Basin Setting Public Review Documents and Comments- Highlights and Discussion

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Butte Advisory Board
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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**

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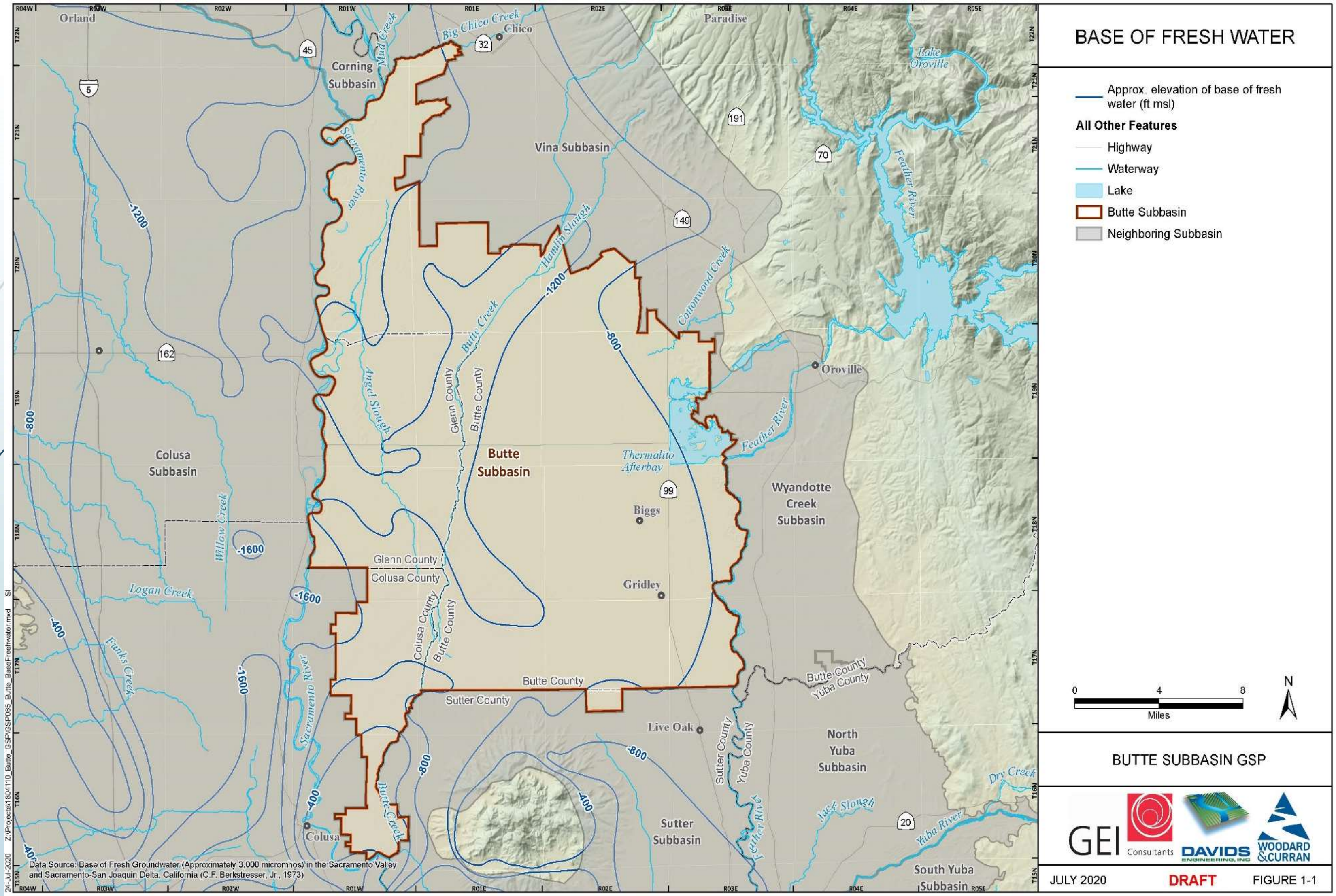
Groundwater Dependent Ecosystems (GDEs)

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

High Level Overview…Good News

- Generally stable groundwater levels with moderate declines during droughts and curtailment years (cutbacks to surface water supplies)
- Generally good water quality- no high ranking High Vulnerability Areas
- No observed land subsidence



