Sierra Valley Subbasin GW Conditions Presentation & Discussion

Presentation Overview

Goal:

- Introduce Sierra Valley Subbasin groundwater conditions and data gaps and begin discussion regarding impacts, concerns, and what might be considered significant and unreasonable

Outline:

- Interconnection between Sustainability Indicators
- Groundwater Elevation Conditions
- Land Subsidence Conditions
- Water Quality Conditions
- Interconnected Surface Water Conditions

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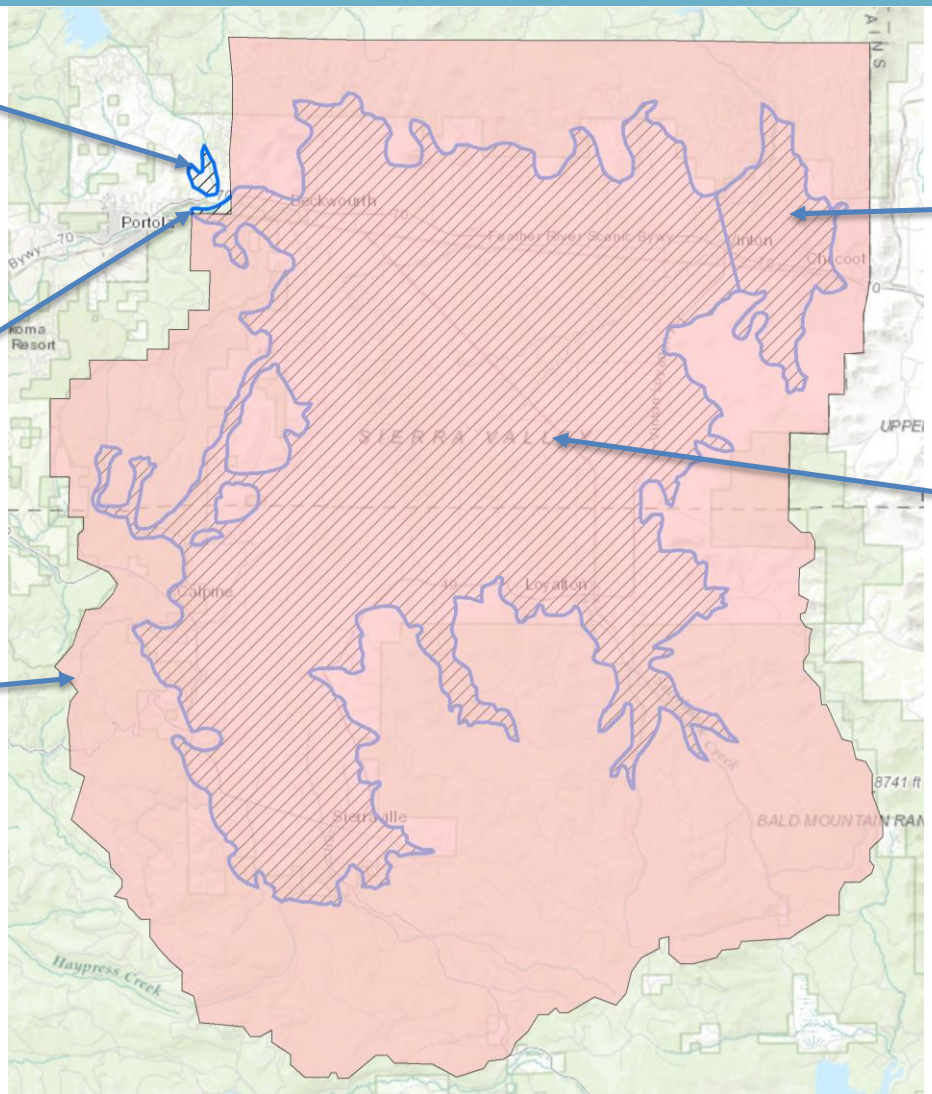
Sierra Valley Subbasin GW Conditions Presentation & Discussion

Sierra Valley Subbasin Overview

"Cats Head" Removed via Basin Boundary Modification

Plumas County GSA's portion of basin

SVGMD Jurisdictional Boundary



Chilcoot Subbasin

Sierra Valley Subbasin

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Summary of Interconnection Between Sustainability Indicators

- Groundwater levels are directly impacted by pumping
- When pumping exceeds “recharge”, groundwater levels fall (known as “overdraft”)
- Extensive overdraft causes subsidence (collapse of soil structure evidenced by reduction in surface elevation)
- Overdraft is temporary loss of groundwater storage; subsidence is permanent loss of storage capacity (reduced pore space)
- Overdraft causes “cone of depression” and migration of pollutants toward center of cone of depression
- Overdraft reduces quantity of water supporting wetlands and flowing from the groundwater system to the MF Feather River

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Groundwater Elevation Conditions – Data Sources

Data Sources:

- SVGMD Groundwater Elevation Monitoring Data (since 1980)
- SVGMD Agricultural Pumpage Data (since 1989)
- DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) Program data (since late 1950s)
- Data reviews/studies:
    - DWR's groundwater reports (since 1960s)
    - SVGMDs groundwater reports (since 1991)
    - UC Davis Upper Middle Fork study (2018)
    - Bachand and Associated groundwater study (in progress)

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Groundwater Elevation Conditions – SVGMD Pumping and Monitoring Wells

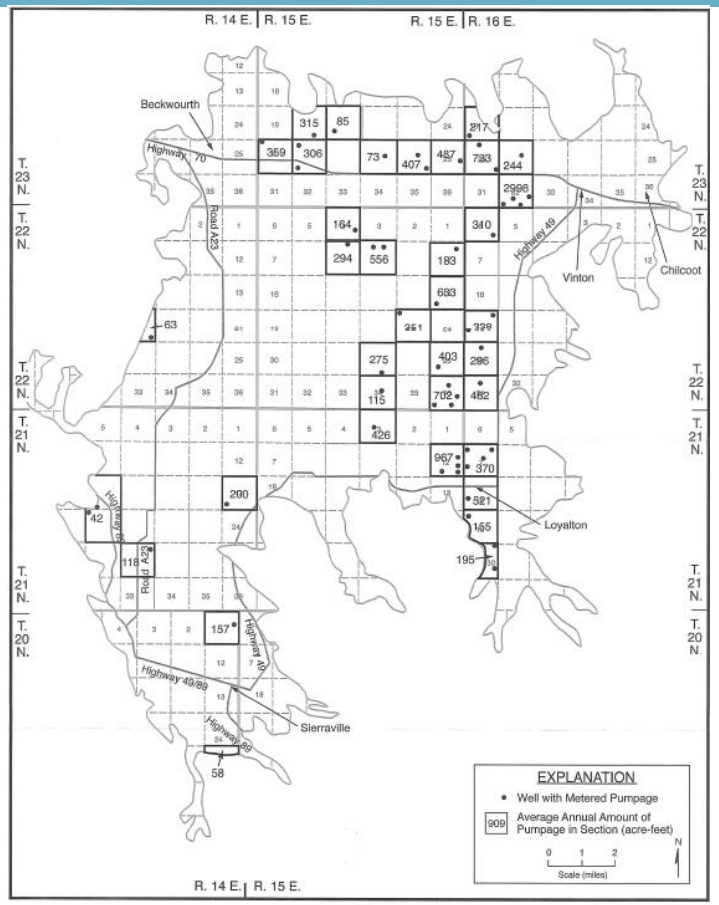

FIGURE 9 - ANNUAL METERED GROUNDWATER PUMPAGE FOR 2015

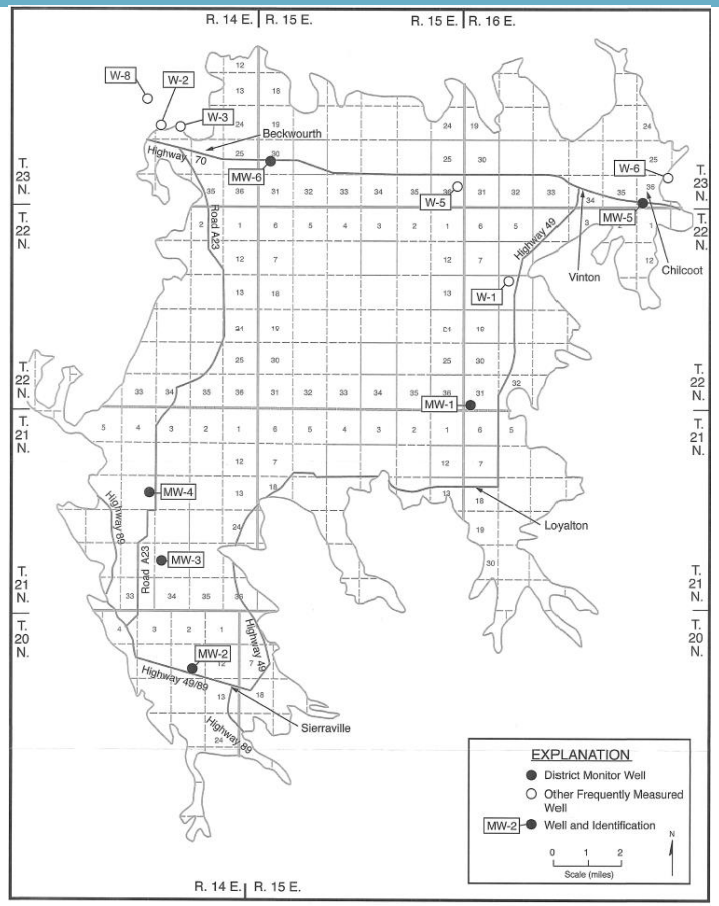

FIGURE 5 - LOCATION OF DISTRICT MONITOR WELLS AND OTHER FREQUENTLY MEASURED WELLS

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Groundwater Elevation Conditions – Monitoring Data Example: Loyalton

