Basin Setting Public Review Documents- Highlights and Discussion

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Vina Subbasin Stakeholder Advisory Committee
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Basin Setting Project- Technical Foundation

Groundwater Sustainability Plan (GSP)

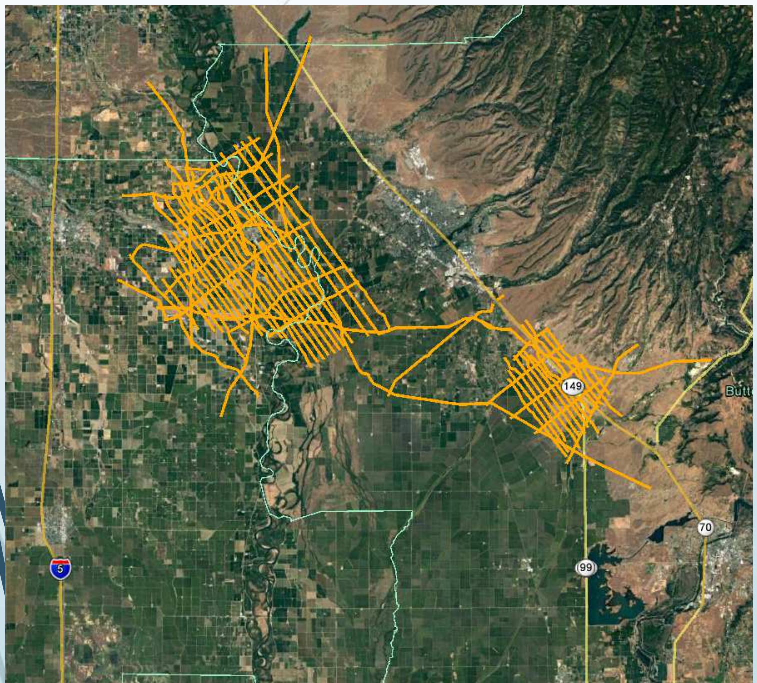
- **1. Administrative Information**
- **2. Basin Setting**
  - Hydrogeologic Conceptual Model
  - Groundwater Conditions
  - Water Budget
  - Management Areas
- **3. Sustainable Management Criteria**
  - Sustainability Goal
  - Undesirable Results
  - Minimum Thresholds
  - Measurable Objectives
- **4. Monitoring Networks**
  - Monitoring Network
  - Representative Monitoring
  - Assessment & Improvement
  - Reporting Monitoring Data
- **5. Projects and Management Actions**

Groundwater Dependent Ecosystems (GDEs)

- Work is underway
- Documentation still to be added to the Basin Setting Document

…Update from Kelly

Airborne Electromagnetic (AEM) Survey



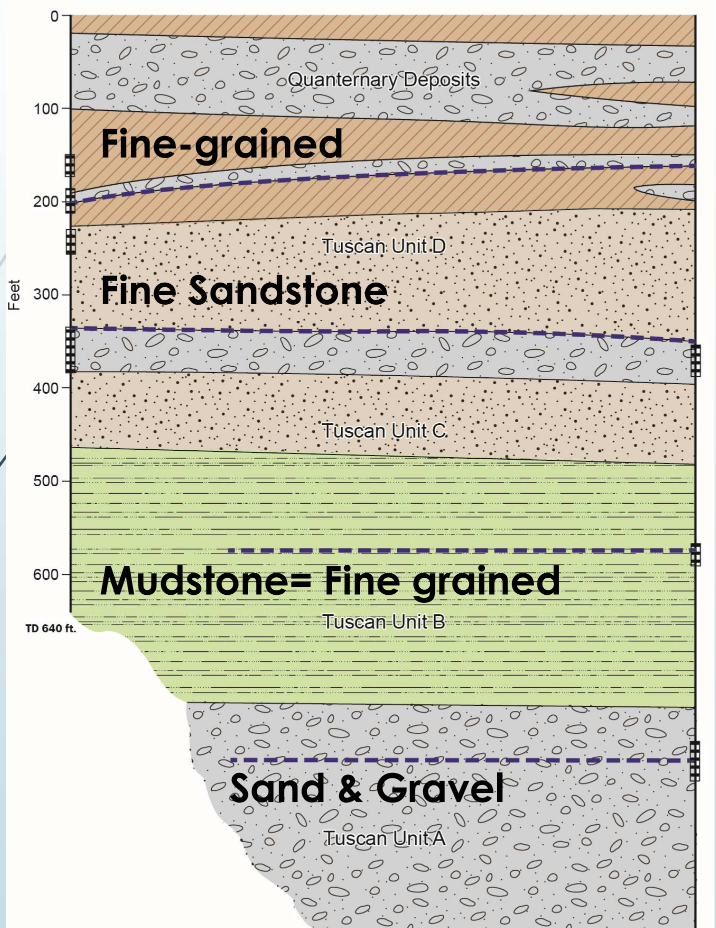
- **What are we hoping to learn?**
- Delineate major aquifer and aquitard units to improve hydrogeologic conceptual model
- Assess spatial distribution of clay-rich layers. How extensive are they?
- Examine level of connectivity between upper and lower portions of the Tehama/Tuscan aquifer systems
- Identify hydrostatigraphic layers with similar aquifer characteristics (transmissivity, specific yield, boundaries, surface water-groundwater relationships) for use in groundwater model development

