Background on Basin Setting Components of a Groundwater Sustainability Plan

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Vina SHAC: February 18, 2020

Basin Setting Project- Technical Foundation

Groundwater Sustainability Plan (GSP)

- **1. Administrative Information**
- **2. Basin Setting**
  - Hydrogeologic Conceptual Model
  - Groundwater Conditions
  - Water Budget
  - Management Areas
- **3. Sustainable Management Criteria**
  - Sustainability Goal
  - Undesirable Results
  - Minimum Thresholds
  - Measurable Objectives
- **4. Monitoring Networks**
  - Monitoring Network
  - Representative Monitoring
  - Assessment & Improvement
  - Reporting Monitoring Data
- **5. Projects and Management Actions**

ONE project for All THREE Subbasins

Hydrogeologic Conceptual Model (HCM)

Regulations require

1. Narrative
2. Graphical Representation

To provide an overview of:

1. Physical basin characteristics
2. Uses of groundwater
3. Sets the stage for the basin setting

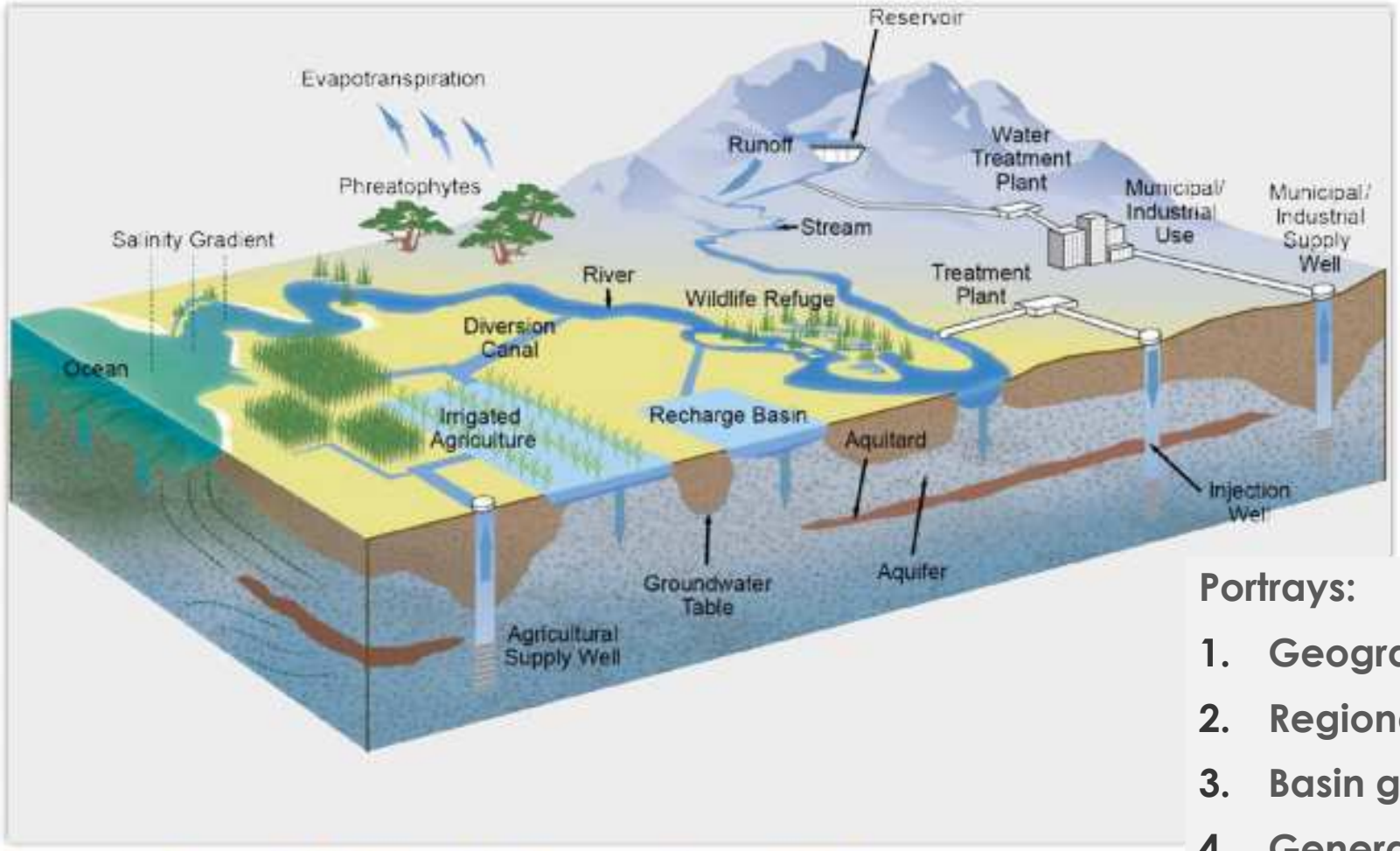


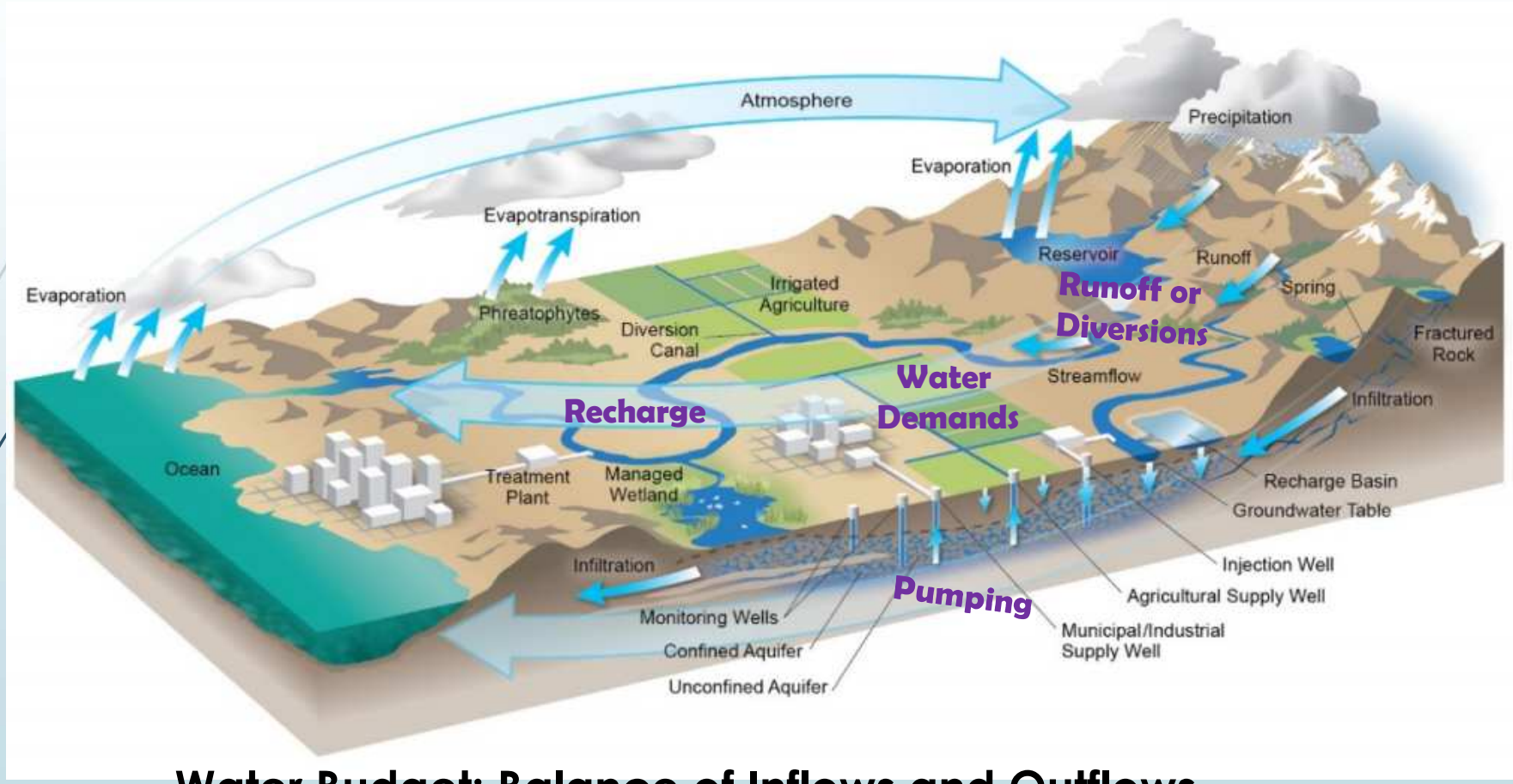
Figure 1 – Example 3-D Graphic Representing a HCM

