Salinas Valley Basin GSA

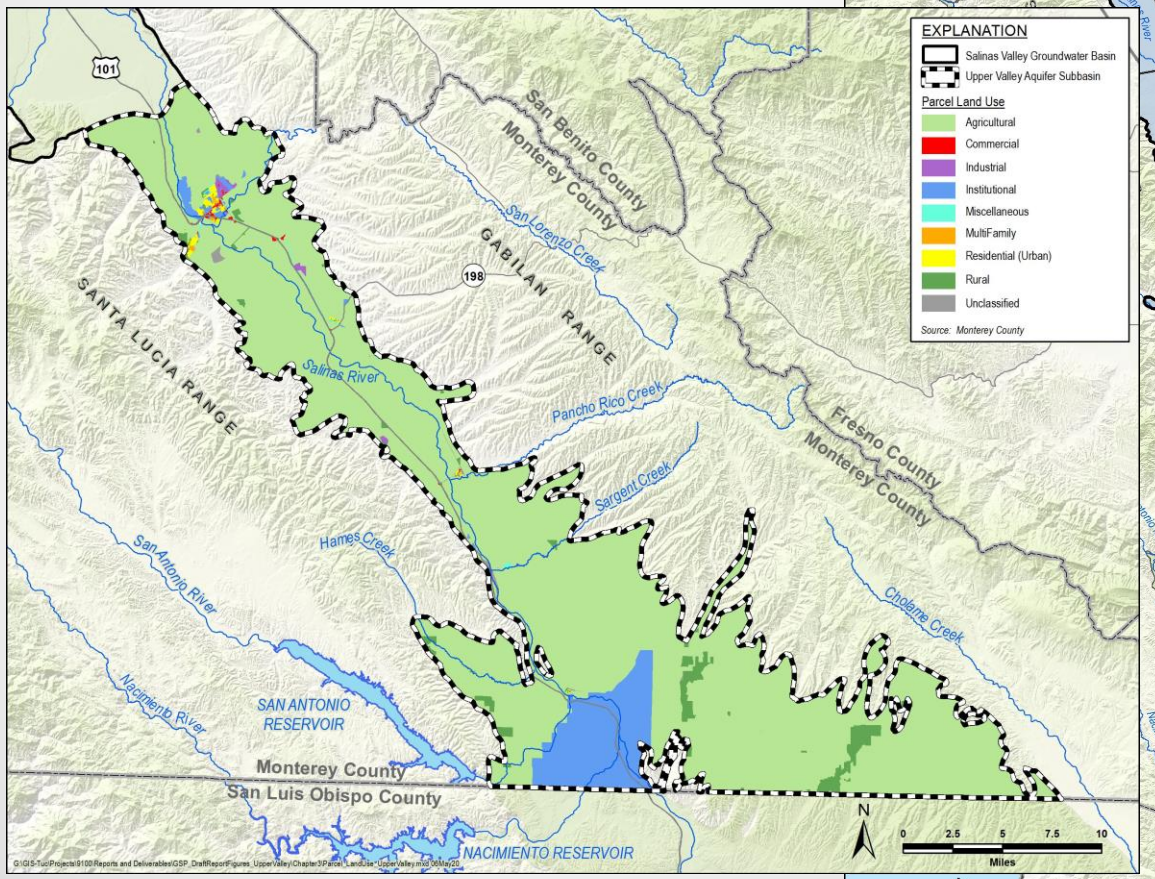
Upper Valley GSP Overview

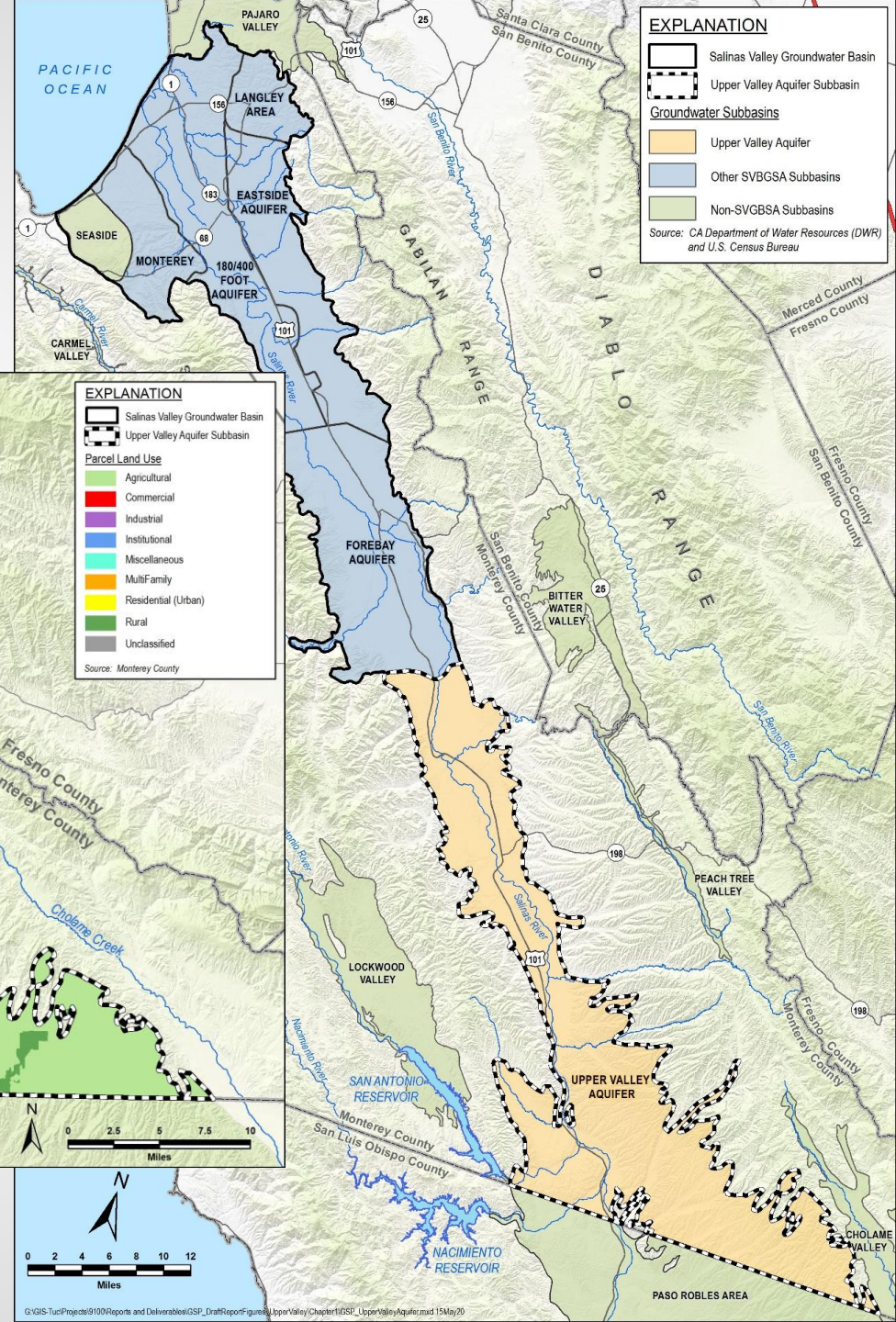
Presented to SVBGSA Board of Directors
August 12, 2021

MONTGOMERY & ASSOCIATES

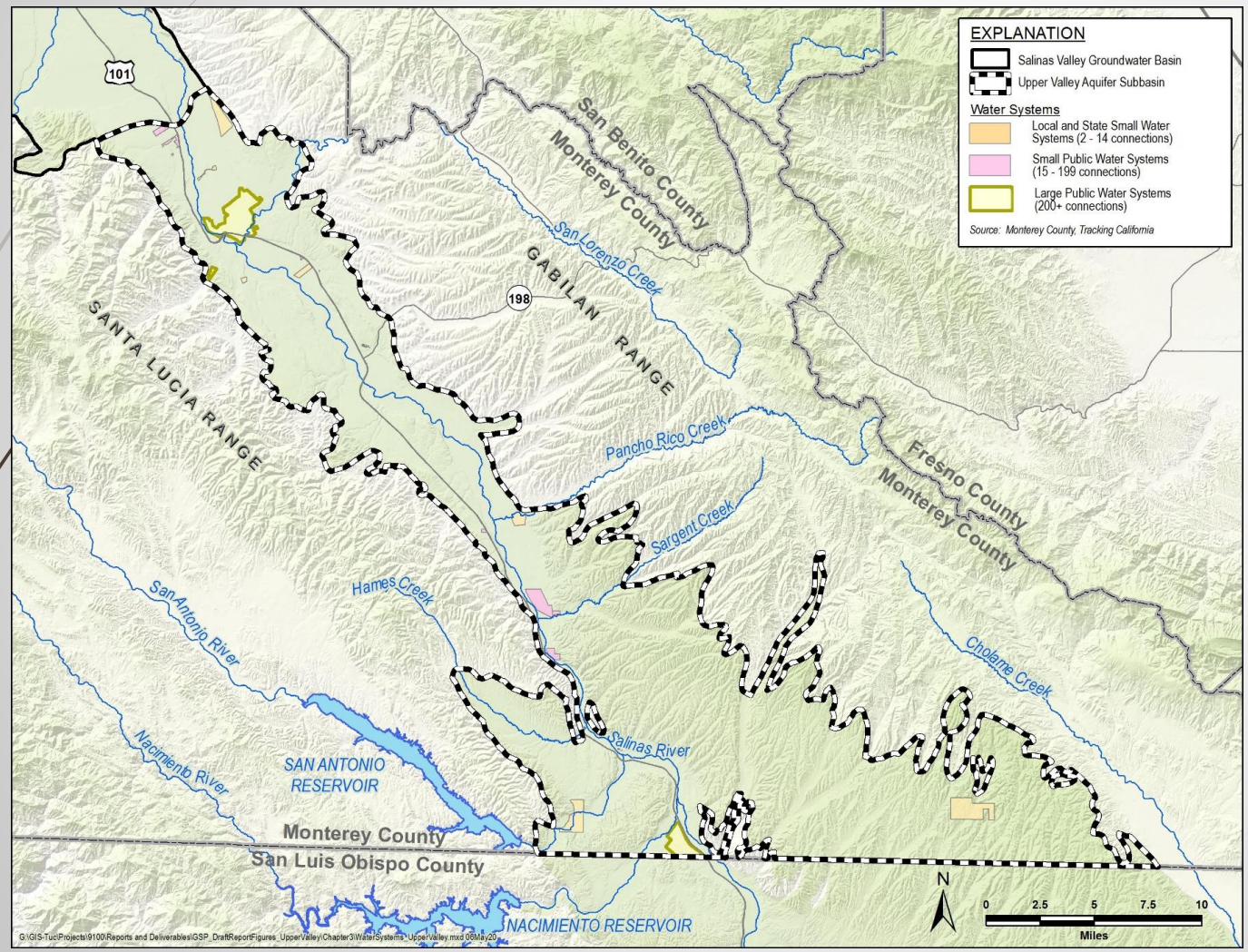
Upper Valley Aquifer Subbasin

- 237,670 acres
- Most land designated agricultural (72,102, irrigated; 136,496, dry)



