Groundwater Sustainability Plan

Public Workshop – March 10, 2021

NORTH AMERICAN Subbasin

Welcome!

- Meeting Format
  - Providing you an overview of how local agencies are planning to meet State Sustainable Groundwater Management Act (SGMA) requirements
  - Seeking your input and comments !!!
- Past/Current/Future Meetings and Focus Areas
  1. Feb 10 – Sustainable Management Criteria
  2. March 10 – Water Budgets
  3. April 14 – Projects & Management Actions

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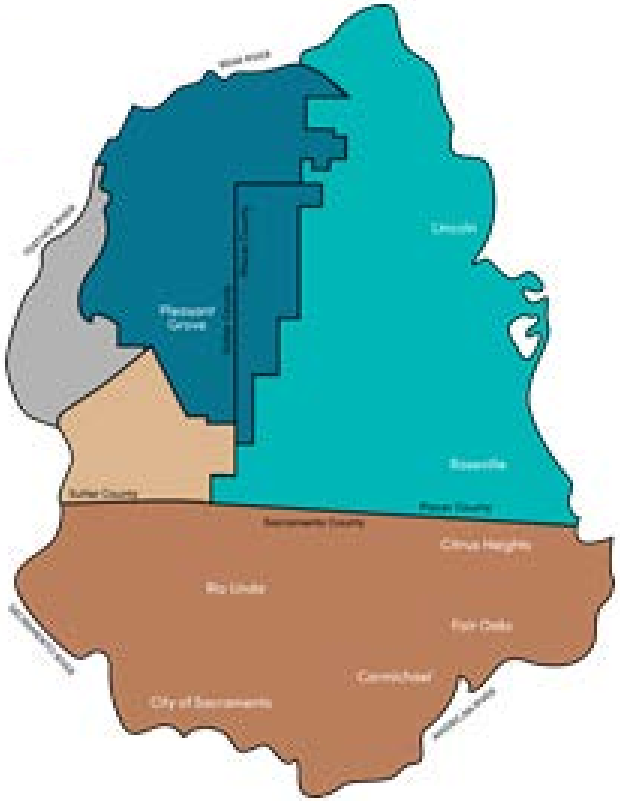
How to Engage During the Meeting

- On Zoom:
  - “Raise hand” function to speak

    OR

  - Type question in “Q&A”
- Via telephone:
  - *9 to “Raise hand”
  - *6 to unmute when called on



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Agenda – *presented today in 3 segments*

1) Introduction & Purpose

- Today's public meeting goals
- Introductions by local agencies - Groundwater Sustainability Agencies (GSAs)
- Updated list of Frequently Asked Questions NEW!

2) SGMA background and State requirements

- SGMA overview, Groundwater Sustainability Plan (GSP) regulatory requirements, & existing draft GSP content
- GSP Water Budget Requirements NEW!

3) Preliminary Water Budget and Modeling Analysis NEW!

- North American Groundwater Subbasin - Beneficial Uses and Users
- Draft SMC – Approach and proposed values

4) Timeline and Q&A

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1) Introduction & Purpose

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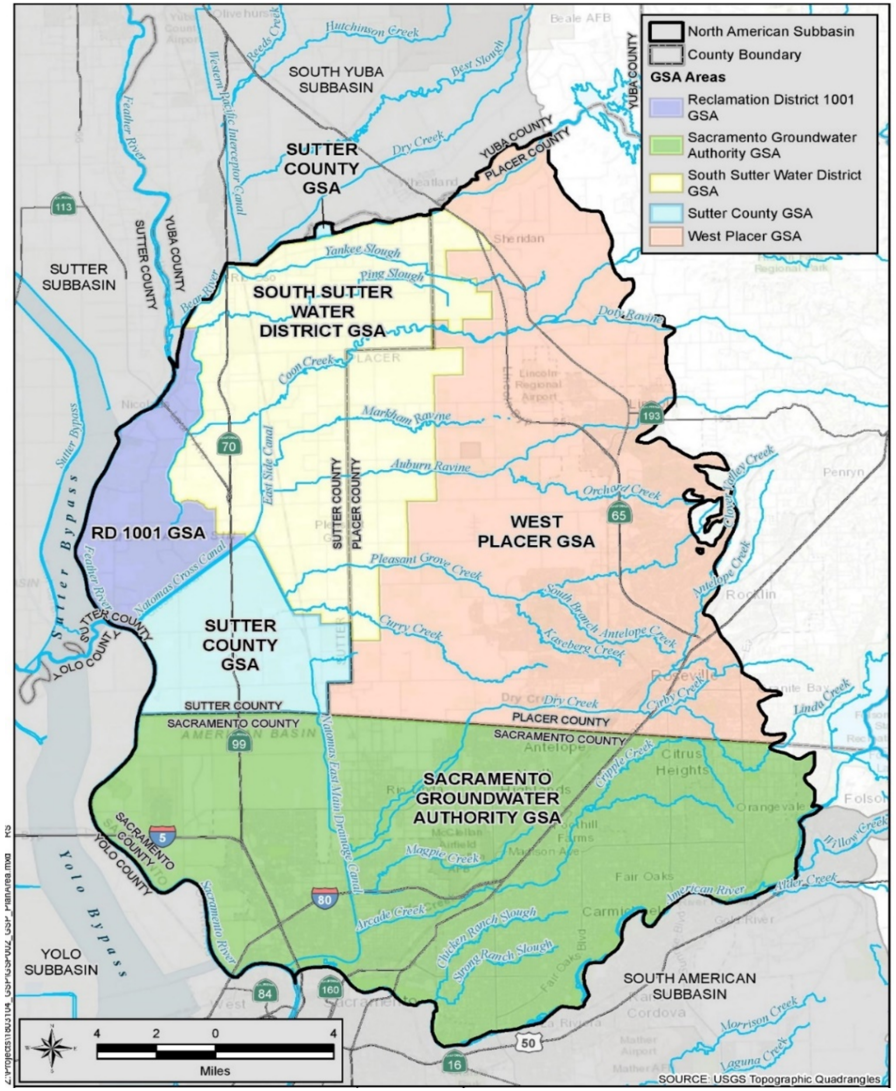
West Placer Groundwater Sustainability Agencies

Reclamation District 1001 GSA
Michael Phillips

Sutter County GSA
Guadalupe Rivera



South Sutter Water District GSA
Brad Arnold

West Placer GSA
Christina Hanson

Sacramento Groundwater Authority GSA
Rob Swartz

WEST PLACER GROUNDWATER SUSTAINABILITY AGENCY

Frequently Asked Questions

1. Why are you working on a GSP now?
2. Why does our basin need a GSP?
3. Will our groundwater continue to be reliable?
4. Will there be restrictions on my access?
5. Will I have to pay fees for this program?
6. Will I have to install a meter on my well?
7. Will my well have to be monitored?

WEST PLACER GROUNDWATER SUSTAINABILITY AGENCY

2) SGMA Background and State Requirements

Sustainable Groundwater Management Act (SGMA)

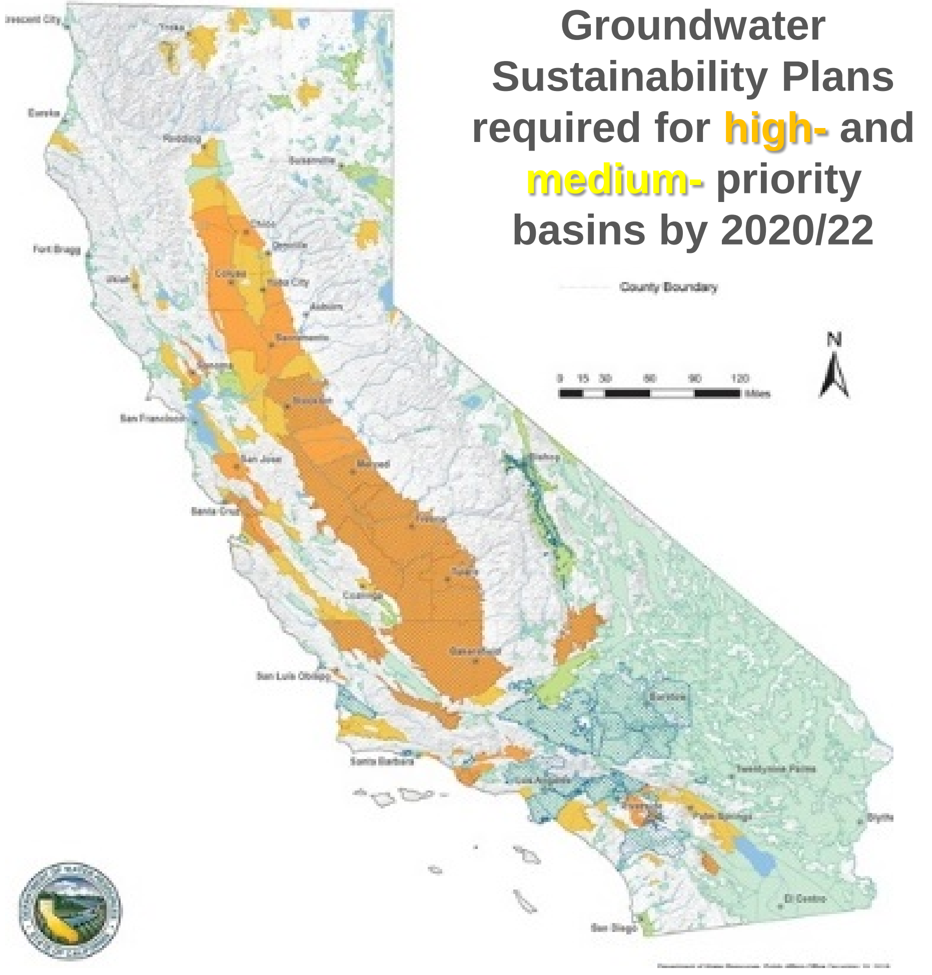
Local Control

"A central feature of these bills is the recognition that groundwater management in California is best accomplished locally."

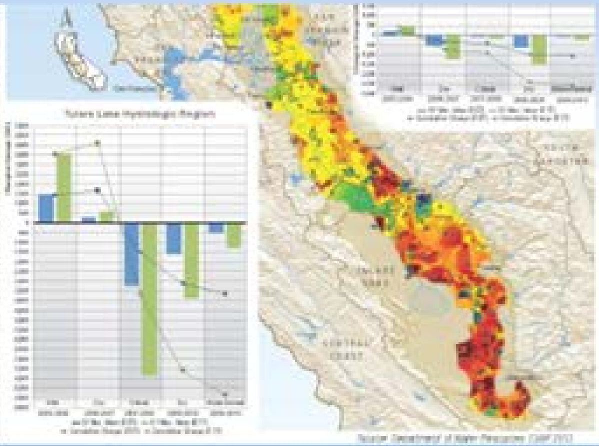
Governor Jerry Brown, September 2014

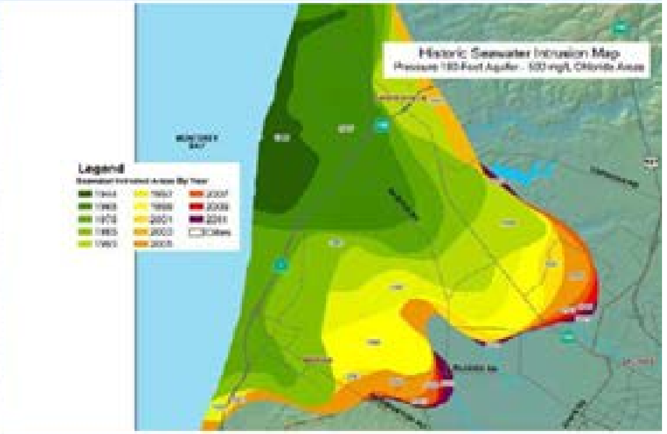
Groundwater Basins

Groundwater Sustainability Plans required for **high-** and **medium-** priority basins by 2020/22



Sustainability - Avoid Six Undesirable Results

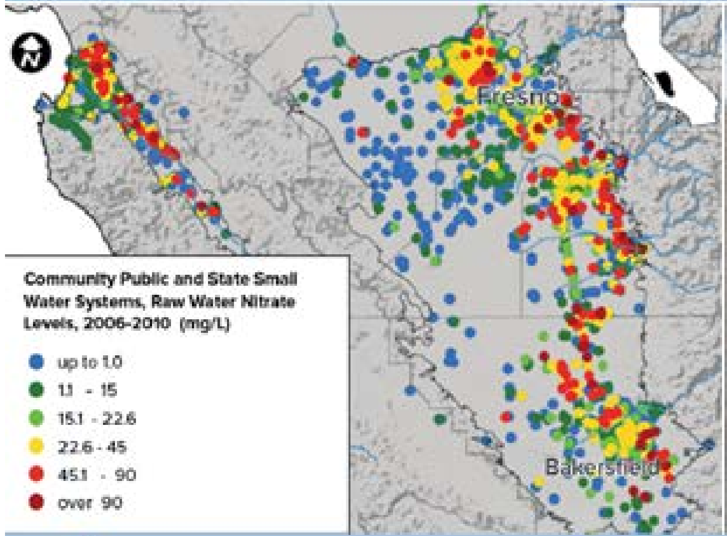




Lowering of GW Levels

Reduction of GW Storage

Seawater Intrusion



Water Quality Degradation

Land Subsidence

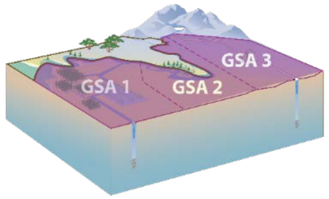
Depletion of Interconnected Streams

GSP Regulatory Requirements & NASb Draft Sections

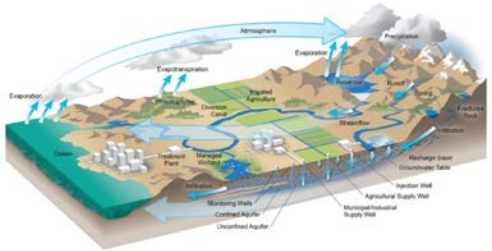
GSP Development Phases	1. Understand existing basin conditions	2. Develop management levels that consider beneficial uses and users	3. Develop management actions and/or projects to ensure basin is sustainable

GSP Regulation Requirements

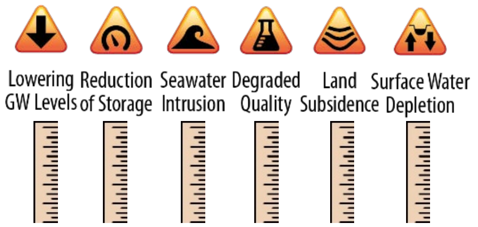
Who
- Administrative Information -



What
- Basin Setting -

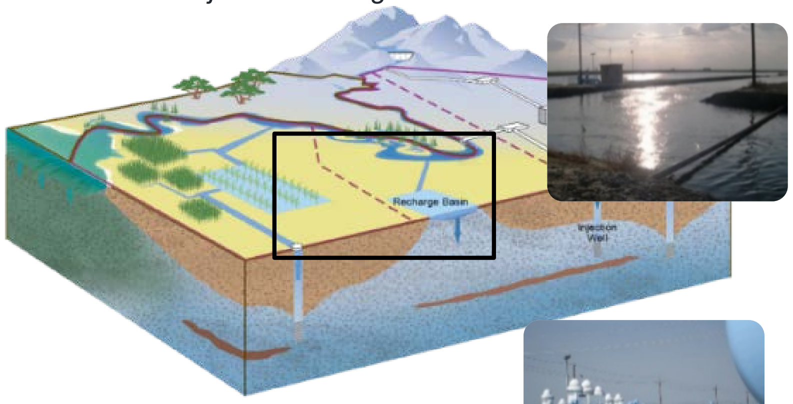


Where
- Sustainable Management Criteria -



- Monitoring Network -

How
- Projects & Management Actions -



NASb GSP Draft Sections

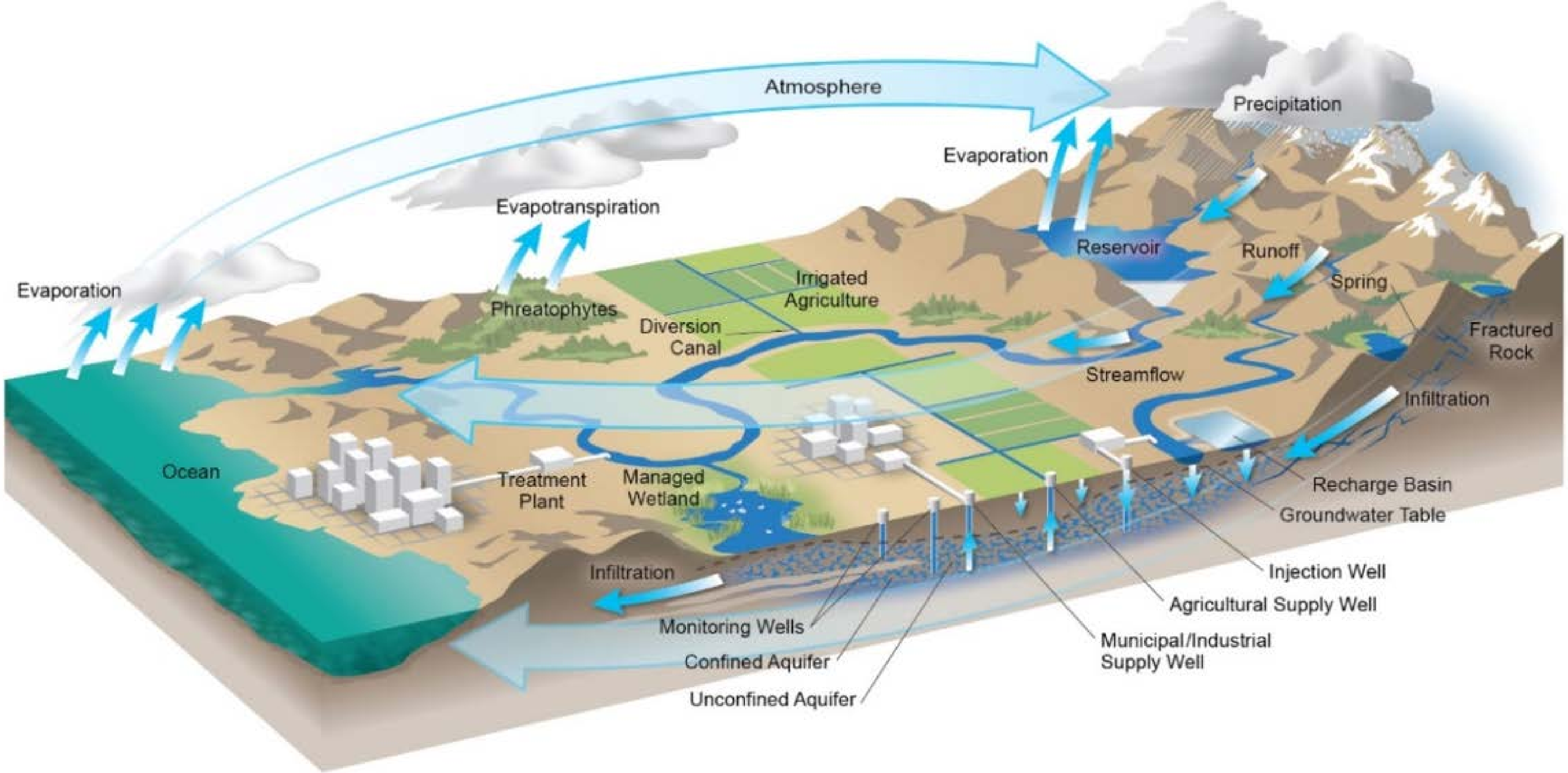
Draft Release Sections
Section 1 – Introduction
Section 2 – Agency Information
Section 3 – Description of Plan Area
Section 4 – Hydrogeologic Setting
Section 5 – Groundwater Conditions

Current Section Topics
Sustainable Management Criteria
Representative Monitoring Network
Water Budgets

Future Section Topics
Projects and Actions

Groundwater Sustainability Plan (GSP) -

Regulatory Requirements for Water Budgets



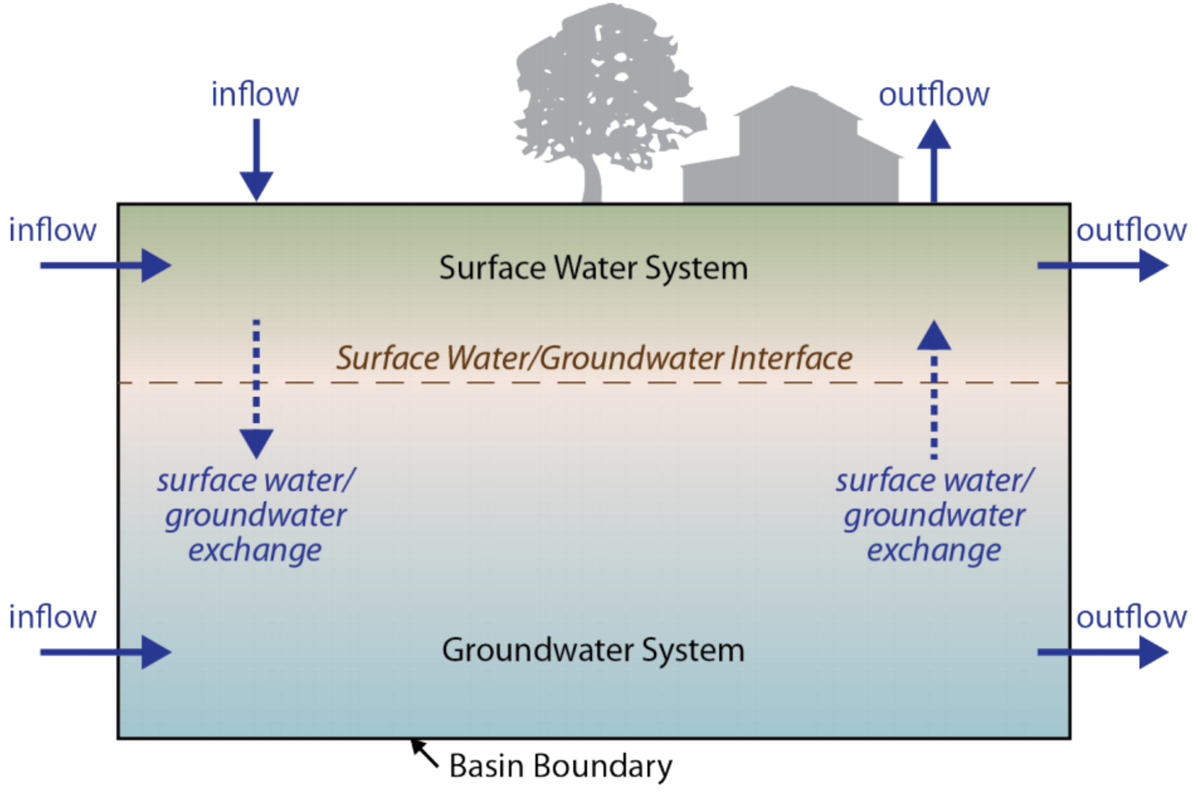
“the hydrologic cycle”

Subbasin

Groundwater Sustainability Plan (GSP) - Regulatory Requirements for <u>Water Budgets</u> (cont.)

23 CCR § 354.18. Water Budget.

- An accounting of total volume of groundwater and surface water entering and leaving the basin
  - Inflows
  - Outflows
  - Change in storage (overdraft?)
- <u>Current Water Budget</u>
  - Today's Baseline
  - Most recent land use, hydrology, water supply and demands
- <u>Historical Water Budget</u>
  - Evaluation of availability/reliability of past supplies in response to demands
- <u>Projected Water Budget</u>
  - Future baseline used to evaluate future scenarios
  - Includes **climate change** impacts



Inflows – outflows = change in storage

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3) Preliminary Water Budget and Modeling Analysis

CoSANA Water Budgets and Groundwater Conditions

Public Meeting

March 10, 2021

WOODARD & CURRAN

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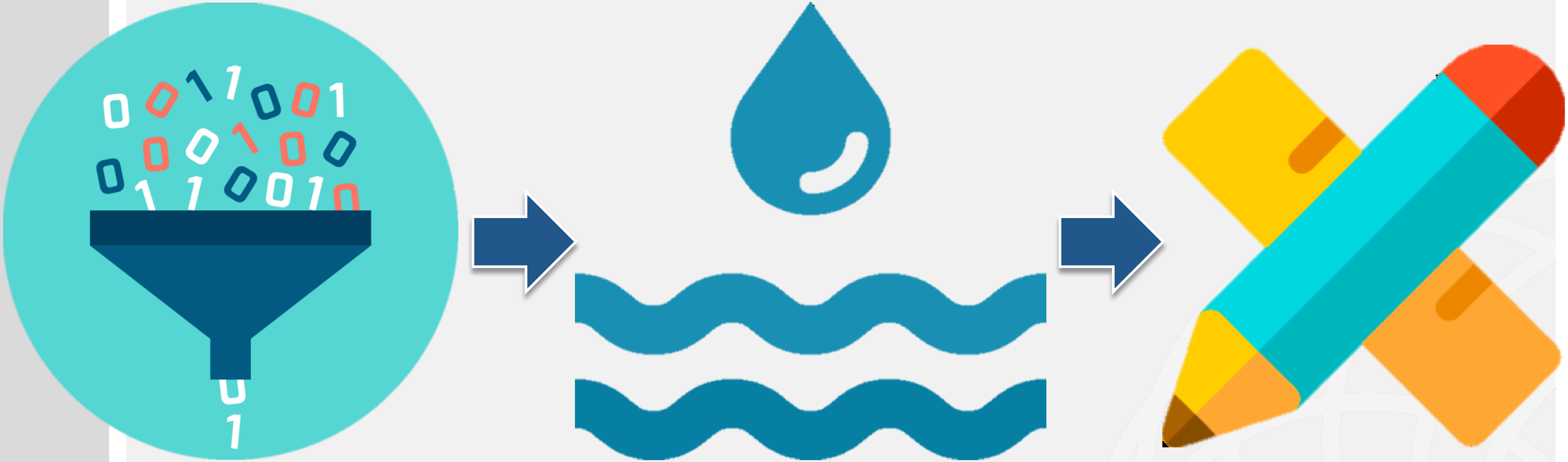
Overview

- Introduction to groundwater flow modeling
  - What is a model?
  - What is CoSANA?
- Groundwater budgets
- Model-estimated budget and groundwater storage results
- Model-estimated projected groundwater levels
- Model conclusions

Introduction to Groundwater Flow Modeling



What are models?



