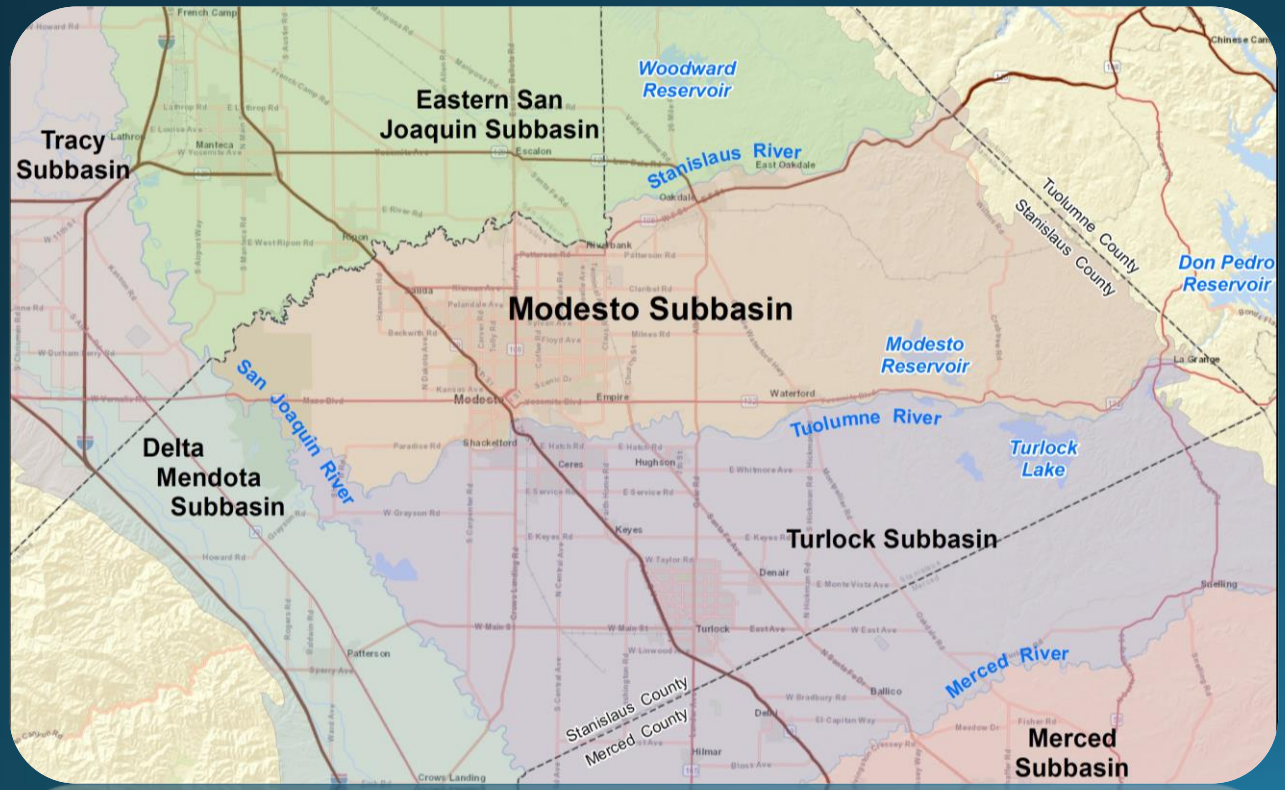
STRGBA Groundwater Sustainability Agency
Tuolumne Groundwater Sustainability Agency

Modesto Subbasin Groundwater Sustainability Plan (GSP) Technical Workshop No. 4

December 11, 2019



Where We Left Off

- August Workshop: Discussed Groundwater Quality
- Since the August Workshop:
  - Continued work on the Basin Setting
  - Continued work on the Modesto Subbasin Model

Today's Focus ⟶ Basin Setting Update

Presentation Outline

- Groundwater Conditions
- Well Depth Analysis
- Eastern Non-District Land Use Analysis
- Subsidence Data

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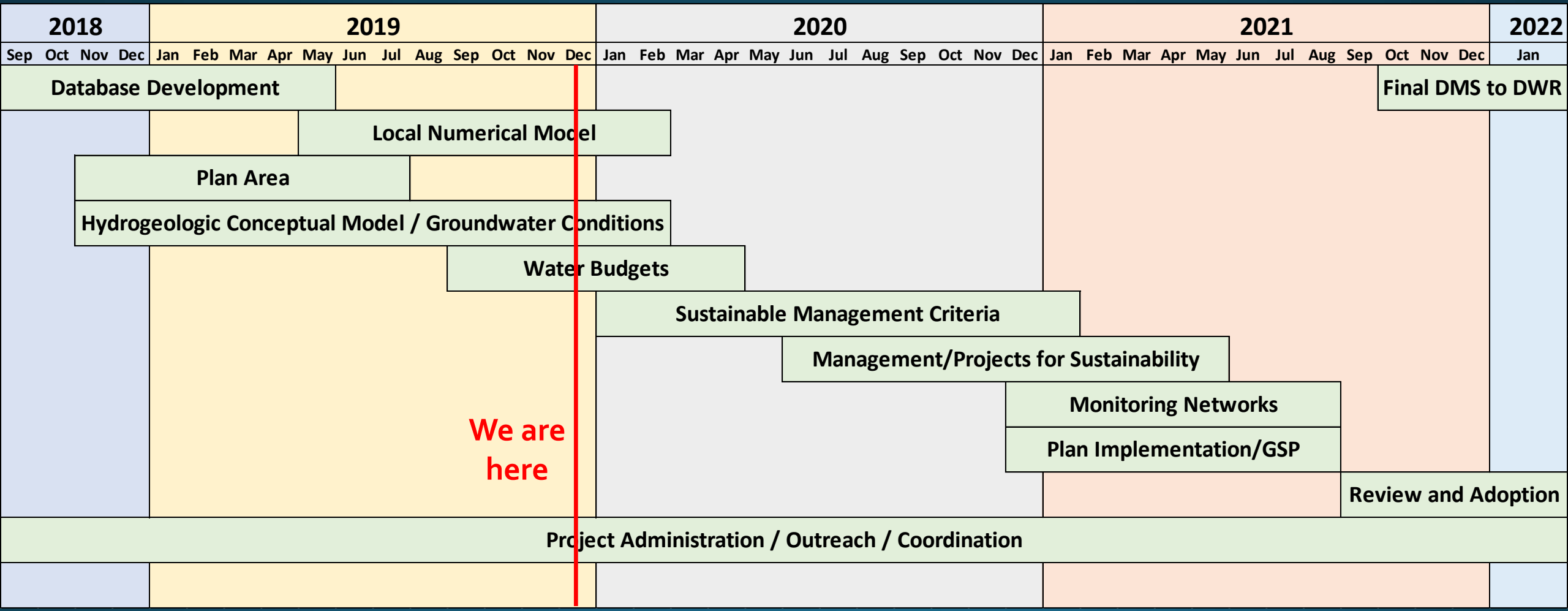
Modesto Subbasin GSP Timeline



TODD GROUNDWATER

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GSP Overview

Today's Workshop

Technical Components

- Data Compilation / Data Management System
- Institutional Setting – Water Supply / Plan Area
- Hydrogeologic Conceptual Model / Groundwater
- Water Budget (Current and Historical)

Policy Components

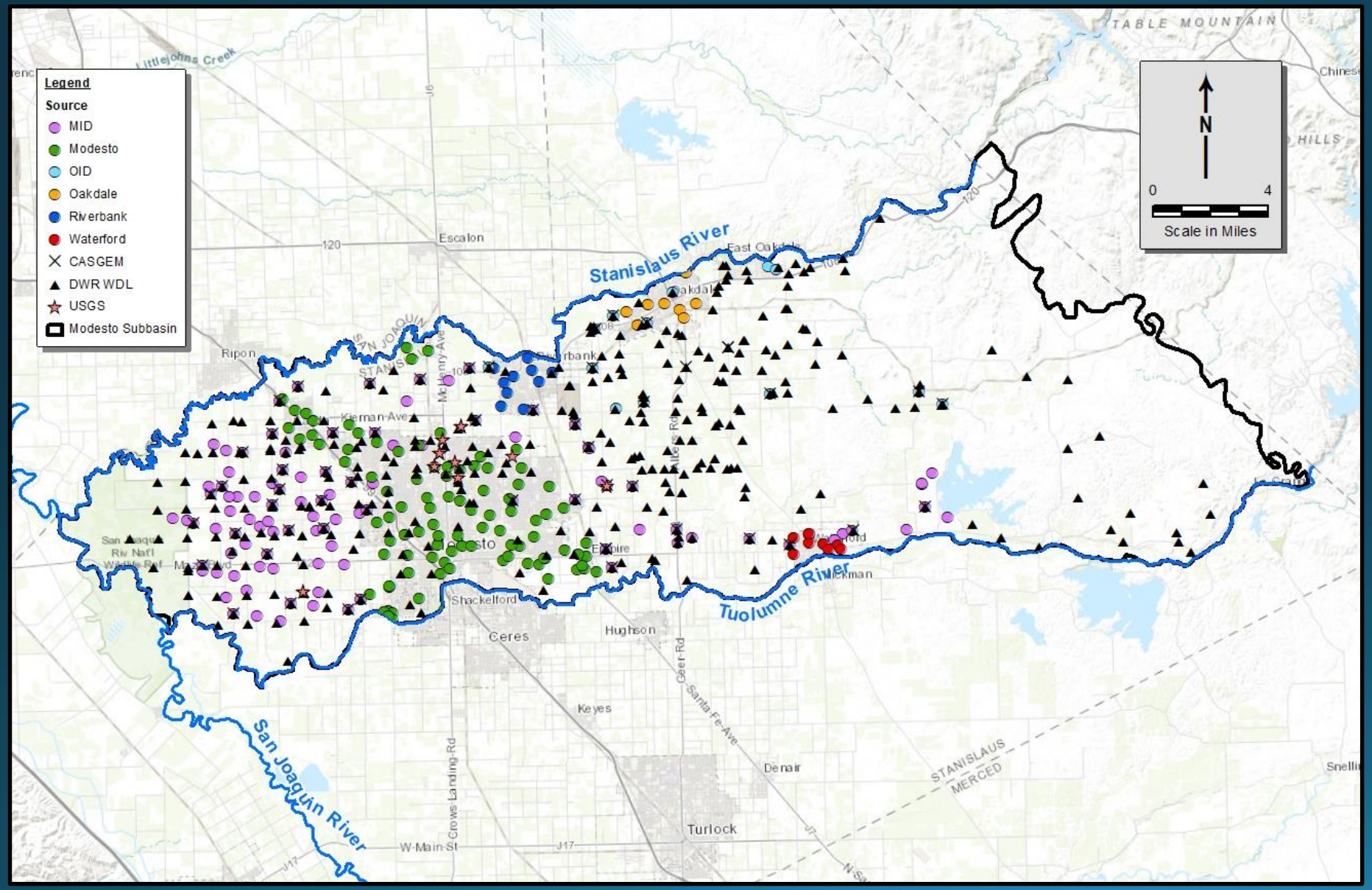
- Sustainability Goals and Criteria

Management / Plan Components

- Management Scenarios Projected Water Budget
- Monitoring Networks Plan Development

TODD GROUNDWATER

Wells with Water Level Data



- >600 wells
- Data Sources:
  - Irrigation Districts
  - Municipalities
  - CASGEM
  - DWR Water Data Library
  - USGS
- Sparse data in east

TODD GROUNDWATER

Representative Hydrograph Locations

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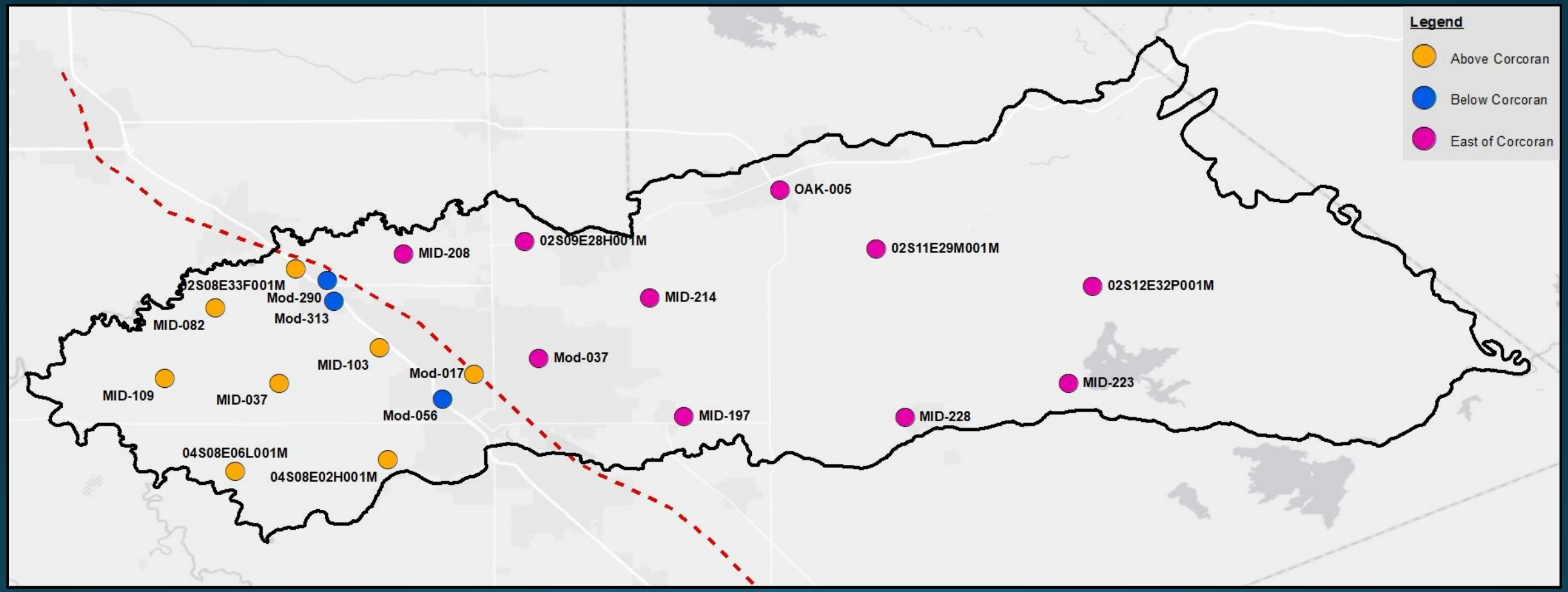

Sources: MID, City of Modesto, City of Oakdale, CASGEM, DWR WDL

TODD GROUNDWATER

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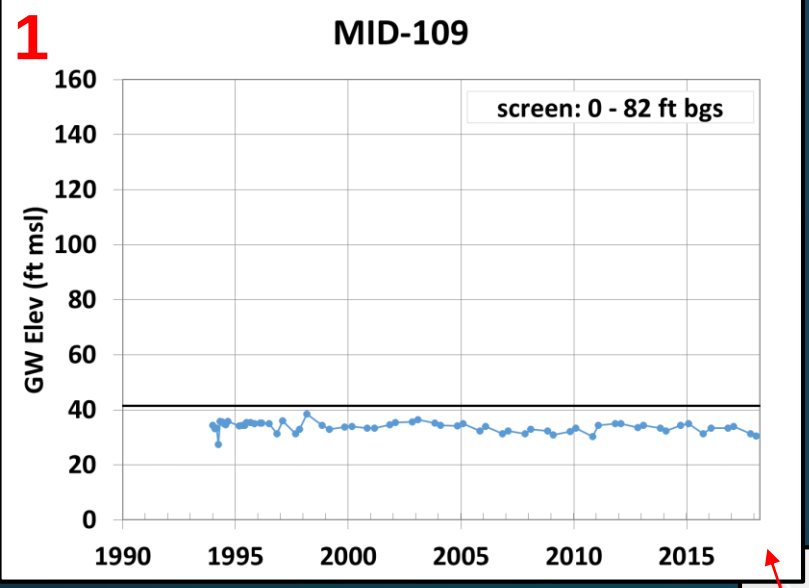

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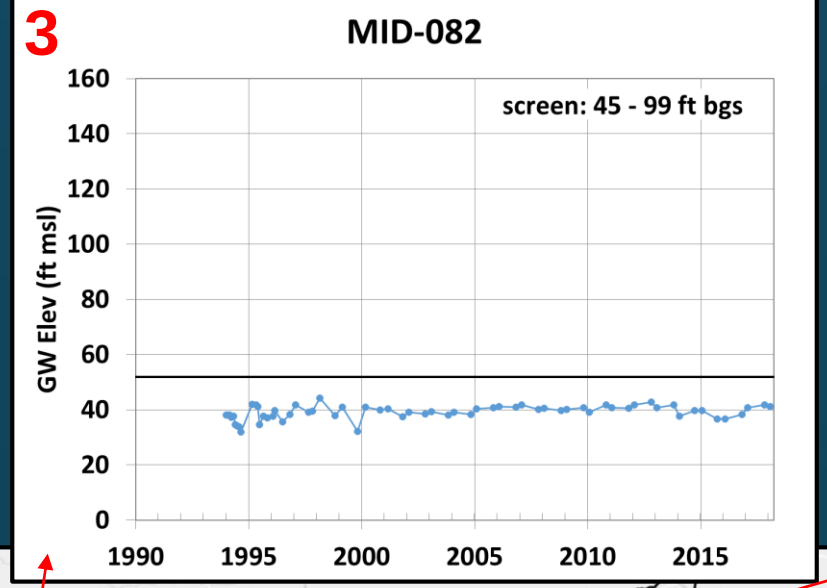

