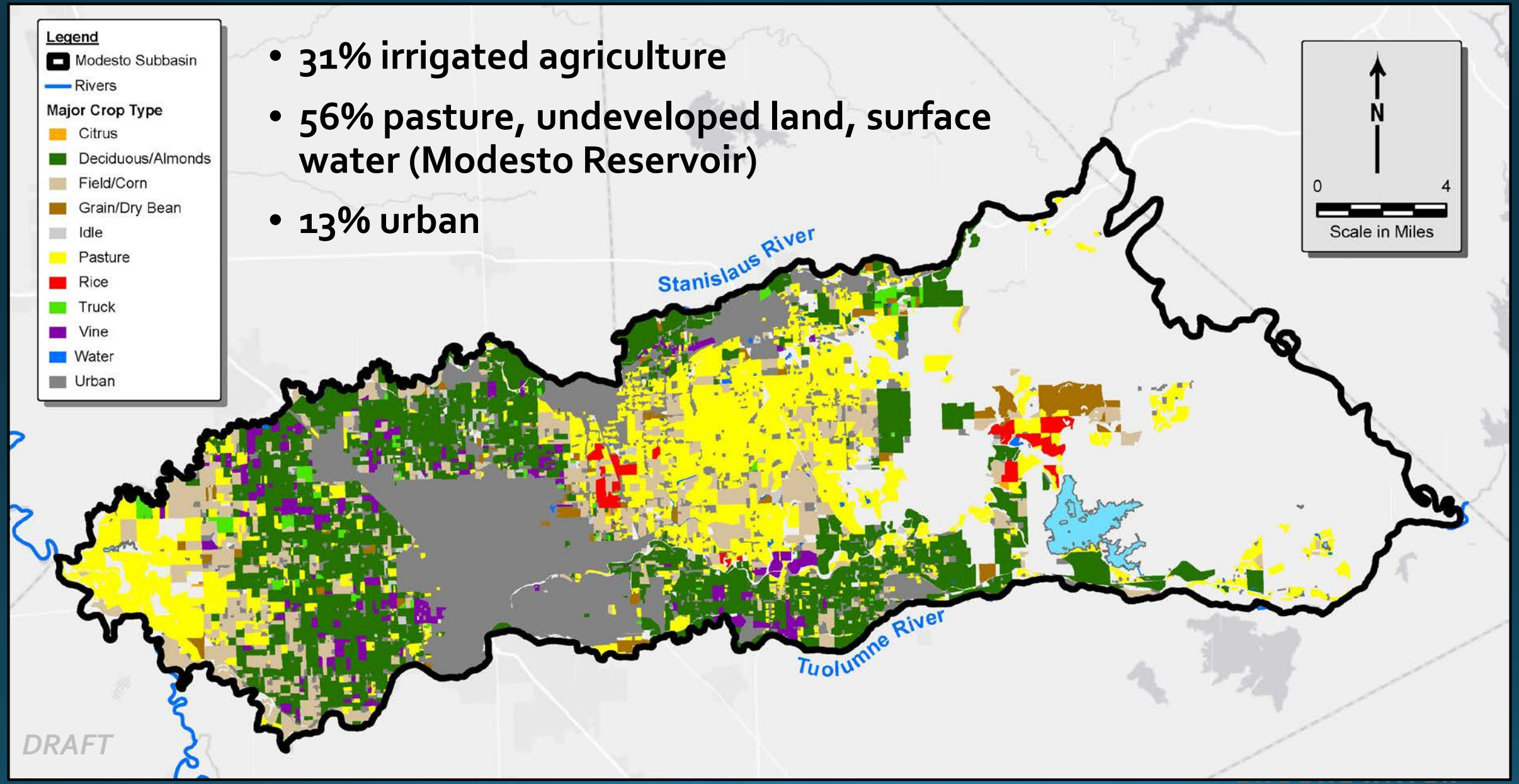


Source: California Farmland Mapping and Monitoring Program

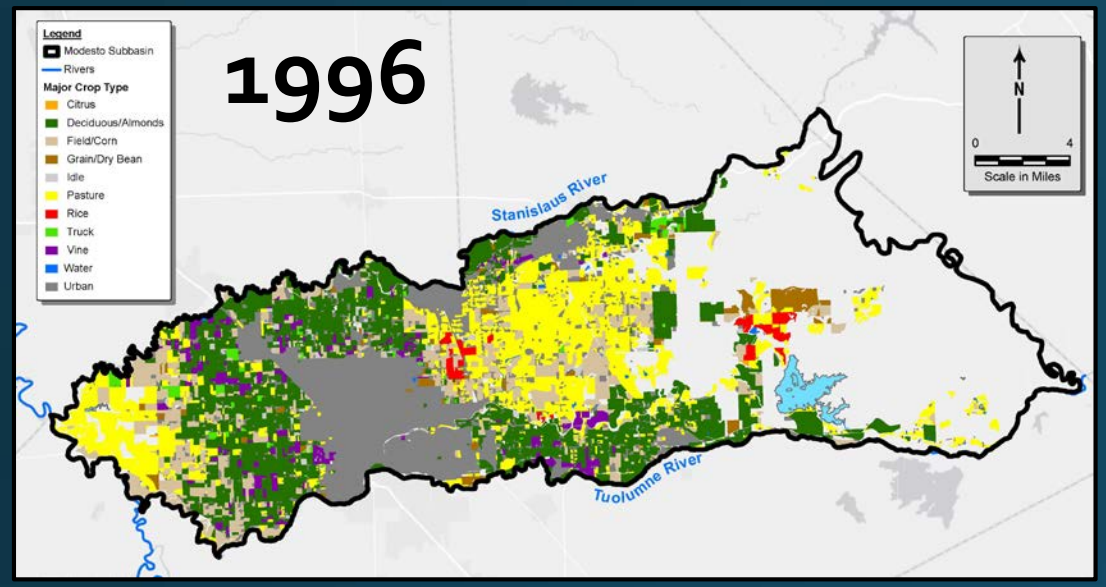
Existing Land Use (2017)

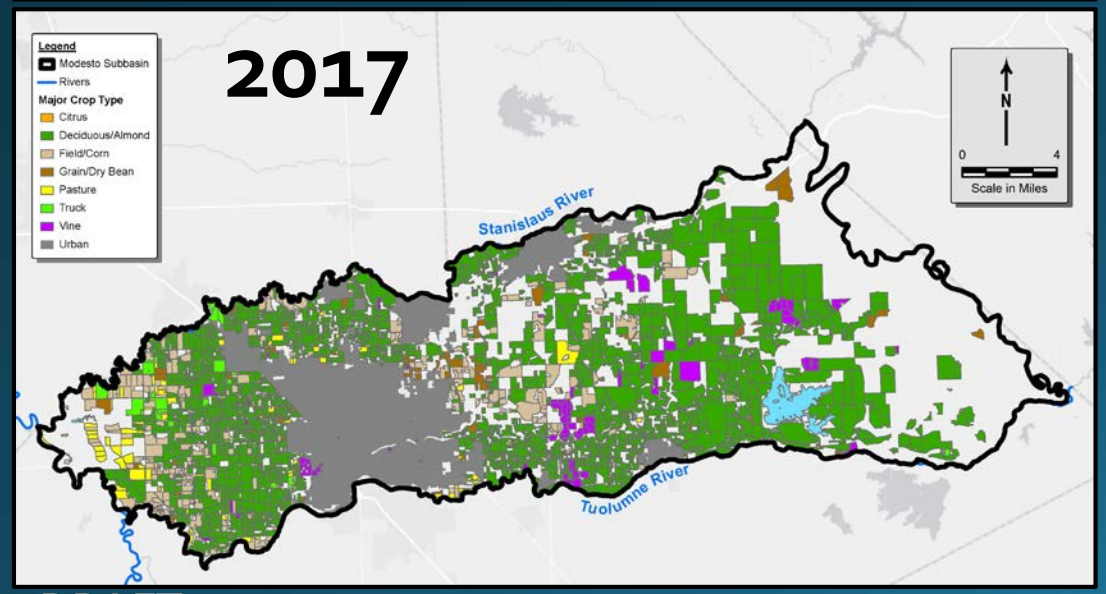


1996 DWR Land Use Map



1996 to 2017 Land Use Changes





- Substantial conversion of pasture to other crops
- Irrigated agriculture increased substantially in the eastern Subbasin (areas reliant on groundwater)
- Deciduous/almond (green) increased from 18 to 37% of Subbasin

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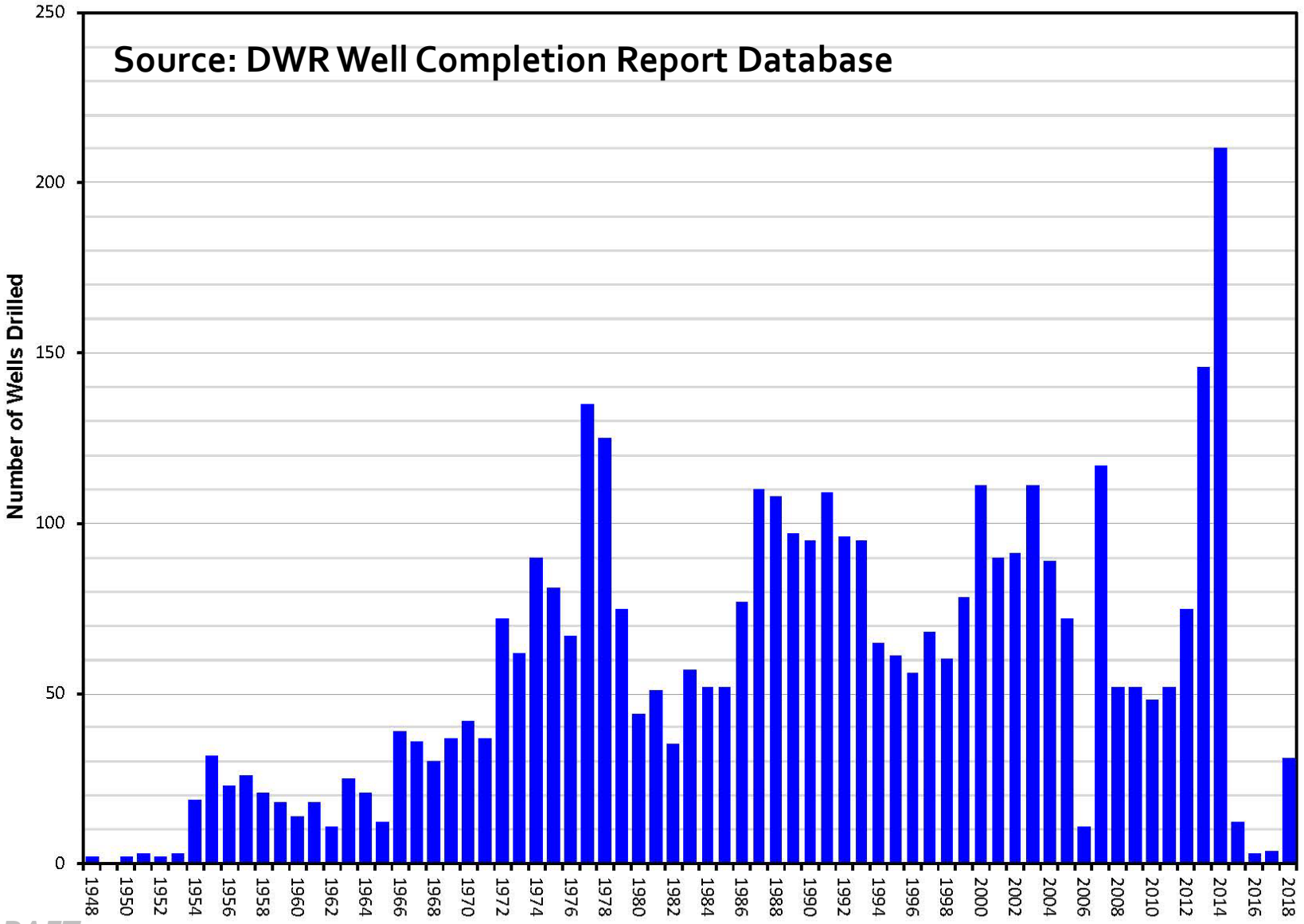
Number of Wells Drilled in Subbasin