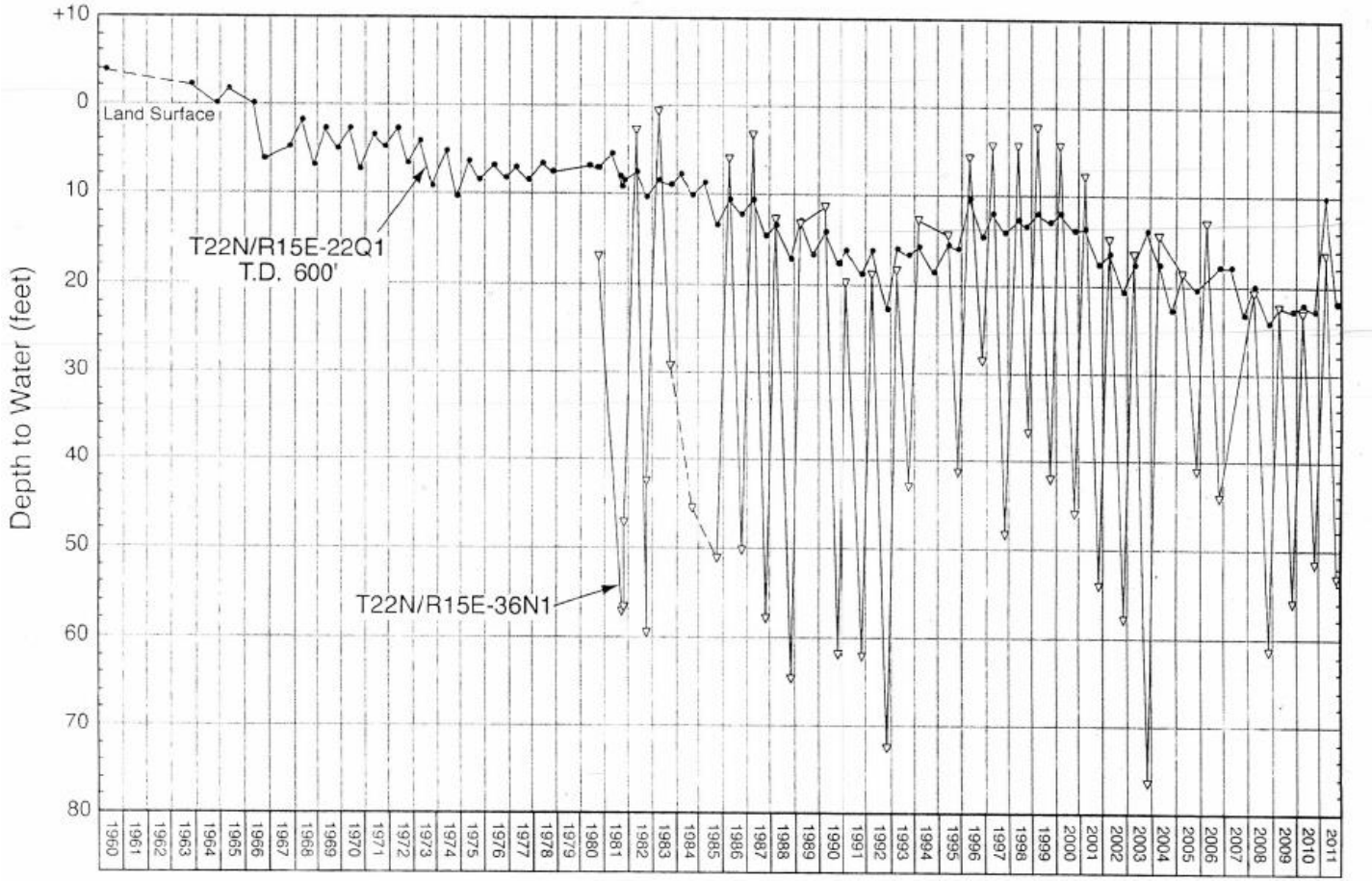

FIGURE 5 - WATER-LEVEL HYDROGRAPHS FOR LOYALTON AREA

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Groundwater Elevation Conditions – Monitoring Data Example: Chilcoot

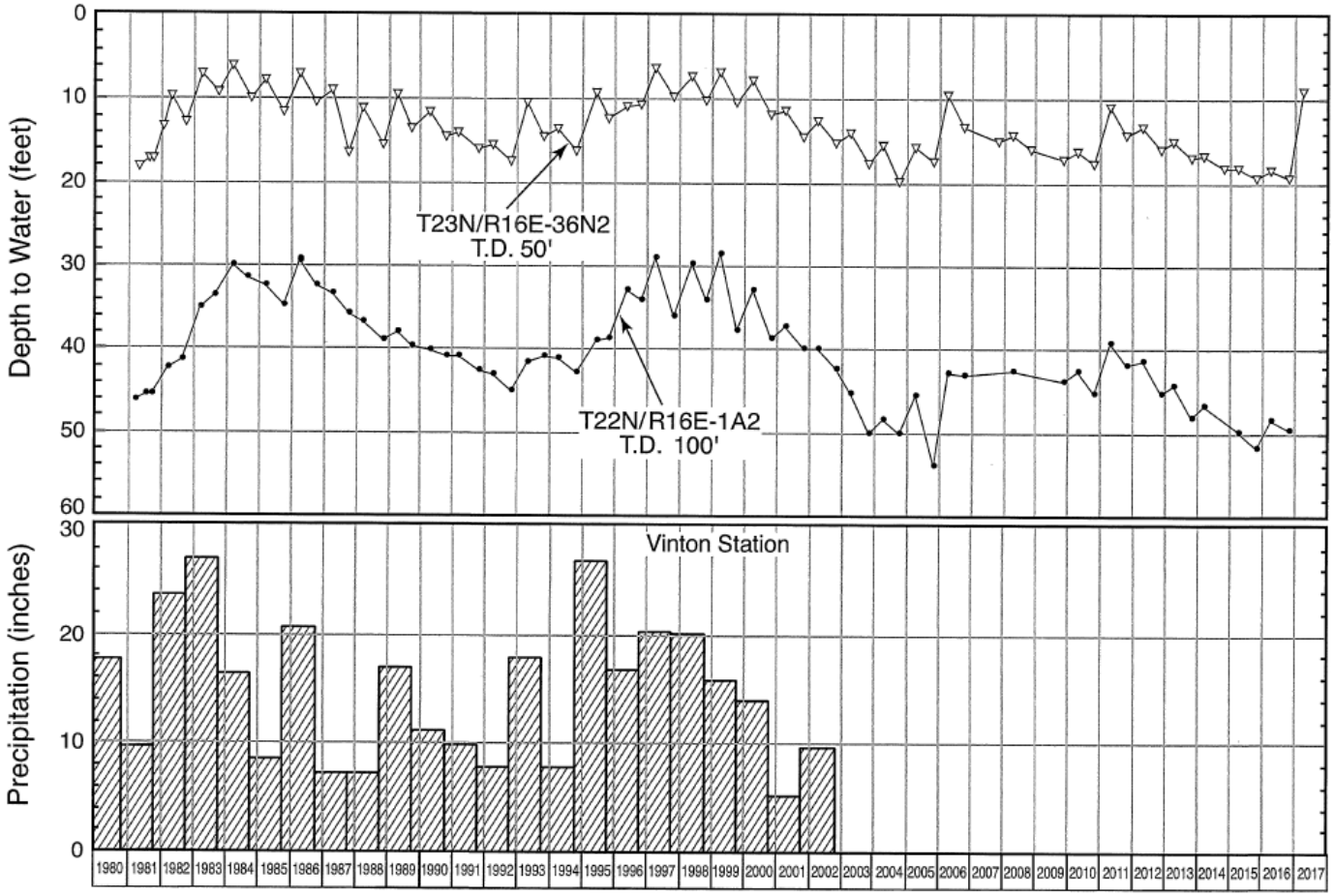

FIGURE 8 - WATER-LEVEL HYDROGRAPHS AND PRECIPITATION FOR CHILCOOT SUB-BASIN

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Groundwater Elevation Conditions – Monitoring Data Example: Vinton