Data

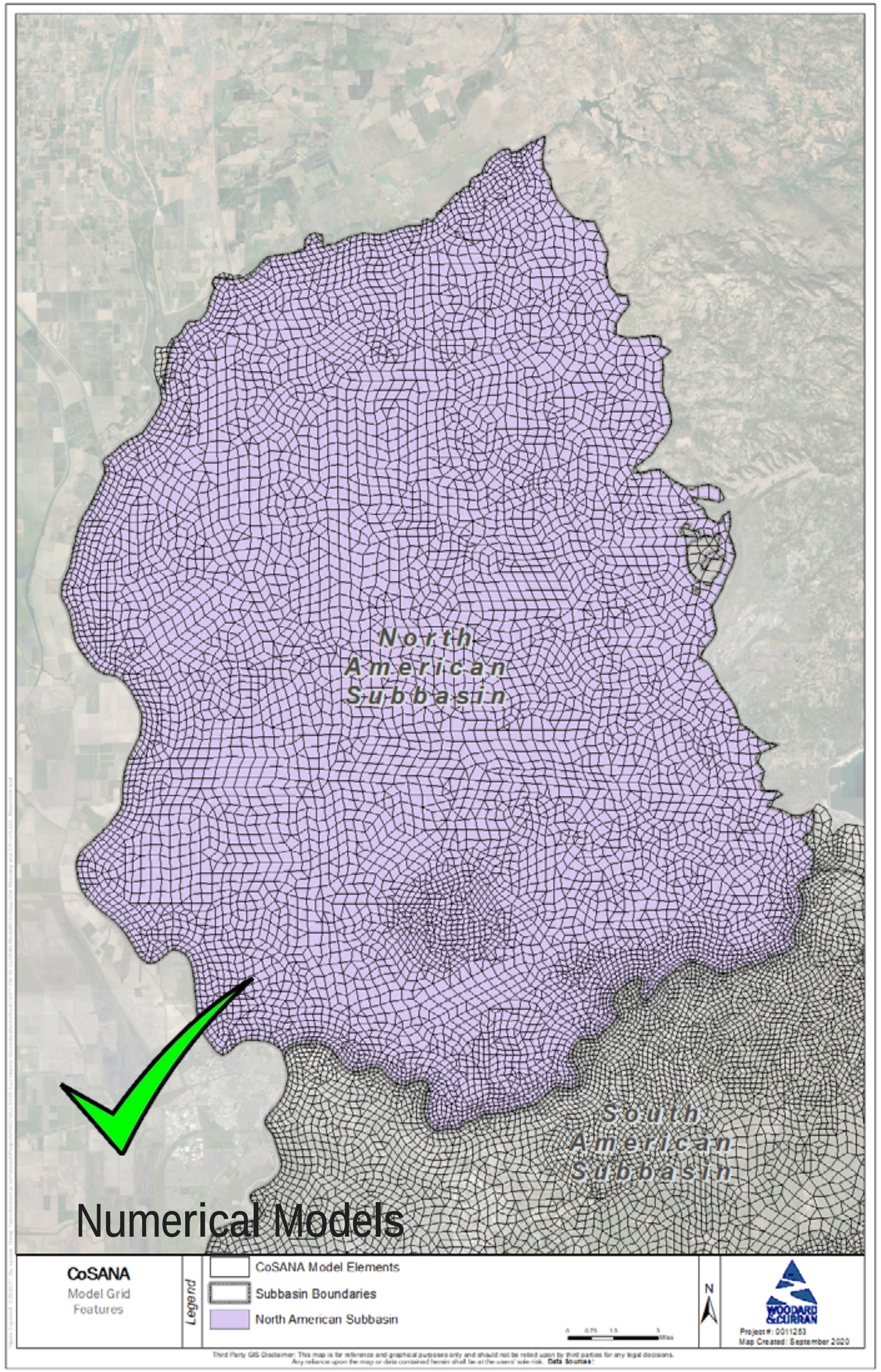
Hydrogeologic Conceptual Model

Groundwater Model

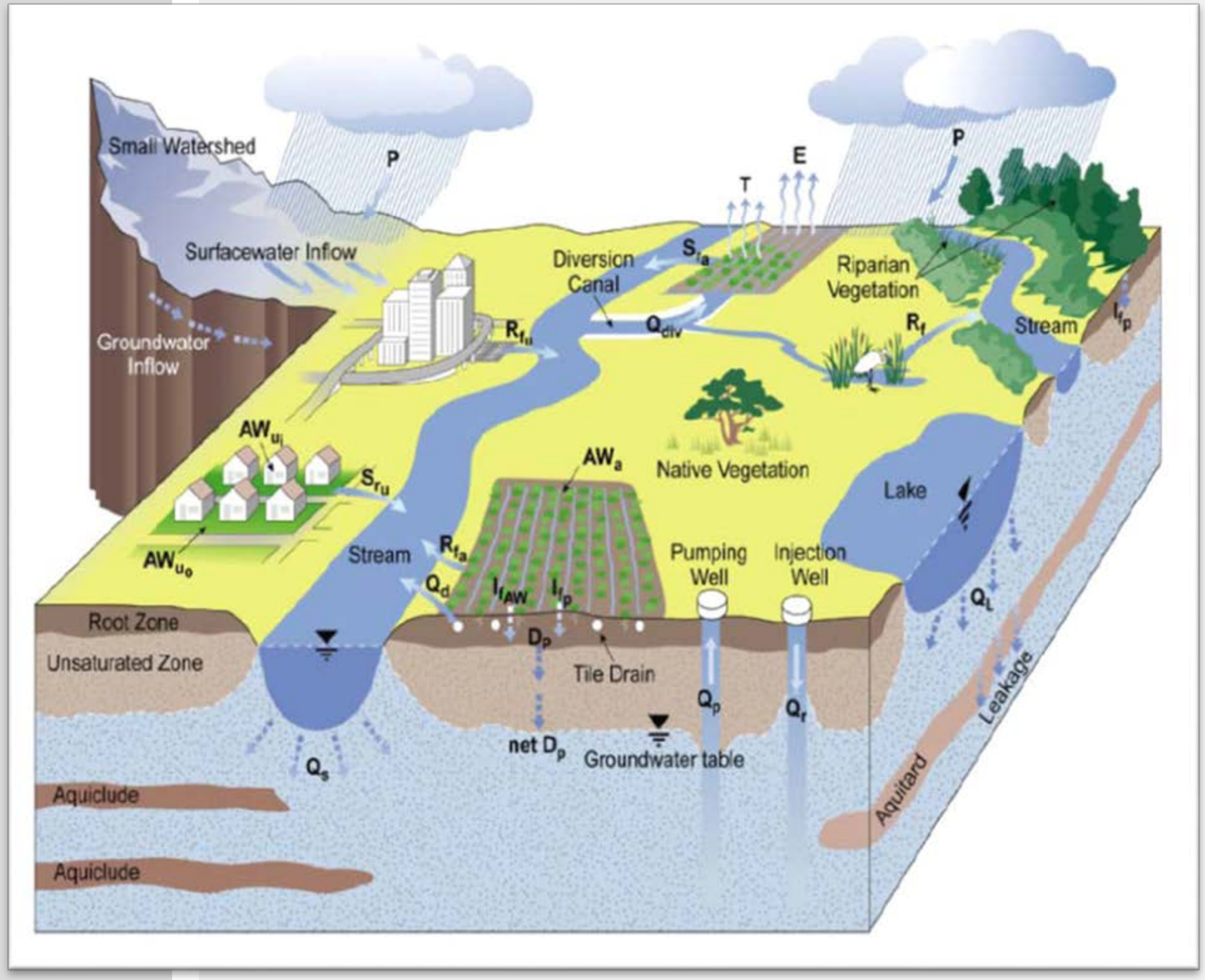
Model Types

Spreadsheet Models

Row #		Component	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Ju
	LAND SURFACE SYSTEM (AF)										
1		*Natural Supplies*									
2		Precip Ag (+)	0	40,905	37,530	7,983	35,699	20,852	51,922	17,101	
3		Precip Native(+)	0	6,642	6,093	1,296	5,796	3,386	8,430	2,777	
4		Precip Urban (+)	0	5,184	4,756	1,012	4,524	2,643	6,580	2,167	
5		Ag Supply									
6		*Ag SW Delivery (+) (Diversion minus losses)*	*4,652*	*568*	*243*	*64*	*137*	*2,032*	*4,661*	*45,517*	*13*
7		*Ag Pumping (+)*	*49,747*	*0*	*0*	*0*	*0*	*18,407*	*39,251*	*109,588*	*8*
8		Urban Supply									
9		Urban Pumping (+)	3,867	2,386	2,033	1,990	1,661	2,455	2,610	4,043	
10		*Inflow Subtotal*	*58,265*	*2,953*	*2,276*	*2,054*	*1,798*	*22,895*	*46,522*	*159,149*	*23*
11	OUTFLOWS	Ag water Demand									
12		Total Ag Demand (ETc+Irr Eff)	54,399	17,169	8,017	7,756	11,599	41,292	95,833	172,207	22
13		Ag Demand (ETc)	45,237	14,537	6,825	6,587	9,850	34,073	79,127	141,784	18
14		Outflows to the Atmospheric System									
15		ET Ag (-)	45,237	14,537	6,825	6,587	9,850	34,073	79,127	141,784	18
16		ET Native	0	5,434	1,799	1,296	4,722	3,386	8,430	2,777	
17		ET Urban	3,867	1,901	702	702	1,843	4,110	5,807	6,210	
18		Outflows to the Stream System									
19		Runoff Ag	0	6,355	4,947	0	4,241	362	11,761	37	
20		Runoff Native	0	0	0	0	0	0	0	0	
21		Runoff Urban	0	2,772	2,436	0	2,258	952	3,383	0	
22		Outflows to the Groundwater System									
23		*Recharge Ag*	*1,632*	*1,244*	*1,133*	*241*	*1,075*	*1,239*	*2,875*	*5,166*	*6*
24		*Recharge Native*	*0*	*199*	*183*	*39*	*174*	*102*	*253*	*83*	
25		*Recharge Urban*	*116*	*227*	*204*	*90*	*186*	*153*	*276*	*186*	
26		*Outflow Subtotal*	*50,852*	*32,669*	*18,230*	*8,956*	*24,350*	*44,376*	*111,912*	*156,244*	*19*
27		**Land Surface System Budget**	**7,414**	**-29,716**	**-15,954**	**-6,902**	**-22,551**	**-21,481**	**-65,390**	**2,905**	**3**



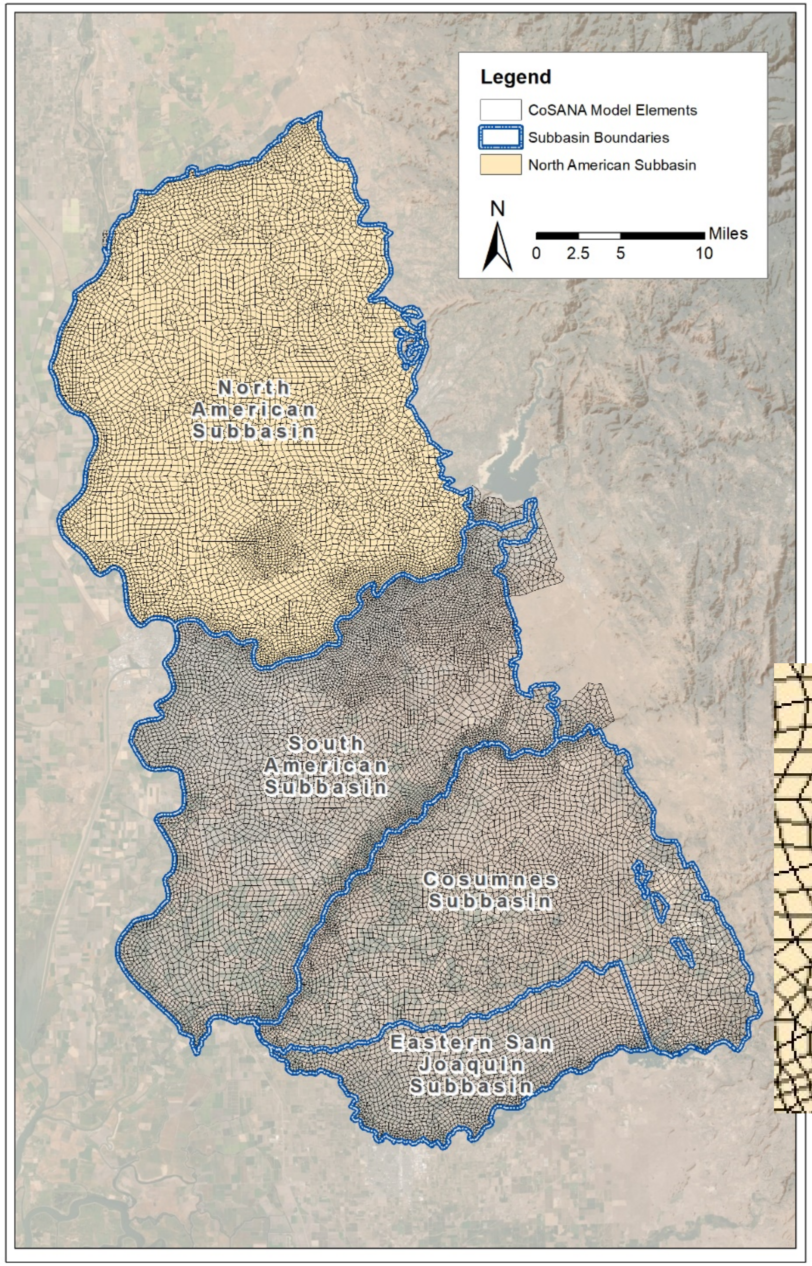
How the Model Works



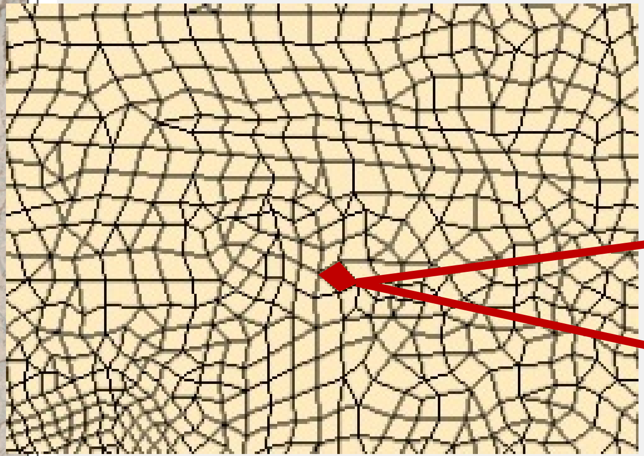
The model captures the interplay between hydrologic processes:

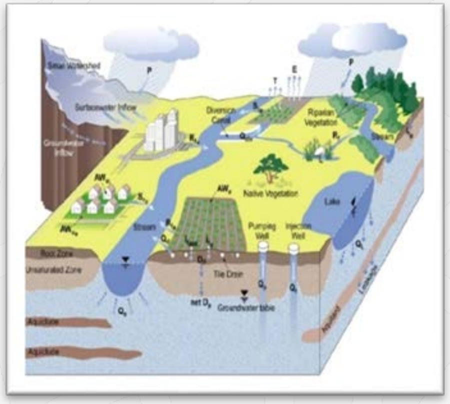
- Land surface processes
- Groundwater flow
- Stream flow
- Physical systems integration
- Water budgets

What is the CoSANA Model?



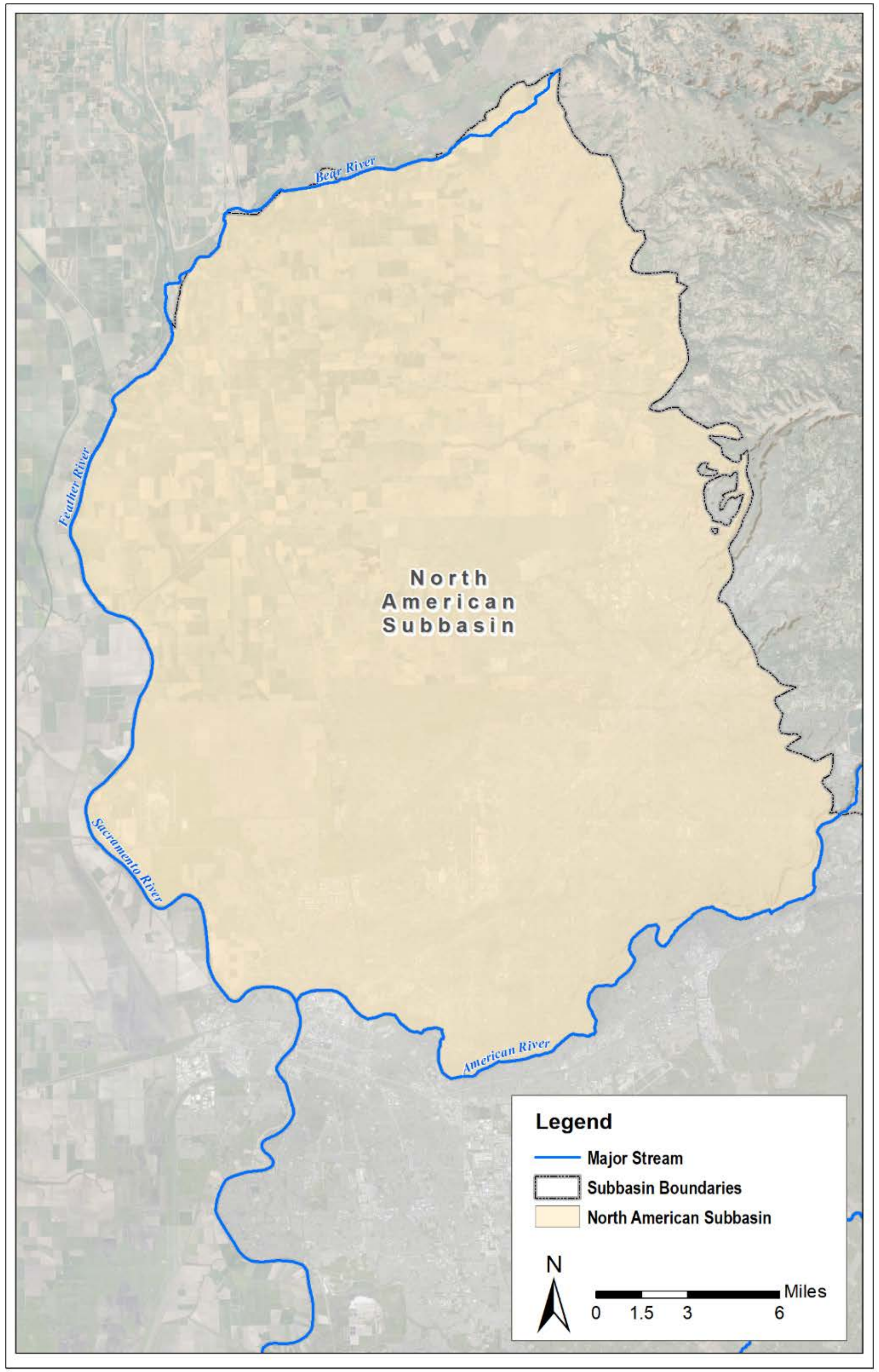
- CoSANA Model Grid:
  - 24,171 elements
    - Average Area: 37 acres
  - 22,274 nodes
    - Node Spacing: 1,170 feet





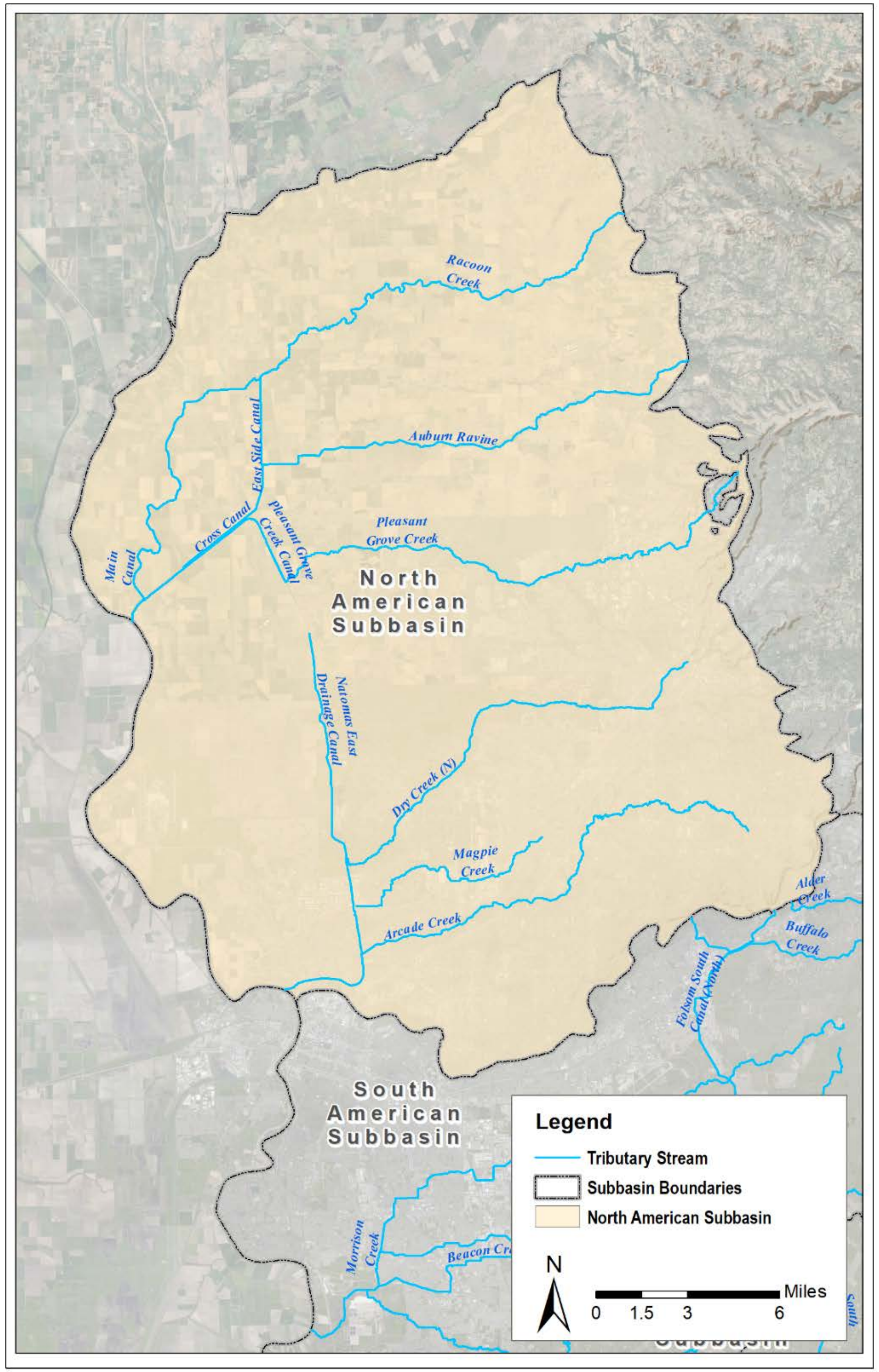
Major Surface Water Features

- Bear River
- Feather River
- Sacramento River
- American River



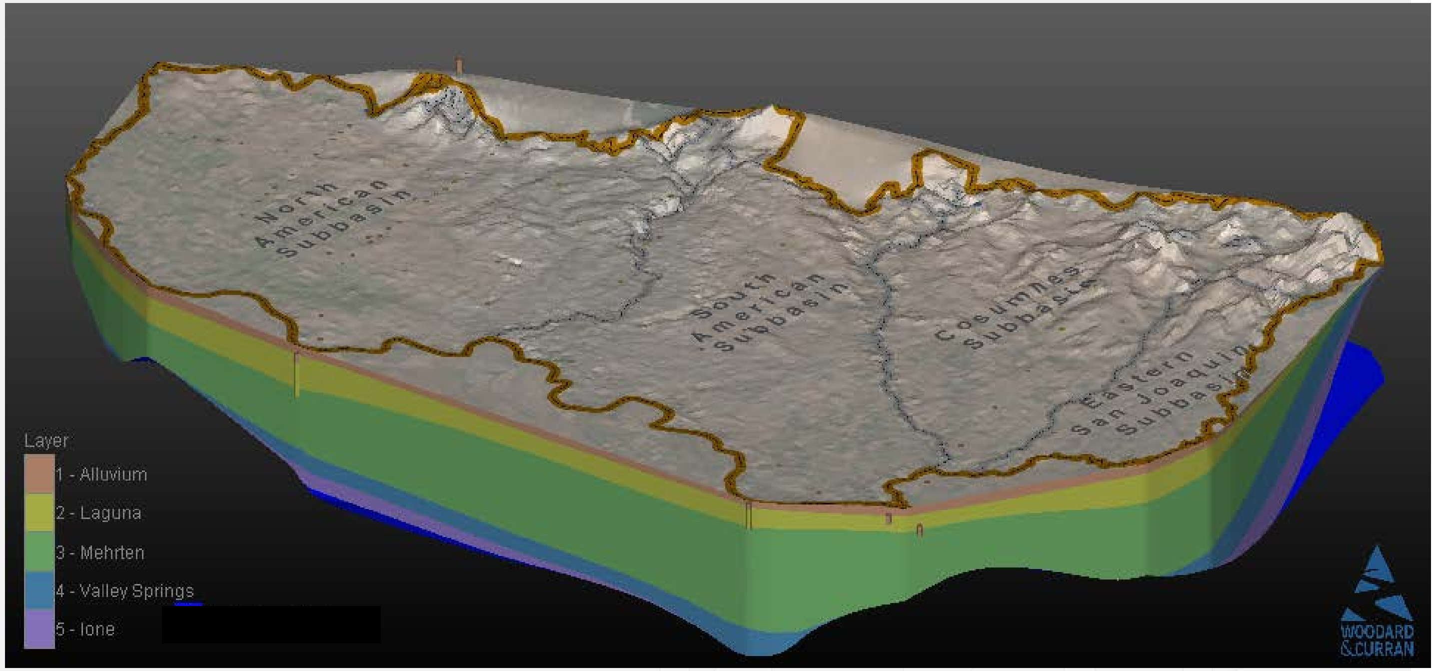
Tributary Surface Water Features

- Racoon Creek
- Auburn Ravine
- East Side Canal
- Cross Canal
- Natomas East Drainage Canal (Steelhead Creek)
- Pleasant Grove Creek
- Dry Creek
- Magpie Creek
- Arcade Creek
- Main Canal



