



COLUSA GROUNDWATER AUTHORITY AND GLENN GROUNDWATER AUTHORITY

Colusa Subbasin Groundwater Workshop

September 19 & 23, 2019

Program



- Welcome and Introductions
- Sustainable Groundwater Management Act (SGMA) Overview
- SGMA Basin Setting - Colusa Subbasin
 - Basin Setting Presentation
 - Small Group Discussion – Subbasin Challenges
 - Water Budget Update
 - Modelling Update
- Groundwater Sustainability Planning - Next Steps
- GSA Question and Answer Session (Comment Cards Available)
- Adjourn

Sustainable Groundwater Management Act (SGMA) Overview

Dave Ceppos – Facilitator, Sacramento State University

SGMA: Who is Affected



Agricultural



Municipal



Industrial



Environmental



Sustainable Groundwater Management Act **SGMA**

- Sustainable Groundwater Management Act of 2014
- **Groundwater Sustainability Agency(ies) (GSA)** by June 30, 2017
- **Groundwater Sustainability Plan(s) (GSP)** by January 31, 2022
- Annual reporting and GSP Update every 5 years, demonstrating progress towards sustainability
- 20 years to achieve Sustainability – 2042
- **SGMA is a completely different program than the Irrigated Lands Regulatory Program (Colusa Glenn Subwatershed Program)**

Groundwater Sustainability Agency Eligibility Requirements

- Local Public Agencies Responsible for:
 - Water Management
 - Water Supply
 - Land Use Authority
 - *For Example: Cities, Counties, Irrigation Districts*
- One or more GSAs must be formed per Basin / Subbasin
- Formed by a single eligible agency or by legal agreement between two or more
- Counties represent / manage all groundwater conditions outside another managed area (Water Code §10724)

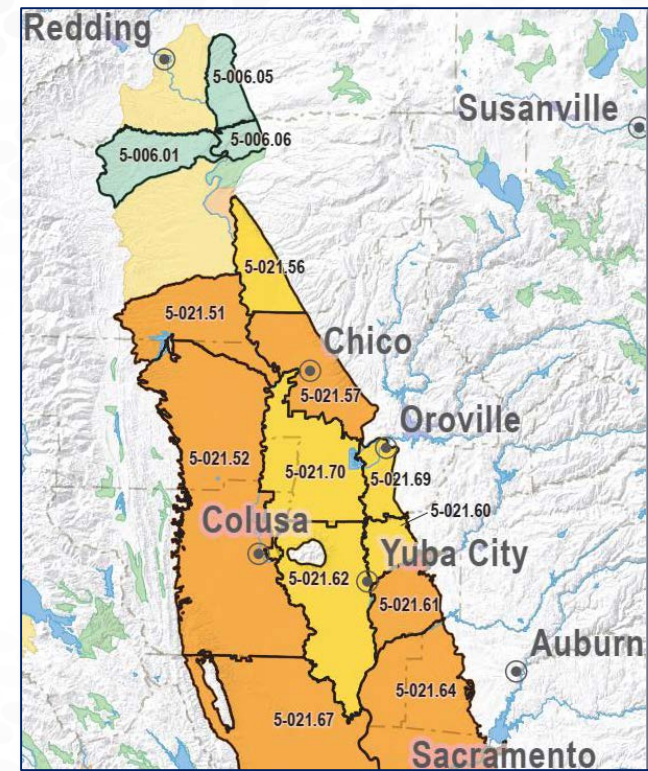
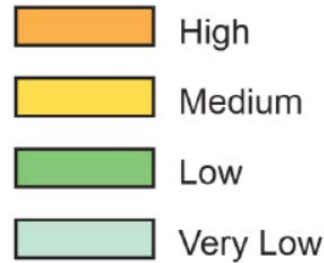
GSA Roles and Responsibilities



- Governance
- Outreach and Engagement
- Funding
- Information Gathering
- Plan Development and Reporting
- Projects (e.g. Groundwater Recharge)
- Groundwater Regulation and Enforcement
- Groundwater Extraction Oversight
- Property Acquisition and Management

SGMA Foundations

- 515 Groundwater Basins / Subbasins Statewide
- 98 Basins / Subbasins required to comply with SGMA*
- Compliance based on basin prioritization as mandated by State Legislature in 2009.
- Prioritization variables include (but not limited to):
 - Population
 - Socioeconomics
 - Number of wells
 - Groundwater elevations
 - Irrigated acres



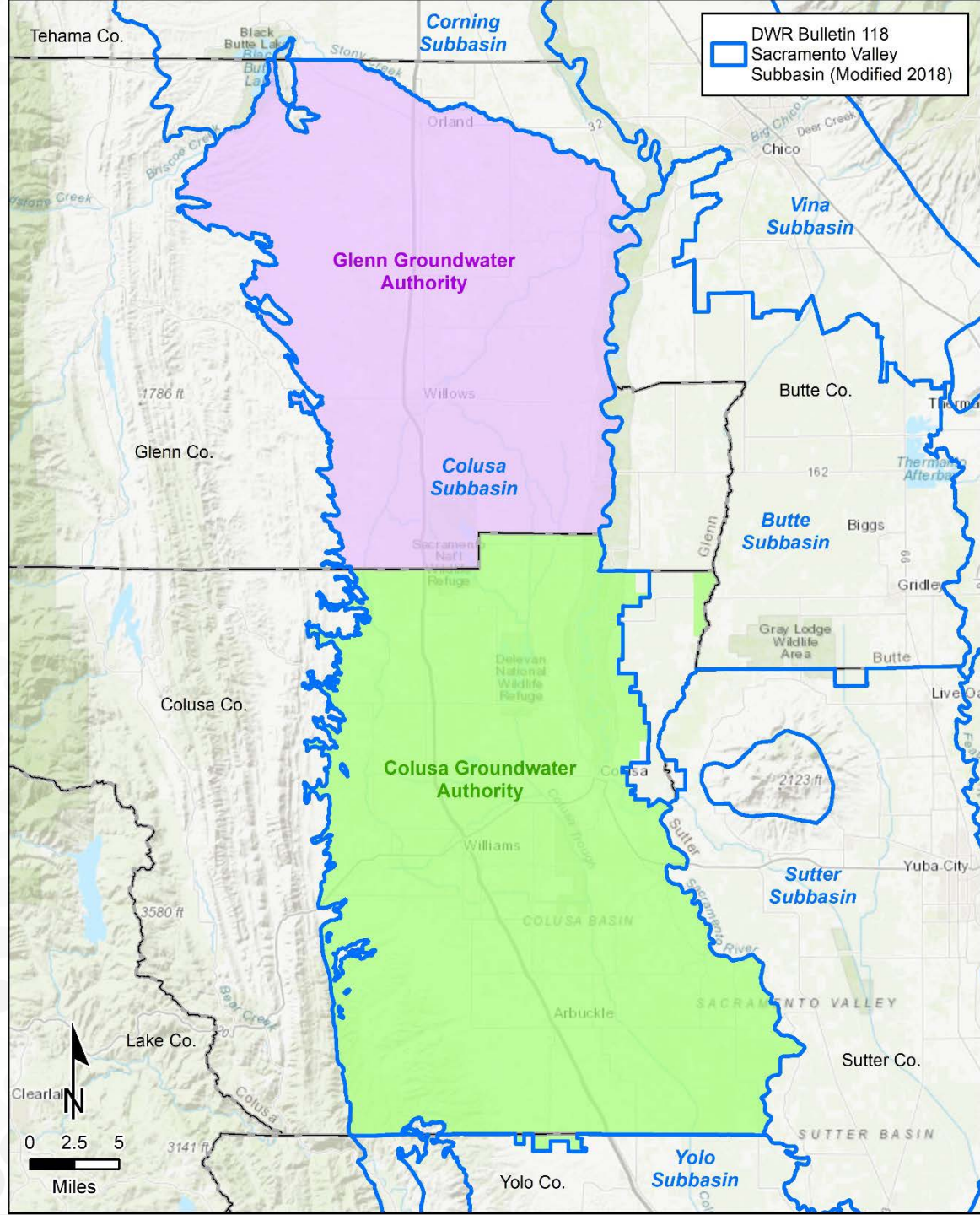
SGMA Foundations



Beneficial Users (Water Code §10723.2)

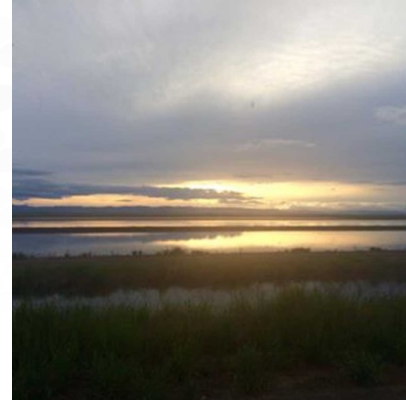
- All Groundwater Users
- Holders of Overlying Rights (agricultural and domestic)
- Municipal Well Operators
- Public Water Systems
- Tribes
- Local Land Use Planning Agencies
- Counties
- Local Landowners
- Disadvantaged Communities
- Businesses
- Federal Government
- Environmental Users
- Surface Water Users (*if connection between surface and groundwater*)

Colusa Subbasin Map



Colusa Groundwater Authority

Member Agencies / Board of Directors



County of Colusa

Denise Carter (Chair) / Alternate: Gary Evans

City of Colusa

Tom Reische / Alternate: Dave Markss

City of Williams

Alfred Sellers, Jr. / Alternate: Sajit Singh

Colusa County Water District

Knute Myers / Alternate: Shelly Murphy

Glenn-Colusa Irrigation District

Blake Vann / Alternate: Thad Bettner

Maxwell I.D. and Westside I.D.

Zachary Dennis / Alternate: Dan Ruiz

Princeton-Codora-Glenn I.D. and Provident I.D.

Jim Campbell / Alternate: Lance Boyd

RD 108

Hilary Reinhard, PE (Vice Chair)

Alternate: Bill Vanderwaal

RD 479

Charles Marsh / Alternate: Derick Strain

Colusa Drain Mutual Water Company

Jim Wallace / Alternate: Lynell Pollock

2 Private Pumper Representatives from the Colusa County Groundwater Commission:

Darrin Williams and Jeff Moresco



Glenn Groundwater Authority

Member Agencies / Board of Directors

County of Glenn

John Viegas / Alternate: Vince Minto

City of Orland

Bruce Roundy

Alternate: Pete Carr

2nd Alternate: Ed Vonasek

City of Willows

Gary Hansen / Alternate: Evan Markey

Glenn-Colusa Irrigation District

John Amaro / Alternate: Thaddeus Bettner

Glide Water District

George Nerli

Alternate: Leslie Nerli

2nd Alternate: Michael Alves

Princeton-Codora-Glenn I.D. and Provident I.D.

Gary Enos / Alternate: Lance Boyd

Kanawha Water District

Randy Hansen / Alternate: Wade Danley

Orland-Artois Water District

Charles Schonauer

Alternate: Emil Cavagnolo

2nd Alternate: Andrea Jones

Sustainability Indicators



Surface Water
Depletion



Reduction
of Storage



Degraded
Quality



Seawater
Intrusion

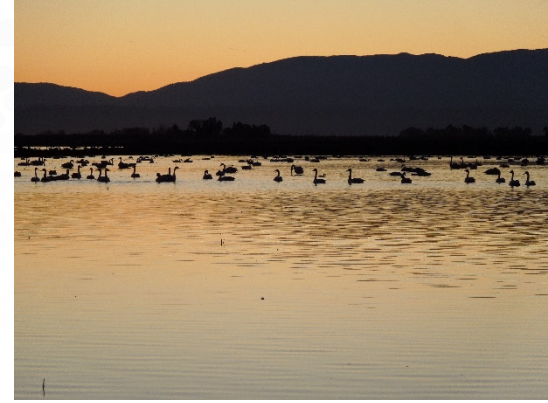


Land
Subsidence



Lowering
GW Levels

Example GSP Section Requirements



- 1. Administrative Information**
- 2. Basin Setting**
- 3. Sustainable Management Criteria**
- 4. Monitoring Networks**
5. Projects and Management Actions
6. Technical & Reporting Standards
7. Interagency Agreements

Example GSP Section Requirements



- Administrative Information
 - General Description of Area
 - Location, Land Uses, Well Information, Maps, etc.
 - Notice and Communication
 - Public Outreach
 - Beneficial User Information and Input
 - GSA Decision-Making

Example GSP Section Requirements



- Basin Setting
 - Hydrogeologic Conceptual Model (HCM)
 - Groundwater Conditions
 - Water Budget
 - Management Areas (if applicable and selected by the GSA)

Example GSP Section Requirements



- Sustainable Management Criteria
 - Sustainability Goal
 - Undesirable Results
 - Minimum Thresholds
 - Interim Milestones
 - Measurable Objectives

Example GSP Section Requirements



- Monitoring Networks
 - Network Objectives for each Sustainability Indicator
 - Scientific Rationale
 - Monitoring Protocols
 - Locations and Type
 - Data and Reporting Standards
 - Assessment and Improvement Methods

GSP Iterative Process



Thank You

Beneficial User input is essential to GSP development and SGMA planning and implementation.