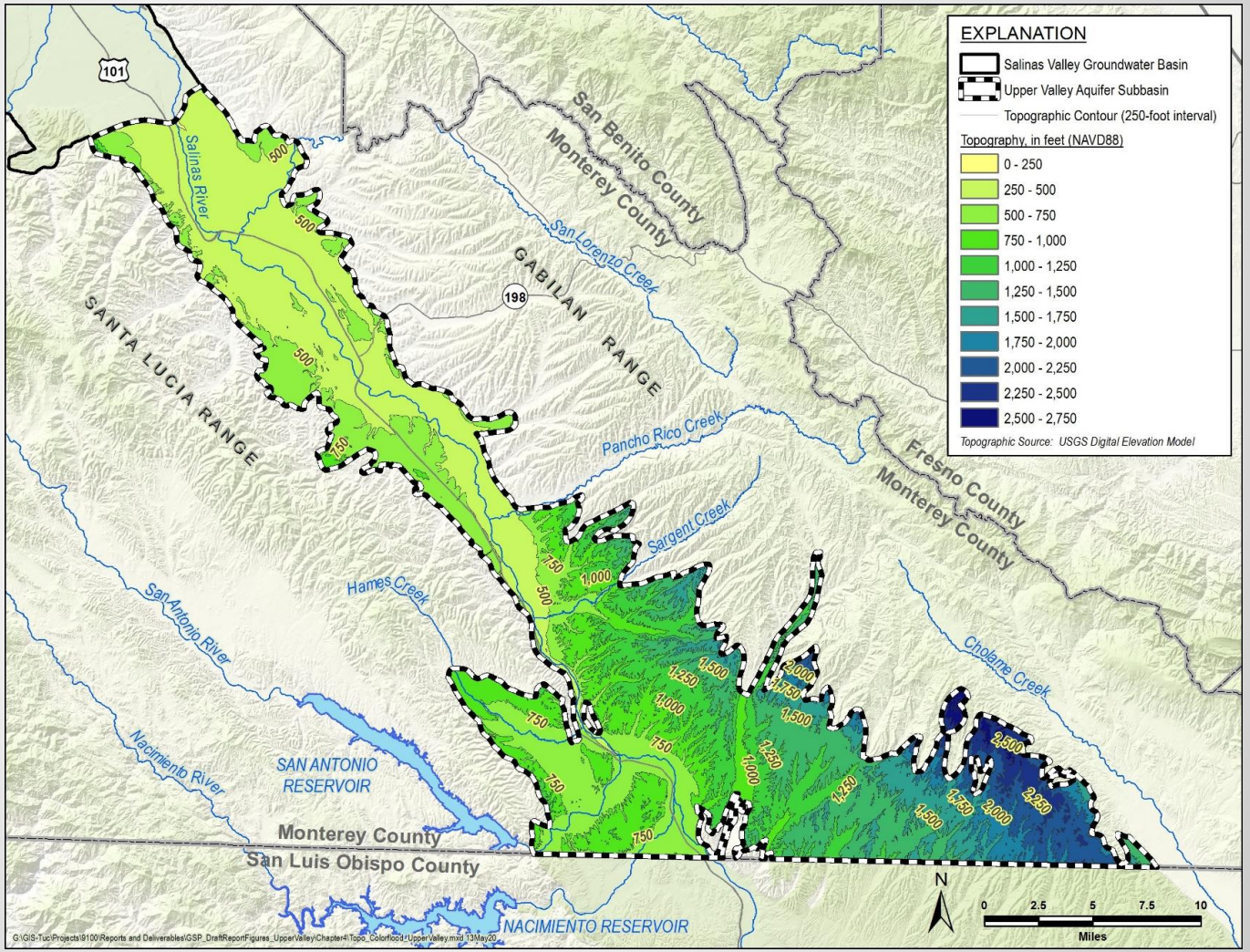


Communities Dependent on Groundwater

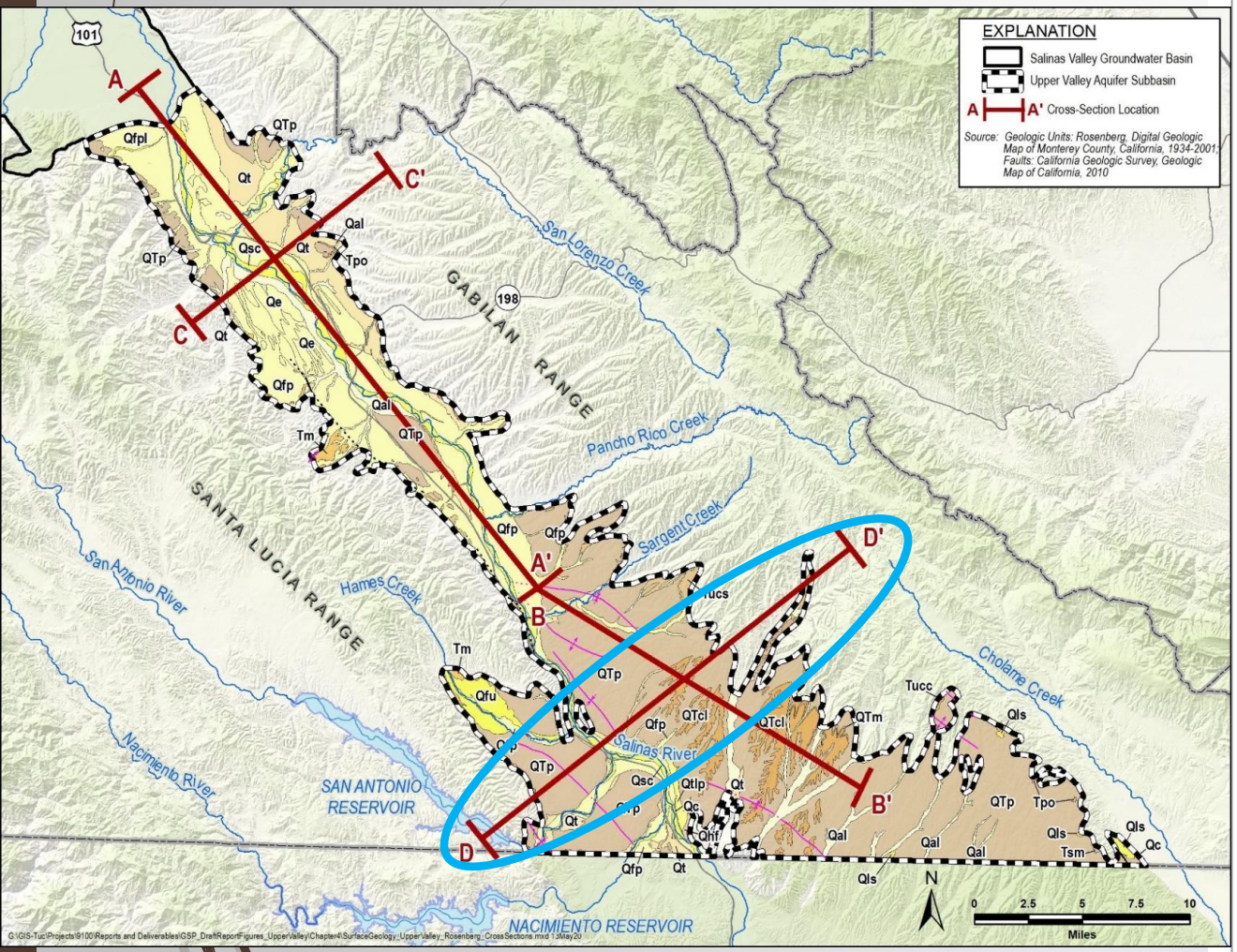


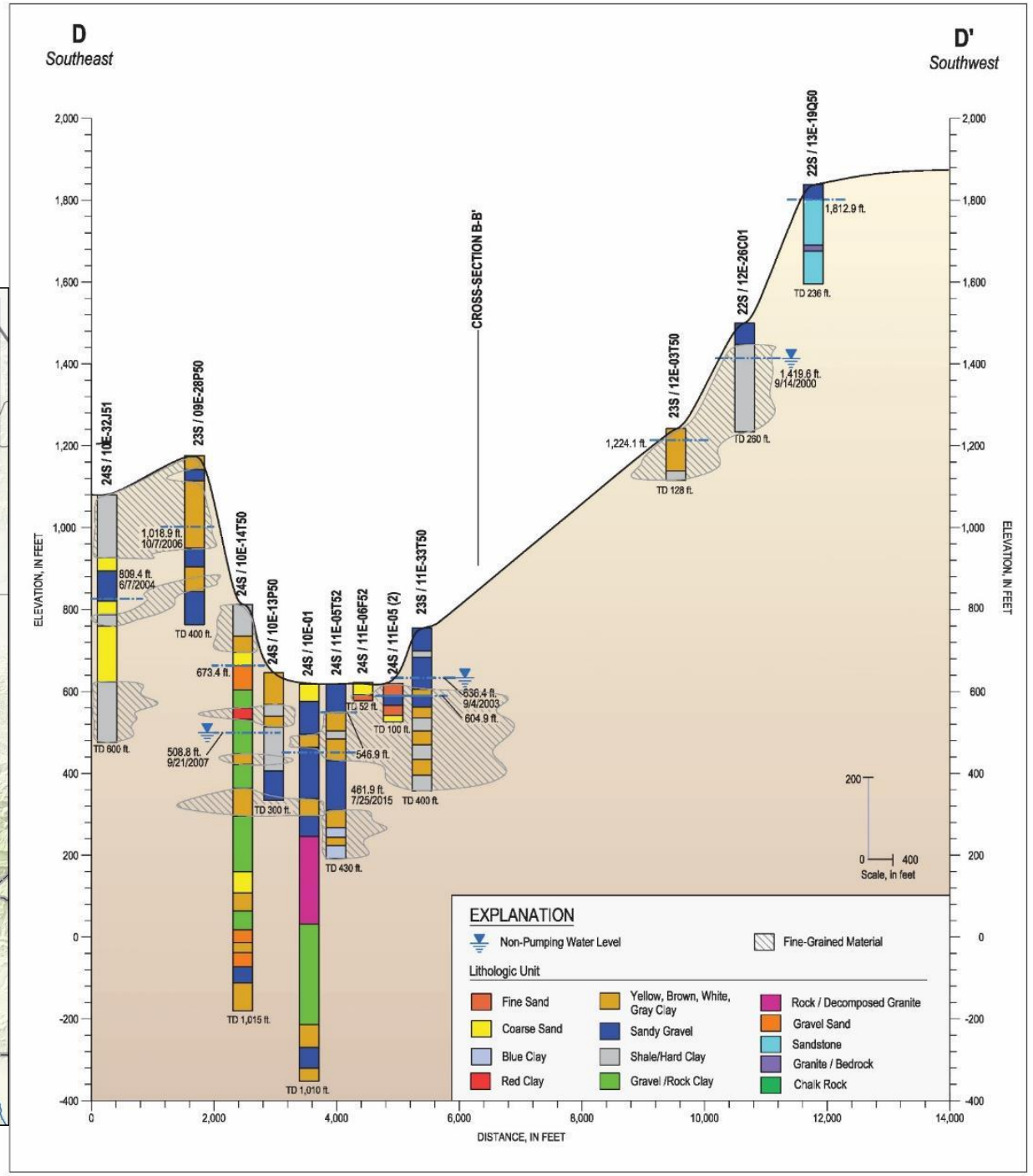
Water Systems	
Local and State Small (2 – 14 connections)	14
Small Public (15 – 199 connections)	9
Large Public (200+ connections)	3

