Glenn County Prop 1 Counties with Stressed Basins Grant:

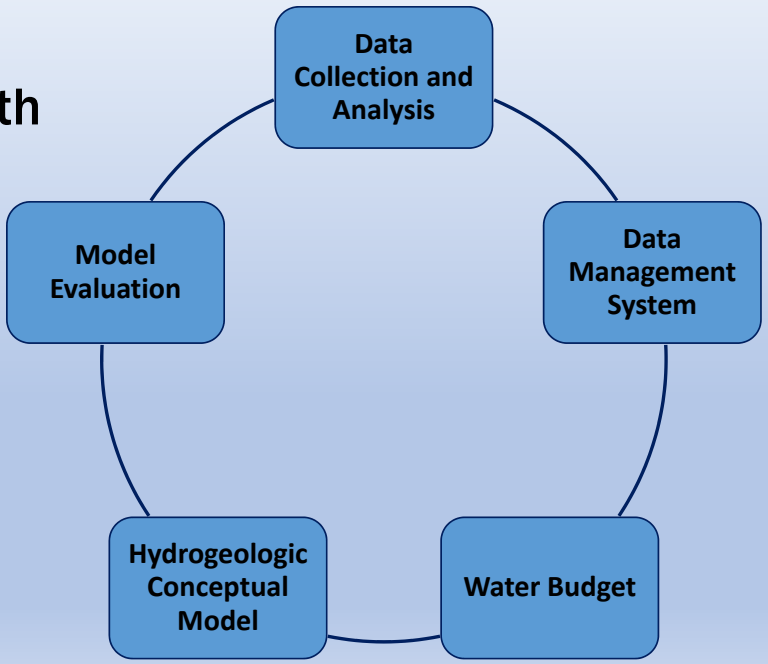
"Data Management and Hydrogeologic Conceptual Modeling to Support a Groundwater Model in Support of Sustainable Groundwater Management Activities"

Davids Engineering

March 20, 2018

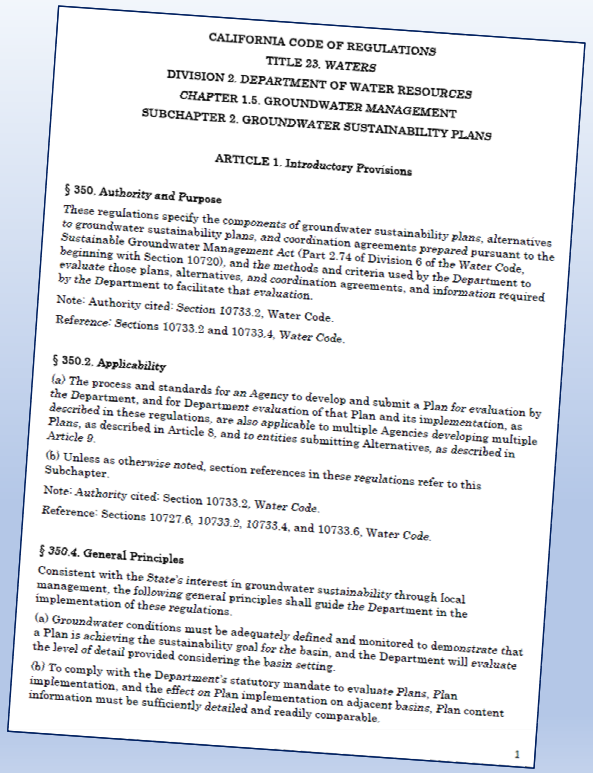
Overview

- Background
- Coordination with Colusa County
- Summary of Results
- Next Steps



Background

- Funded by DWR Prop 1 Counties with Stressed Basins Grant
- Applied for by Glenn County in December 2015
- Davids–West Yost contracted in December 2016
- Foundational to Groundwater Sustainability Plan (GSP) development and tied to GSP Regulations



CALIFORNIA CODE OF REGULATIONS
TITLE 23. WATERS
DIVISION 2. DEPARTMENT OF WATER RESOURCES
CHAPTER 1.5. GROUNDWATER MANAGEMENT
SUBCHAPTER 2. GROUNDWATER SUSTAINABILITY PLANS

ARTICLE 1. Introductory Provisions

§ 350. Authority and Purpose

These regulations specify the components of groundwater sustainability plans, alternatives to groundwater sustainability plans, and coordination agreements prepared pursuant to the Sustainable Groundwater Management Act (Part 2.74 of Division 6 of the Water Code, beginning with Section 10720), and the methods and criteria used by the Department to evaluate those plans, alternatives, and coordination agreements, and information required by the Department to facilitate that evaluation.