Vertical Connectivity??

https://www.buttecounty.net/waterresourceconservation/AEM-Project
https://mapwater.stanford.edu/

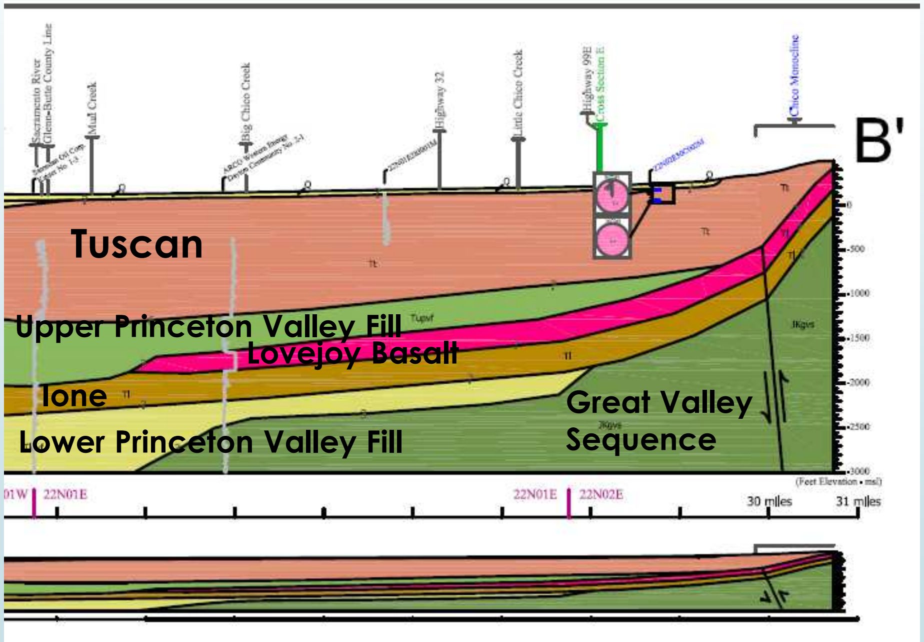
Hydrogeologic units vs. Stratigraphic units

Sediment Type= Fine vs. Course grained



From Lower Tuscan Aquifer Investigation, 2013

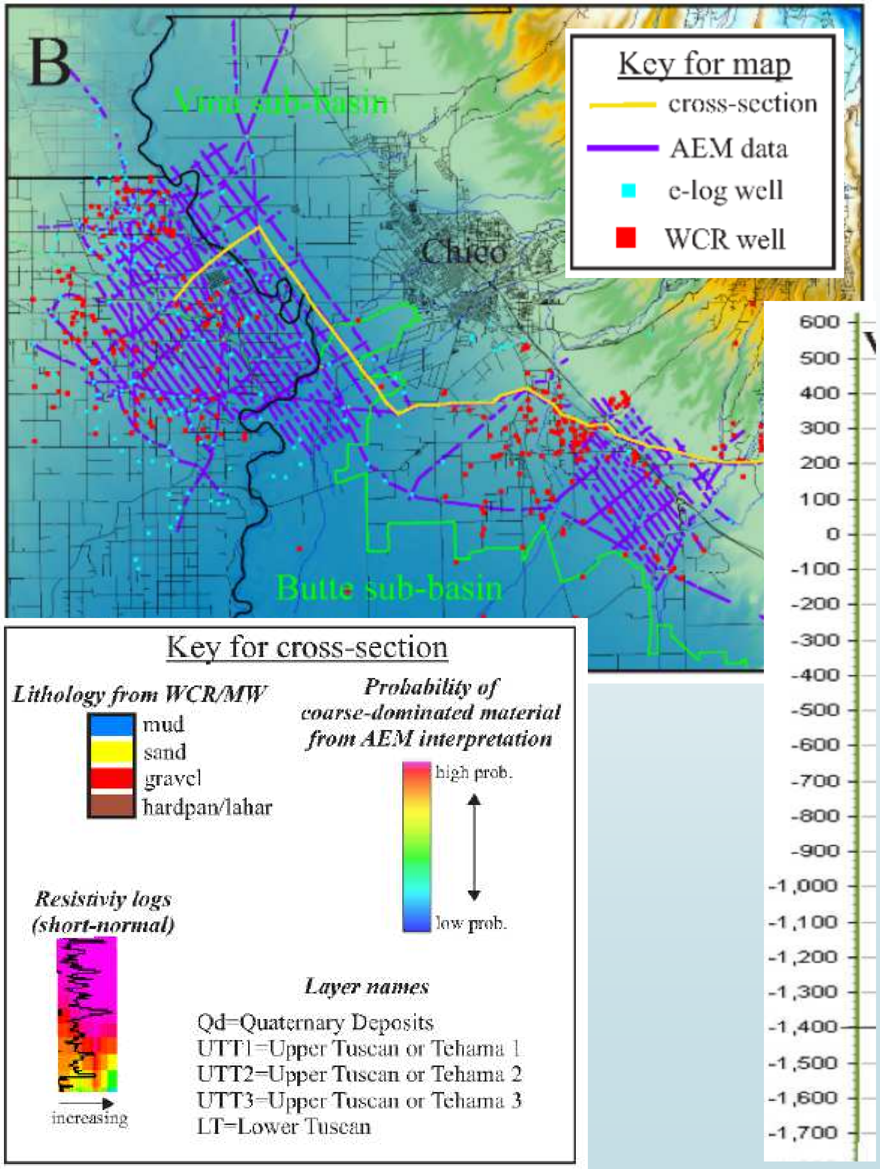
Geologic Formations
- **Quaternary Deposits**
- **Tuscan**
- **Tehama**