Basin Setting - Topography



Hydrogeologic Conceptual Model



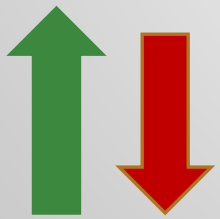


Upper Valley Chapter 6 – Water Budgets

Historical Water Budget

	Modeled Historical Average (WY 1980-2016)
Groundwater Pumping	-91,600
Net Stream Exchange	89,100
Groundwater Evapotranspiration	-57,900
Deep Percolation of precipitation and irrigation water	57,300
Net Flow from Adjacent Subbasins/Basin	1,900
Net Storage Gain (+) or Loss (-)	-1,200

+ Indicates increase in storage



- Indicates decrease in storage

Historical Sustainable Yield

	Model Estimate (WY 1980-2016)	Low GEMS Estimate (WY 1995-2016)	High GEMS Estimate (WY 1995-2016)
Total Subbasin Pumping	91,600	108,500	129,600
Change in Storage	-1,200	0	0
Estimated Sustainable Yield	90,400	108,500	129,600

Because the subbasin is not in overdraft, it is impossible to estimate the historical sustainable yield, so the water budget contains a range of +/- 1 standard deviation of the GEMS reported pumping

GEMS change in storage set to zero because there has not been a chronic decline in groundwater storage

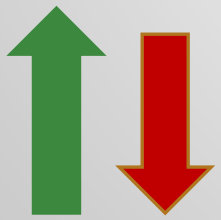
USING BEST AVAILABLE DATA: GEMS

Upper Valley Chapter 6 – Water Budgets

Future Water Budget

	Model Estimate 2070
Groundwater Pumping	-90,900
Net Stream Exchange	73,200
Groundwater Evapotranspiration	-46,300
Deep Percolation of precipitation and irrigation water	66,700
Net Flow from Adjacent Subbasins/Basin	8,300
Net Storage Gain (+) or Loss (-)	10,800

\+ Indicates increase in storage



\- Indicates decrease in storage

Future Sustainable Yield

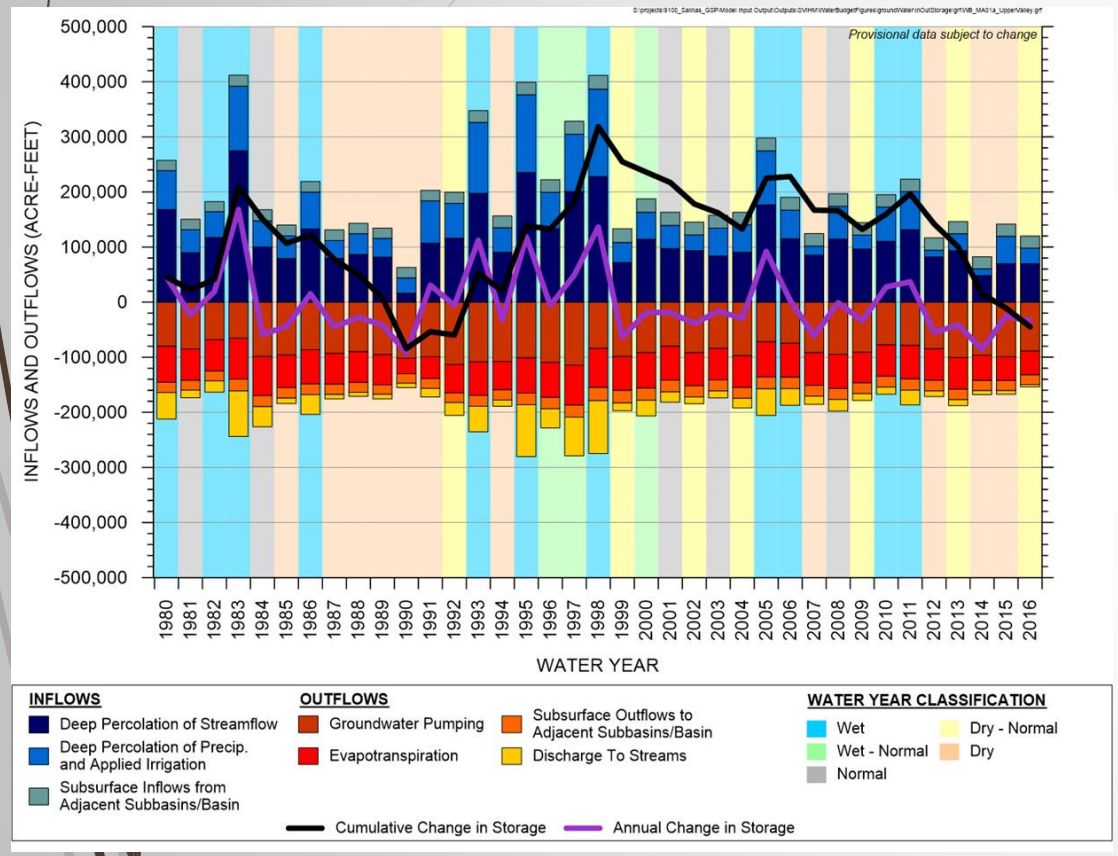
	Model Estimate 2070	GEMS Estimate 2070
Total Subbasin Pumping	90,900	117,000
Change in Storage	10,800	0
Estimated Sustainable Yield	101,700	117,000

SVOM likely estimates only about 76% of the pumping, according to GEMS reported data, so the SVOM estimated pumping was adjusted by that amount

GEMS change in storage set to zero because there has not been a chronic decline in groundwater storage and the model-estimated change in storage was within the model error

USING BEST AVAILABLE DATA: GEMS

Groundwater Budget Summary



- Overall – there is no chronic decline in water levels and Upper Valley is in balance
- Historical and future water budgets are both averages of many years/hydrologic periods
- Current water budget is a snapshot and does not tell us much since it only views change from one year to the next
- Future water budget incorporates average climate change, but does not represent short-term climate change effects
- The water budget will be refined with future versions of the SVIHM/SVOM that have pumping estimates that better reflect observed data.

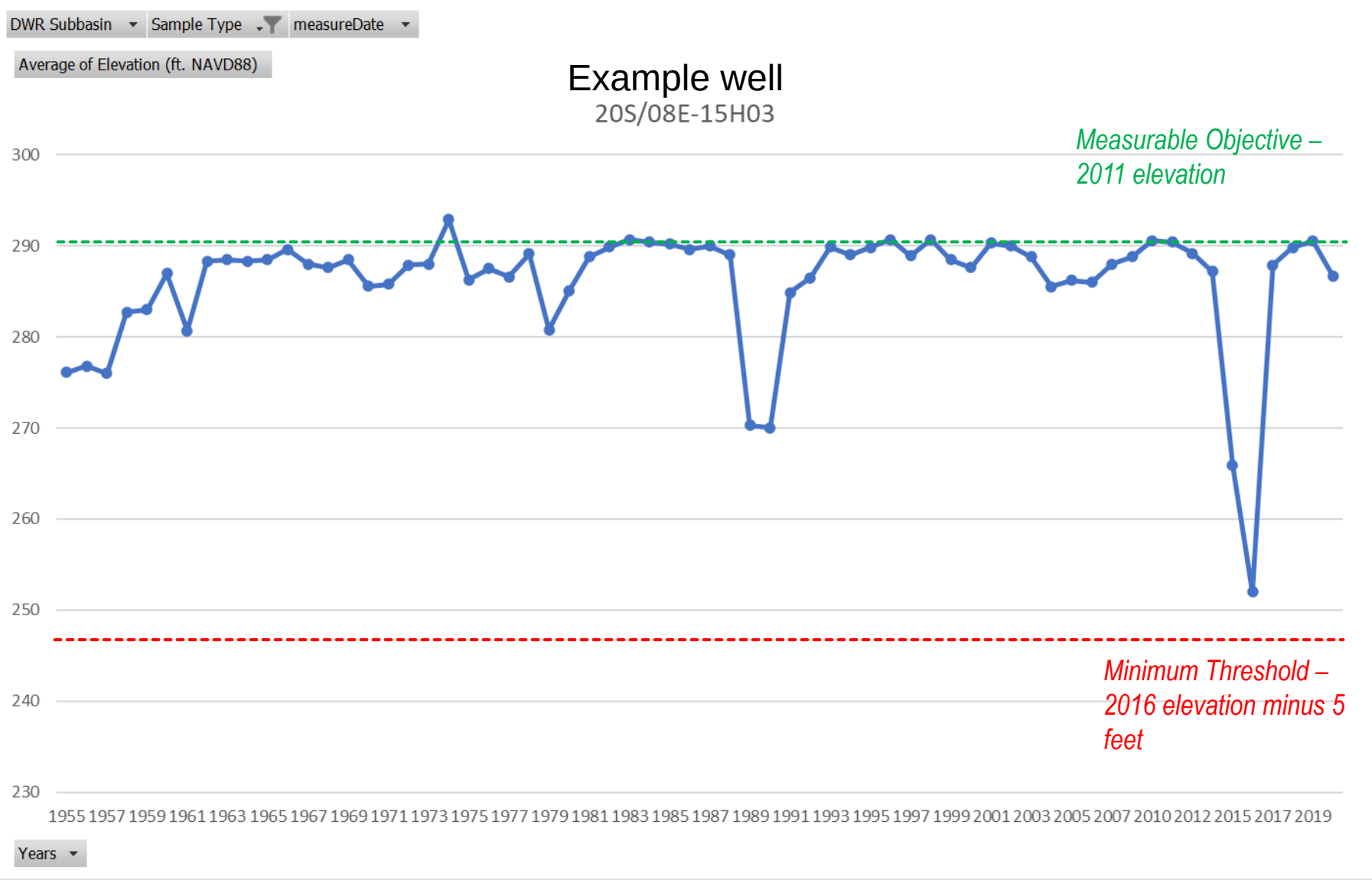
Groundwater conditions/SMC – **Groundwater Levels**