Portrays:

1. **Geographic setting**
2. **Regional geology**
3. **Basin geometry**
4. **General water quality**
5. **Water uses**

Water Budgets

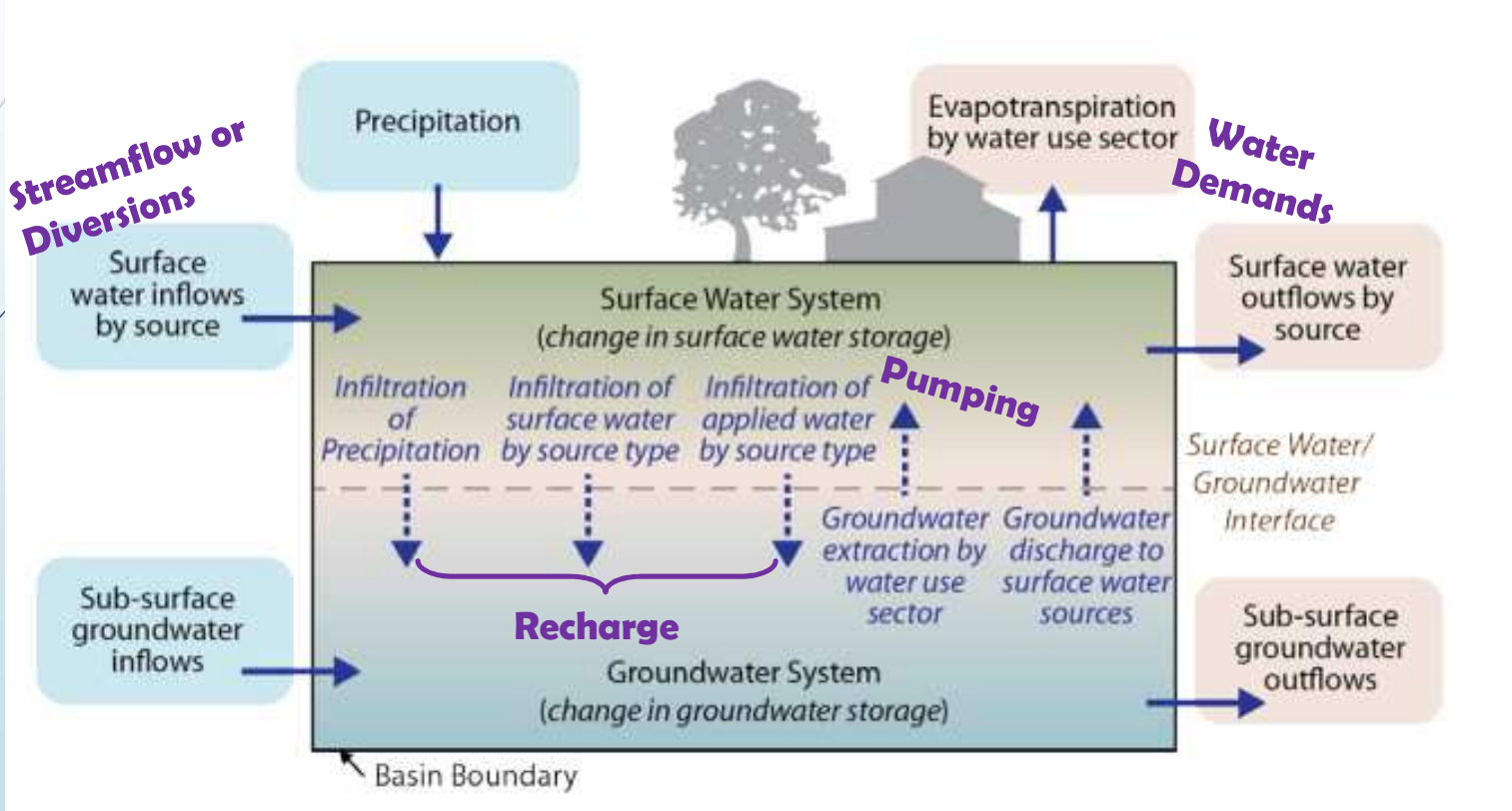
Add numbers to the narrative



Water Budget: Balance of Inflows and Outflows

Three Interacting Systems

1. Surface Water System
2. Land System
3. Groundwater System



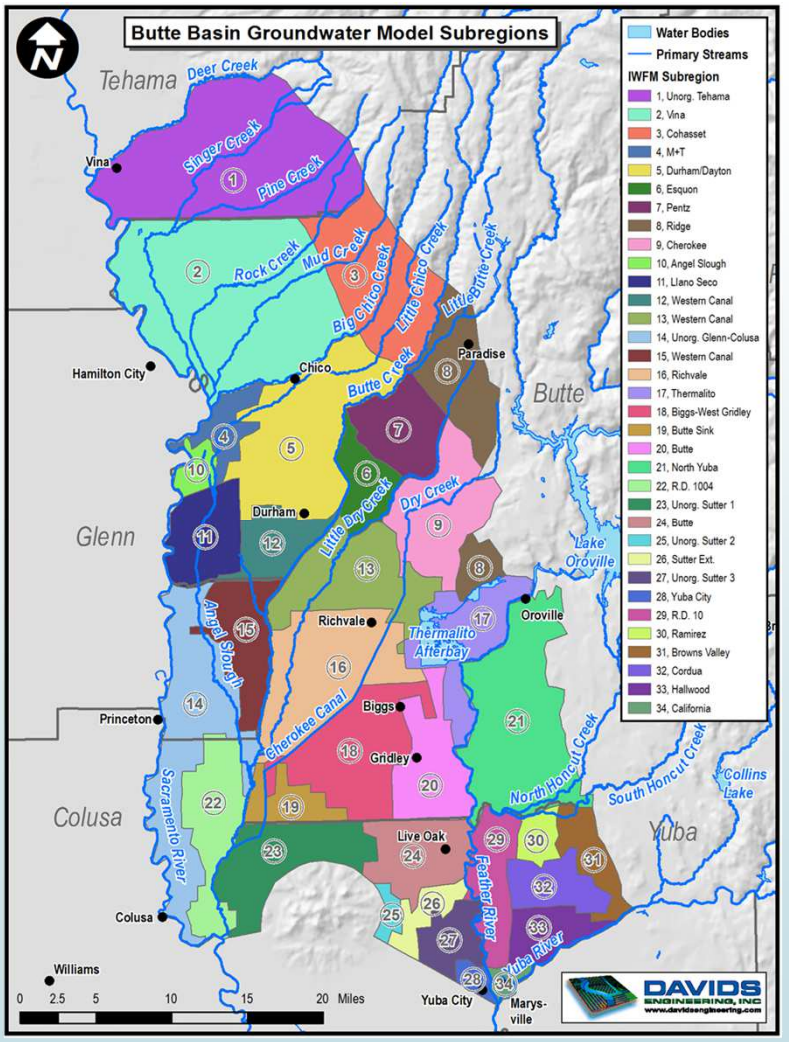
Required Water Budget components

"Numerical" vs. "Conceptual" Model