CoSANA Model Layering

- CoSANA uses 5 layers to represent geological formations:
  - Alluvium (orange/rust color)
  - Laguna formation (mustard color)
  - Mehrten formation (green)
  - Valley Springs formation (blue)
  - Ione formation (violet)

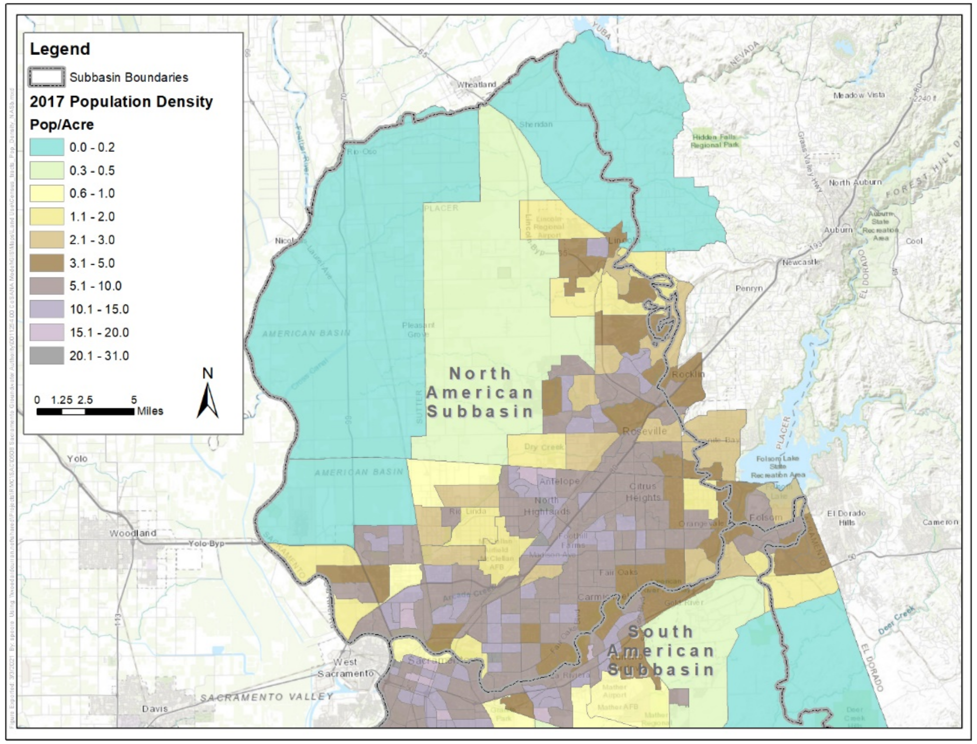


Pumping Data

- Groundwater pumping is a significant component of the groundwater system
- Metered data used where available
  - Urban water purveyors
- Pumping estimated for other uses
  - Rural residential uses
  - Agricultural uses

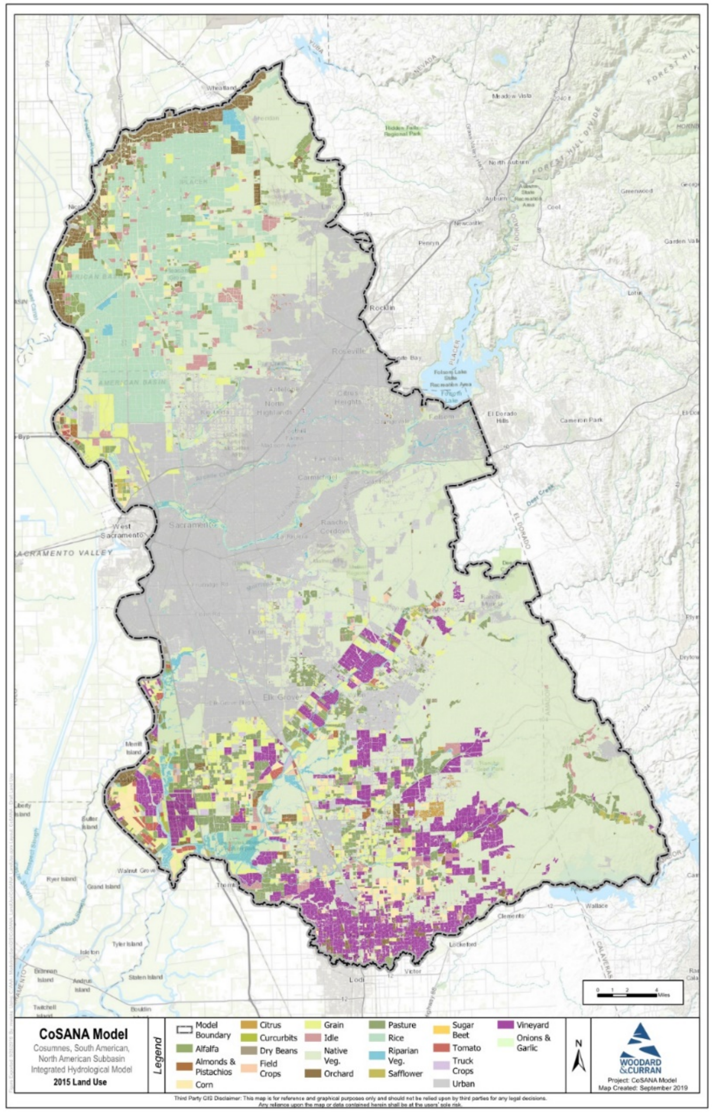
How Rural Residential Pumping is Estimated

- Outside of urban water purveyors, domestic demand is assumed to be met by groundwater pumping by private, domestic wells
- Estimated based on population and average water use
  - Population is estimated using census tract data
  - Water use is estimated using California Department of Water Resources county estimates for urban water use



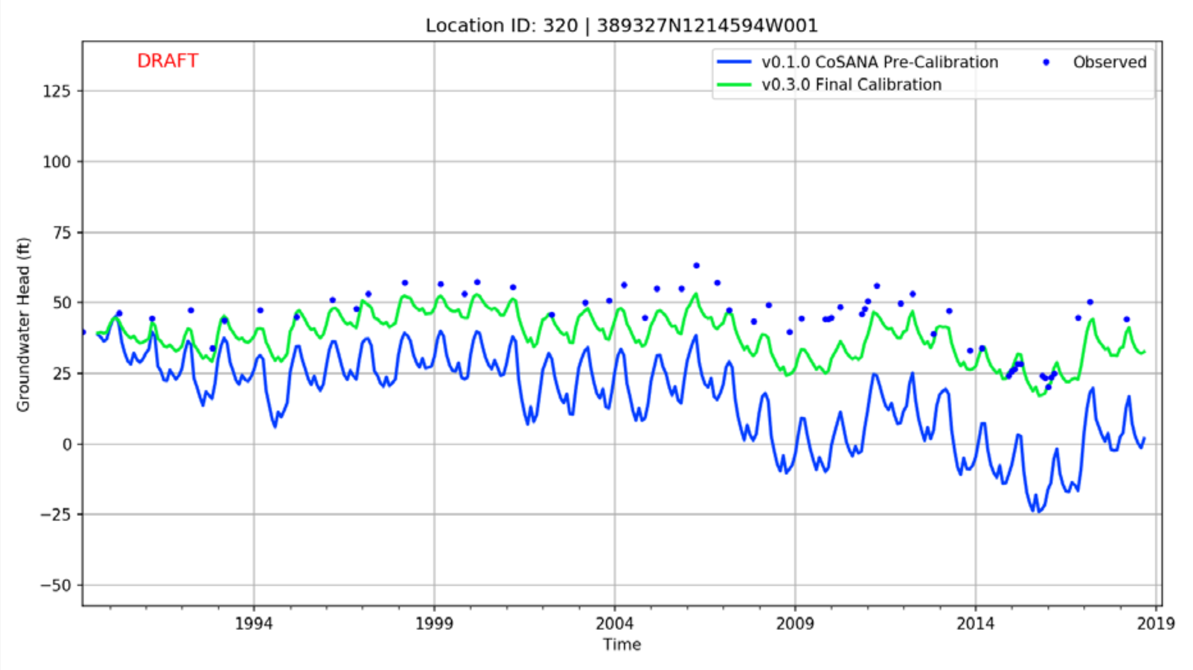
How Agricultural Pumping is Estimated

- Reference evapotranspiration data is acquired from the state's CIMIS network
- Monthly factors are used to reflect different crops
- Estimated irrigation efficiency applied (70%)
- Adjusted for known surface water deliveries



Model Calibration

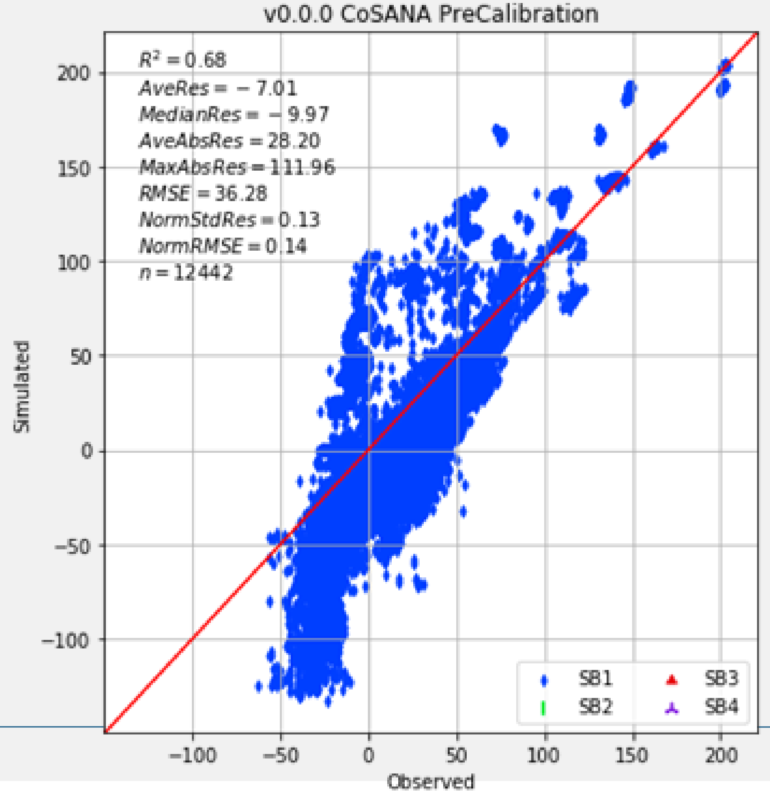
- Process to match observed and simulated values as closely as possible while adhering to understanding of the groundwater basin
  - Groundwater levels
  - Streamflow



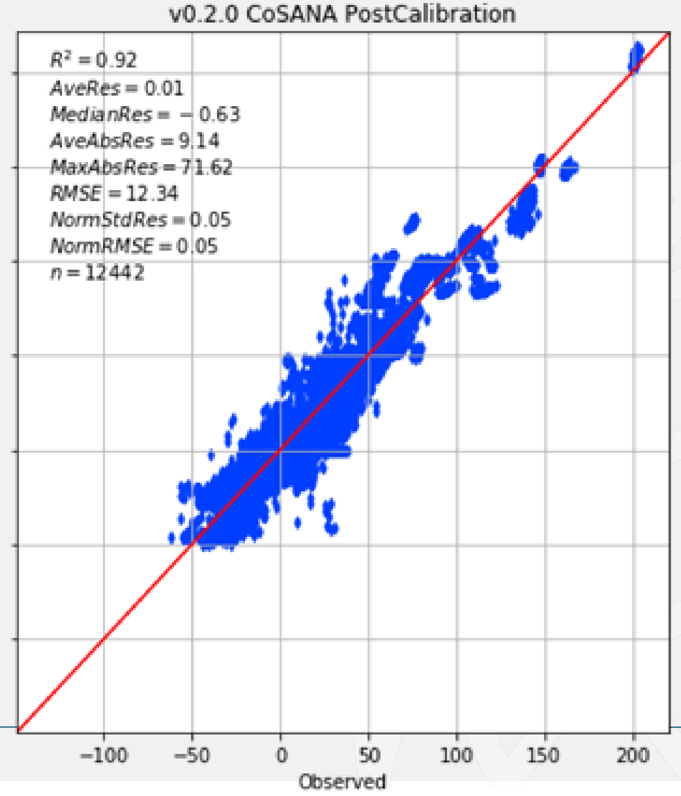
Model Calibration

- Process to match observed and simulated values as closely as possible while adhering to understanding of the groundwater basin

BEFORE



AFTER

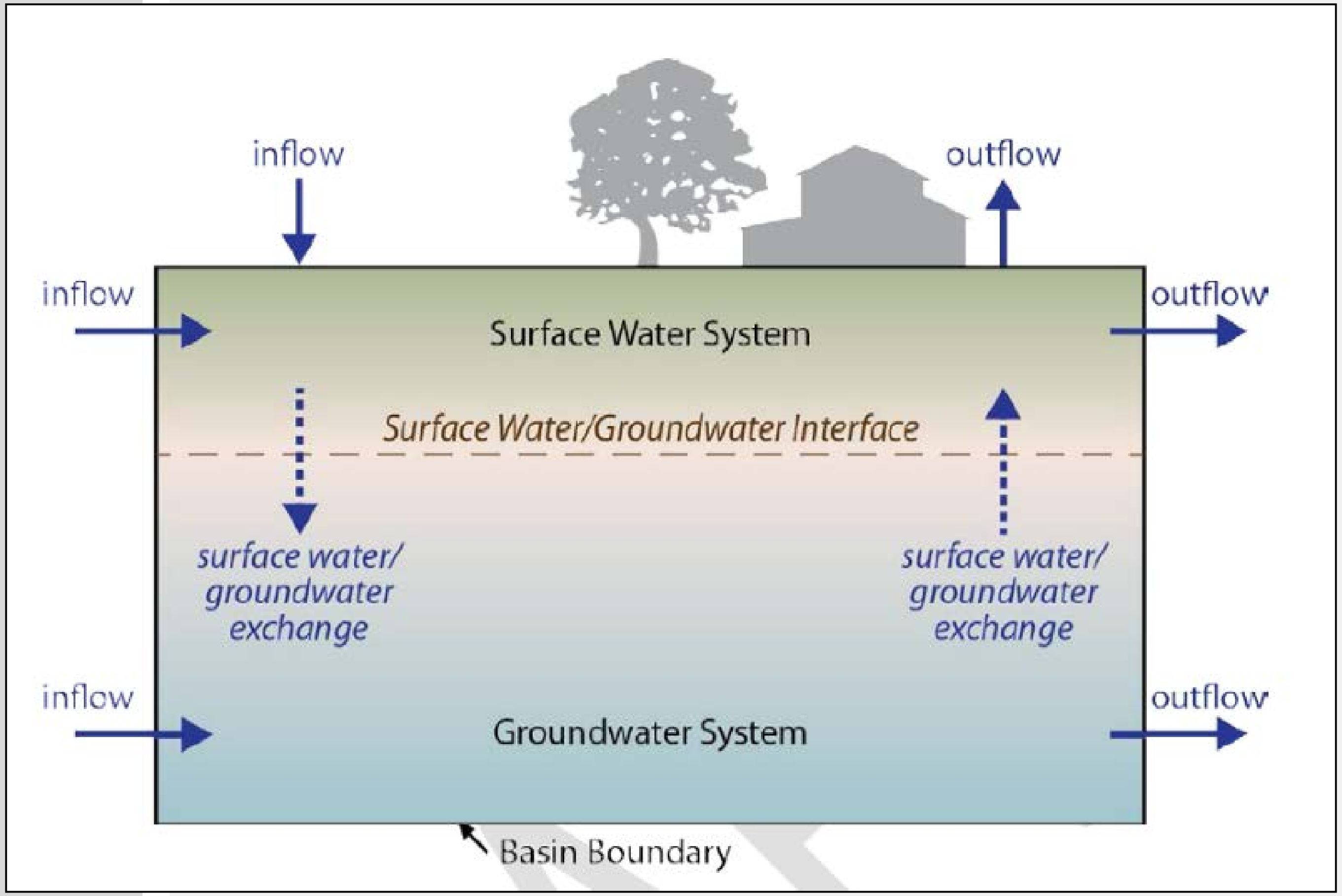


Model Use in the GSP

- Prepare historic and projected water budgets
- Assist in establishing measurable objectives (MOs) and minimum thresholds (MTs)
- Assess need for projects and management actions and estimating results of implementing them
- Assist in coordination with neighboring subbasins

Groundwater Budgets

What is a Groundwater Budget?



An accounting of the total groundwater and surface water entering and leaving a groundwater basin.

Inflows - Outflows = Change in Storage

<u>Change in Storage</u>

Zero: Stable Conditions

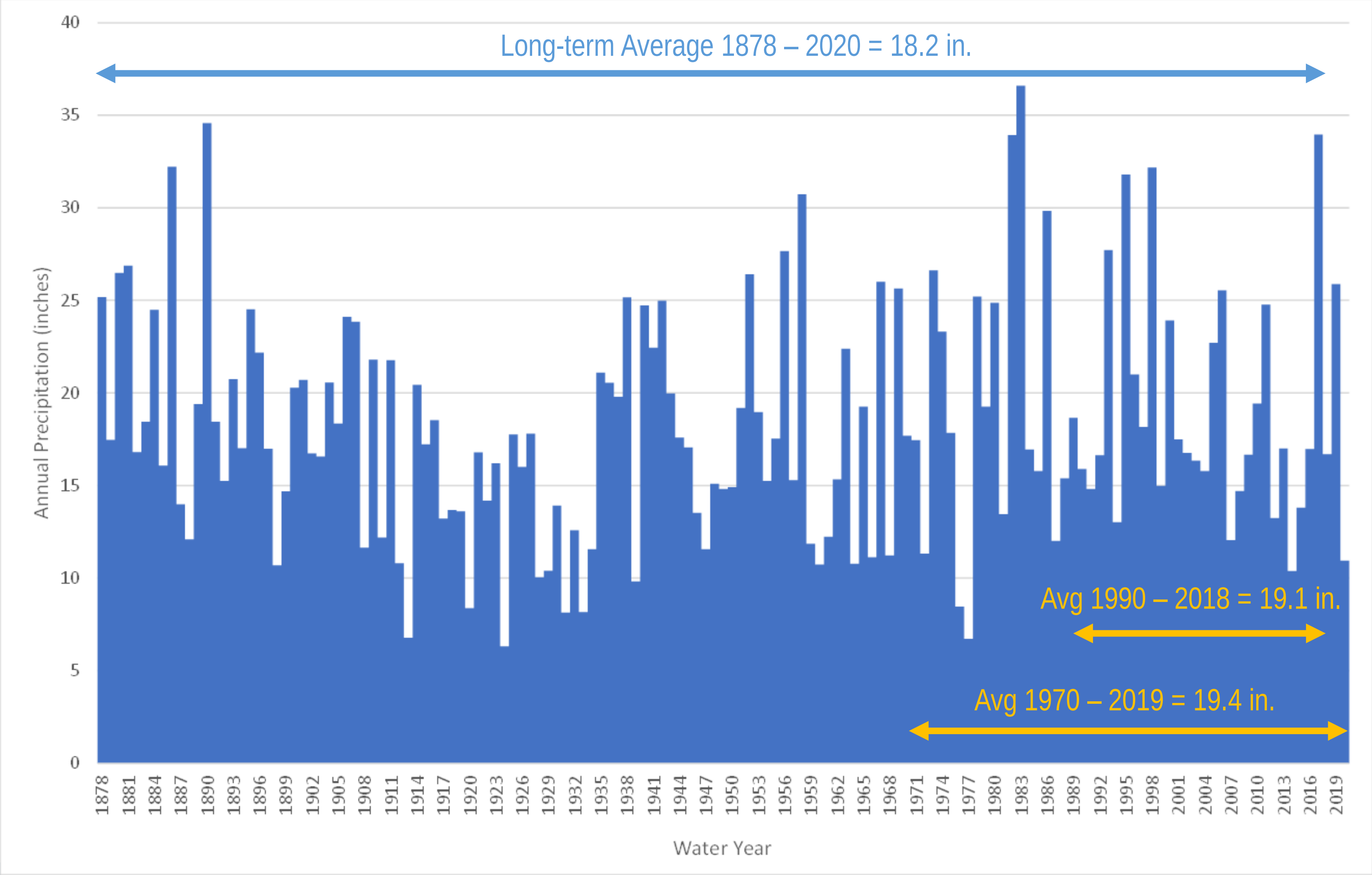
Positive: Increasing Groundwater Levels

Negative: Decreasing Groundwater Levels

Approach to Estimating Budgets

- Historical Water Budget based on modeling of historical conditions
- Current, Projected and Projected with Climate Change use baselines
- Baselines
  - Set land and water use at identified levels
  - Simulates groundwater conditions over 50 years of hydrology
  - Isolate changes in land and water use from hydrology
  - Allows understanding of
    - Long-term trends
    - Conditions during wet, dry, and normal hydrology