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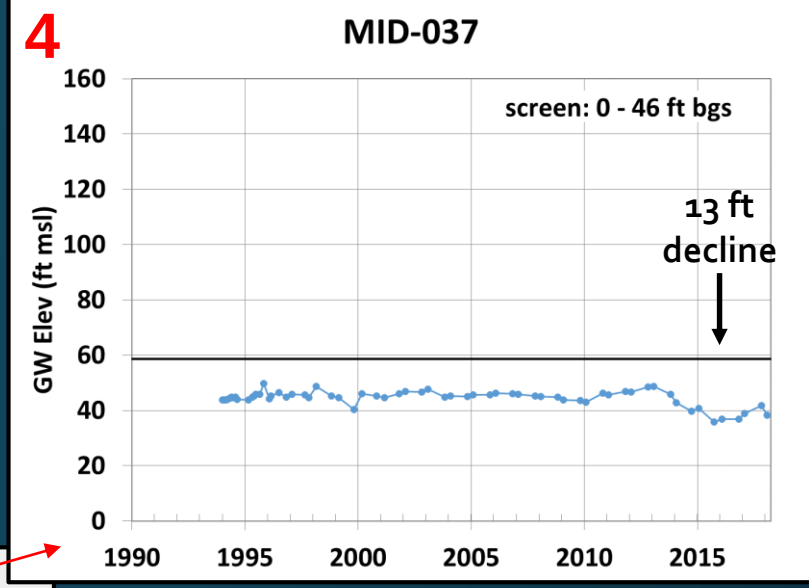

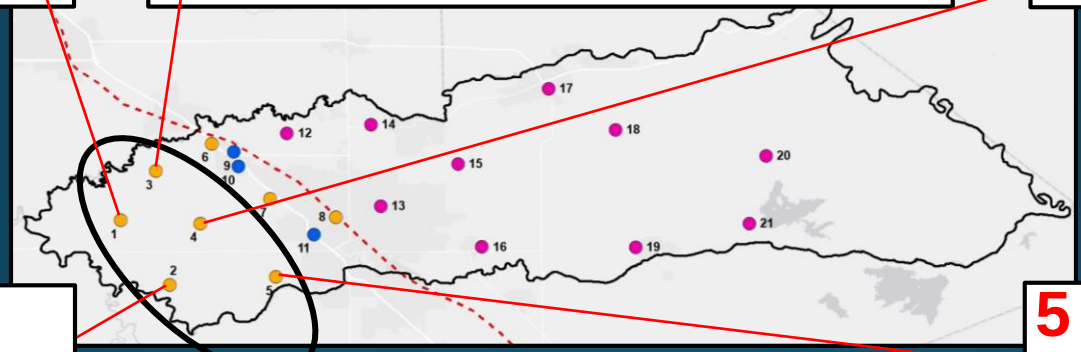

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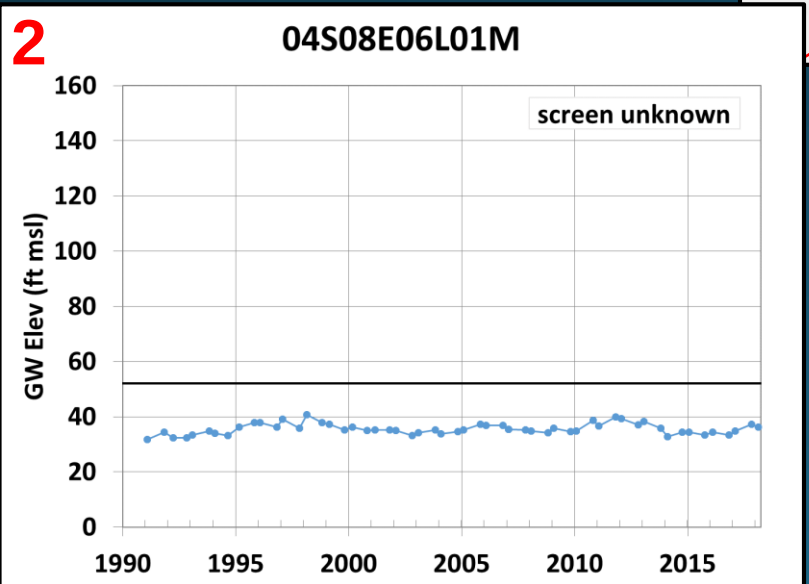
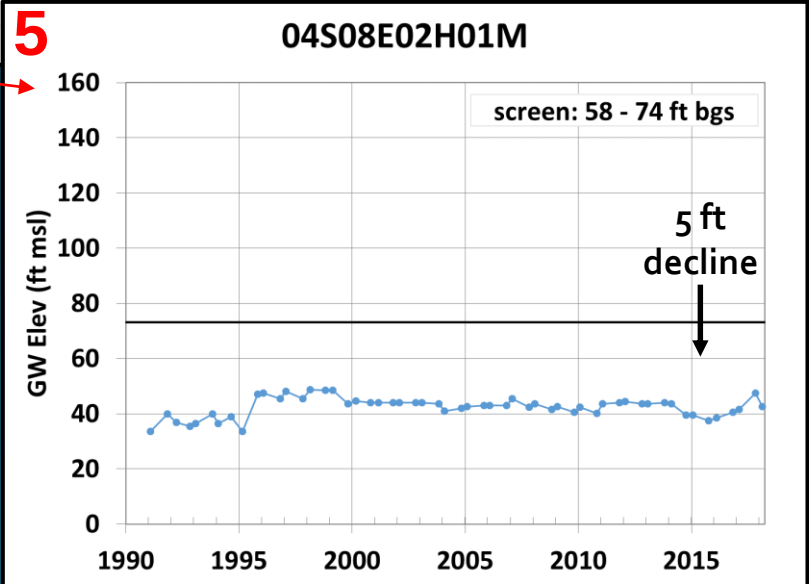
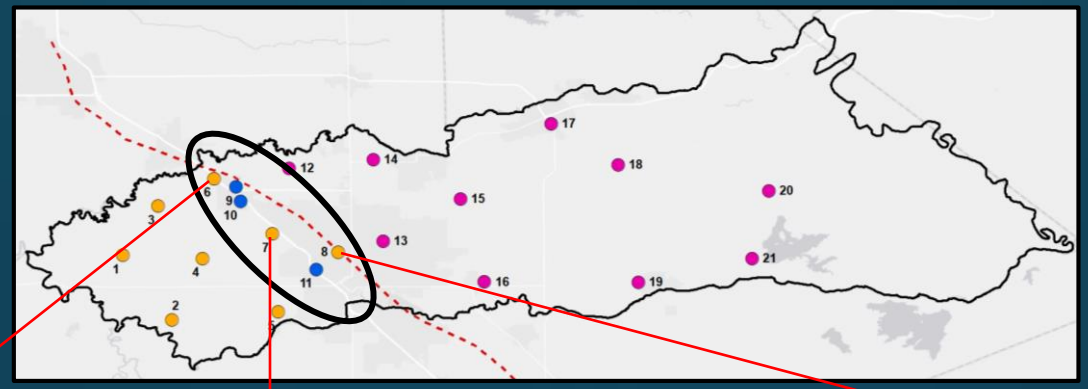


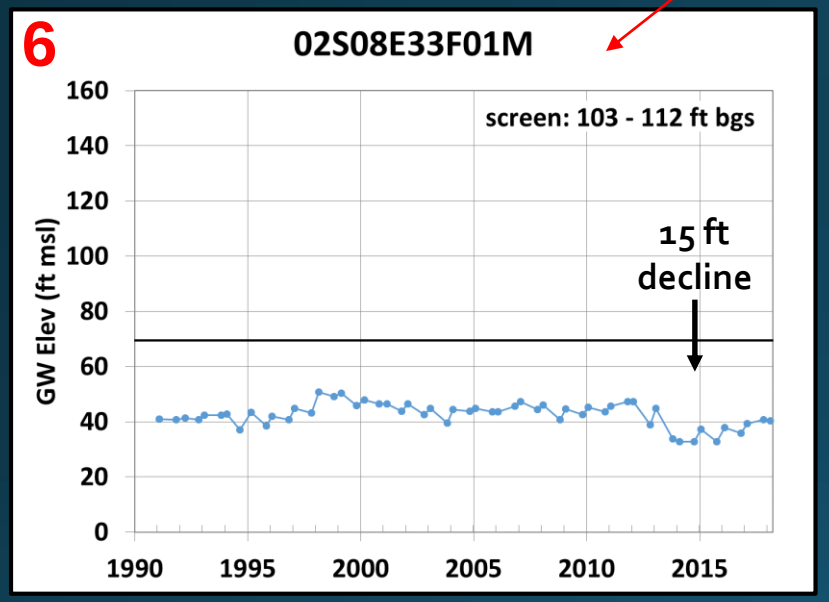
Above Corcoran

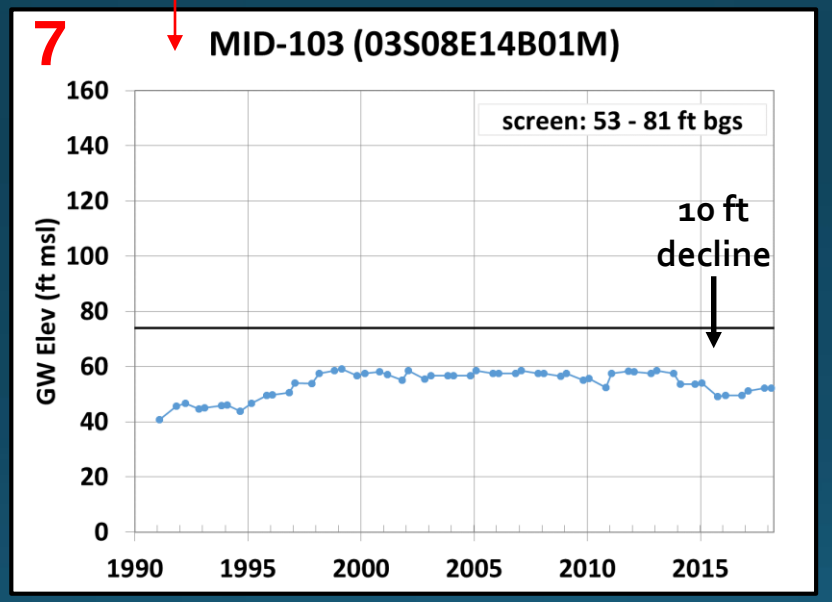
- Groundwater is shallow
- Depth to water increases to south and east
- Water levels relatively steady, muted historical trend
- Decline during recent drought more significant to east

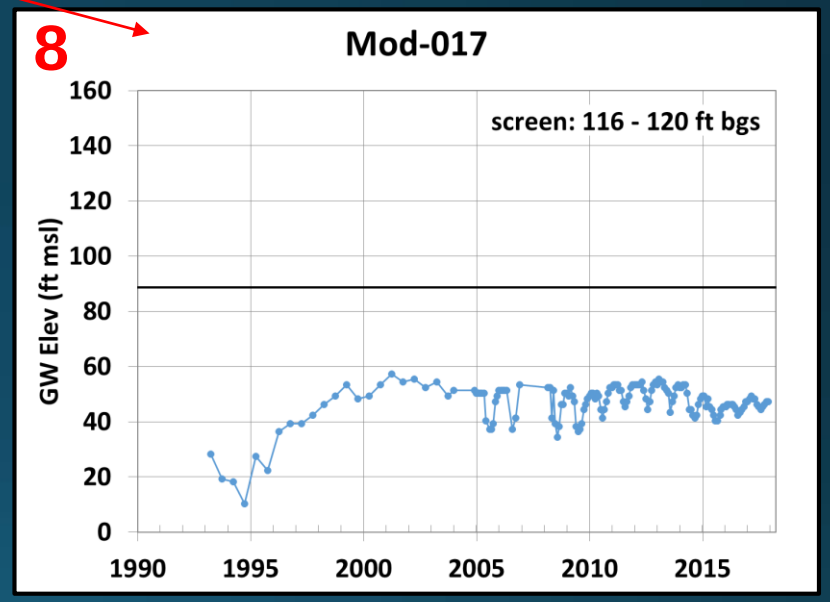
5











Above Corcoran (close to edge of Corcoran)

- General pattern: water levels rise after 1995, when City of Modesto began receiving water from Modesto Regional Water Treatment Plant, relatively steady from 2000 to recent drought
- City of Modesto well shows significant seasonal pumping variations

TODD GROUNDWATER

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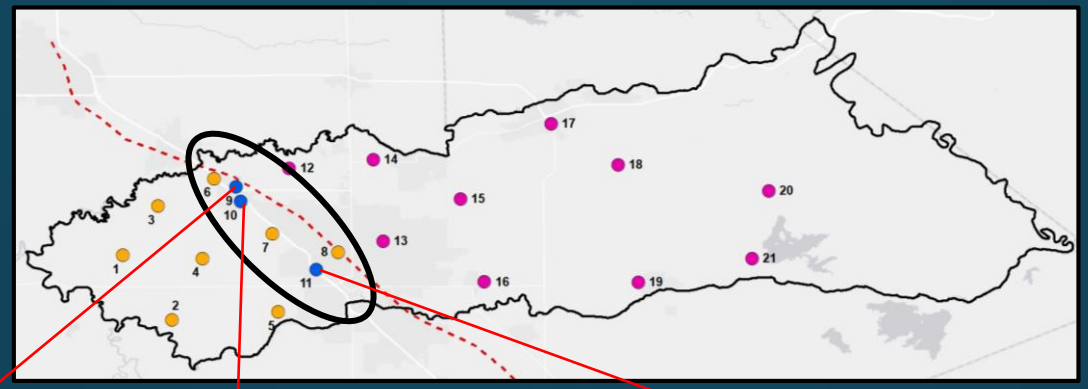

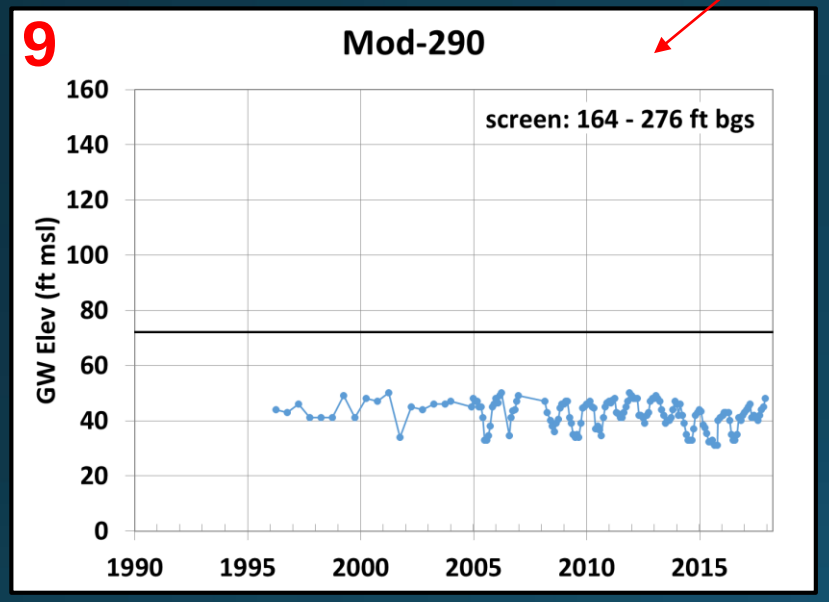

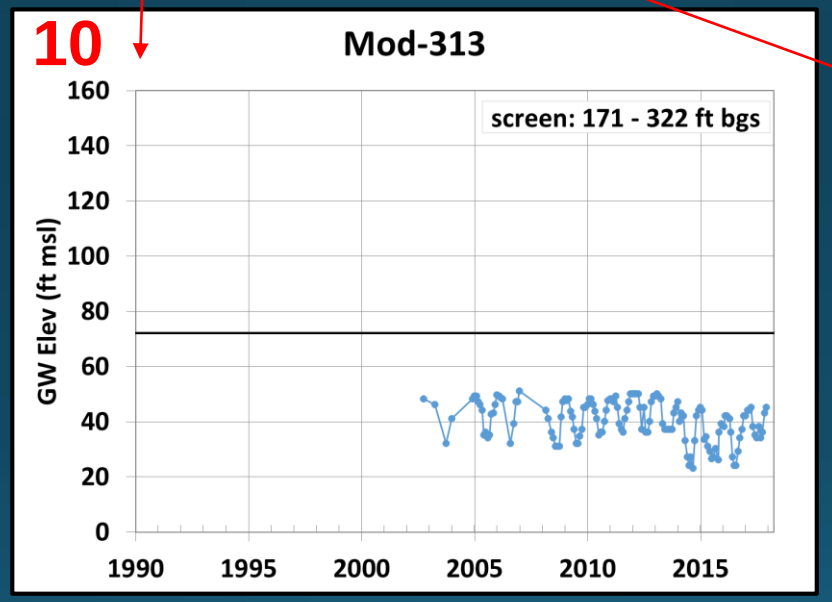

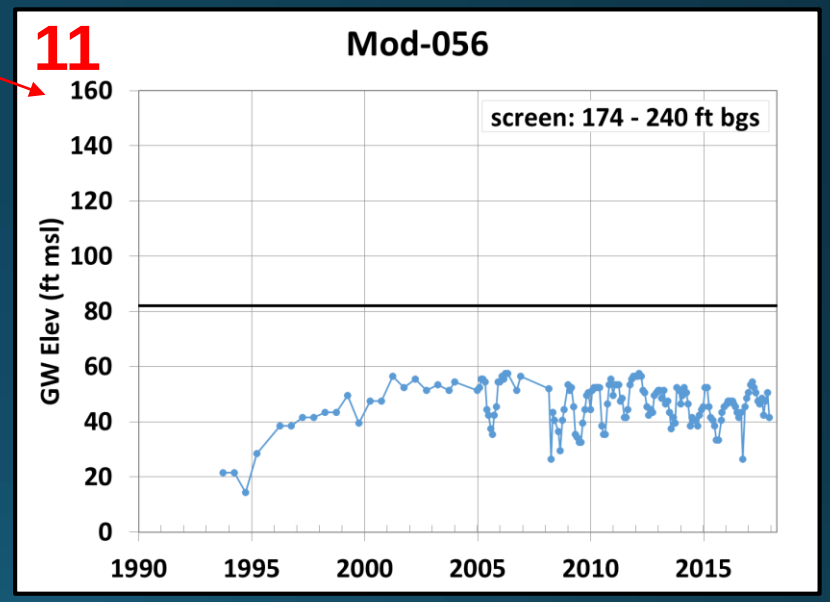

<u>Below Corcoran</u>

- City of Modesto wells
- More pumping variation than above Corcoran
- Modesto Well 56 shows historical water level trend

