Revisiting the GSP Basin Setting Chapter in Relation to Projects and Management Actions

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Vina GSA Board
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Tonight's Agenda Topic

- Projects and Management Actions are being scoped and reviewed.
- The **magnitude of the basin imbalance drives the magnitude and scope of needed Projects and Management Actions** to be adopted in this GSP.
- Projects and Management Actions must reflect what imbalance is expected over the next twenty years.
- Assumptions can be made about future (best case to worst case) basin imbalances using the information from the Basin Setting chapter.
- A policy decision will need to be made on the projected imbalance that must be overcome by 2042.
- No matter which starting point, best case to worst case or something in between, this will be reassessed <u>every</u> five years.

Tonight's Agenda Topic

The initial policy decision will drive the magnitude, scope and locations of Projects and Management Actions – this will have program and financial consequences for GSP Implmentation

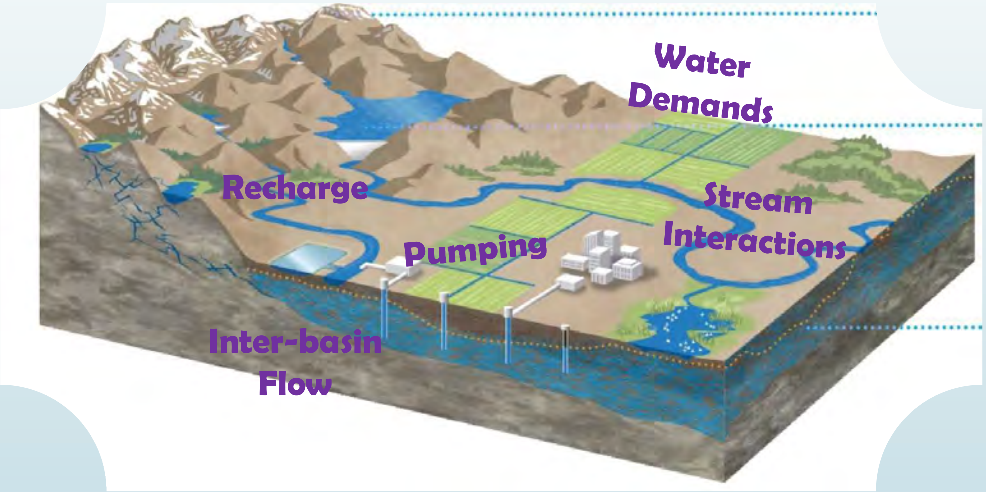
- An **optimistic view (target 5,000 AF/yr)** would address the estimated imbalance under current conditions.
- A **middle of the road view (target 15,000 AF/yr)** would address the potential increased imbalance due to urban growth over the next 10 years.
- A **worst case view (target 30,000 AF/yr)** would address the imbalance for changed conditions due to urban growth and potential impacts of climate change.
- Going from the optimistic view to worst case view would increase the number of complex, controversial and costly Projects and Management Actions.

Requested Action: Provide direction to staff regarding the future level of risk to the subbasin and input on the magnitude and targeted areas of need to be addressed by Projects and Management Actions.

Step 1. Basin Setting: Understand the System

Basin Setting

- Hydrogeologic Conceptual Model
- Groundwater Conditions
- Water Budget
- [Management Areas]