BASE OF FRESH WATER
Approx. elevation of base of fresh water (ft msl)
All Other Features
Highway
Waterway
Lake
Butte Subbasin
Neighboring Subbasin
0 4 8
Miles
N
BUTTE SUBBASIN GSP
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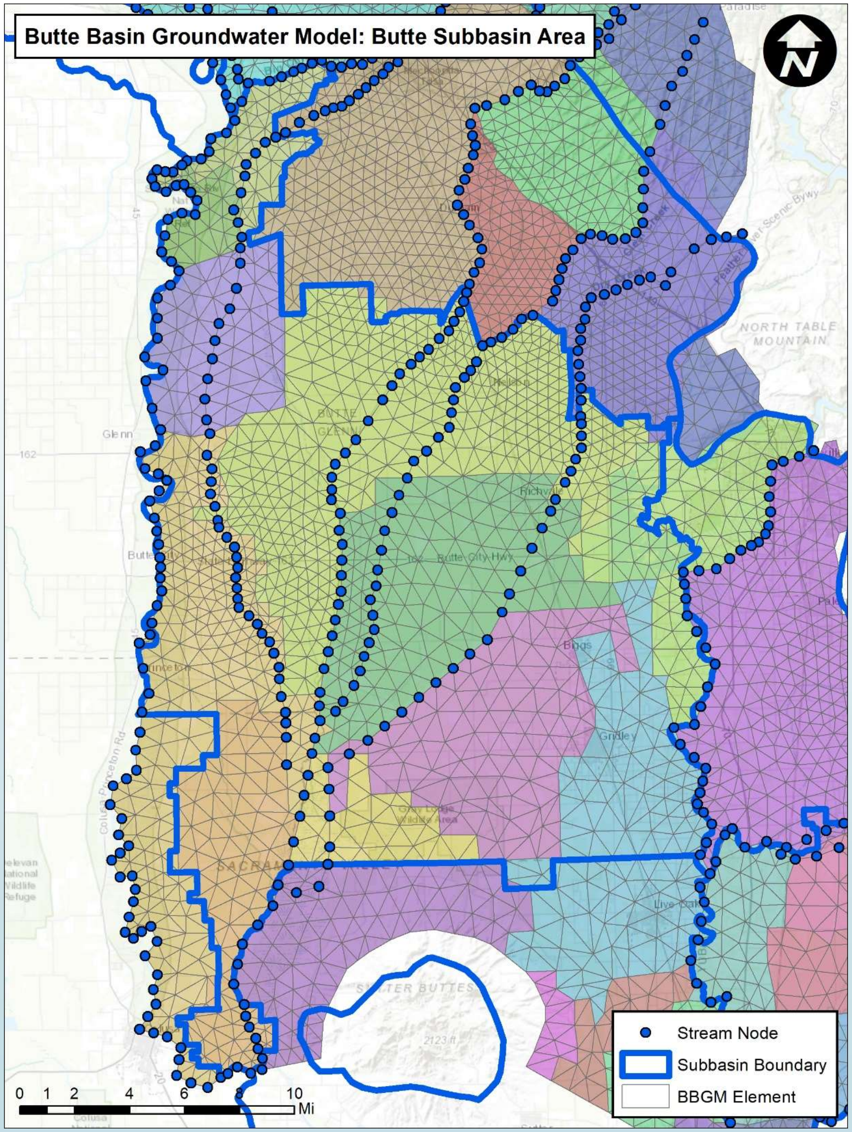
JULY 2020
DRAFT
FIGURE 1-1
Butte Subbasin
Colusa Subbasin
Vina Subbasin
Corning Subbasin
Wyandotte Creek Subbasin
North Yuba Subbasin
Sutter Subbasin
South Yuba Subbasin
Orland
Chico
Paradise
Oroville
Biggs
Gridley
Live Oak
Colusa
Thermalito Afterbay
Lake Oroville
Sacramento River
Feather River
Butte Creek
Angel Slough
Hamlin Slough
Cottonwood Creek
Big Chico Creek
Mud Creek
Willow Creek
Logan Creek
Funk's Creek
Jack Slough
Yuba River
Dry Creek
Glenn County
Colusa County
Butte County
Sutter County
Yuba County
-1200
-800
-1600
-400
Data Source: Base of Fresh Groundwater (Approximately 3,000 micromhos) in the Sacramento Valley and Sacramento-San Joaquin Delta, California (C.F. Berkstresser, Jr., 1973)