TODD GROUNDWATER

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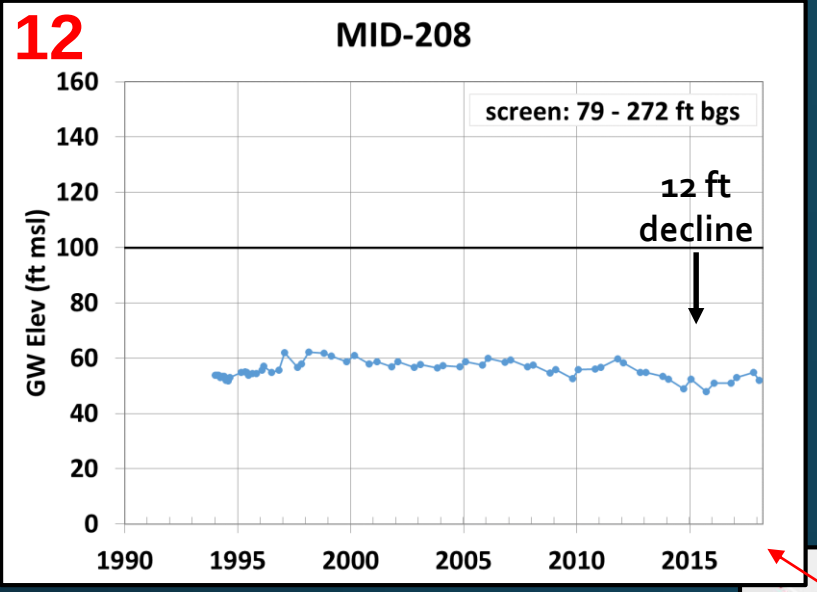

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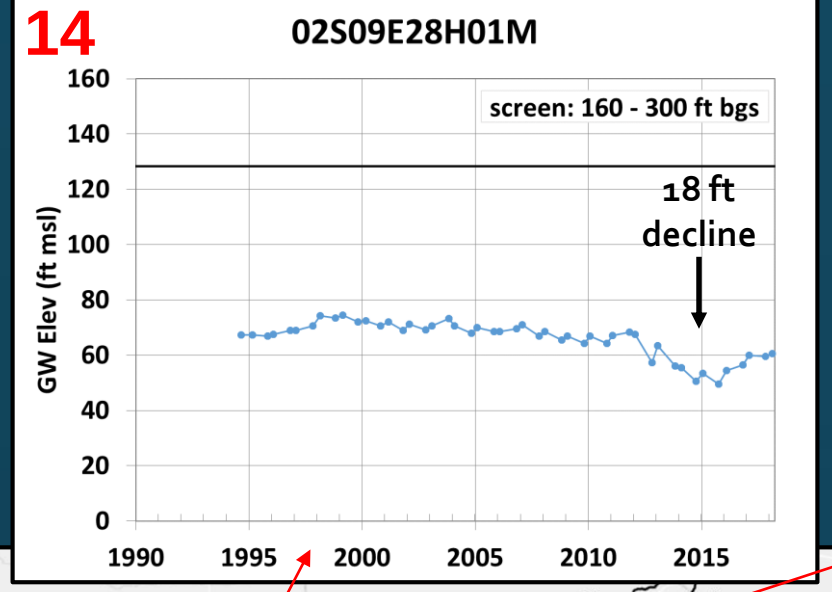

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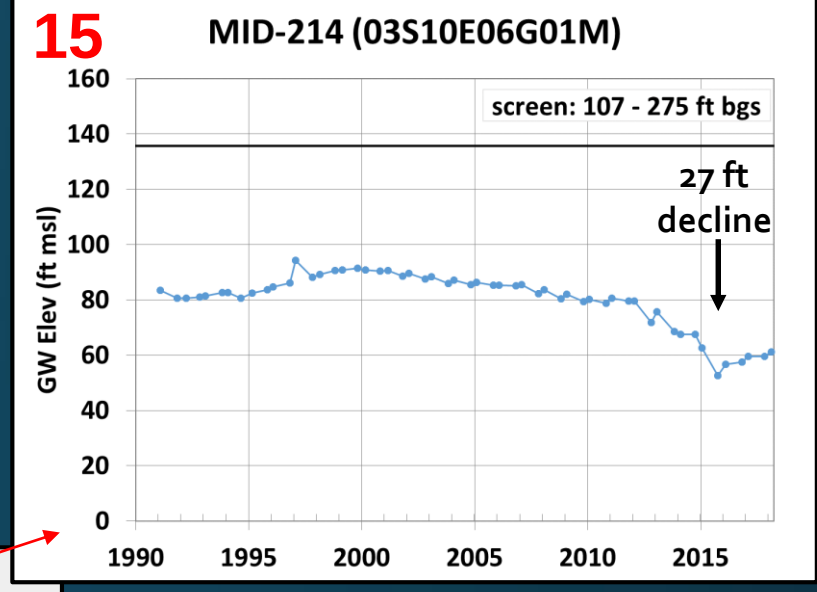

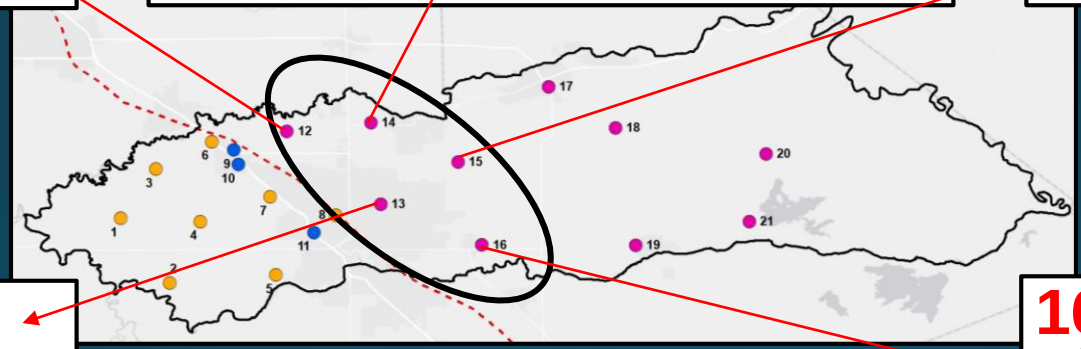

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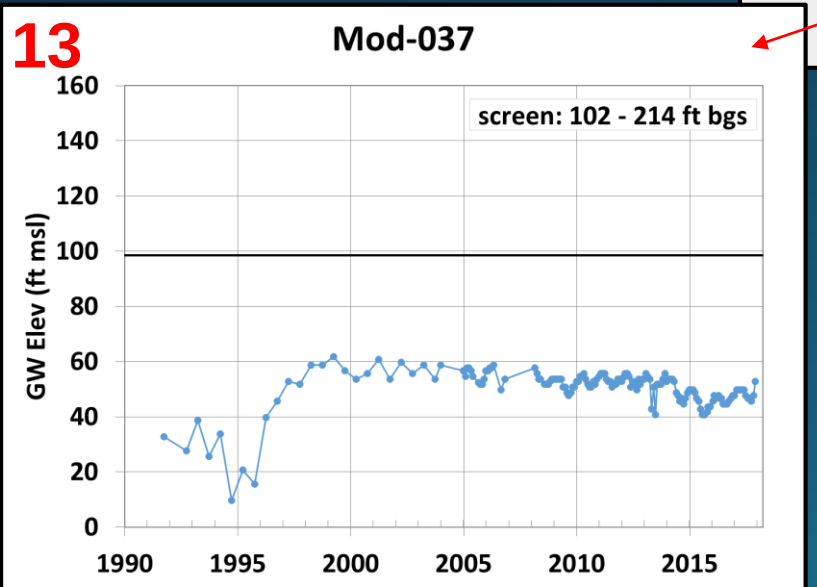

East of Corcoran

- City of Modesto Well 37 shows 40 foot water level increase from 1995 to 2000.
- MID wells relatively steady, illustrate historical trend
- Declines during recent drought increase to east, followed by some recovery

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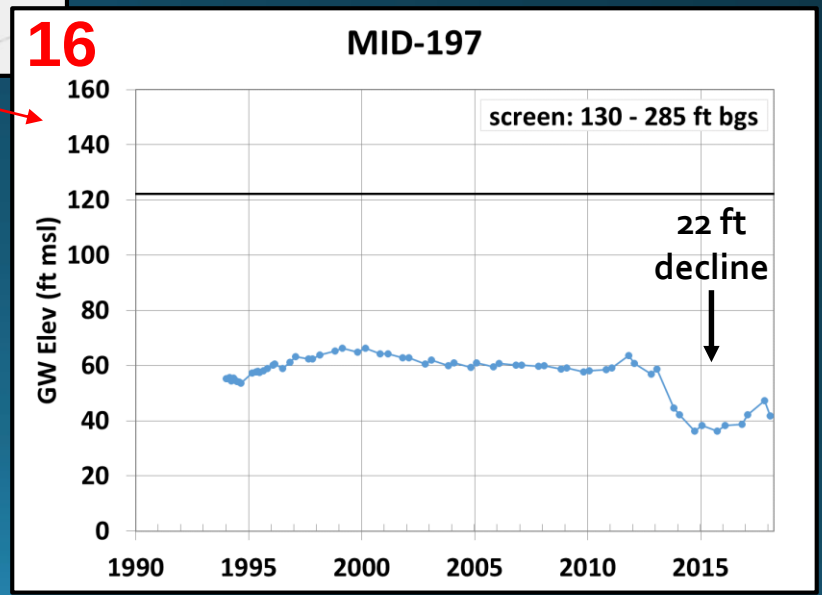
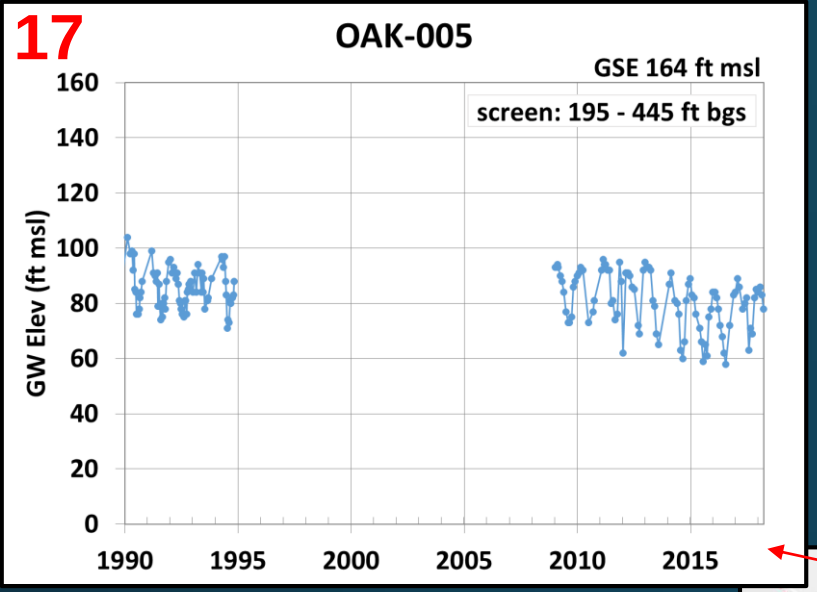
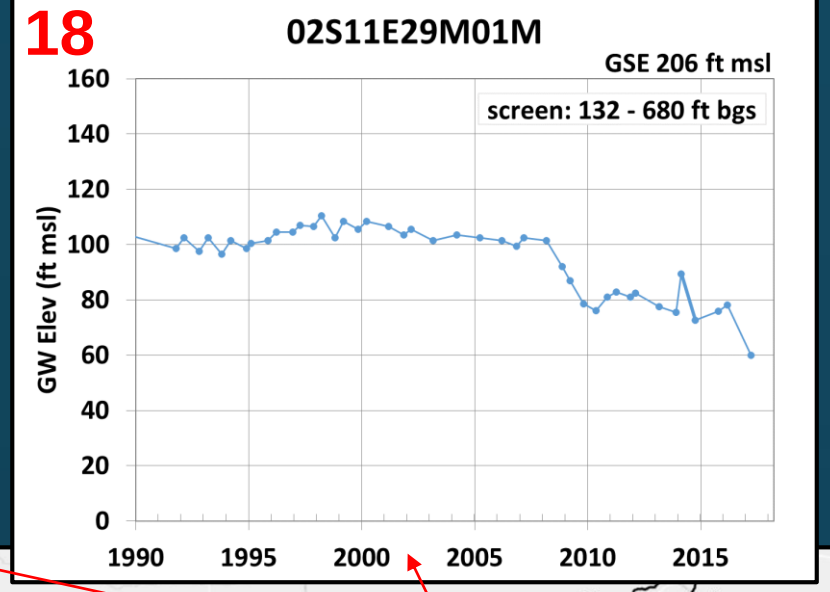
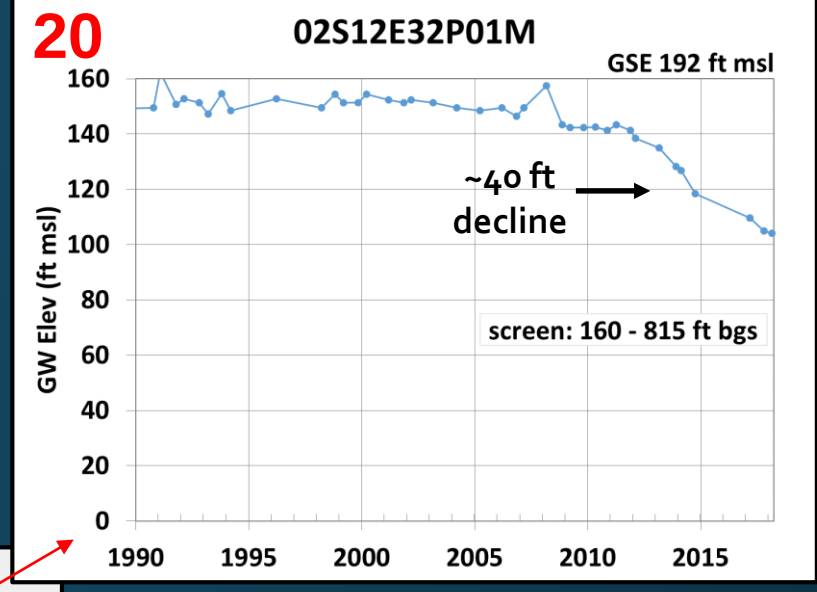
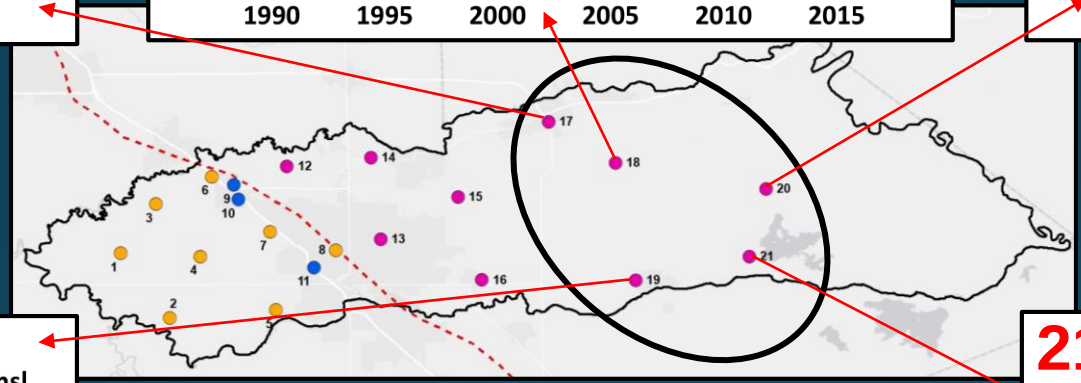
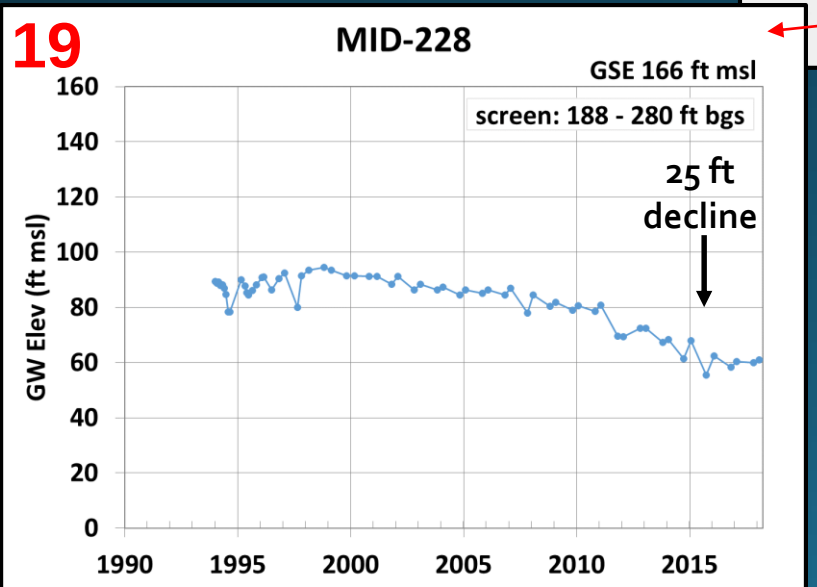