- ~5,800 wells in database
- ~4,000 with dates (1948-August 2018)
- Pre-1970: <40/year
- Post-1970: 50-100 wells/year
- 2013/2014: ~350 wells drilled

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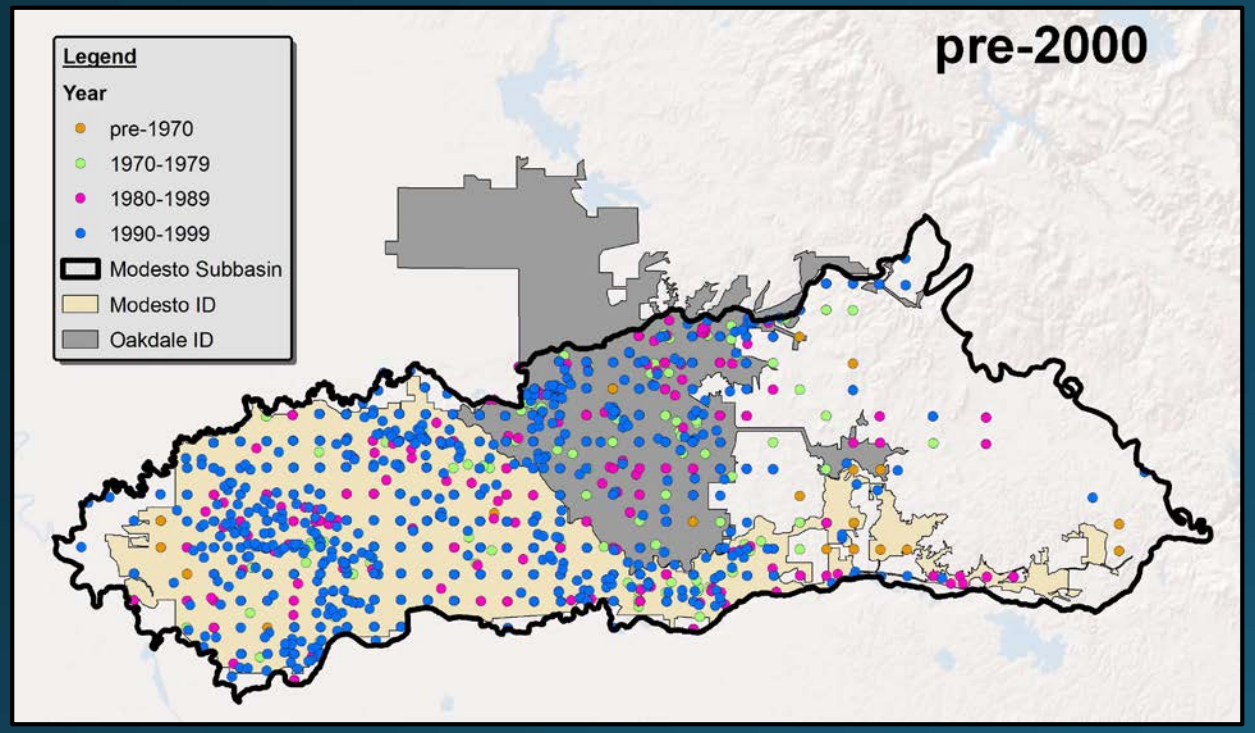
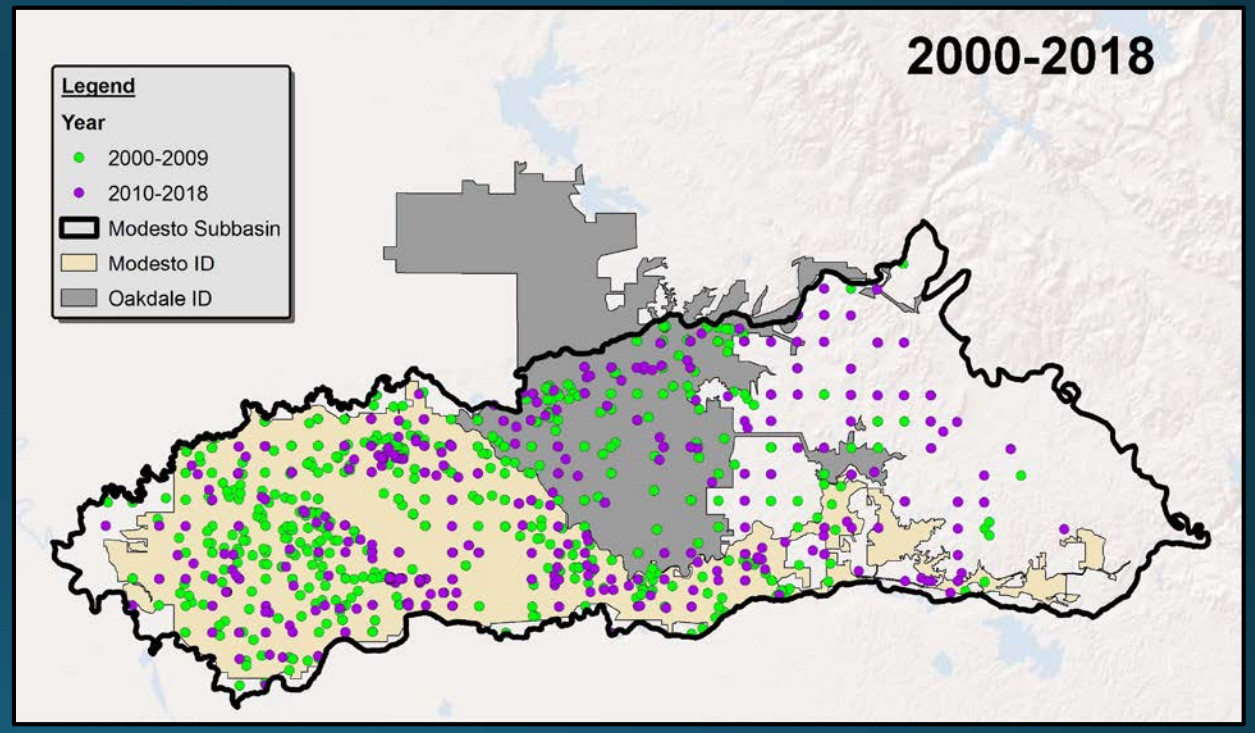
Location of Wells Drilled in Subbasin





- Well drilling since 2000 expanded into the eastern Subbasin (outside MID and OID boundaries)

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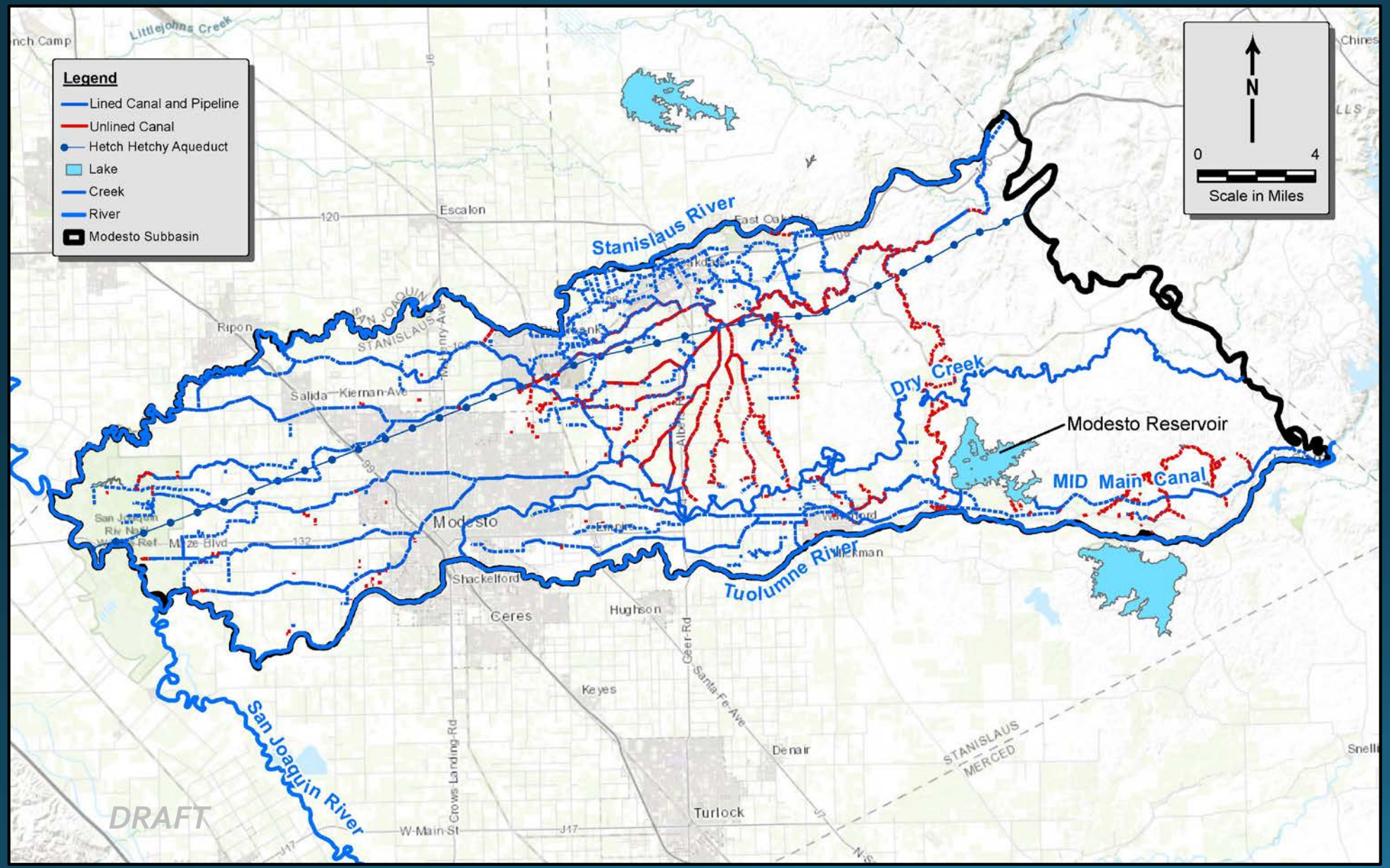
Surface Water Bodies and Conveyance



- Surface water from the Stanislaus and Tuolumne Rivers
- Groundwater
- No imported water