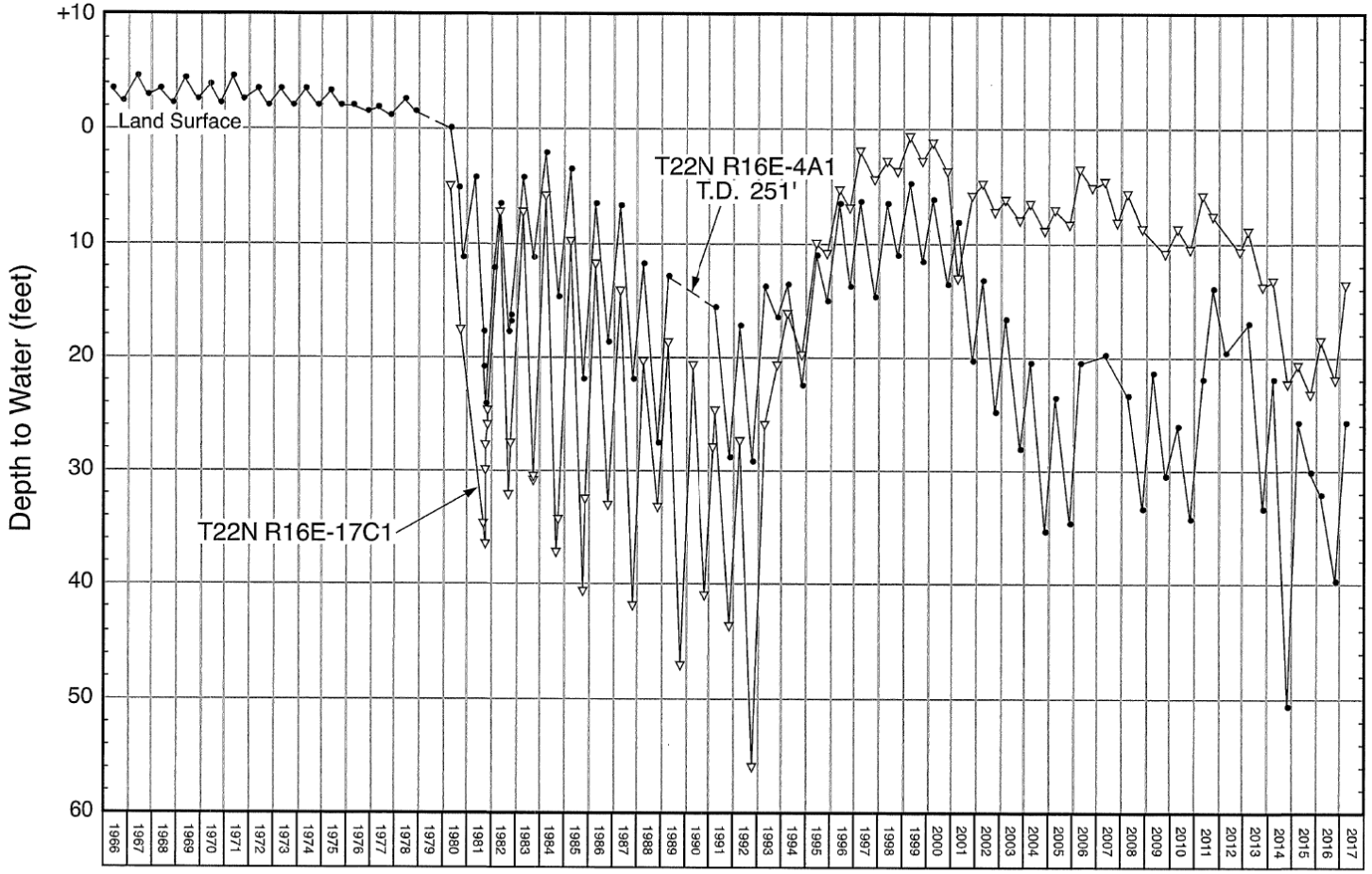

FIGURE 6 - WATER-LEVEL HYDROGRAPHS FOR VINTON AREA

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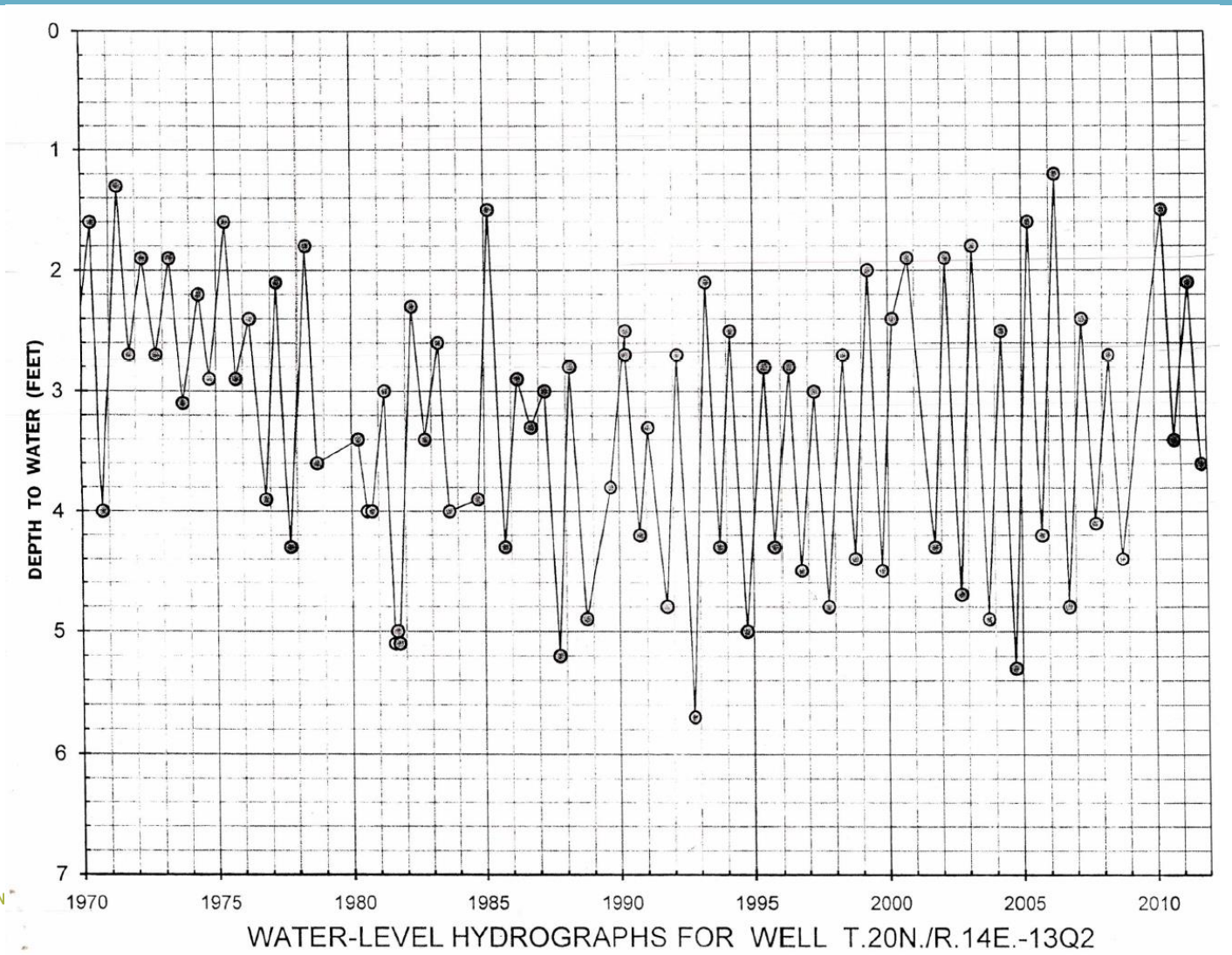
Groundwater Elevation Conditions – Monitoring Data Example: Sierraville



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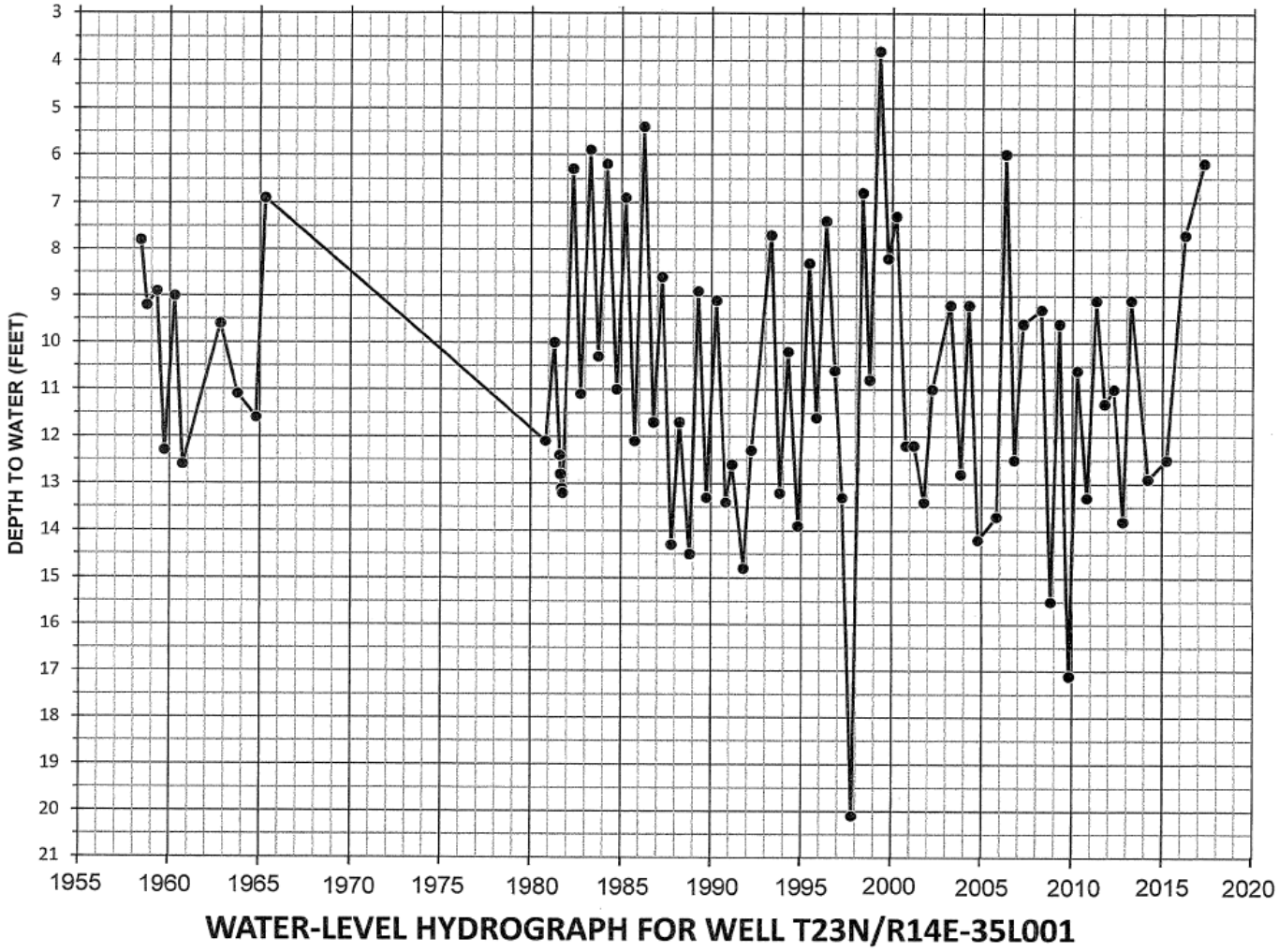
Groundwater Elevation Conditions – Monitoring Data Example: Beckwourth



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Groundwater Elevation Conditions – GW Elevation Changes 2005-2016

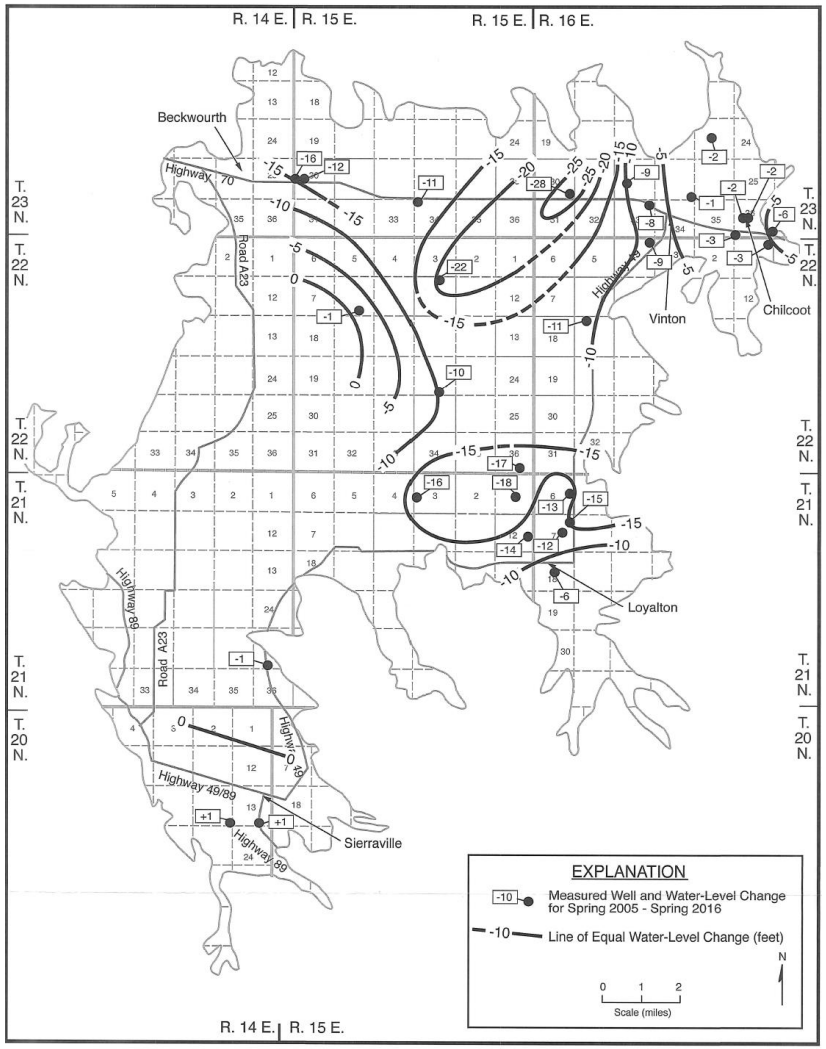

FIGURE 4 - WATER-LEVEL CHANGES FOR SPRING 2005-SPRING 2016

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Sierra Valley Subbasin GW Conditions Presentation & Discussion