1. Chronic Lowering of Groundwater Levels

Measurable Objective (MO):
Set to 2011 groundwater elevations.

Minimum Threshold (MT):
Set to 5 feet below the lowest groundwater elevation between 2012 and 2016.

Undesirable Result:
More than 15% of groundwater elevation minimum thresholds are exceeded.



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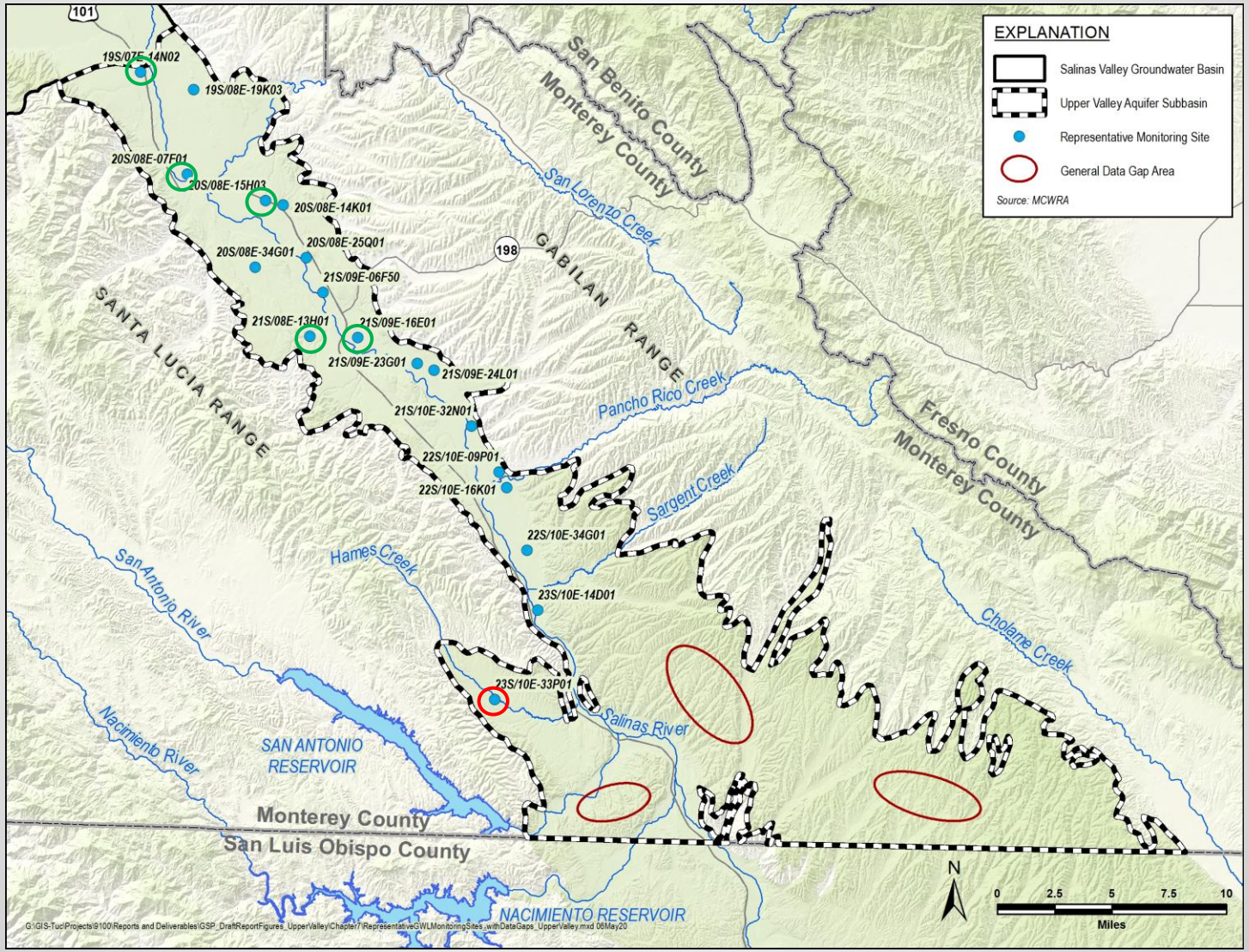


Representative Monitoring Sites

Wells with groundwater levels above the MO in 2019 are circled in GREEN

Wells with groundwater levels below the MT in 2019 are circled in RED

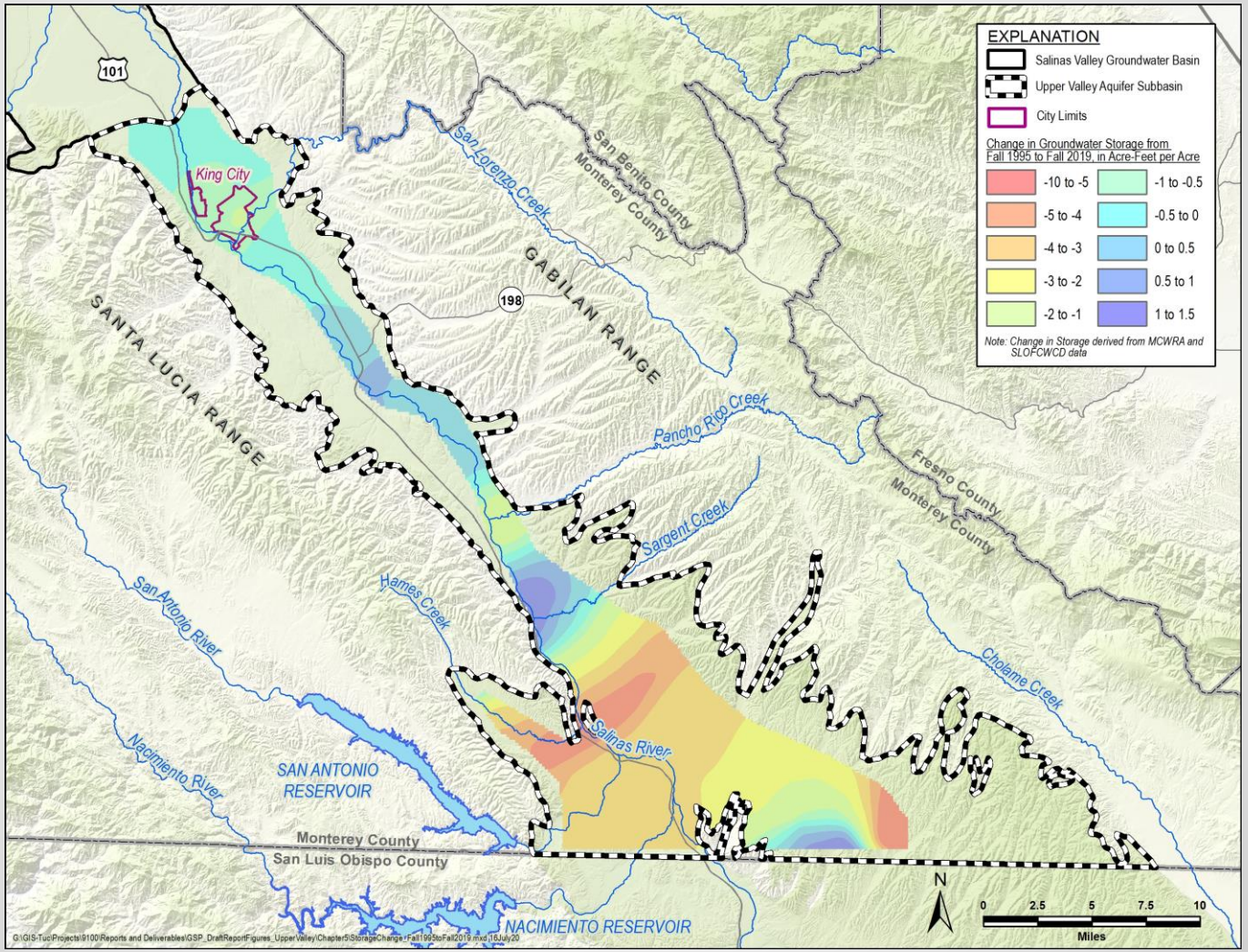
Groundwater conditions/SMC – **Groundwater Storage**

2. Reduction in Groundwater Storage

Measurable Objective (MO):
Established by proxy using groundwater elevations. Set to the same as groundwater levels measurable objectives

Minimum Threshold (MT):
Established by proxy using groundwater elevations. Set to the same as groundwater levels minimum thresholds

Undesirable Result:
More than 15% of groundwater elevation minimum thresholds are exceeded.



Groundwater conditions/SMC – **Water Quality**

4. Degraded Groundwater Quality

Measurable Objective (MO)

Zero additional exceedances of either the regulatory drinking water standards (potable supply wells) or the Basin Plan objectives (irrigation supply wells) beyond those observed in 2019 for groundwater quality constituents of concern.

Minimum Threshold (MT)

Identical to the measurable objective.

Undesirable Result:

The minimum threshold is exceeded as a direct result of projects or management actions taken as part of GSP implementation.