Note: Authority cited: Section 10733.2, Water Code.

Reference: Sections 10733.2 and 10733.4, Water Code.

§ 350.2. Applicability

(a) The process and standards for an Agency to develop and submit a Plan for evaluation by the Department, and for Department evaluation of that Plan and its implementation, as described in these regulations, are also applicable to multiple Agencies developing multiple Plans, as described in Article 8, and to entities submitting Alternatives, as described in Article 9.

(b) Unless as otherwise noted, section references in these regulations refer to this Subchapter.

Note: Authority cited: Section 10733.2, Water Code.

Reference: Sections 10727.6, 10733.2, 10733.4, and 10733.6, Water Code.

§ 350.4. General Principles

Consistent with the State's interest in groundwater sustainability through local management, the following general principles shall guide the Department in the implementation of these regulations.

(a) Groundwater conditions must be adequately defined and monitored to demonstrate that a Plan is achieving the sustainability goal for the basin, and the Department will evaluate the level of detail provided considering the basin setting.

(b) To comply with the Department's statutory mandate to evaluate Plans, Plan implementation, and the effect on Plan implementation on adjacent basins, Plan content information must be sufficiently detailed and readily comparable.

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Technical Tasks

- Data Collection and Analysis
- Data Management System (DMS) Design and Preliminary Implementation
- Initial Water Budget Development
- Hydrogeologic Conceptual Model (HCM) Development
- Evaluation of Existing Model Codes and Calibrated Models

Coordination with Colusa County

- Concurrent Stressed Basin Grant for Colusa County
- Coordination Objectives
  - Similar progress
  - Maximum value
- Builds upon prior work for Colusa County
- Areas of Coordination
  - Data Collection and Analysis
  - Data Management System (DMS)
  - Hydrogeologic Conceptual Model (HCM)
  - Monitoring Network
  - Water budgets

Data Collection and Analysis

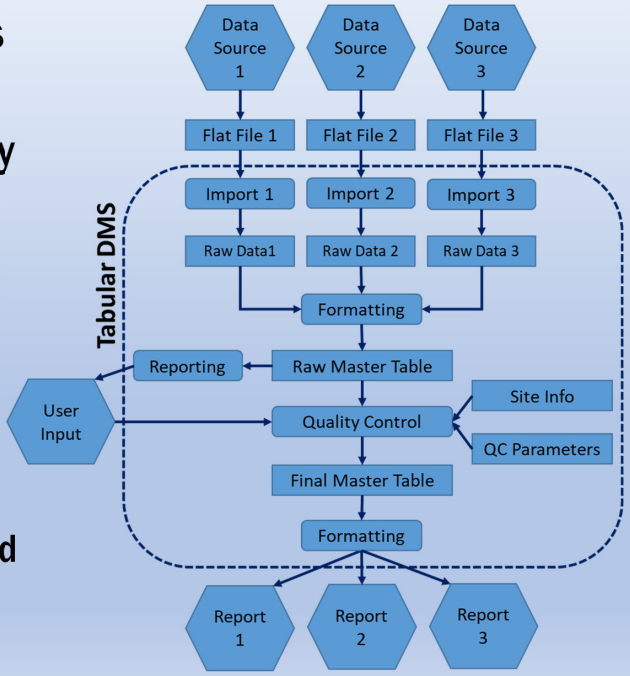
- Existing Data Review
  - Compile data
    - Geology, soils, precipitation, stream flows, diversions, land use, groundwater levels, etc.
  - Organize for inclusion in DMS
- Data Gap Analysis
  - Identify additional information needed
  - Prepare data gap action plan
- Deliverables
  - Data Inventory and Datasets
  - Data Gap Action Plan