Please visit the websites or contact Staff to get on the contact list:

Mary Fahey

Water Resources Manager, Colusa Groundwater Authority
530-458-0719

CGA Website: <https://colusagroundwater.org/>

Lisa Hunter

Program Manager, Glenn Groundwater Authority
530-934-6501

GGA Website: <https://www.countyofglenn.net/dept/agriculture/water-resources/glenn-groundwater-authority>

SGMA Basin Setting Colusa Subbasin

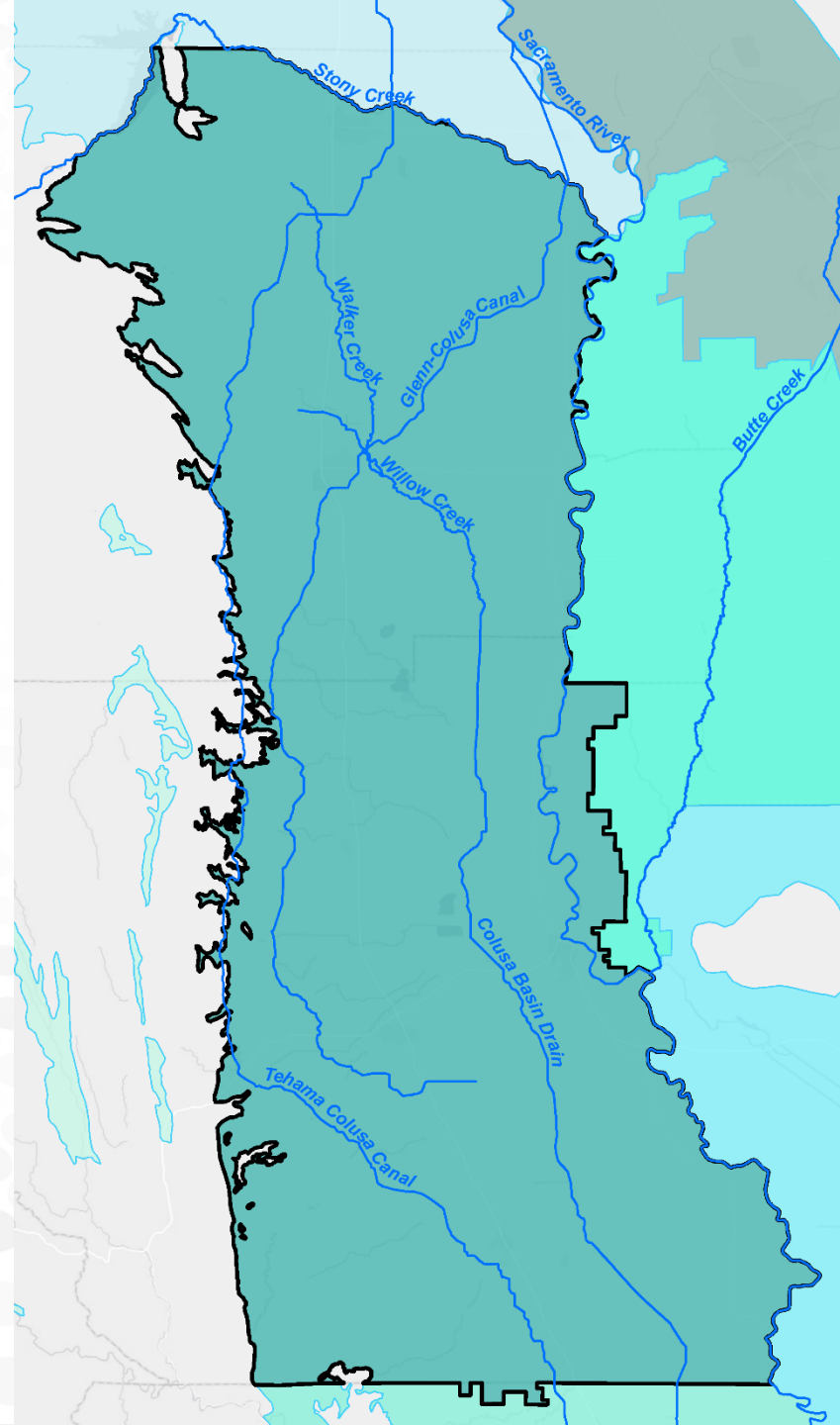
Ken Loy, CHG – West Yost Associates

Dave Ceppos – Facilitator, Sacramento State University

Byron Clark, PE – Davids Engineering

Session Agenda

- Basin Setting Presentation
 - SGMA Definitions
 - Colusa Subbasin Overview
 - Groundwater Flow in Alluvial Basins
 - Stream-Aquifer Interactions
 - Colusa Subbasin HCM
 - Colusa Subbasin Groundwater Conditions
- Small Group Discussions
- Water Budget Update
- Modelling Update



Basin Setting

“Basin Setting”

Definition

(23 CCR § 354.12)

“... physical setting ... characteristics ... and current conditions of the basin ... including ... **data gaps** and **levels of uncertainty** ... that serve as the basis for defining and assessing reasonable **sustainable management criteria** and projects and management actions.”

Includes

- Hydrogeologic Conceptual Model (HCM)
- Groundwater Conditions
- Water Budget
- Management Areas (if applicable)

Logical Progression of Basin Activities Needed to Increase Basin Sustainability

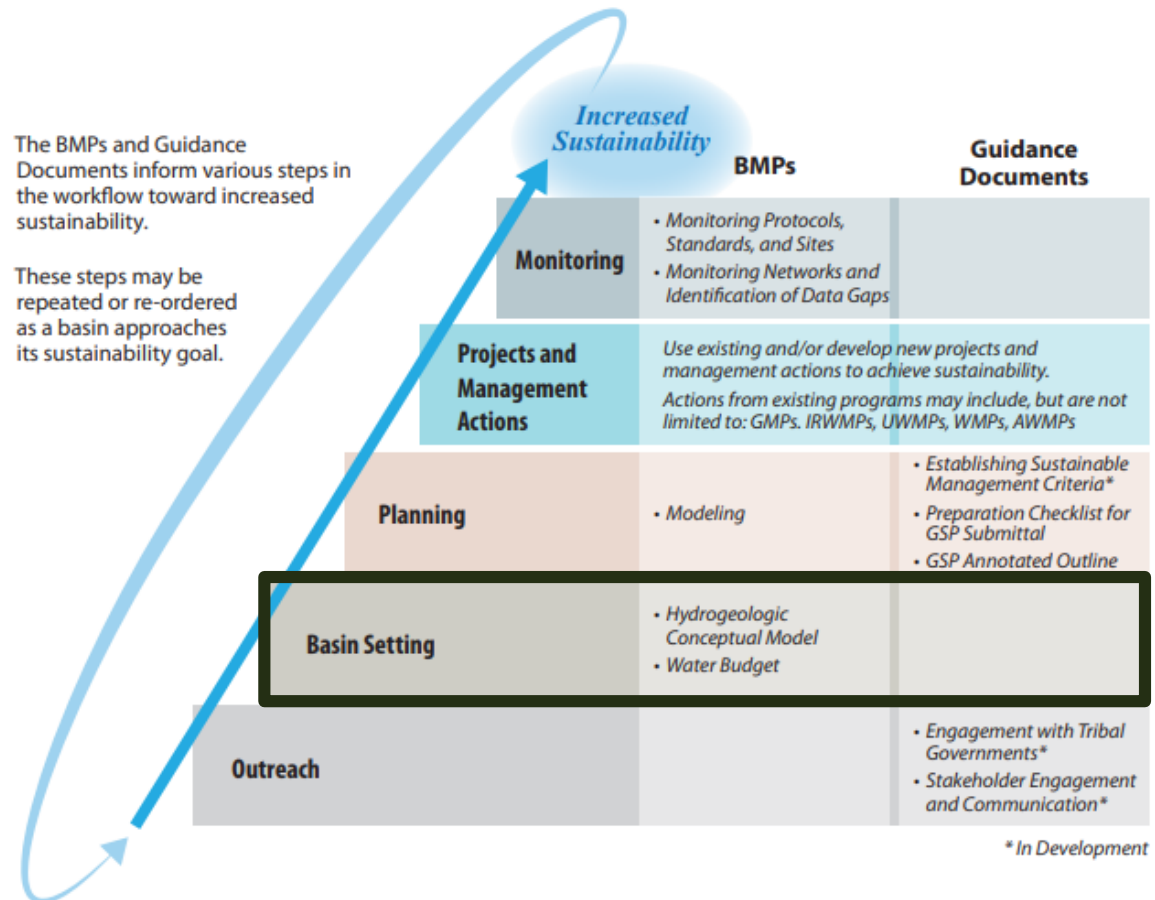


Image Source: DWR, Framework BMP, December 2016.

“Data Gaps” and “Uncertainty”

- **Data Gaps** refer to a lack of information that significantly affects the understanding of the basin setting.
- **Uncertainty** refers to a lack of understanding of the basin setting that affects an Agency's ability to develop sustainable management criteria, appropriate projects, and management actions in a Plan.
- **Data Gaps** and **Uncertainty** may limit the ability to evaluate the efficacy of Plan implementation and to assess whether a basin is being sustainably managed.

“Sustainability Indicators” and Sustainable Management Criteria

- **Sustainability Indicators** refer to any of the effects caused by groundwater conditions that can cause undesirable results with regard to:

- Groundwater levels
- Groundwater storage
- Seawater intrusion
- Water quality
- Land subsidence
- Interconnected surface water

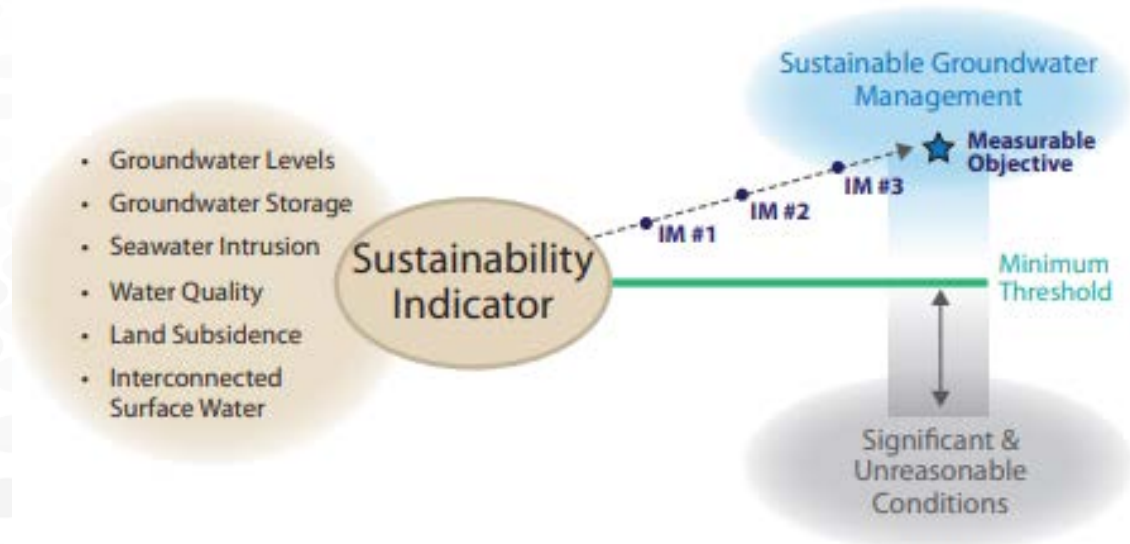
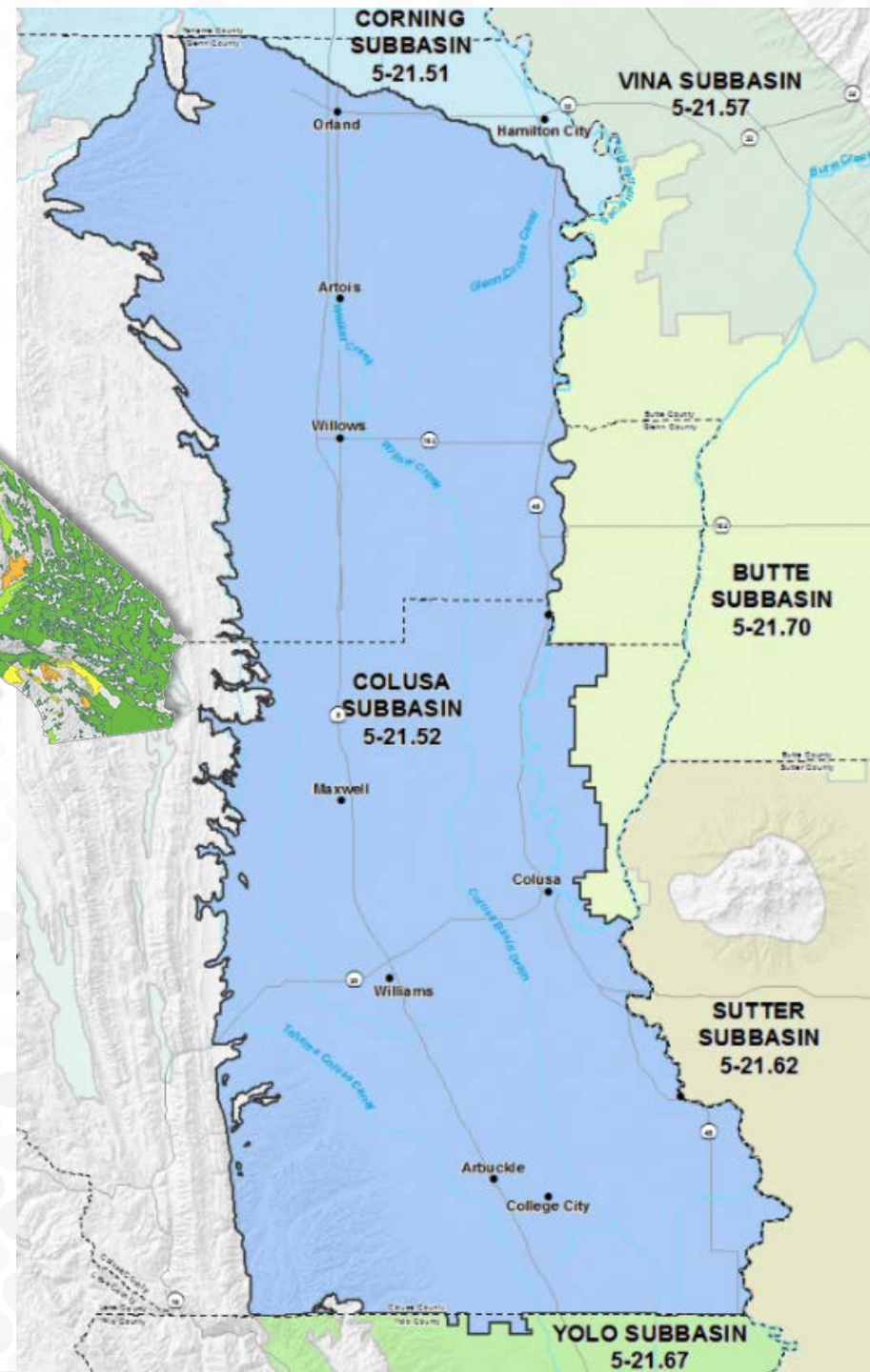
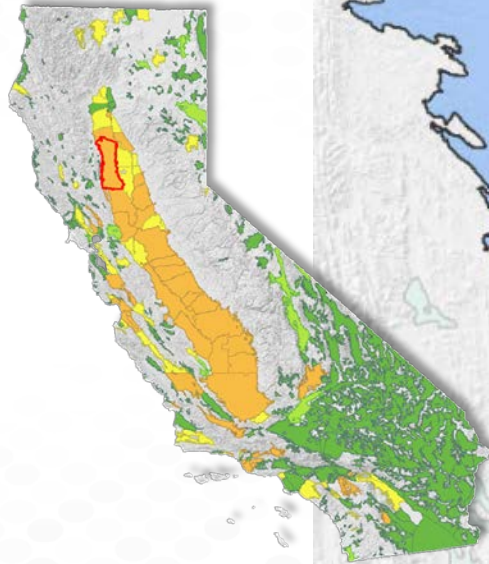