Groundwater Elevation Conditions – Cone of Depression Growth 2015-2016

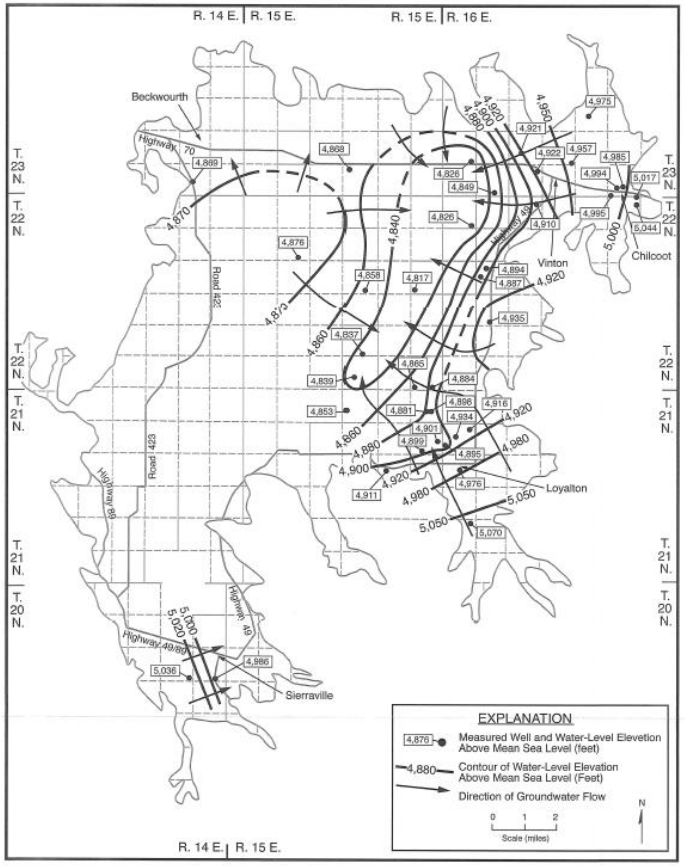

FIGURE 1 - WATER-LEVEL ELEVATIONS AND DIRECTION OF GROUNDWATER FLOW IN SPRING 2015

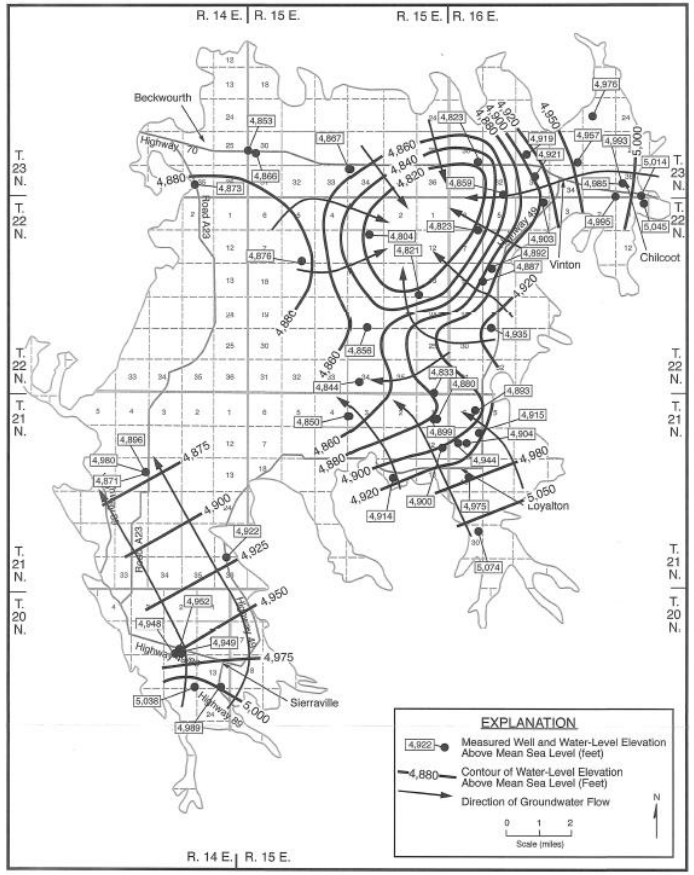

FIGURE 2 - WATER-LEVEL ELEVATIONS AND DIRECTION OF GROUNDWATER FLOW IN SPRING 2016

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Sierra Valley Subbasin GW Conditions Presentation & Discussion

Groundwater Elevation Conditions – 2017 Recharge

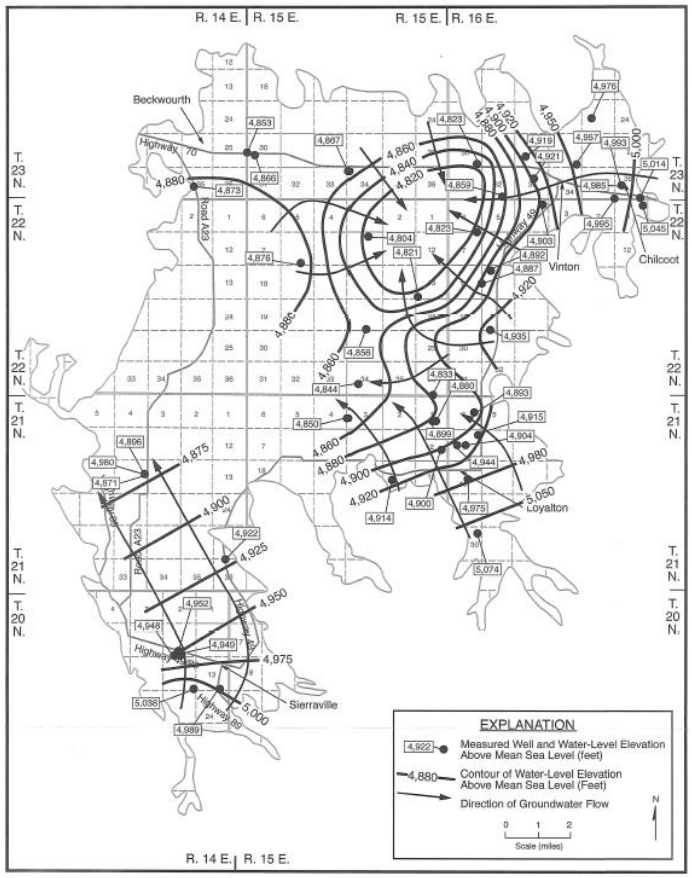

FIGURE 2 - WATER-LEVEL ELEVATIONS AND DIRECTION OF GROUNDWATER FLOW IN SPRING 2016

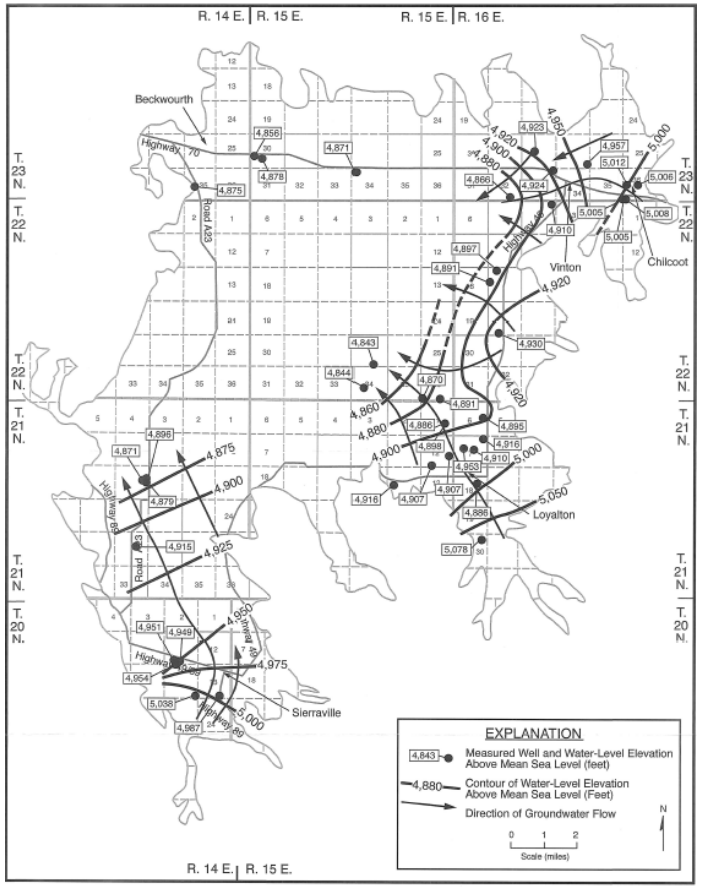

FIGURE 3 - WATER-LEVEL ELEVATIONS AND DIRECTION OF GROUNDWATER FLOW IN SPRING 2017

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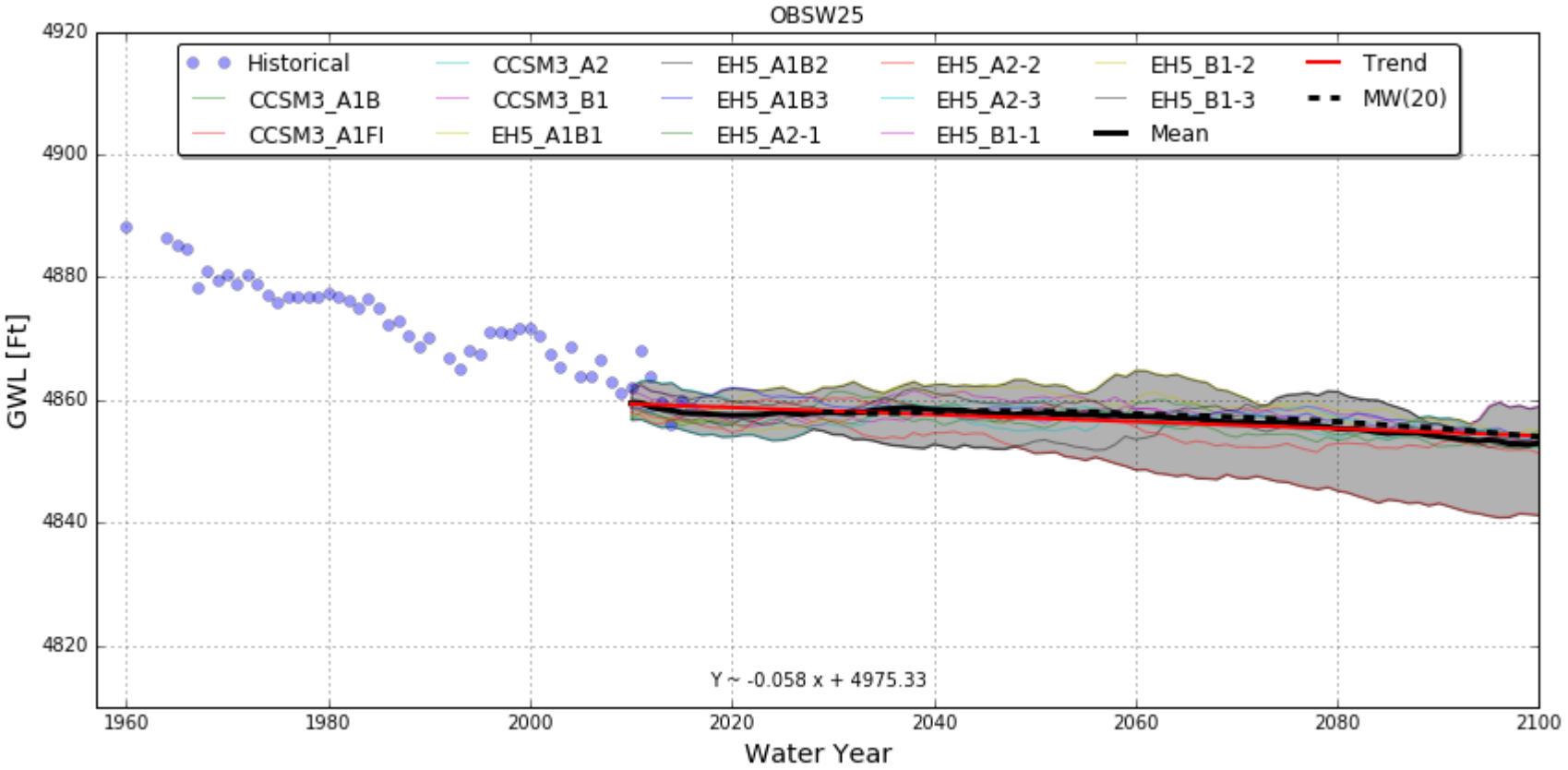
Groundwater Elevation Conditions – Future Projections Example: Loyalton



Source: Dib, A., Ceyhan, S., Ishida, K., Kavvas, M.L., Jang, S., Ohara, H. 2017. Final Report on the Upper Middle Fork Project. Hydrologic Research Laboratory. Department of Civil and Environmental Engineering. University of California, Davis.