Data Collection and Analysis

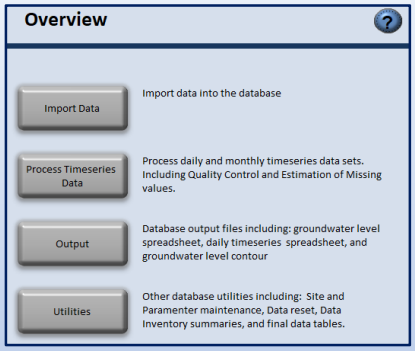
Data Type	Source	Time Step	Minimum Date	Maximum Date
Diversions	USBR	Monthly	12/1/1990	1/1/2015
Evapotranspiration	DWR	Daily	10/1/1989	12/31/2015
Groundwater Level	DWR-WDL	Varies	1/31/1923	8/22/2017
Land Use	DWR, County Ag Commissioners	Annual	1/1/1990	12/31/2015
Precipitation	NCEI	Daily	1/1/1904	11/10/2017
Precipitation	PRISM	Daily	1/1/1981	12/28/2017
Streamflows	CDEC	Daily	1/1/1992	1/25/2018
Streamflows	USGS	Daily	1/1/1920	11/2/2017
Streamflows	DWR-WDL	Daily	10/1/1938	9/30/2016
Groundwater Quality	USGS/DWR	Varies	7/21/1941	7/25/2017
Land Subsidence	DWR	Daily	3/1/2005	8/16/2017
Well Completion Reports	Colusa and Glenn Counties	Varies	1/1/1912	11/22/2017

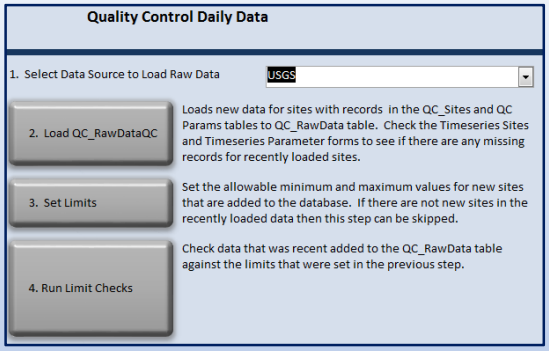
Data Management System (DMS)

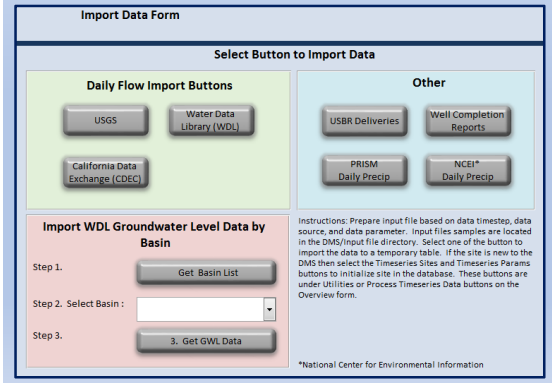
- Review GSP Regulations and Data Requirements
- Define Core Functionality and Specifications
- Implement Initial DMS
- Deliverables
  - Summary Report
  - User Guide
  - Programmer Guide
  - Database Application and Data Files

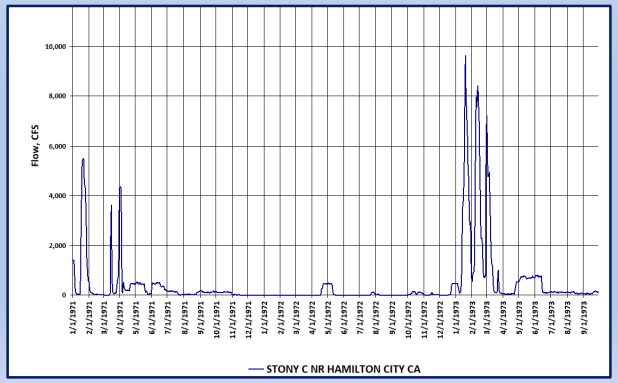


Data Management System (DMS)