Approach to Estimating Budgets - Hydrology



Historical

Current and Projected

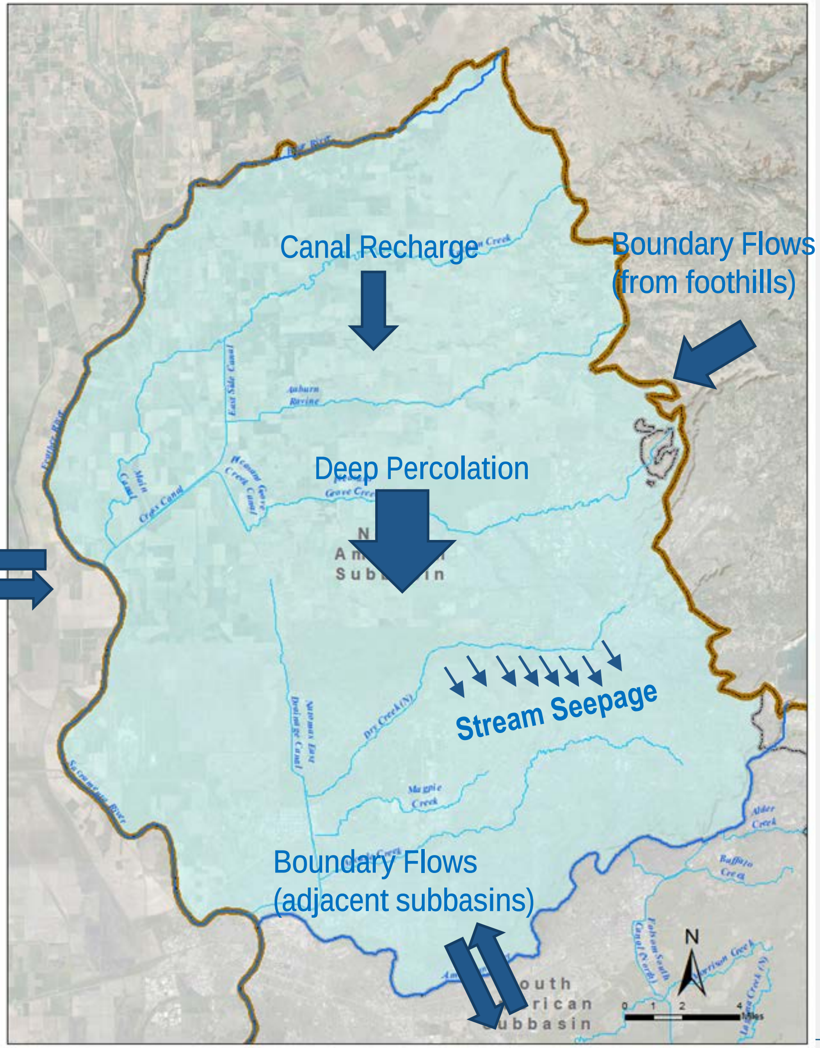
Groundwater Budgets Under SGMA

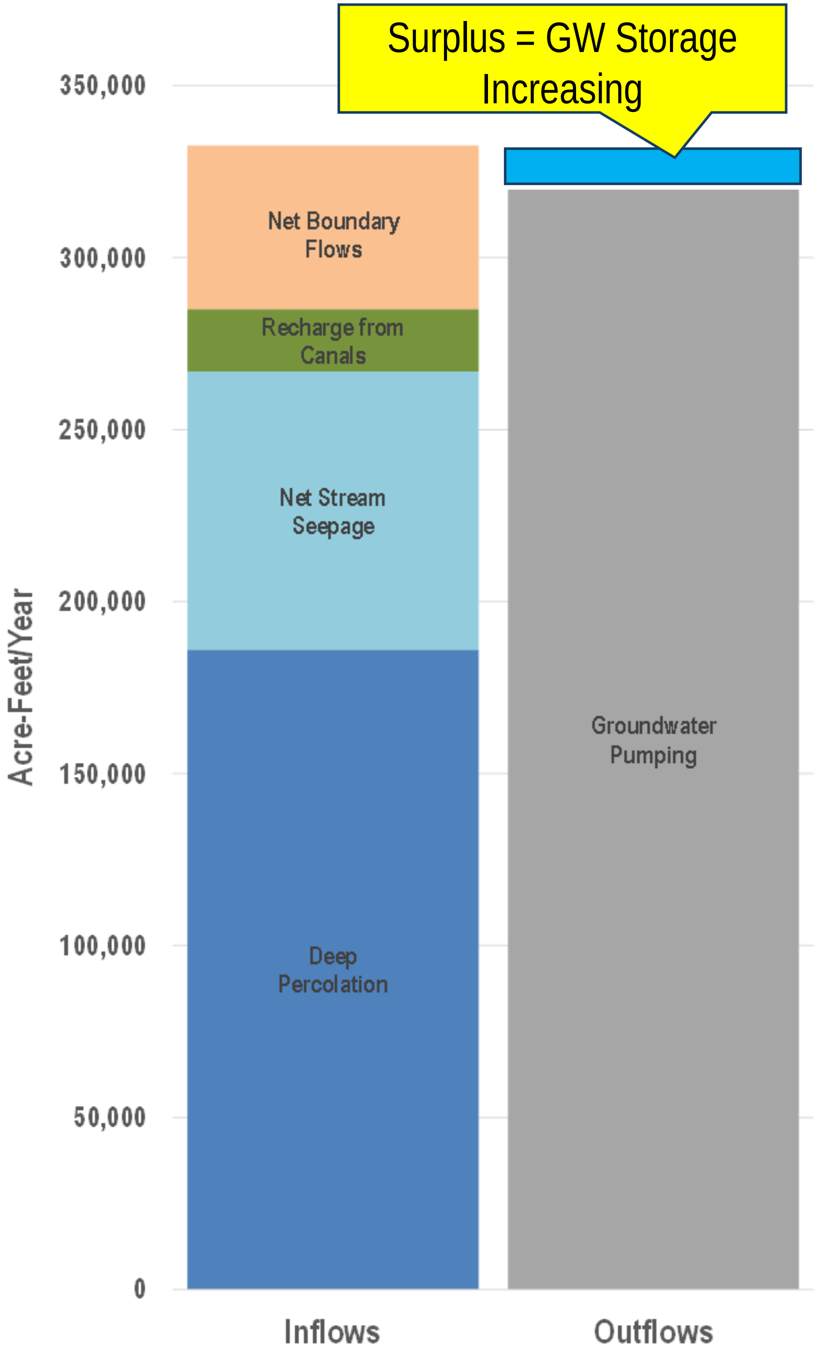
- Historical – Recent conditions (1990 through 2018)
- Current – Current operations (over 50-year hydrology)
- Projected – Incorporating future growth and land use changes (over 50-year hydrology)
- Projected with Climate Change – Adds climate change hydrology (over 50-year hydrology)

Model-Estimated Budget and Groundwater Storage Results

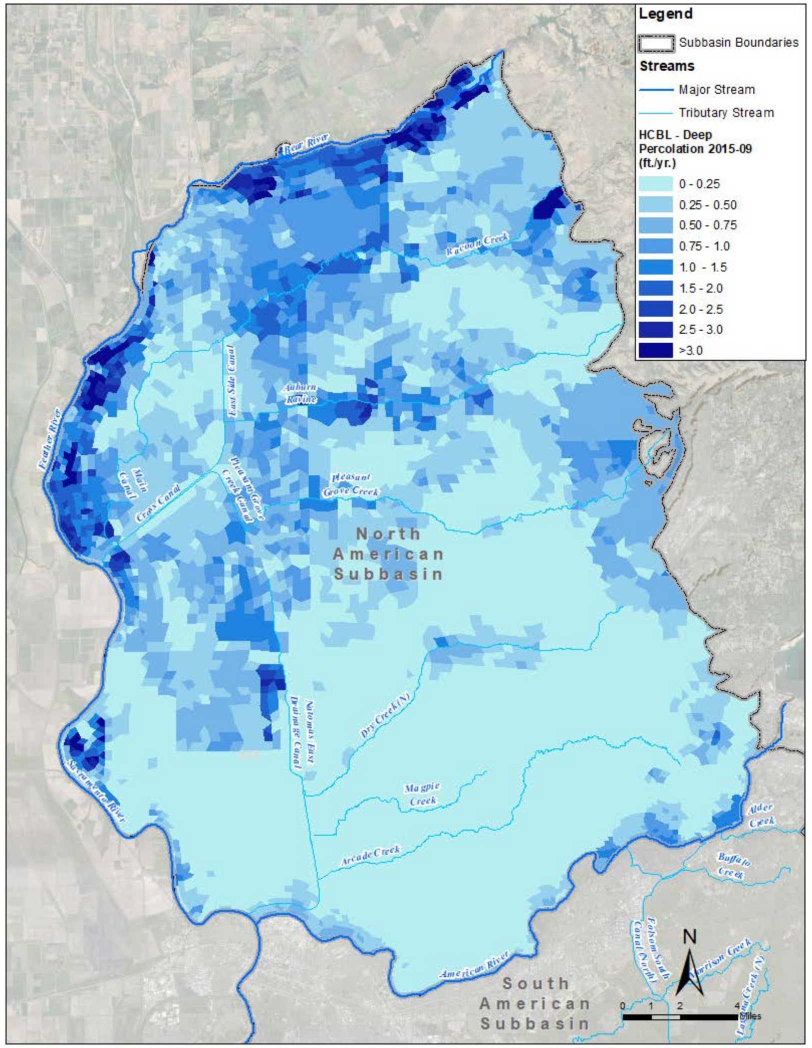
Historical Conditions – Groundwater Budget

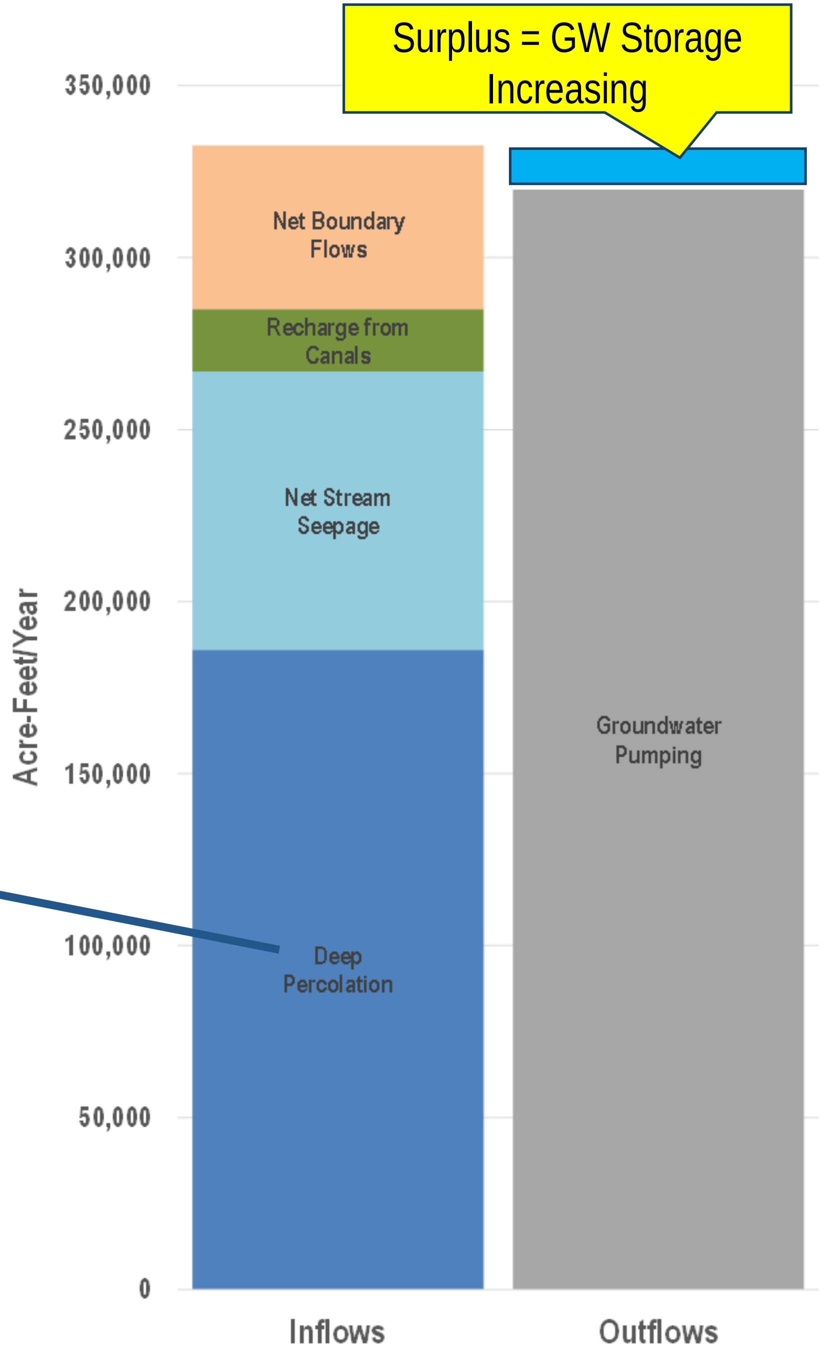
Boundary Flows
(adjacent areas
outside of model)



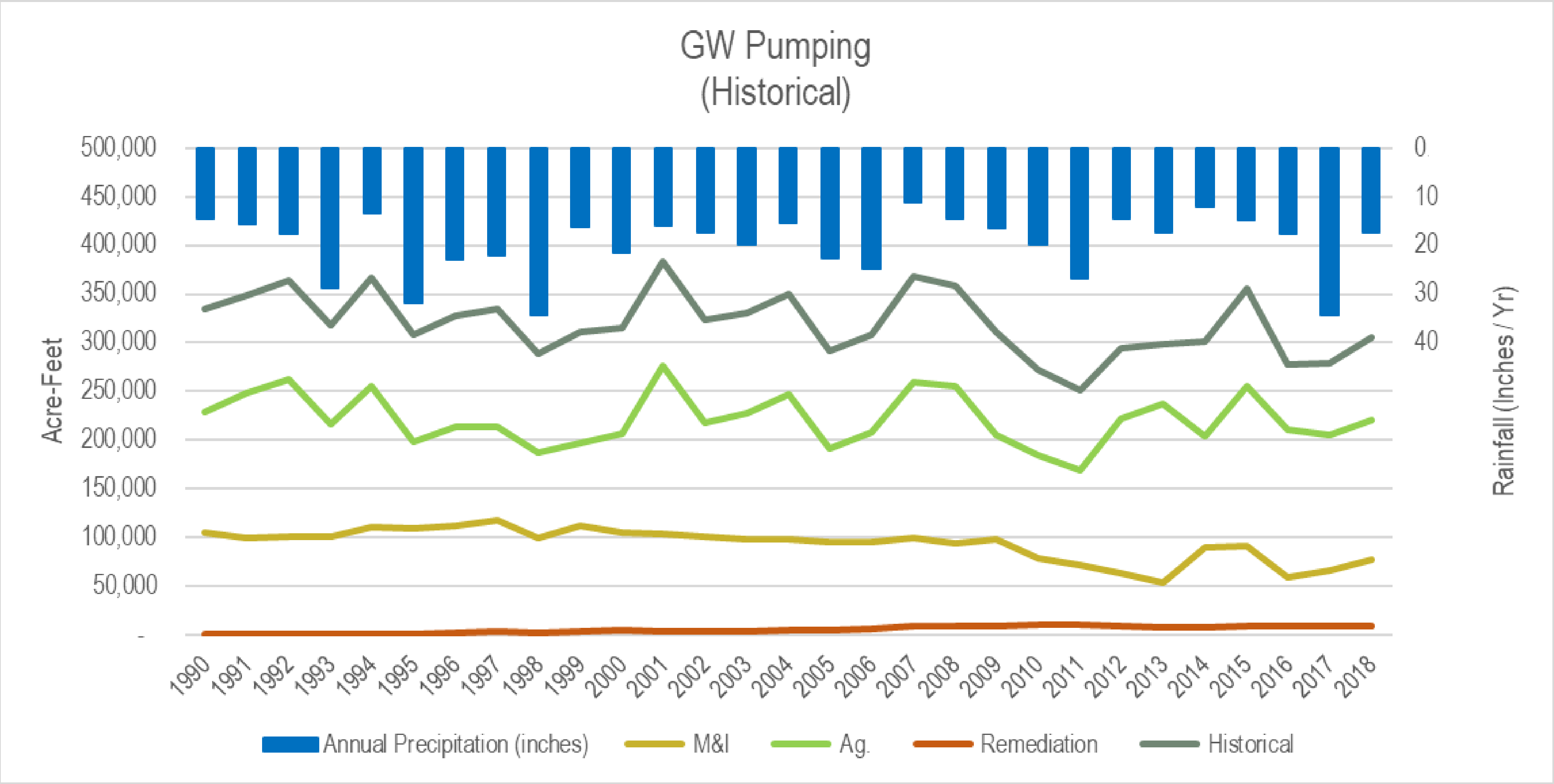


Historical Conditions – Groundwater Budget

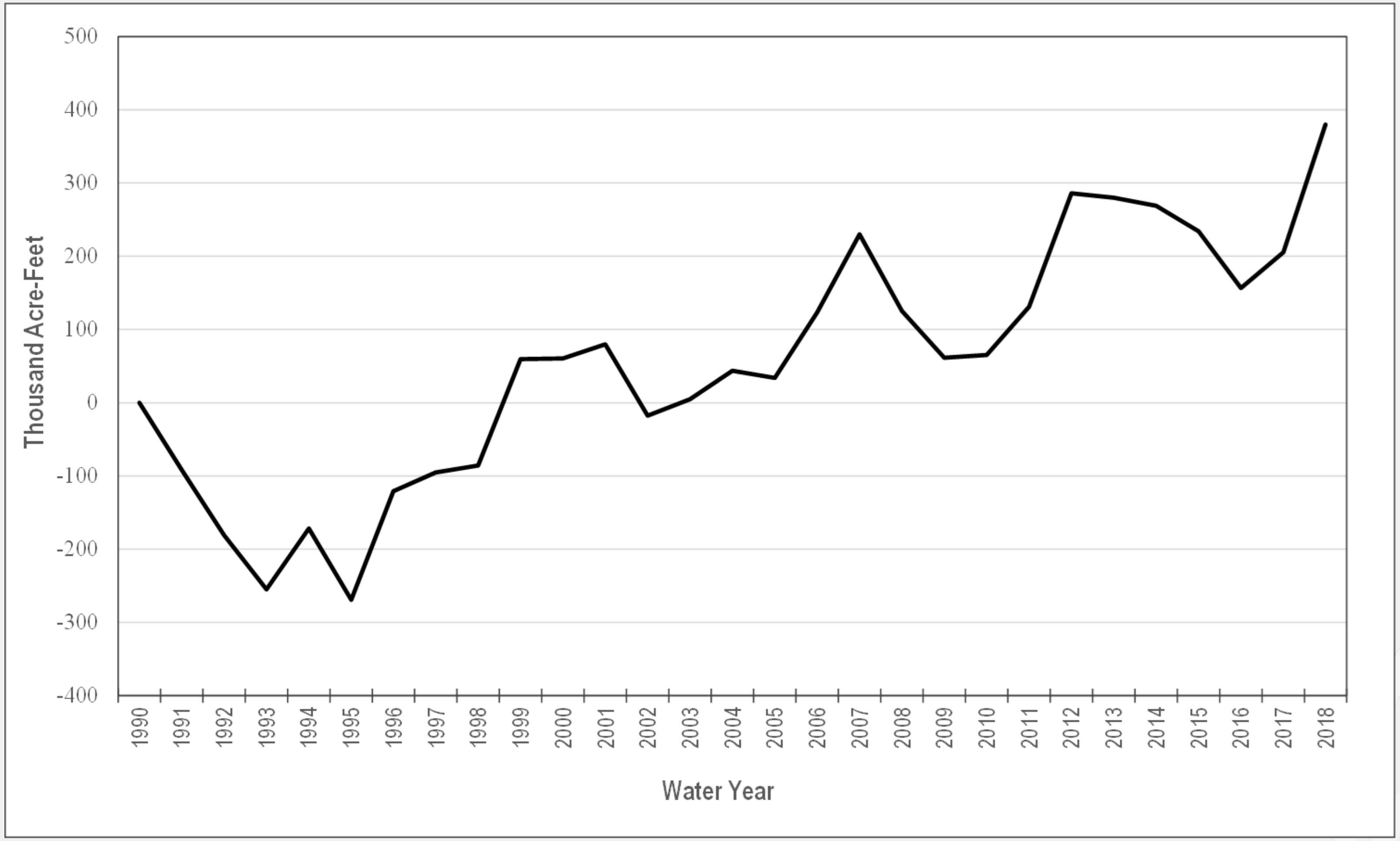




Historical Conditions GW Pumping

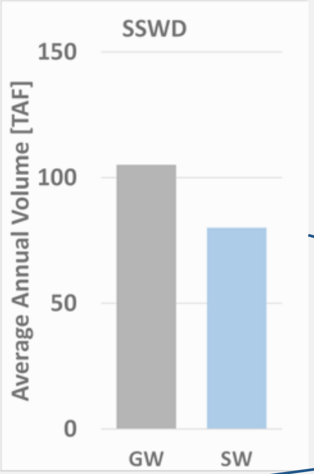


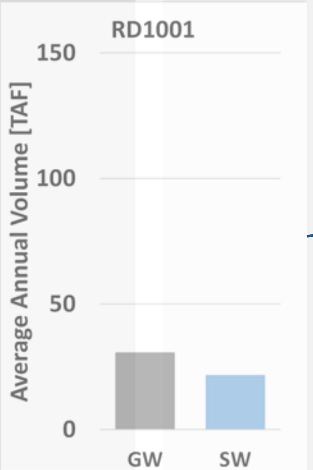
Historical Conditions – Change in Storage

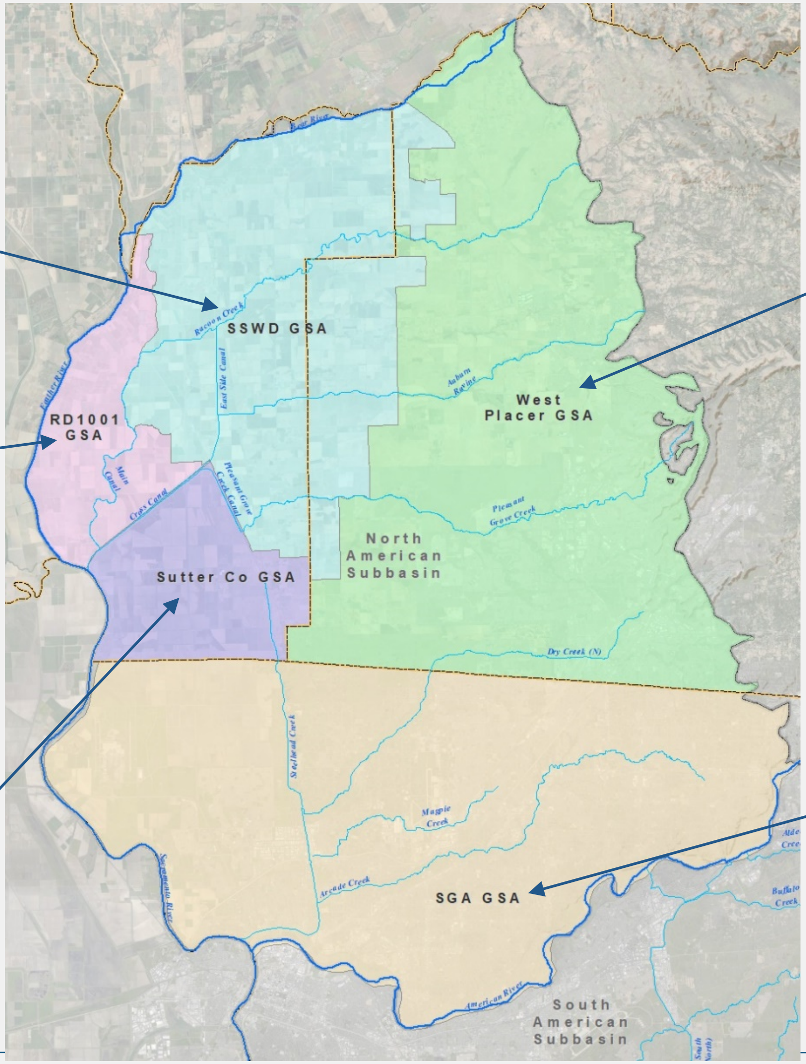


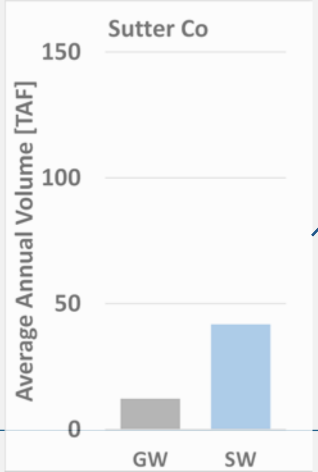
Average Annual Change in Storage
12,700 acre-feet per year

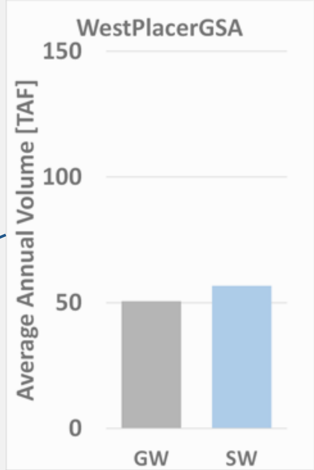
NASb Current Conditions Water Supplies, by GSA