Constituent of Concern (COC)	Number of Wells Sampled for COC	Minimum Threshold/Measurable Objective – Number of Wells Exceeding Regulatory Standard from latest sample
DDW Wells		
Boron	18	2
Lindane	24	2
Benzo(a)Pyrene	22	1
Cadmium	39	1
Dinoseb	29	1
Iron	40	8
Hexachlorobenzene	20	1
Manganese	39	6
Nitrate (as nitrogen)	44	8
Specific Conductance	40	5
Sulfate	40	4
1,2,3-Trichloropropane	37	4
Total Dissolved Solids	37	7
Vinyl Chloride	44	1
ILRP On-Farm Domestic Wells		
Chloride	74	7
Nitrate (as nitrogen)	**72**	**30**
Nitrate + Nitrite (sum as nitrogen)	**28**	**11**
Specific Conductance	**72**	**33**
Sulfate	**74**	**26**
Total Dissolved Solids	**74**	**35**
ILRP Irrigation Wells		
Chloride	133	13

Groundwater conditions/SMC – Current Water Quality Exceedance Maps

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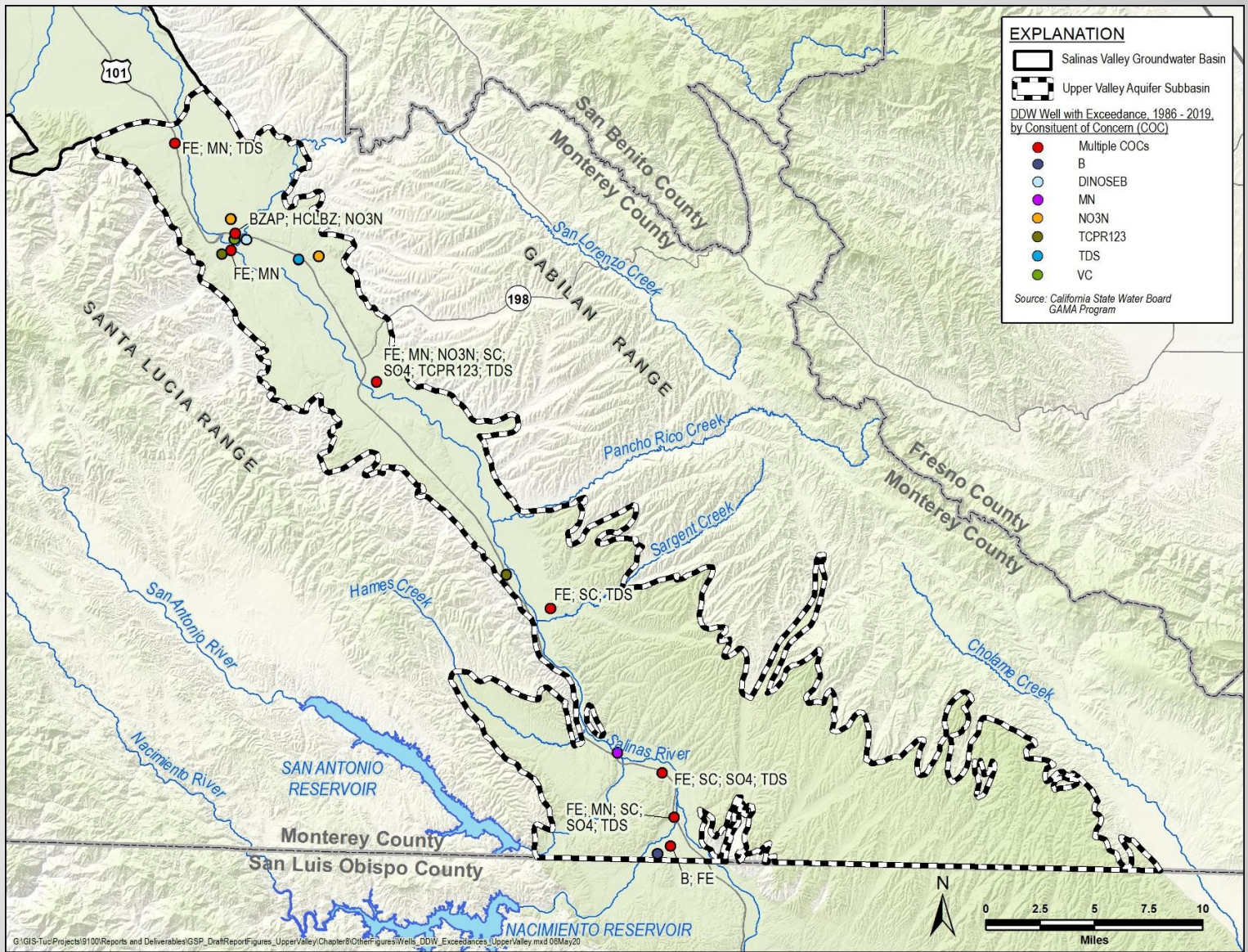
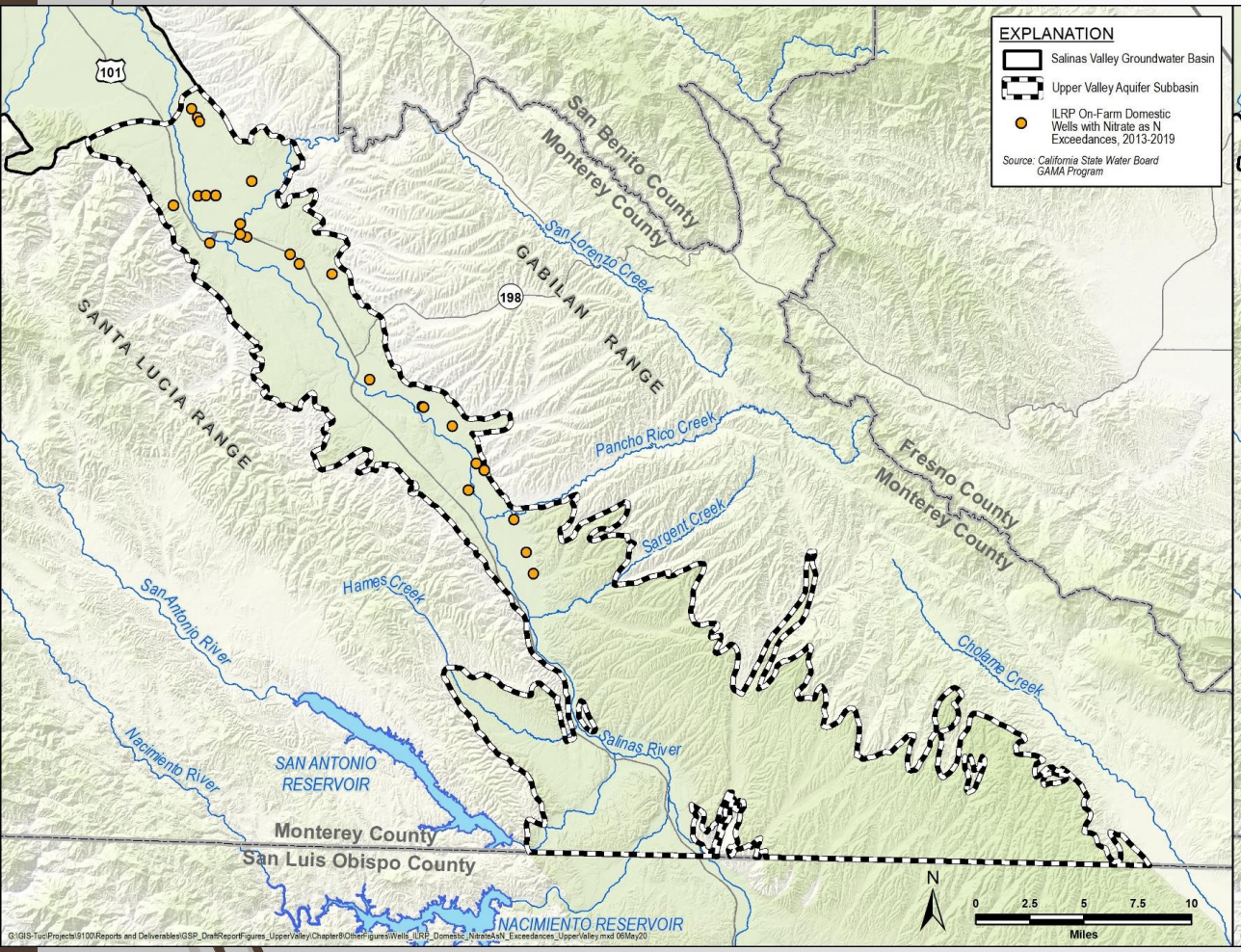
DDW