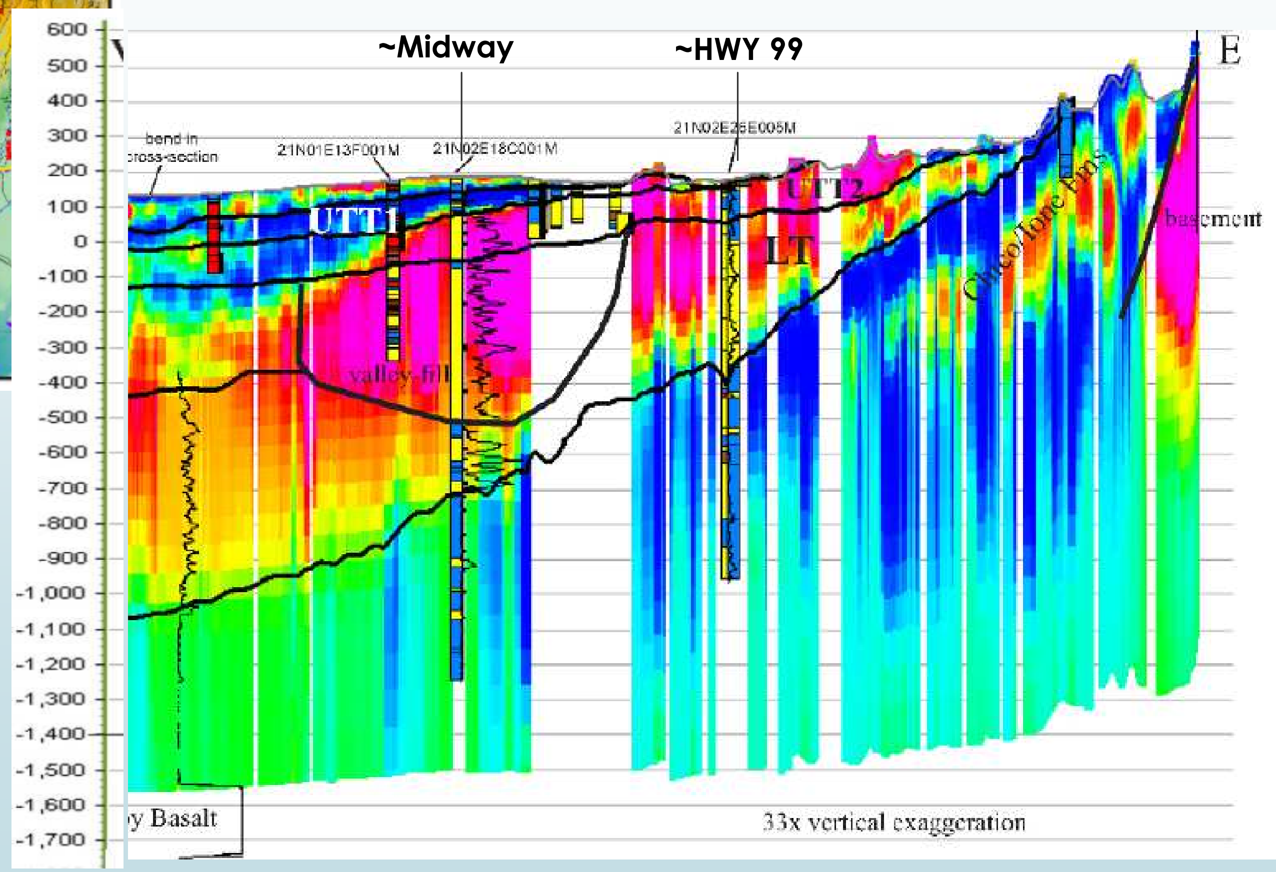


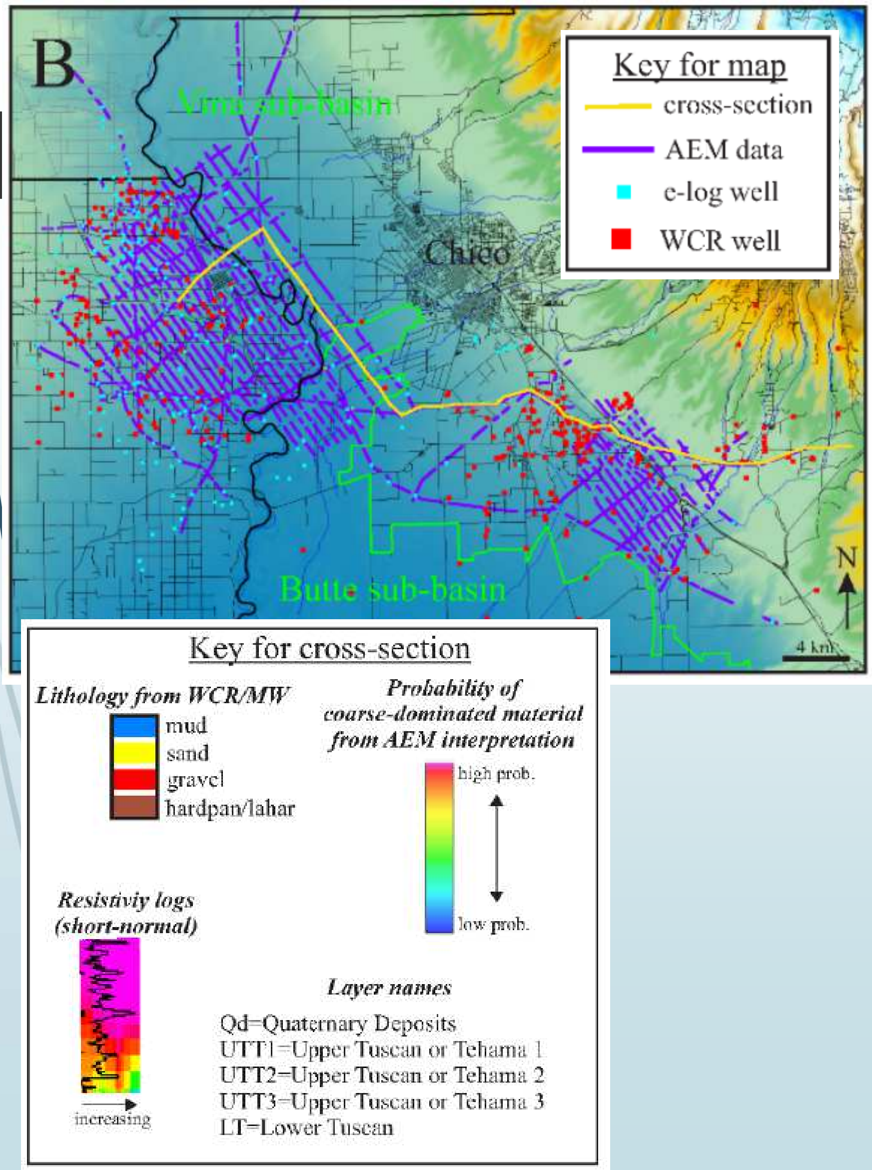
Portion of DWR Cross Section B-B' from 2014 Geology of Northern Sacramento Valley Report

Common Terms:

- Coarse grained material, coarse dominated= sands/gravels
- Fine grained material, fine-dominated= silt/clay

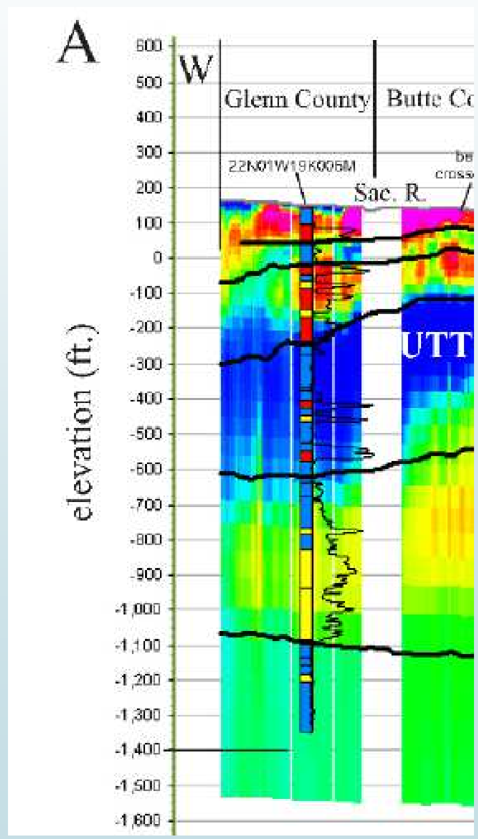






Common Terms:

- Coarse grained material, coarse dominated, aquifer material= sands/gravels
- Fine grained material, fine-dominated, aquitard material= silt/clay



