Groundwater Sustainability Plan – Public Meeting

Enterprise Anderson Groundwater Sustainability Agency

October 16, 2019

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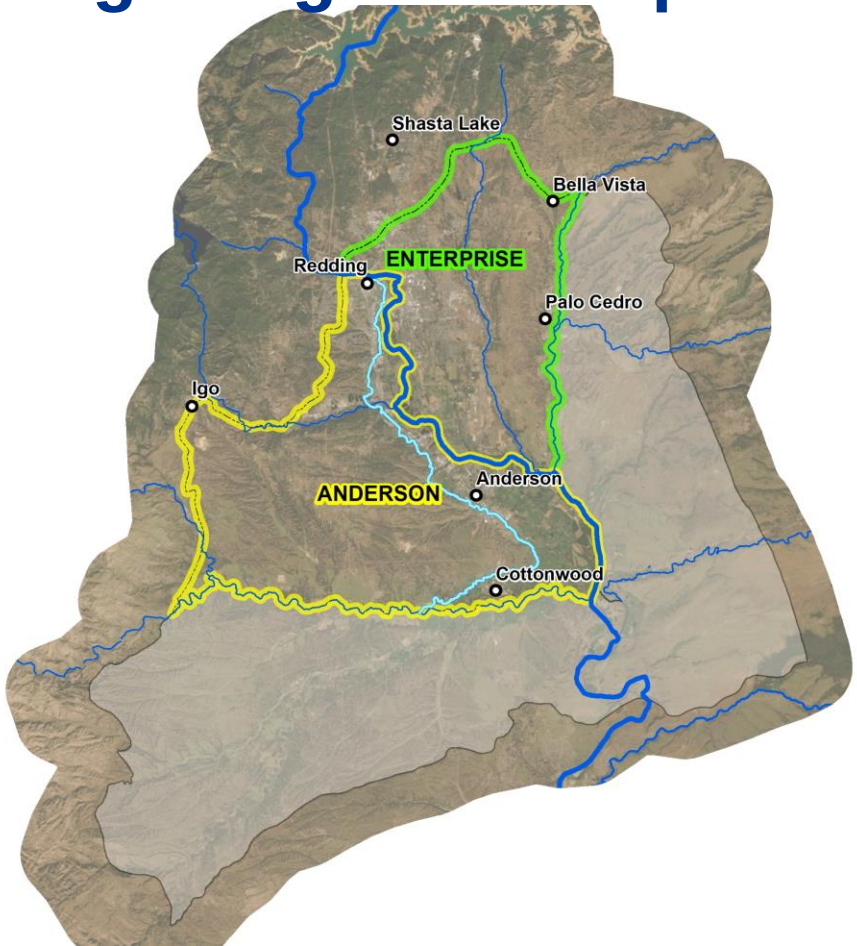
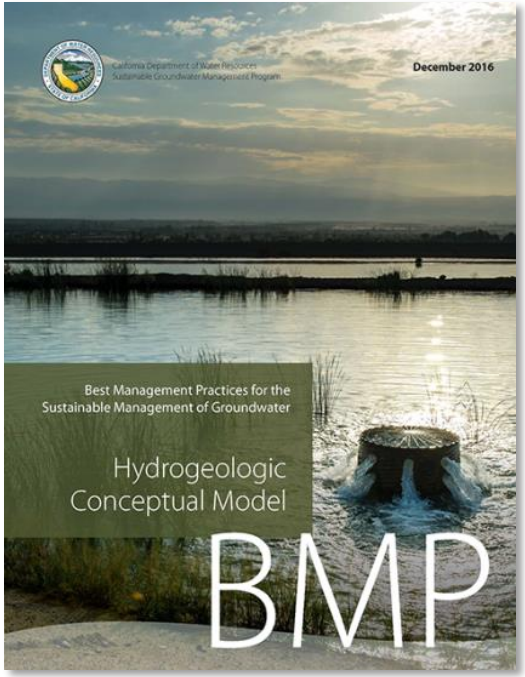
Redding Area Groundwater Basin