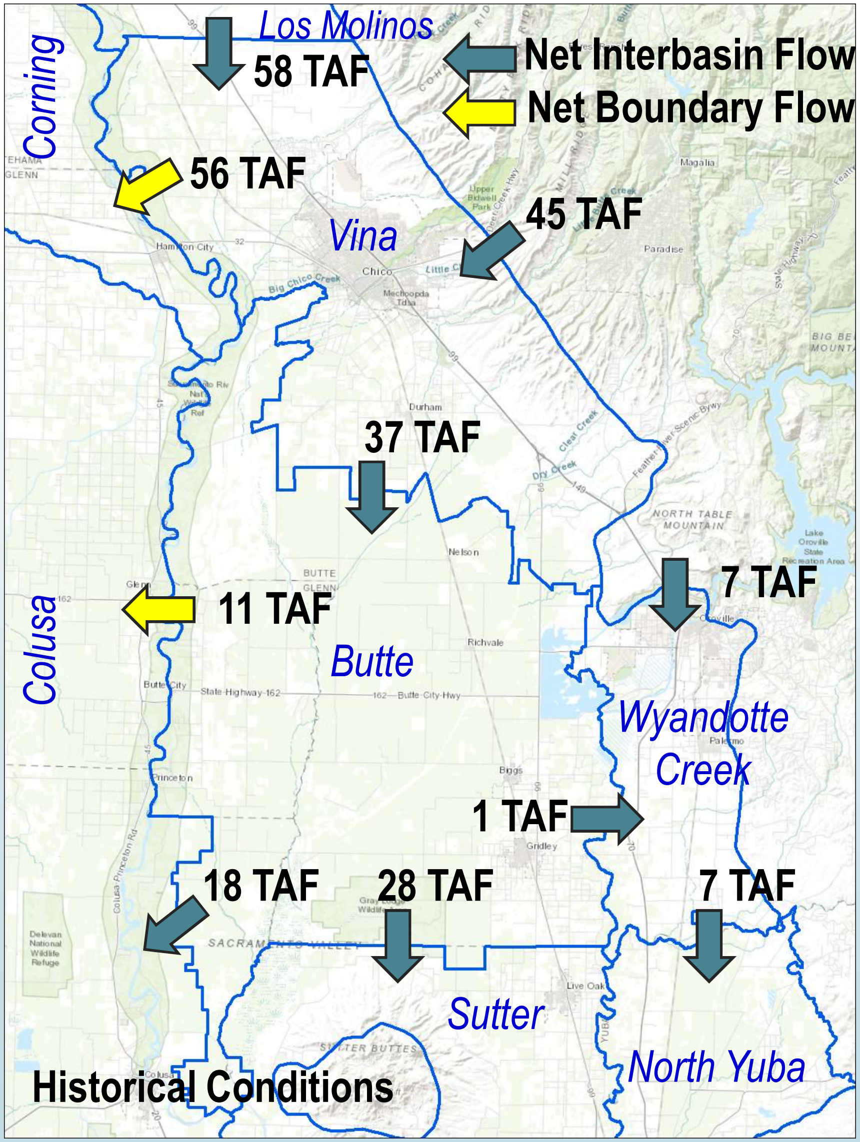
Water Budget Approach

- Butte Basin Groundwater Model
- Daily Calculations
- 2,221 Elements in Butte Subbasin (119 acres, on average)
- Sacramento River is the Edge of Model Domain
- Groundwater Levels at Boundary Nodes Based on Earlier DWR C2VSim Model
- Along the Model Boundary, Split Between River Interaction and Interbasin Flows Highly Uncertain in BBGM
- Use of regional models to understand these interactions will be important
- Groundwater level contours from monitoring data provide insight into interbasin flow
- Interbasin Coordination effort underway- comparing water budget numbers from regional models used by neighbors



Net Western Boundary Outflow

- Interbasin Subsurface Flows
  - Subsurface Flows
- Boundary Flows
  - Subsurface Flows
  - Surface Water – Groundwater Interaction
- Boundary Flows Require Additional Investigation