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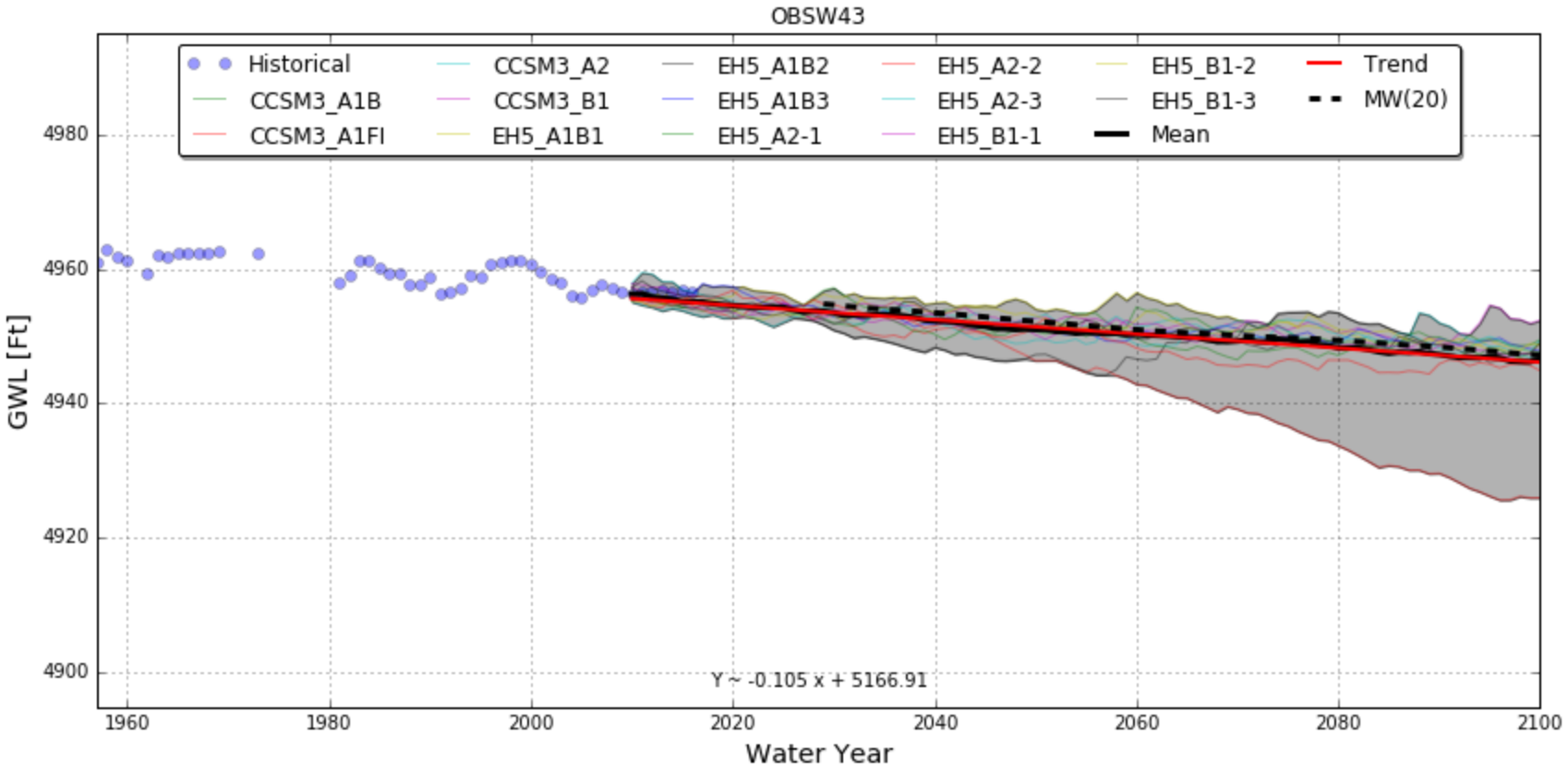
Groundwater Elevation Conditions – Future Projections Example: Chilcoot

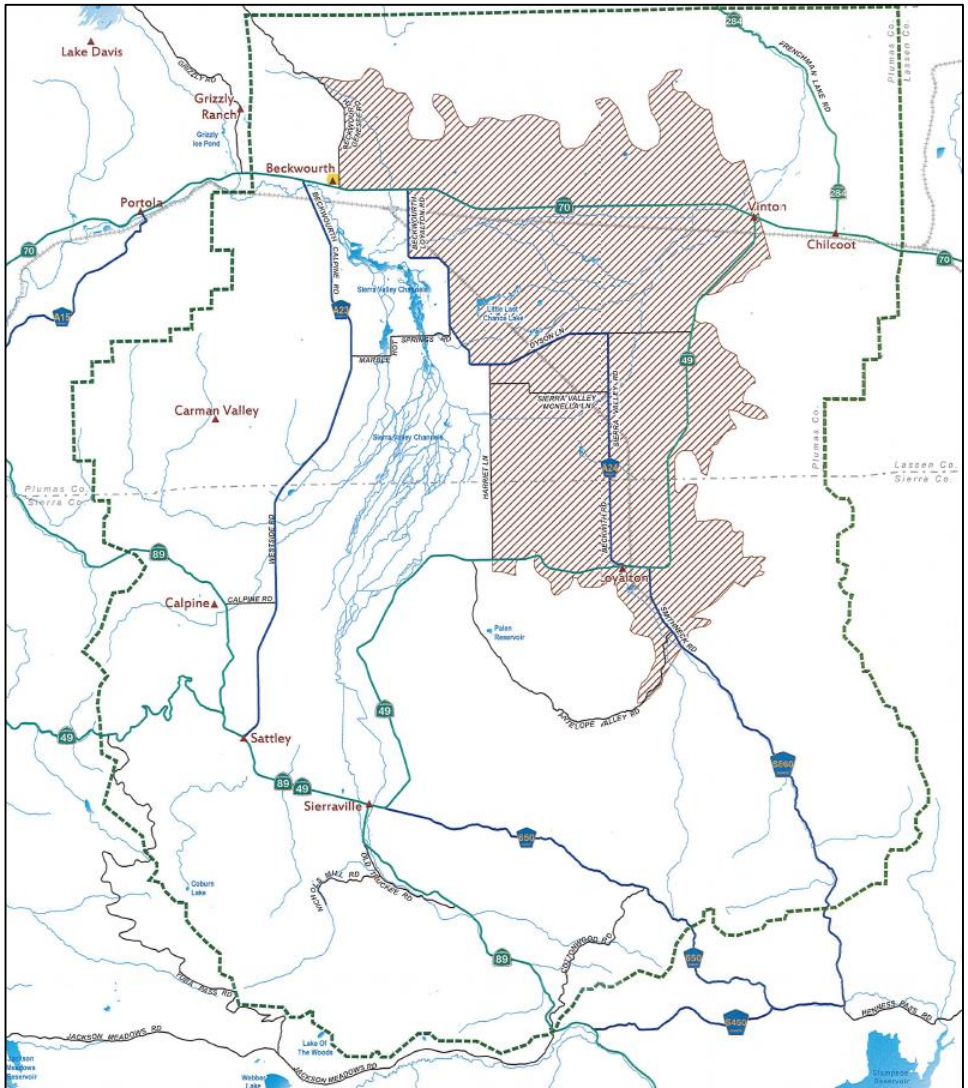


Source: Dib, A., Ceyhan, S., Ishida, K., Kavvas, M.L., Jang, S., Ohara, H. 2017. Final Report on the Upper Middle Fork Project. Hydrologic Research Laboratory. Department of Civil and Environmental Engineering. University of California, Davis.

Sierra Valley Subbasin GW Conditions Presentation & Discussion

Groundwater Elevation Conditions – Restricted Area

- "Restricted Area" mapped by Ken Schmidt, Hydrogeologist
- Large-capacity wells no longer permitted within the restricted area, per SVGMD Ordinance 18-01 (4/9/2018)



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Groundwater Elevation Conditions – Data Gaps

Data Gaps:

- limited knowledge of groundwater elevations in certain areas of the basin
- limited understanding of aquifer "layers" (confined vs. unconfined aquifers)
- limited understanding of short-term groundwater elevation fluctuations
- Limited understanding of effects of climate on groundwater elevations relative to effects of pumping

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Discussion

Sierra Valley Subbasin GW Conditions Presentation & Discussion

Land Subsidence Conditions – Data Sources

Data Sources:

- 1983 Technical Report by DWR
- 1958 DWR and 1983 Plumas County Rd Department Surveys
- 2015-2016 NASA Jet Propulsion Laboratory Study
- 2012-2016 CalTrans Survey (data available upon request)
- Anecdotal and groundwater level data

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Sierra Valley Subbasin GW Conditions Presentation & Discussion

Land Subsidence Conditions – DWR Data

1983 SVGMD Technical Report by DWR:

- Based on in-person observations and data assessment
- Several concrete well pads observed either hanging from well casings or cracked or collapsed (lack of ground support)
- Groundwater level declines of a few feet to over 20 feet had been documented since 1960 in the same general area
- Conclusion: as much as 1.5 feet of subsidence had occurred in the eastern half of the groundwater basin from the 1950s to 1983

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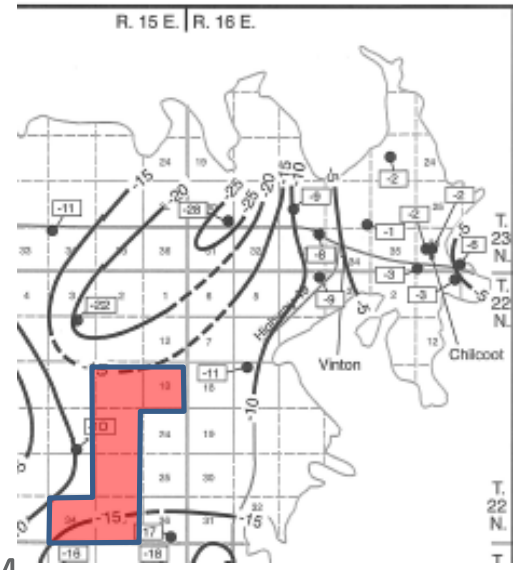
Sierra Valley Subbasin GW Conditions Presentation & Discussion

Land Subsidence Conditions – Plumas County Data

1983 Plumas County Road Department Surveys:

- The Plumas County Road Dept surveyed elevations from USGS benchmarks to 32 wells in eastern Sierra Valley in 1983
- DWR (1983) compared the elevations to 1958 DWR surveyed elevations; reported of the 32 wells surveyed:
  - 7 wells showed gains of 0.l to 0.7 feet,
  - 14 wells showed losses of 0.1 to 2.2 feet,
  - 3 wells remained unchanged, and
  - 8 had been altered or destroyed
- Conclusion: 1 to 2 feet of subsidence occurred in Sections 17, 18, 19, 30, and 31 of T22N/Rl6E and in Section 36 of T22N/Rl5E, MDBM