Hydrogeologic Conceptual Model





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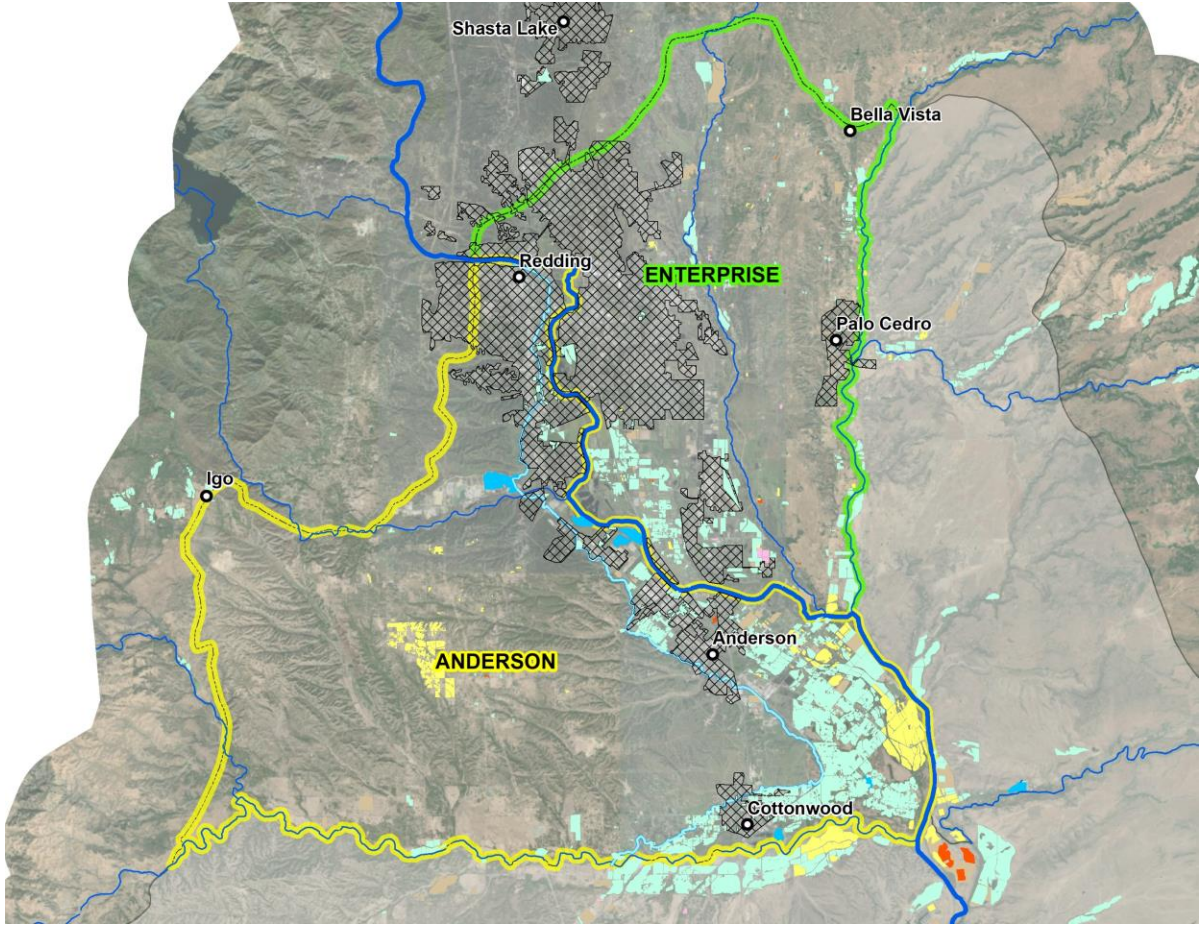
2014 DWR Land Use