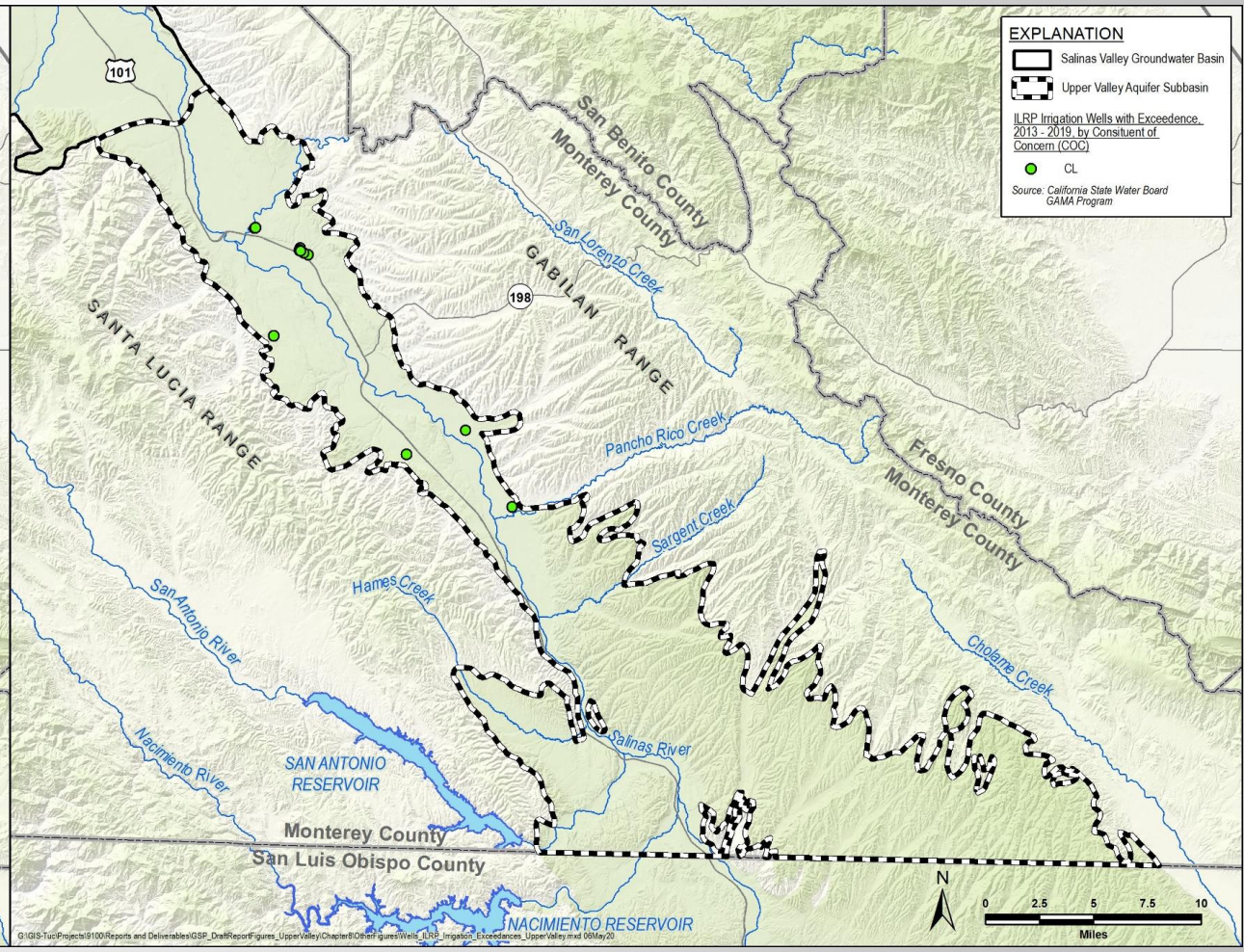


Groundwater conditions/SMC – Current Water Quality Exceedance Maps

ILRP On-Farm Domestic



ILRP Irrigation



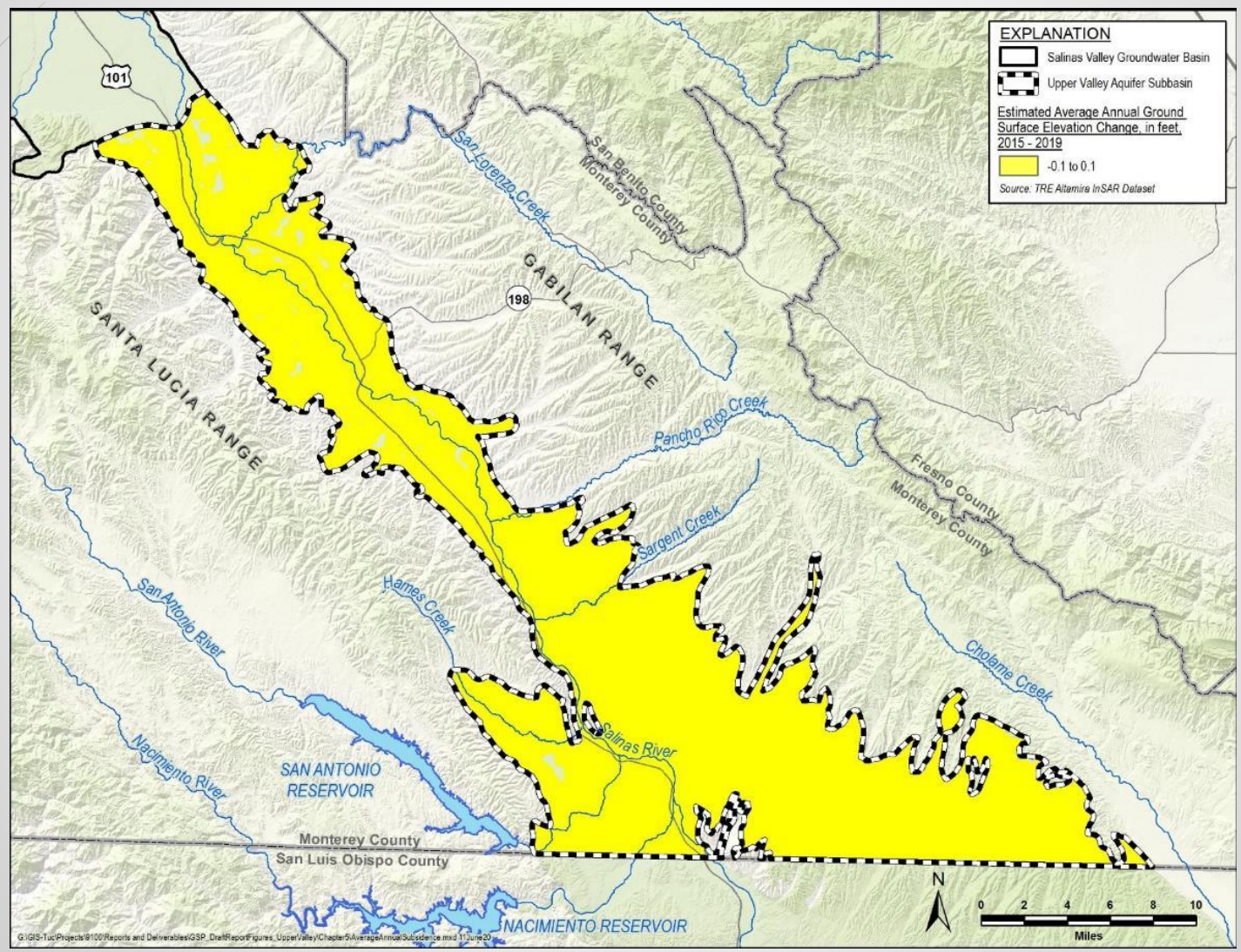
Groundwater conditions/SMC – **Subsidence**

5. Subsidence

Measurable Objective (MO):
Zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement to account for InSAR errors

Minimum Threshold (MT):
Zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement to account for InSAR errors

Undesirable Result:
There is an exceedance of minimum thresholds for subsidence.



- Negligible current subsidence
- Future subsidence due to groundwater conditions is unlikely
- Minimum threshold and measurable objective set at zero long-term subsidence

Groundwater conditions/SMC – **Interconnected Surface Water**

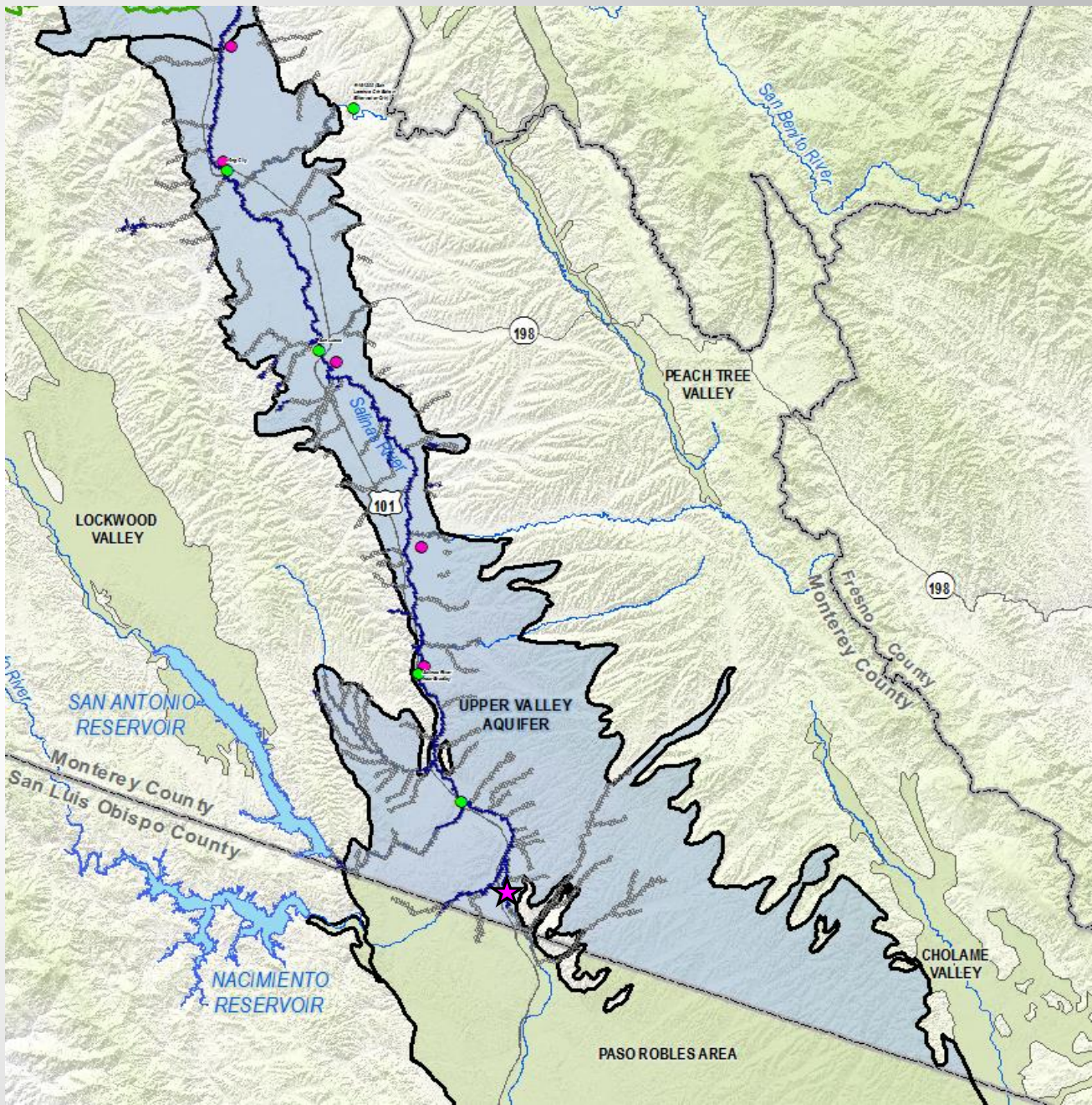
6. Depletion of Interconnected surface water (ISW)

Measurable Objective (MO):
Established by proxy using shallow groundwater elevations observed in 2011 near locations of ISW

Minimum Threshold (MT):
Established by proxy using shallow groundwater elevations observed in 2016 near locations of ISW

Undesirable Result:
There is an exceedance of the minimum threshold in a shallow groundwater monitoring well used to monitor ISW.