Image Sources: DWR, GSP Emergency Regulations Guide, July 2016.

Colusa Subbasin

- Largest Subbasin in the Sacramento Valley
- 724,000-acre Area
- 60 miles North-South
- 20 miles East-West
- 1,500 ft Thickness



Groundwater Flow in Alluvial Basins

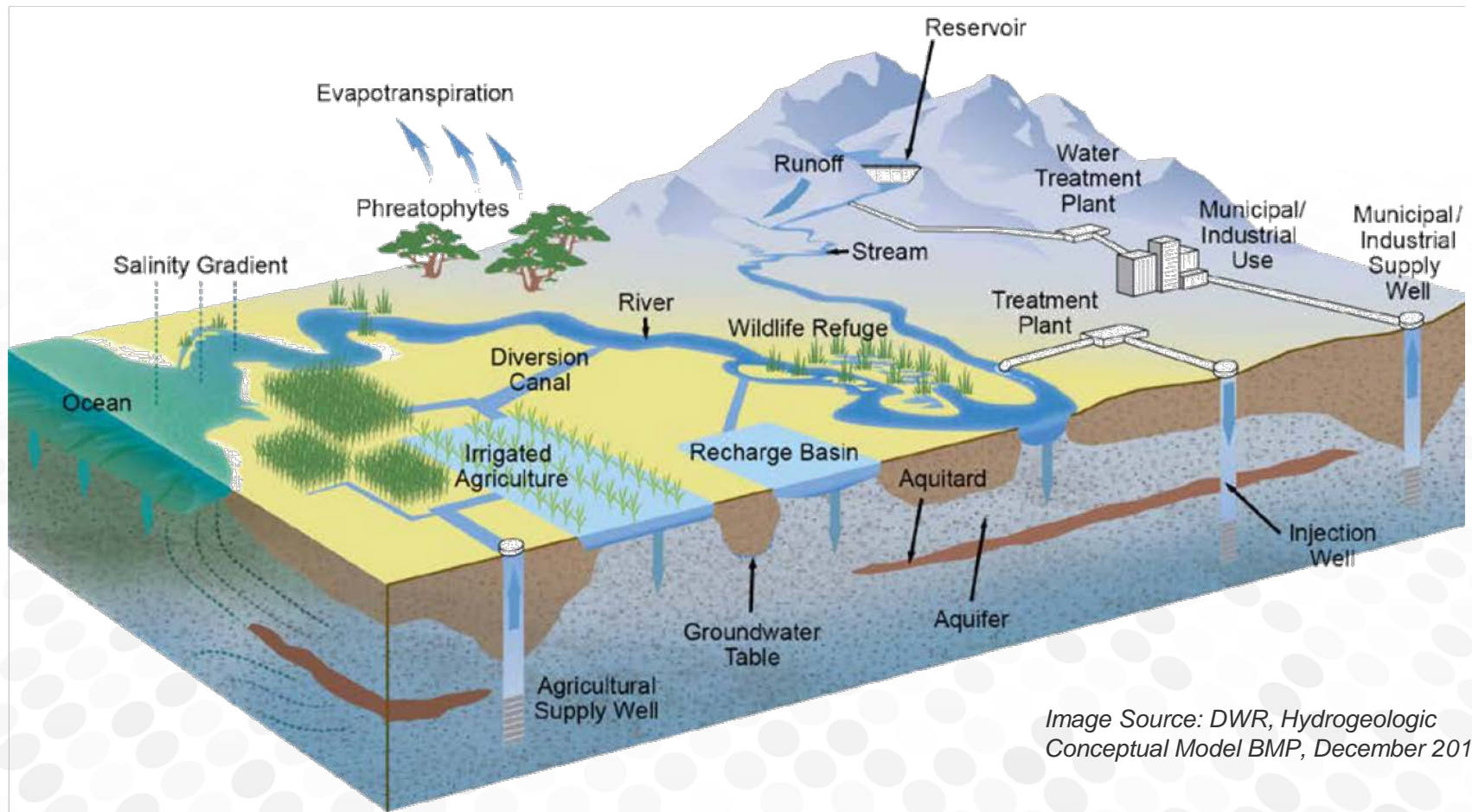
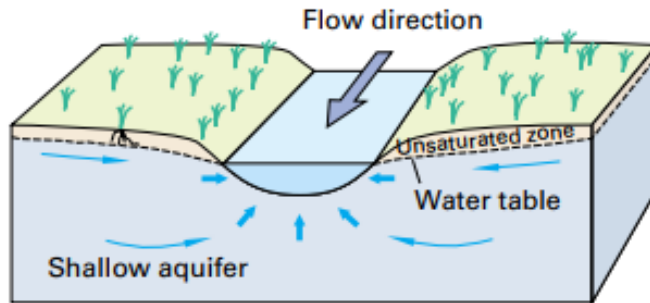


Image Source: DWR, Hydrogeologic Conceptual Model BMP, December 2016.

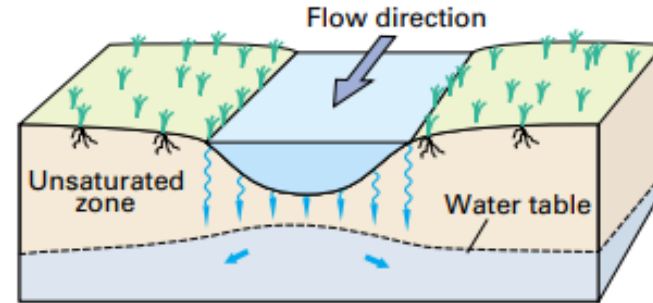
Stream – Aquifer Interactions

GAINING STREAM



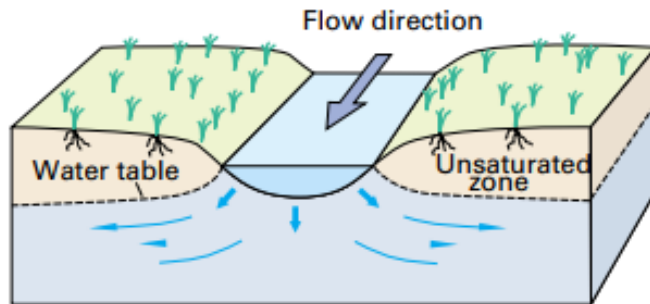
Gaining streams receive water from the groundwater system.

DISCONNECTED STREAM



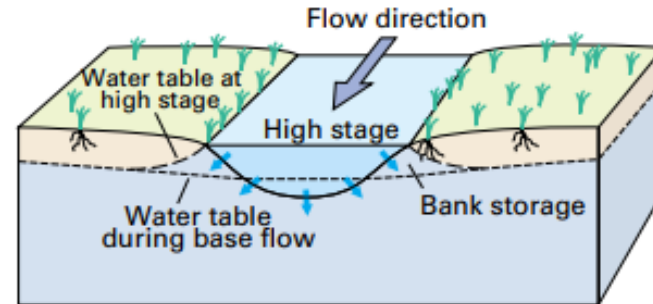
Disconnected streams are separated from the ground water system by an unsaturated zone. For disconnected streams, losses are independent of the groundwater level.

LOSING STREAM



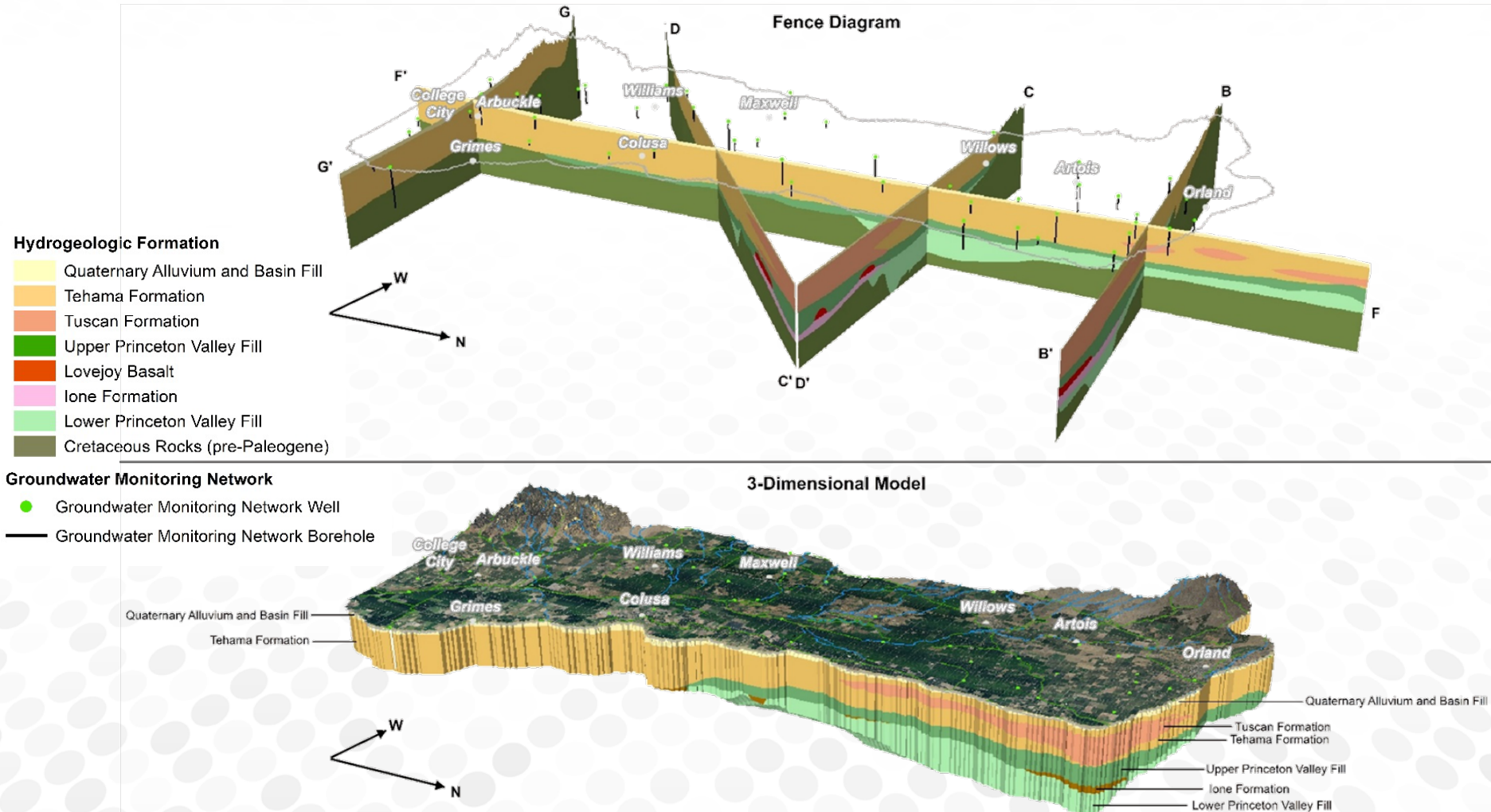
Losing streams lose water to the groundwater system.

BANK STORAGE



If stream levels rise higher than adjacent groundwater levels, stream water moves into the streambanks as bank storage.