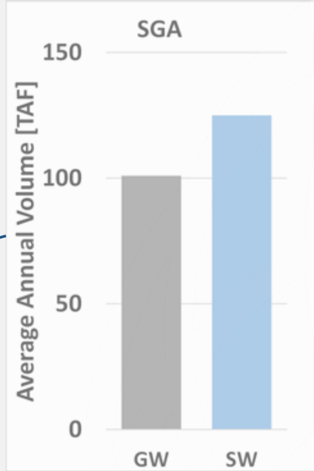




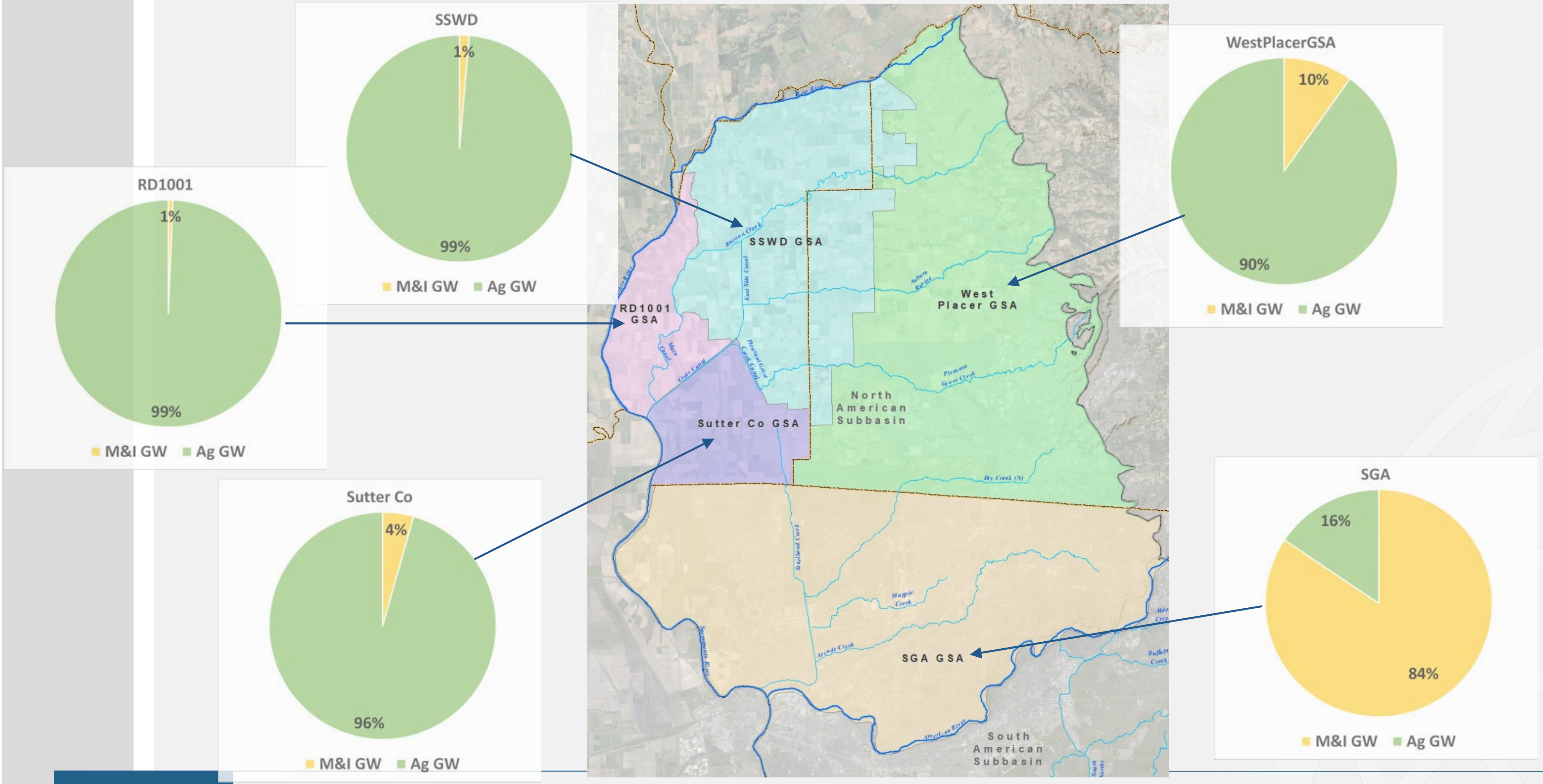






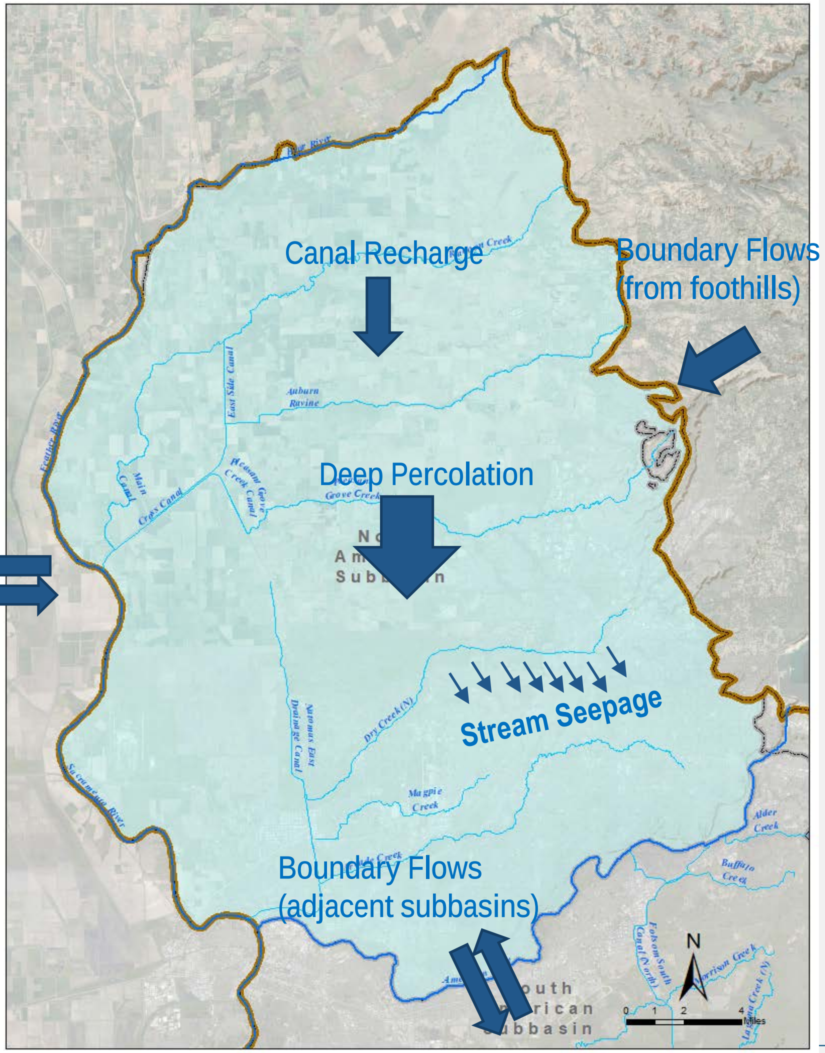


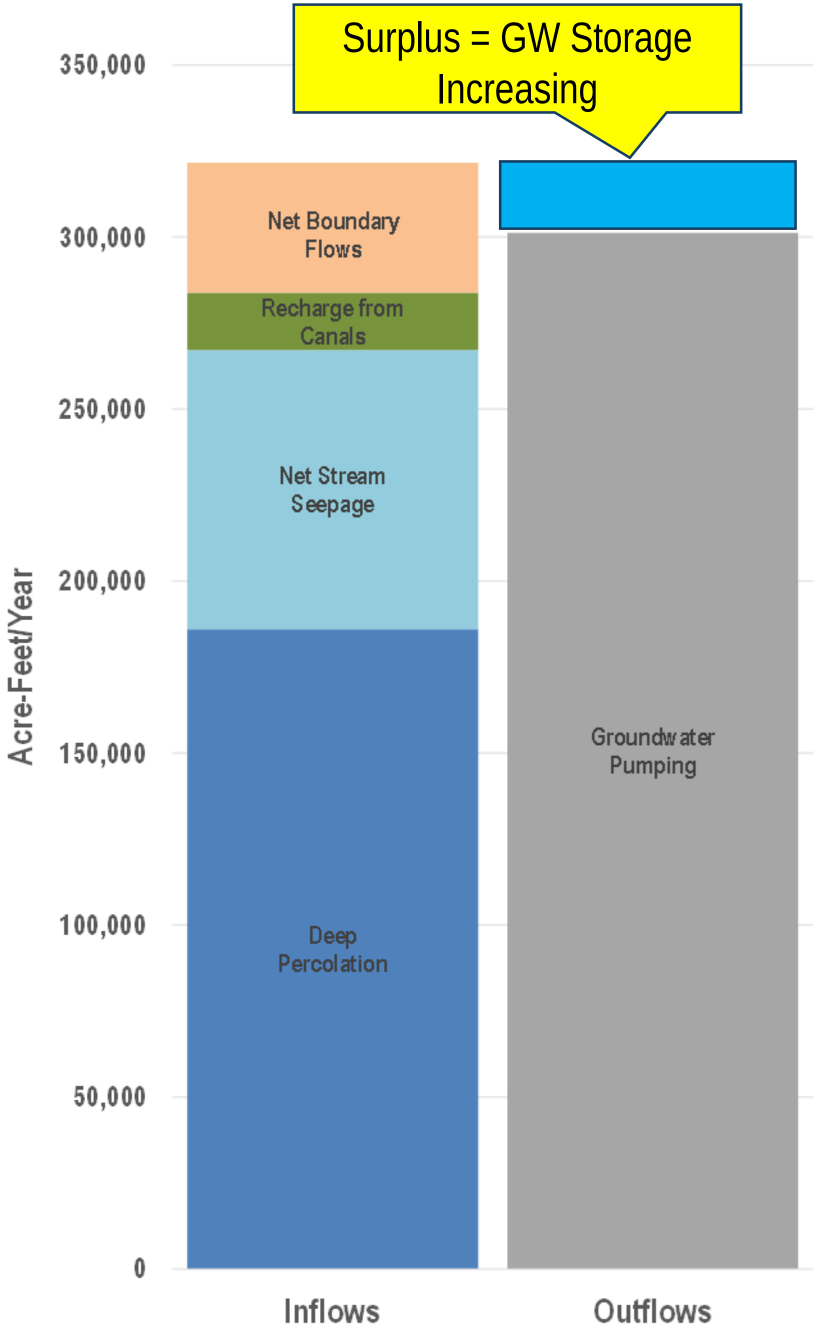
NASb Current Conditions Groundwater Uses, by GSA



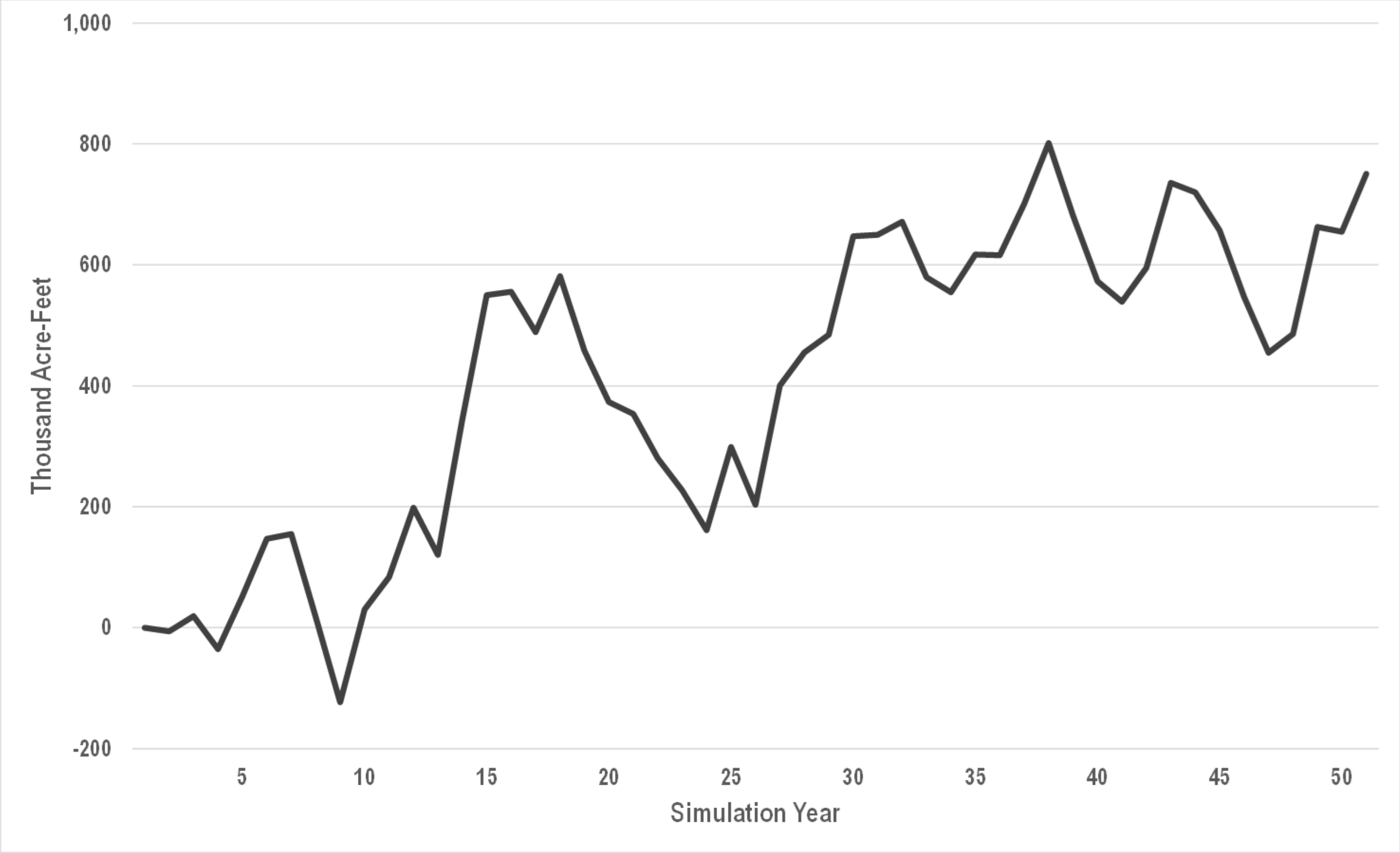
Current Conditions – Groundwater Budget

Boundary Flows
(adjacent areas
outside of model)





Current Conditions – Change in Storage



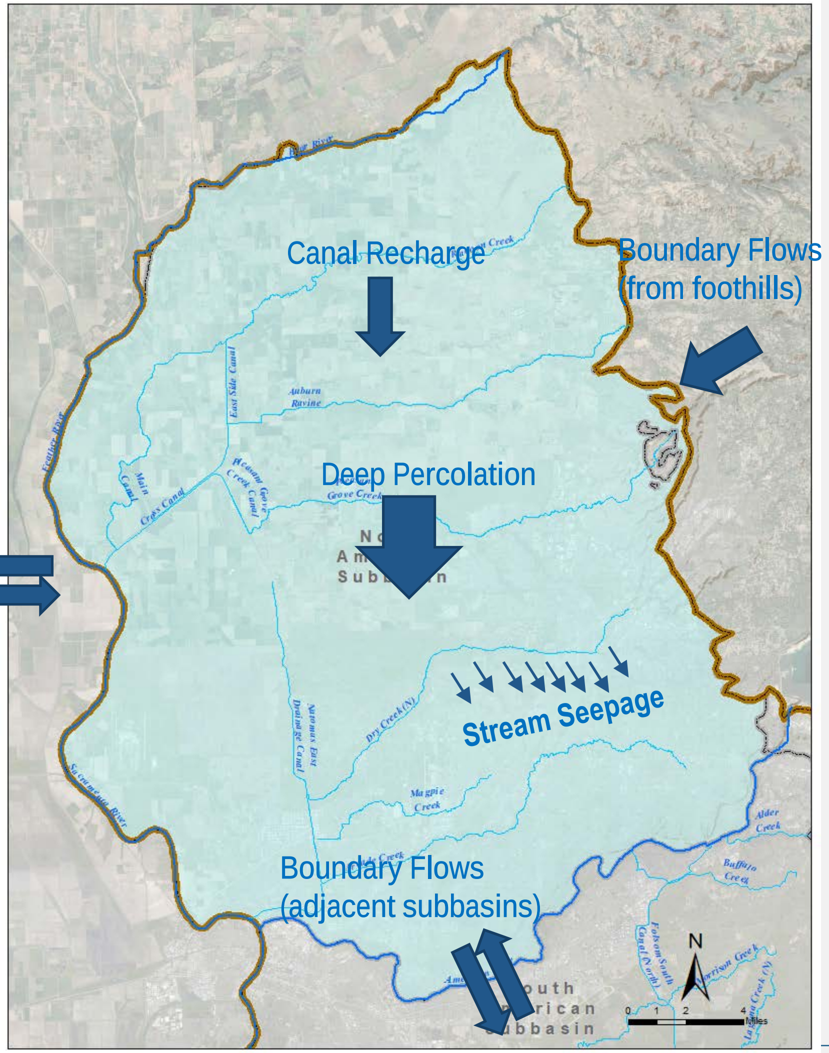
Average Annual Change in Storage
15,000 acre-feet per year

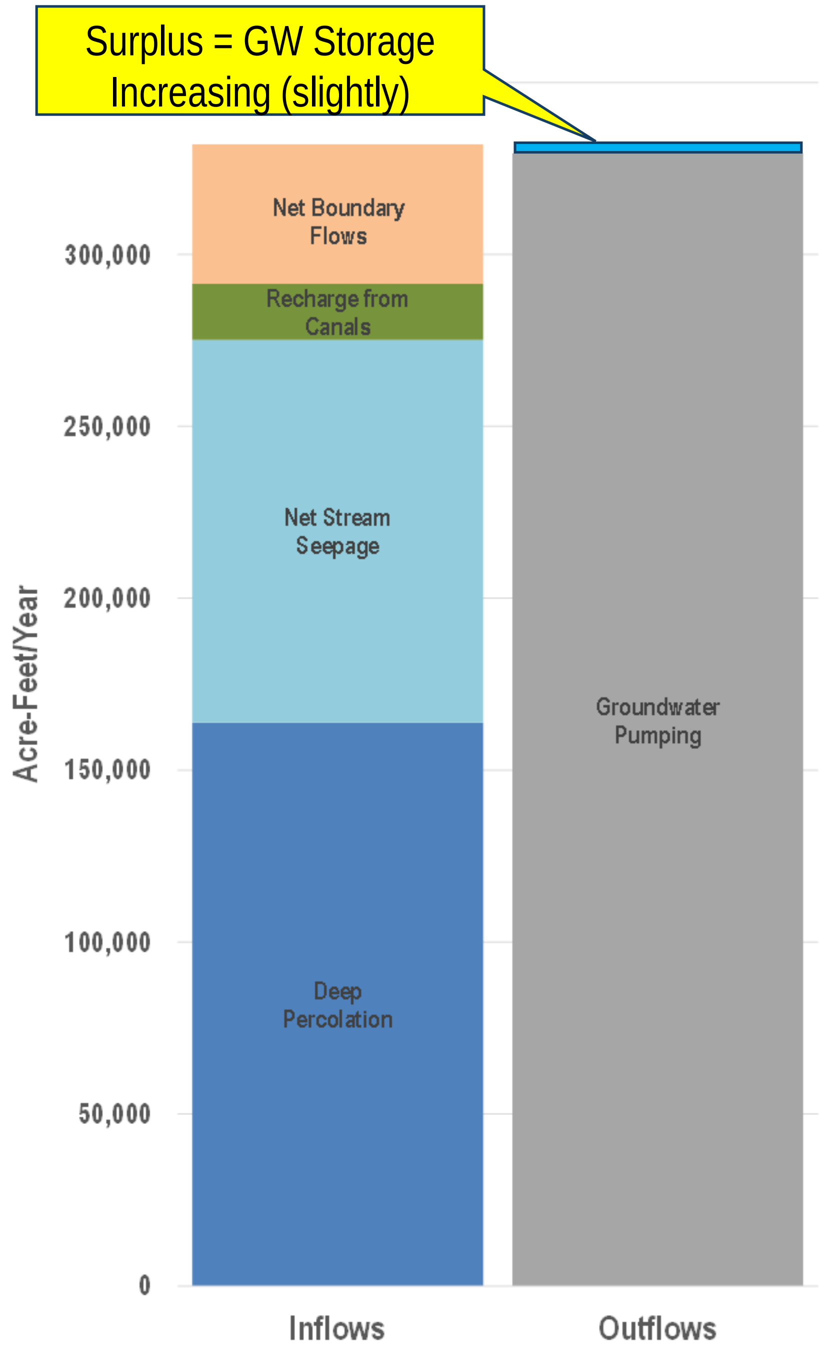
Projected Conditions – Assumptions

- Projected Land and Water Use Conditions ---- Historical Hydrology
- 50 years of hydrology
  - WY 1970-2019
- Land Use and Cropping Pattern
  - Urban footprint for 2035-2040 projected conditions
- Urban Demand
  - Urban water demand reflective of 2035-2040 projected conditions (purveyors, UWMPs)
  - Demand met by groundwater except where surface water is planned or required
- Ag Demand
  - Ag demand reflective of modified land use based on 2035-2040 projected urban conditions
  - Incorporates cropping changes noted by Placer County and Sutter County agricultural entities

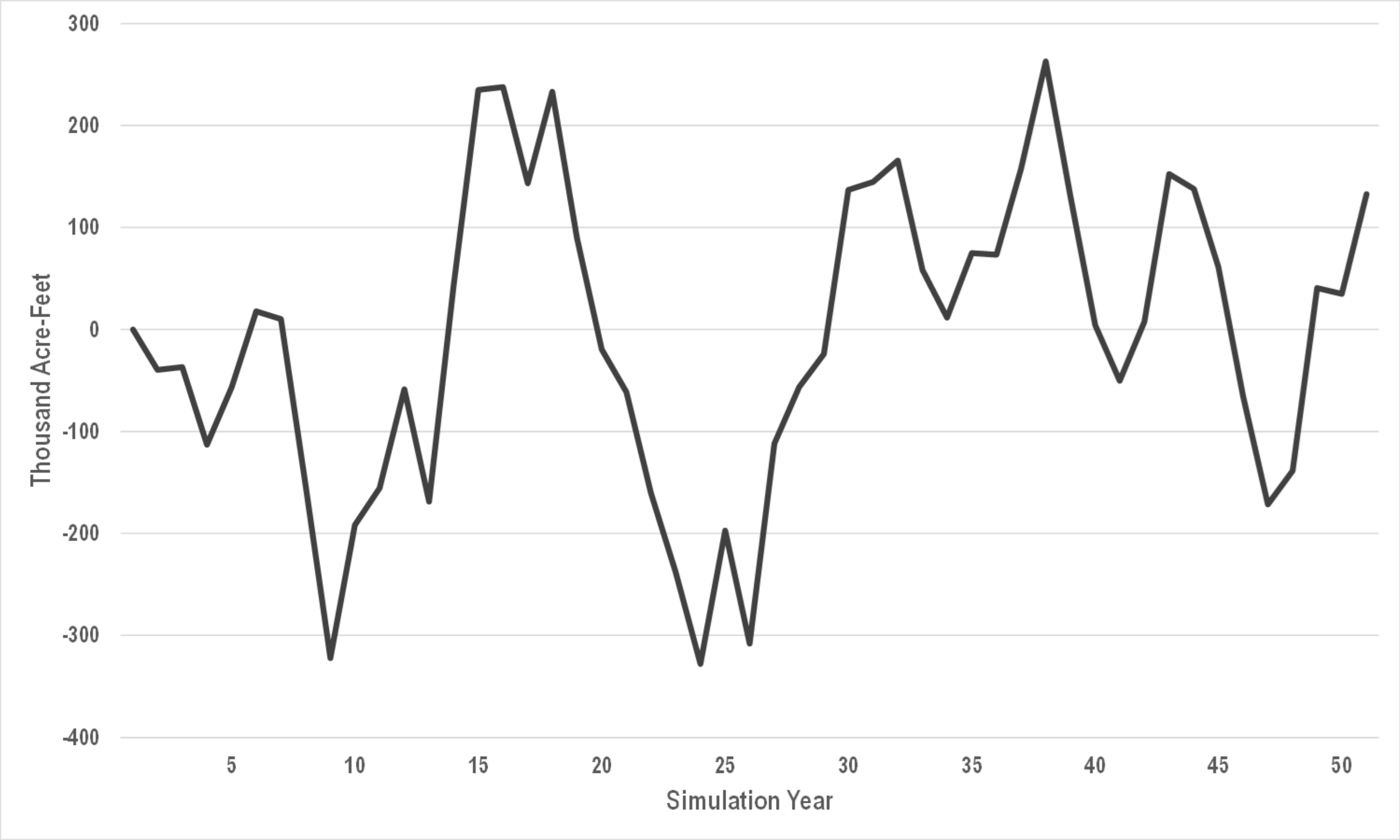
Projected Conditions – Groundwater Budget

Boundary Flows
(adjacent areas
outside of model)