Groundwater Change in Storage

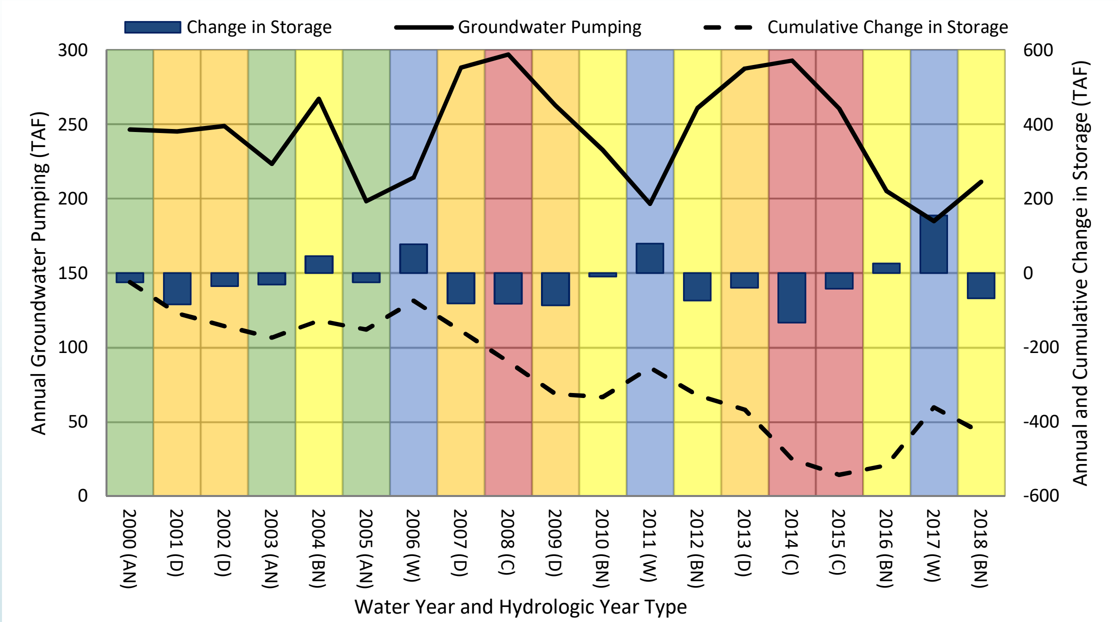


Table 1-9. Historical Water Supplies and Change in Groundwater Storage by Hydrologic Water Year Type

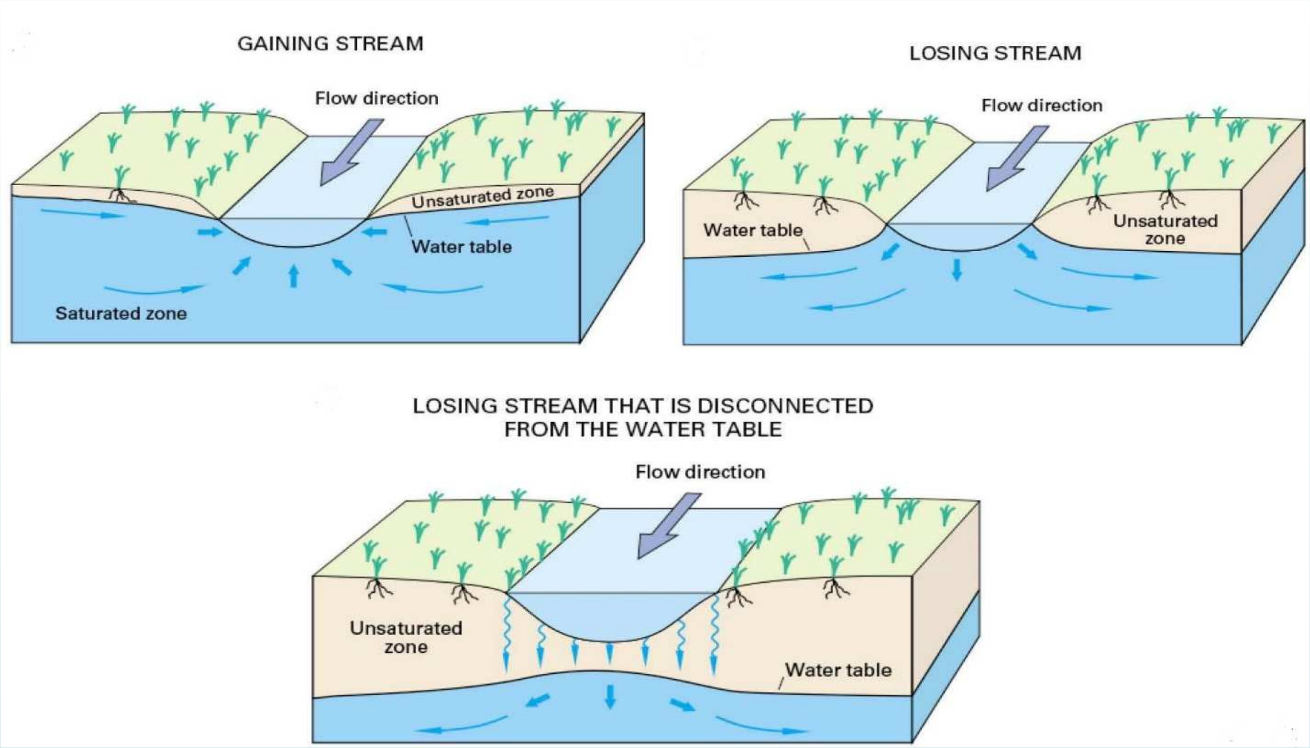
Water Year Type	Surface Water Deliveries (AFY)	Groundwater Pumping (AFY)	Total Supply (AFY)	Change in Groundwater Storage (AFY)
Wet	24,000	198,600	222,700	117,900
Above Normal	21,100	222,800	243,900	10,700
Below Normal	20,600	235,500	256,200	-19,200
Dry	17,300	266,600	284,000	-82,000
Critical	12,200	283,700	295,800	-84,500

Table 1-8. Water Budget Summary: Groundwater System.