Water Budget Results

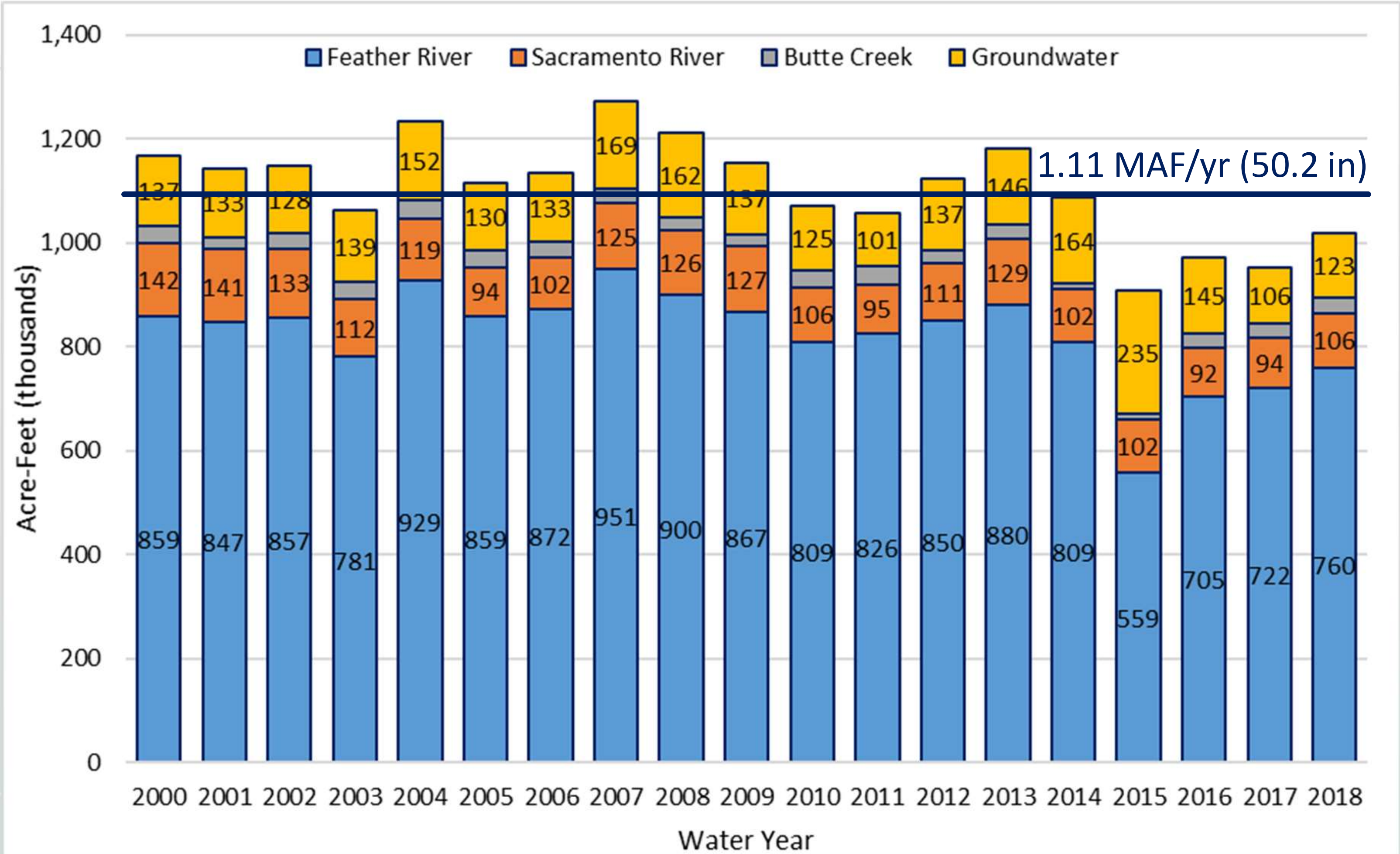
- Water Budget Results:
  - Historical- 2000-2018
  - "Current"- 2016 land use (2015 used in critical years), 2016-2018 urban demands
  - Future Conditions- based on 2030 General Plan change to urban footprint→ little/no change for Butte Subbasin
  - Climate Change- change hydrology inputs
- Main changes to inputs:
  - Land use foot print
  - Hydrology (precipitation, stream inflows, evapotranspiration)

Table 1-7 (corrected)

Component	Historical (AFY)	Current (AFY)	Future, No Climate Change (AFY)	Future, 2030 Climate Change (AFY)	Future, 2070 Climate Change (AFY)
Inflows					
Subsurface Inflows	103,100	110,700	105,400	105,700	104,200
Colusa Subbasin	*17,100*	*15,500*	*15,500*	*16,400*	*17,300*
Sutter Subbasin	*6,600*	*5,300*	*5,300*	*5,400*	*5,500*
Vina Subbasin	*65,400*	*75,100*	*70,800*	*69,500*	*66,600*
Wyandotte Creek Subbasin	*14,000*	*14,800*	*13,700*	*14,400*	*14,900*
Deep Percolation	265,800	268,000	268,000	269,700	269,600
Precipitation	*83,900*	*89,500*	*89,300*	*89,200*	*89,000*
Applied Surface Water	*146,400*	*139,500*	*139,400*	*132,100*	*132,100*
Applied Groundwater	*35,500*	*39,100*	*39,300*	*48,400*	*48,400*
Seepage	105,700	108,600	108,700	108,500	110,500
Streams	*6,400*	*13,700*	*13,700*	*16,400*	*19,300*
Lakes	*26,400*	*26,400*	*26,400*	*26,400*	*26,400*
Canals and Drains	*72,900*	*68,500*	*68,500*	*65,700*	*64,800*
Total Inflow	***474,600***	***487,300***	***482,100***	***483,900***	***484,300***
Outflows					
Subsurface Outflows	112,800	113,300	113,000	111,200	112,200
Colusa Subbasin	*34,800*	*31,900*	*31,900*	*31,300*	*30,800*
Sutter Subbasin	*34,200*	*42,200*	*42,200*	*41,300*	*41,800*
Vina Subbasin	*28,600*	*25,900*	*25,500*	*25,800*	*26,600*
Wyandotte Creek Subbasin	*15,200*	*13,300*	*13,300*	*12,900*	*13,000*
Groundwater Pumping	142,200	162,800	162,600	189,400	210,500
Agricultural	*114,800*	*130,300*	*129,900*	*152,200*	*170,700*
Urban and Industrial	*2,300*	*1,800*	*2,000*	*2,000*	*2,000*
Managed Wetlands	*25,100*	*30,700*	*30,700*	*35,200*	*37,800*
Stream Gains from Groundwater	218,500	154,800	152,700	137,200	123,500
Western Boundary Net Outflows	10,900	57,600	55,100	47,600	40,100
Total Outflow	***484,400***	***488,500***	***483,400***	***485,400***	***486,300***
Change in Storage (Inflow - Outflow)	***-9,800***	***-1,200***	***-1,300***	***-1,500***	***-2,000***