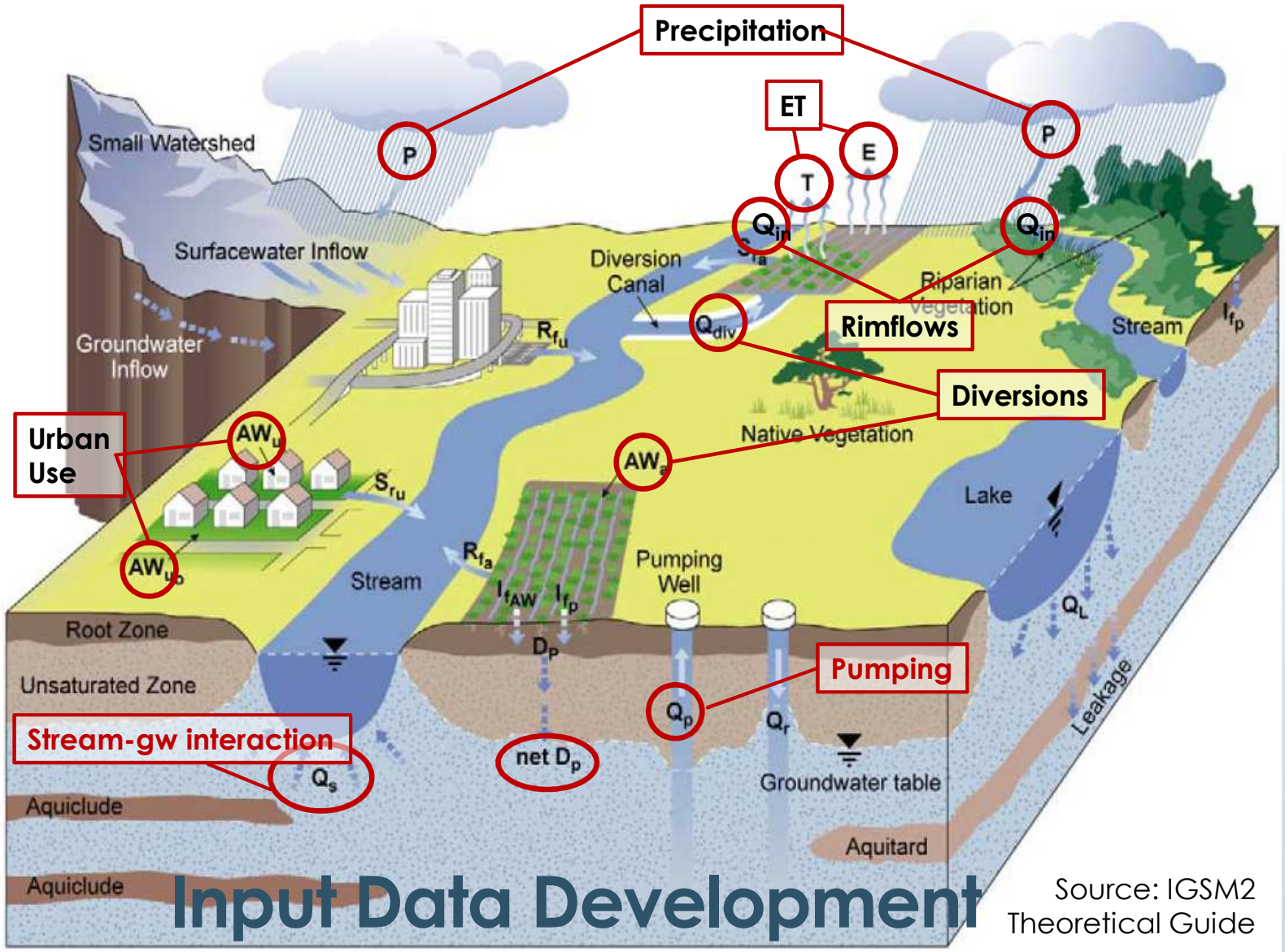
Butte Basin Groundwater Model

Butte Basin Groundwater Model (BBGM)

- Chosen to support Basin Setting GSP development
- Number cruncher over time and space
- Integrated Hydrologic Model meaning it includes things that happen above and below ground: All Three Systems
- Pulls together different types of data and hydrologic processes that all interact
- Used to estimate water budget numbers