First, a clarification…

Basin Setting Chapter: Groundwater Budget

2000-2018

1971-2018*

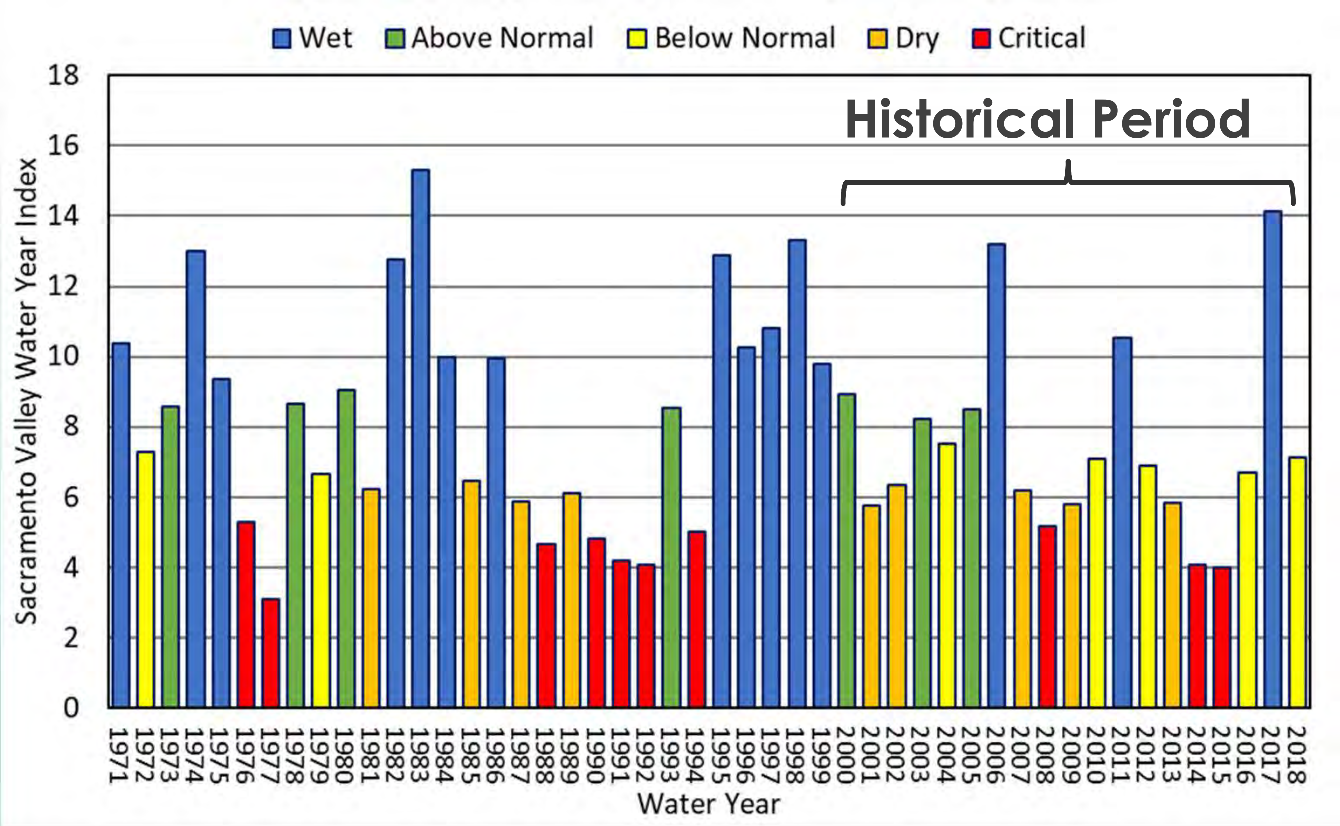
Component	Historical (AFY)	Current (AFY)	Future, No Climate Change (AFY)	Future, 2030 Climate Change (AFY)	Future, 2070 Climate Change (AFY)
Inflows					
Subsurface Inflows	137,400	143,200	142,800	144,600	145,500
Foothill Area	*45,700*	*50,100*	*49,700*	*50,600*	*50,600*
Los Molinos Subbasin	*63,000*	*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*	*66,700*
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*	*66,6*[illegible]
Wyandotte Creek Subbasin	*0*	*0*	*0*	*0*	[illegible]
Groundwater Pumping	243,500	209,200	215,800	225,900	23[illegible]
Agricultural	*209,100*	*185,500*	*184,800*	*194,700*	*20*[illegible]
Urban and Industrial	*26,500*	*20,100*	*27,500*	*27,500*	*2*[illegible]
Managed Wetlands	*8,000*	*3,500*	*3,500*	*3,600*	*3,*[illegible]
Stream Gains from Groundwater	3,700	1,100	1,000	1,000	1,00[illegible]
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***

Q1. Why the big difference? And what's the target?