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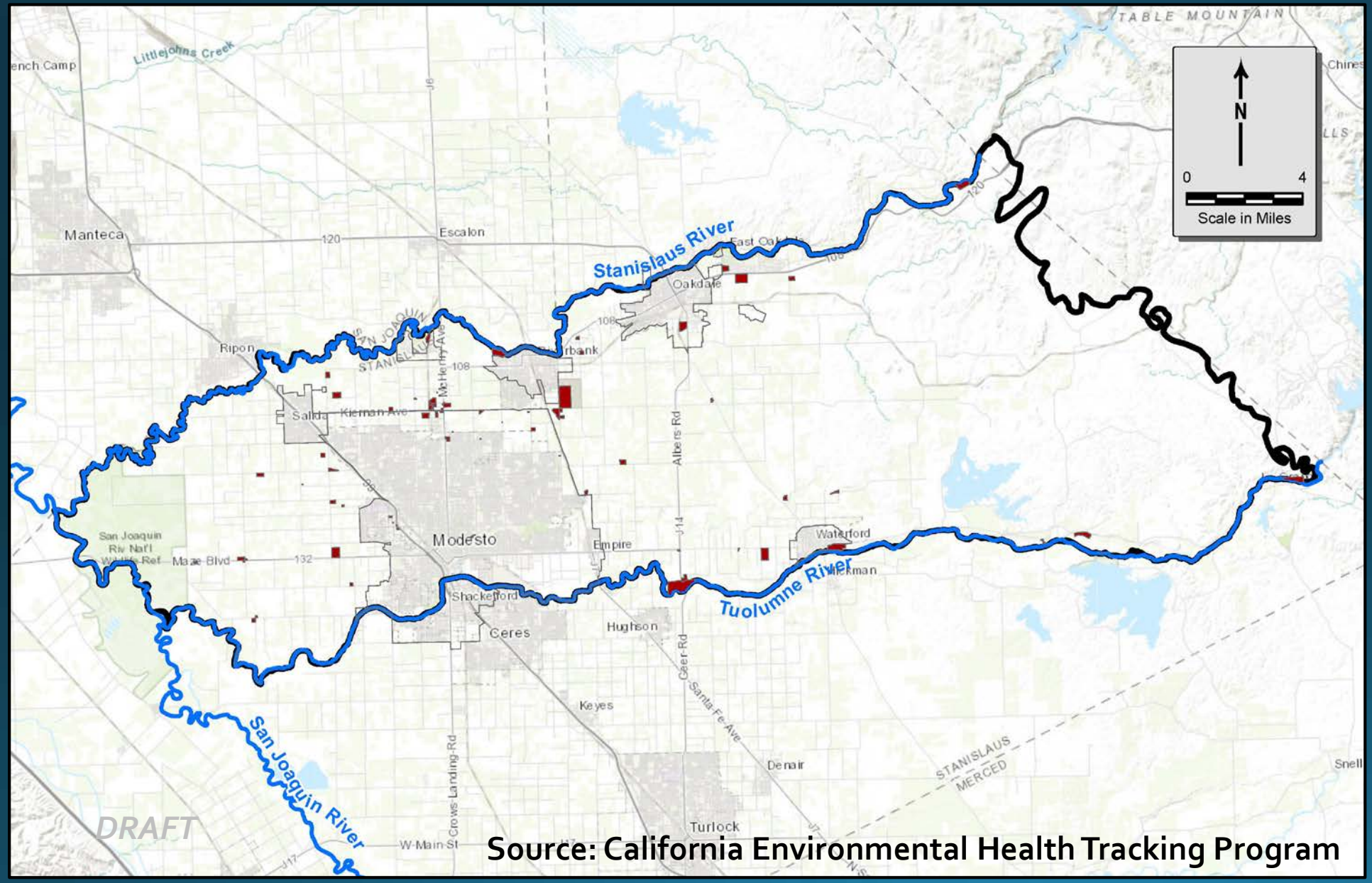
Small Community Water Systems



Source: California Environmental Health Tracking Program

- 78 small systems
- 56 have <10 connections
- 71 have <50 connections
- 7 have >50 connections

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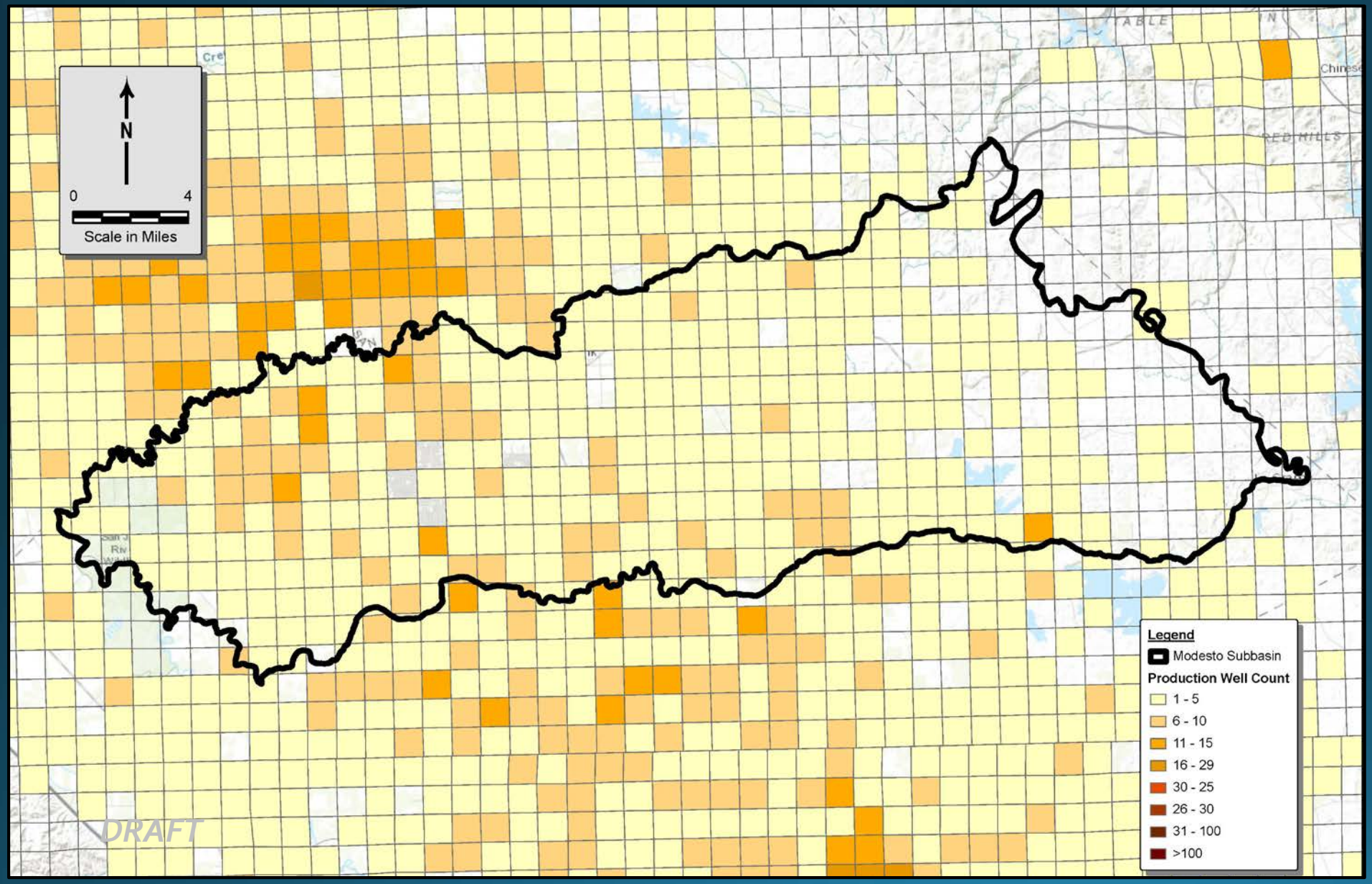
Production Well Density



- Number of Production Wells per square mile
- Includes agricultural, public, municipal and industrial wells
- DWR lists 4,009 wells in the 2018 Basin Prioritization

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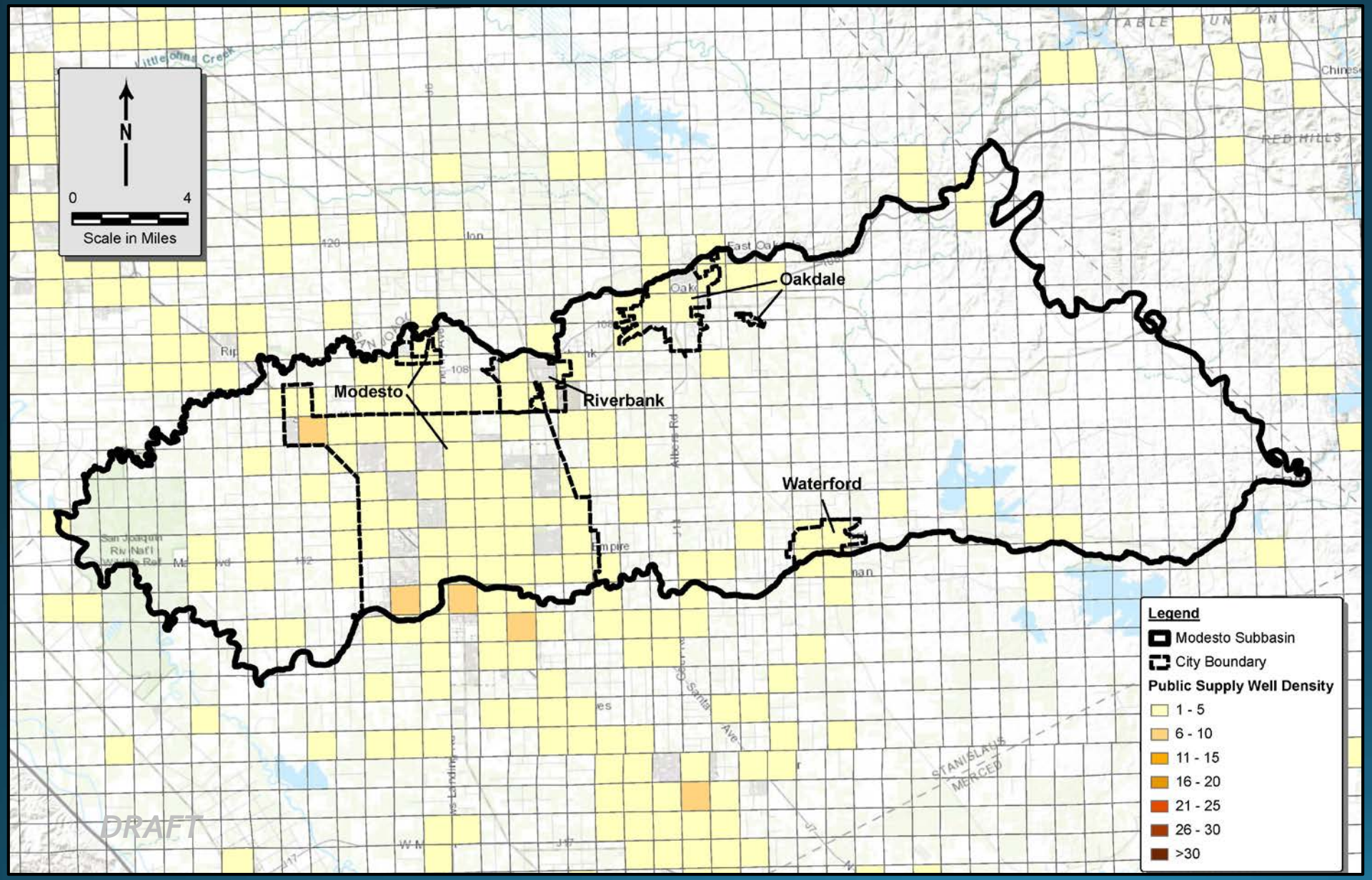
Public Supply Well Density



- Number of Public Water Supply Wells per square mile
- Largest density associated with municipalities
- Small community service districts
- DWR lists 194 PWS wells in the 2018 Basin Prioritization