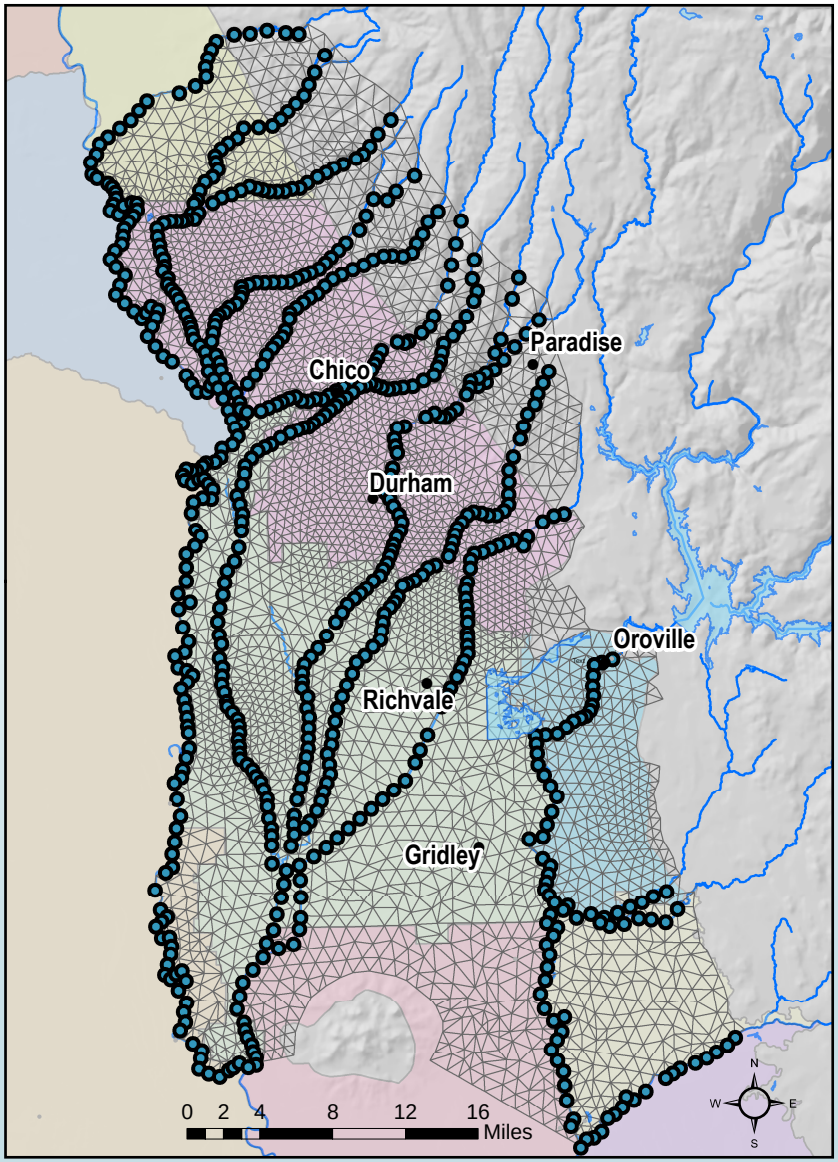
Input Data Development



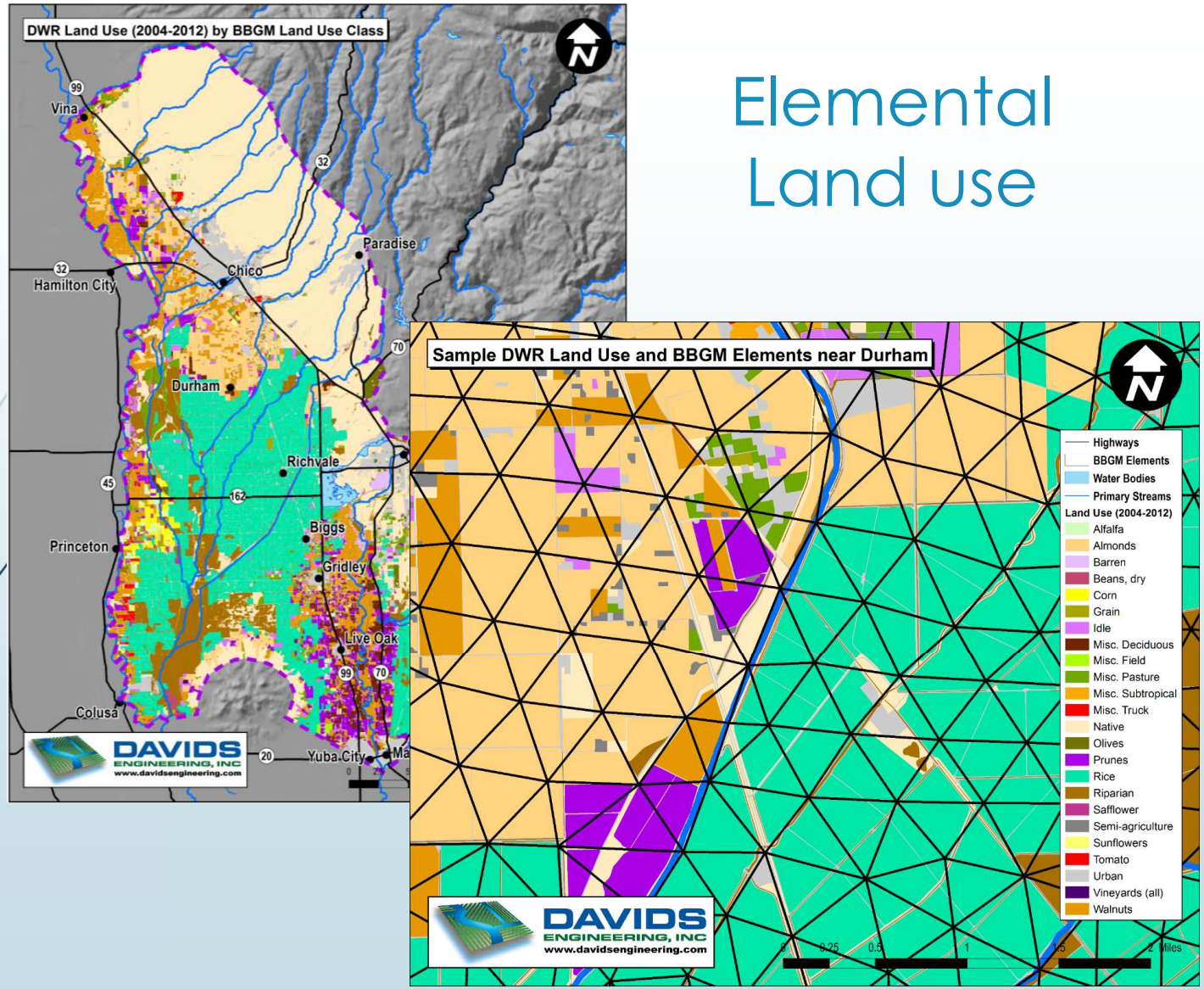
Source: IGSM2 Theoretical Guide

Butte Basin Groundwater Model

- Integrated GW-SW Model:
  - IWFM-2015 code
- 1970-2018, daily
- 1,265 square miles
- 7,200+ Individual elements
  15-670 acres (Avg. 112 acres)
- Boundaries:
  - Deer Creek,
  - Sacramento River,
  - North side of Sutter Buttes/Yuba River
  - Eastern foothills



Elemental Land use

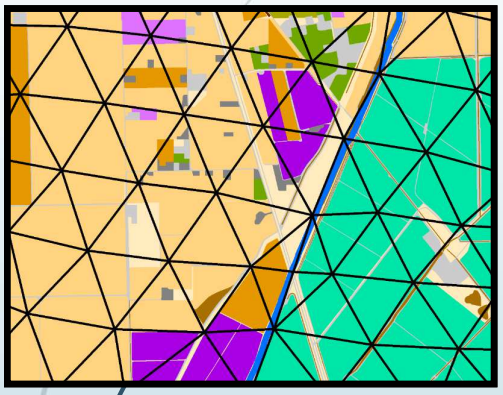


Estimates Crop Water Demand

- Given data:
  - Climate conditions (precipitation, ETc)
  - Soil and land surface physical properties
  - Land use management practices

➔ Uses Irrigation-scheduling type approach to calculate crop water demand

Estimates Groundwater Pumping

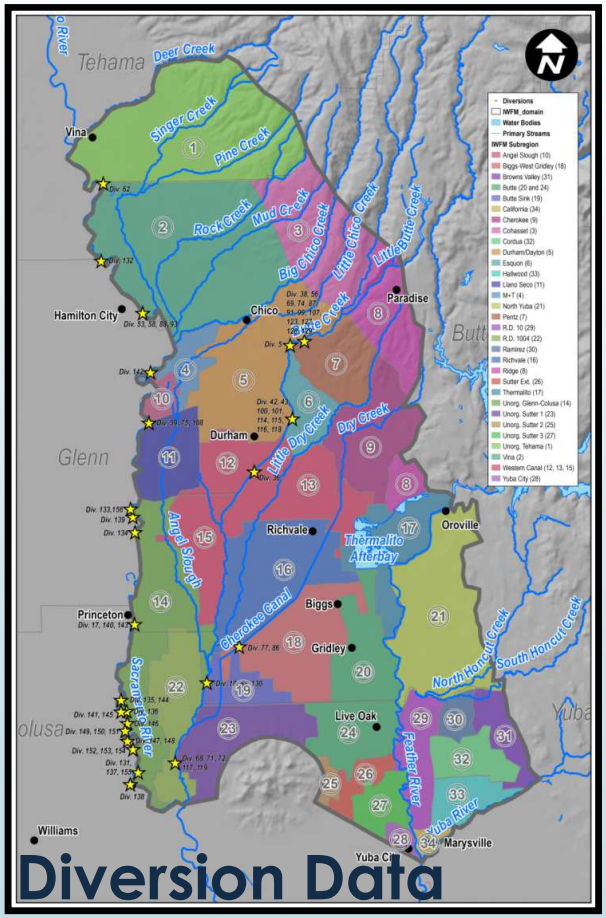


Crop Water Demand

\- Diversions

= Pumping

- Representative well per element adjusts pumping amount to meet demand
- Urban groundwater pumping is specified using data



Groundwater Conditions & Monitoring Networks

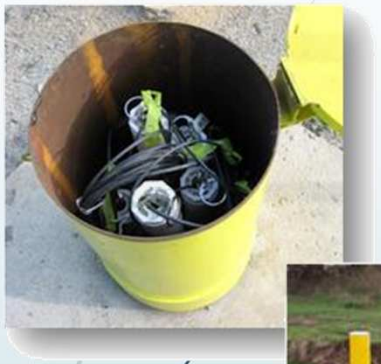
Includes groundwater elevations, water quality, and subsidence

Why Monitor Groundwater Levels?