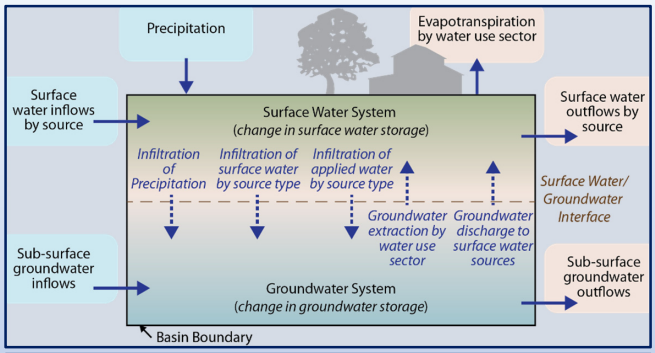


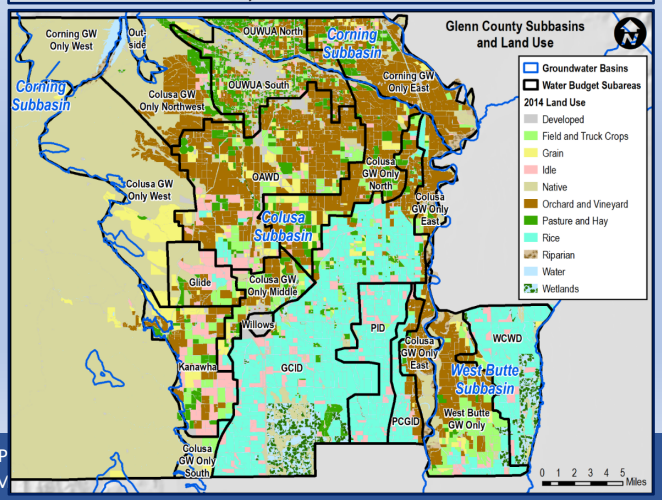




Initial Water Budget

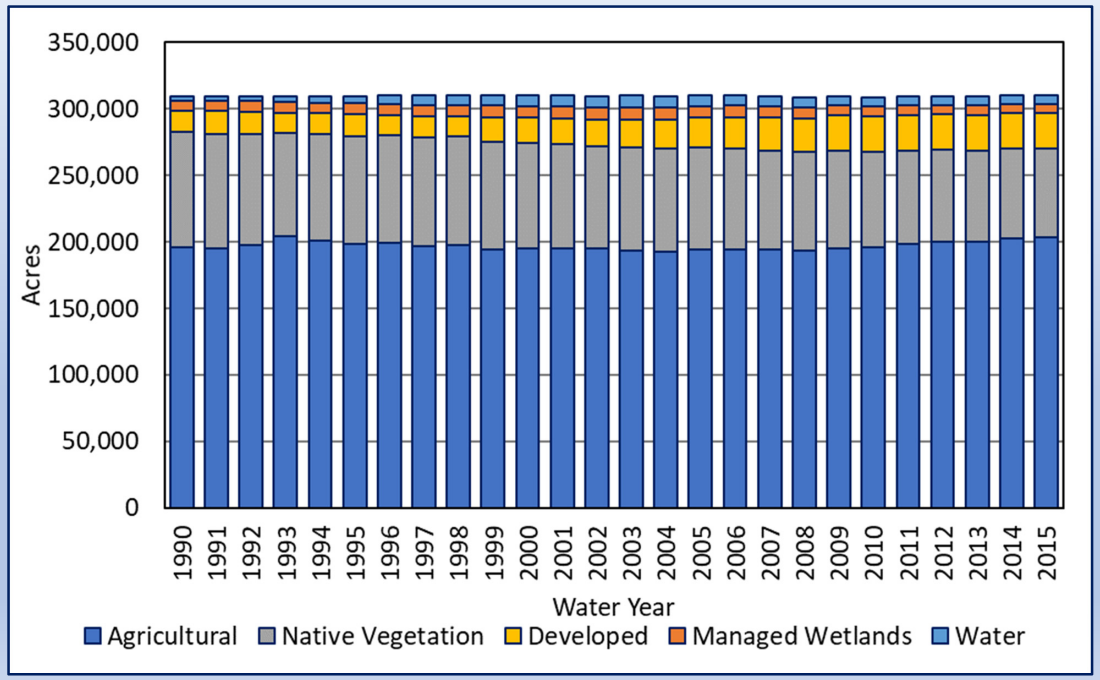
- Initial Basin Water Budgets
  - Surface water and groundwater systems
  - Subbasins within Glenn County
  - Rely on available data
- Deliverables
  - Water Budget Report
  - Water Budget Data