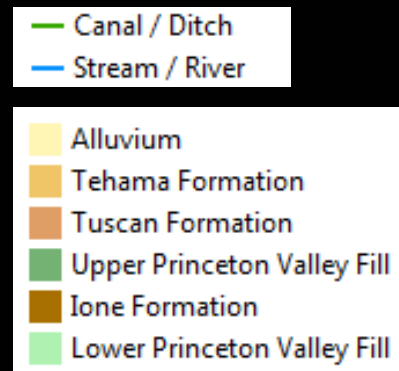
Hydrogeologic Conceptual Model



Vertical Exaggeration=10x

Image Source: Hydrogeologic Conceptual Model Report, May 2018.

Hydrogeologic Conceptual Model



Vertical Exaggeration=1x

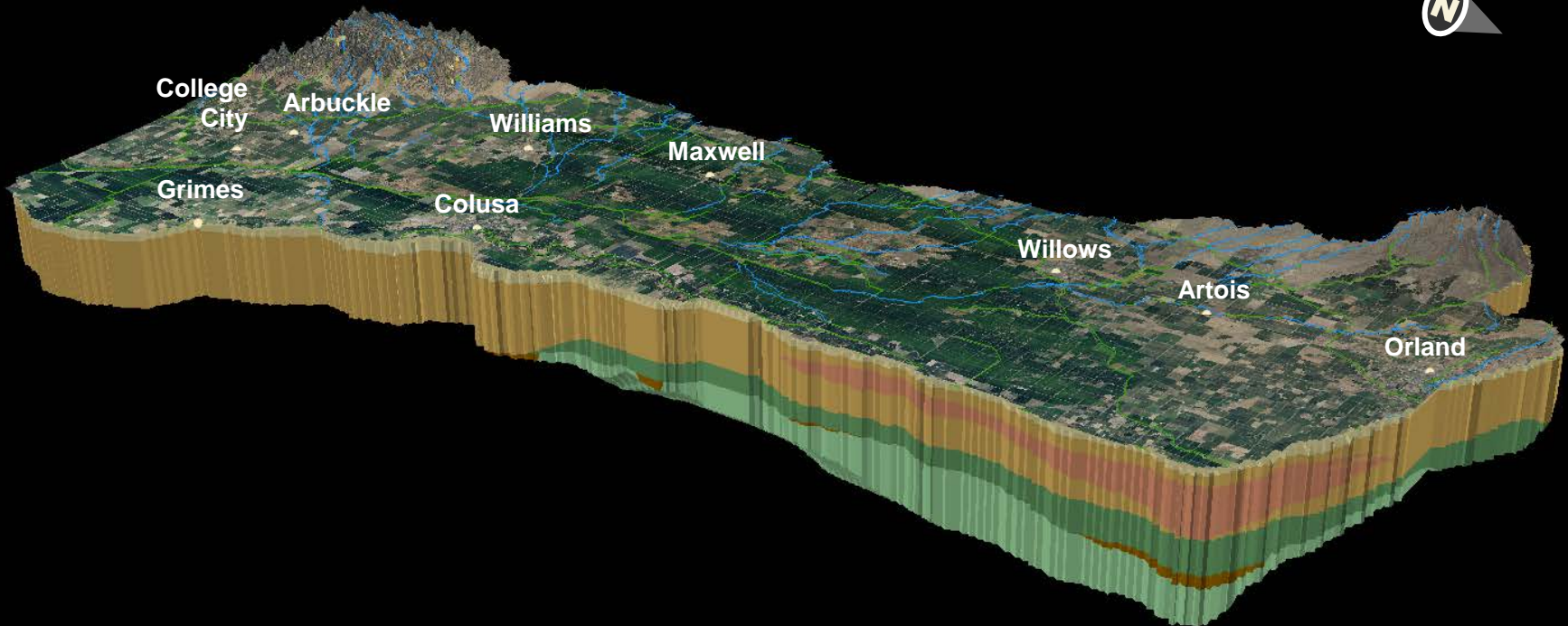


Hydrogeologic Conceptual Model

— Canal / Ditch
— Stream / River

Alluvium
Tehama Formation
Tuscan Formation
Upper Princeton Valley Fill
Ione Formation
Lower Princeton Valley Fill

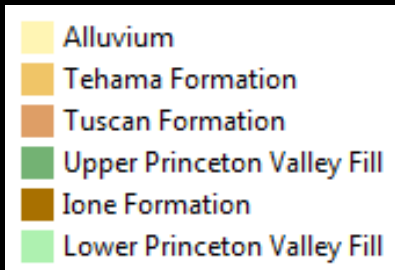
Vertical Exaggeration=10x



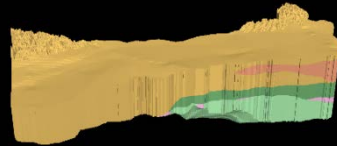
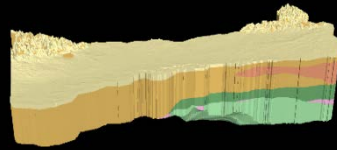
Improved Understanding of Principal Aquifers



Vertical Exaggeration=10x



Stacked Formations



Below Geologic Base of Freshwater



Principal Aquifers



Geologic Formation

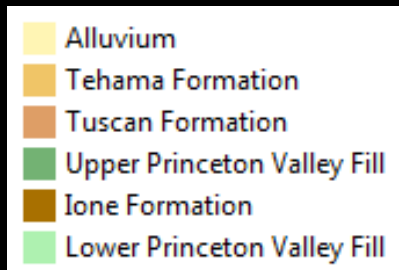
Young Alluvium

Tehama Formation

Tuscan Formation

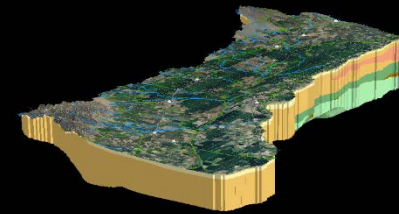
Upper Princeton Valley Fill
Ione Formation
Lower Princeton Valley Fill

Multi-Directional View of HCM

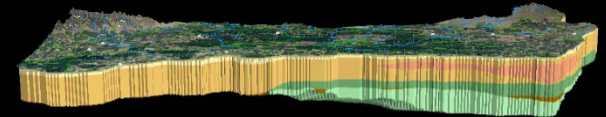


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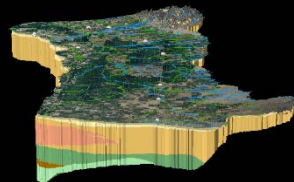
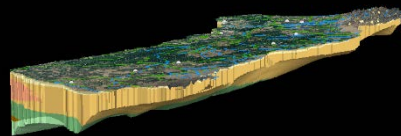
Looking North



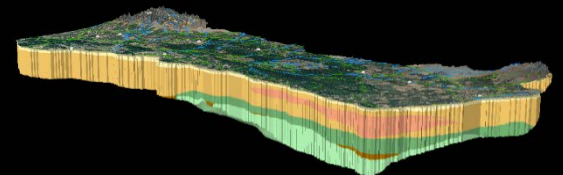
Looking East



Looking West

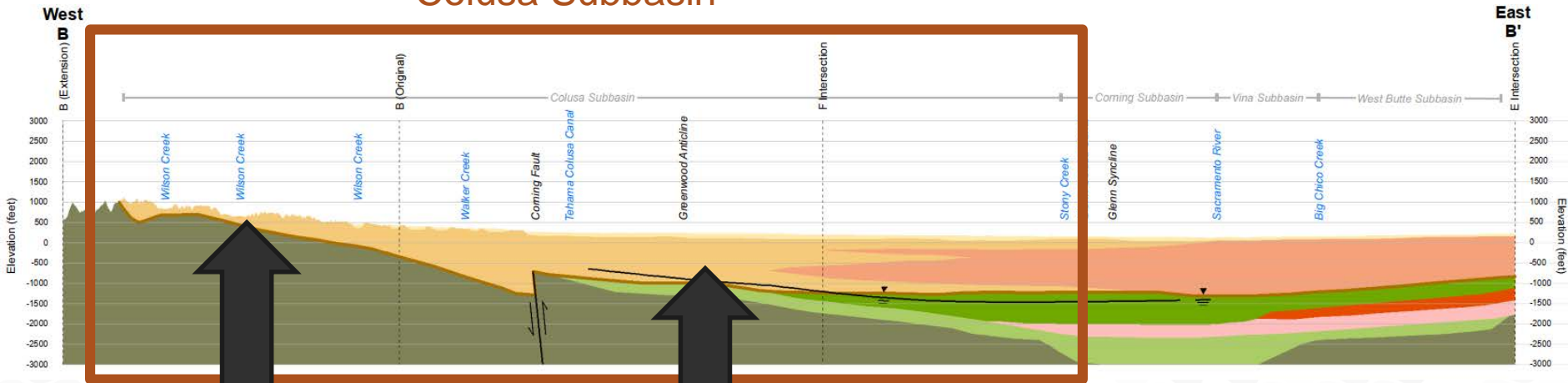


Looking South



Cross Section B-B'

Colusa Subbasin



Principal aquifers are thinner along the western edge of the basin

Principal aquifers are generally thicker closer to middle of the Sacramento Valley

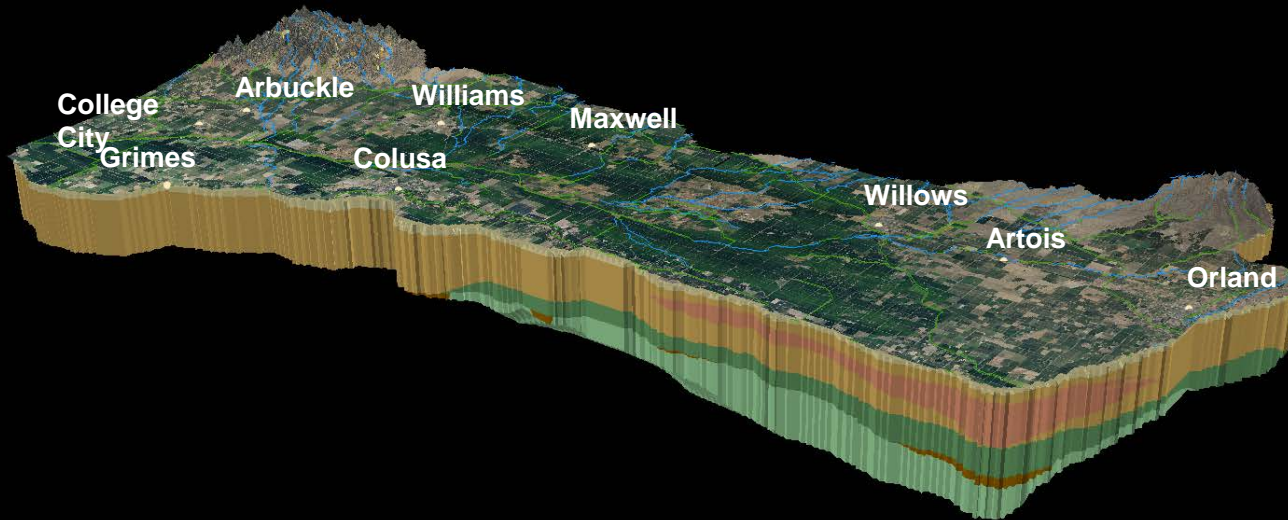
Symbology

- Fault
- Approximate Base of Groundwater Subbasin
- Base of Fresh Water (~2,000 mg/L TDS)

Geologic Units

- | | |
|-----------------------------|----------------------------------|
| Alluvium | Lovejoy Basalt |
| Tehama Formation | Ione Formation |
| Tuscan Formation | Lower Princeton Valley Fill |
| Upper Princeton Valley Fill | Cretaceous Rocks (pre-Paleogene) |

Water Movement Through the HCM



Major Water Budget Components

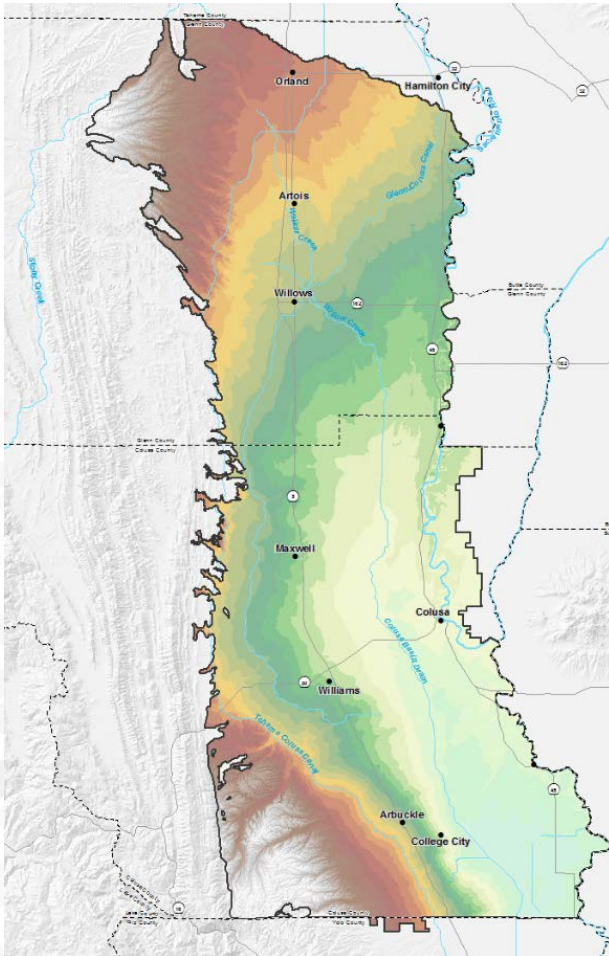
- Precipitation Recharge
- Applied Water Recharge
- Evapotranspiration
- Pumping & Injection
- Surface Water Inflows & Outflows
- Stream - Aquifer Interactions
- Underflow