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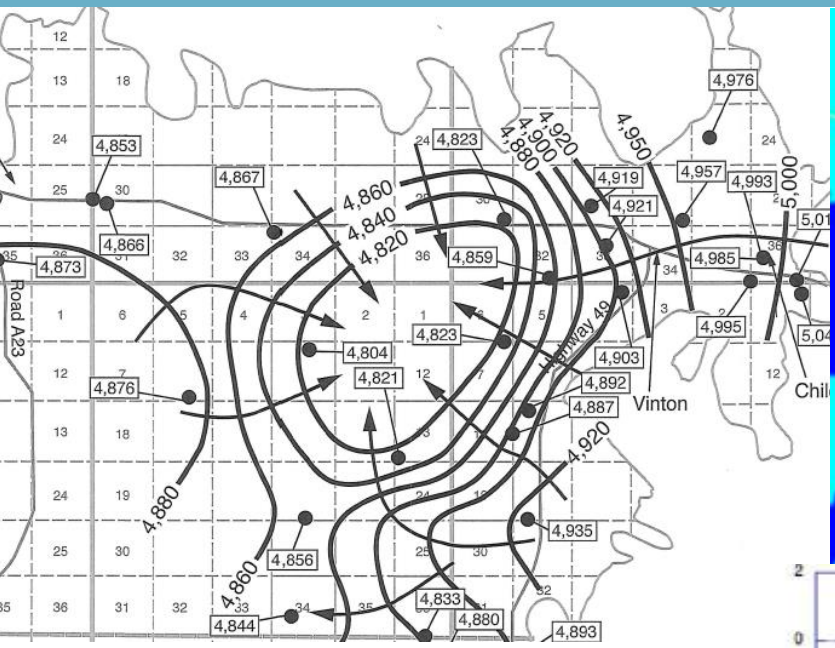
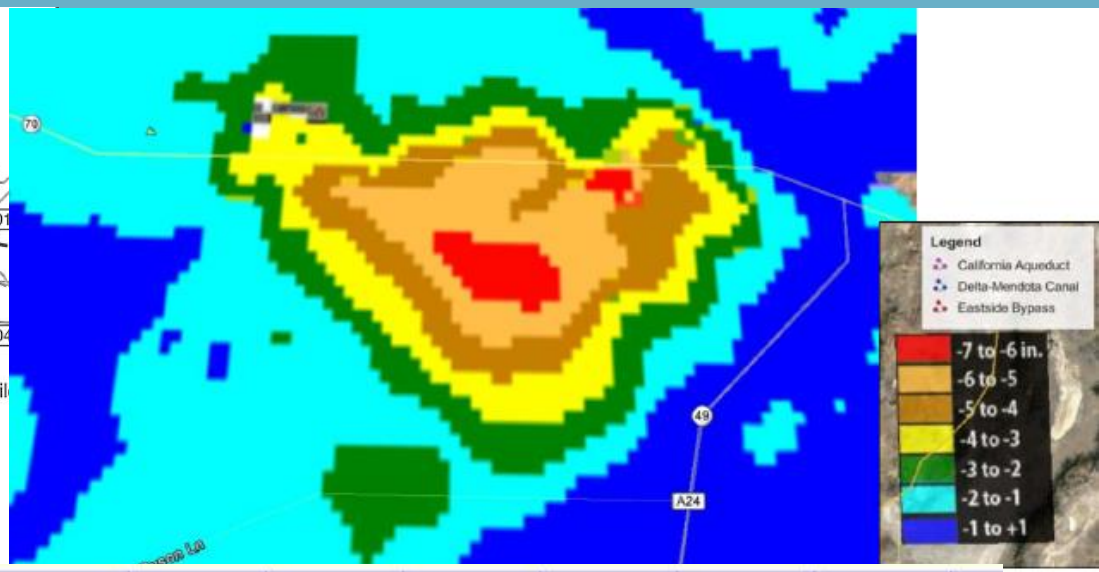
Land Subsidence Conditions – NASA Data





- Up to 7-inches subsidence from 2015-2016
- Location consistent with area of observed overdraft

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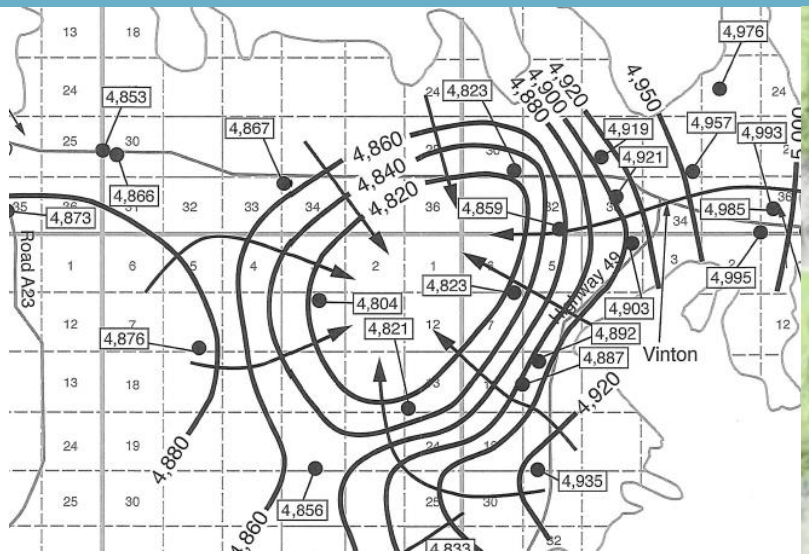
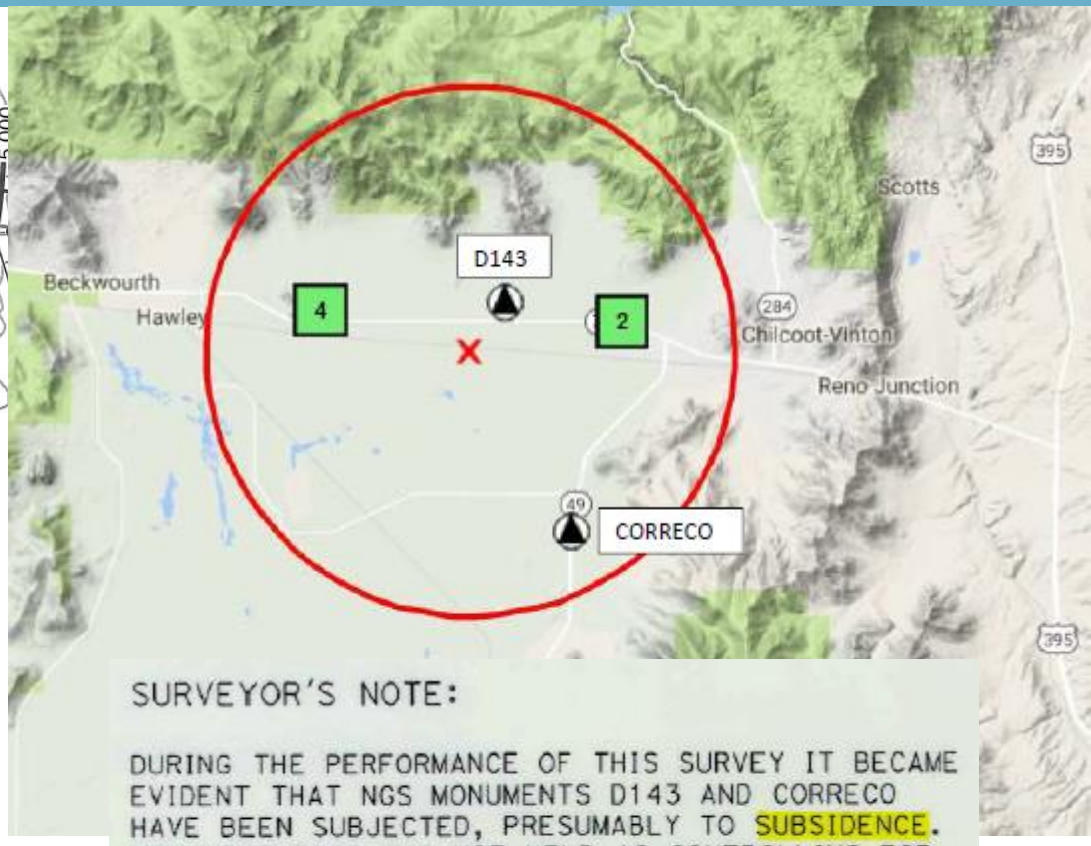
Land Subsidence Conditions – Caltrans Data





SURVEYOR'S NOTE:

DURING THE PERFORMANCE OF THIS SURVEY IT BECAME EVIDENT THAT NGS MONUMENTS D143 AND CORRECO HAVE BEEN SUBJECTED, PRESUMABLY TO SUBSIDENCE. MONUMENT D143 WAS NOT HELD AS CONTROLLING FOR ADJUSTMENT PURPOSES. MONUMENT CORRECO WAS ONLY HELD FOR ITS HORIZONTAL LOCATION ONLY AND WAS NOT HELD VERTICALLY FOR ADJUSTMENT PURPOSES.

- 1.9 ft subsidence at D143 and 0.3 ft subsidence at CORRECO from 2012-2016
- Location consistent with area of observed overdraft

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Land Subsidence Conditions – Anecdotal & GW Elevation Data

- Anecdotal Data:
  - Accounts of damage to private wells, increased ponding, drainage, and flooding issues, and a dip on County Route A24
  - No major damage to driveways, foundations, or major infrastructure has been attributed to subsidence
  - Elastic subsidence has posed infrastructure challenges to Plumas County Public Works (e.g. on County Road A-23)
- Groundwater Elevation Data:
  - Observed overdraft coincides with and corroborates subsidence data; subsidence occurs when groundwater levels decline beyond a certain threshold (typically, when levels decline below historic lows)

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Land Subsidence Conditions – Data Gaps

Data Gaps:

- Limited knowledge of extents, magnitude, and rates of subsidence
- Limited knowledge of correlation between groundwater level decline and subsidence (how much subsidence would occur for a given amount of groundwater level decline)
- Limited understanding of effects of subsidence on drainage, irrigation, and other land uses

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Discussion

Sierra Valley Subbasin GW Conditions Presentation & Discussion

Water Quality – Data Sources, Constituents of Concern, Other Concerns

Data Sources:

- DWR (since 1950's)
- SVGMD (since 2002)
- USGS (MF Feather River, 1970-1980)

Naturally Occurring Constituents of Concern:

- Sodium, boron, fluoride, nitrate, iron, and arsenic; potentially manganese, dissolved organics (discoloration), and others

Other Concerns:

- Pollutant sources such as wastewater systems and agricultural chemicals
- Migration of poor quality groundwater due to overdraft

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Sierra Valley Subbasin GW Conditions Presentation & Discussion

Water Quality – Data Summary

- Data Summary:
  - Groundwater quality in the Sierra Valley Subbasin: generally good
    - especially near the basin edges and major recharge areas
  - Generally poorest near fault-related thermal waters and some high concentrations in the area between the buttes and Vinton
  - Sodium can be problematic in agriculture
    - high concentrations exist primarily in the central west side of the valley near thermal waters
    - sodium concentrations have fluctuated some over time
  - Boron can be harmful to certain crops (i.e. alfalfa if above 2 to 4 mg/L)
    - concentrations are generally less than 0.3 mg/L
    - exceed 8 mg/L in thermal waters & 2 mg/L in the area east of the butte s
    - boron concentrations have fluctuated some over time

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Water Quality – Data Summary (Continued)

- Data Summary (Continued):
  - Fluoride concentrations in excess of 2 to 3 mg/L can damage teeth
    - only in thermal waters have higher concentrations been observed
    - fluoride concentrations have been relatively stable
  - Nitrate drinking water standard is 10 mg/L
    - few exceedances were observed in DWR's samples; much of the more recent nitrogen data is total nitrogen and therefore not comparable
  - Iron drinking water standard is 0.3 mg/L:
    - higher concentrations have been observed in a few wells in the central west portion of the basin and between the buttes and Vinton
    - iron concentrations have not significantly changed over time

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Water Quality – Data Gaps

Data Gaps:

- Limited data set = limited knowledge of:
  - extents and movements of poor quality groundwater
  - effects of potential pollutant sources on water quality over time
  - effects of overdraft on migration of poor quality groundwater and potential effect to beneficial uses/users
  - effects of groundwater management practices on surface water quality and beneficial uses (i.e. due to the mixing and movements of poor quality groundwater)

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Interconnected Surface Water – Summary

- Potential impacts:
  - Overdraft could lead to reduced surface water flows within and leaving the valley which could affect in-stream habitat and downstream water users
  - Overdraft could lead to reduced water supporting wetland/marshes, thereby affecting the sensitive habitat
- Data review:
  - MF Feather River Streamgage data at Rocky Point: 1969-80, 2006-present
  - Monitoring well data showing gradually declining groundwater level trends indicates that interconnected surface water may be impacted
  - Nature Conservancy's "GDE Pulse" primarily shows little/no long-term changes in GDEs; some reduction during drought period then rebound
  - Nature Conservancy's database of vegetation and wildlife identified in the Sierra Valley – can be used to track ecosystem health over time

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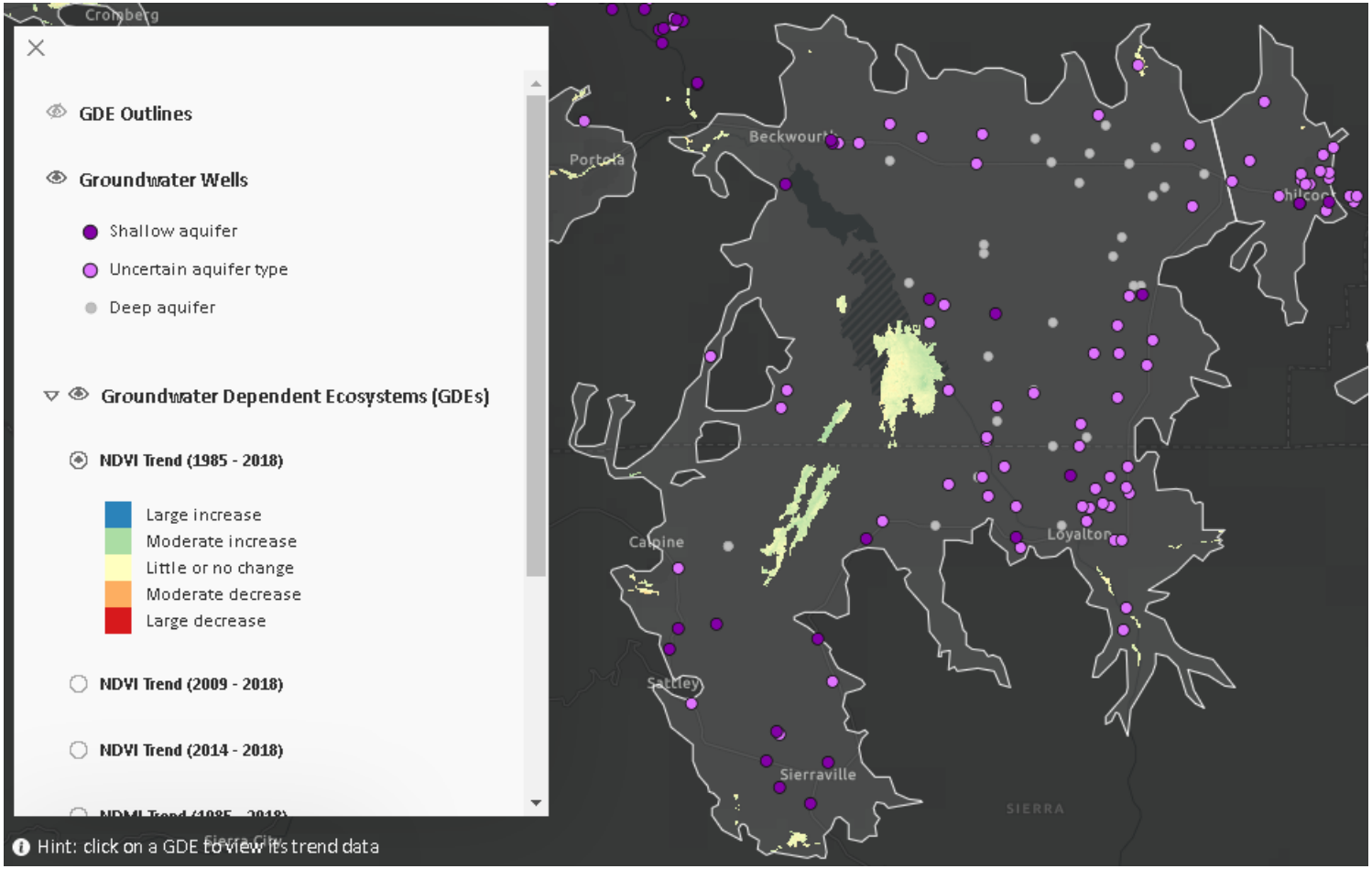
Interconnected Surface Water – GDE Pulse Map: 1985-2018

Nature Conservancy's GDE (Groundwater Dependent Ecosystem) Pulse Map, Changes in GDEs from 1985-2018:



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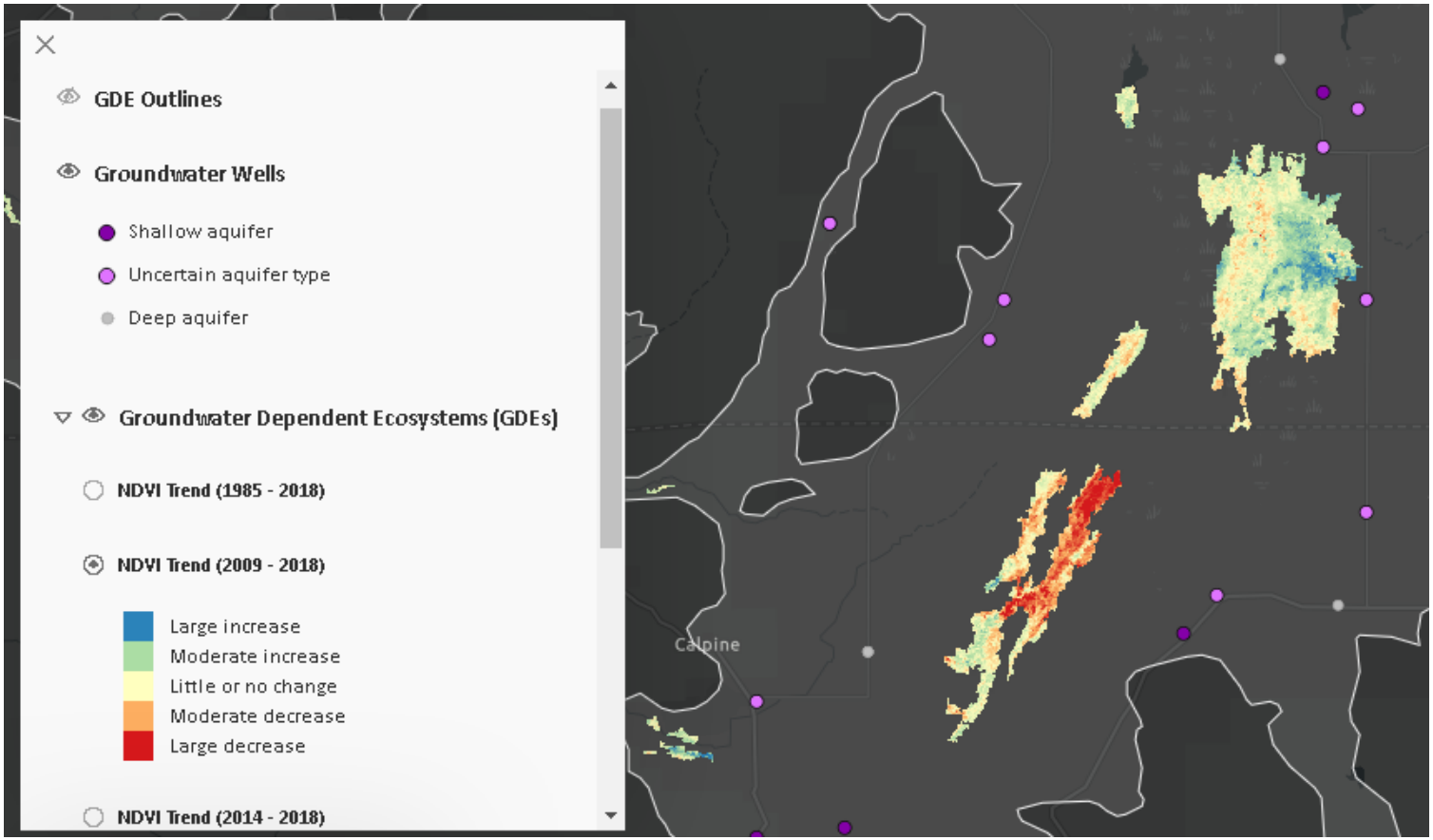
Interconnected Surface Water – GDE Pulse Map

Nature Conservancy's GDE Pulse Map, Changes in GDEs from 2009-2018:



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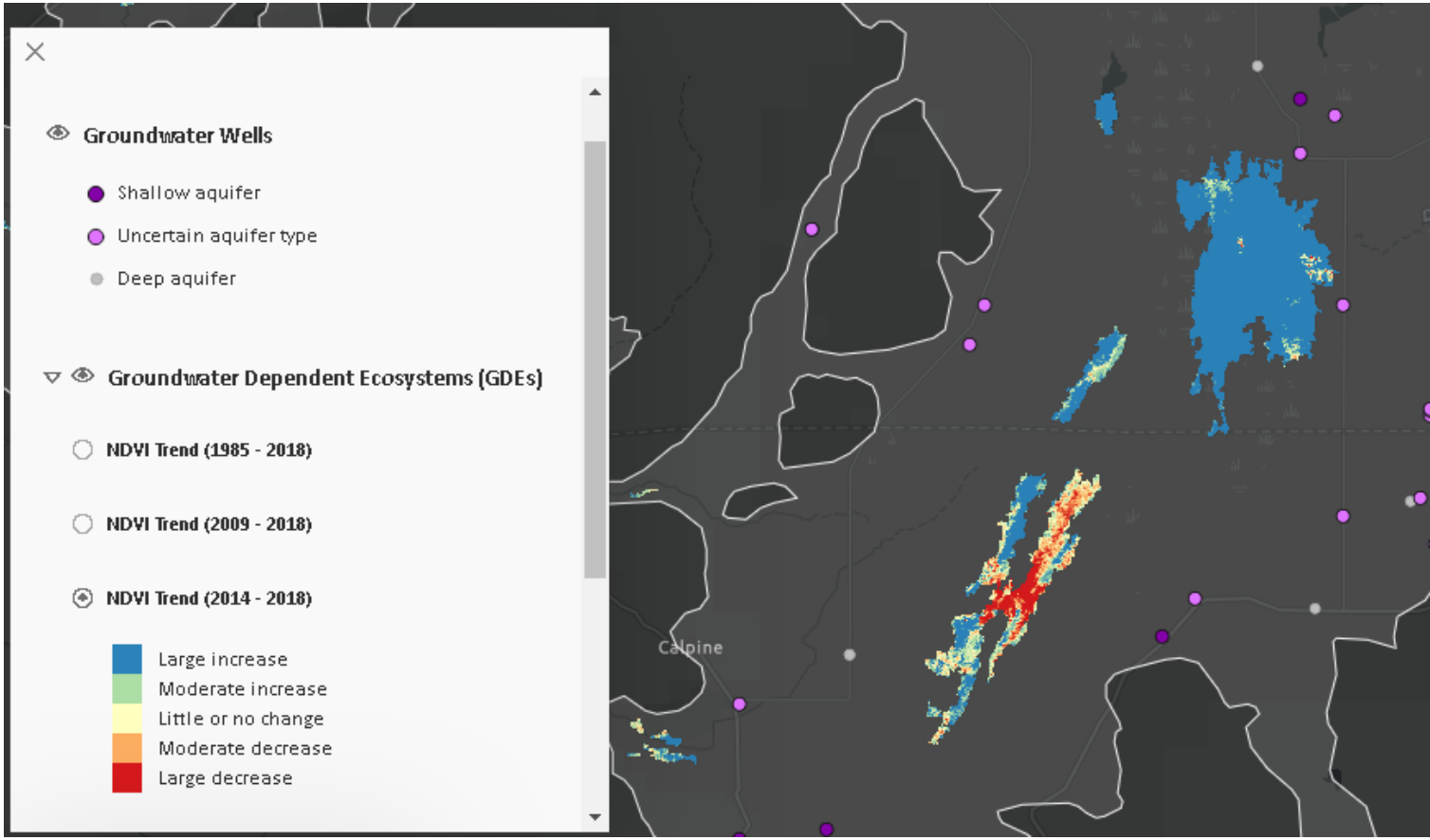
Interconnected Surface Water – GDE Pulse Map