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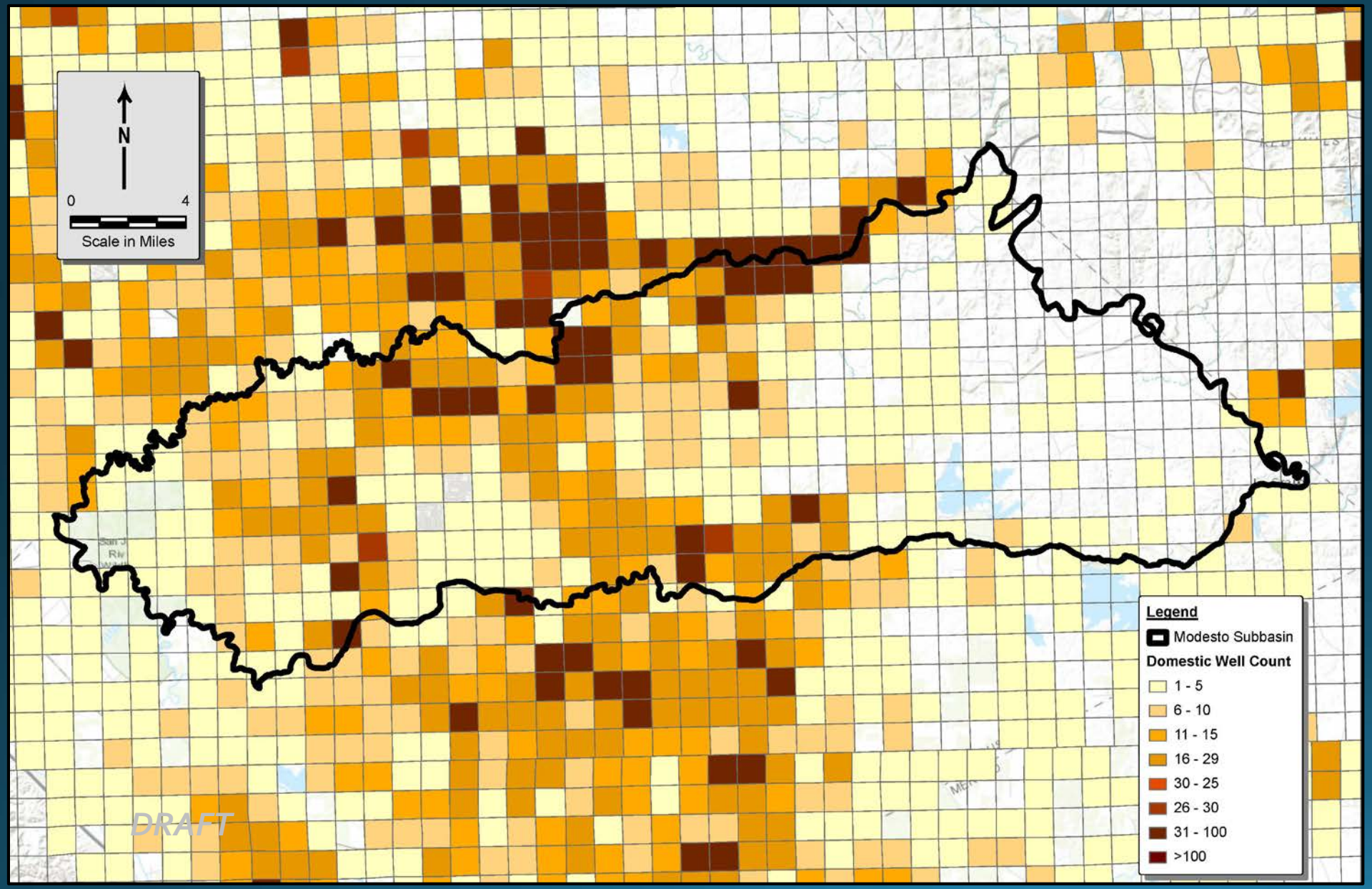
Domestic Well Density



- Number of domestic wells per square mile
- Largest density in the central Subbasin, near the Stanislaus and Tuolumne rivers, and west of Modesto
- Did wells go dry during the recent drought? If so, where?

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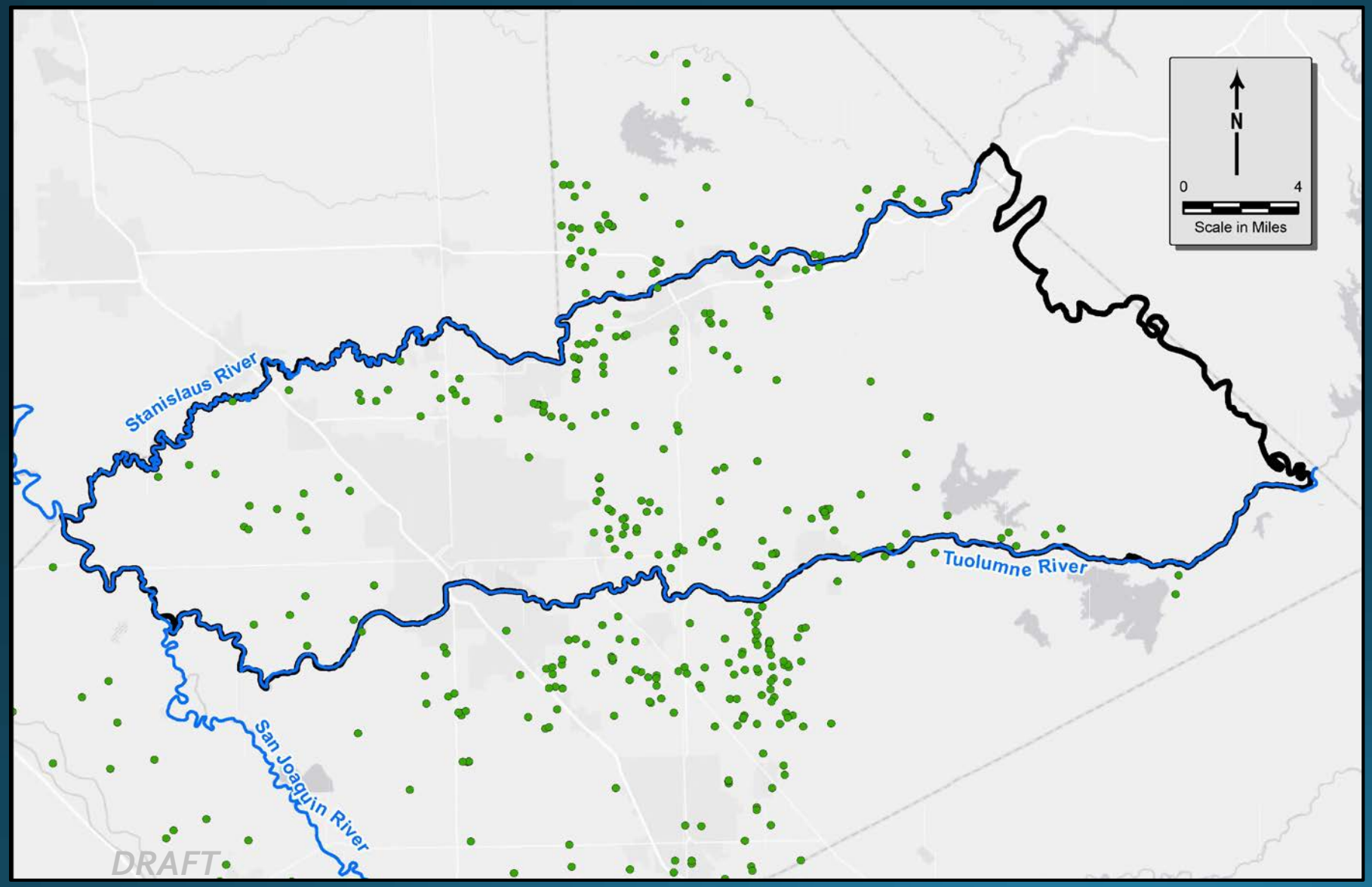
Dry Wells in Stanislaus County (2014-2017)



- 159 domestic wells went dry in the Subbasin during the most recent drought
- Most <100 ft deep and >50 years old
- County assisted well owners with storage tanks and new well installations
- Possible GSP strategies for assisting domestic supply?

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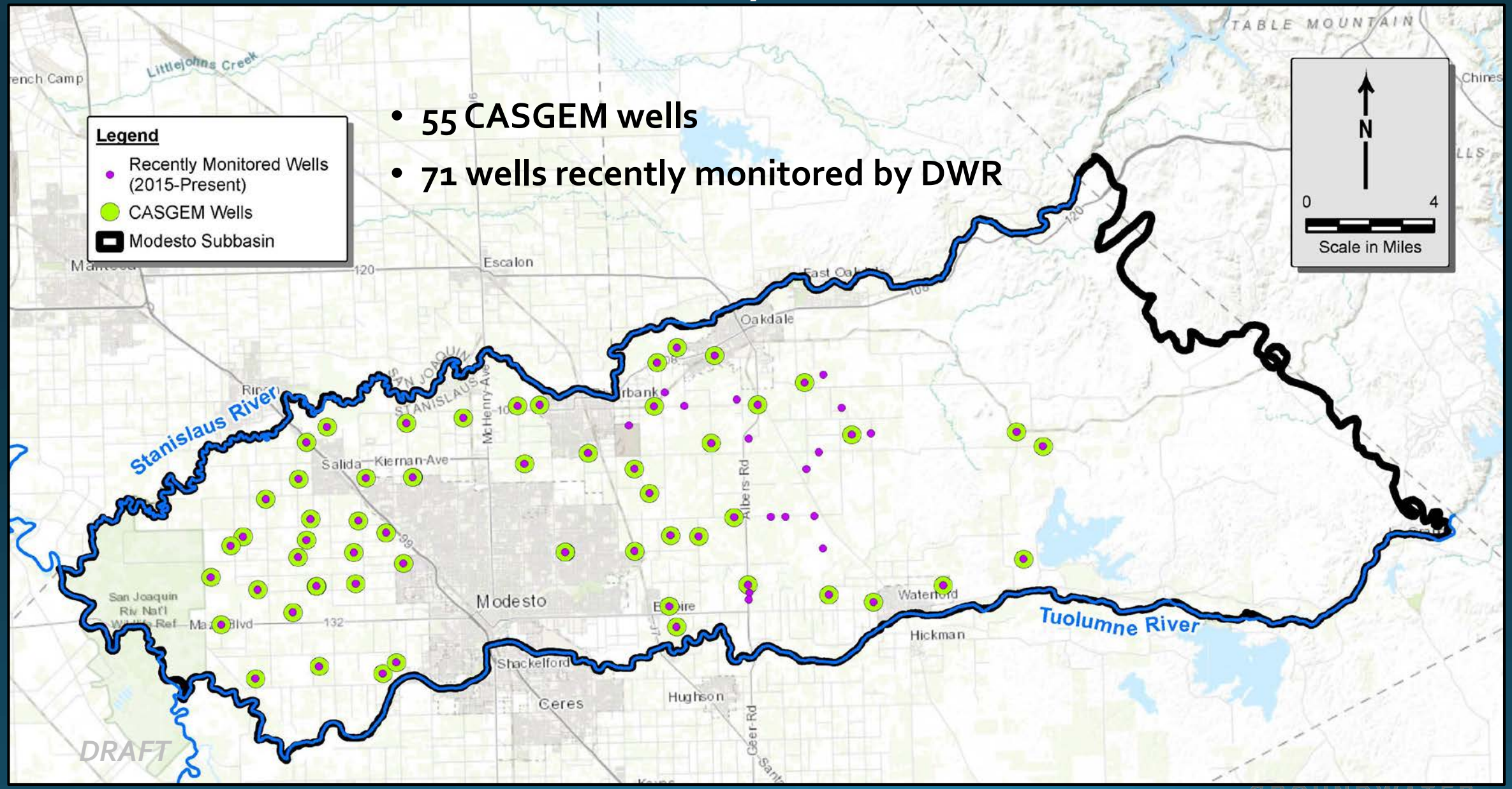
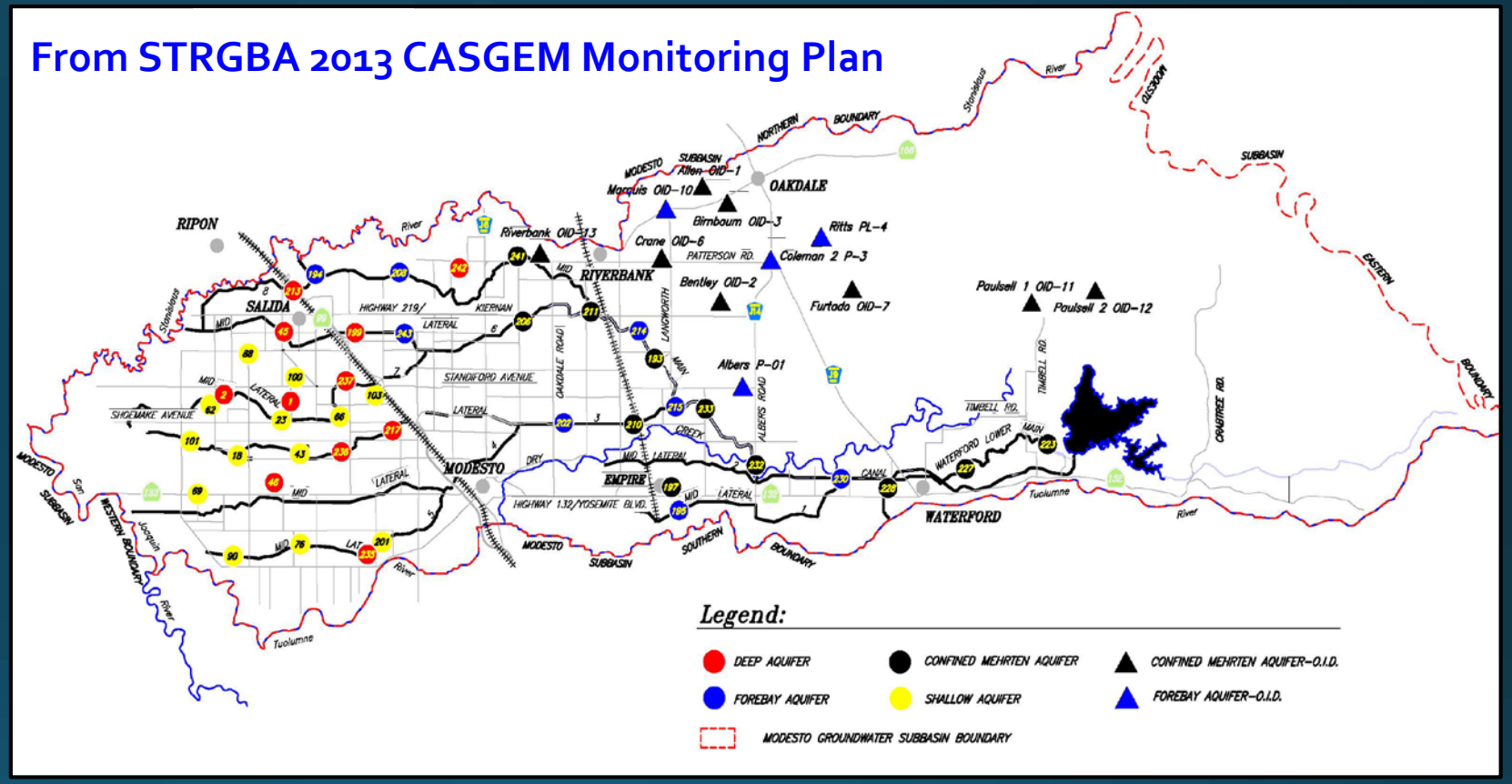
CASGEM and Recently Monitored DWR Wells