Role of Hydrologic Variability

Hydrologic variability means the selected time period can significantly change the average annual amount

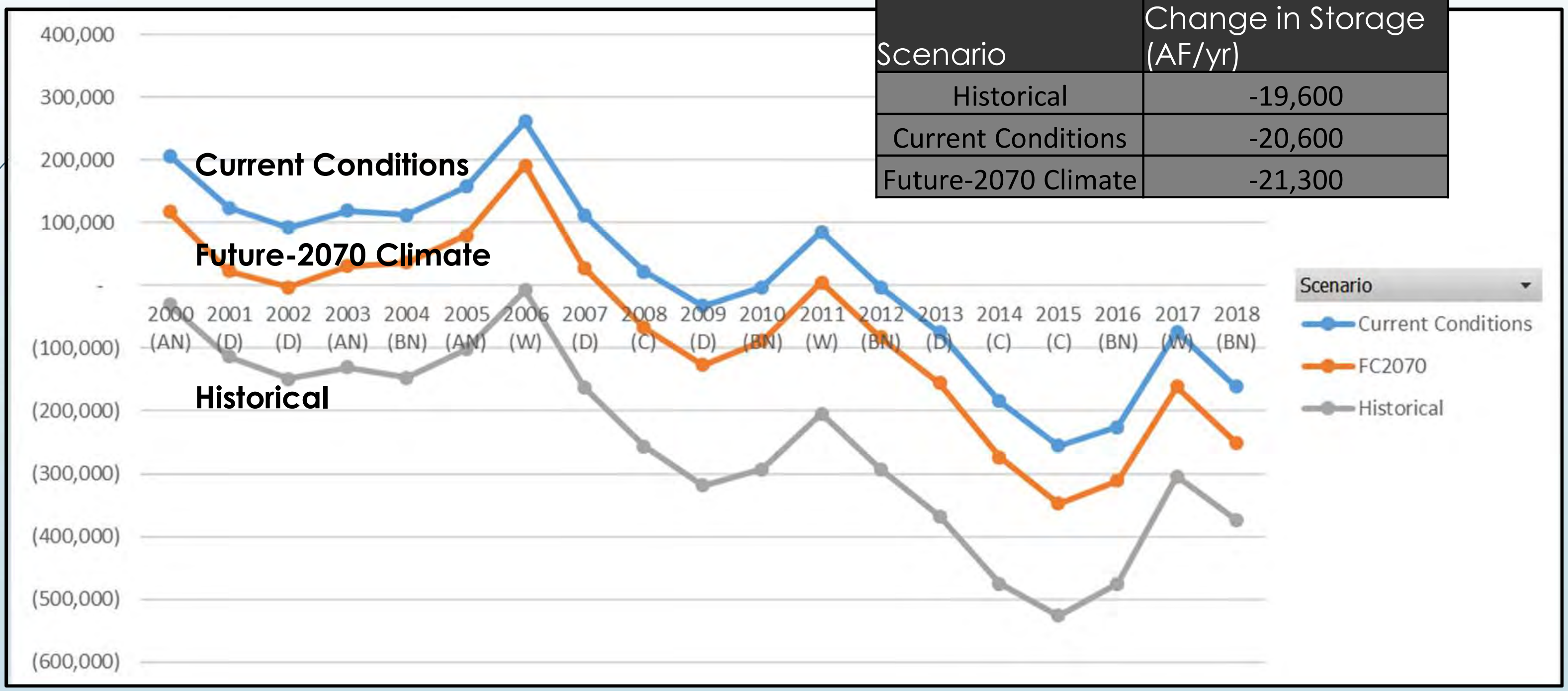
Time Period	Precipitation (AF/yr)
1971-2018	420,000
1990-2018	430,500
2000-2018	411,000



Change in Storage: 2000-2018

For the same time period, the Historical, Current Conditions, and Future Conditions-2070 Climate Change scenarios all have a change in storage of about -20,000 AF/yr

Scenario	Change in Storage (AF/yr)
Historical	-19,600
Current Conditions	-20,600
Future-2070 Climate	-21,300