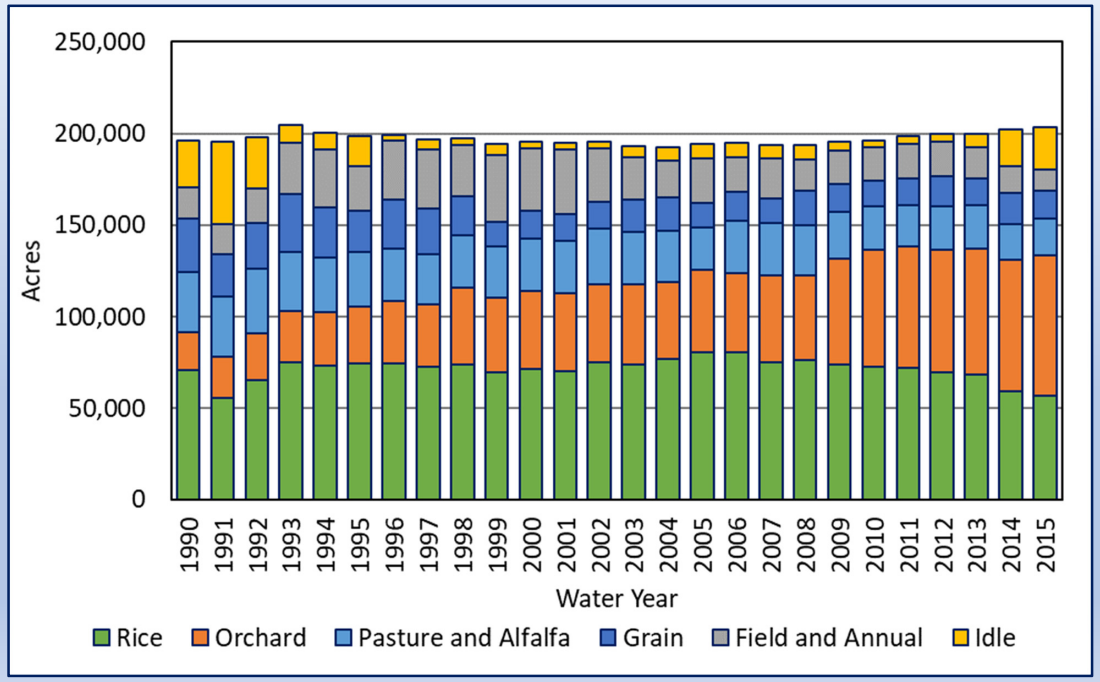
Initial Water Budget Results: Colusa Subbasin in Glenn County

General Land Use



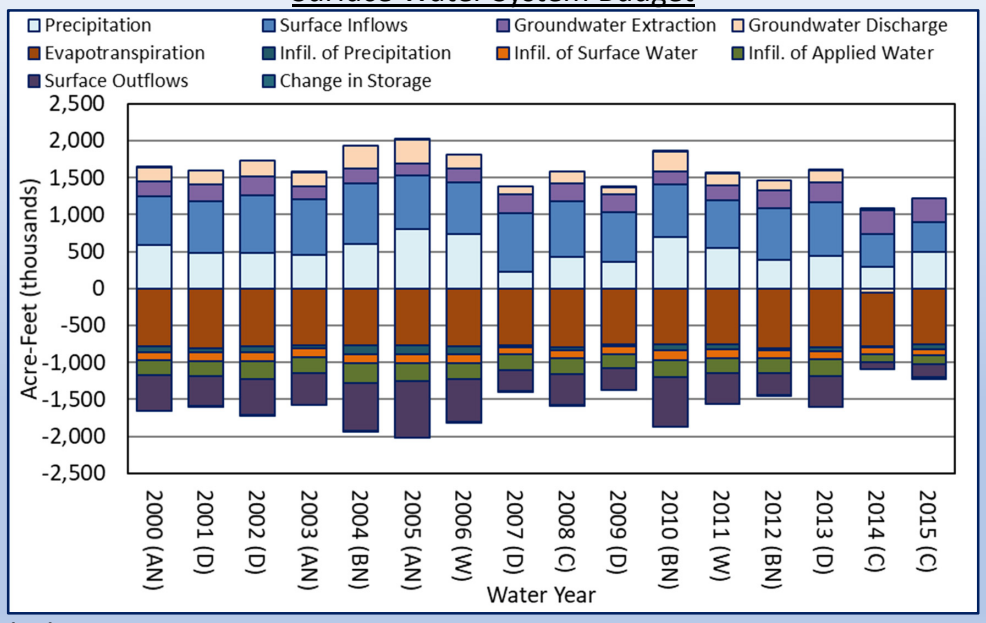
Initial Water Budget Results: Colusa Subbasin in Glenn County