Water Supplies in the Butte Subbasin

- 87% Surface water diversions
- 13% Groundwater Pumping
- Cutbacks to surface water supplies in 2015



Historical Results: Groundwater Change in Storage

- Groundwater demand is sensitive to water year type and availability of surface water (cutback years)
- Change in Storage is sensitive to water year type also
- Overall Change in Storage over the Historical Period is a decline of about 175,000 AF from 2000 to 2018
  - Amounts to an average decline of almost 10,000 AF annually (from Table 1-7 shown previously)

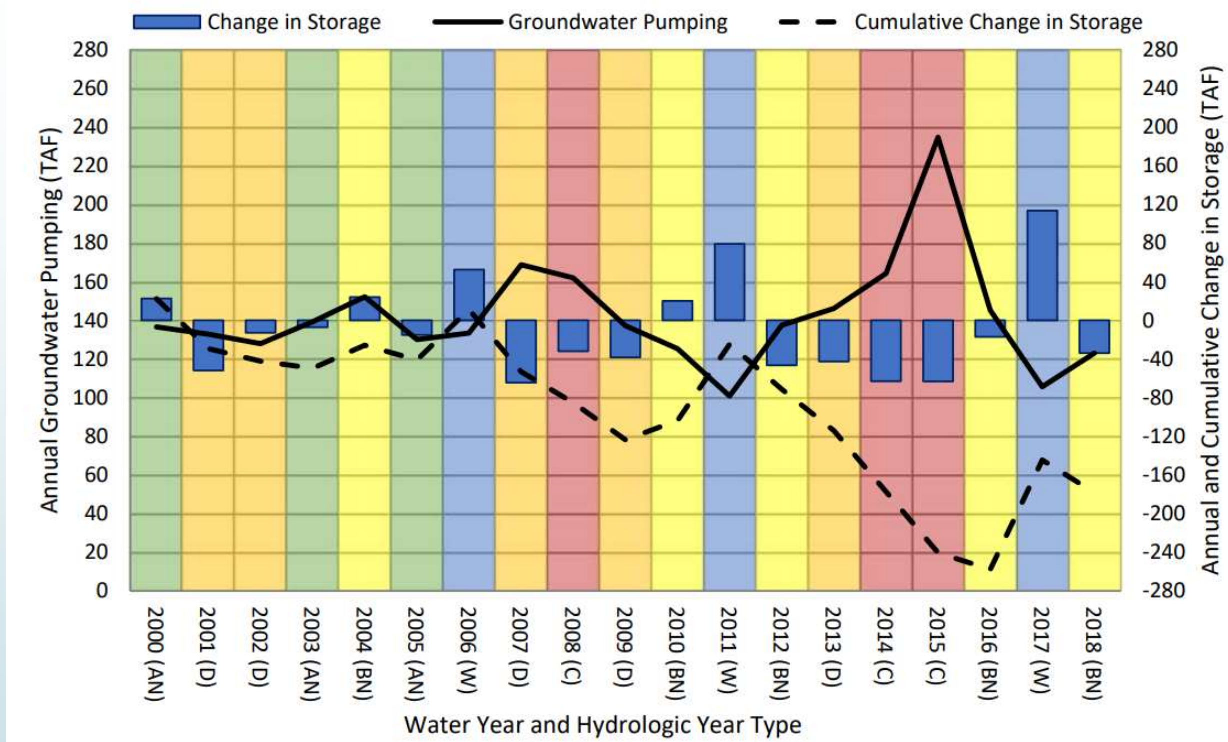


Table 1-8. Historical Water Supplies and Change in Groundwater Storage by Hydrologic Water Year Type.