Vertical Exaggeration=10x

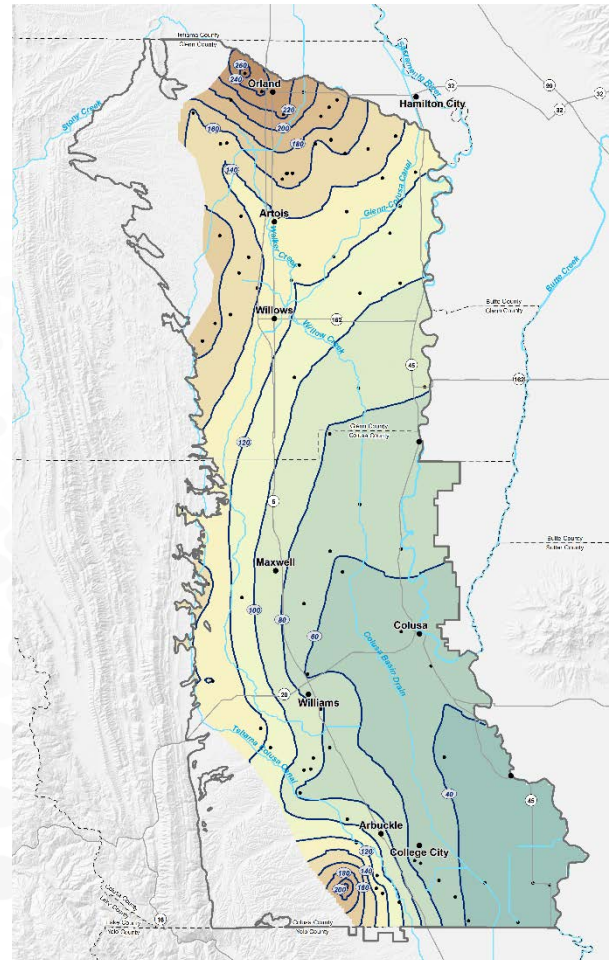


Groundwater Flow Trends

Land Surface Elevation

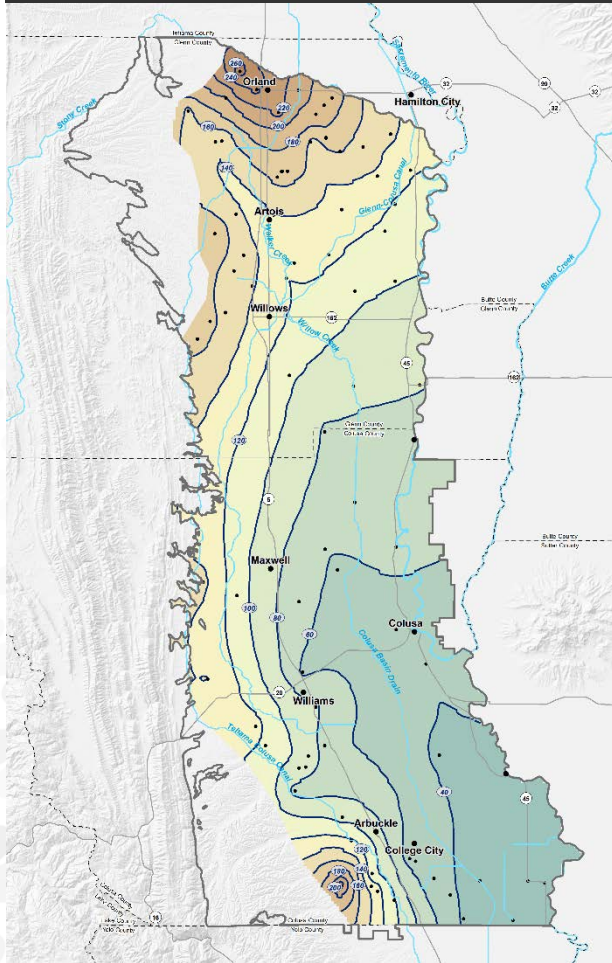


GWE Spring 2006

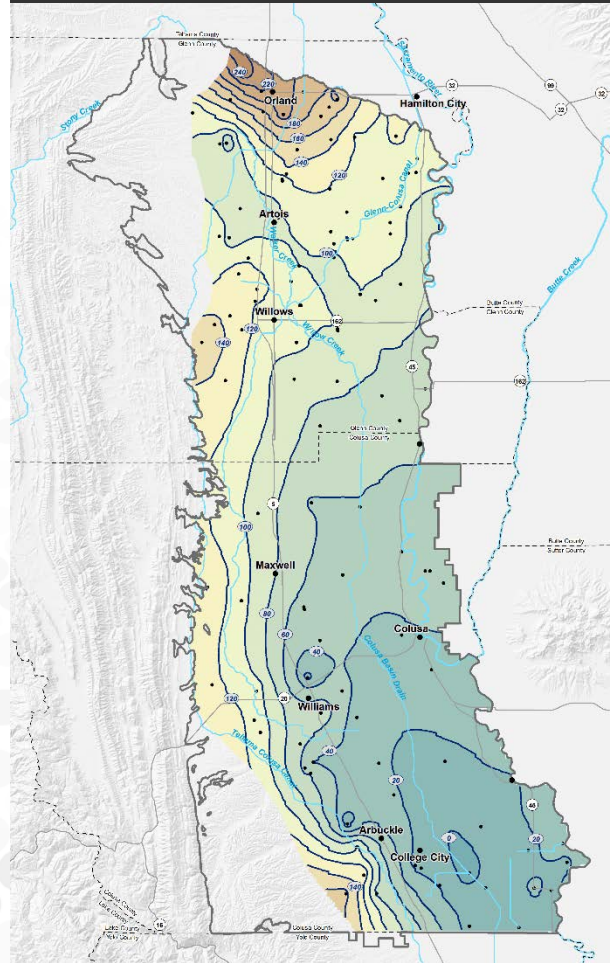


Groundwater Elevation Change - 2006 to 2015

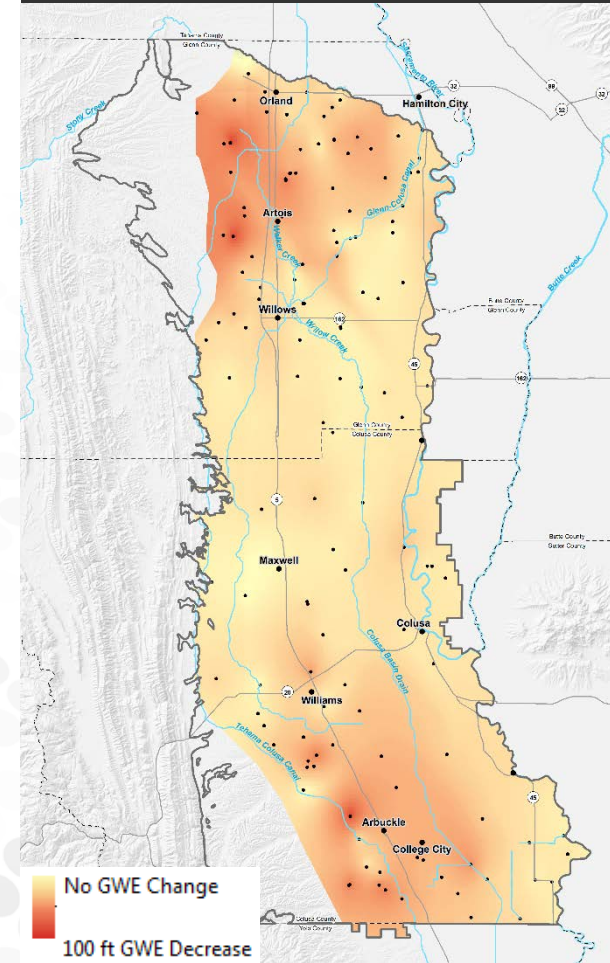
GWE Spring 2006



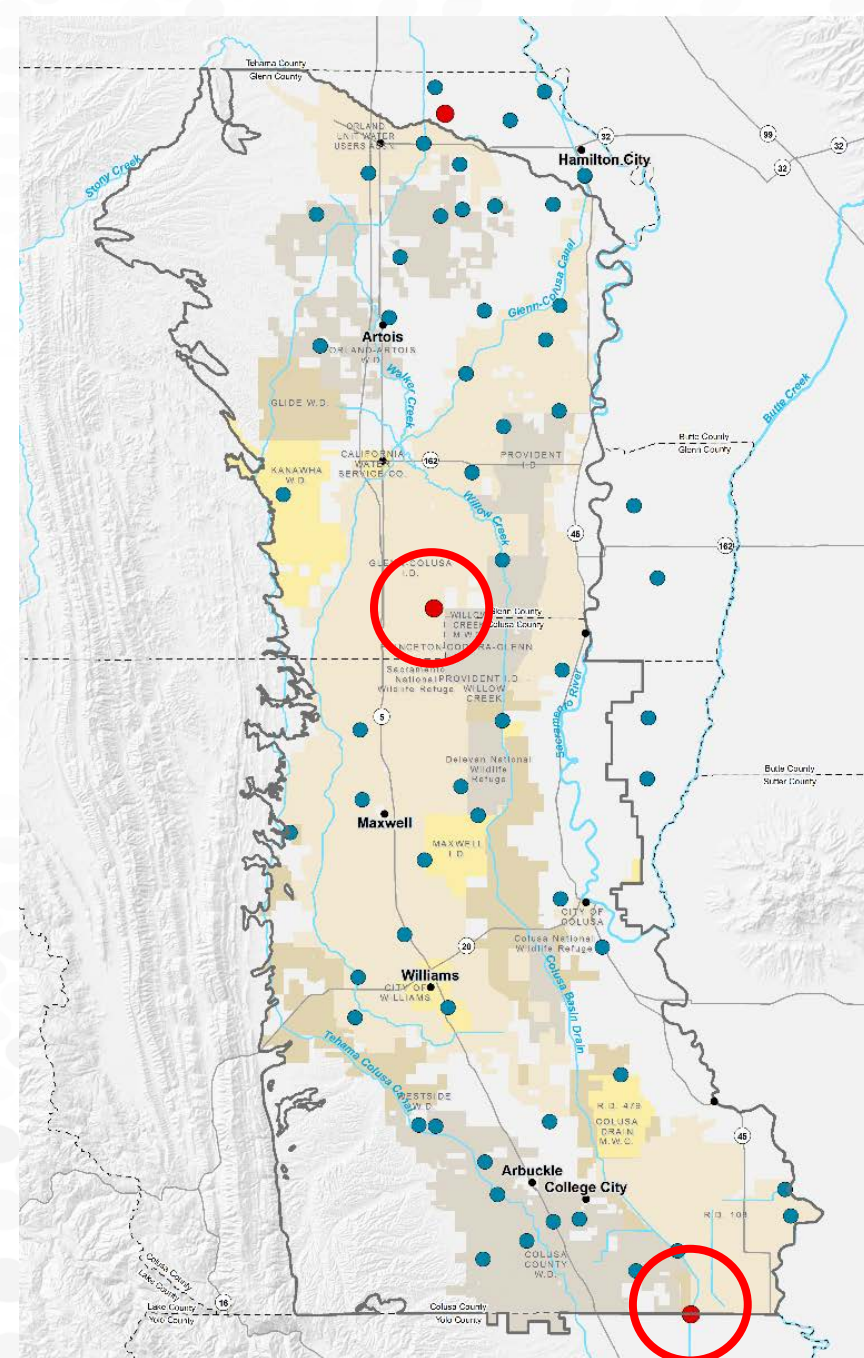
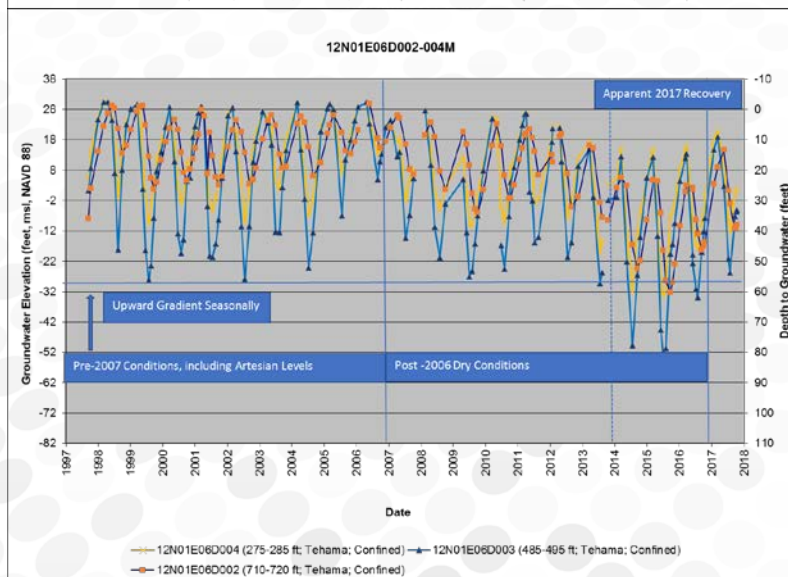
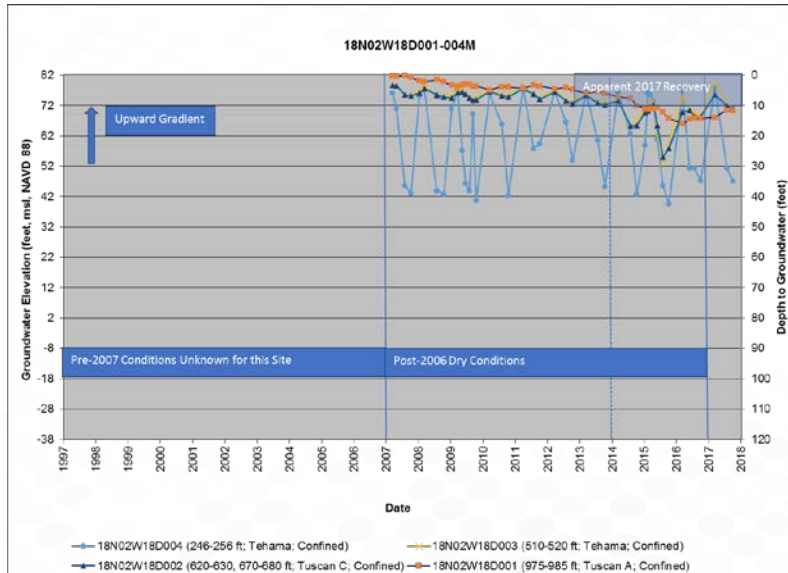
GWE Spring 2015