Agricultural Land Use



Initial Water Budget Results: Colusa Subbasin in Glenn County

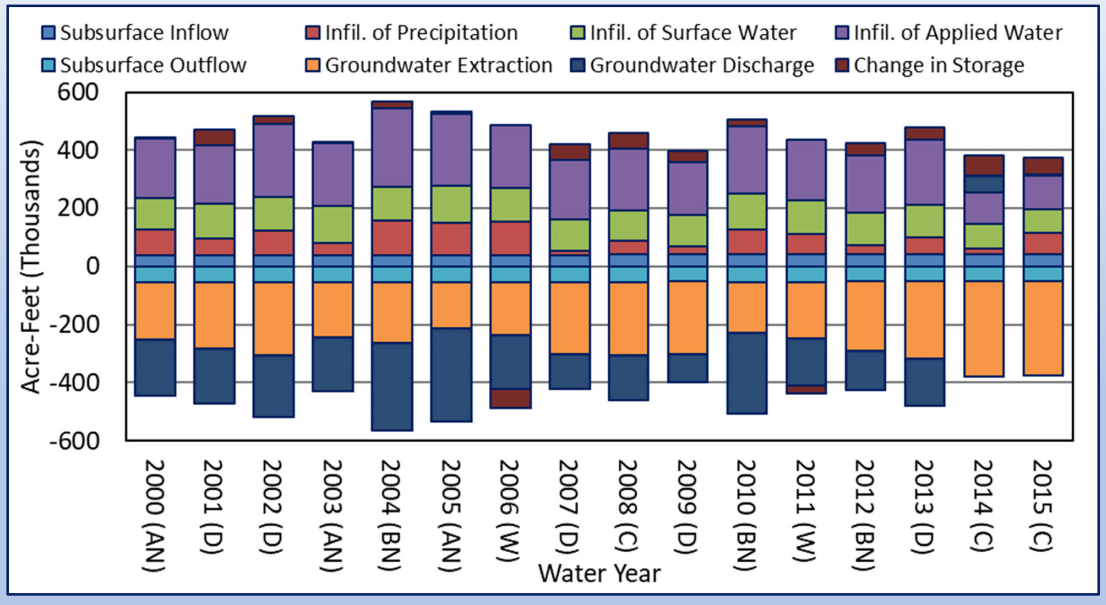
Surface Water System Budget



Hydrologic Year Types: W = Wet; AN = Above Normal; B = Below Normal; D = Dry; C = Critical

Initial Water Budget Results: Colusa Subbasin in Glenn County

Groundwater System Budget

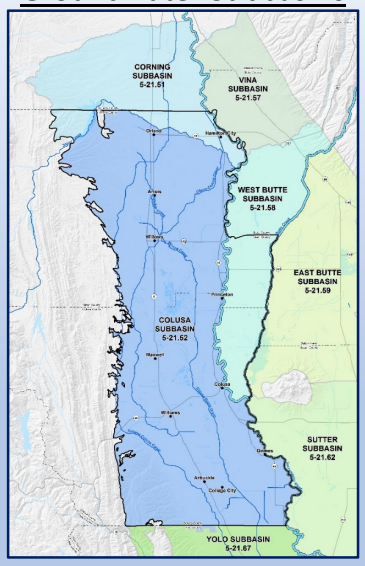


Hydrologic Year Types: W = Wet; AN = Above Normal; B = Below Normal; D = Dry; C = Critical

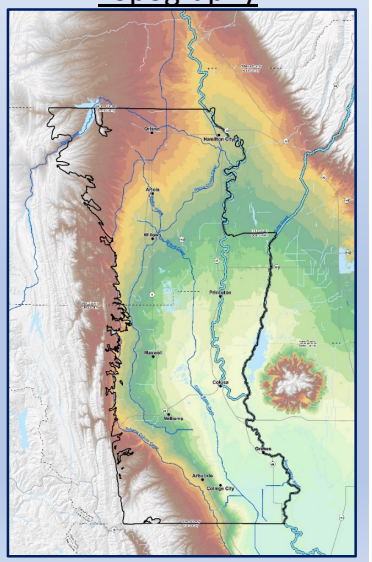
Hydrogeologic Conceptual Model

- Characterize alluvial subbasins in Glenn County subject to SGMA
- Prepare maps
- Deliverables
  - HCM Report
  - Associated Datasets