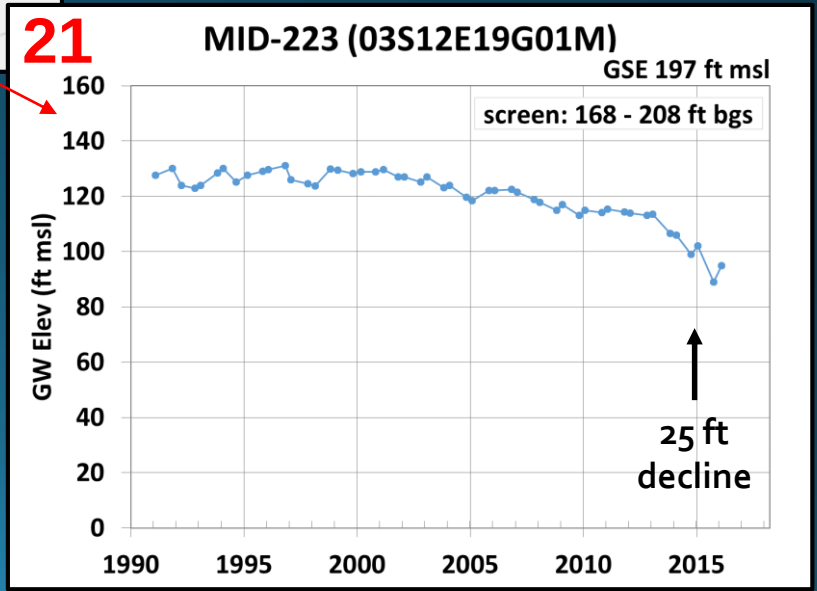






East of Corcoran

- Pumping variations in Oakdale well
- Overall historical declining trends
- Declines during recent drought are most significant in the eastern Subbasin (up to 40 feet)
- Little recovery since drought



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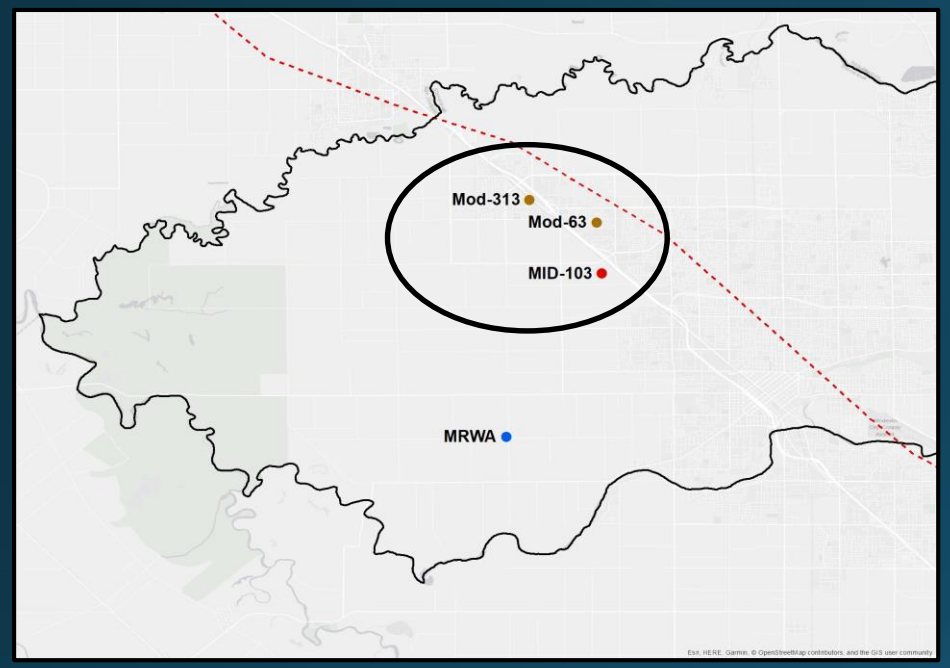
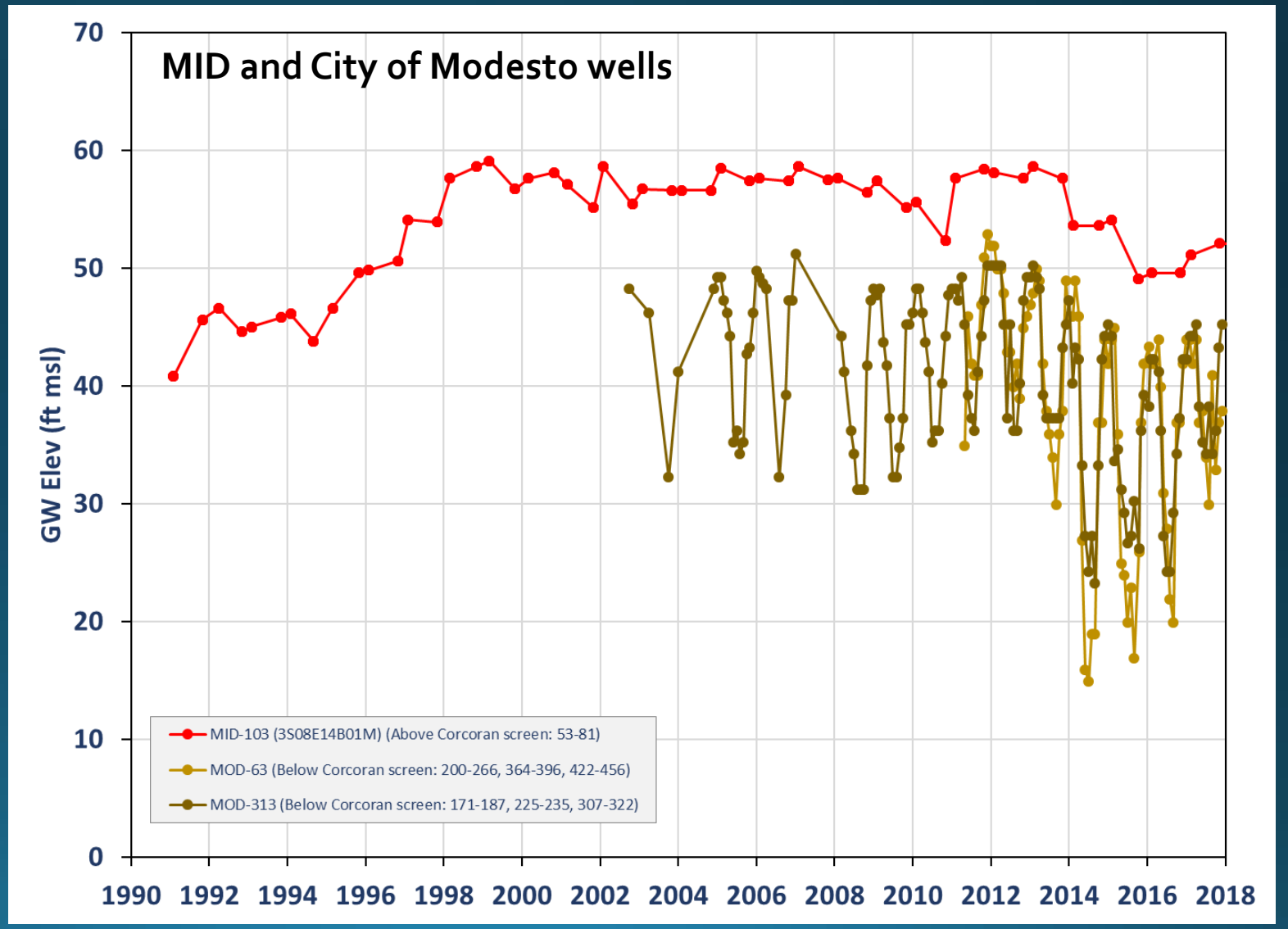
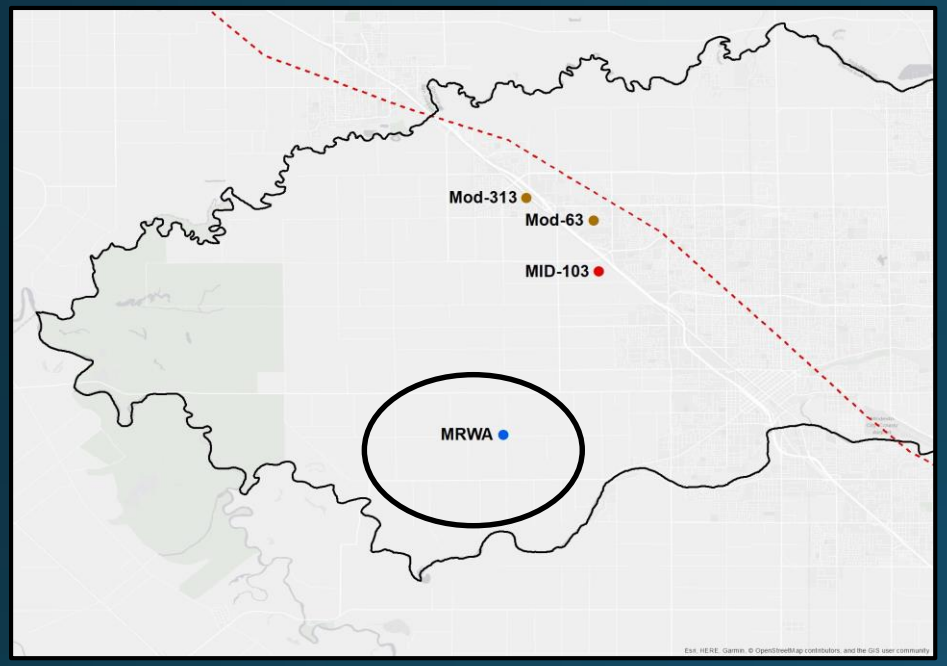
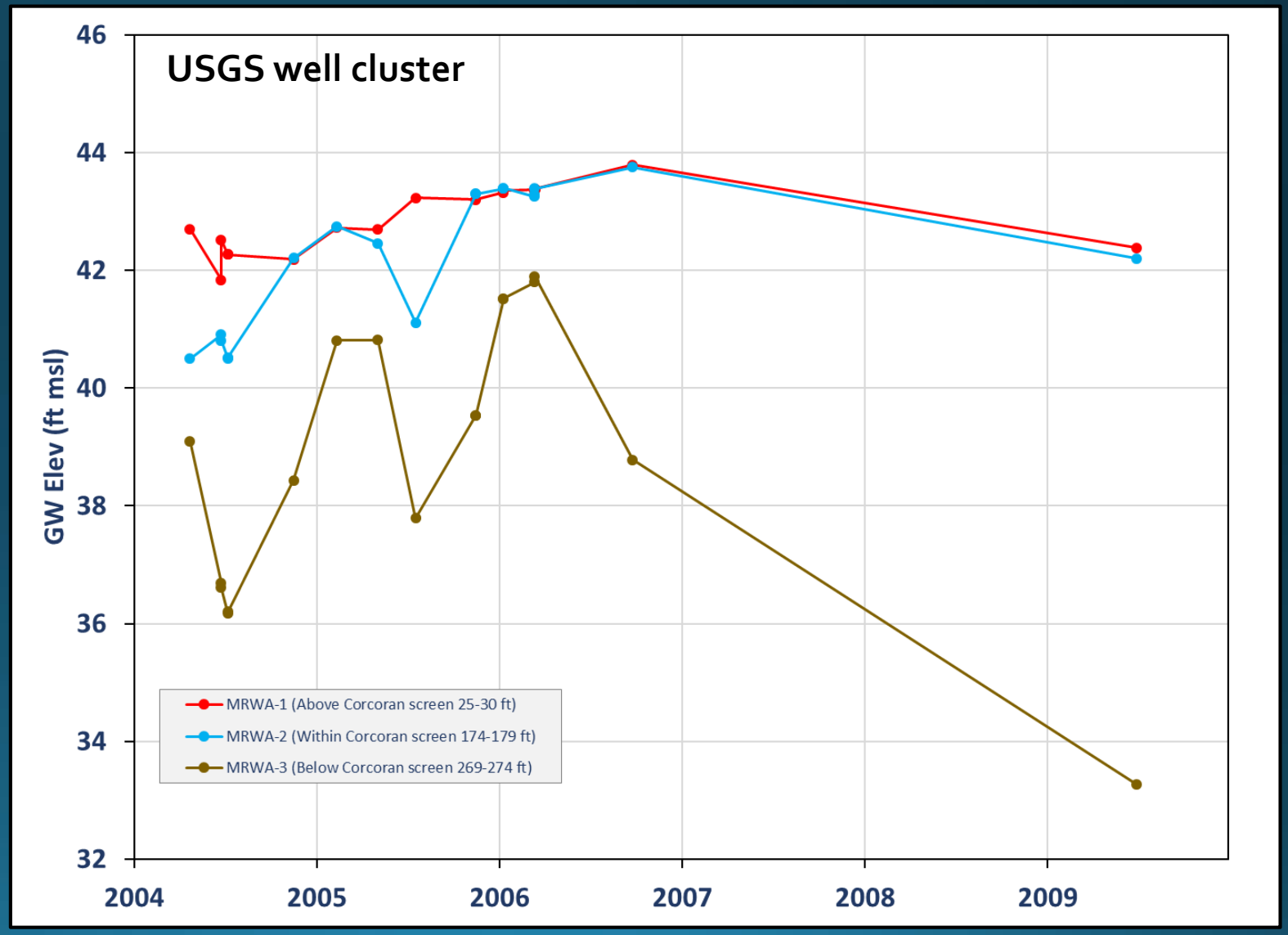
Vertical Gradients





Vertical Gradients





Groundwater Elevation Contours Spring 1998, Unconfined

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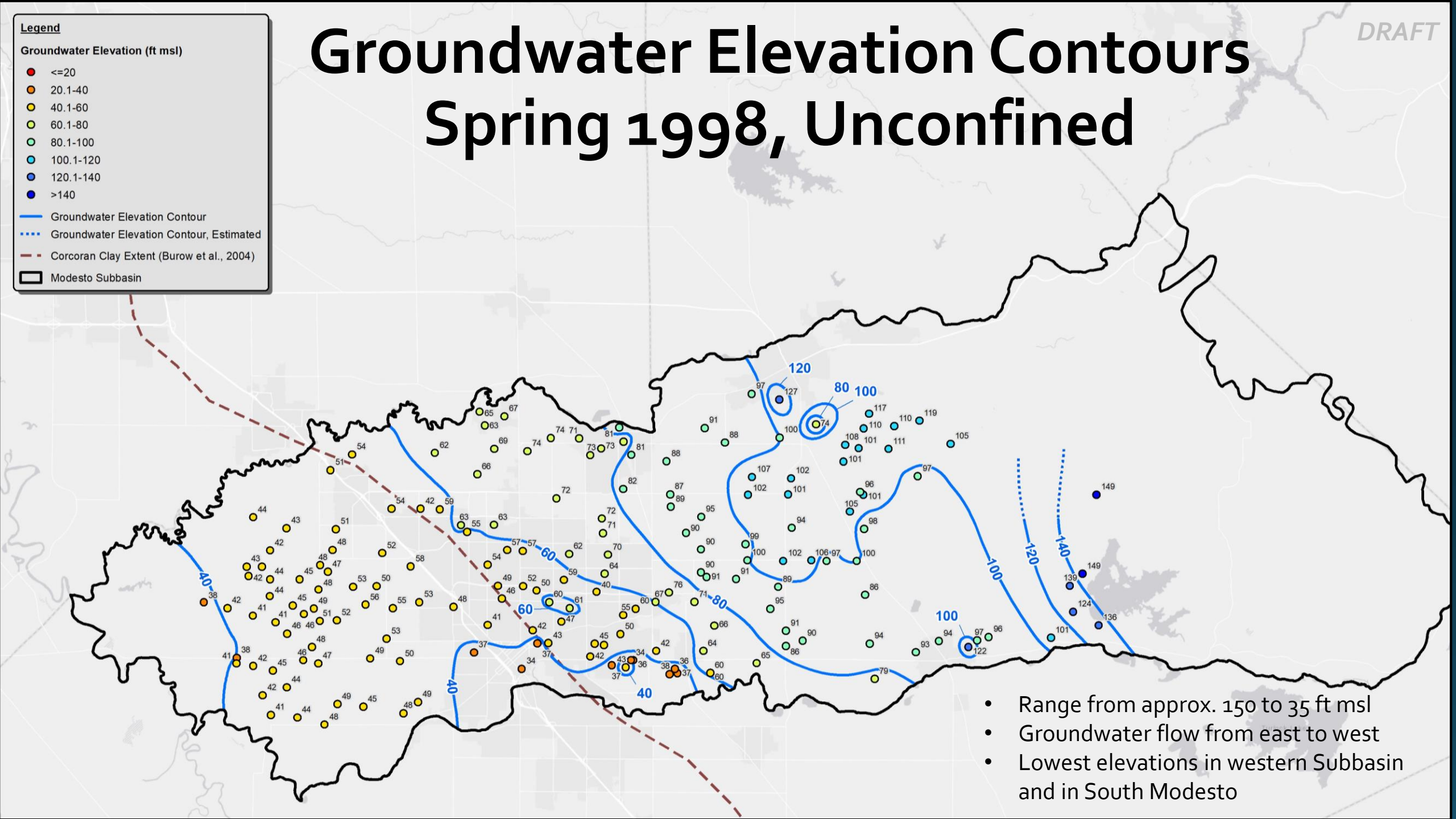