Component	Historical (AFY)	Current (AFY)	Future, No Climate Change (AFY)	Future, 2030 Climate Change (AFY)	Future, 2070 Climate Change (AFY)
Inflows					
Subsurface Inflows	137,400	143,200	142,800	144,600	145,500
Foothill Area	*45,700*	*50,100*	*49,700*	*50,600*	*50,600*
Los Molinos Subbasin	*63,000*	*67,000*	*67,300*	*67,900*	*68,100*
Butte Subbasin	*28,600*	*25,900*	*25,500*	*25,800*	*26,600*
Wyandotte Creek Subbasin	*200*	*300*	*200*	*300*	*300*
Deep Percolation	192,700	191,800	189,300	194,500	196,800
Precipitation	*120,200*	*125,400*	*120,400*	*123,500*	*123,600*
Applied Surface Water	*4,800*	*5,600*	*5,600*	*4,900*	*4,500*
Applied Groundwater	*67,600*	*60,900*	*63,300*	*66,100*	*68,700*
Seepage	24,000	27,700	27,800	27,800	27,400
Streams	*20,800*	*24,100*	*24,200*	*24,600*	*24,400*
Canals and Drains	*3,200*	*3,600*	*3,600*	*3,200*	*3,000*
Total Inflow	***354,100***	***362,700***	***359,900***	***366,900***	***369,700***
Outflows					
Subsurface Outflows	70,400	76,200	72,000	70,700	67,800
Foothill Area	*300*	*200*	*200*	*200*	*200*
Los Molinos Subbasin	*4,700*	*900*	*900*	*900*	*900*
Butte Subbasin	*65,400*	*75,100*	*70,800*	*69,500*	*66,600*
Wyandotte Creek Subbasin	*0*	*0*	*0*	*0*	*0*
Groundwater Pumping	243,500	209,200	215,800	225,900	238,000
Agricultural	*209,100*	*185,500*	*184,800*	*194,700*	*206,800*
Urban and Industrial	*26,500*	*20,100*	*27,500*	*27,500*	*27,500*
Managed Wetlands	*8,000*	*3,500*	*3,500*	*3,600*	*3,700*
Stream Gains from Groundwater	3,700	1,100	1,000	1,000	1,000
Western Boundary Net Outflows	56,100	77,400	73,000	71,000	65,600
Total Outflow	***373,700***	***363,900***	***361,800***	***368,600***	***372,400***
Change in Storage (Inflow - Outflow)	***-19,600***	***-1,100***	***-1,700***	***-1,700***	***-2,600***