Water Year Type	Surface Water Deliveries (AFY)	Groundwater Pumping (AFY)	Total Supply (AFY)	Change in Groundwater Storage (AFY)
Wet	1,003,400	148,600	1,152,000	73,500
Above Normal	777,300	123,500	900,700	-2,400
Below Normal	969,800	147,100	1,116,900	-4,300
Dry	831,400	173,800	1,005,300	-36,900
Critical	912,900	140,900	1,053,800	-64,400

Water Budget Scenarios

- Increased reliance on groundwater, primarily due to climate change and impacts to surface water supplies
  - 2030 Climate Scenario- reduced surface water diversions in 11 of 50 years
  - 2070 Climate Scenario- reduced surface water diversions in 13 of 50 years
- Increased groundwater pumping demand of about 50,000 AF, yet relatively stable **average** decrease in groundwater storage between those scenarios
- How does the system respond?

Table 1-9. Estimated Groundwater Pumping, Decrease in Storage, and Change in Sustainable Yield.

Baseline Scenario	Groundwater Pumping (AFY)	Decrease in Groundwater Storage (AFY)	Difference (AFY)
Current	162,800	1,200	161,600
Future, No Climate Change	162,600	1,300	161,300
Future, 2030 Climate Change	189,400	1,500	187,900
Future, 2070 Climate Change	210,500	2,000	208,500

50 TAF

Greater swings in groundwater storage

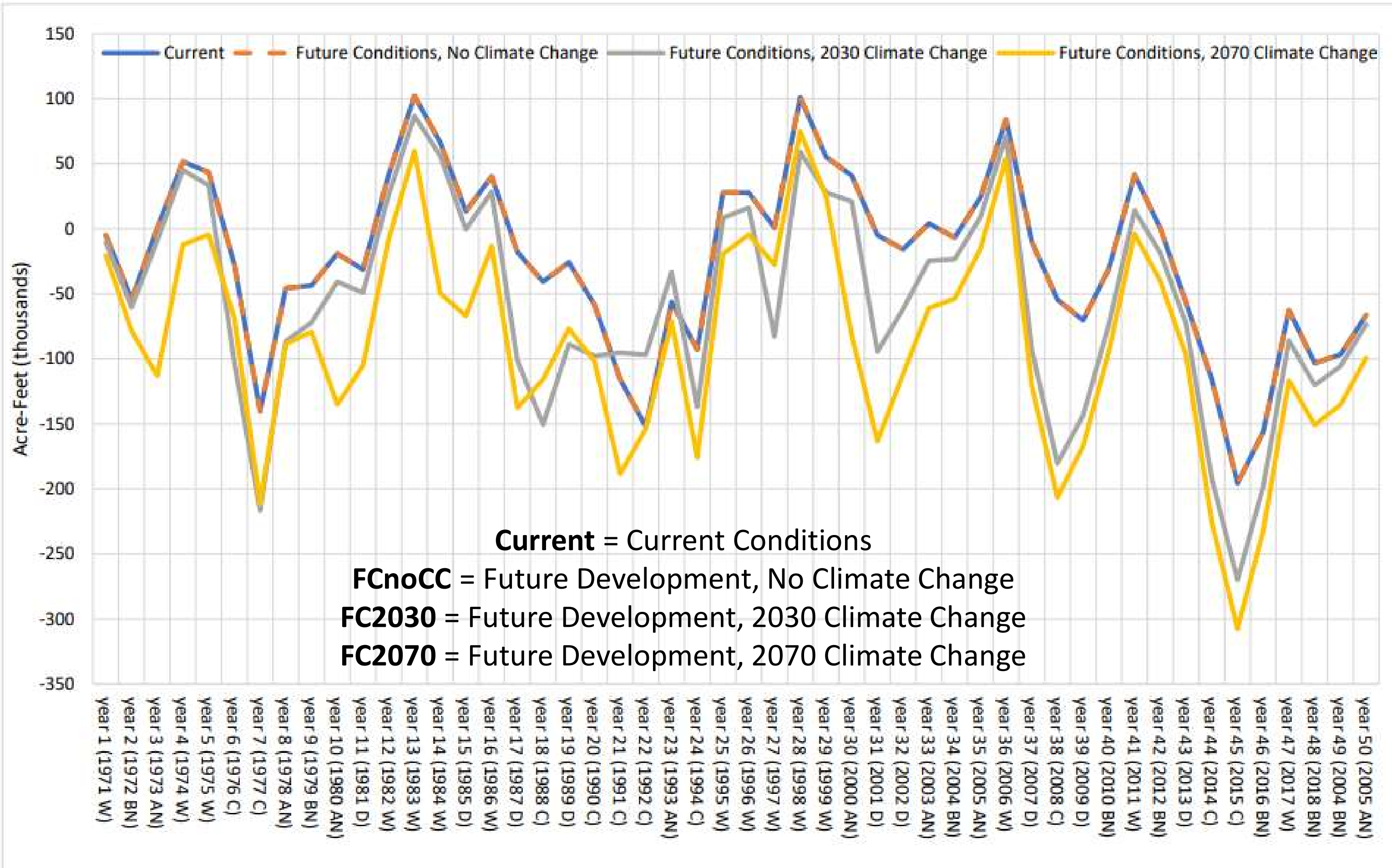


Figure 1-39. Cumulative Change in Groundwater Storage for Current and Future Conditions Baseline Scenarios