Groundwater Subbasins

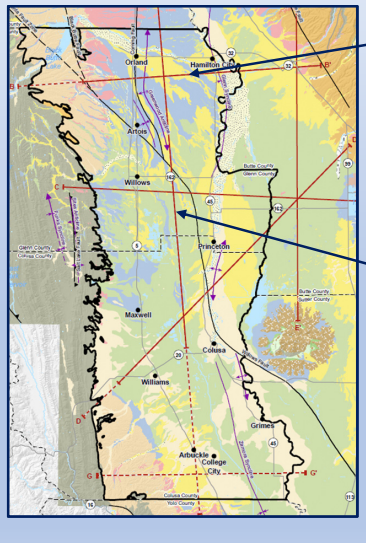


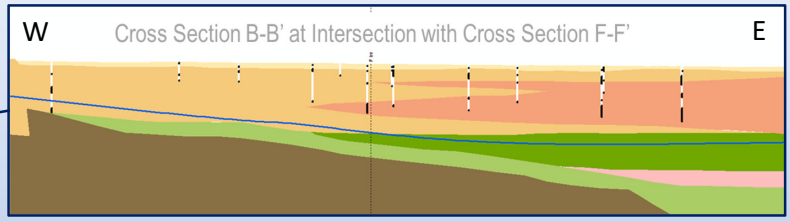
Topography

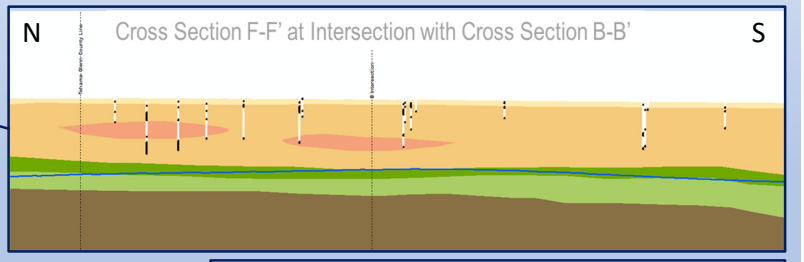


Hydrogeologic Conceptual Model

Geologic Cross Sections





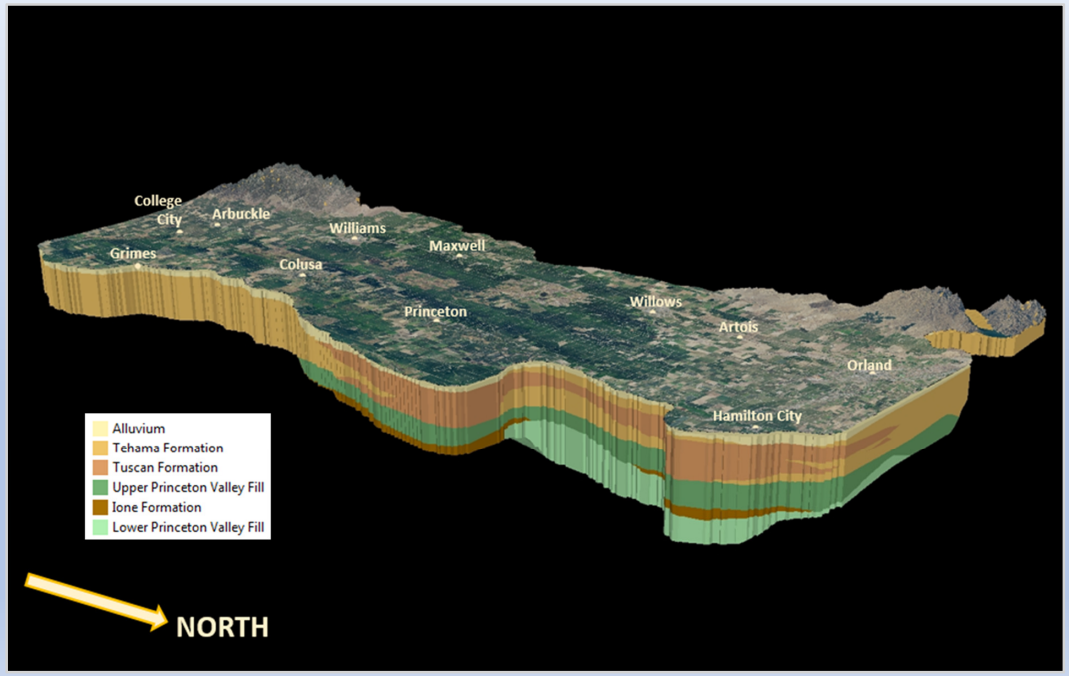


Geologic Units

- Alluvium
- Tehama Formation
- Tuscan Formation
- Upper Princeton Valley Fill
- Lovejoy Basalt
- Ione Formation
- Lower Princeton Valley FIll
- pre-Tertiary Rocks and Deposits
- Base of Fresh Water (~2,000mg/L TDS)