*Note corrected Total Inflow and Total Outflow

Interconnected Surface Water



Interconnected Surface Water

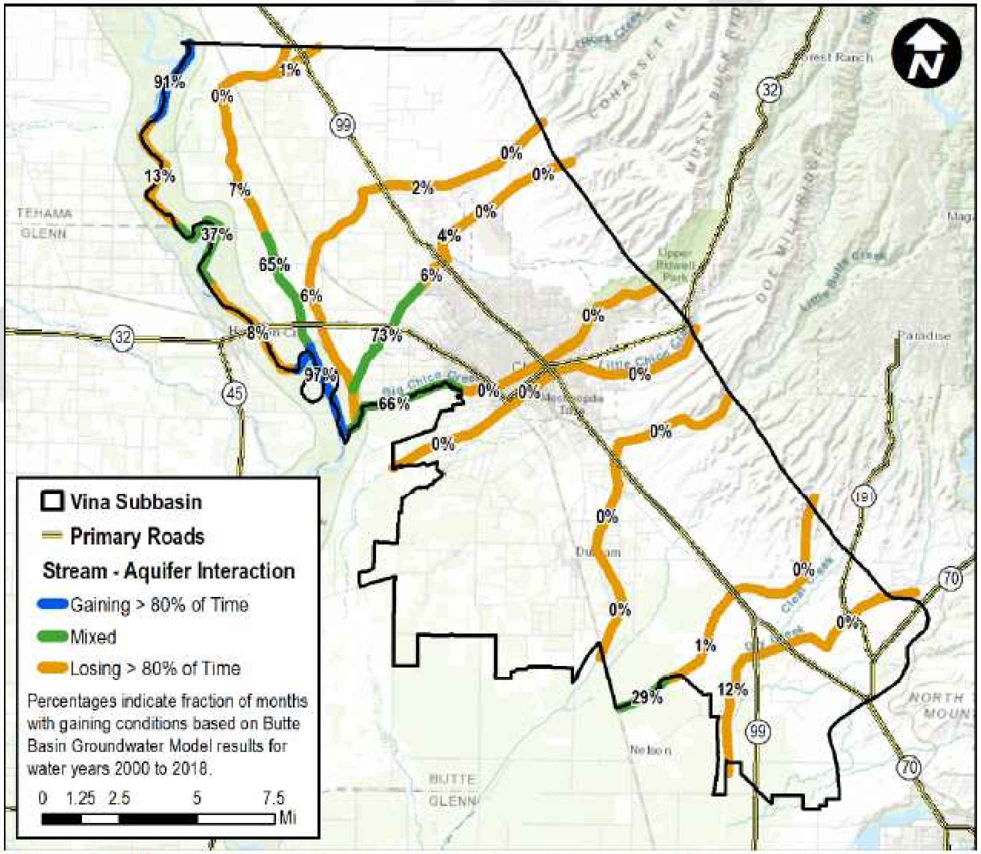


Figure 1-22. Vina Subbasin Gaining and Losing Stream Reaches based on BBGM, Water Year 2000 to 2018