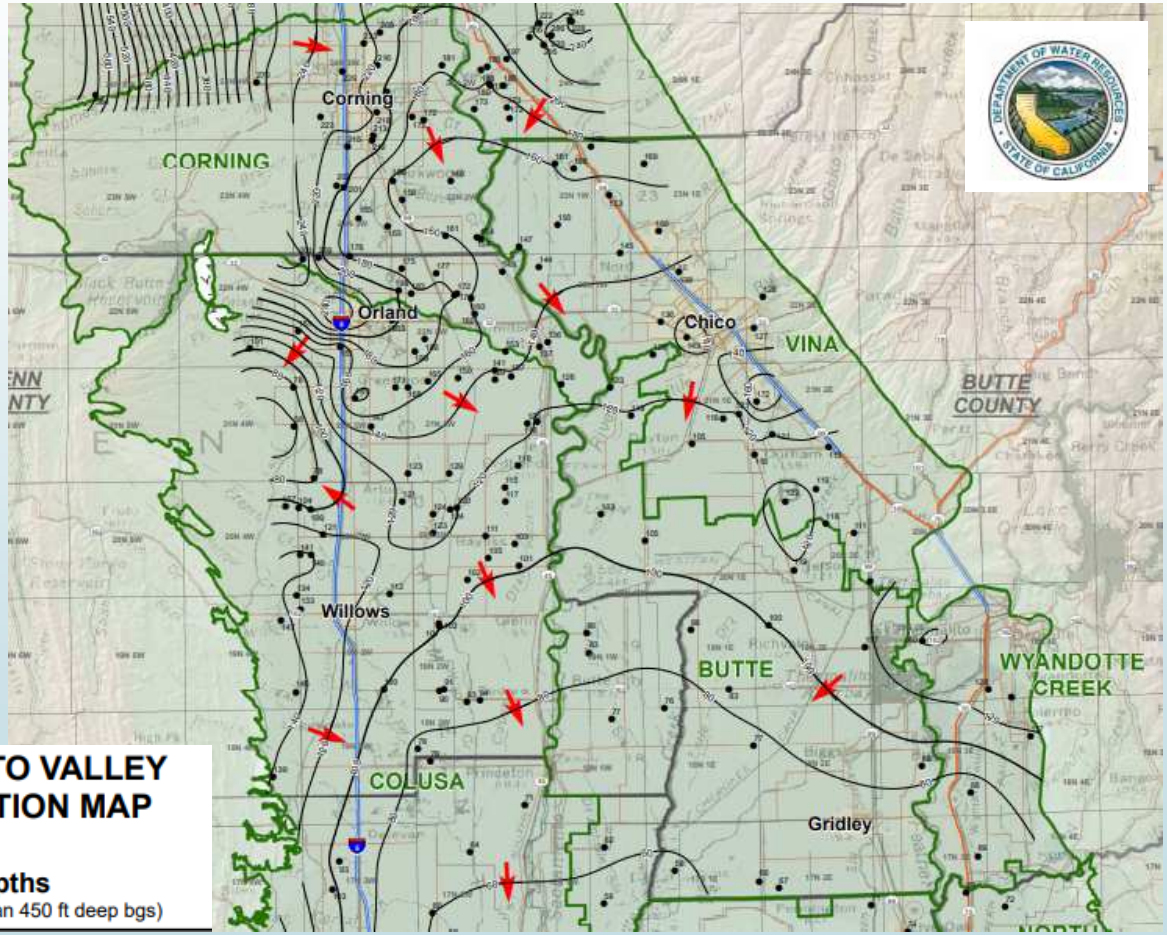
- Track changes over time
- Compare well infrastructure (depth) to groundwater levels
- Estimate groundwater flow direction
- Understand how water is moving in and through the system (i.e. aquifer dynamics)
- Understand the resource → protect and manage

Groundwater levels reflect the cumulative effects of hydrologic variability and groundwater use