CASGEM Wells

STRGBA CASGEM Plan defines ***3 principal aquifers***:

- above Corcoran (13)
- below Corcoran (11)
- east of Corcoran
  - above Mehrten (12)
  - within Mehrten (19)



Principal Aquifer is a term of art in SGMA

The CASGEM designation of the 3 Principal Aquifers is consistent with Turlock Subbasin and Merced Subbasin – good!

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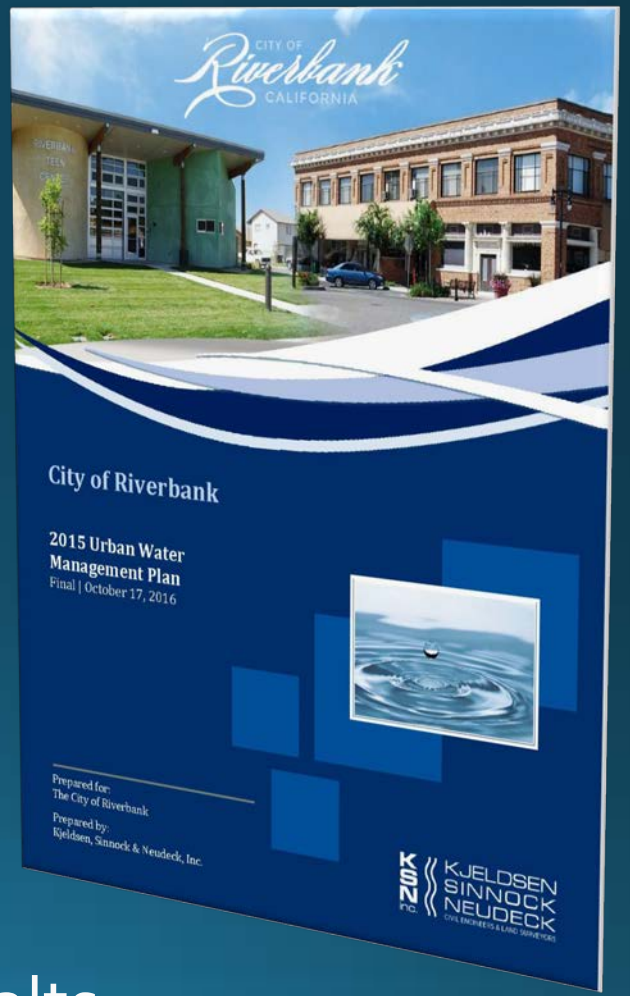
Plan Area – Water Resources Programs

- Water Conservation
- Metering
- Public Education
- Planning documents
  - Integrated Regional Groundwater Management Plan
  - Urban Water Management Plans
  - Agricultural Water Management Plans
  - Irrigated Lands Program – Groundwater Assessment Report (GAR)
  - Salt and Nutrient Management Plans – CV Salts



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Land Use Planning

- Stanislaus County Groundwater Ordinance and Discretionary Well Permitting and Management Program
- General Plans:
  - Modesto
  - Oakdale
  - Riverbank
  - Waterford
  - Stanislaus County
- How General Plans could affect GSP
  - Do they increase water demands?
  - Do they limit movement of supplies?
  - Do they protect habitat? Vegetation?

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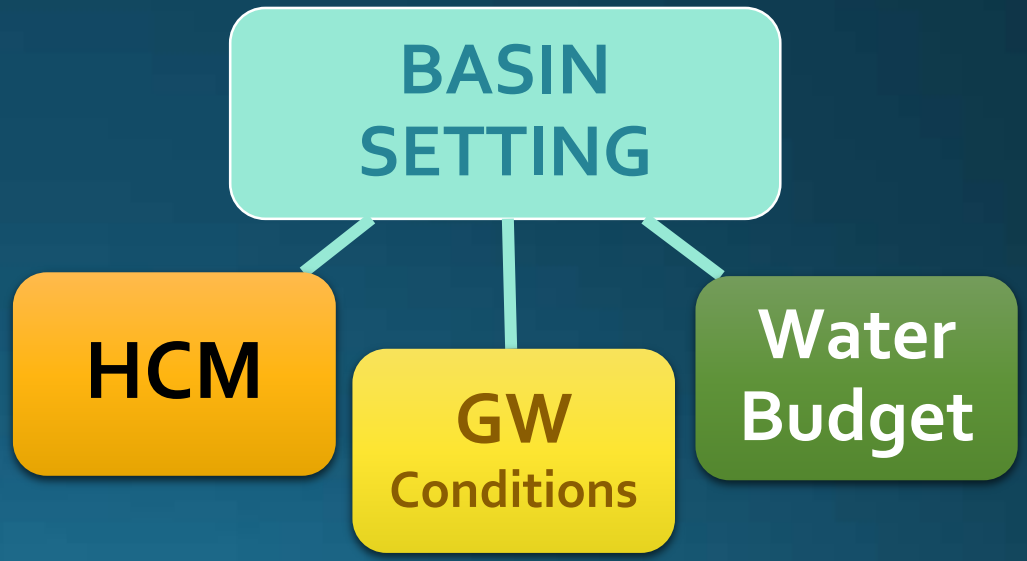
GSP Requirements for Basin Setting

- Hydrogeologic Conceptual Model (HCM)
- Groundwater Conditions
- Water Budget Analysis
  - Historical and Current periods
  - Uses groundwater model



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Hydrogeologic Conceptual Model GSP Requirements

What does the groundwater basin look like?

- Physical Setting
  - Topography
  - Geologic and structural setting
  - Surface geology, soils
  - Hydrology
- Groundwater Basin and Aquifers
  - Basin geometry, lateral boundaries and bottom
  - Principal aquifers and aquitards and properties
  - Stratigraphic and structural changes

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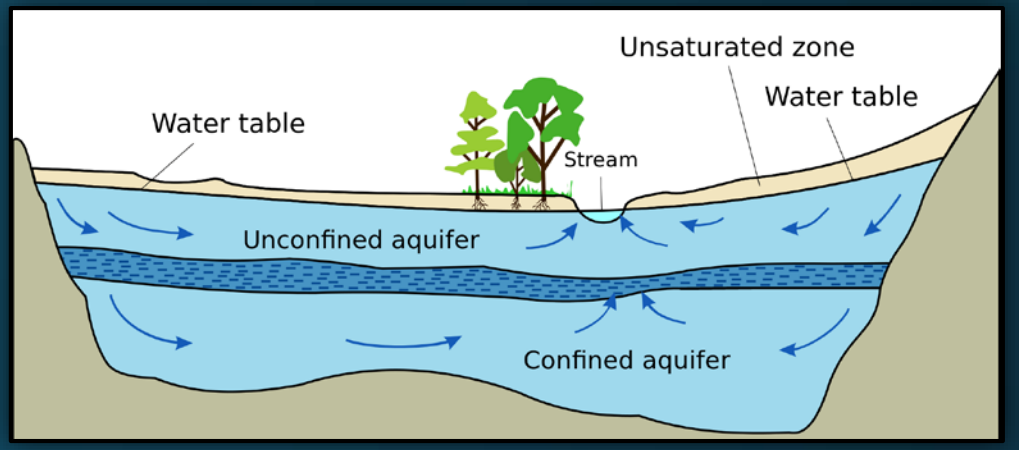
Groundwater Conditions GSP Requirements



What are the current and historical groundwater conditions?