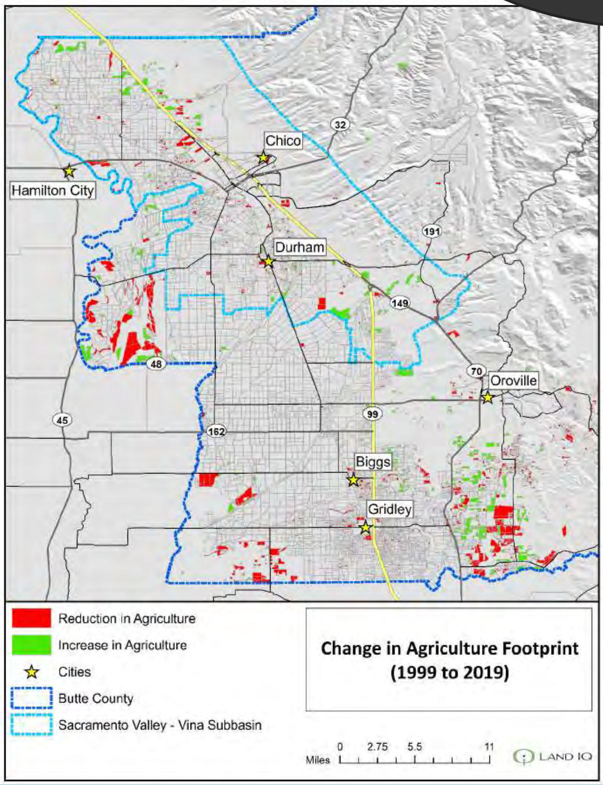


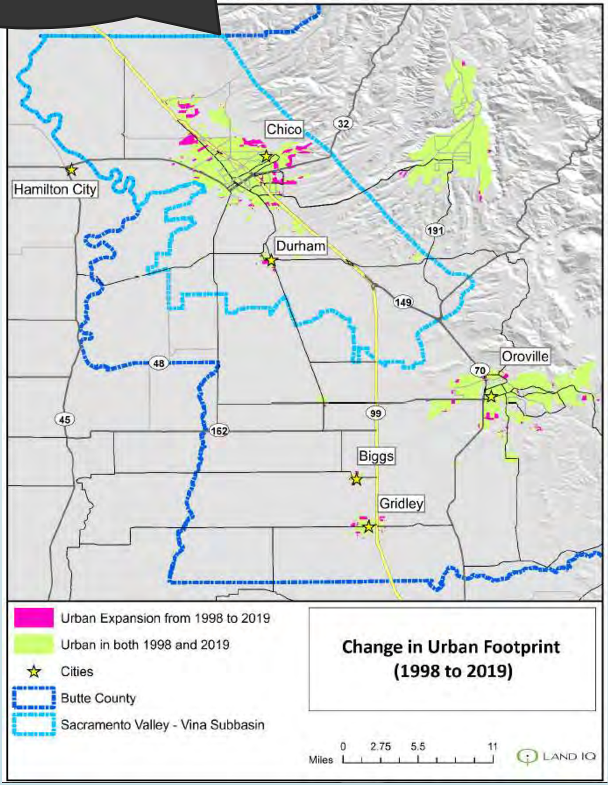
"Current Conditions"

Q2. Have we already fixed the problem?

Compared to Historical Conditions:

- Smaller agricultural footprint
- Increased irrigation efficiency
- Crop shift with lower water demand
- If these improvements have not occurred, the situation would be worse





From "20-Year Land and Water Use Change in Butte County and the Vina Subbasin (1999-2019)"
Prepared by Land IQ for Agricultural Groundwater Users of Butte County, January 2021

Water Budget Scenarios

Water Budget Sensitivity- How does the system respond to changes in Land Use (Current/Future) and Climate Changed-Hydrology (CC 2030 and CC 2070)?

Use the Butte Basin Groundwater Model to explore the system's response to different changes.