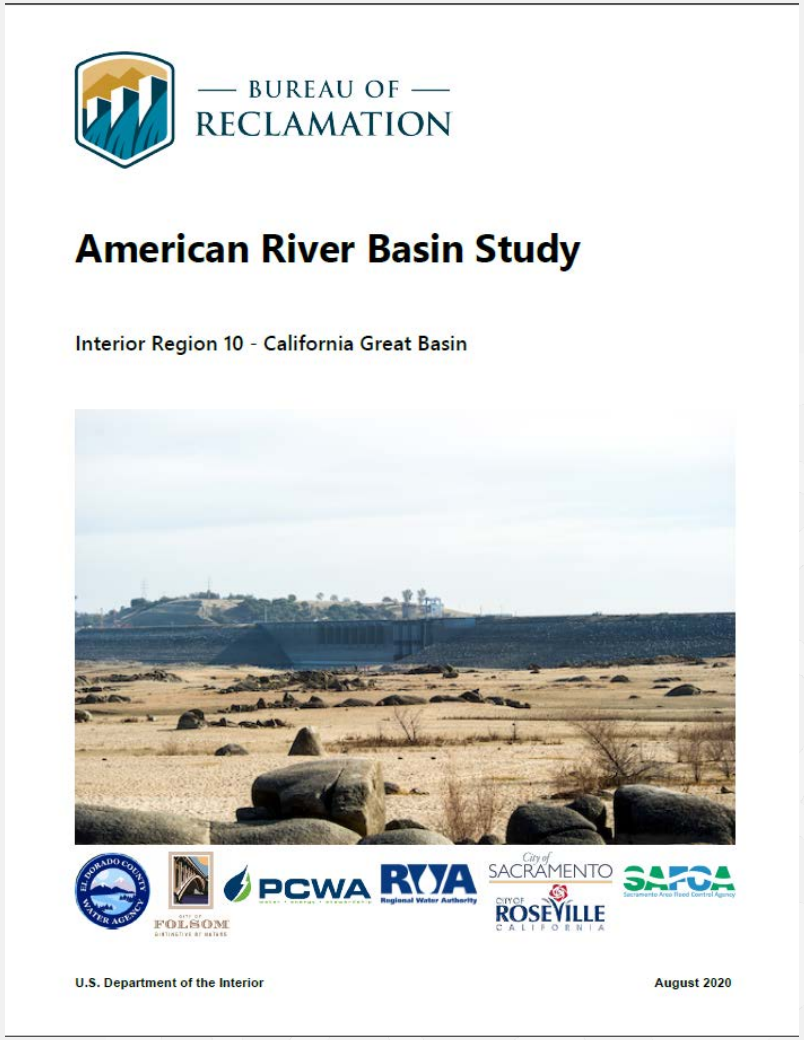
Projected Conditions – Change in Storage



Average Annual Change in Storage
2,700 acre-feet per year

Projected Conditions with Climate Change – Assumptions

- Data from Global Climate Models (GCMs) are downscaled to a regional planning scale
- American River Basin Study used the downscaled data for the entire American River Basin area
- Analysis adapted to analyze the North American Subbasin
- Results represent 2070 Central Tendency


BUREAU OF RECLAMATION

American River Basin Study

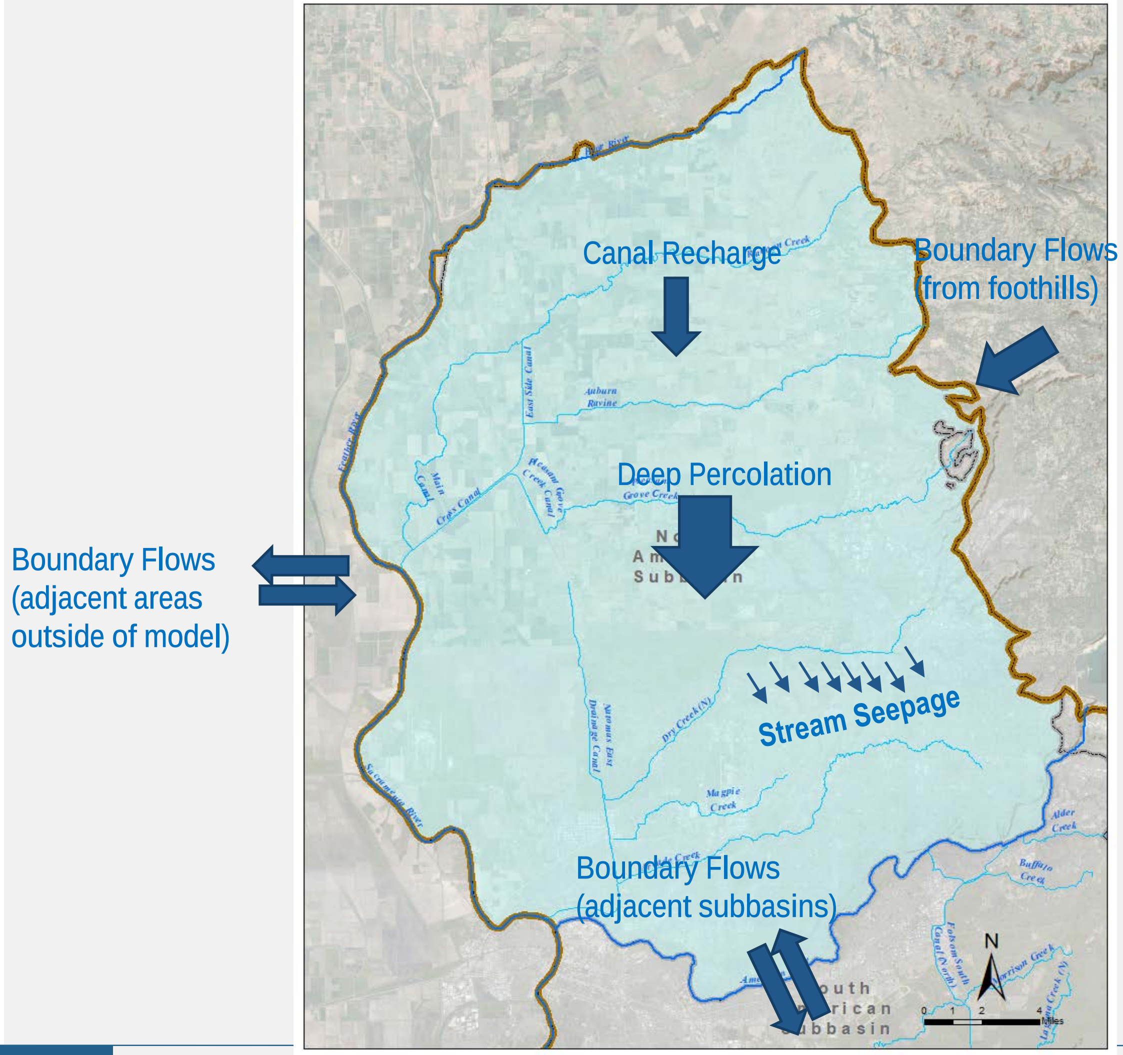
Interior Region 10 - California Great Basin

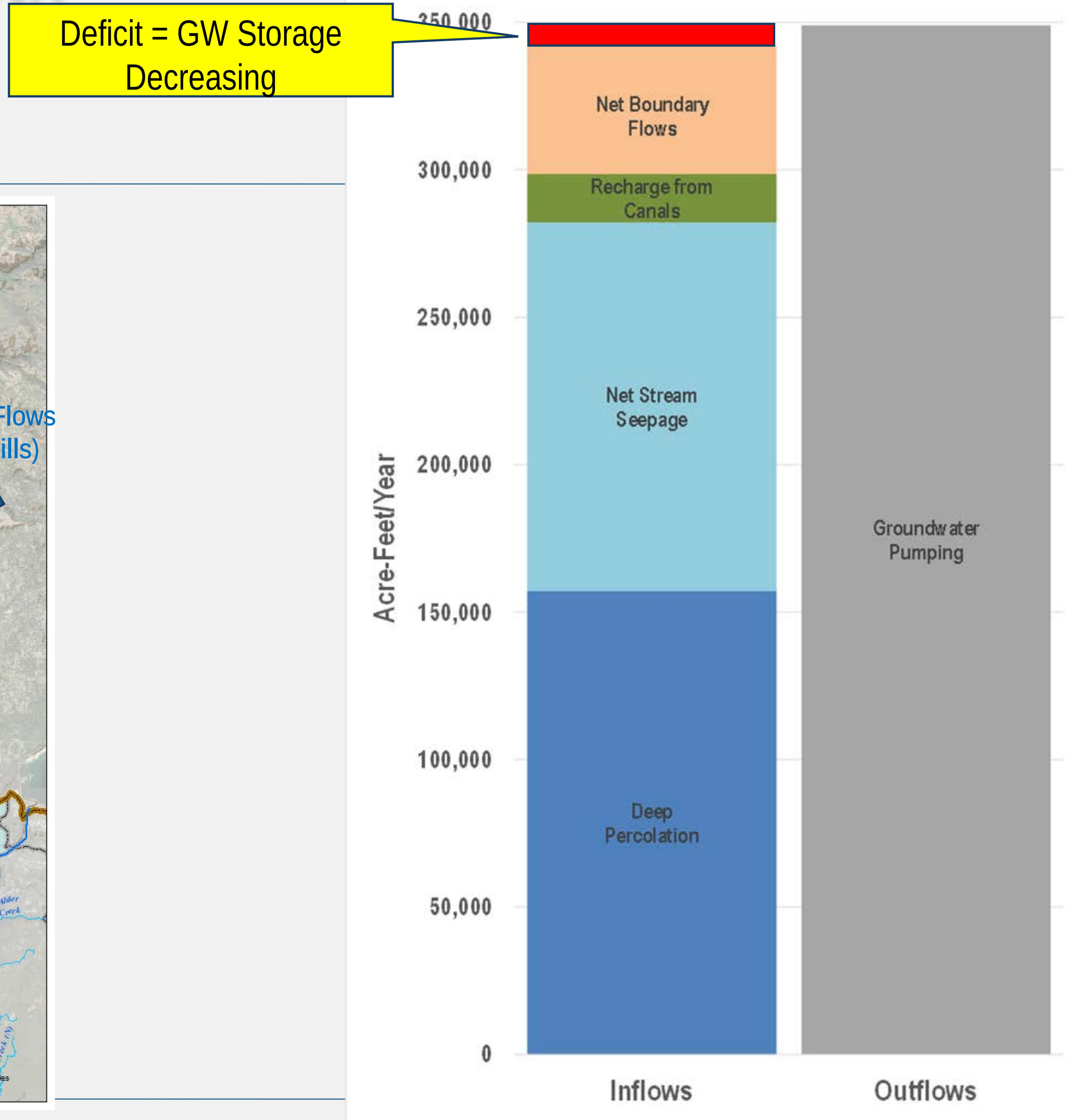
PCWA RWA SACRAMENTO ROSEVILLE SAFCA FOLSOM

U.S. Department of the Interior

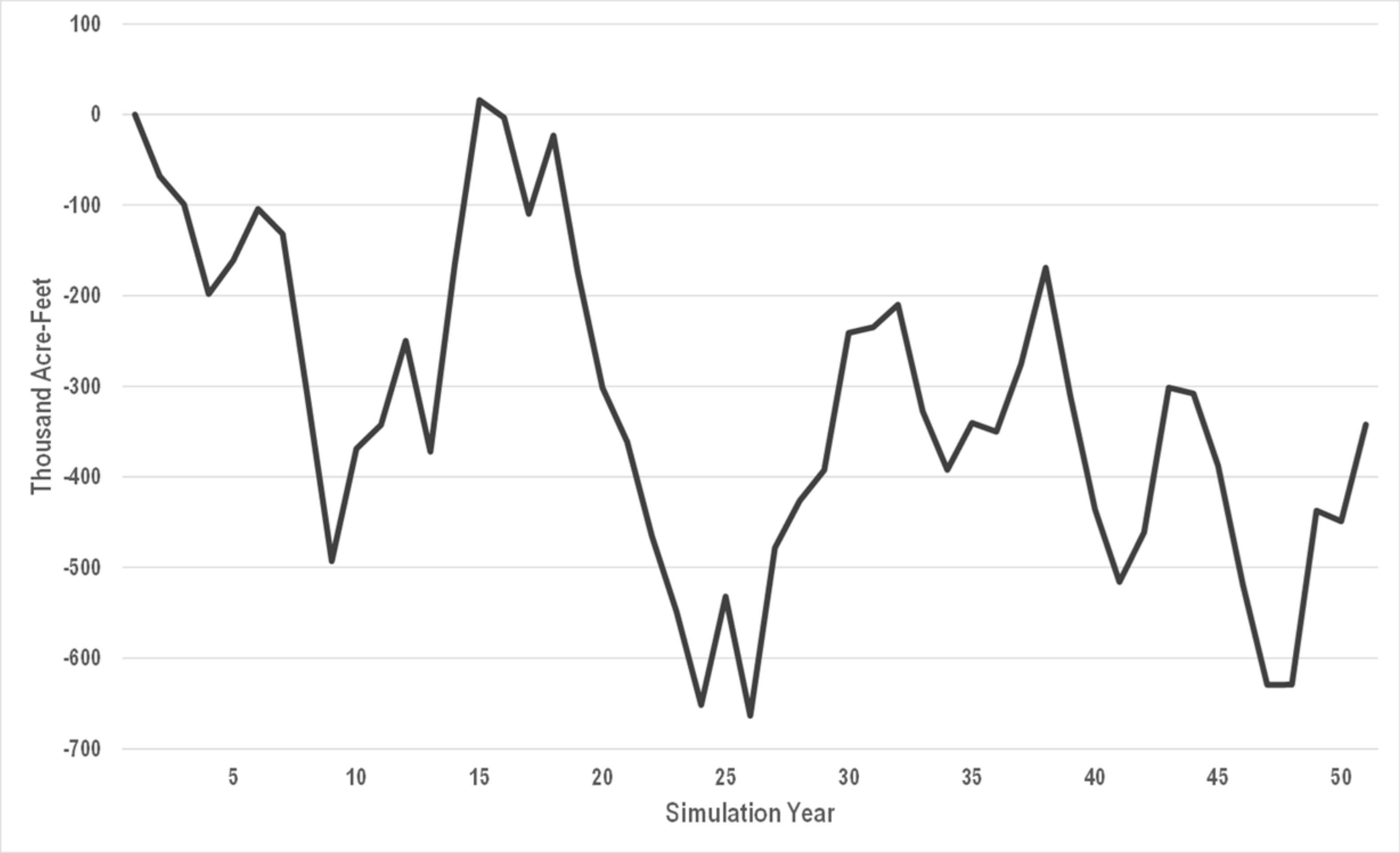
August 2020

Projected Conditions with Climate Change – Groundwater Budget

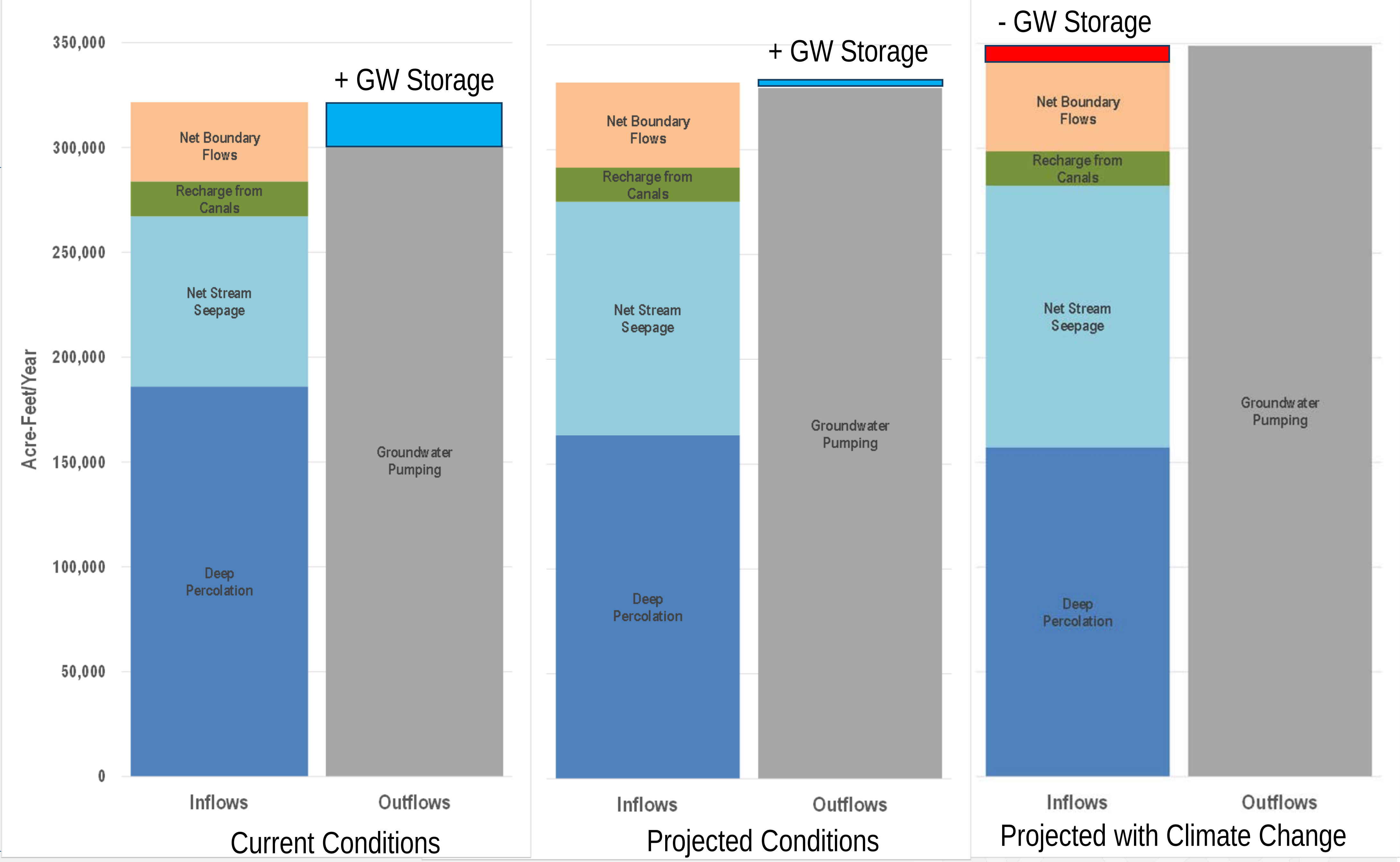




Projected Conditions with Climate Change–Change in Storage



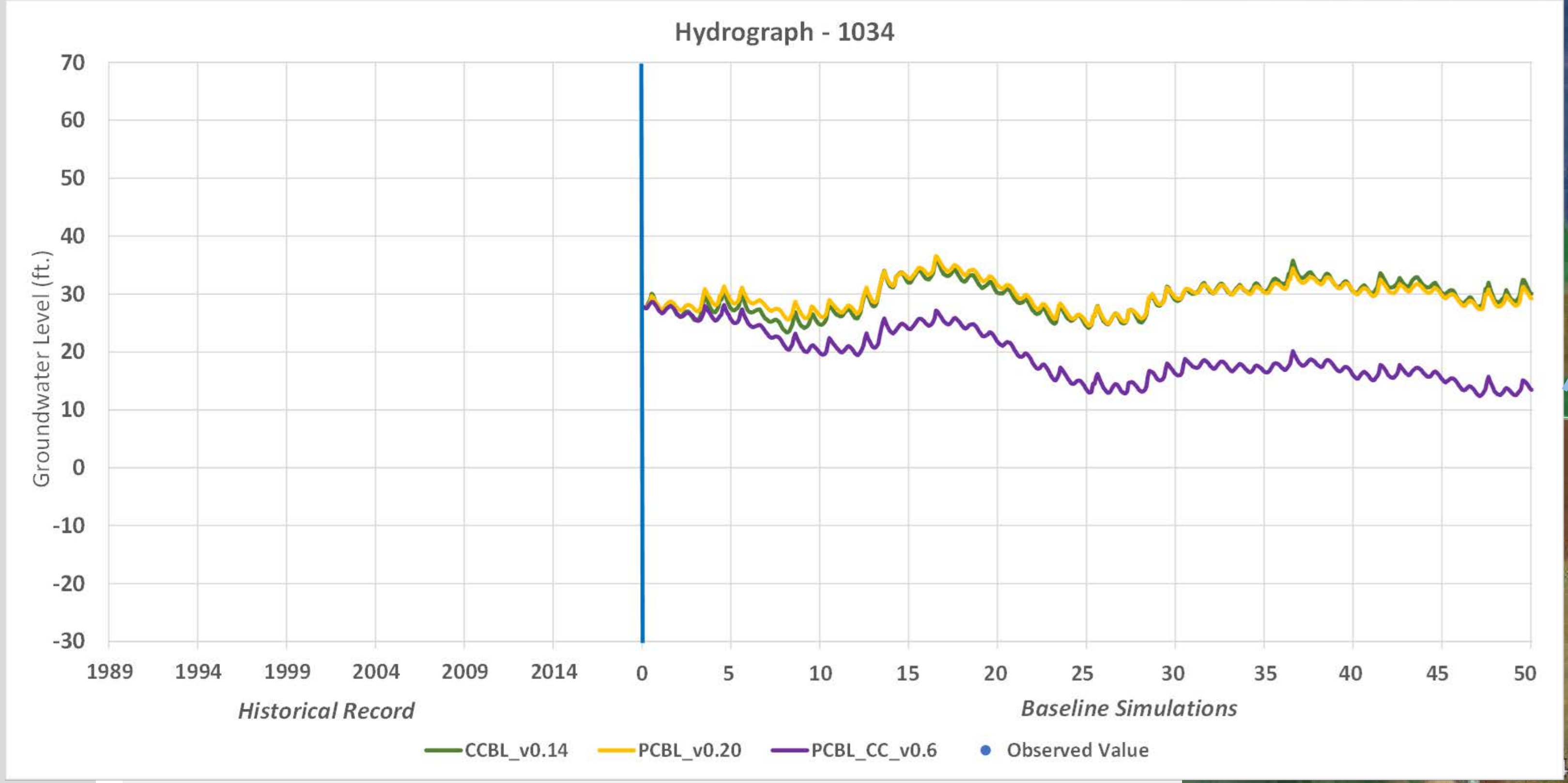
Average Annual Change in Storage
-6,800 acre-feet per year



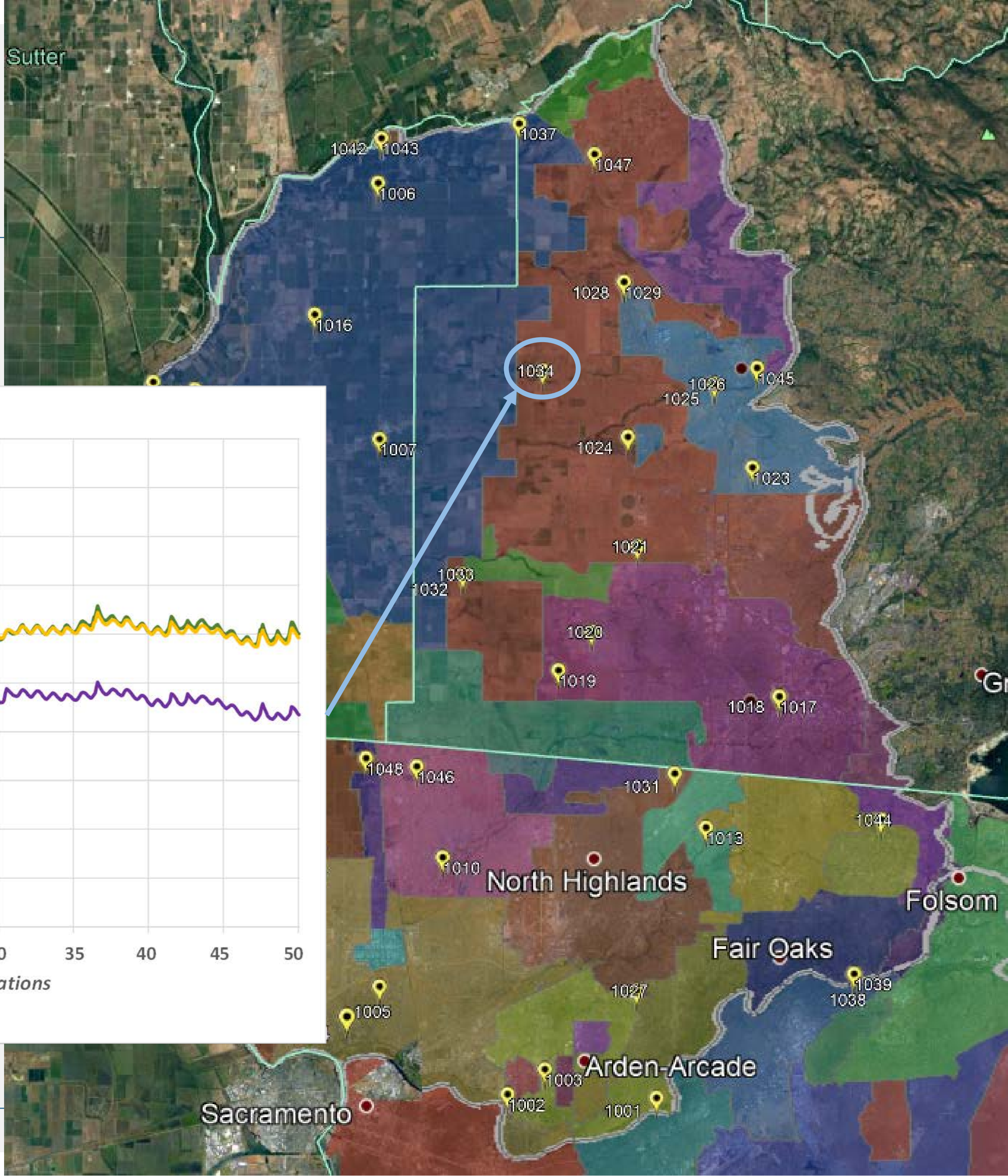
Acre-Feet/Year
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
+ GW Storage
Net Boundary Flows
Recharge from Canals
Net Stream Seepage
Deep Percolation
Groundwater Pumping
Inflows
Outflows
Current Conditions
+ GW Storage
Net Boundary Flows
Recharge from Canals
Net Stream Seepage
Deep Percolation
Groundwater Pumping
Inflows
Outflows
Projected Conditions
- GW Storage
Net Boundary Flows
Recharge from Canals
Net Stream Seepage
Deep Percolation
Groundwater Pumping
Inflows
Outflows
Projected with Climate Change