- Range from approx. 150 to 35 ft msl
- Groundwater flow from east to west
- Lowest elevations in western Subbasin and in South Modesto

Groundwater Elevation Contours October 2015, Unconfined

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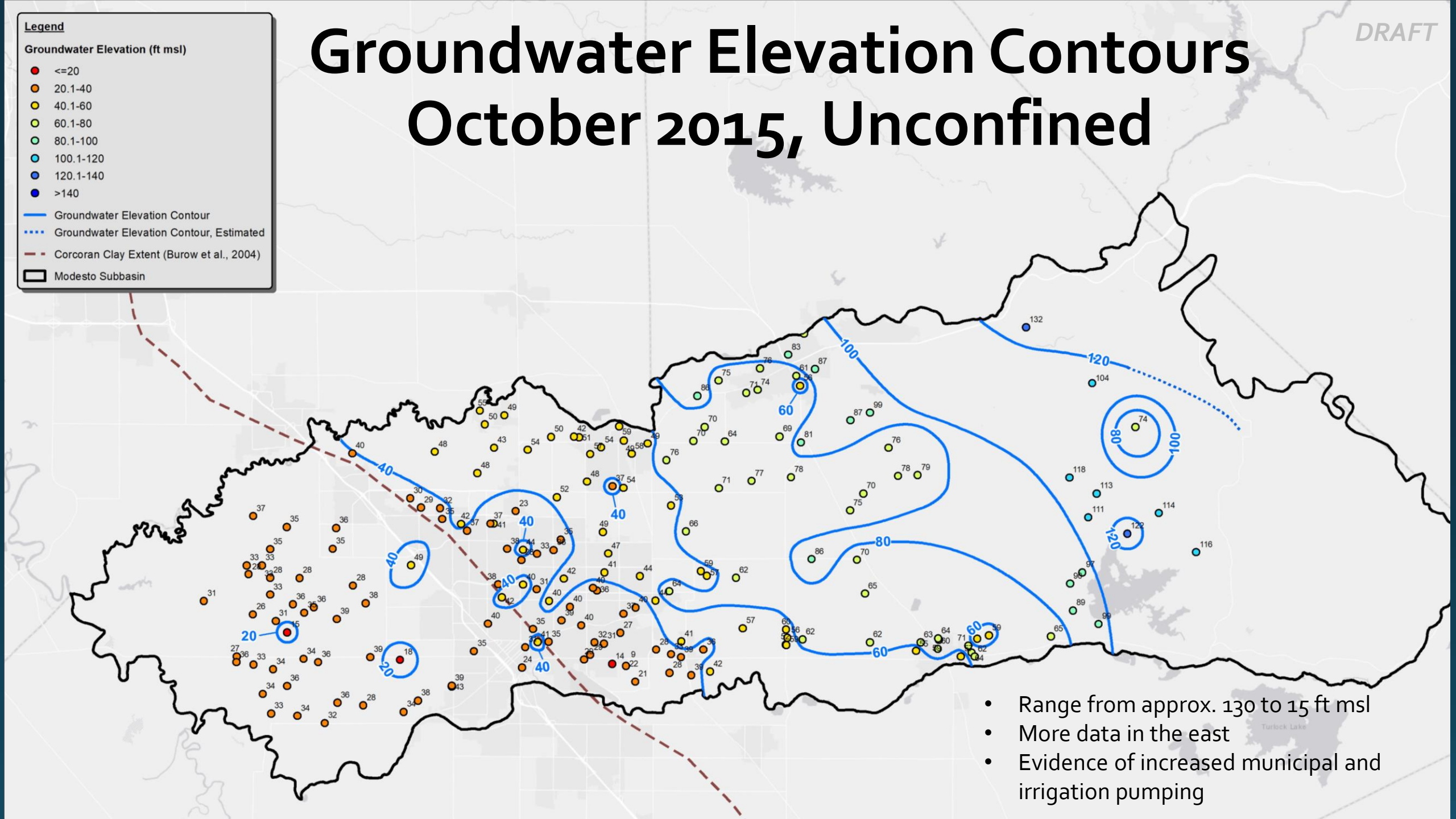

- Range from approx. 130 to 15 ft msl
- More data in the east
- Evidence of increased municipal and irrigation pumping

Groundwater Elevation Contours Spring 2017, Unconfined

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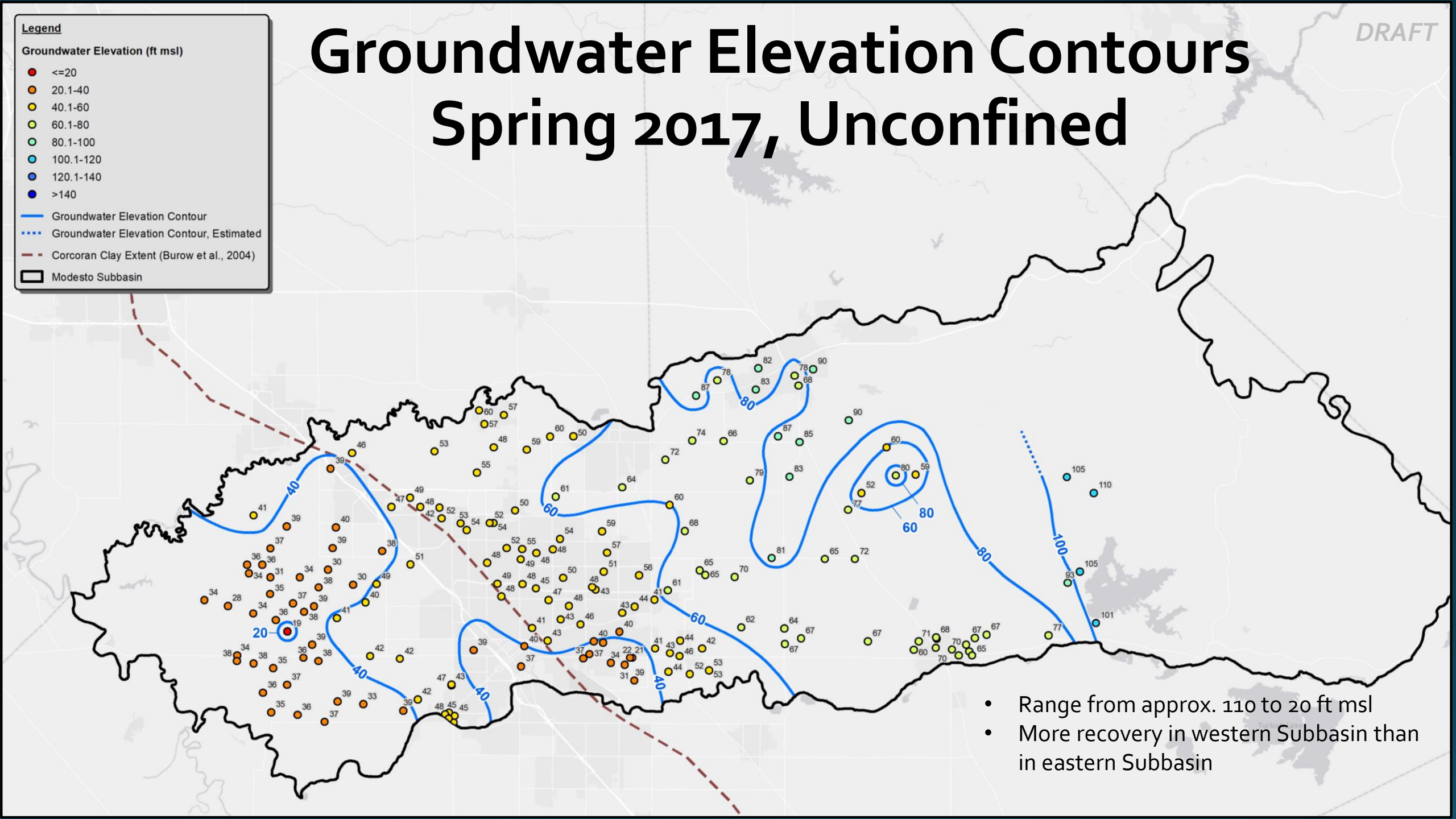
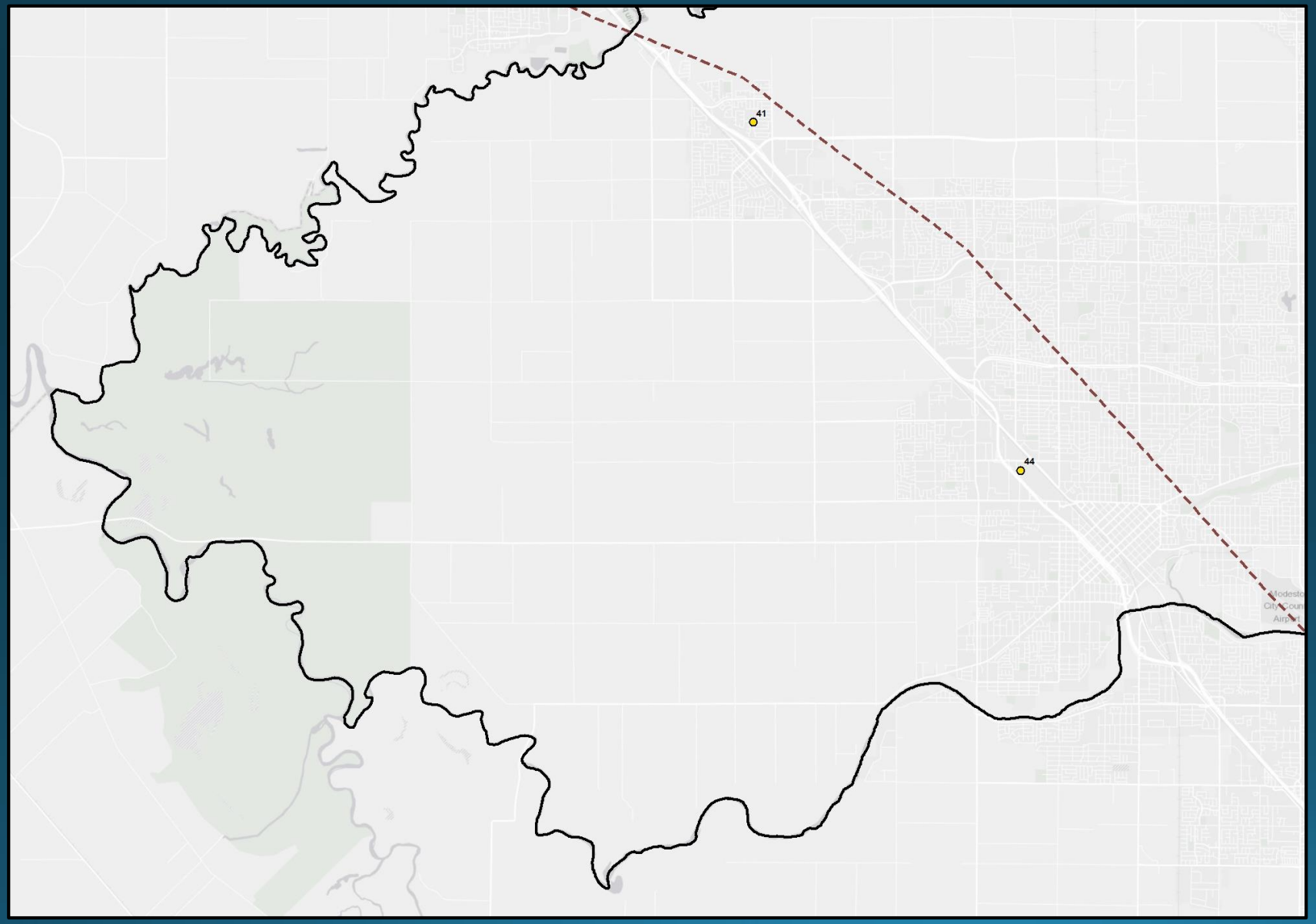


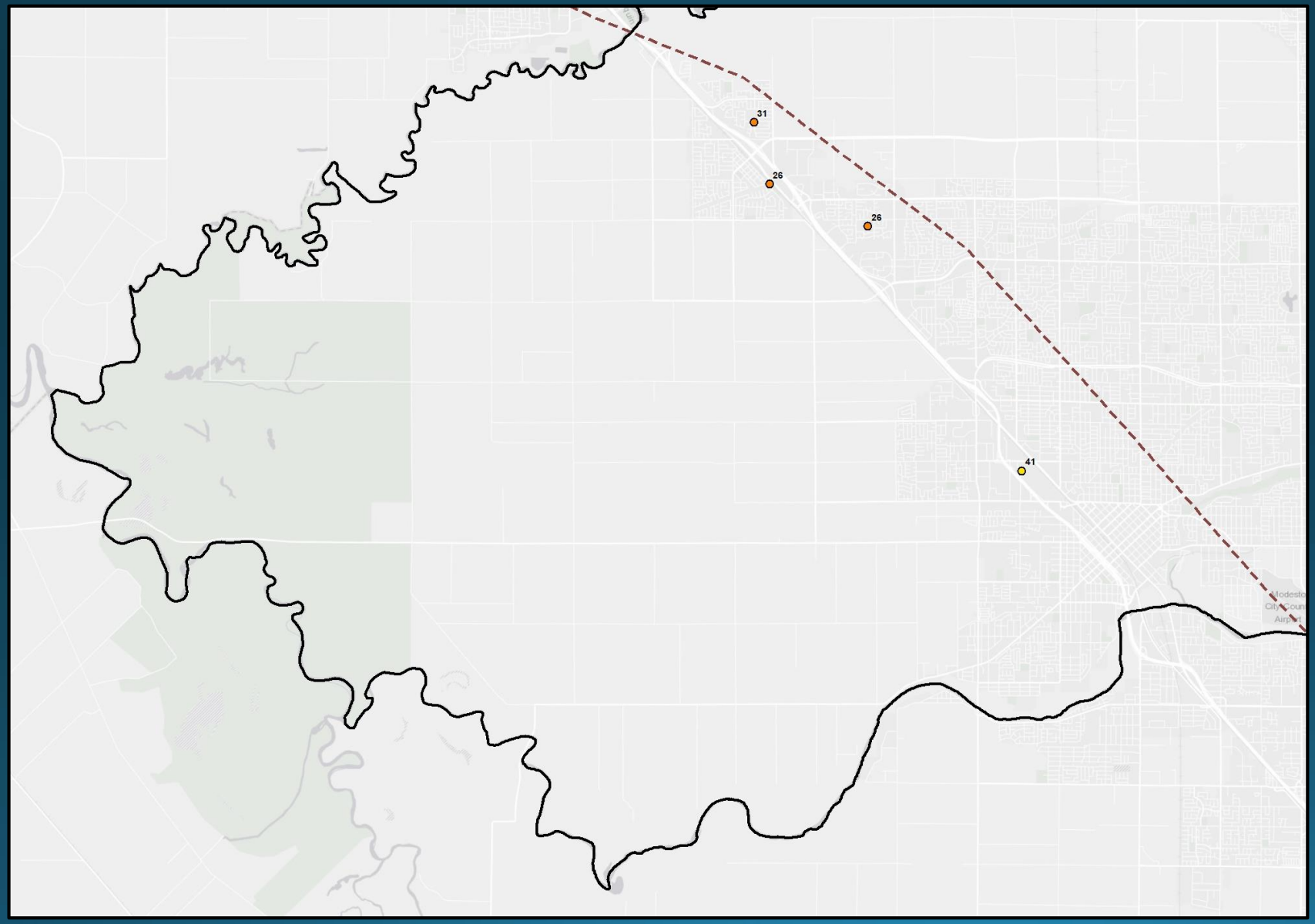
- Range from approx. 110 to 20 ft msl
- More recovery in western Subbasin than in eastern Subbasin