Wells are a window…



Contour Maps: GW Flow Direction



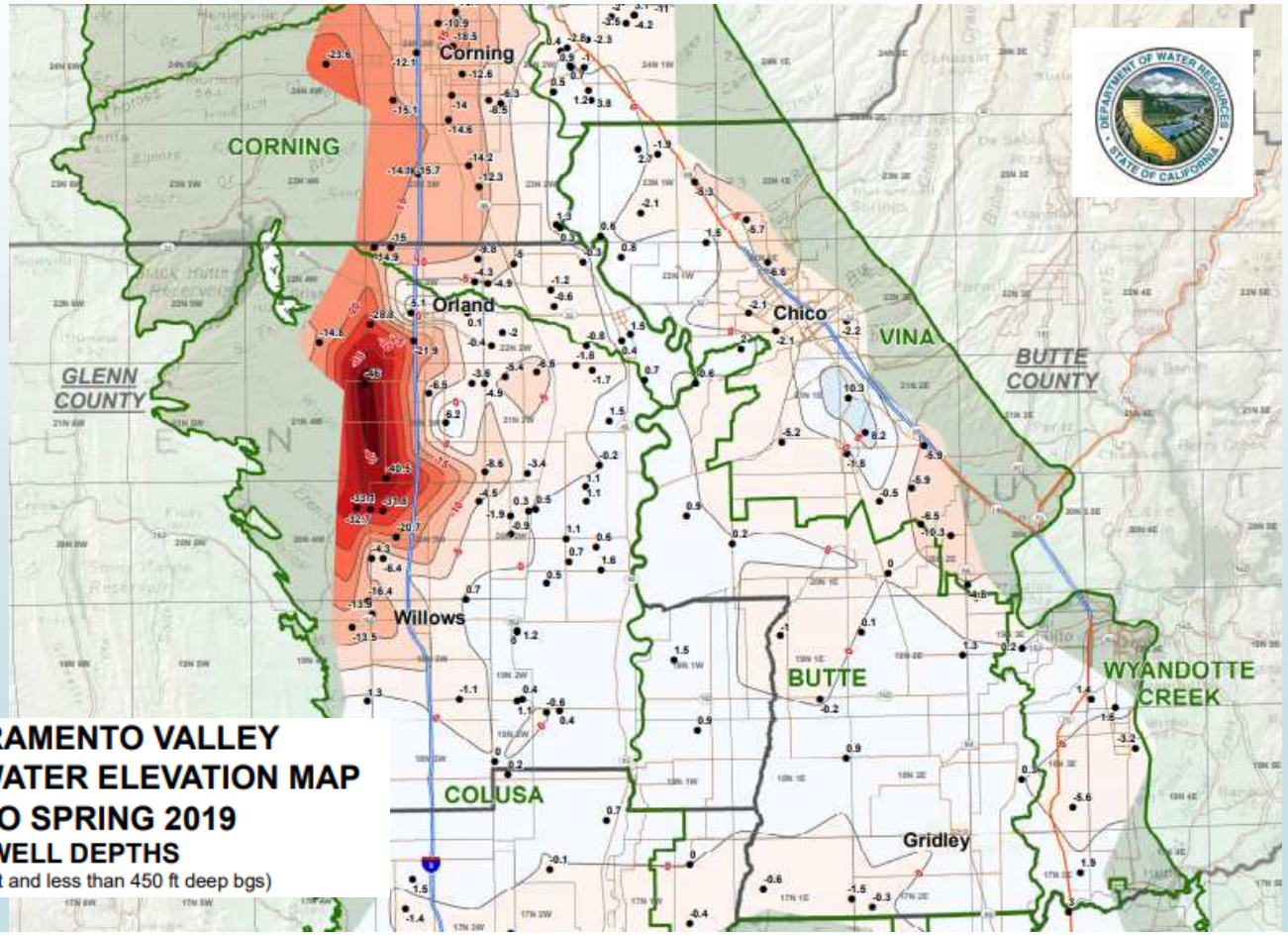
NORTHERN SACRAMENTO VALLEY GROUNDWATER ELEVATION MAP

Spring 2019

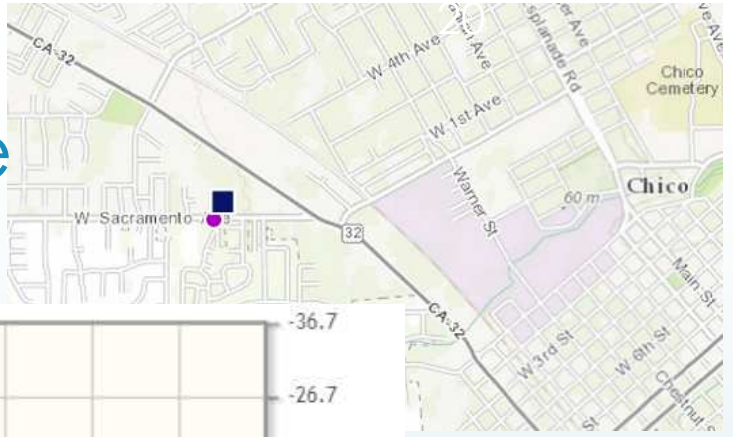
100 to 450 ft Well Depths

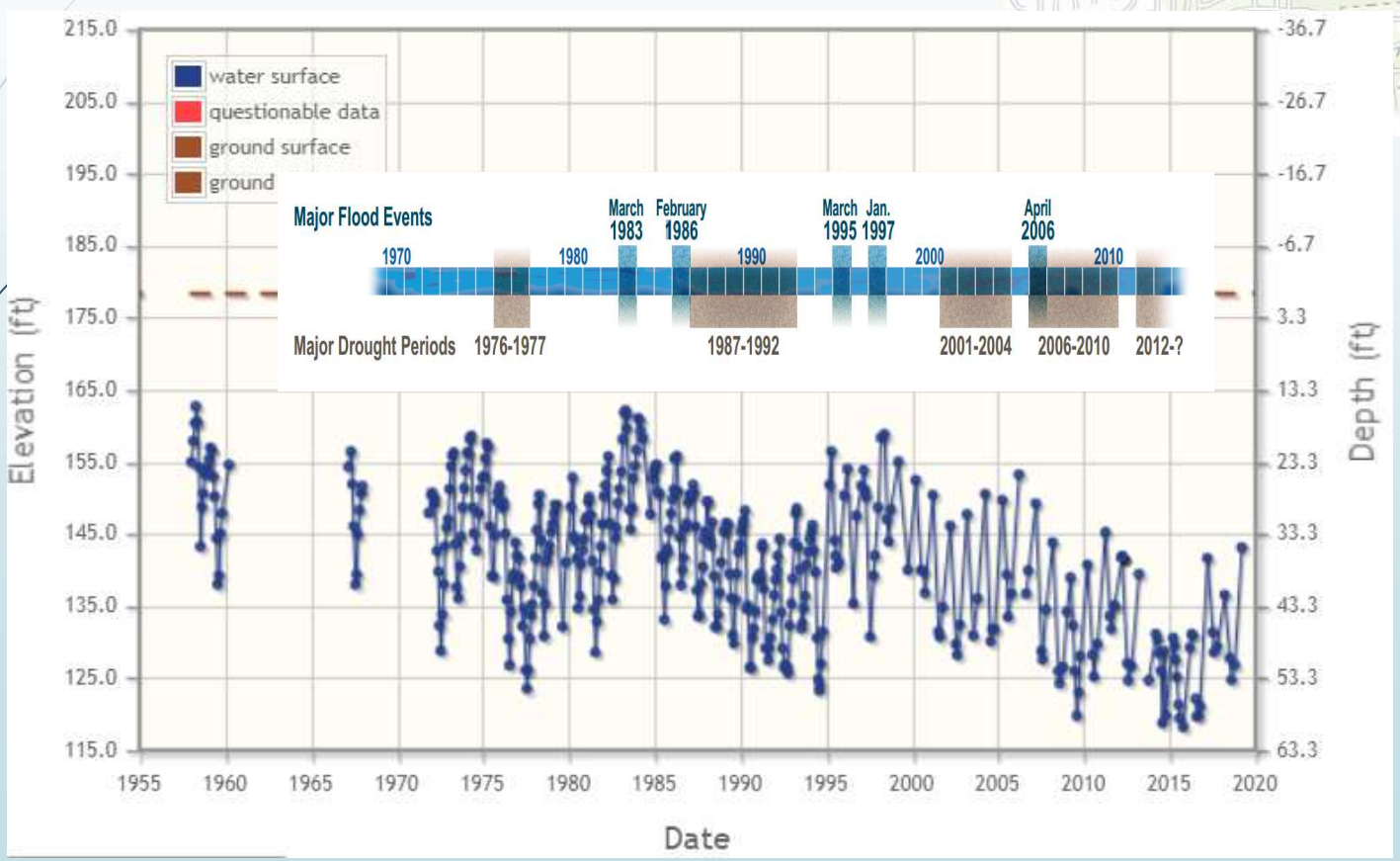
(Well depths greater than 100 ft and less than 450 ft deep bgs)