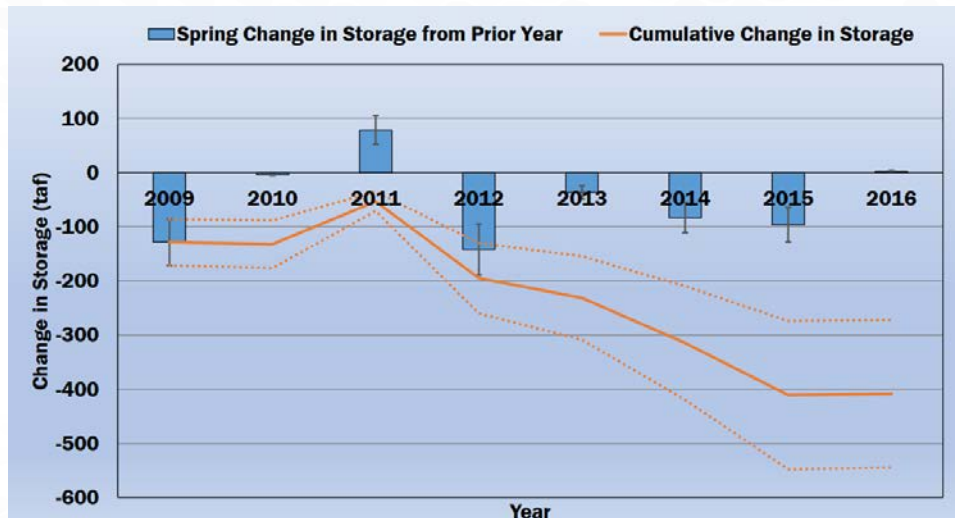
GWE Change



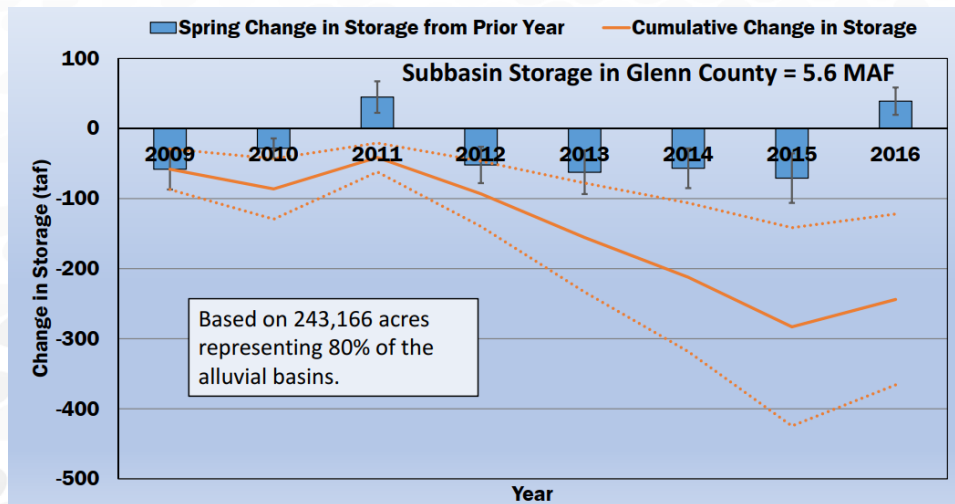
Hydrographs



Colusa Subbasin Groundwater Storage Colusa County



Glenn County



Groundwater Storage

- Storage reduced during multiple-year drought but early analysis indicates recovery.

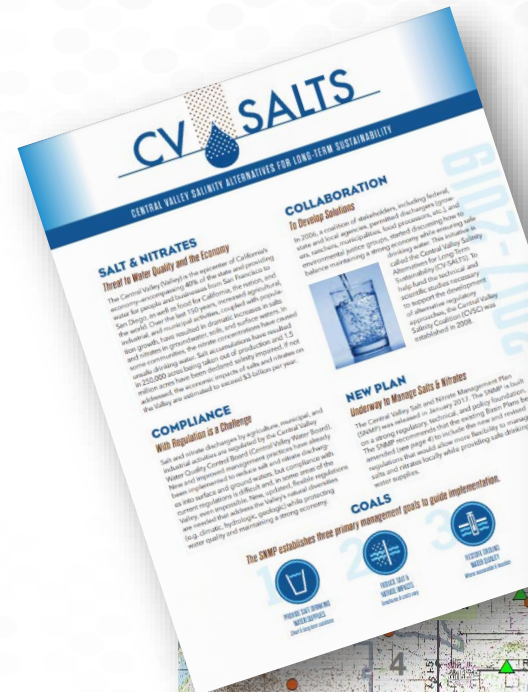
Image Sources:

Groundwater Conditions in Colusa County Relative to Final Groundwater Sustainability Plan Regulations, July 2016.

Glenn County Reconnaissance-Level Groundwater Sustainability Risk Assessment, May 2017.

Groundwater Quality

- Current groundwater quality is generally “good” with potential for some isolated issues.
- Focus will be on impacts to groundwater quality due to activities after implementation of Colusa Subbasin GSP.
- Existing water quality monitoring programs are sufficient and not expected to change due to GSP implementation.



Irrigated Lands Regulatory Program (ILRP)

www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands

For any questions or to find out more information, ILRP staff can be reached at:

Sacramento Office: ILRP Tel: (916) 464-4611
Email: irlands@waterboards.ca.gov

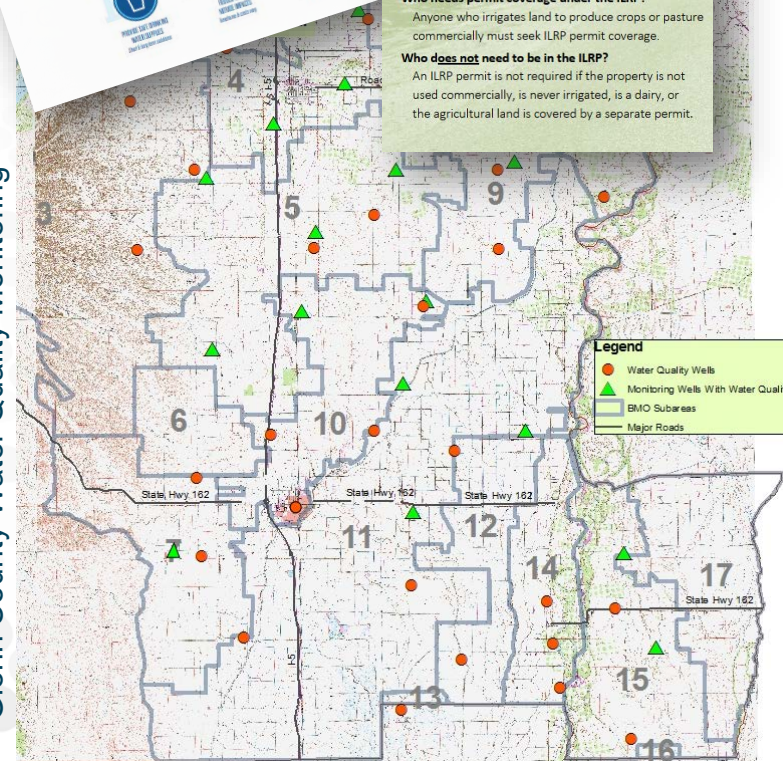
Fresno Office: ILRP Tel: (559) 488-4396
Email: lrpinfo@waterboards.ca.gov

What is the ILRP?
The ILRP is a Central Valley Water Board (CVWB) program that issues permits and conducts compliance and enforcement activities to ensure growers comply with CVWB regulations.

Who needs permit coverage under the ILRP?
Anyone who irrigates land to produce crops or pasture commercially must seek ILRP permit coverage.

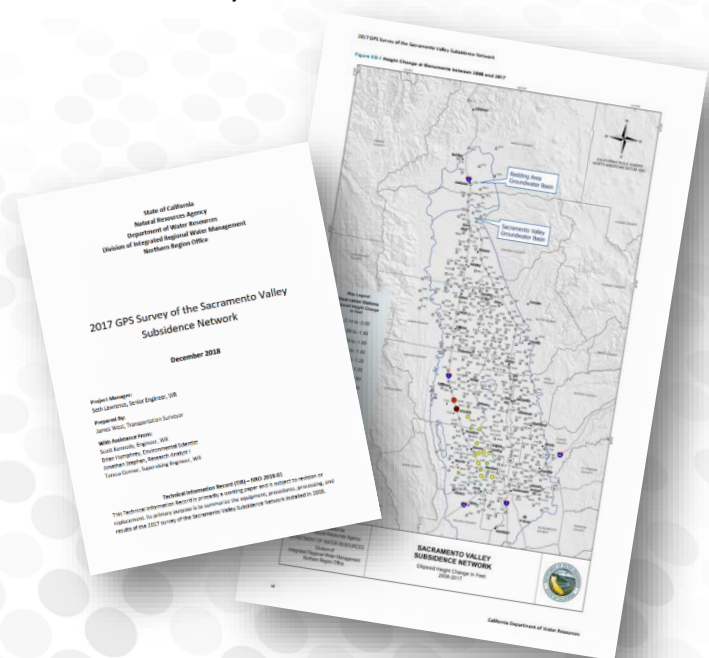
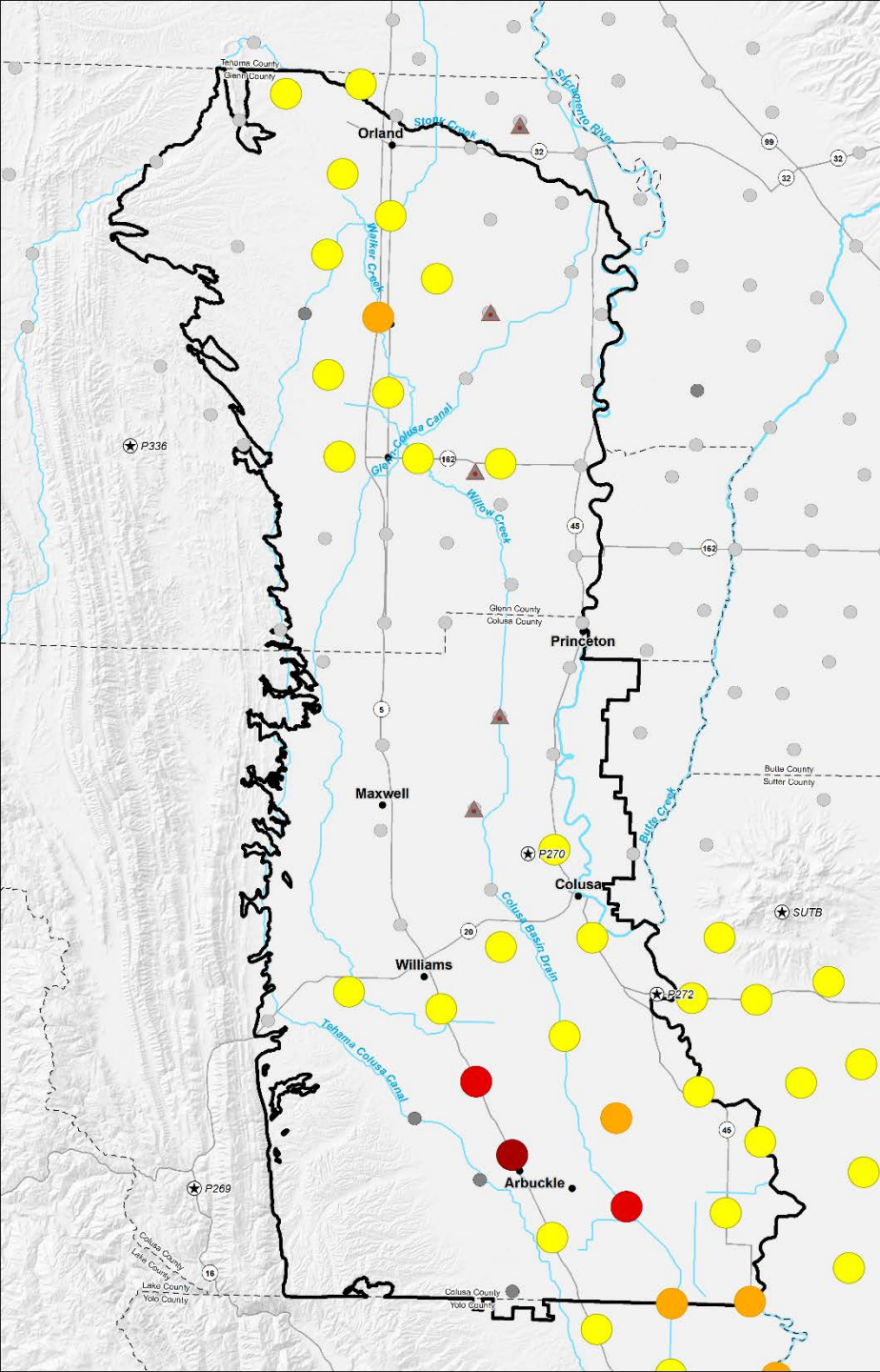
Who does not need to be in the ILRP?
An ILRP permit is not required if the property is not used commercially, is never irrigated, is a dairy, or the agricultural land is covered by a separate permit.