Spring 1998, Confined



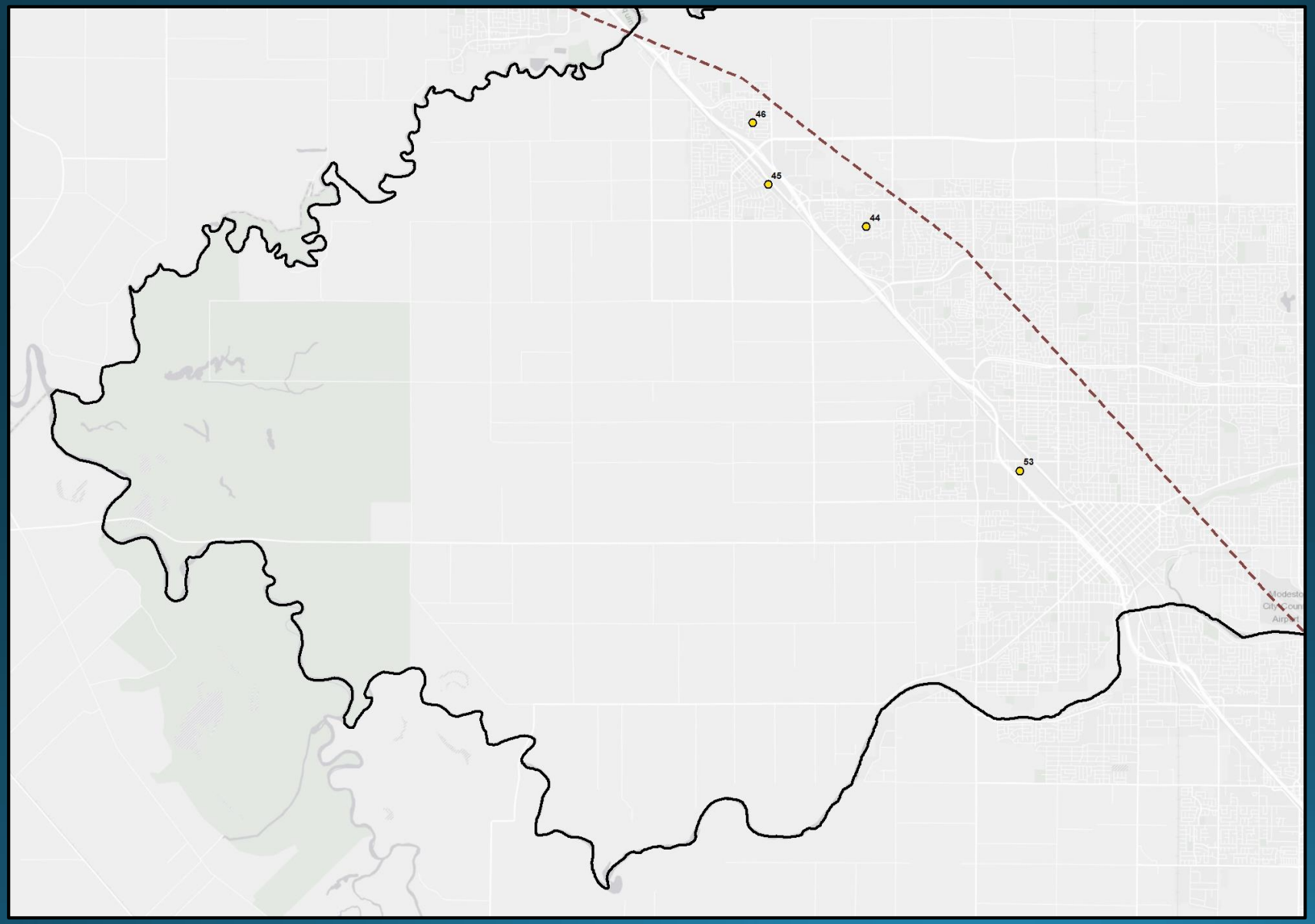
TODD GROUNDWATER

October 2015, Confined



TODD GROUNDWATER

Spring 2017, Confined



TODD GROUNDWATER

Potential for Dry Wells (October 2015)

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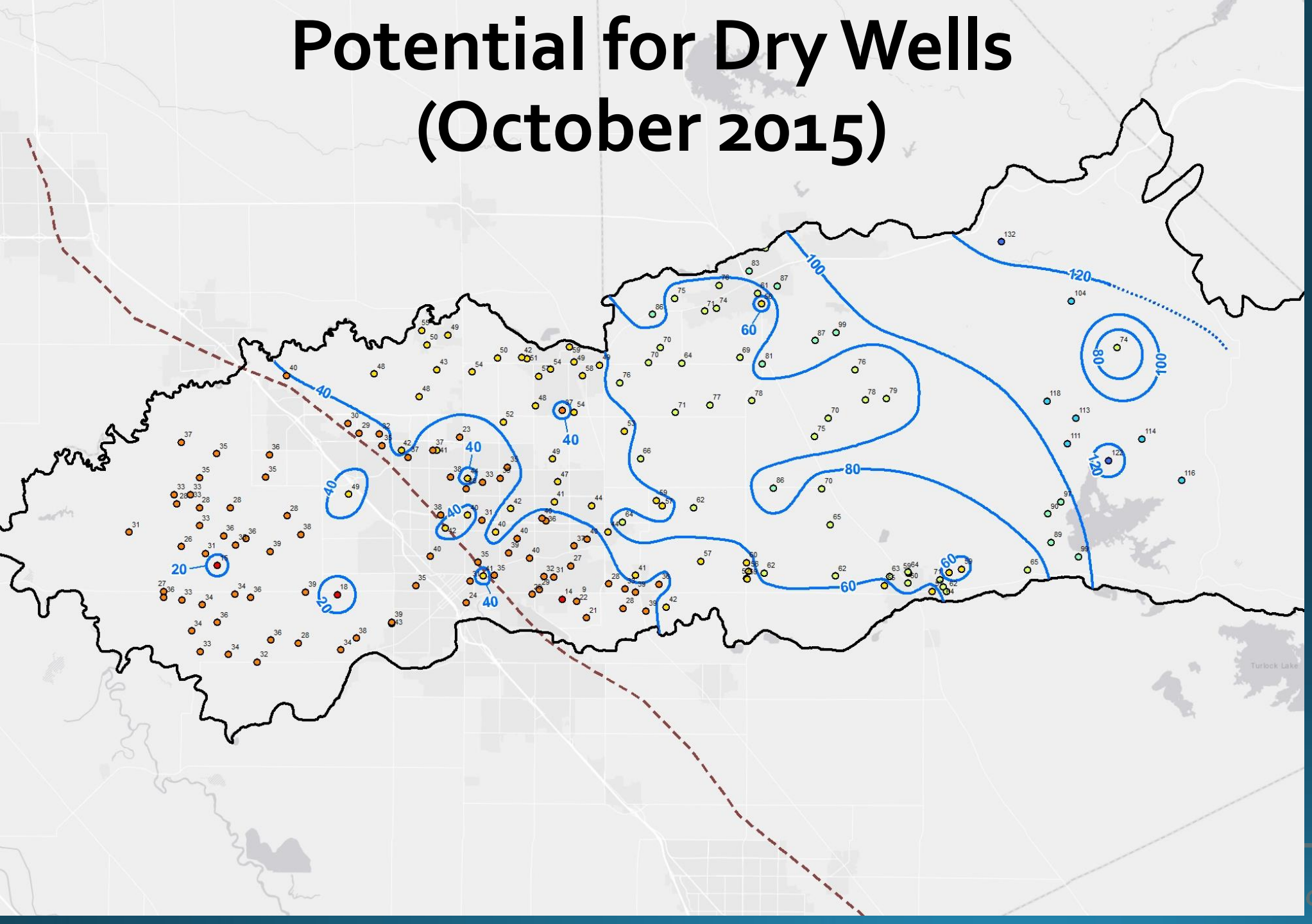

TODD GROUNDWATER

Potential for Dry Wells (October 2015, measured)

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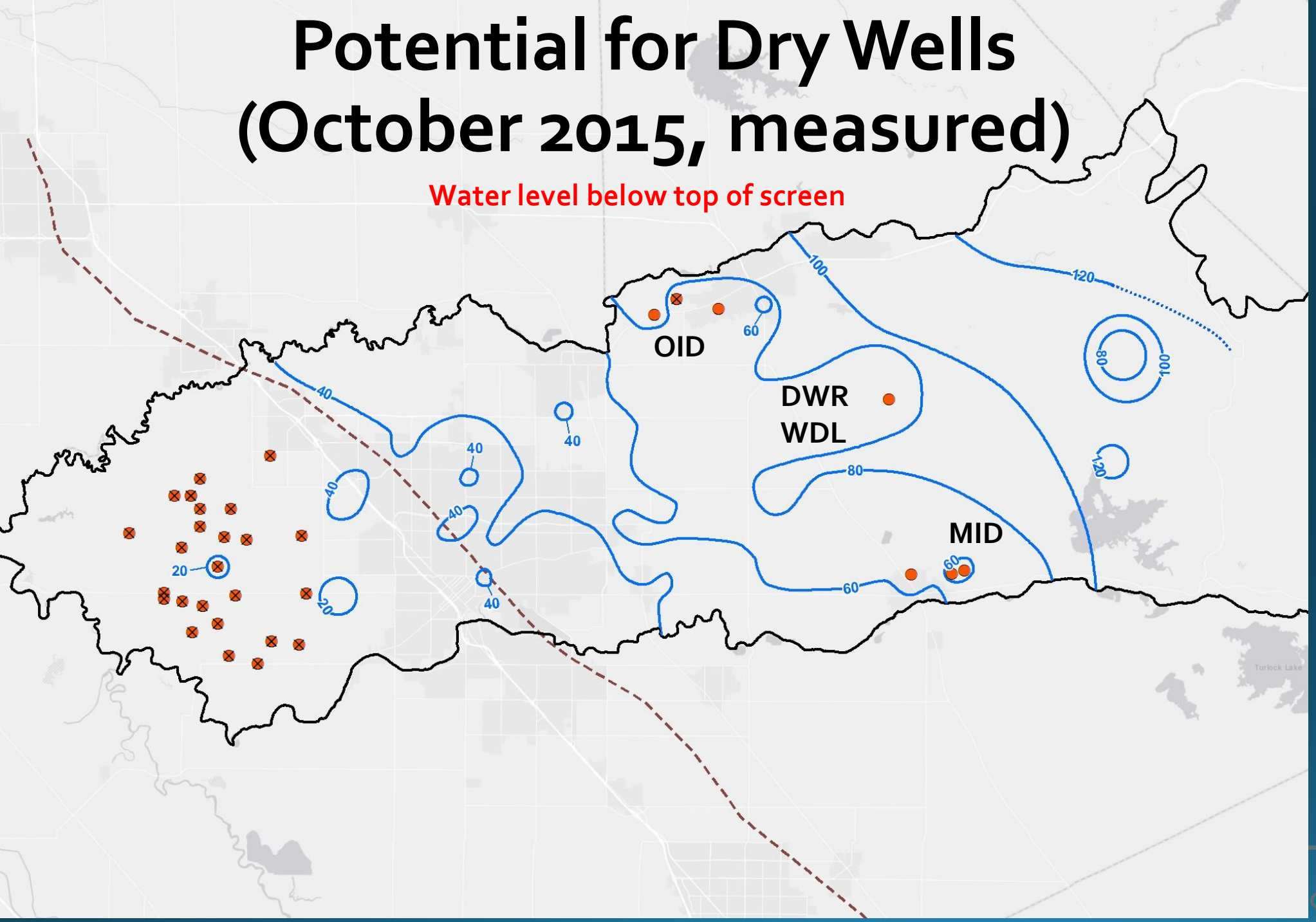
Water level below top of screen



- 33 wells with water level below top of screen
- Most (27) of these wells have top of screen w/in 15 feet of surface
- 6 wells with water level below screen in east

TODD GROUNDWATER

Potential for Dry Wells (October 2015, estimated)

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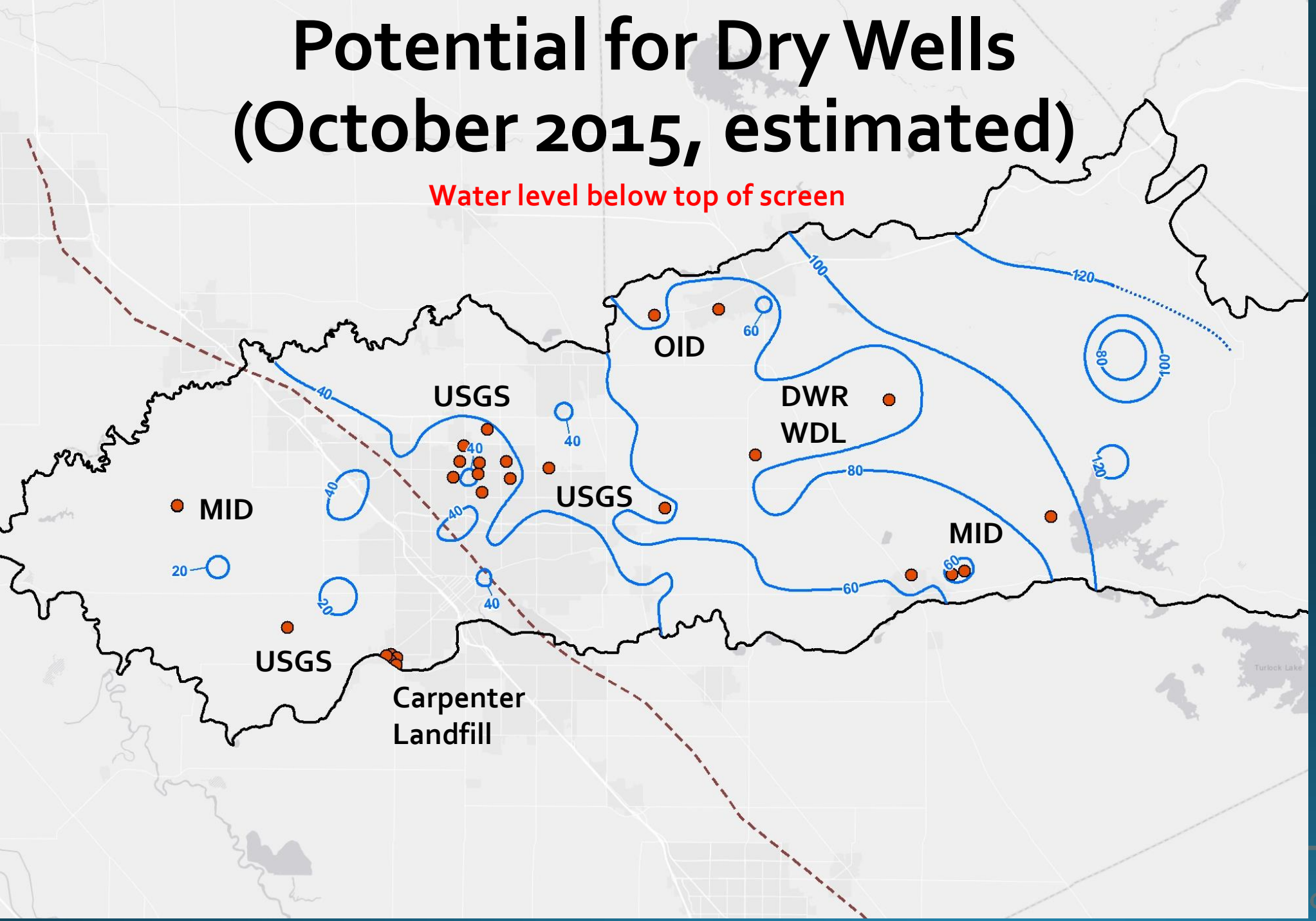
Water level below top of screen



- 28 wells potentially below top of screen
- Most are USGS and Carpenter Landfill monitoring wells
- Some MID and OID wells

TODD GROUNDWATER

Potential for Dry Wells (October 2015, estimated)

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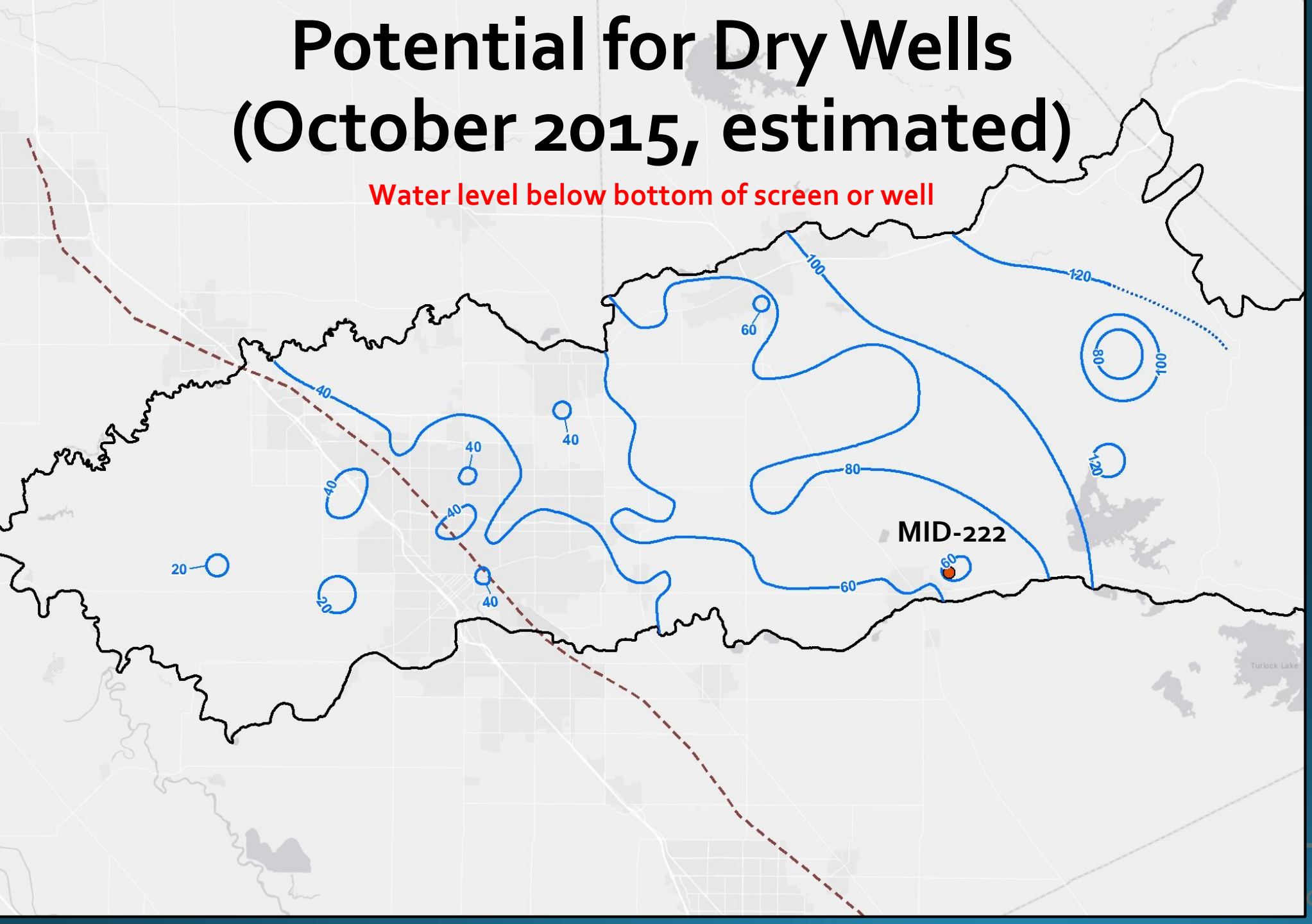
Water level below bottom of screen or well