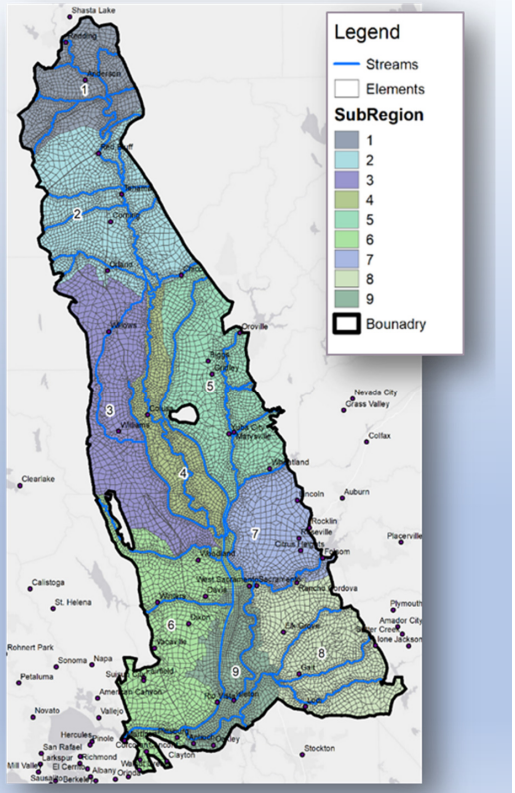
Hydrogeologic Conceptual Model

3D Geologic Model



Model Evaluation

- Evaluate existing/forthcoming Integrated Hydrologic Models
- Develop and apply evaluation criteria
- Stop short of final model selection
- Objective of leveraging existing information
- Deliverables
  - Model Evaluation Report



Model Evaluation

DRAFT Ranking Results

	Model/Application			
	C2VSim-FG	SVSim	CVHM	SacFEM2013
Criteria Based on BMP Guiding Principles and General Modeling Requirements[a]				
Model code is publicly available at no cost and complete modeling platform (input and output files and executables) can be provided to DWR at no cost	10	10	10	0
Model code has been peer reviewed for the intended use	10	10	10	0
Model has publicly available supporting documentation, including explanation of the model code (physical processes simulated, mathematical equations, and assumptions) and model application (conceptual model, application development, assumptions, inputs, etc.)	10	10	10	0
Models developed after effective date of GSP regulations (August 15, 2016) must use public domain open-source software	10	10	10	0
Spatial extent of the model application covers entire subbasin at a minimum[b]	10	10	10	10
Score Based on Binary Criteria	**50**	**50**	**50**	**10**
Criteria Based on BMP Modeling Considerations[c]				
Application capable of evaluating each sustainability indicator and the potential presence of and magnitude of undesirable results in the basin, including:				
Lowering of Groundwater Levels	3	3	3	3
Reduction of Groundwater Storage	3	3	3	3
Seawater Intrusion	Not applicable in the Glenn County Subbasins			
Degraded Water Quality	1	1	1	1
Land Subsidence	3	3	3	1
Depletion of Interconnected Surface Water	2	3	1	1
Model application supports development of water budgets	2	3	1	2
Model application capable of forecasting future conditions, such as reduction of surface water supplies, changes in land use and associated water demands, the effects of climate change, and quantifying the uncertainty in these predictions	3	3	3	2
Model application capable of demonstrating how selected projects and management actions will achieve the sustainability goal within 20 years of GSP implementation	3	3	3	2
Model application capable of identifying data gaps and monitoring needs	2	3	1	2
Model application capable of assessing impacts on adjacent basins	2	3	1	2
Model application adaptable to refined hydrogeologic interpretations and incorporation of additional data.	3	3	3	3
Model application capable of simulating forecast changes in agricultural practices, including changes in crop types, irrigation practices, irrigation water source, etc.	3	3	2	3
Model application capable of efficiently and effectively conveying simulation outputs, either directly or with post-processing tools	3	3	3	2
Score Based on Gradational Criteria	**33**	**37**	**28**	**27**
Total Score	**83**	**87**	**78**	**37**

Discussion