Nature Conservancy's GDE Pulse Map, Changes in GDEs from 2014-2018:



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Interconnected Surface Water – Data Gaps

Data Gaps:

- Limited data set (i.e. flow data and habitat mapping) = limited knowledge of:
  - interconnection of deep aquifer and shallow aquifer throughout basin and from place to place;
  - affect of groundwater pumping from deep aquifers on shallow groundwater systems and wetlands/marshes;
  - affect of groundwater pumping from deep aquifers on surface water flows within the valley and leaving the valley through the Feather River
  - changes to flow rates and water quality in the MF Feather River and changes to wetland/marsh habitat since groundwater pumping increased in the ’60s and ‘70s

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Discussion

GROUNDWATER SUSTAINABILITY PLAN PLANNING GRANT

Kristi Jamason
Consultant (and SV resident)

PRESENTATION OVERVIEW

DWR Planning Grant Opportunity

- Background
- Development
- Schedule

Proposed Workplan

- Developing the Sierra Valley Groundwater Sustainability Plan
- Implementation Steps Toward Adaptive Management
- Team & Roles
- Schedule

DWR PLANNING GRANT OPPORTUNITY

BACKGROUND

Sustainable Groundwater Management Planning Grant Round 3

- Sierra Valley ineligible for Round 1
- No capacity to apply for Round 2
- Feather River Land Trust grant funded Round 3 proposal development

Round 3 Opportunity Basics

- Funded by Prop 68
- Administered by the Department of Water Resources
- $47 million available across CA
- Priority given to basins not funded previously

DWR PLANNING GRANT OPPORTUNITY
DEVELOPMENT

Feather River Land Trust Groundwater Funding

- Contracted Bachand & Associates
  - Literature review / Groundwater Technical Analysis & Reports
  - LESA Irrigation Efficiency Study – Year 1
  - Groundwater Planning Grant Proposal Development

Planning Grant Proposal Effort Supported by…

- Plumas County
- Sierra Valley Groundwater Management District
- Consensus Building Institute

FEATHER RIVER LAND TRUST

BACHAND & ASSOCIATES
Sustainable Water Resources

PLUMAS COUNTY CALIFORNIA

Sierra Valley Groundwater Management District

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DWR PLANNING GRANT OPPORTUNITY

GRANT AWARD SCHEDULE

Published Schedule:

- Grant Proposal Deadline — November 15, 2019
- Draft Awards Announced — January 27, 2020 - February 11, 2020
- Final Awards Announced — March 2020

Then “Contracting” begins…

PROPOSED WORKPLAN
OVERARCHING GOAL

To create and begin implementing a plan to move the Sierra Valley Basin toward groundwater sustainability in a way that:

- Is cost-effective, efficient and practical
- Protects and supports the region's unique ranching, environmental and ecological heritage
- Complements and leverages regional efforts associated with improving land and water management

PROPOSED WORKPLAN
GOALS

- Develop a Sustainability Vision for Sierra Valley
- Define “Significant & Unreasonable” for each Sustainability Indicator
- Determine cost-effective and efficient Sustainable Management Criteria
- Develop tools & protocols for data collection, processing, management & utilization
- Support broad Stakeholder Engagement





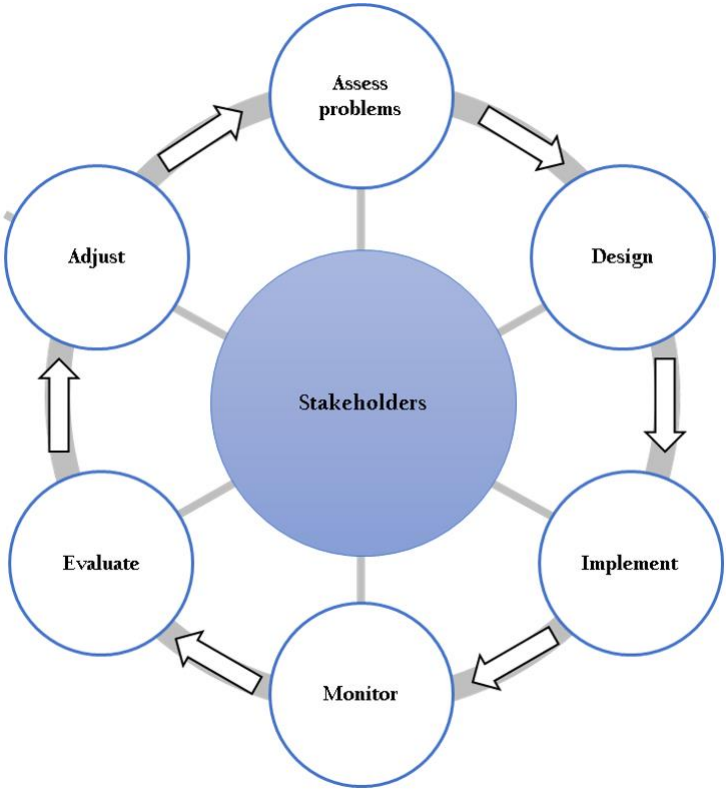
PROPOSED WORKPLAN
TWO OBJECTIVES

Develop a Groundwater Sustainability Plan that…

- Meets SGMA requirements
- Leverages DWR Best Management Practices
- Provides an implementation roadmap to sustainability that is effective & cost-efficient
- Addresses enforcement

Begin Implementation Steps to…

- Support an Adaptive Management strategy for the basin
  - Fill in data gaps
  - Beef up monitoring
- Help enlist important allies influencing groundwater recharge



Adaptive Management

PROPOSED WORKPLAN
ELEMENTS

Groundwater Sustainability Plan

- Outreach, stakeholder engagement, facilitation
- Financial/economic analysis – weighing alternatives, funding sources
- Preparation of the required elements of the plan itself
- Technical and reporting standards

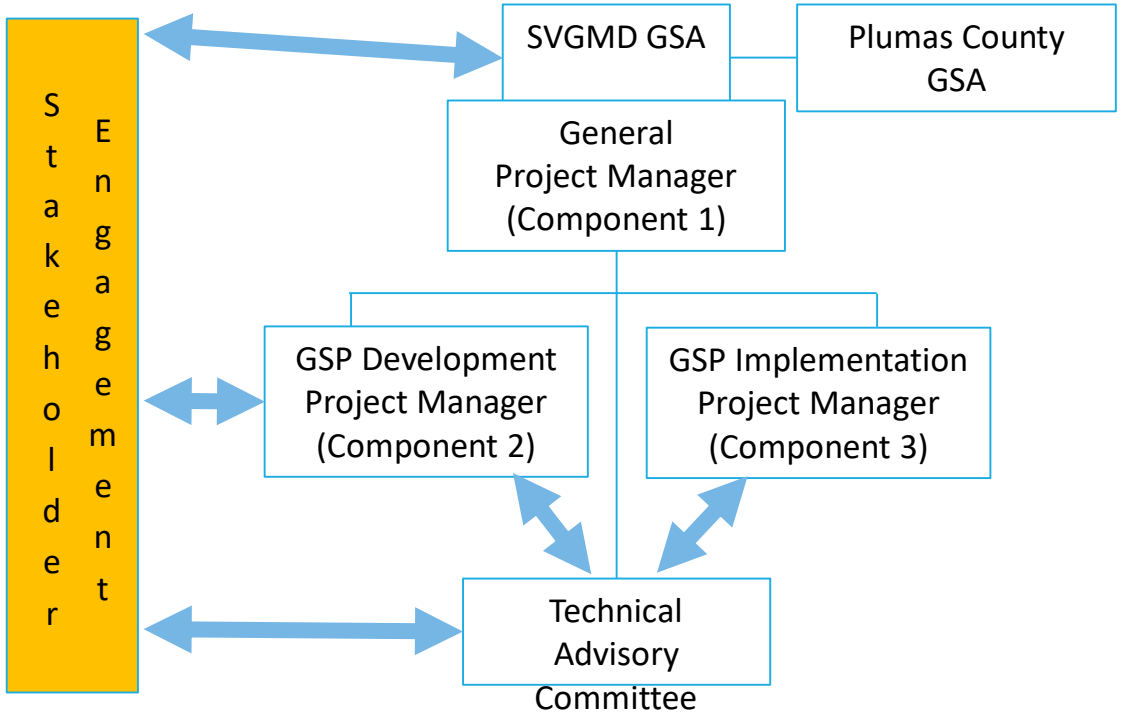
Implementation Steps / Adaptive Management Strategy Support

- Upgrade data collection / networks
  - To monitor land subsidence, groundwater levels, groundwater utilization & groundwater-dependent ecosystems
  - Leveraging existing data collection efforts where feasible
- Additional studies
  - Irrigation efficiency alternatives
  - Public land management strategies' influence on groundwater recharge
  - Frenchman Dam operations' influence on groundwater recharge

Frenchman Dam spillway

PROPOSED WORKPLAN
TEAM STRUCTURE

- Short grant implementation timeframe requires simultaneous efforts
- Project Managers will be professional engineers with GSP experience
- Additional expertise provided by a Technical Advisory Committee
- Stakeholders play an important role



PROPOSED WORKPLAN
SCHEDULE

Draft award announcement	February 2020
Overall Project Manager RFP/Selection	February – June 2020
Contracting (Grant agreement)	March – June 2020
Groundwater Plan Development ▪ Team selection will precede ▪ Final grant reporting will follow	August 2020 – January 2022
Implementation Projects	September 2020 – October 2022

IN SUMMARY…

The Planning Grant provides an opportunity for us to jointly develop and express our vision of groundwater sustainability in Sierra Valley and to chart our way toward it.

Stakeholder Participation Opportunities

- Workshops at key points in the groundwater sustainability planning process over next two years
- Sierra Valley Groundwater Management District Board meetings (third Monday of the month from 6-9 PM)
- Sign-up for interested parties list to receive notifications and go to District's website for more information: www.sierravalleygmd.org
- Fill out comment card or contact the District: sierravallygmd@sbcglobal.net or 530-414-6831.

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Thank you!

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