- Water level below bottom of screen in one well (MID-222)
- MID-222 was abandoned in 2017

TODD GROUNDWATER

1996 to 2017 Land Use Changes

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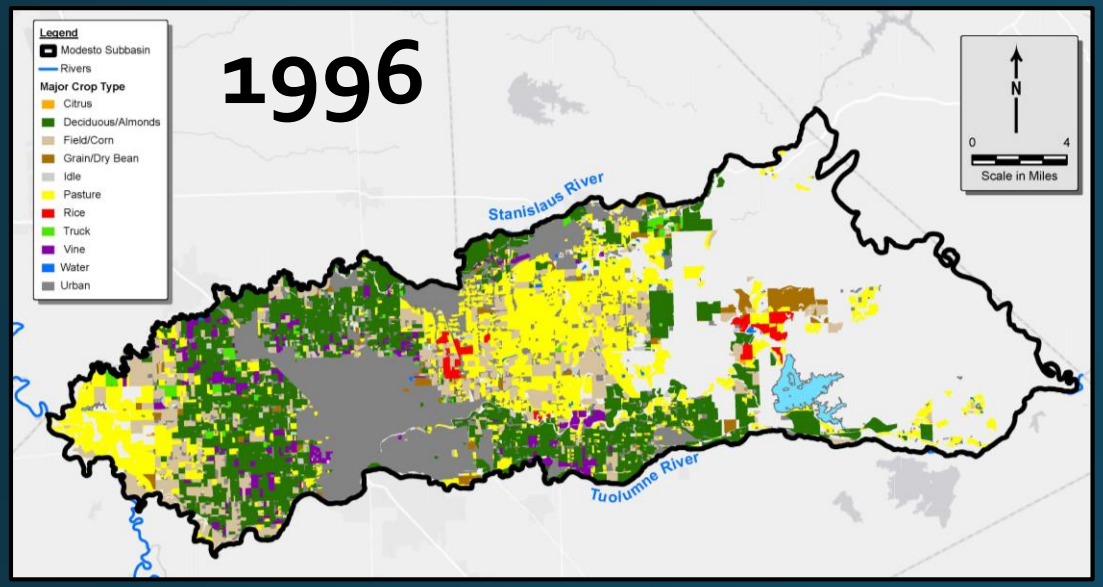
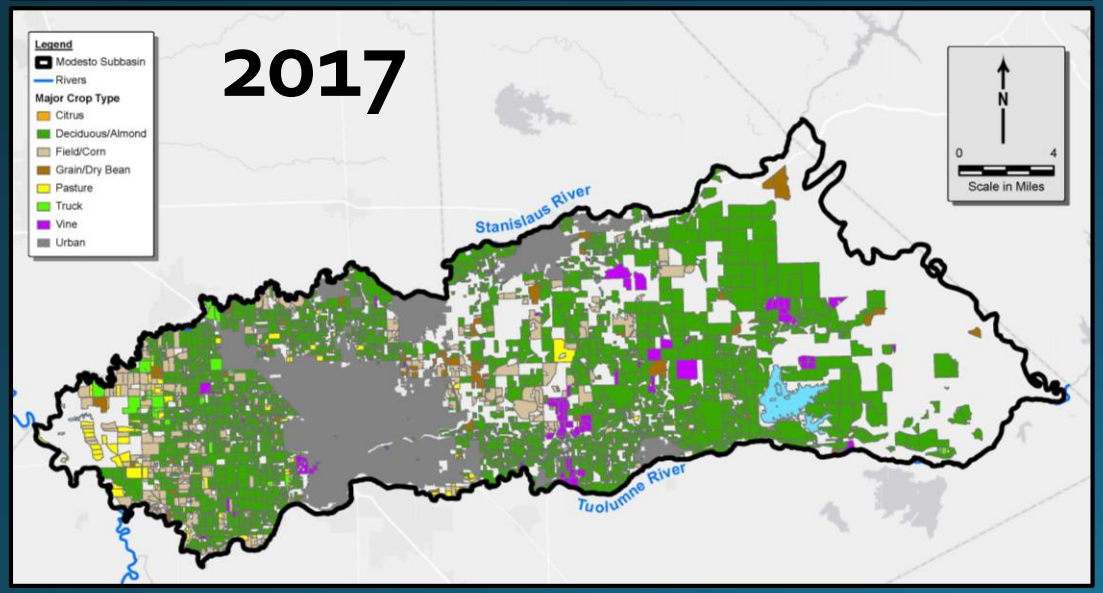
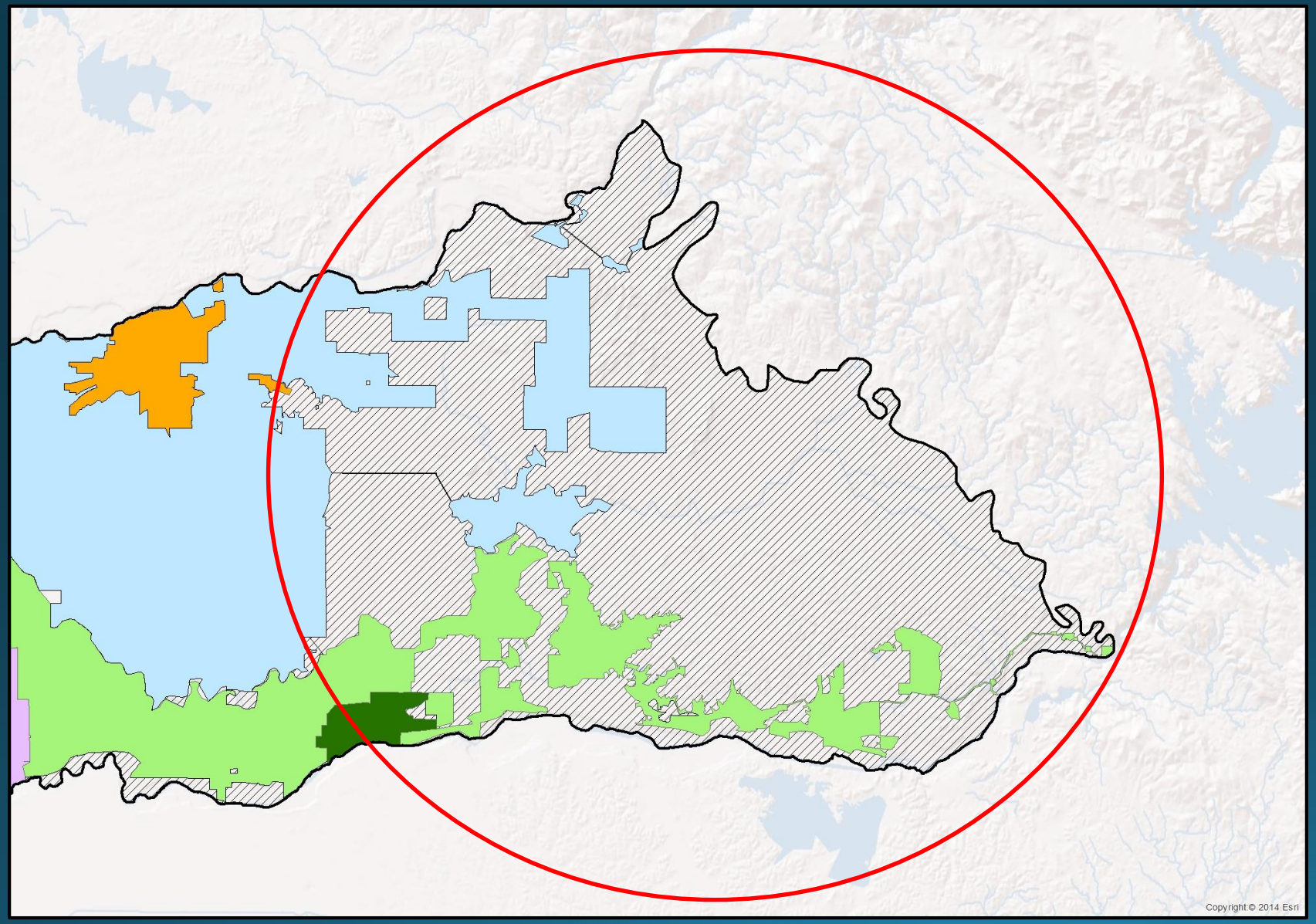




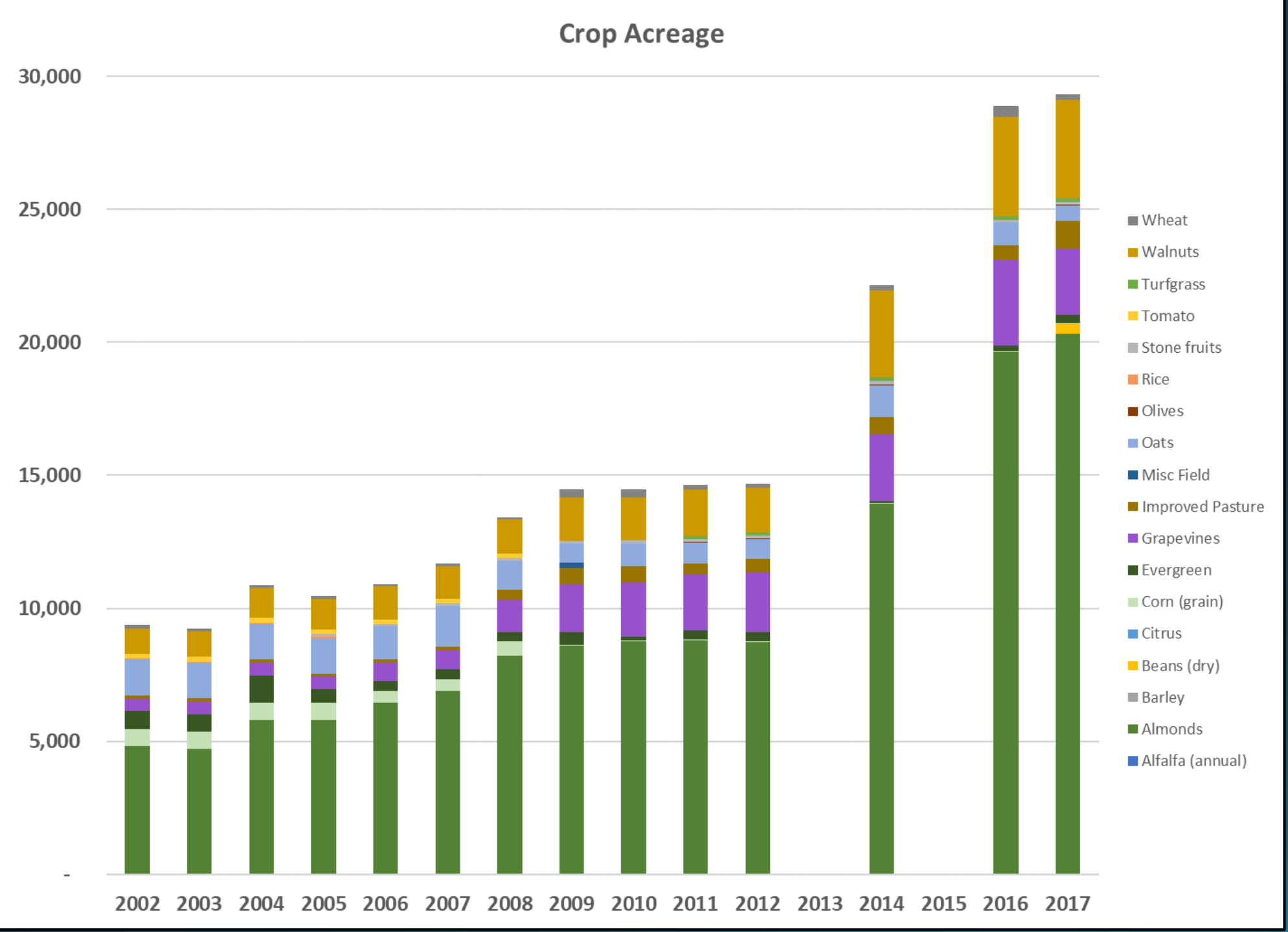
- Based on DWR Land Use Maps
- Substantial conversion of pasture to other crops
- Irrigated agriculture increased substantially in the eastern Subbasin (areas reliant on groundwater)
- Deciduous/almond (green) increased from 18 to 37% of Subbasin

TODD GROUNDWATER

Eastern Non-District Land Use



TODD GROUNDWATER



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- Stanislaus County Crop Maps, 2002 – 2017 (except 2013 and 2015)
- Major crops:
  - Almonds (green)
  - Grapevines (purple)
  - Oats (light blue)
  - Walnuts (beige)
- Total acreage triples
  - 2002 = 9,364 acres
  - 2017 = 29,314 acres
- Almonds quadruple
  - 2002 = 4,821 acres
  - 2017 = 20,308 acres

TODD GROUNDWATER

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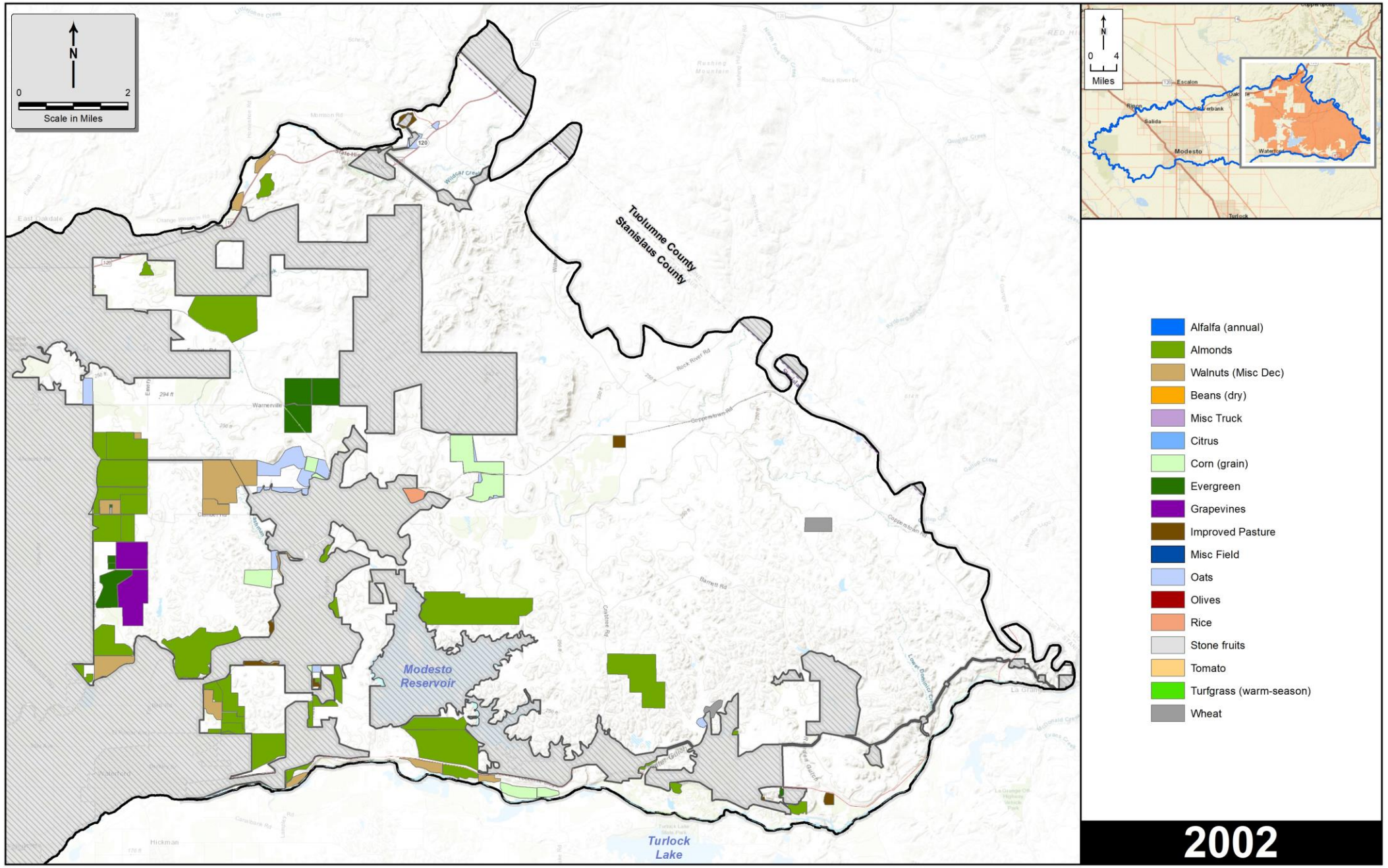
N
0
2
Scale in Miles
Tuolumne County
Stanislaus County
Modesto Reservoir
Turlock Lake
Warnerville
Rock River Rd
Barnett Rd
Hickman
N
0
4
Miles
Escalon
Ripon
Riverbank
Salida
Modesto
Waterford
Turlock
Alfalfa (annual)
Almonds
Walnuts (Misc Dec)
Beans (dry)
Misc Truck
Citrus
Corn (grain)
Evergreen
Grapevines
Improved Pasture
Misc Field
Oats
Olives
Rice
Stone fruits
Tomato
Turfgrass (warm-season)
Wheat
2002