Year Types:
Critical (C)
Dry (D)
Below Normal (BN)
Above Normal (AN)
Wet (W)

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↓ Subsurface Inflows

↑ Deep Percolation

↑ Stream Seepage (5)

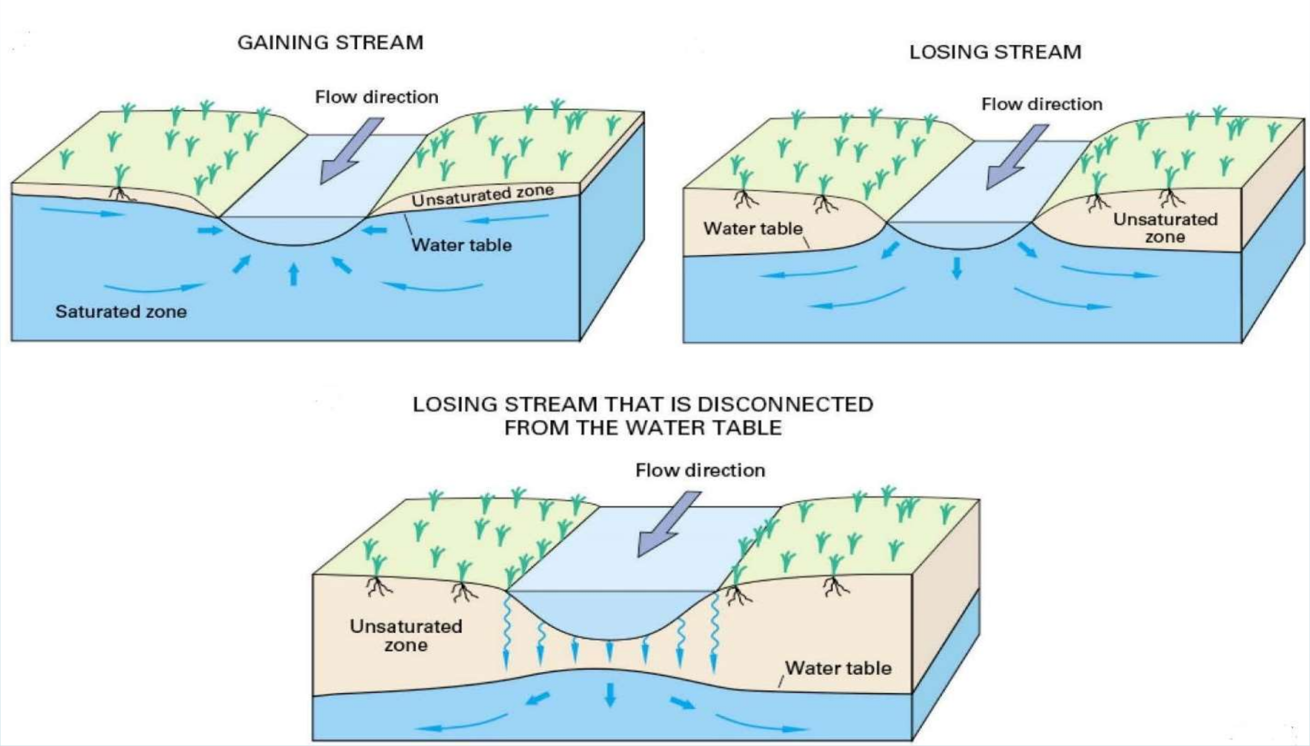
— Subsurface Outflows

↑ Groundwater pumping (48)

↓ Stream gains (31)

↓ W. Boundary Net Outflows (18)

Interconnected Surface Water



Interconnected Surface Water

- Historical conditions show significant gains to streamflow from groundwater

Table 1-4. Average Monthly Gains to Streamflow from Groundwater, Water Years 2000 to 2018 (cfs)

Stream	Monthly Gains from Groundwater (cfs)												Average (cfs)
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Angel Slough	42	44	43	55	60	69	71	65	54	44	42	45	53
Big Chico Creek	0	0	0	1	1	1	2	2	1	1	1	1	1
Butte Creek	113	109	108	120	121	127	132	129	126	117	122	120	120
Cherokee Canal	73	64	66	77	80	84	85	77	78	72	77	78	76
Dry Creek	0	0	0	0	0	0	0	0	0	0	0	0	0
Feather River	19	24	31	42	34	42	36	29	12	4	7	11	24
Little Chico Creek	0	0	0	0	0	1	1	1	0	0	0	0	0
Little Dry Creek	18	17	13	17	17	18	20	20	20	20	20	19	18
Sacramento River	415	465	366	183	300	237	420	478	457	447	487	428	390
Total	681	722	627	495	612	580	767	801	748	706	756	703	683