Model-Estimated Projected Groundwater Levels

Hydrograph

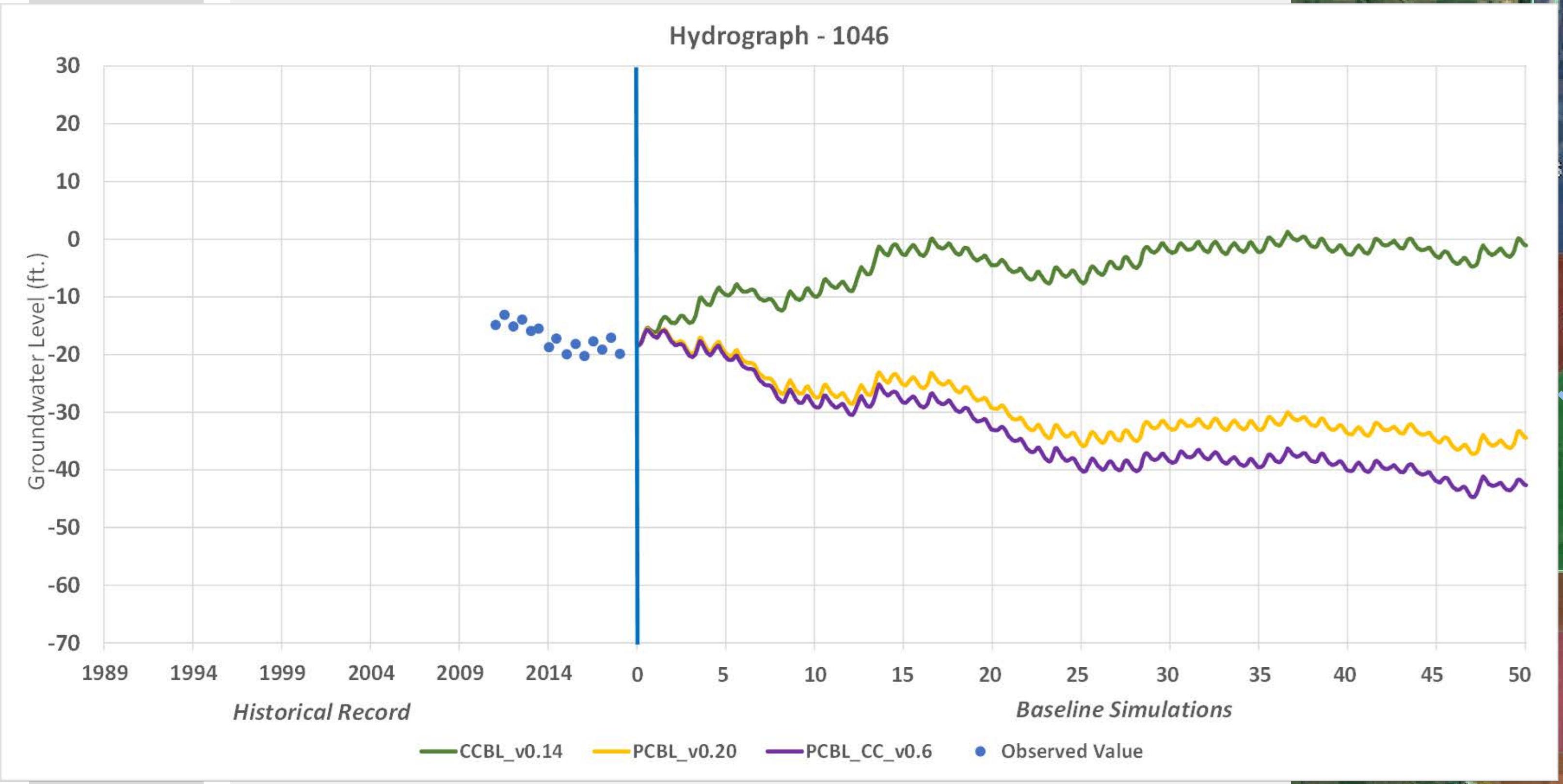


Hydrograph - 1034
Groundwater Level (ft.)
70
60
50
40
30
20
10
0
-10
-20
-30
1989
1994
1999
2004
2009
2014
0
5
10
15
20
25
30
35
40
45
50
Historical Record
Baseline Simulations
CCBL_v0.14
PCBL_v0.20
PCBL_CC_v0.6
Observed Value

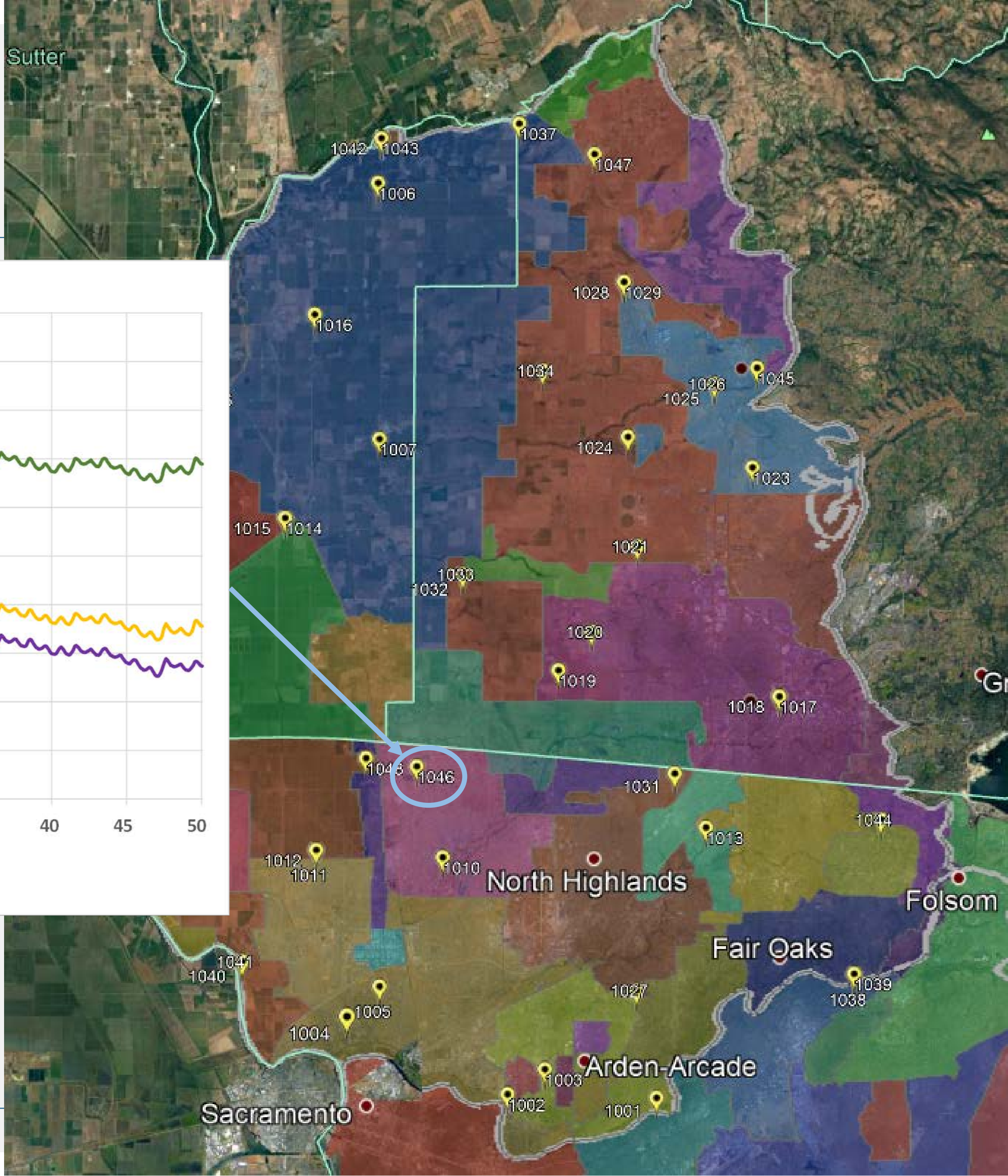


Sutter
1042
1043
1037
1047
1006
1028
1029
1016
1034
1026
1045
1025
1007
1024
1023
1021
1033
1032
1020
1019
1018
1017
1048
1046
1031
1044
1013
1010
North Highlands
Folsom
Fair Oaks
1039
1038
1027
1005
Arden-Arcade
1003
1002
1001
Sacramento

Hydrograph

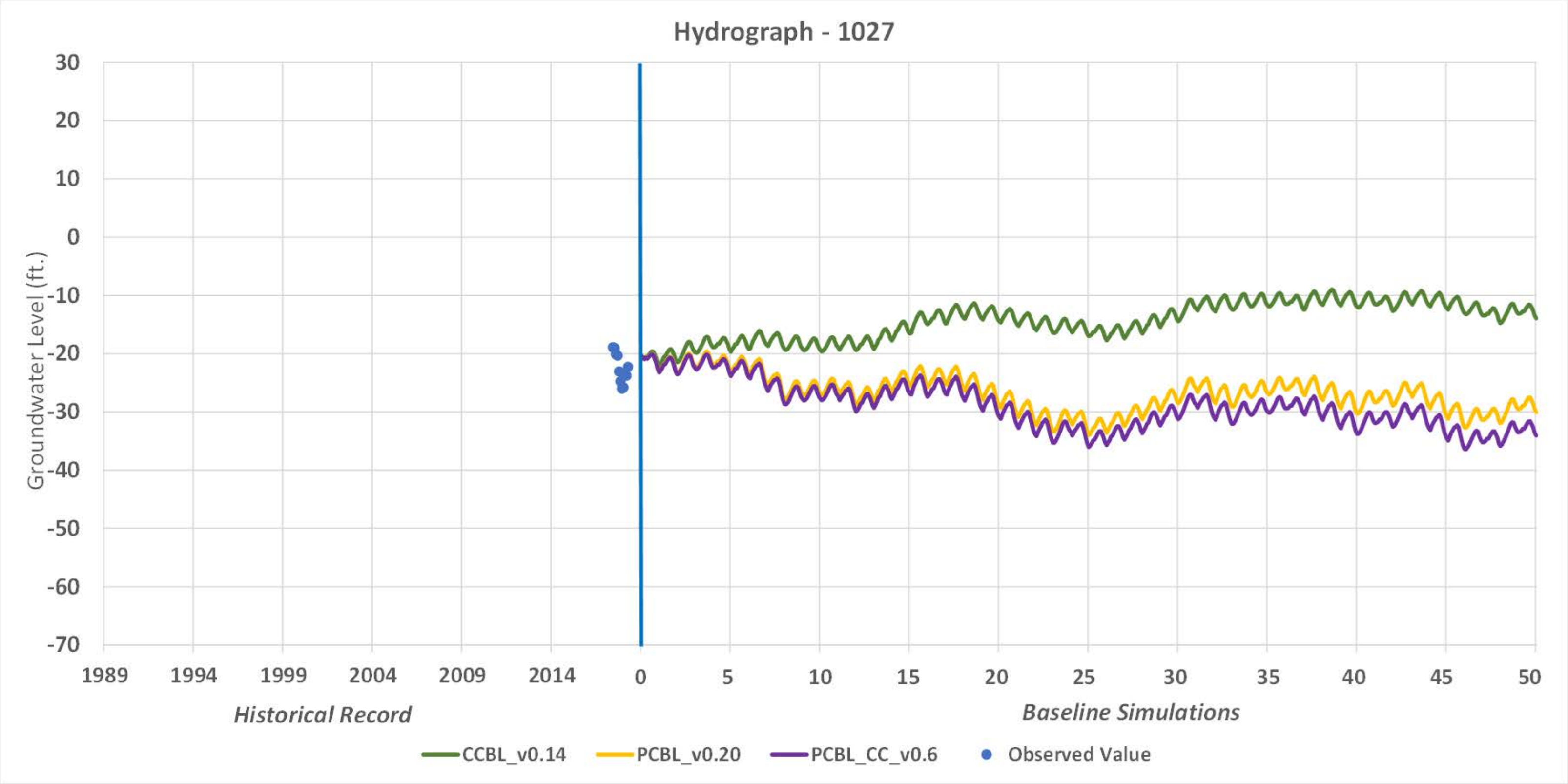


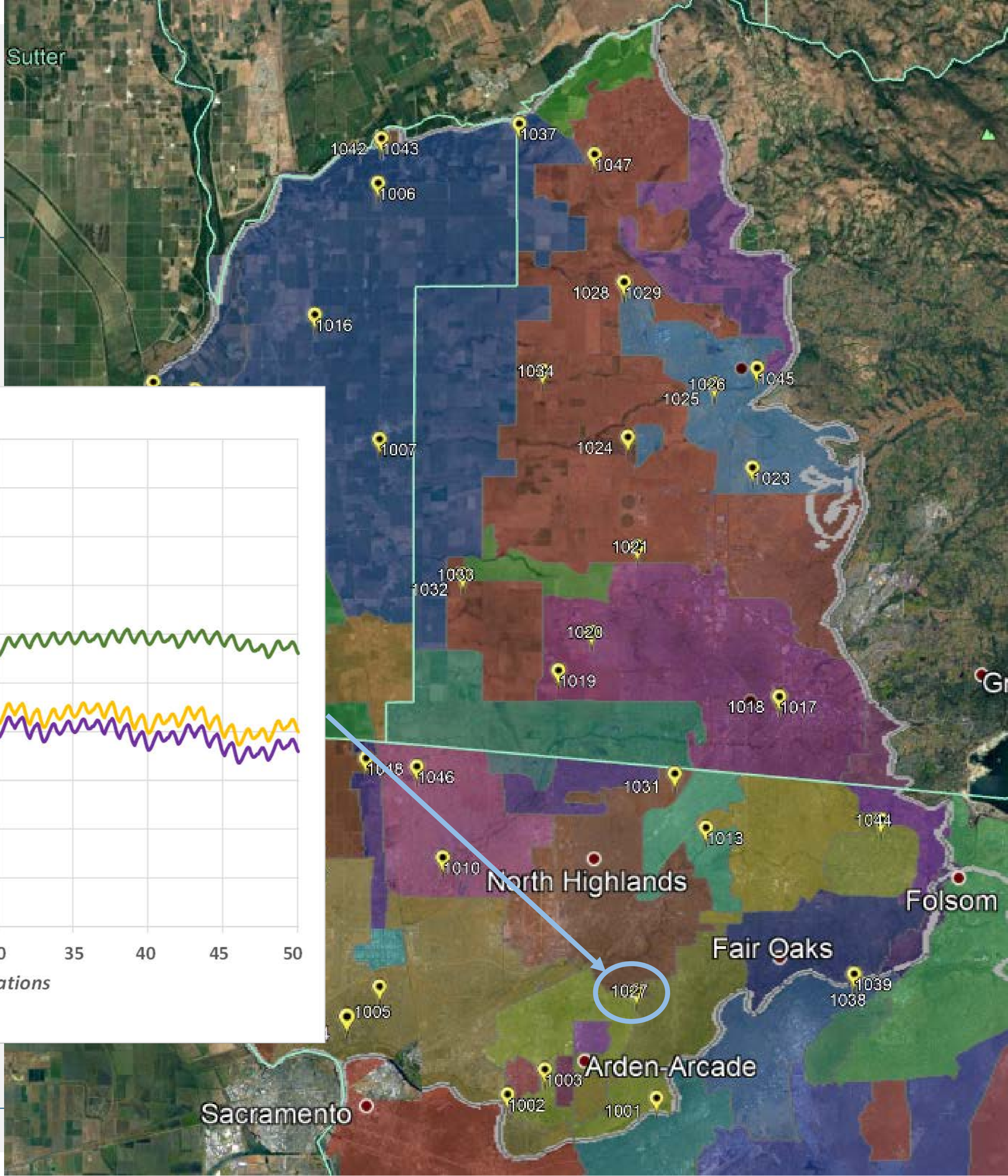
Hydrograph - 1046
Groundwater Level (ft.)
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
1989
1994
1999
2004
2009
2014
0
5
10
15
20
25
30
35
40
45
50
Historical Record
Baseline Simulations
CCBL_v0.14
PCBL_v0.20
PCBL_CC_v0.6
Observed Value



Sutter
1042
1043
1037
1047
1006
1028
1029
1016
1026
1045
1025
1024
1007
1023
1015
1014
1021
1032
1020
1019
1018
1017
1046
1031
1044
1013
1012
1011
1010
North Highlands
Folsom
Fair Oaks
1040
1005
1004
1027
1039
1038
Arden-Arcade
1003
1002
1001
Sacramento

Hydrograph


Hydrograph - 1027
Groundwater Level (ft.)
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
1989
1994
1999
2004
2009
2014
0
5
10
15
20
25
30
35
40
45
50
Historical Record
Baseline Simulations
CCBL_v0.14
PCBL_v0.20
PCBL_CC_v0.6
Observed Value


Sutter
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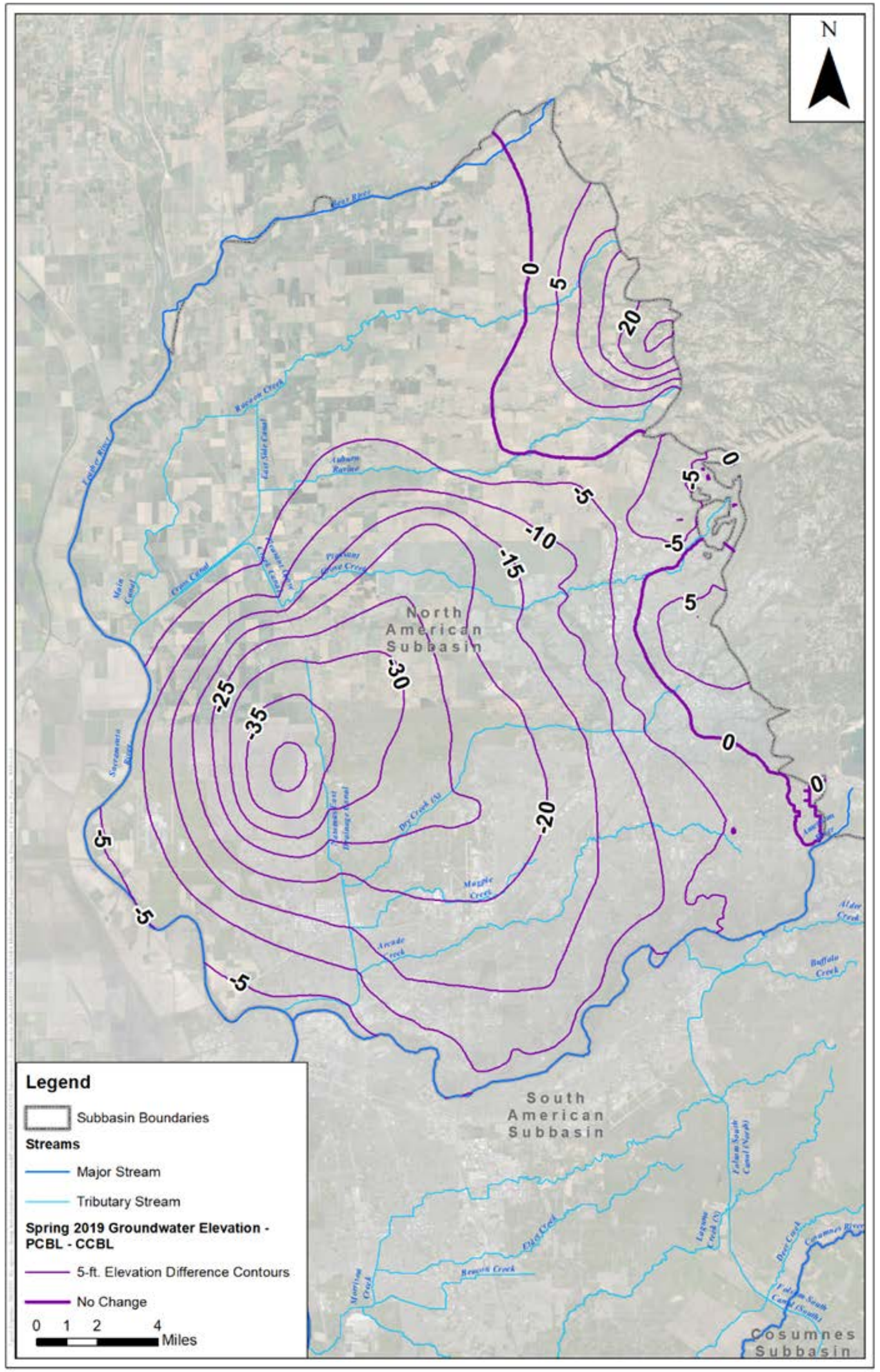
1046
1031
1044
1013
1010
North Highlands
Folsom
Fair Oaks
1027
1039
1038
1005
Arden-Arcade
1003
1002
1001
Sacramento

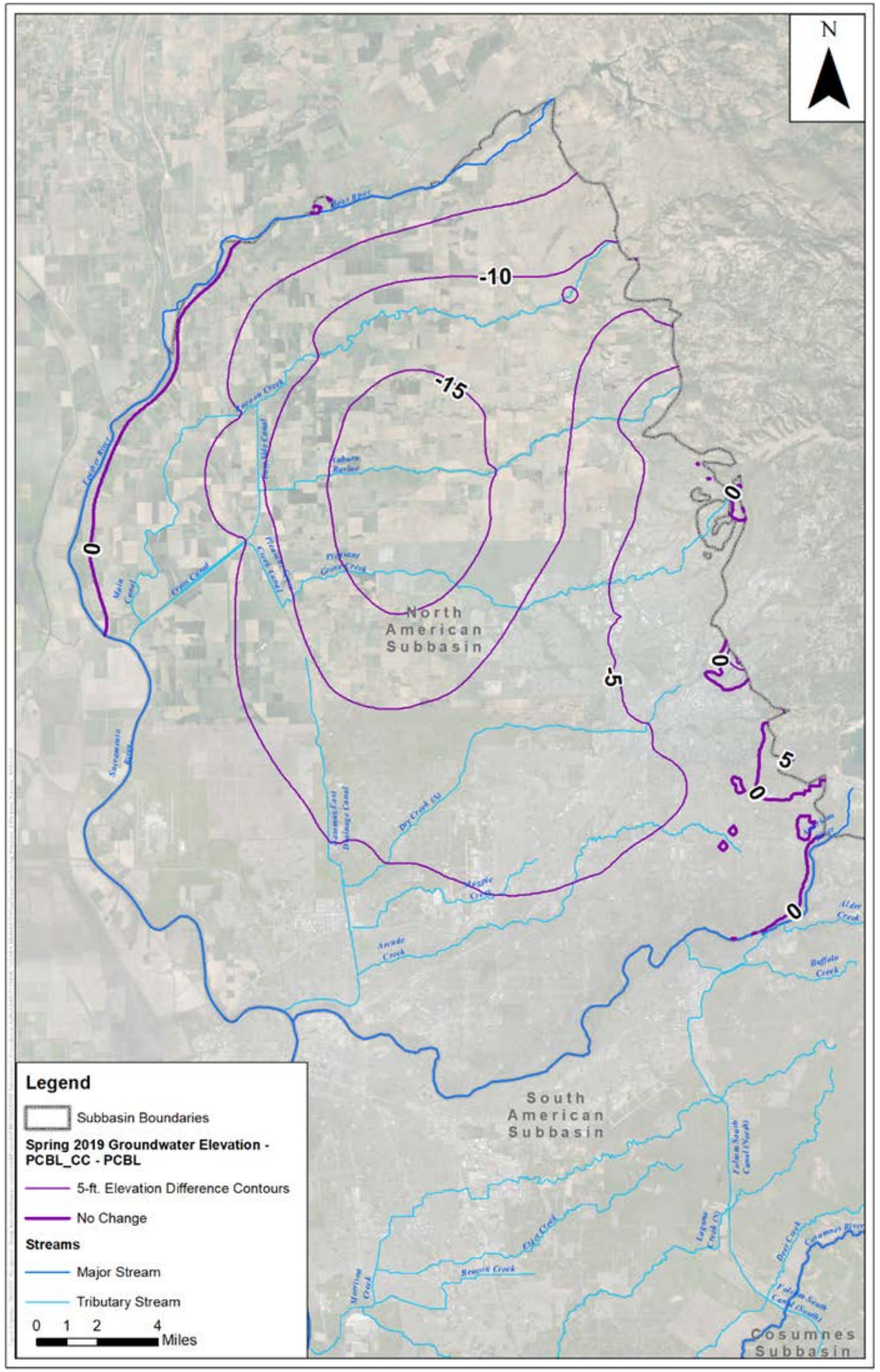
GWL Scenario Comparison

- Projected Conditions minus Current Conditions
  - Groundwater Storage under Projected Conditions is fairly stable in model, but some areas will experience groundwater level declines
  - Scenario may be close to the Sustainable Yield of the Subbasin
  - Subject to analysis of other Sustainability Indicators (e.g., water levels)



GWL Scenario Comparison

- Projected Conditions with Climate Change minus Projected Conditions
  - Isolating impacts of climate change on projected conditions
  - More effects seen in agriculturally intensive areas



Model Conclusions



Modeling Conclusions (so far!)