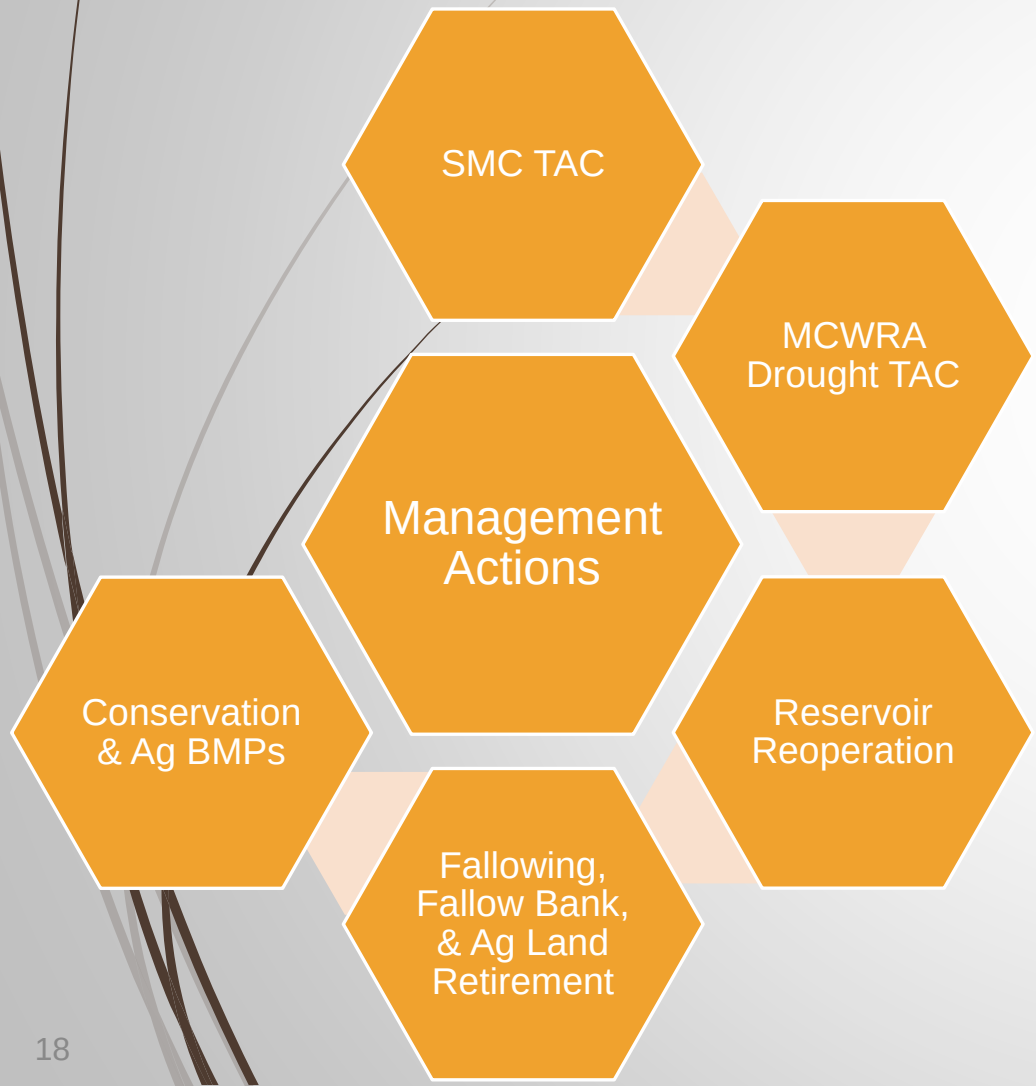
- No interconnected surface water monitoring points yet
  - Green dots are USGS gauge and MCWRA River Series measurement site
  - Pink dots are existing wells that will be added to network
- One new well will be added upstream of conservation releases (pink star)

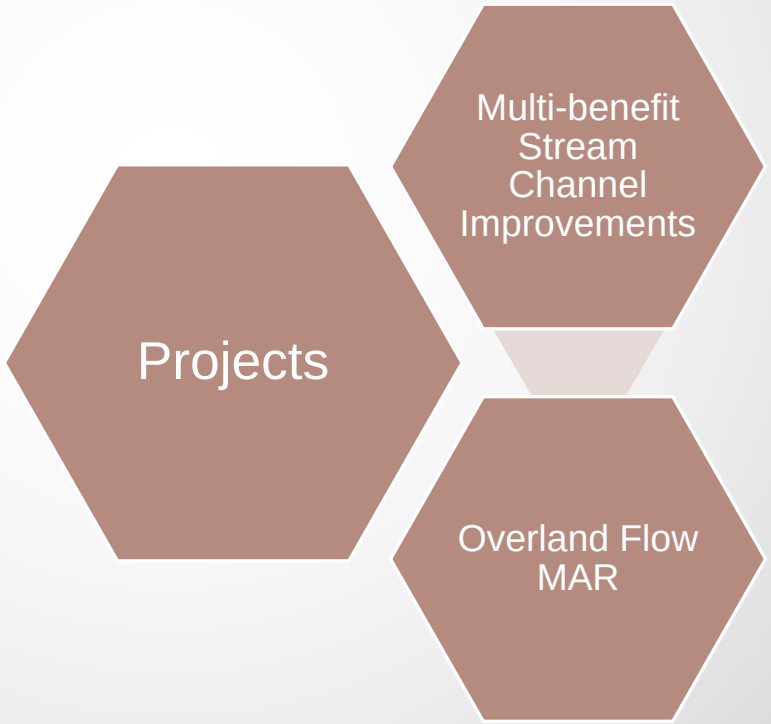


Summary of Current Conditions in Relation to SMC

- Upper Valley Aquifer Subbasin has not historically been in overdraft, nor experienced chronic lowering of groundwater levels
- From 1980 to 2016, the basin was in overdraft during only 5 years
- However, there are a few areas away from the river where groundwater elevations have been declining
- Given that the Subbasin's extraction is currently close to the sustainable yield, this GSP includes a robust set of potential management actions and projects that could be undertaken if needed

Management Actions and Projects





Upper Valley SMC TAC

Technical committee that reviews groundwater conditions and provides science-based advice on management actions & projects to Subbasin Planning Committee.

Will consider recharge projects, demand management, and groundwater quality mitigation.

Cost: staffing costs plus $10,000/yr.

Conservation & Ag BMPs

Promotes agricultural best management practices (BMPs) and supports use of evapotranspiration data as an irrigation management tool for growers.

Cost: Approximately $100,000 for 4 workshops, grant writing, and demonstration trials. Cost could be reduced if shared between subbasins.

Fallowing, Fallow Bank, & Ag Land Retirement

A voluntary program of incentives for fallowing or retiring agricultural land

Includes a fallow bank, whereby anybody fallowing land could draw against the bank to offset lost profit.

Cost: $195-$395/AF if land is fallowed, $810-$2,000/AF if land is retired (can be scaled to desired amount)

MANAGEMENT ACTIONS

MCWRA Drought Reoperation

Support the existing Drought Technical Advisory Committee (D-TAC), which plans reservoir releases during drought conditions.

No additional costs since already formed.

Reservoir Reoperation

Collaborate with MCWRA to evaluate potential reoperation scenarios.

Could be paired with projects such as the MCWRA Interlake Tunnel and Winter Release with ASR projects.

Cost: approximately $400,000 - $500,000

Management Actions

Multi-benefit Stream Channel Improvements

Prune native vegetation and remove non-native vegetation, manage sediment, and enhance floodplains for recharge. Includes 3 components:

1. **Stream Maintenance Program**, Multi-subbasin cost of $0.6M-$1.0M/yr.

2. **Invasive Species Eradication**, Multi-subbasin benefits of 2,790-20,880 AF/yr., cost of $16.5M or $60-$600/AF

3. **Floodplain Enhancement and Recharge**, benefits of 400 AF/yr. for 4 basins in Upper Valley alone, cost of $4.5M or $930/AF

Managed Aquifer Recharge with Overland Flow

Description: Construct recharge basins for managed aquifer recharge of overland flow before it reaches streams.

Benefits: approximately 400 AF/yr. for 4 recharge basins; could be scaled up or down

Cost: $4,128,000 for 4 recharge basins, or $870/AF

Project Options Over 50 Year Planning Horizon

Implementation Actions

Well Registration

- Register all production wells, including domestic wells

Water Quality Partnership

- Form a working group for agencies and organizations to collaborate on addressing water quality concerns.

GEMS Expansion & Enhancement

- Update current GEMS program, by collecting groundwater extraction data from wells in areas not currently covered by GEMS and improving data collection

Dry Well Notification System

- Develop a system for well owners to notify the GSA if their wells go dry. Refer those owners to resources to assess and improve their water supplies. Form a working group if concerning patterns emerge.