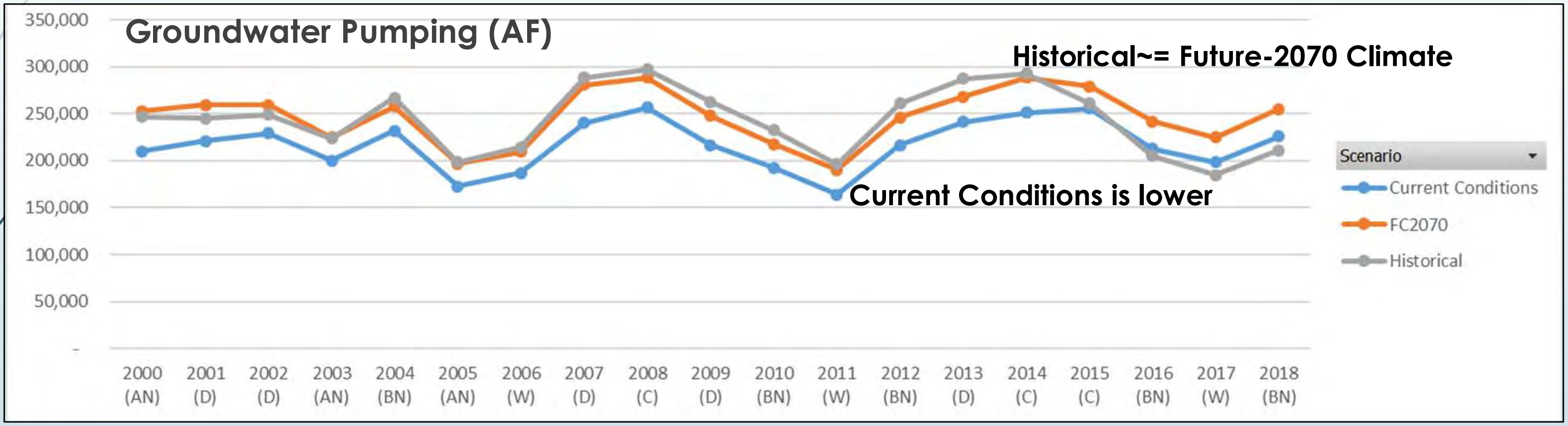
Model Runs and Scenario Assumptions

Scenario Runs

Scenario	Hydrology	Land Use	Water Supplies
Historical Simulation	Historical (daily)	Historical (annual)	Historical (monthly)
Current Conditions Baseline	Historical	Current (2015 and 2016)	Current (2015 and 2016 surface water diversions, 2016-2018 average urban demands)
Future Conditions, No Climate Change Baseline	Historical	Current, adjusted based on Butte County 2030 General Plan	Current (2015 and 2016 Surface water diversions and 2050 projected urban demands)
Future Conditions, 2030 Climate Change Baseline	Historical, adjusted based on 2030 climate change	Current, adjusted based on General Plan	Current, adjusted based on climate change
Future Conditions, 2070 Climate Change Baseline	Historical, adjusted based on 2070 climate change	Current, adjusted based on General Plan	Current, adjusted based on climate change

Impacts of Climate Change?
Groundwater Pumping and Evapotranspiration

Future Conditions with 2070 Climate looks a lot like Historical amounts of groundwater pumping. Climate change impacts are estimated to increase water demand (evapotranspiration) above Historical levels.



Scenario	Evapotranspiration (TAF/yr)*	Groundwater Pumping (TAF.yr)*
Historical	281	243
Current Conditions	275.5 ↓	217 ↓
FC_Climate 2070	302.5 ↑	247 ↑

*__2000-2018__ average annual estimates
Evapotranspiration includes total ET for ag, urban, and managed wetlands