Land Use

- Urban
- Pasture
- Orchard
- Managed Wetland
- Truck Crops
- Idle
- Other

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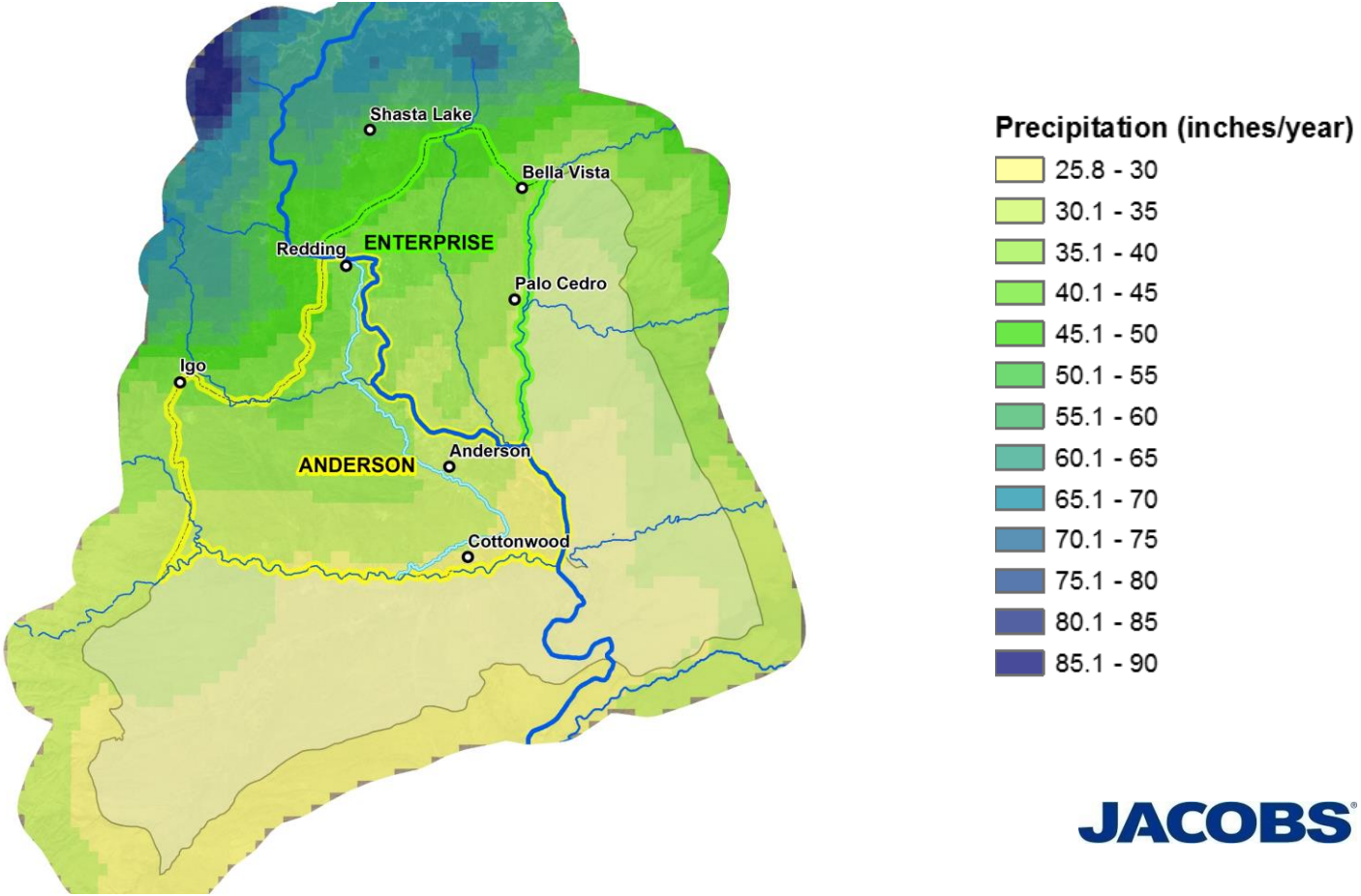
Average Annual Precipitation (1980–2010)