- Current regional groundwater conditions are very healthy overall (more inflows than outflows)
- Able to absorb future projected growth and land use changes from a change in storage perspective
  - Still need to further assess sub-regional conditions to ensure meeting sustainable management criteria
- Climate change modeling suggests possible future negative change in storage
  - Still need to evaluate future projects and management actions

Model Conclusions (continued)

- CoSANA Model is the best available tool to quantify NASb groundwater conditions
- Use in planning reflects uncertainties associated in any groundwater model
- CoSANA Model to be updated and refined over time, incorporating
  - Continued data collection
  - Improved understanding of the subbasin
- Management under the GSP is ultimately through monitored data

< insert slides>

NORTH AMERICAN Subbasin

4) Timeline and Q&A

NORTH AMERICAN Subbasin

Timeline – GSP development and adoption

Public Meetings

- Sustainable Management Criteria (Feb 10th)
- Water Budgets (March 10th)
- Projects / Management Actions (April 14th)

May 2017
GSA formed and begin to develop GSP

November 2020
Partial Draft GSP Released (Sections 1 through 5)

Mid 2021
Draft Final GSP Release

Late 2021
Adopt Final GSP & Implementation Begins

January 31, 2022
GSP due to State

20 years with 5-year updates

January 31, 2042
Avoid Undesirable Results

WEST PLACER GROUNDWATER SUSTAINABILITY AGENCY

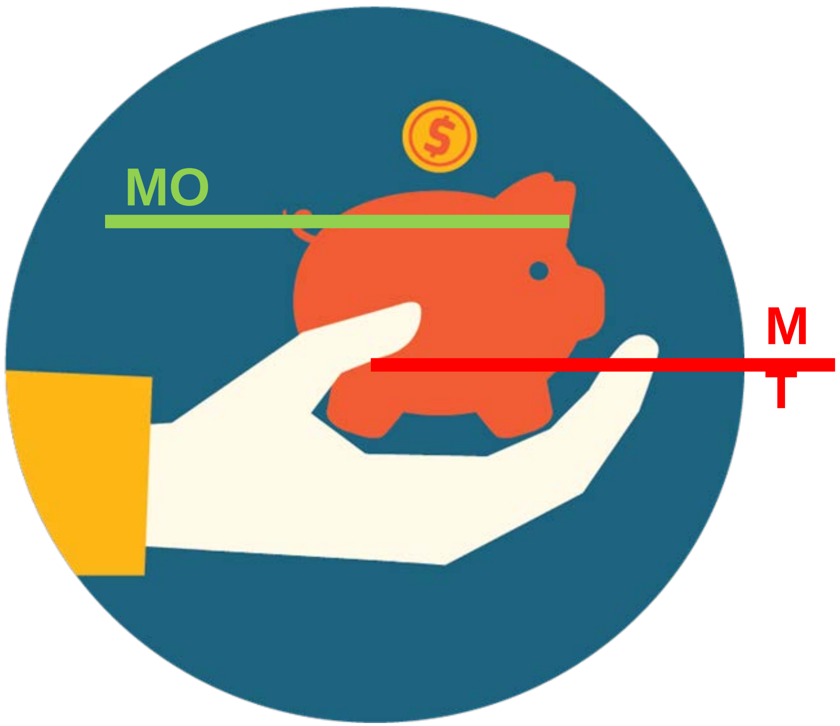
Questions

End of Presentation

<extra slides if needed>

Sustainable Management Criteria

Measurable Objectives and Minimum Thresholds

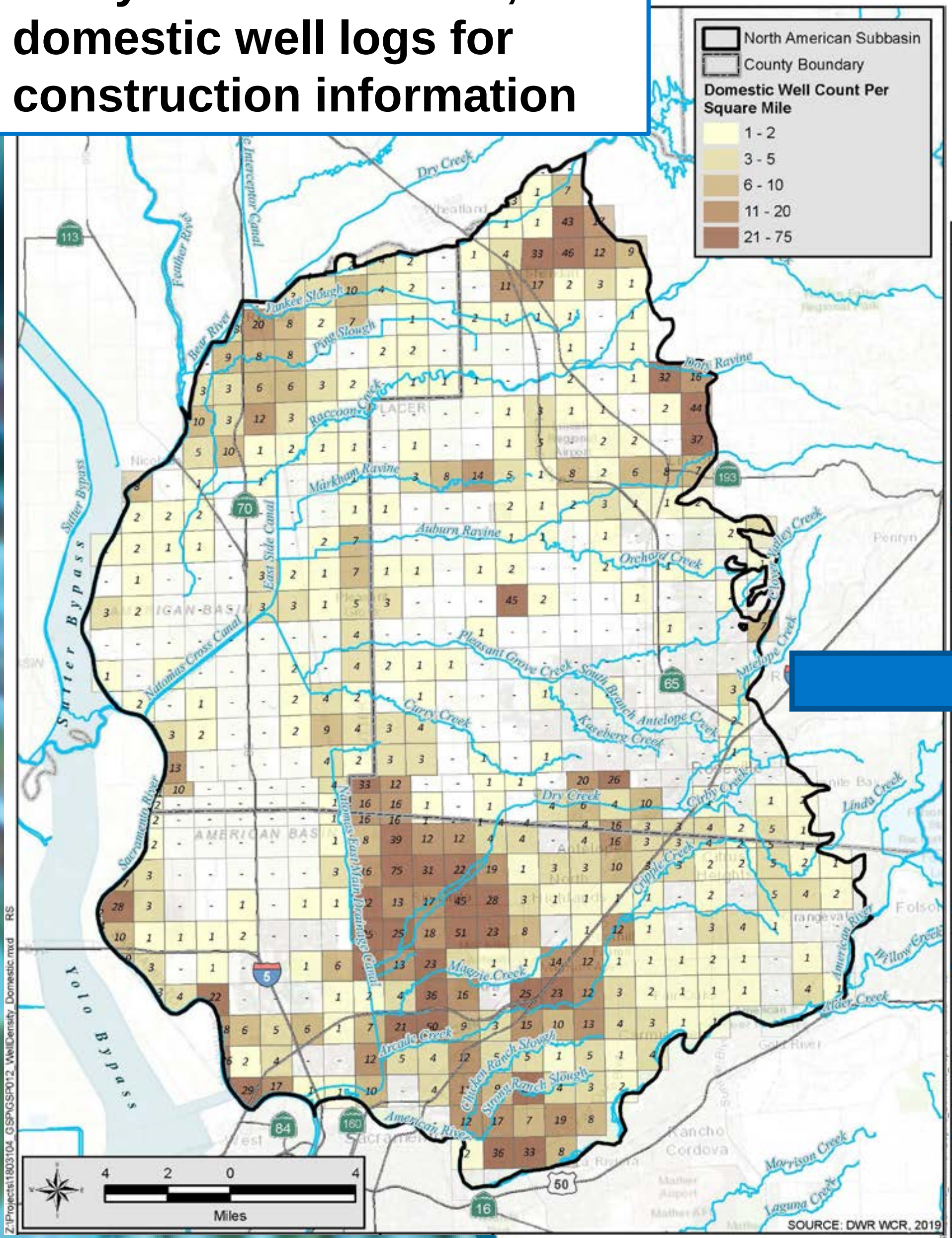


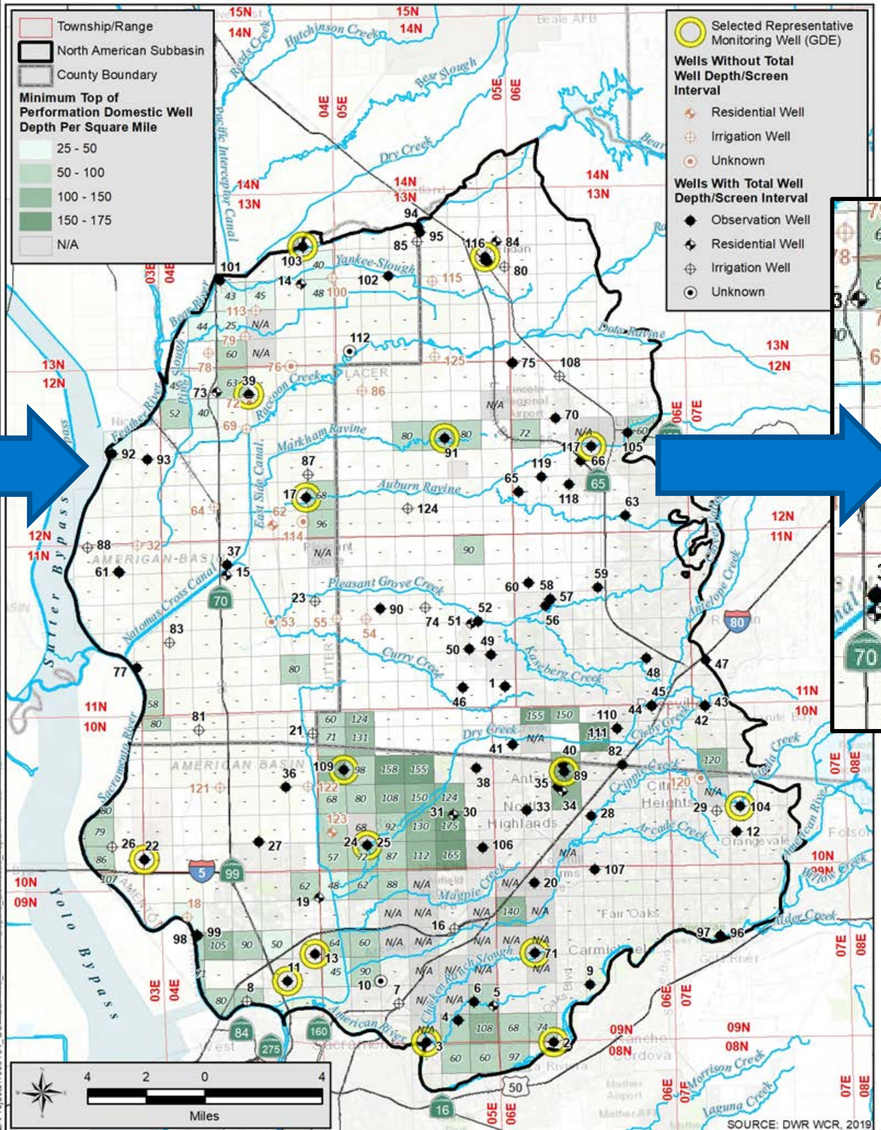
Measurable Objective (MO) = levels that reflect desired conditions...that enable GSA to achieve sustainability

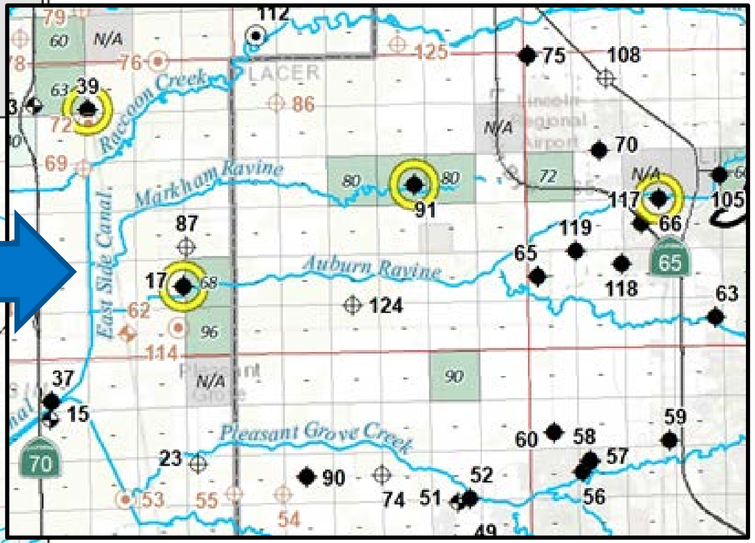
Minimum Threshold (MT) = levels at a site that when exceeded, either individually or at a combination of sites, may cause undesirable results

MOs and MTs for Groundwater Users

Analyzed more than 1,800 domestic well logs for construction information

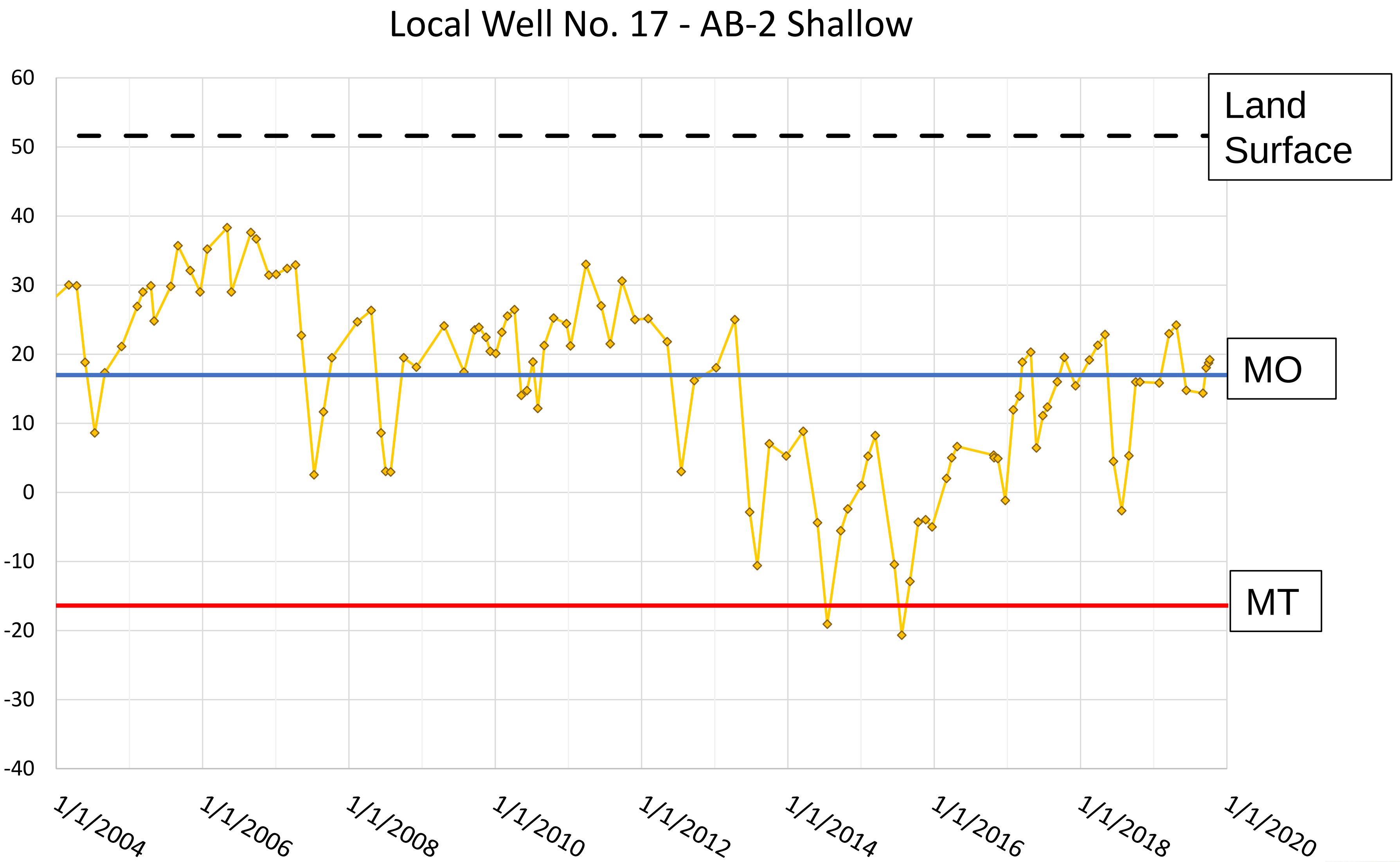


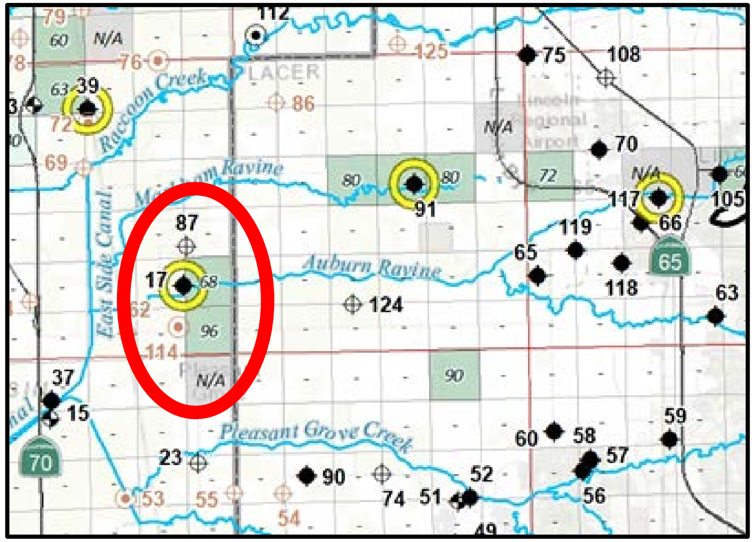




WEST PLACER GROUNDWATER SUSTAINABILITY AGENCY

Example Draft MO and MT for Domestic Well Users





WEST PLACER GROUNDWATER SUSTAINABILITY AGENCY

NASb Groundwater Sustainability Plan (GSP)

Partial Draft Release – Sections 1 through 5

Section 1 – Introduction

Executive summary and overview

Section 2 – Agency Information

GSA organizational structure, authority, and GSP implementation costs

Section 3 - Description of Plan Area

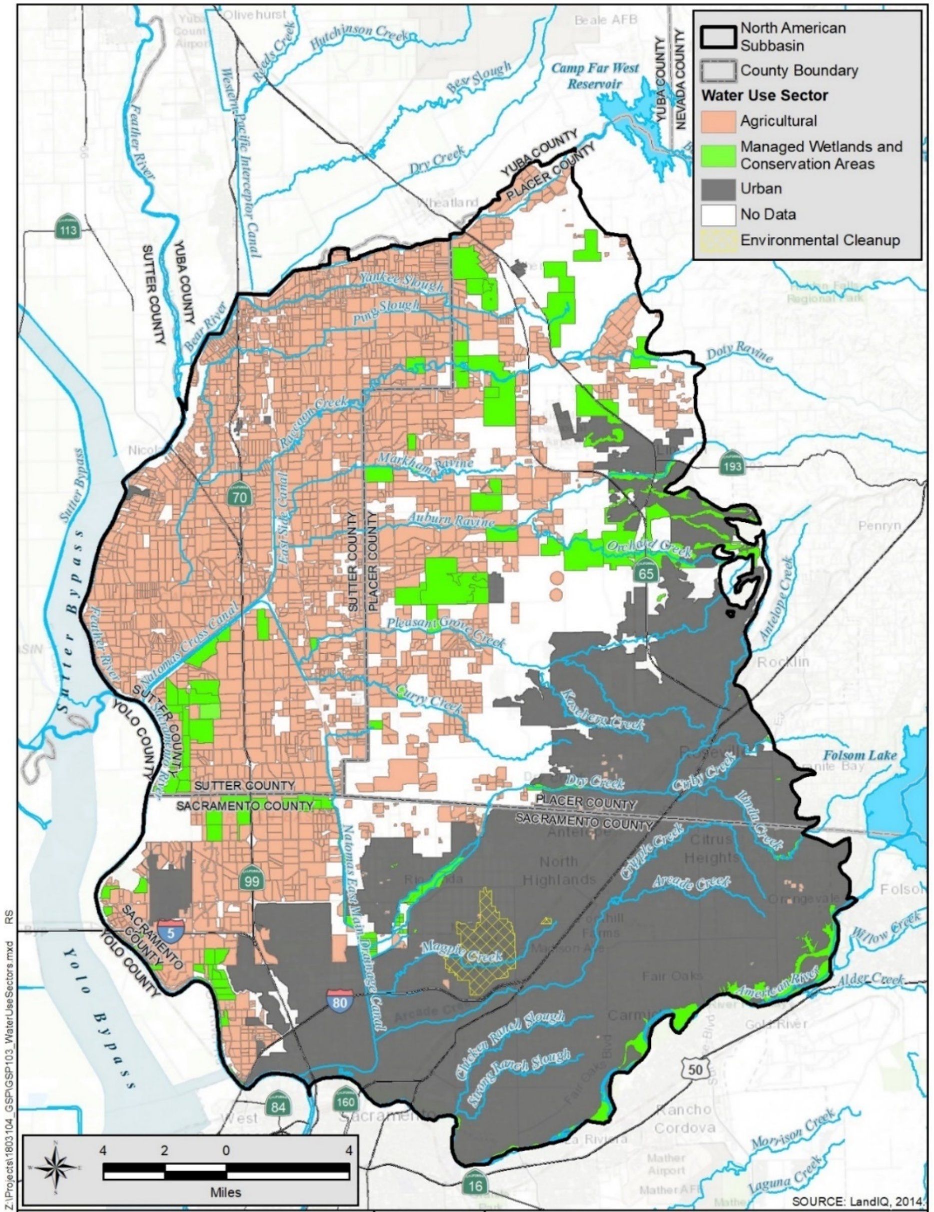
Maps and descriptions of water and land use

Section 4 – Hydrogeologist Setting

Basin boundaries, regional geology, and aquifer information

Section 5 – Groundwater Conditions

Groundwater levels, water quality, domestic wells, and ecosystems



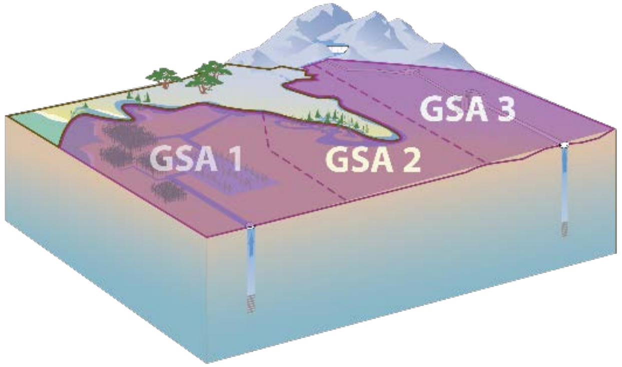
Outreach to Date

- 2017 – Stakeholder workshops, MACs, BOS
- 2018 – Outreach campaigns, survey, BOS
- 2019 – No public meetings, data gathering, BOS
- 2020 – Virtual public meetings (2), Ag tailgate, BOS
- 2021
  - ✓ Feb 10 – Sustainable Management Criteria
  - ✓ March 10 – Water Budget
  - ✓ April 14 – Projects & Management Actions

Groundwater Sustainability Plan (GSP) - Regulatory Requirements

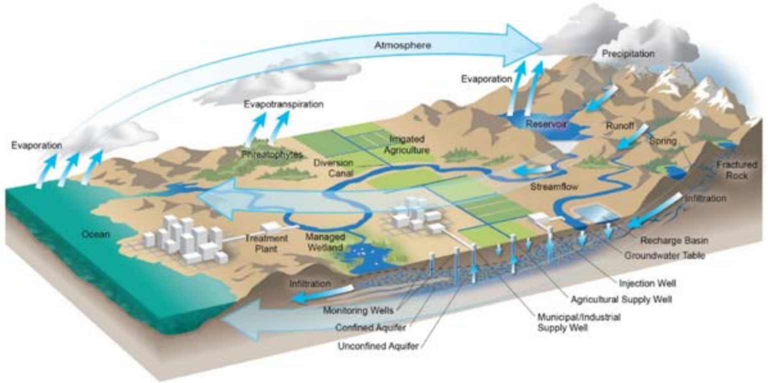
Who

- Administrative Information -



What

- Basin Setting -

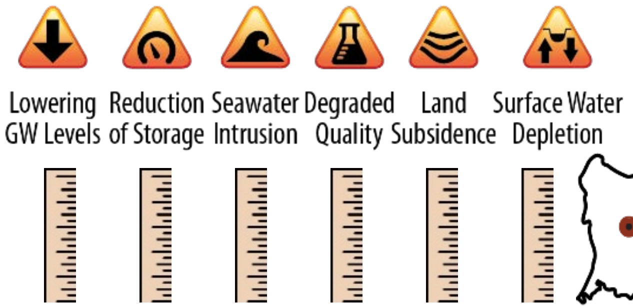


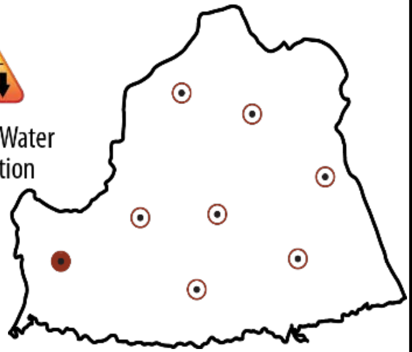
GSP

Where

- Sustainable Management Criteria -

- Monitoring Network -





How

- Projects & Management Actions -