- Hydrographs (changes in groundwater levels over time)
- Groundwater elevation contour maps
- Changes in groundwater in storage (between seasonal highs)
- Groundwater quality
- Land subsidence
- Groundwater Dependent Ecosystems (if applicable)

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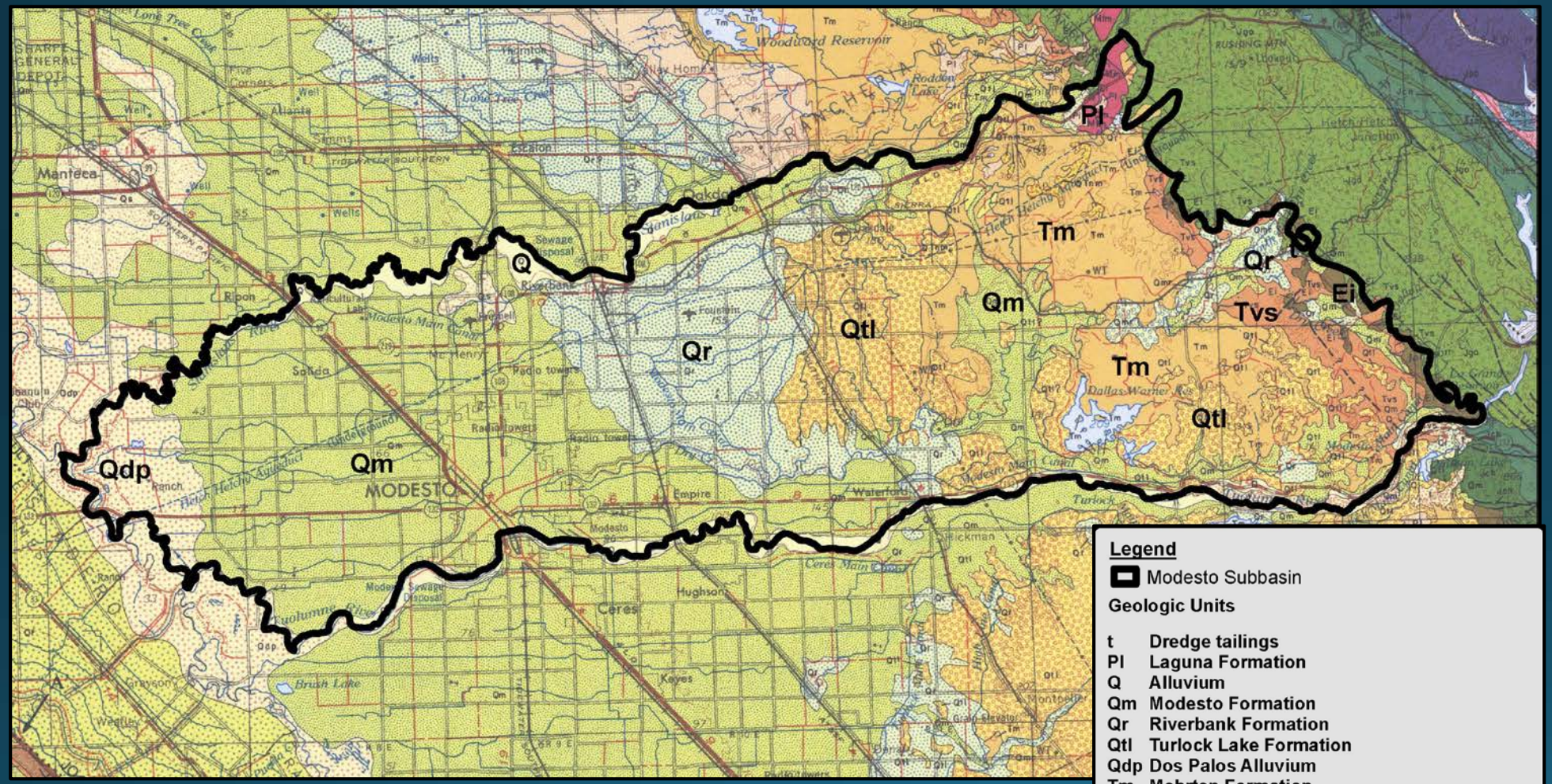
Geologic Map



- Older sediments in east dip west into the valley below younger units
- Younger sediments in west

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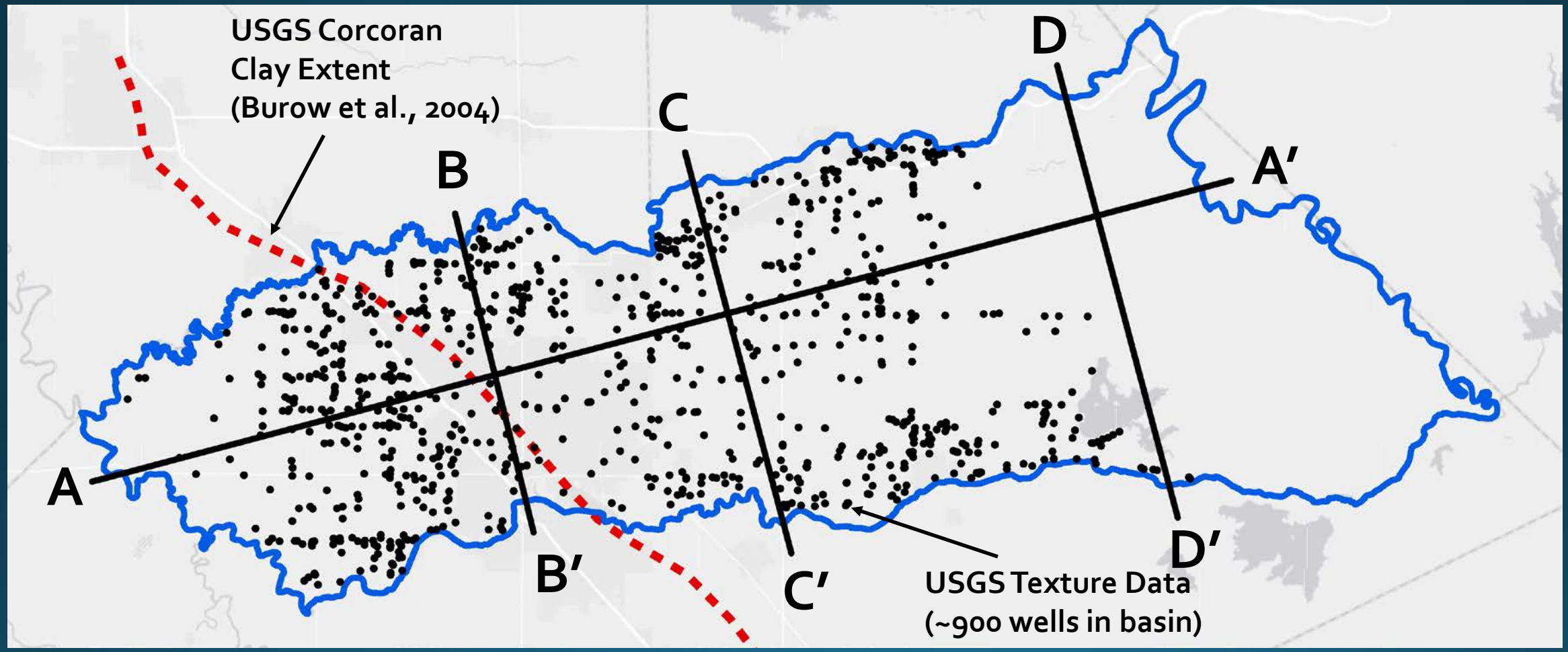
Cross Section Transects and Texture Data



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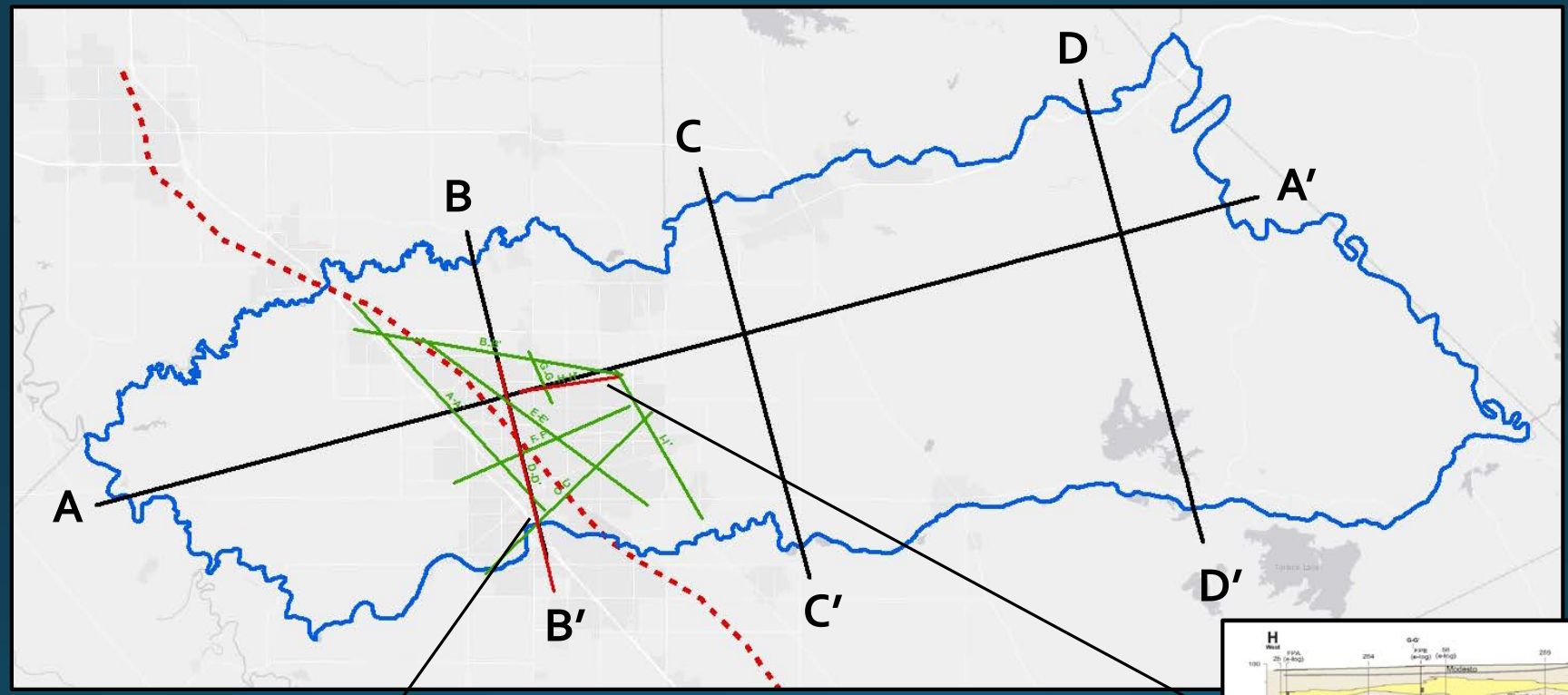
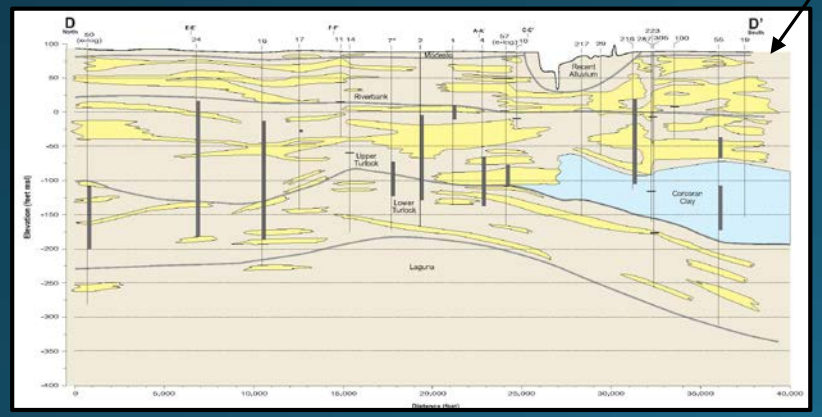
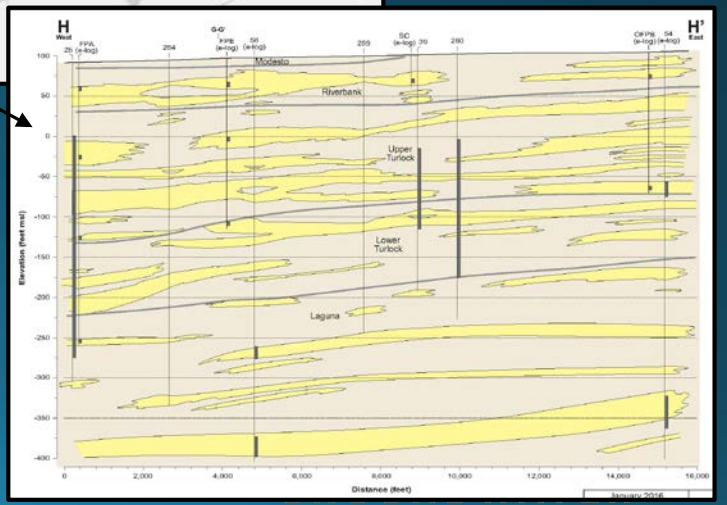
Incorporating City of Modesto Sections