Glenn County Water Quality Monitoring



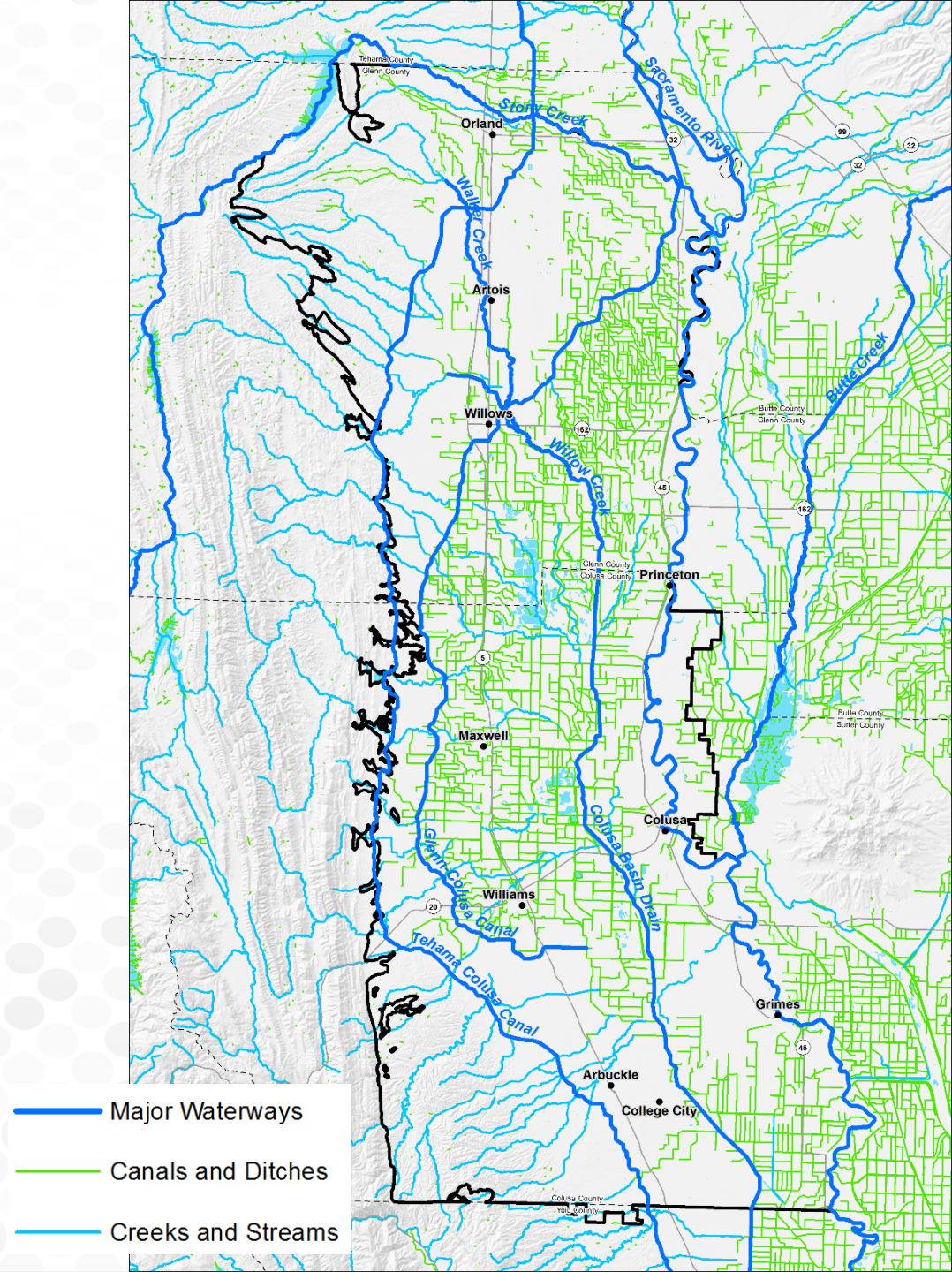
Land Subsidence Survey

2017 GPS Survey Sacramento Valley Subsidence Network, December 2018



Interconnected Surface Waters

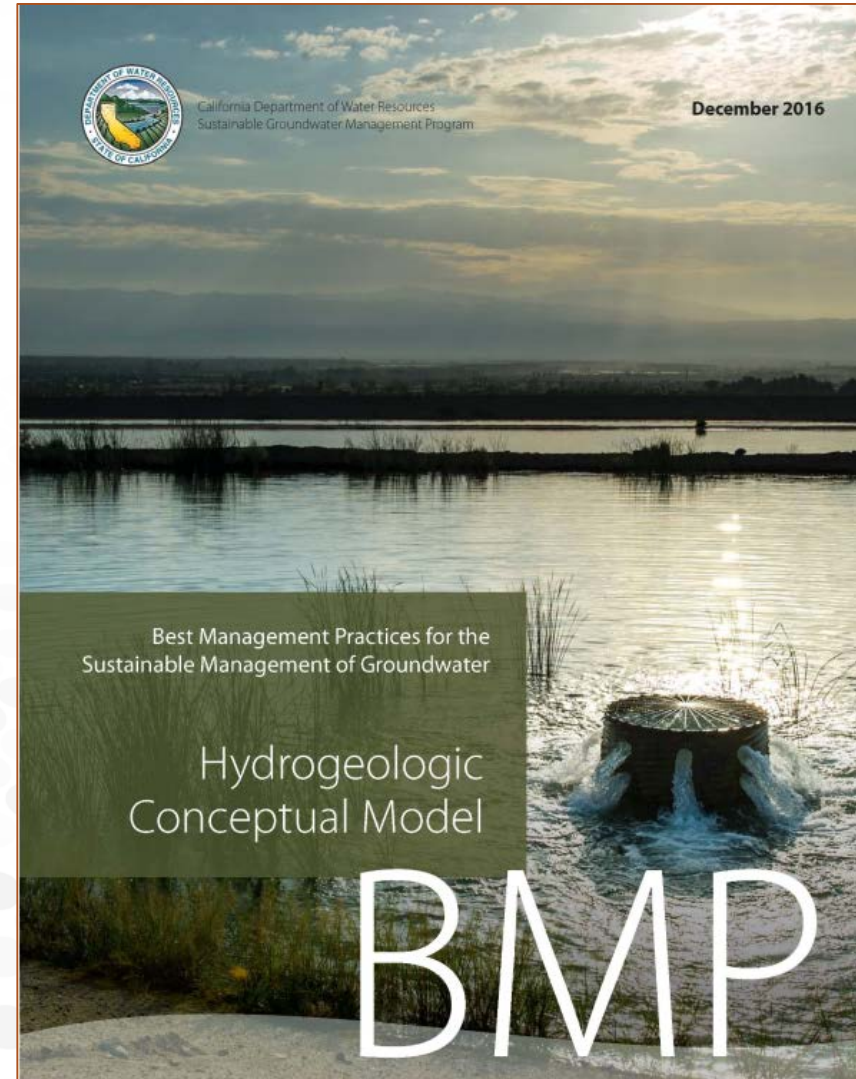
- Interconnected surface waters exist within Colusa Subbasin.
- There is uncertainty regarding how groundwater use under the Colusa Subbasin GSP would impact these surface waters.
- Numerical modelling will be used to evaluate impacts to interconnected surface waters.



Additional HCM Information

- HCM Fundamentals
 - Technical Assistance
 - Key Definitions
 - Related Materials
-
- Google:

“SGMA HCM BMP”



Questions?



Ken Loy, CHG

Principal Hydrogeologist - West Yost Associates

kloy@westyost.com

Small Group Discussions

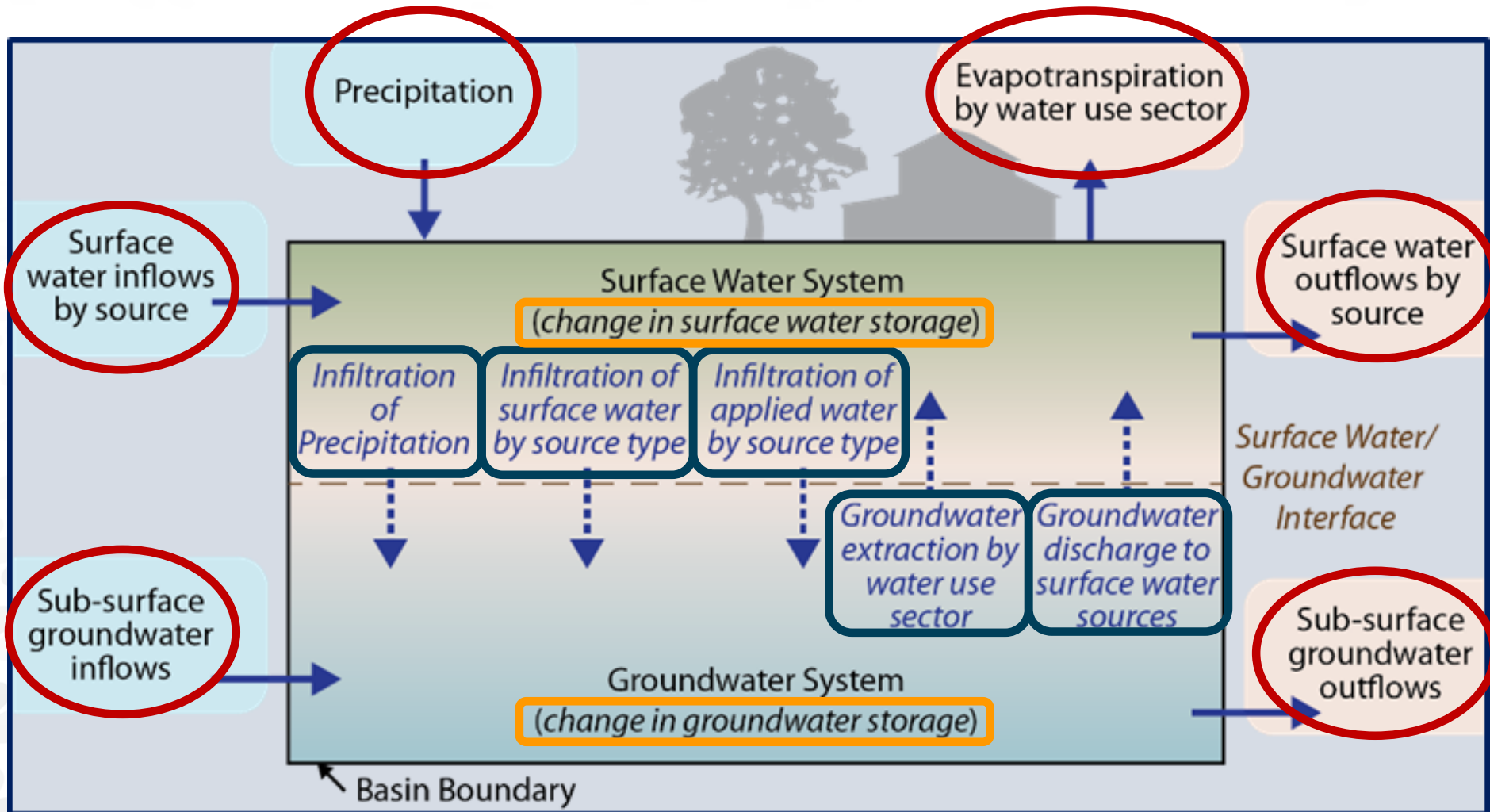
– Subbasin Challenges

Water Budget Update

Water Budget Overview

- Explicitly required for inclusion in the GSP (§354.18)
- Complete accounting of inflows, outflows, and change in storage
- Just like a checking account:
 - Deposits – Withdrawals = Balance Change, or
 - Inflows – Outflows = Change in Storage
- Grounded in data
- Must be developed for historical, current, and potential future conditions
- Supported by development of an Integrated Hydrologic Model