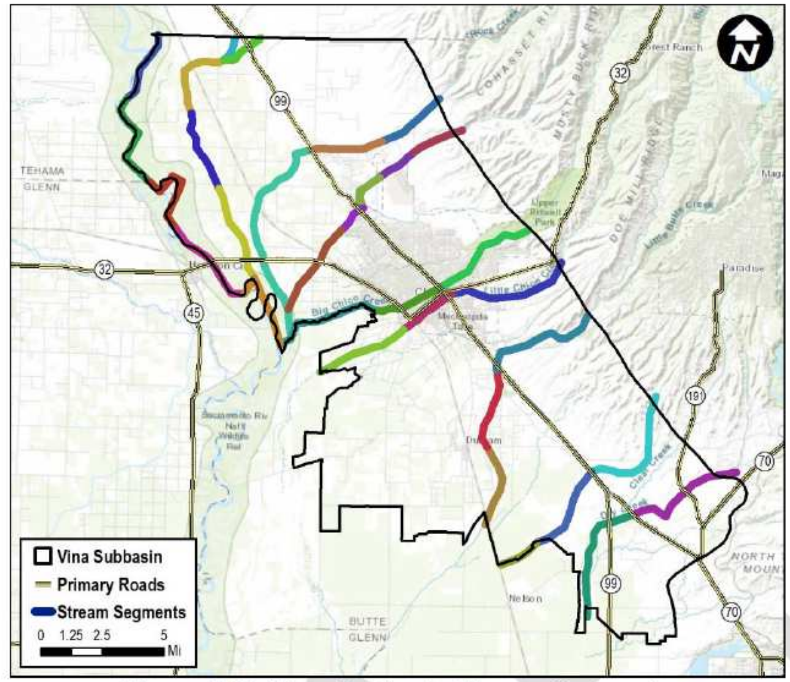


Figure 1-21. Vina Subbasin Stream Segments

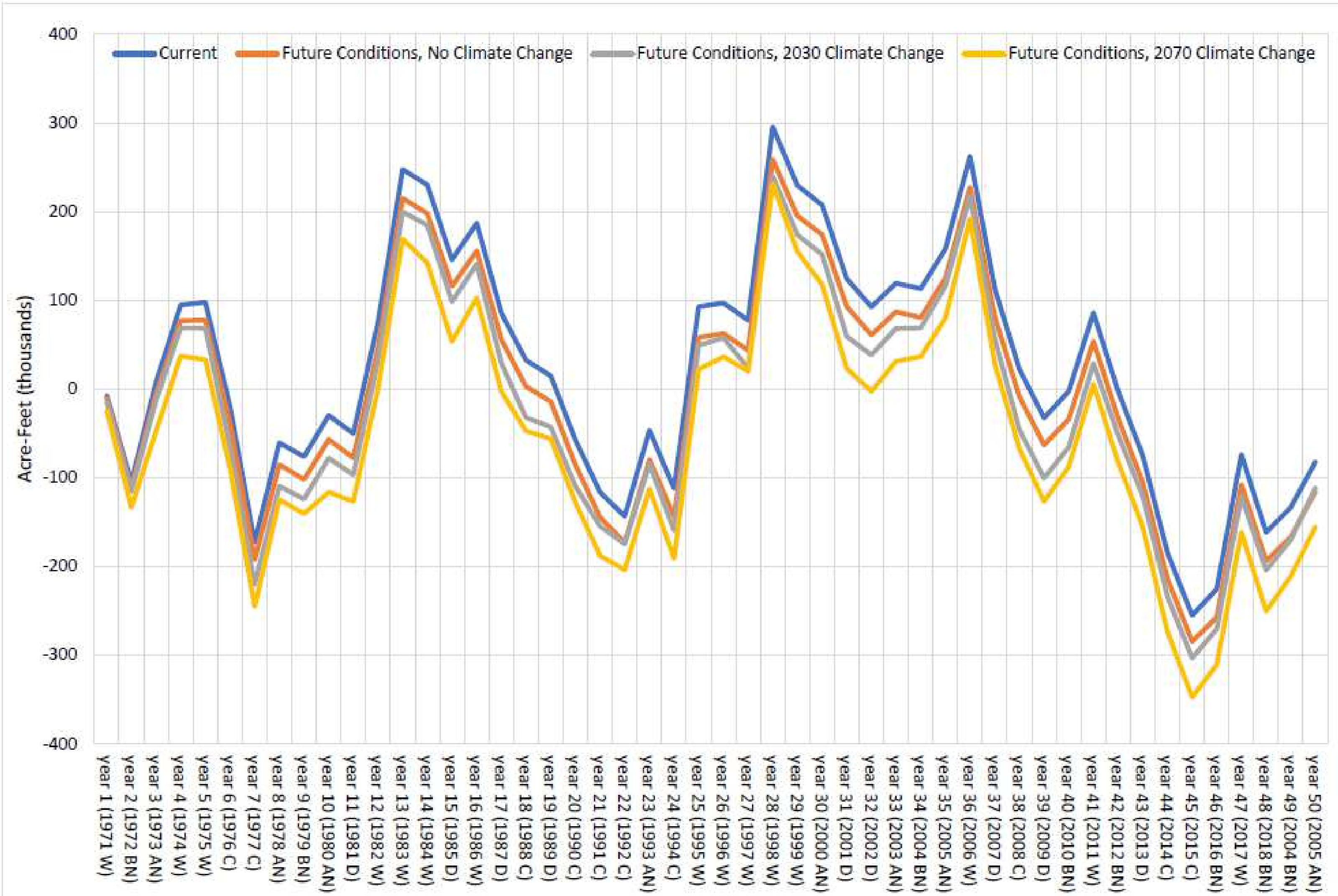


Figure 1-36. Cumulative Change in Groundwater Storage for Current and Future Conditions Baseline Scenarios

Summary of Comments from Staff Memo

Several themes emerged which are summarized in the bullets below:

- Commenters highlight the importance of the multiple aquifer zones that are present in the subbasin and the pressurized nature of the deeper zones. This has implications for understanding flow paths, vertical gradients, groundwater conditions and connectivity between zones, interbasin flow in the pressurized deep aquifer zone, connection of shallow groundwater to deeper zones and vulnerability of groundwater dependent ecosystems (GDEs), efficacy of recharge projects to provide benefits to shallow vs. deep zones, delayed and long lasting potential effects of deep pumping on stream-groundwater interactions.
- Commenters point out that monitoring the four defined aquifer zones is a data gap that should be filled with monitoring groundwater levels in each zone. The aquifer zones should also be better defined using well logs, cross sections to understand connectivity between zones, groundwater flow paths, and changes in vertical gradients over time.
- Monitoring of the shallowest portion of the groundwater system was identified as a need to identify baseline and dynamic water levels that support groundwater dependent ecosystems. A shallow monitoring network needs to be developed and implemented to understand conditions in the shallowest portions of the aquifer system.
- A comment suggested that the rooting depth of the Valley Oak is incorrectly limited by The Nature Conservancy documentation on GDEs to 30 feet. Sources listed by the US Forest Service identify a rooting depth of 80 feet. The urban forest in Chico should also be identified and considered as a GDE and habitat monitoring should survey and monitor impacts on wetlands and other GDE areas.
- A number of clarification questions and comments were submitted

Comments largely relate to the Hydrogeologic Conceptual Model and have implications for expansion of monitoring to address identified data gaps.