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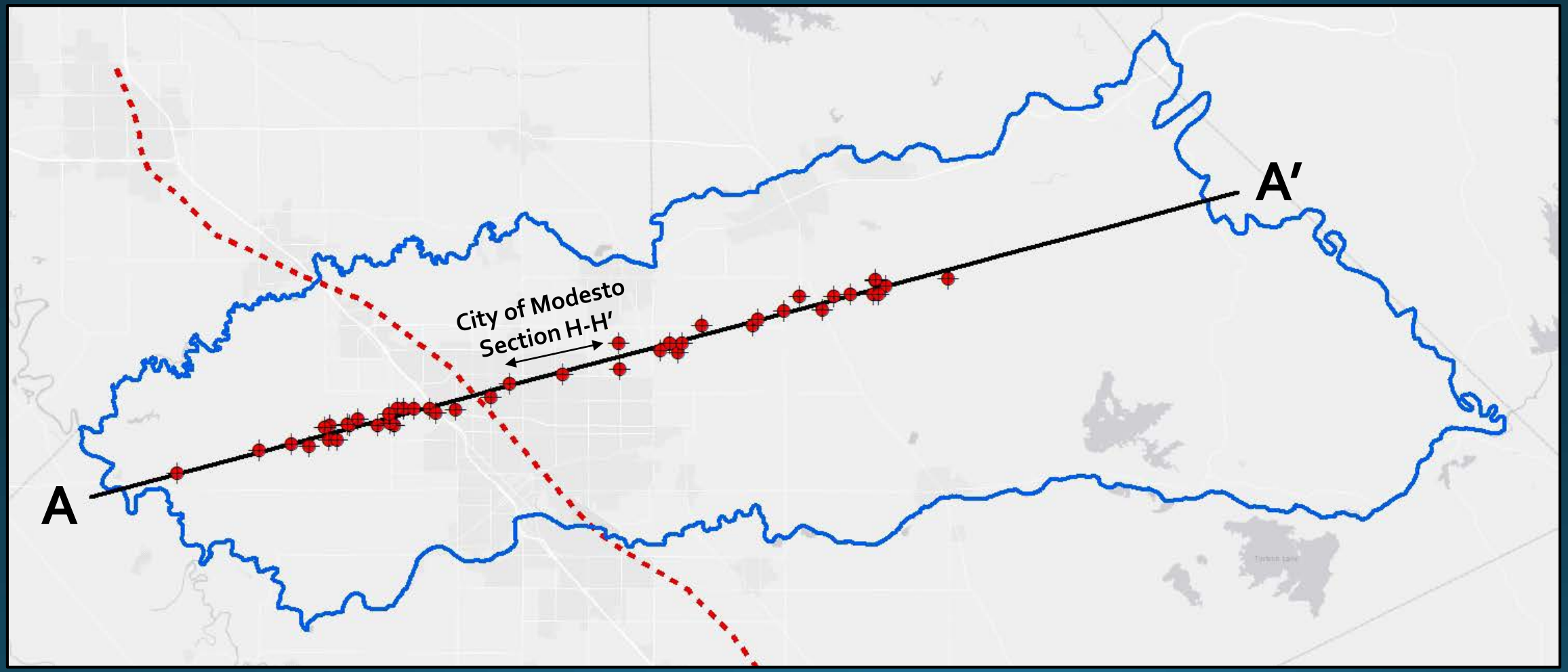
Cross Section A-A’



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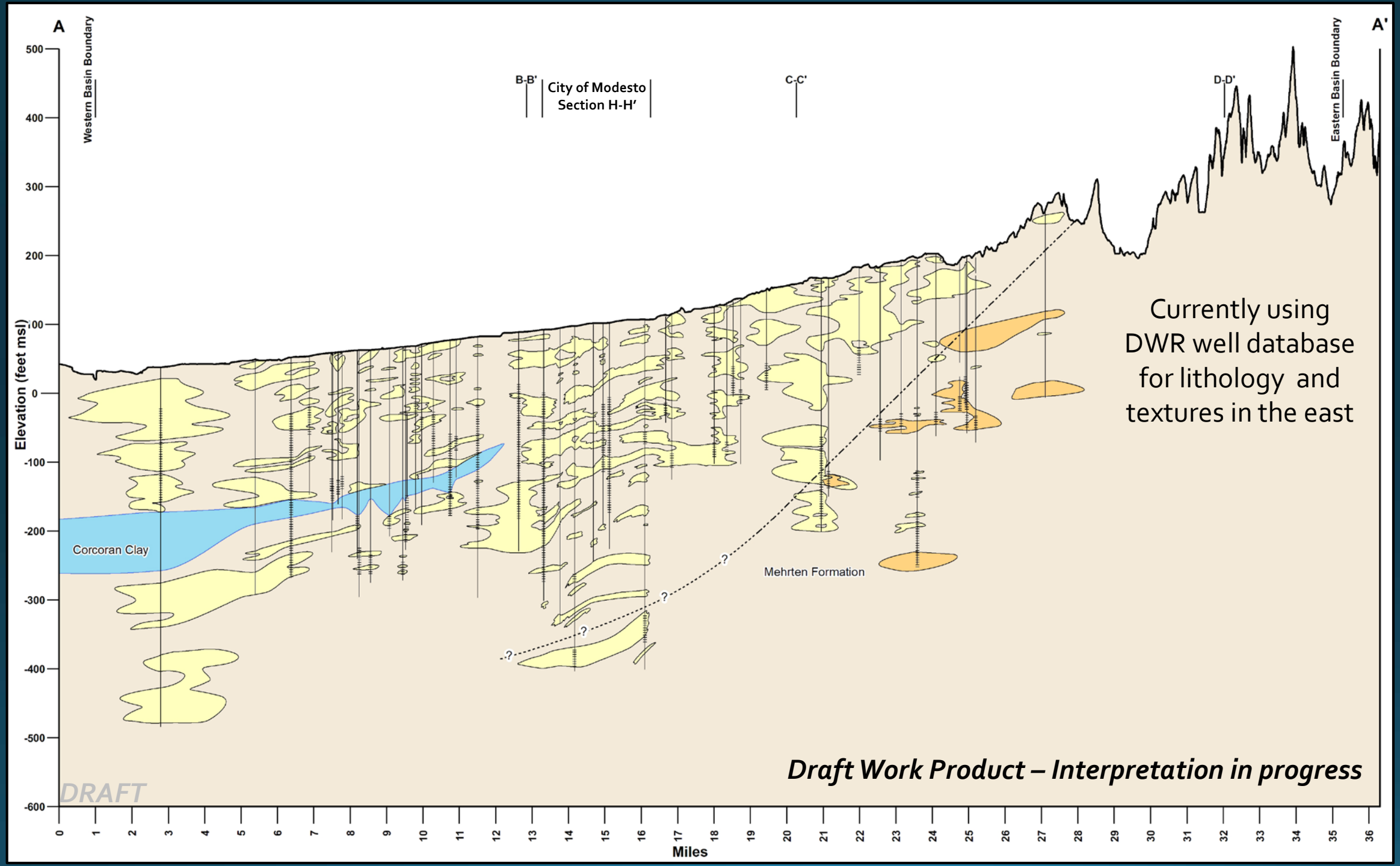
A
A'
Western Basin Boundary
Eastern Basin Boundary
B-B'
City of Modesto
Section H-H'
C-C'
D-D'
Elevation (feet msl)
500
400
300
200
100
0
-100
-200
-300
-400
-500
-600
Corcoran Clay
Mehrten Formation
?
?
?
?
Miles
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Currently using DWR well database for lithology and textures in the east
Draft Work Product – Interpretation in progress
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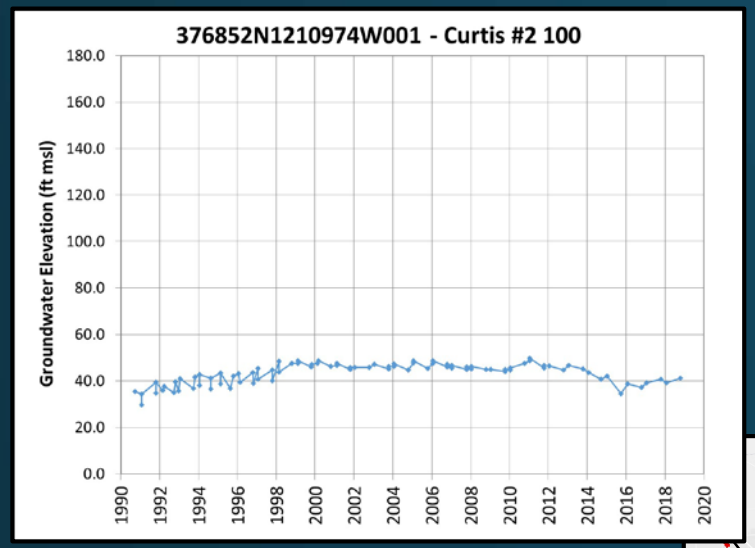
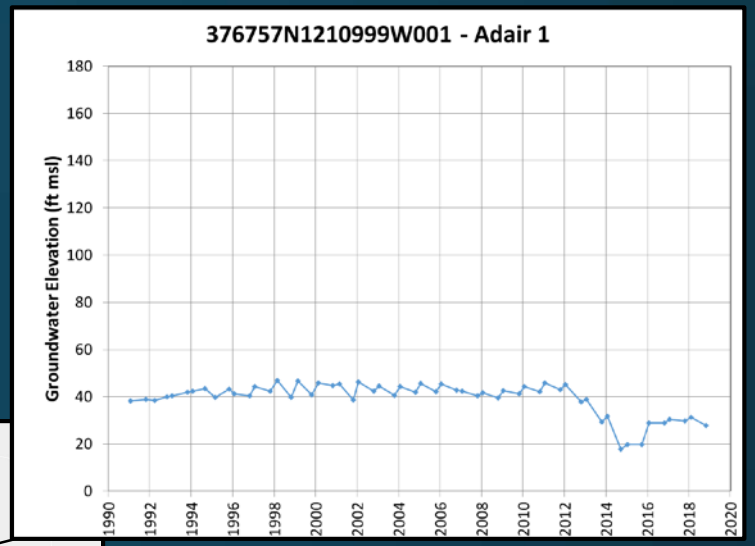
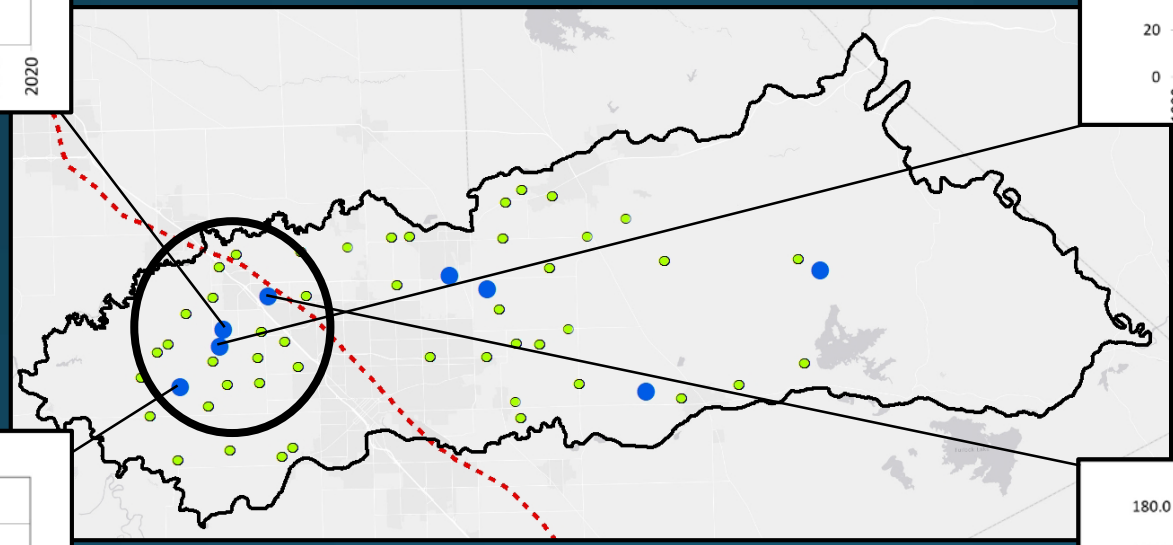
CASGEM Well Hydrographs (western Subbasin)