Targeting the Need: Net Recharge

Net Recharge = Deep Percolation + Stream Losses - Pumping

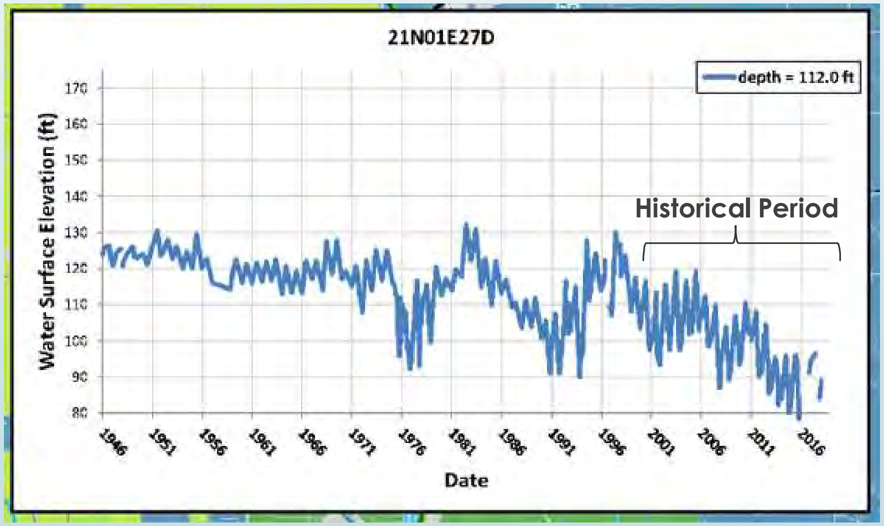
- Focus on the vertical balance
- “Stream Losses” includes recharge from creeks and streams within the subbasin (excludes the Sacramento River)
- Stream losses are relatively insensitive to land use change or climate change impacts.
    - Increased <1,000 AF/yr with Future-2070 Climate compared to Current Conditions

Targeting the Need: Net Recharge

Net Recharge = Deep Percolation + Stream Losses - Pumping

Net Recharge (TAF/yr)

Scenario	2000-2018	1971-2018
Historical	-27	-
Current Conditions	-5	+8.5
Future Conditions	-14	-0.5
FC_Climate 2070	-31	-16