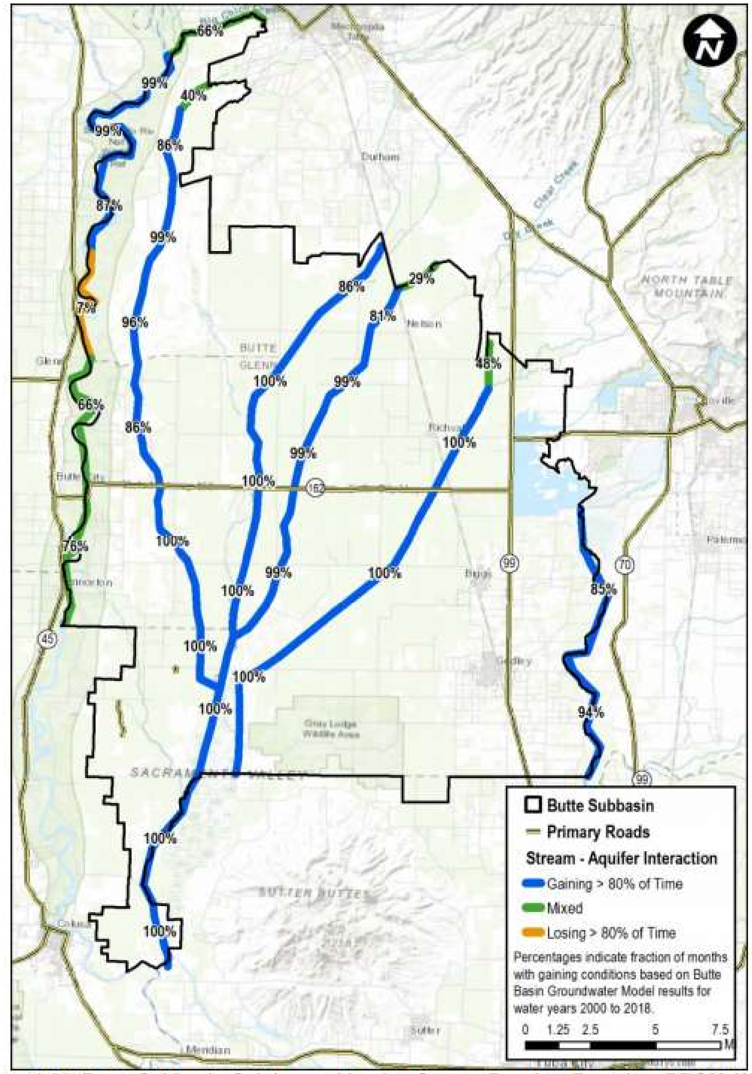


Figure 1-25. Butte Subbasin Gaining and Losing Stream Reaches Based on BBGM, Water Year 2000 to 2018

Summary of Comments from Staff Memo

Several themes emerged which are summarized in the bullets below:

- Comments provide suggestions regarding additional monitoring related to shallow groundwater and understanding GDEs and stream-groundwater interaction as well as water quality concerns
- Comments provide suggested revisions to the Hydrogeologic Conceptual Model regarding the structure and influence of the Sutter Buttes, Willows Fault and Colusa Dome and provide a number of report references and data sources to be included in the document
- Comments express concern for groundwater pumping or water transfer activity (from east of Sacramento River to the west side) and potential affects on vertical gradients that may therefore cause water quality impacts to GDEs, domestic wells or municipal water supplies in the southwest portion of the subbasin (west of the Sutter Buttes)
- Comments suggest other clarifications or corrections to the text

Next Steps- Proposed action to each comment

Four general categories:

1. **Revise document based on comment**
2. **Recommendation noted and will be considered for inclusion in the description of data gaps and possible Projects and Management Actions for additional monitoring**
3. **Concern noted and can be taken into consideration through development of Sustainable Management Criteria (SMC)**
4. **Information noted and will be incorporated as appropriate**

Board Discussion

1. Questions?
2. Are there issues raised here that you would like to be sure to see addressed as other portions of the plan are developed?

   i.e. data gaps, sustainable management criteria, plan implementation (additional monitoring), projects and management actions

3. Shallow Monitoring Network

   Does the board support prioritizing development of a shallow monitoring network in the Butte Subbasin?

4. Saline Intrusion vs. Water Quality Sustainability Indicators

Discussion

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