Summary of Comments from Staff Memo- continued

Other significant issues that have been raised include:

- Importance of understanding and characterizing interbasin flows
- Climate change impact assessment- concern has been raised that the 2030/2070 climate change scenarios utilized by the water budget analysis in the Basin Setting Chapter do not include the potential for multi-decade drought (i.e. megadrought).

Next Steps

- Today- Discussion and possible recommendations from the SHAC to the Vina GSA Board
- Overview of Basin Setting documents, public comments, SHAC recommendations to Vina GSA Board (October meeting)
- Revisions based on direction of the GSA Board

Questions/Discussion Regarding Basin Setting Documents and/or Comments

Highlighted Topics for Possible Discussion/Recommendation

1. Shallow Monitoring Network
   - The document and public comment identify a lack of existing monitoring in the shallowest portions of the aquifer system as an important data gap. The SHAC could recommend that development of a shallow monitoring network be prioritized as a data gap.
2. Evaluating Climate Change- some options to consider
   - Recommend conducting further analysis of the Historical period (2000-2018) of the Butte Basin Groundwater Model (BBGM) results to explore possible effects of megadrought.
   - Recommend that evaluation of projects or management actions consider climate change and the SHAC could more clearly define what such a scenario could include
     - A megadrought or other more extreme dry scenario (ex. 2070 Drier with Extreme Warming scenario DWR dataset) could be developed for the BBGM and/or used when considering and evaluating specific projects or policies.
   - Additional model runs for the BBGM could be developed to evaluate effects on groundwater storage, streamflows, interbasin flows, available supplies and pumping demands. The SHAC could recommend that additional climate change model runs be prioritized to address the data gap through subsequent analysis after GSP submission.

Discussion

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