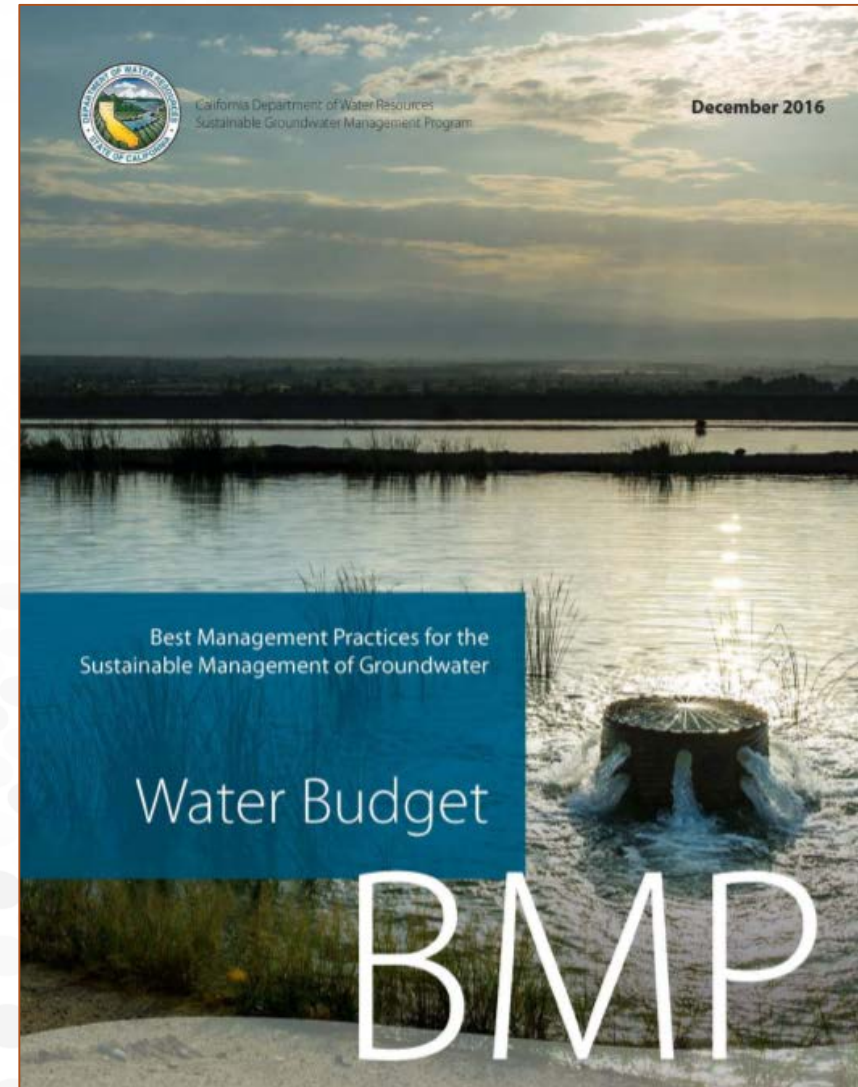
Water Budget Components



Additional Water Budget Information

- Water Budget Fundamentals
- Technical Assistance
- Key Definitions
- Related Materials
- Google:

“SGMA Water Budget BMP”



Questions?



Byron Clark, PE

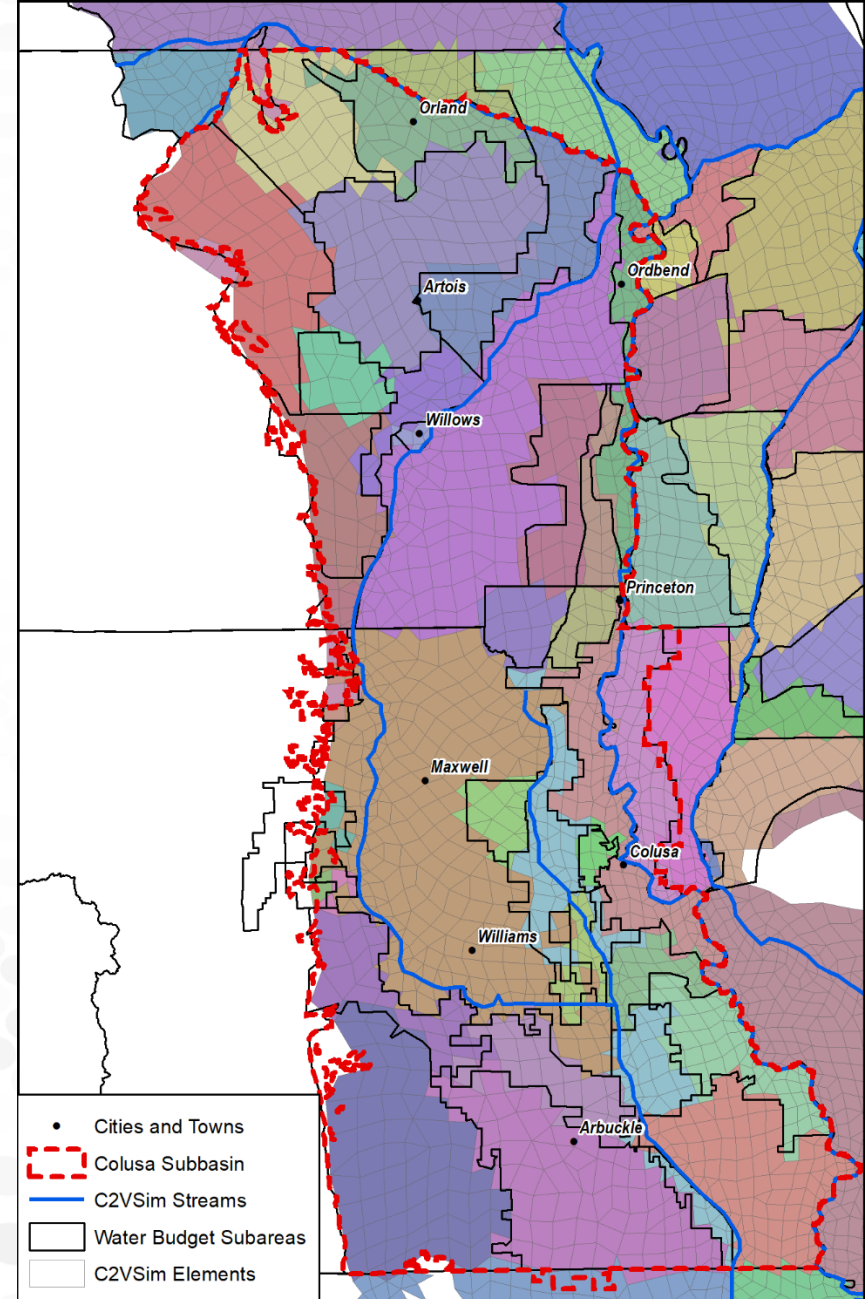
Supervising Engineer – Davids Engineering

byron@davidsengineering.com

Modelling Update

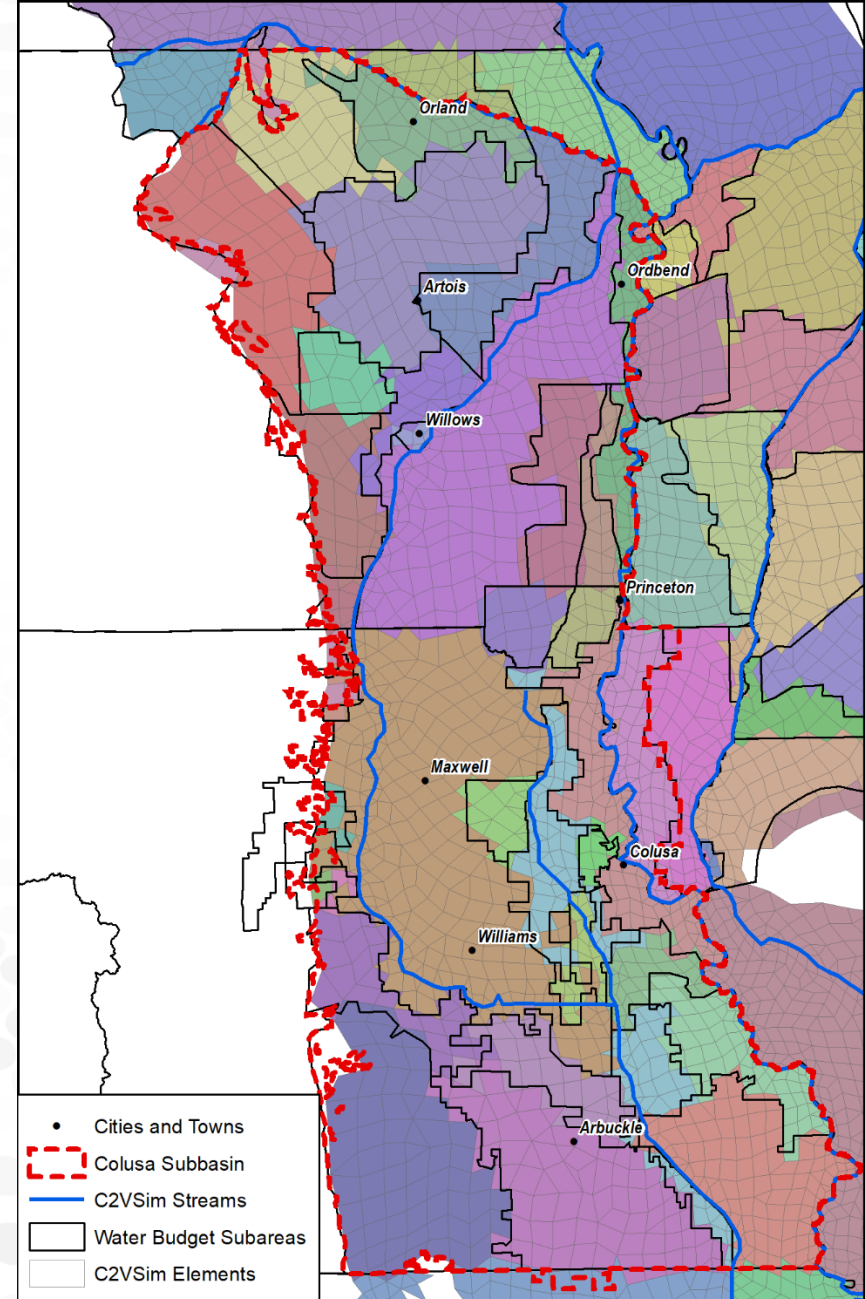
Integrated Hydrologic Model Overview

- Simulates movement of water in the basin over time
- Based on DWR's California Central Valley Groundwater-Surface Water Simulation Model (C2VSim)
- Refined for Local Use
 - Land Use
 - Surface Water Diversions
 - Aquifer Parameters
- Calibrated Based on Measured Data
 - Groundwater levels
 - Streamflows



Integrated Hydrologic Model Uses

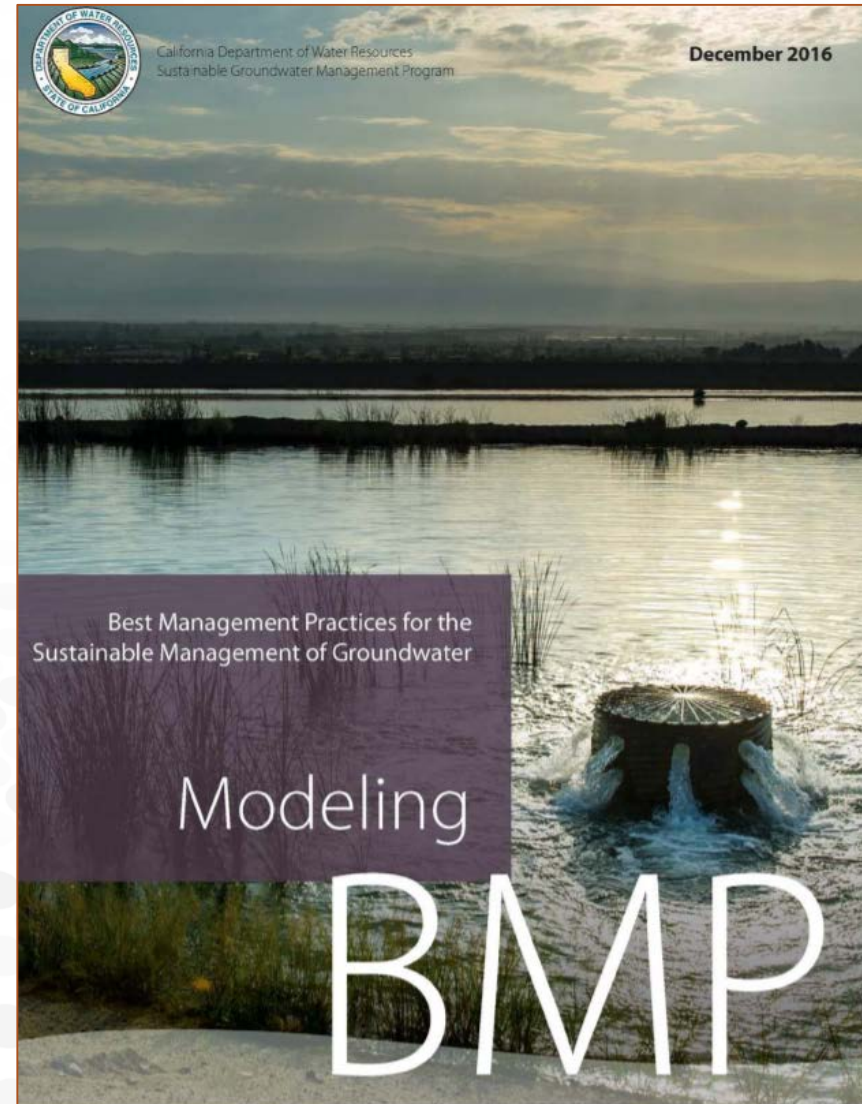
- Water Budgets
 - Historical
 - Current
 - Projected
- Sustainable Management Criteria
 - Groundwater levels and storage
 - Stream gains and losses
- Projects and Management Actions
 - Level and storage changes
 - Area of benefit



Additional Modeling Information

- Modeling Fundamentals
 - Technical Assistance
 - Key Definitions
 - Related Materials
-
- Google:

“SGMA Modeling BMP”



Questions?



Byron Clark, PE

Supervising Engineer – Davids Engineering

byron@davidsengineering.com

Groundwater Sustainability Planning Next Steps

Dave Ceppos – Facilitator, Sacramento State University

GSP Iterative Process



GSA Question and Answer Session

Closing Remarks