Change Maps: Changes over Space for a snapshot in Time

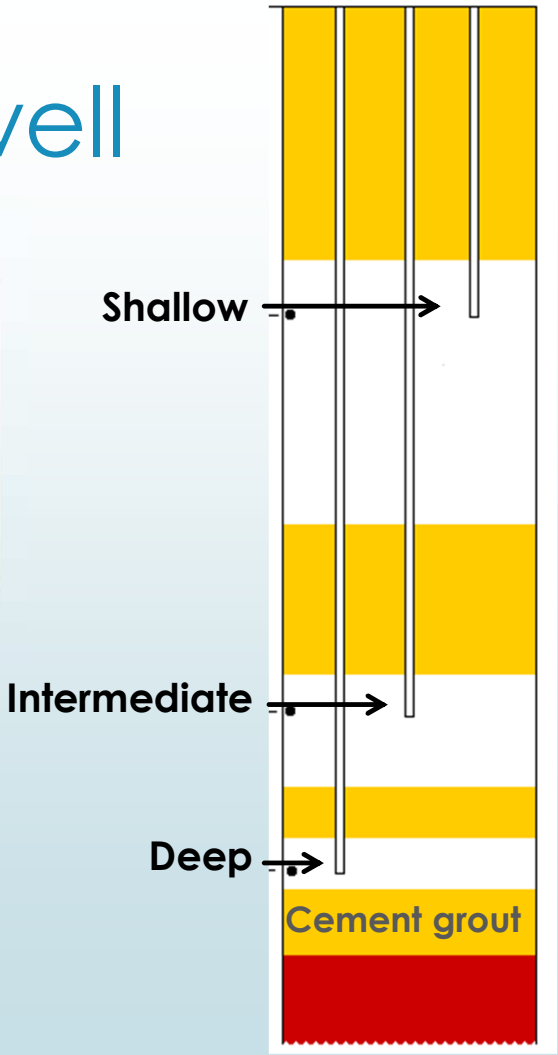


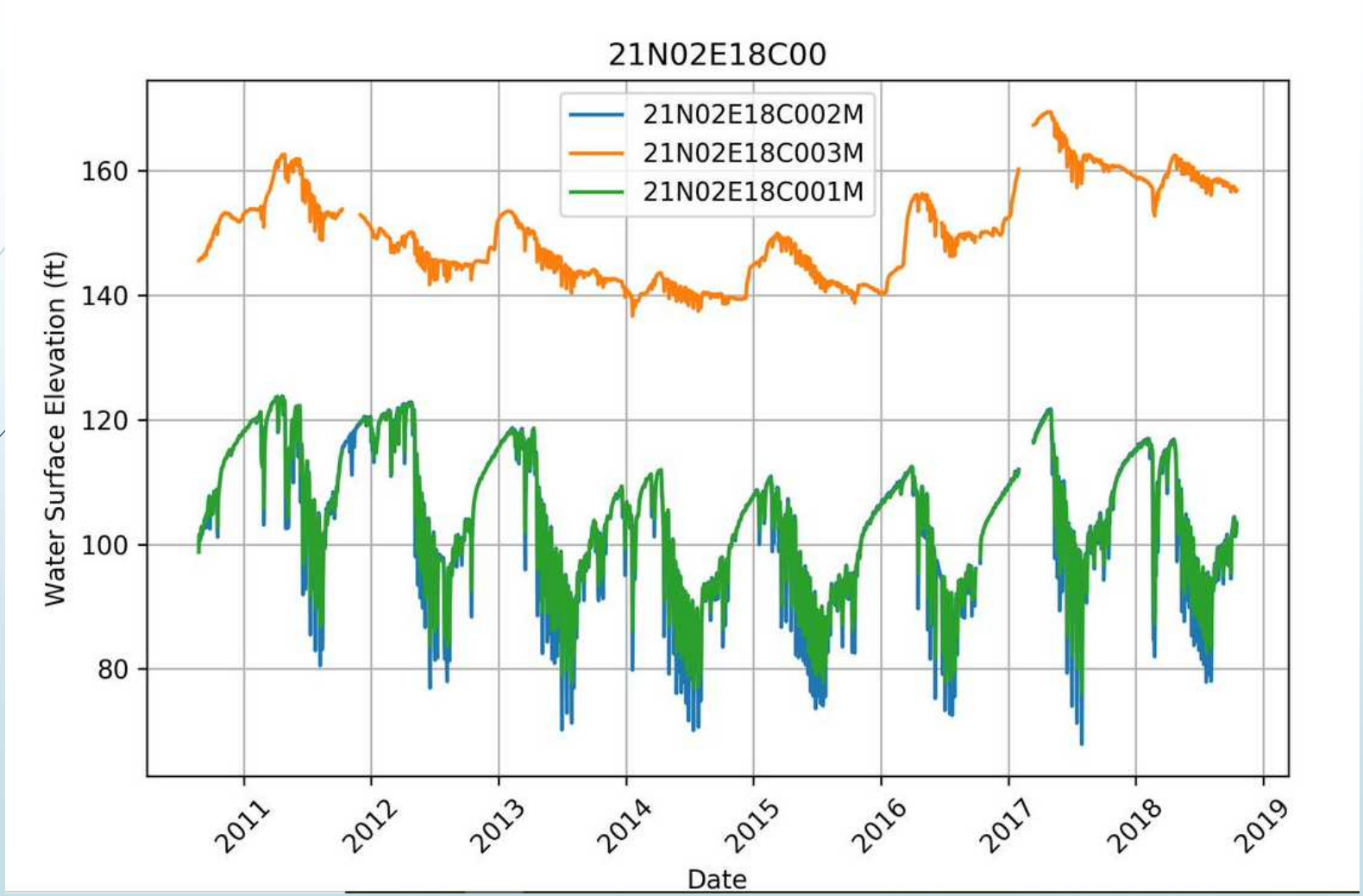
Changes Over Time for One Point in Space