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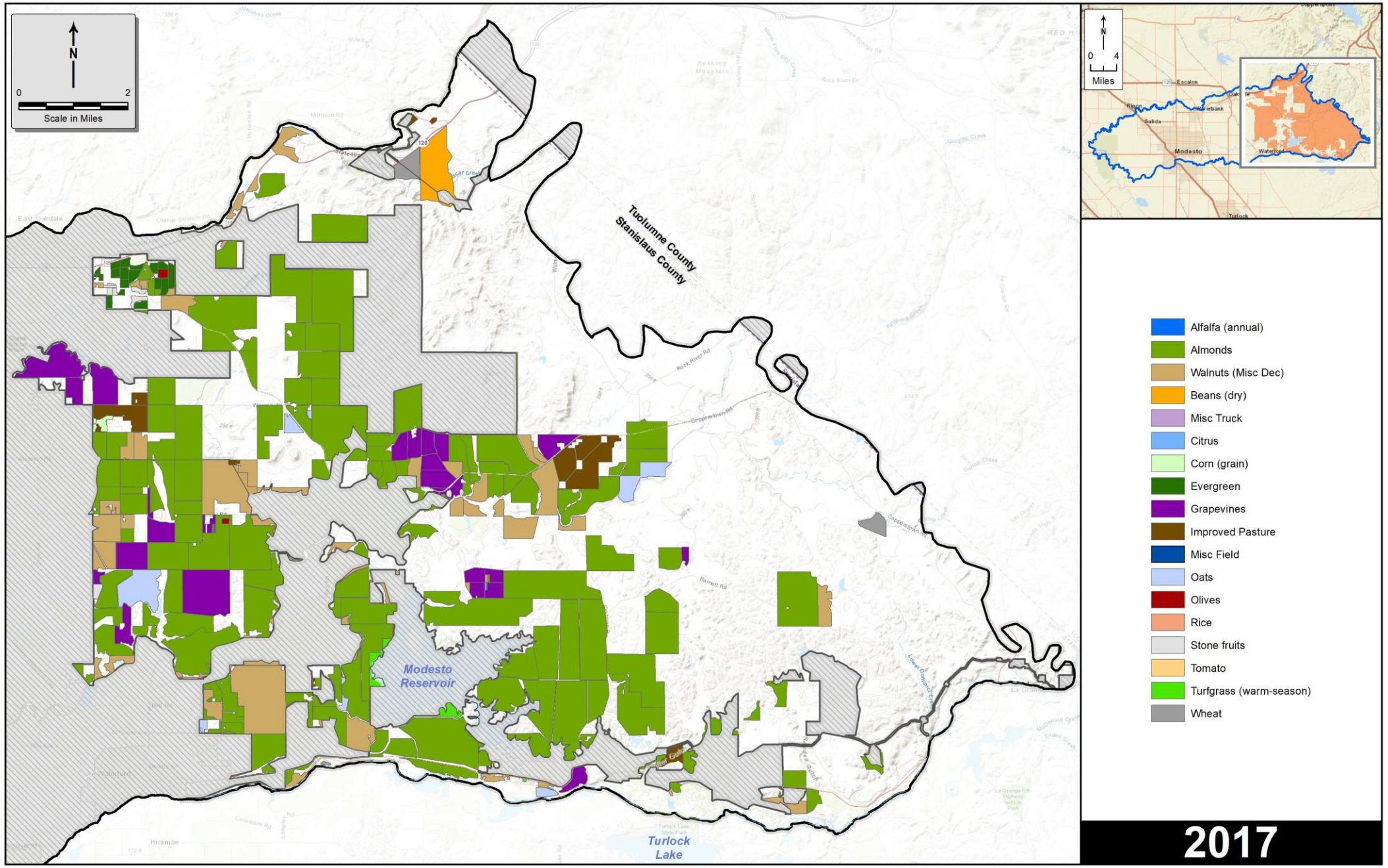
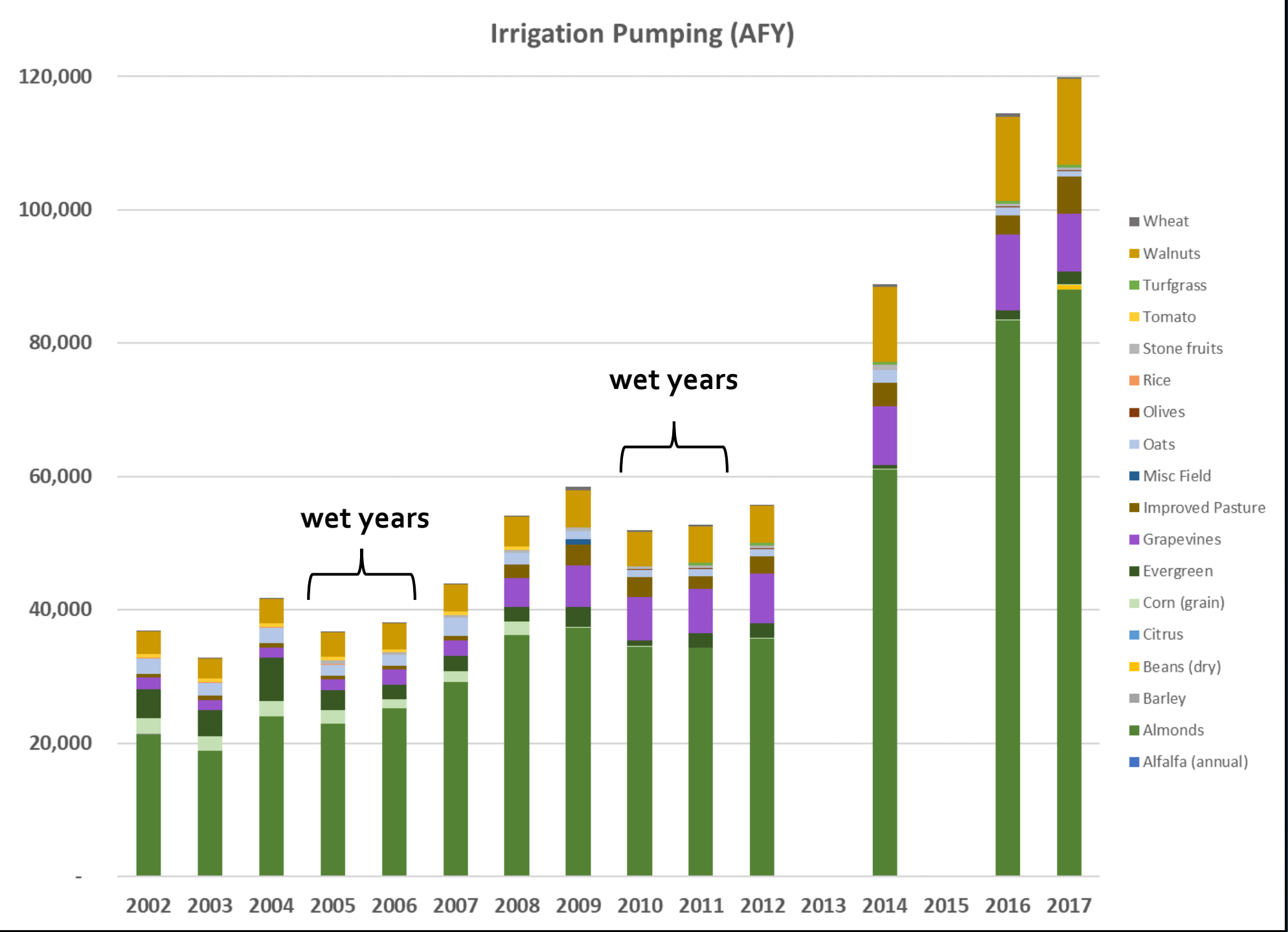

N
0
2
Scale in Miles
Tuolumne County
Stanislaus County
Modesto Reservoir
Turlock Lake
Hickman
N
0
4
Miles
Escalon
Ripon
Oakdale
Riverbank
Salida
Modesto
Waterford
Turlock
Alfalfa (annual)
Almonds
Walnuts (Misc Dec)
Beans (dry)
Misc Truck
Citrus
Corn (grain)
Evergreen
Grapevines
Improved Pasture
Misc Field
Oats
Olives
Rice
Stone fruits
Tomato
Turfgrass (warm-season)
Wheat
2017

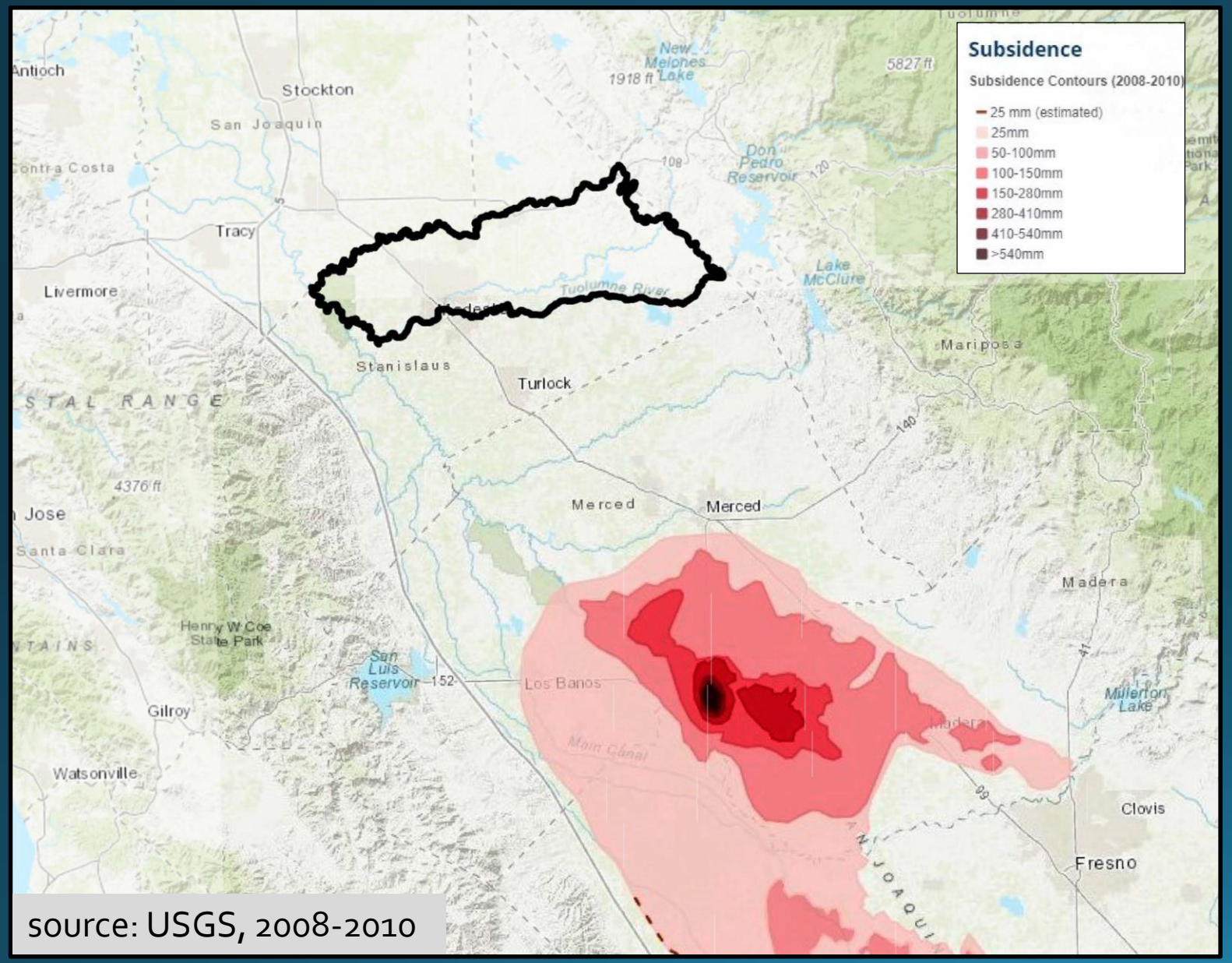


- Assumes 80% irrigation efficiency
- Total pumping triples
  - 2002 = 36,921 AFY
  - 2017 = 119,913 AFY
- Almonds pumping quadruples
  - 2002 = 17,082 AFY
  - 2017 = 70,376 AFY
- Grapevines increase from ~2,000 to 9,000 AFY
- Walnuts increase from ~3,000 to 13,000 AFY

TODD GROUNDWATER

Subsidence (2008-2010)

DRAFT



source: USGS, 2008-2010

- Historical subsidence is not a significant issue in the Modesto Subbasin

TODD GROUNDWATER

Subsidence: June 2015-June 2018

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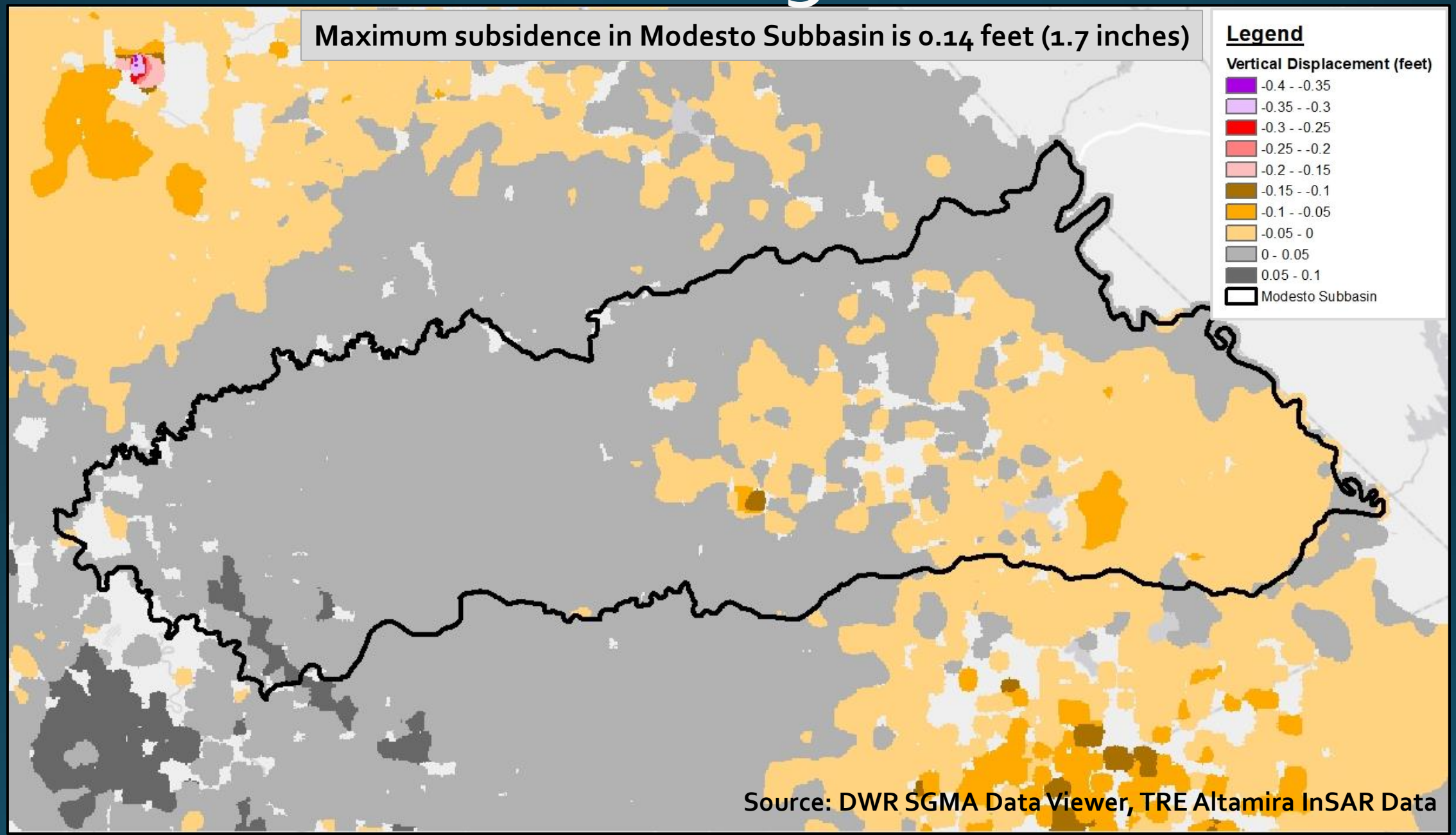

Next Steps

- Write Administrative Draft Section 3 – Basin Setting (first quarter 2020)
- Coordination Meeting with Turlock Subbasin (first quarter 2020)
- Continue model calibration and development of water budgets
- Next Workshop – March 2020: Numerical Model and Water Budgets, Interconnected Surface Water