Summary of Management Actions

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
A1	SMC Technical Advisory Committee (TAC)	Establish TAC to review groundwater conditions and provide advice on projects and management actions	Potential for increased groundwater elevations, increased groundwater storage, decreased groundwater extraction, protection of water quality	Dependent on specific recommendations implemented	Staffing costs plus $10,000 per year
A2	Conservation and Agricultural BMPs	Promote agricultural best management practices (BMPs) and support use of ET data as an irrigation management tool for growers	Better tools assist growers to use water more efficiently; decreased groundwater extraction	Unable to quantify benefits until specific BMPs are identified and promoted	Approximately $100,000 for 4 workshops, grant writing, and demonstration trials. Cost could be reduced if shared between subbasins.
A3	Fallowing, Fallow Bank, and Agricultural Land Retirement	Includes voluntary fallowing, a fallow bank whereby anybody fallowing land could draw against the bank to offset lost profit from fallowing, and retirement of agricultural land	Decreased groundwater extraction for irrigated agriculture	Dependent on program participation	$195-$395/AF if land is fallowed $810-$2,000/AF if land is retired

Summary of Management Actions

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
A4	MCWRA Drought Reoperation	Support the existing Drought Technical Advisory Committee (D-TAC) when it develops plans for how to manage reservoir releases during drought conditions	Additional regular winter reservoir releases; drought resilience	Unable to quantify benefits since drought operations have yet to be triggered	No additional costs since already formed
A5	Reservoir Reoperation	Collaborate with MCWRA to evaluate potential reoperation scenarios	Additional regular annual reservoir releases; drought resilience	Unable to quantify benefits until feasibility study completed	Approximately $400,000 - $500,000

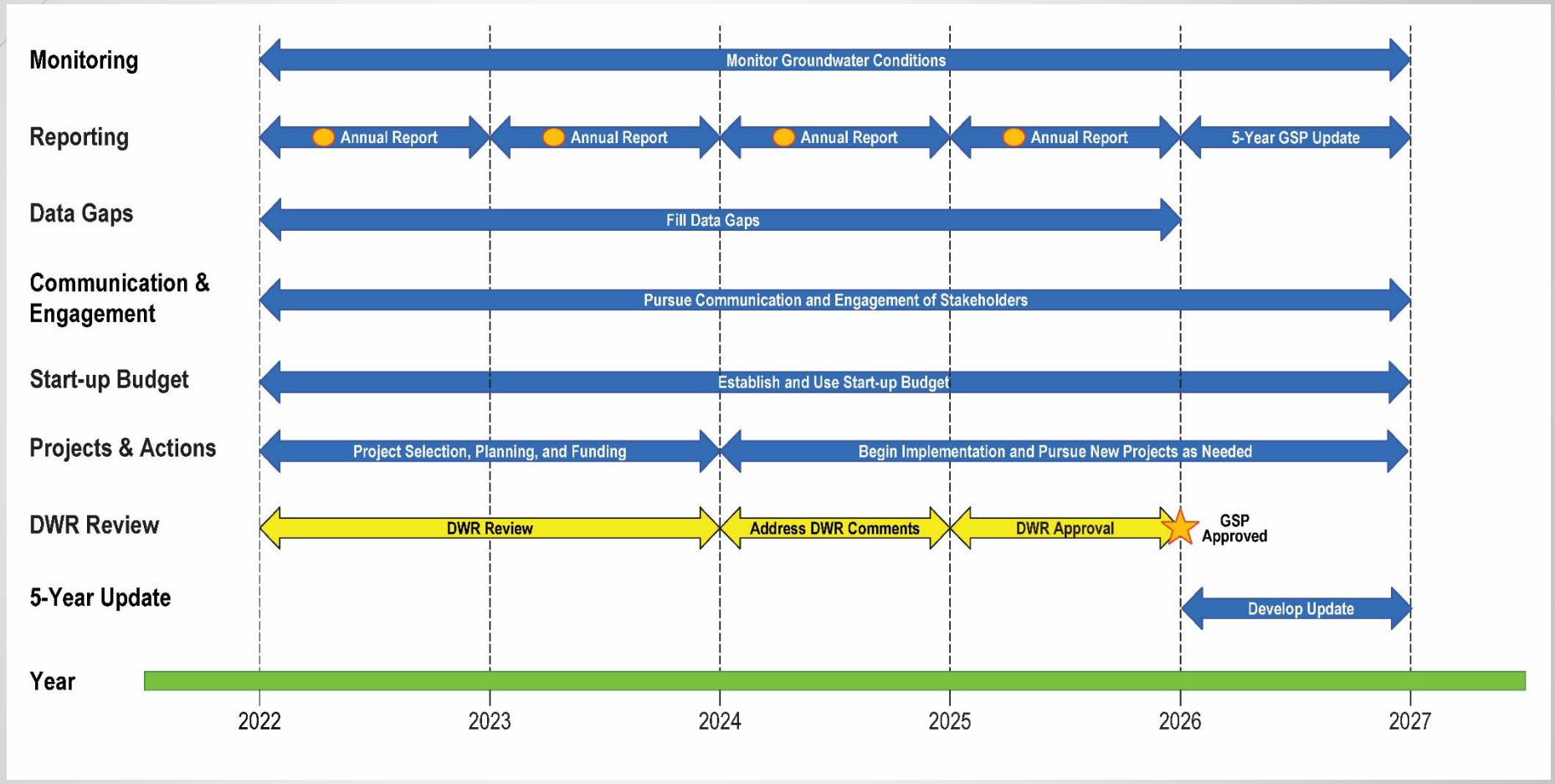
Summary of Potential Projects

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
B1	Multi-benefit Stream Channel Improvements	Prune native vegetation and remove non-native vegetation, manage sediment, and enhance floodplains for recharge. Includes 3 components: 1. Stream Maintenance Program 2. Invasive Species Eradication 3. Floodplain Enhancement and Recharge	Groundwater recharge, flood risk reduction, returns streams to a natural state of dynamic equilibrium	Component 1: Multi-subbasin benefits not quantified Component 2: Multi-subbasin benefits of 2,790 to 20,880 AF/yr. of increased recharge Component 3: Upper Valley benefits of 400 AF/yr. from 4 recharge basins	<u>Component 1</u> Multi-subbasin Cost: $150,000 for annual administration and $95,000 for occasional certification; $780,000 for the first year of treatment on 650 acres, and $455,000 for annual retreatment of all acres <u>Component 2</u> Multi-subbasin Average Cost: $16,500,000 Unit Cost: $60 to $600/AF <u>Component 3</u> Upper Valley Cost: $4,464,000 Unit Cost: $930/AF
B2	MAR with Overland Flow	Construct basins for MAR of overland flow before it reaches streams	Groundwater recharge, less stormwater and erosion, more regular surface temperature	400 AF/yr. in increased recharge	Capital Cost: $4,128,000 Unit Cost: $870/AF

Summary of Implementation Actions

Project/ Management Action #	Name	Description	Project Benefits	Quantification of Project Benefits	Cost
C1	Well Registration	Register all production wells, including domestic wells	Better informed decisions, more management options	N/A – Implementation Action	Not estimated at this time
C2	Groundwater Extraction Management System (GEMS) Expansion and Enhancement	Update current GEMS program, by collecting groundwater extraction data from wells in areas not currently covered by GEMS and improving data collection	Better informed decisions	N/A – Implementation Action	Not estimated at this time
C3	Dry Well Notification System	Develop a system for well owners to notify the GSA if their wells go dry. Refer those owners to resources to assess and improve their water supplies. Form a working group if concerning patterns emerge.	Support affected well owners with analysis of groundwater elevation decline	N/A – Implementation Action	Not estimated at this time
C4	Water Quality Partnership	Form a working group for agencies and organizations to collaborate on addressing water quality concerns.	Improve water quality	N/A – Implementation Action	Not estimated at this time

Implementation Schedule



Adaptive Management

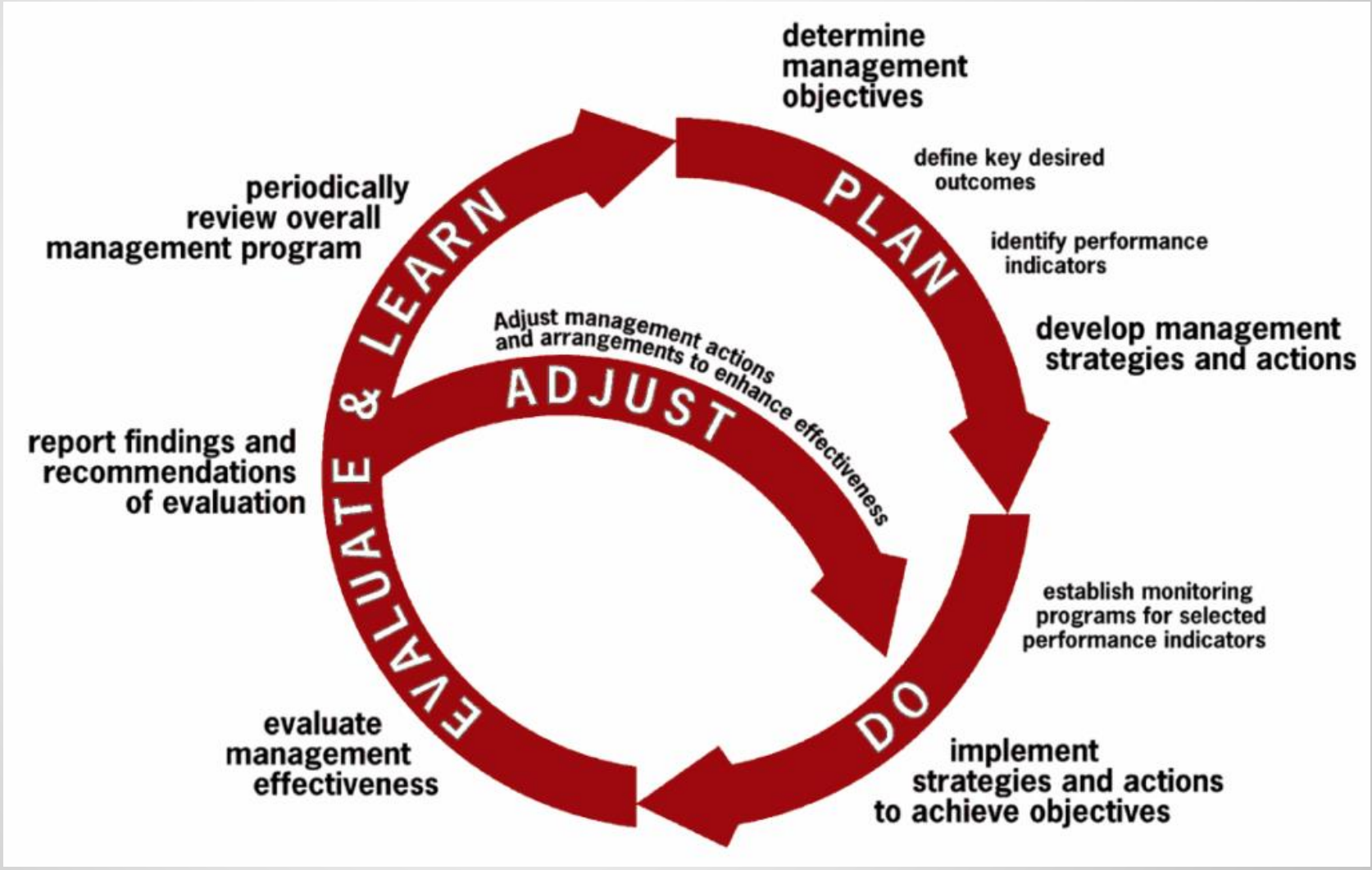


Image source: https://reefresilience.org/management-strategies/marine-protected-areas/adaptive-management

Questions