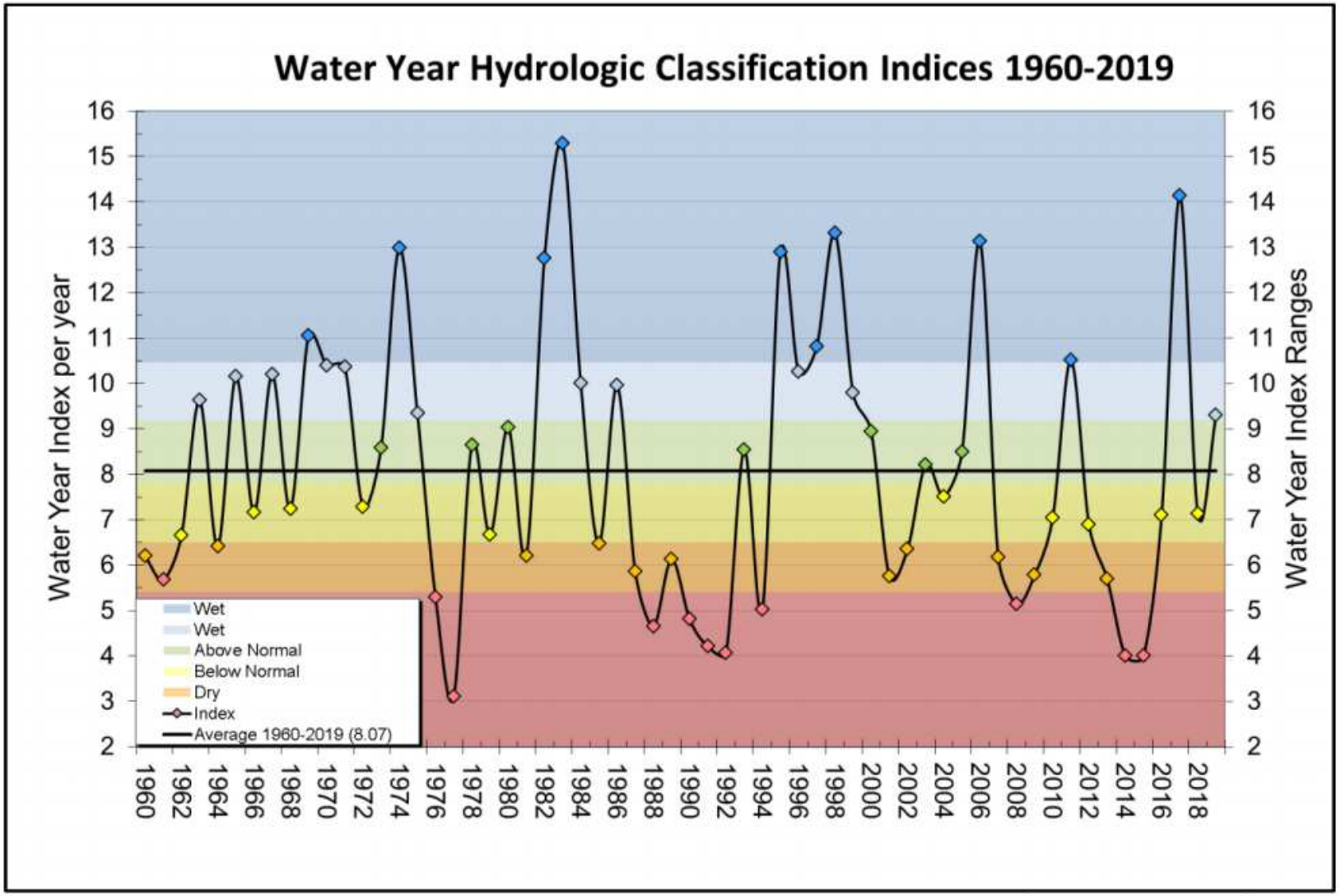




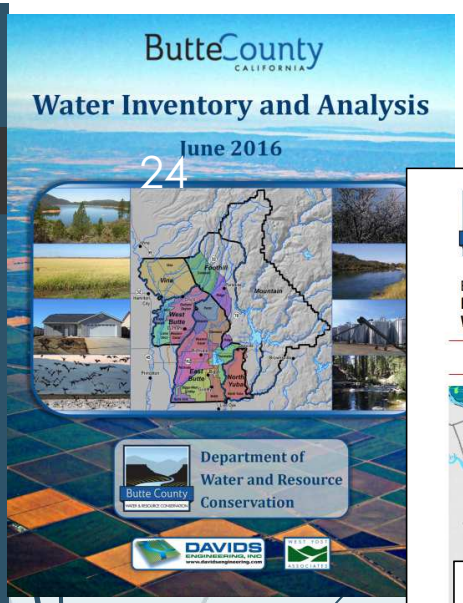
Multi-completion well

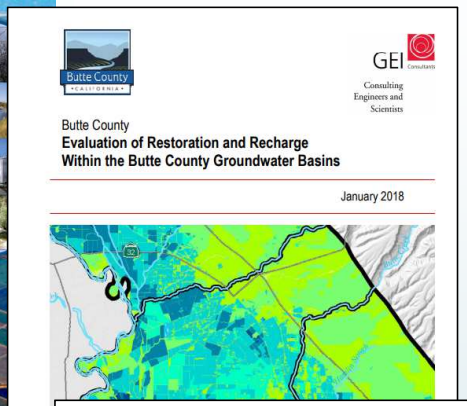


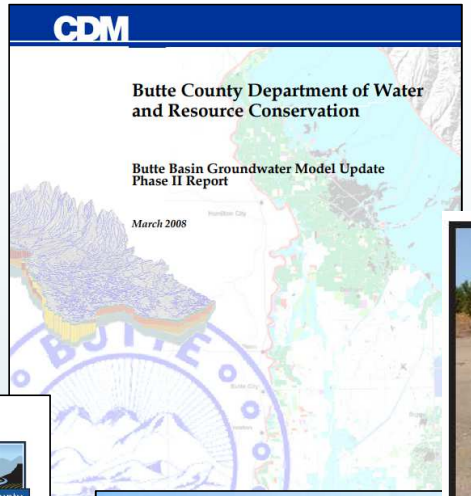

21N02E18C00
21N02E18C002M
21N02E18C003M
21N02E18C001M
Water Surface Elevation (ft)
160
140
120
100
80
2011
2012
2013
2014
2015
2016
2017
2018
2019
Date

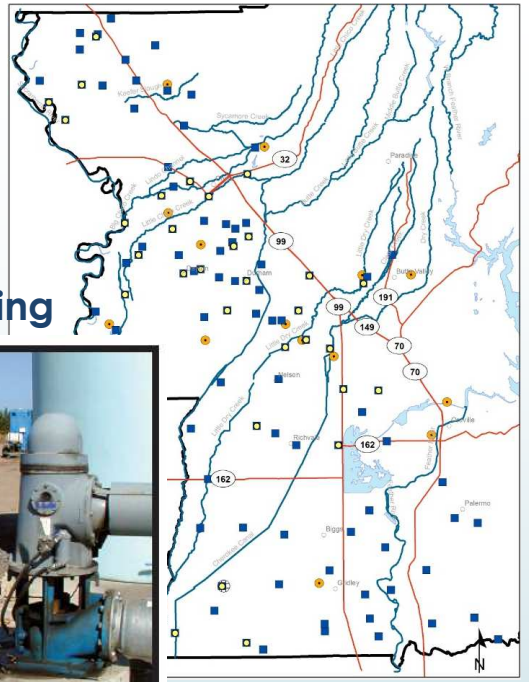

Water Year Hydrologic Classification Indices 1960-2019
Water Year Index per year
Water Year Index Ranges
Wet
Wet
Above Normal
Below Normal
Dry
Index
Average 1960-2019 (8.07)

Monitoring & Special Studies

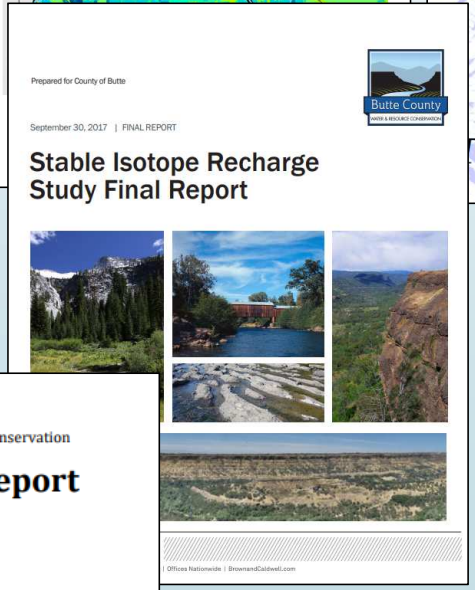


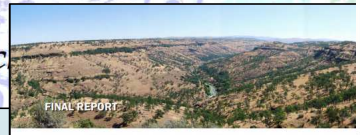


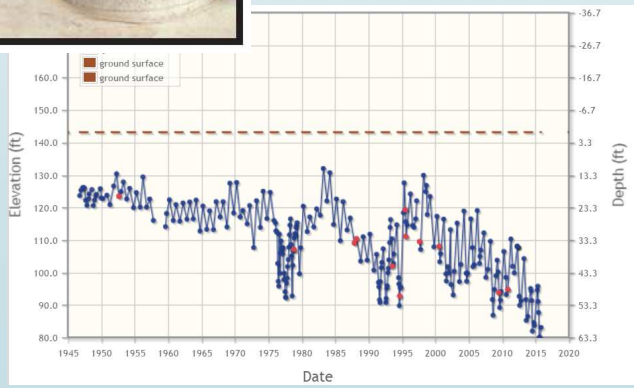


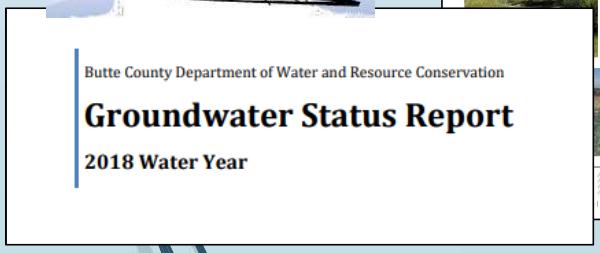


Monitoring









Next Time…RESULTS!

Water Budget and Groundwater Conditions

Questions?

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