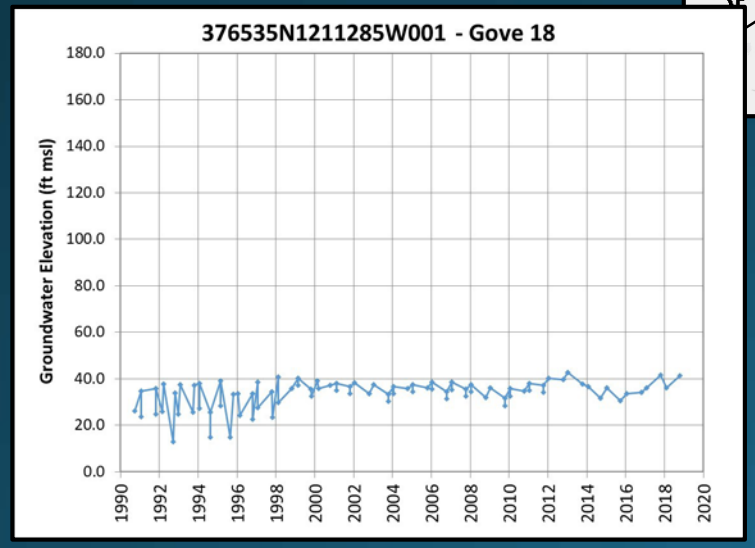


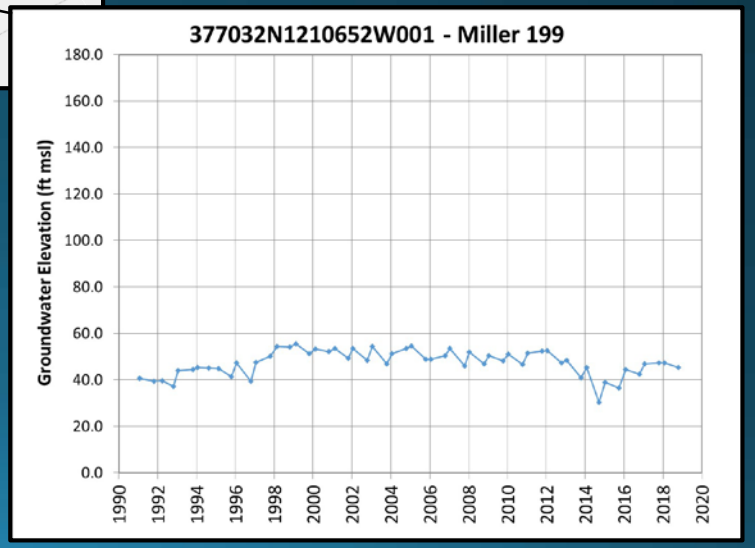


ABOVE CORCORAN



BELOW CORCORAN





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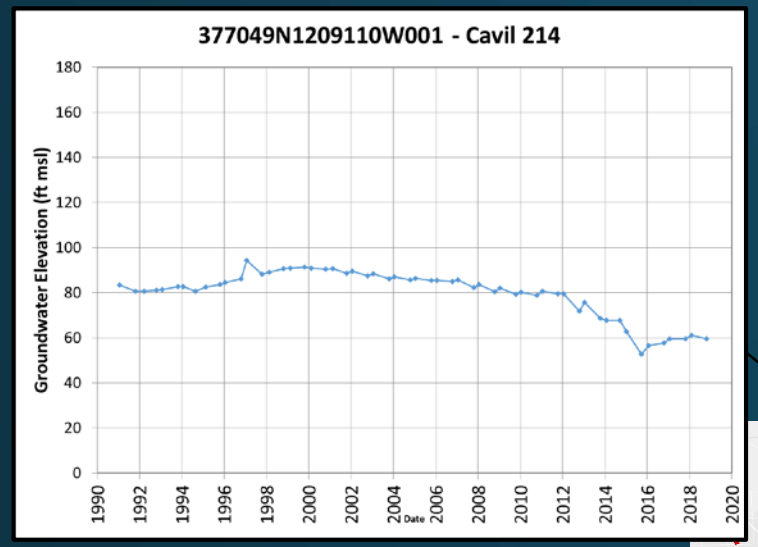
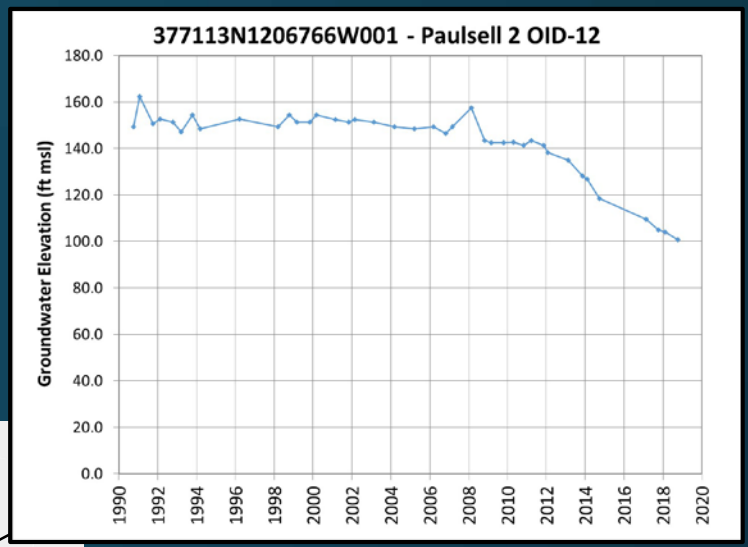
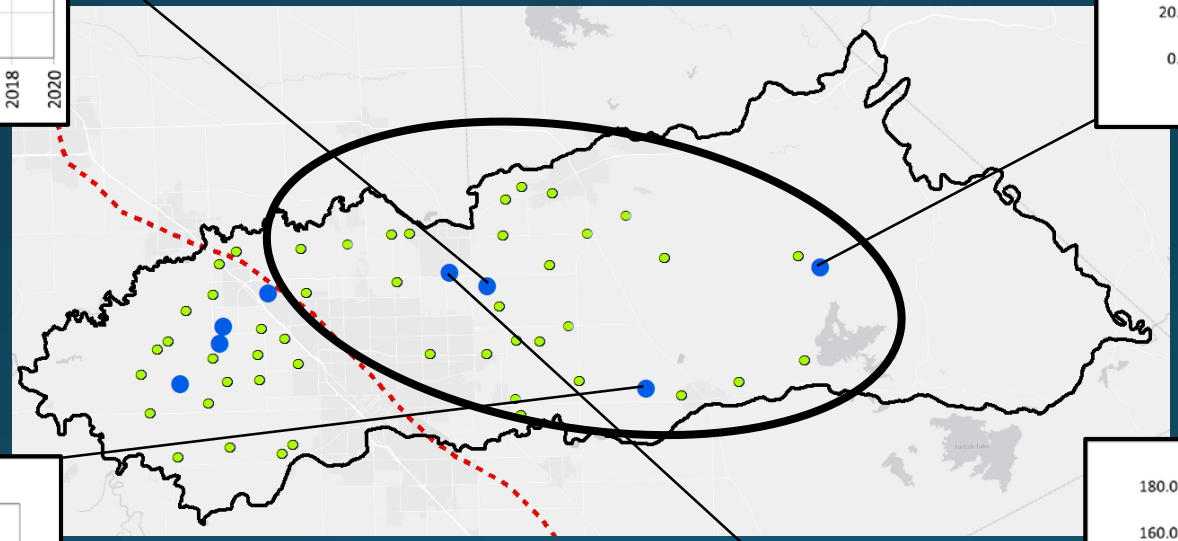
CASGEM Well Hydrographs (east of Corcoran)

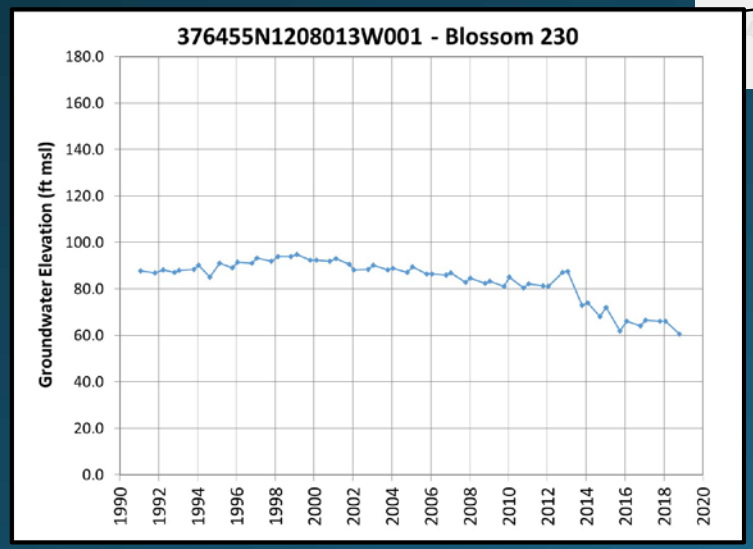


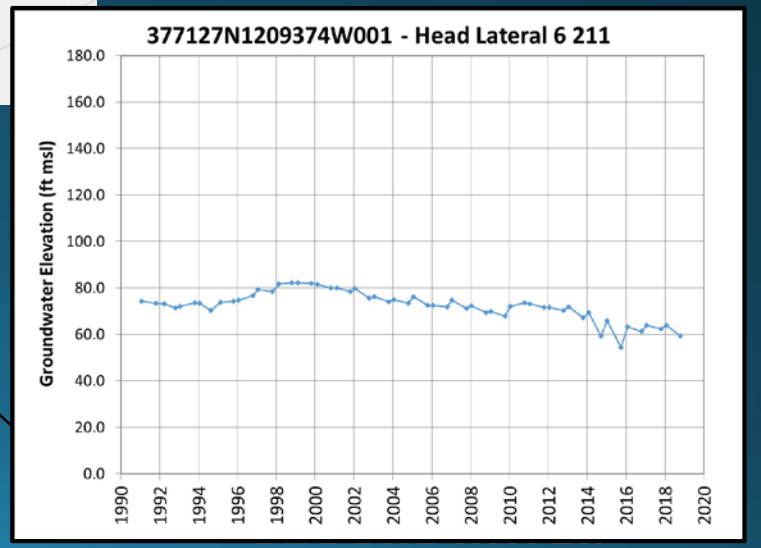


ABOVE MEHRTEN



WITHIN MEHRTEN





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Water Quality Database

	Arsenic (µg/L)	DBCP (µg/L)	Nitrate (as N) (mg/L)	PCE (µg/L)	Uranium (pCi/L)
Number of samples (N)	1,255	3,834	66,496	700	3,676
Maximum	190	116	42.9	1,360	55
75th percentile	6.8	0.27	7.25	7.30	13
Median	4	0.11	4.56	2.60	6.82
25th percentile	2	0.01	0.06	0.51	1.01
Drinking water standards (CA MCL)	10	0.2	10	5	20
% of samples > CA MCL	5.8%	31%	10%	34%	11%

Primary data sources: City of Modesto, ESJ, CV Salts, USGS 1920s – 2018

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TODD GROUNDWATER

Subsidence (March 2015 - May 2016)

Source: NASA JPL

TODD GROUNDWATER

GSP Next Steps

- Continue Technical Analysis
  - Hydrogeologic Conceptual Model
  - Groundwater Conditions
  - Modesto C2VSIM Model
- Provide Administrative Draft GSP Sections 1 and 2 (Administration Information and Plan Area) by end of April
- Prioritize Meetings:
  - Outreach Strategy Meeting (next week)
  - Adjacent Subbasin Coordination Meetings