Framing the Discussion

- An **optimistic view** could target **5000 AF/yr** to address the imbalance. This focuses on addressing the estimated imbalance under current conditions.
- A **middle of the road view** could target **15,000 AF/yr** to address the imbalance**.** This plans for the potential increased imbalance due to urban growth over the next 10 years.
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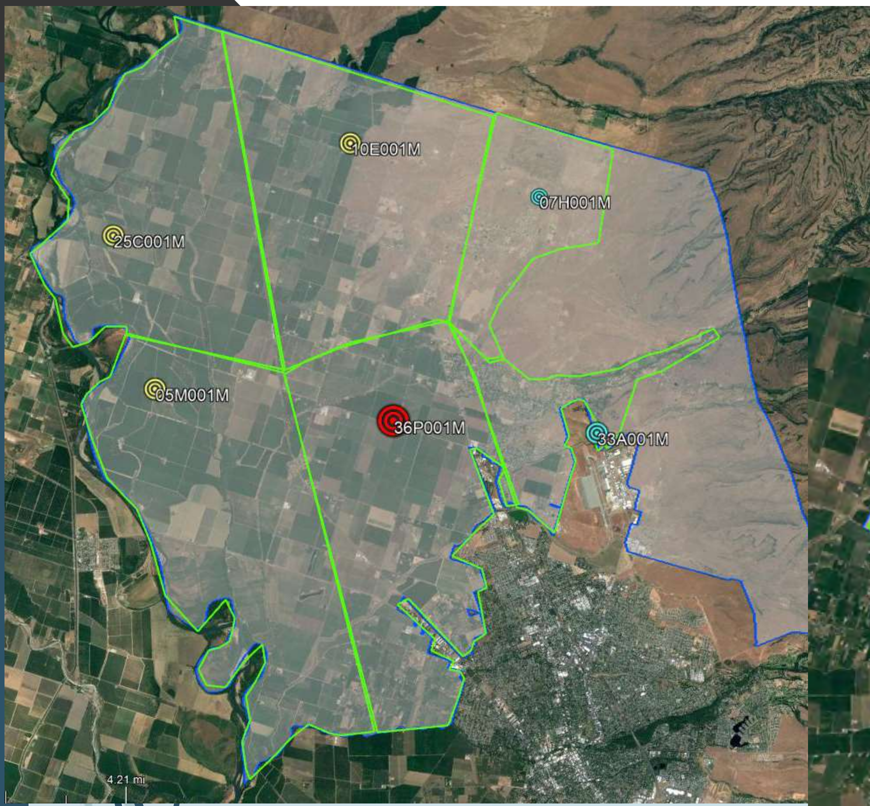
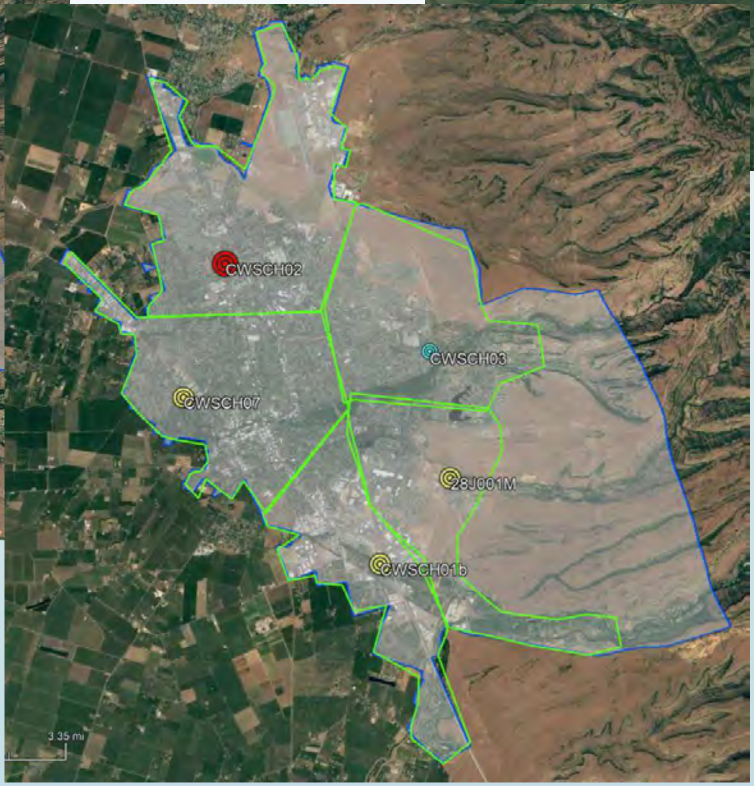
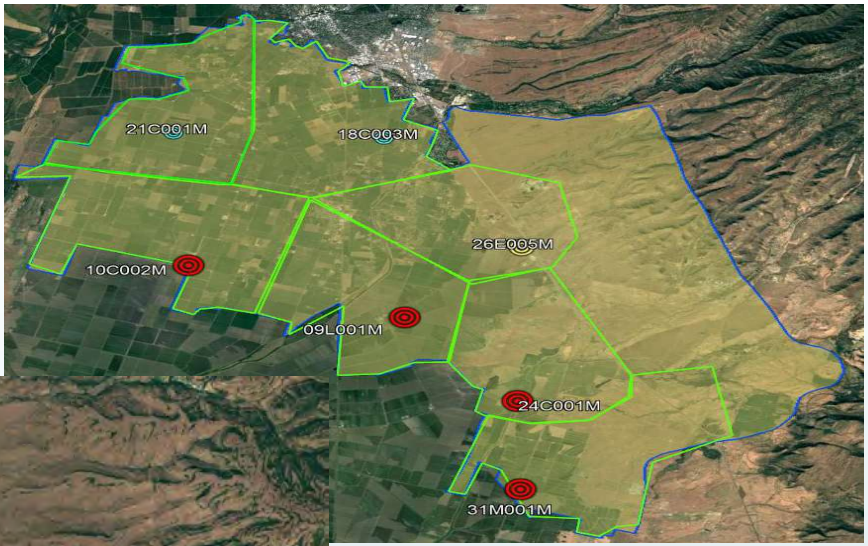
Potential Target Areas







Relative comparison:

Downward trends are the steepest in Vina South, then Vina North, and lastly Chico Urban Area

16

Policy Decision Implications

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Questions/Discussion

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Butte County
WATER & RESOURCE CONSERVATION

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