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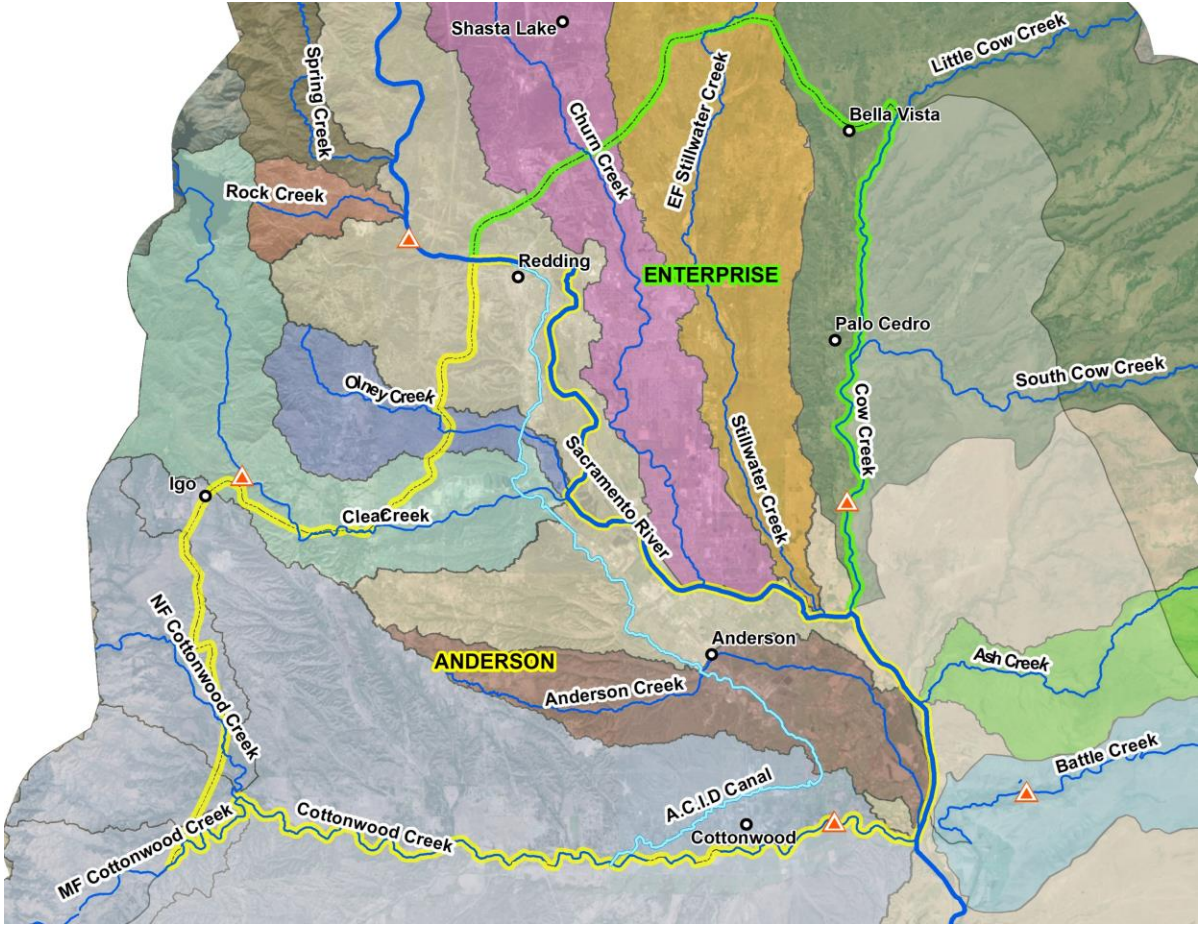
Primary Streams and Catchments



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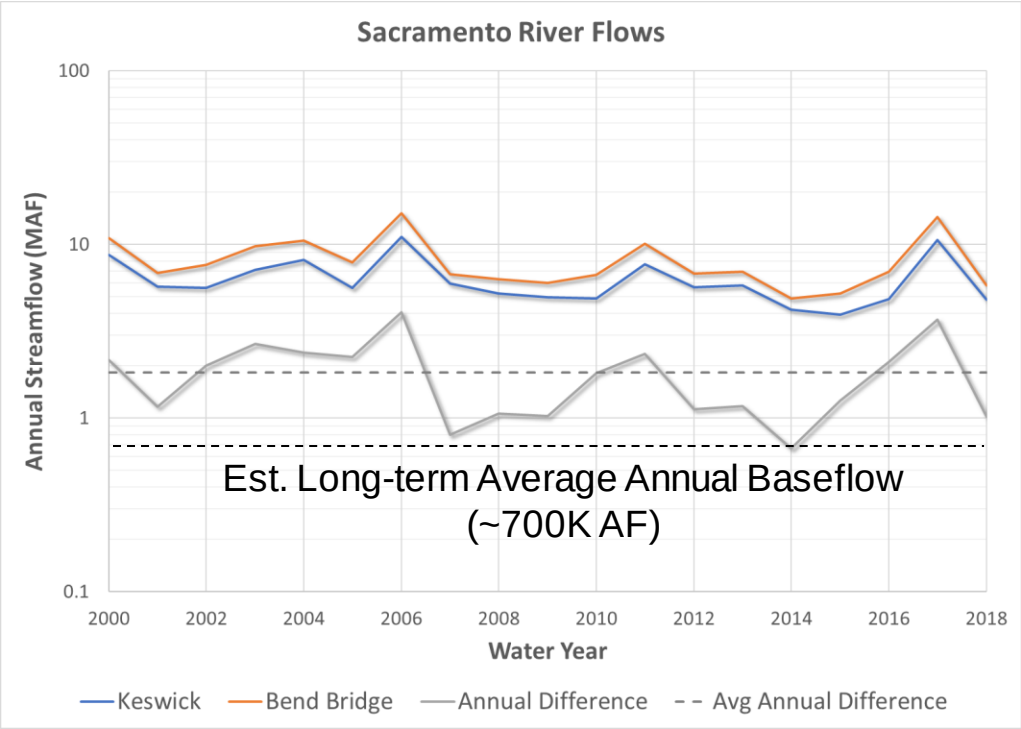
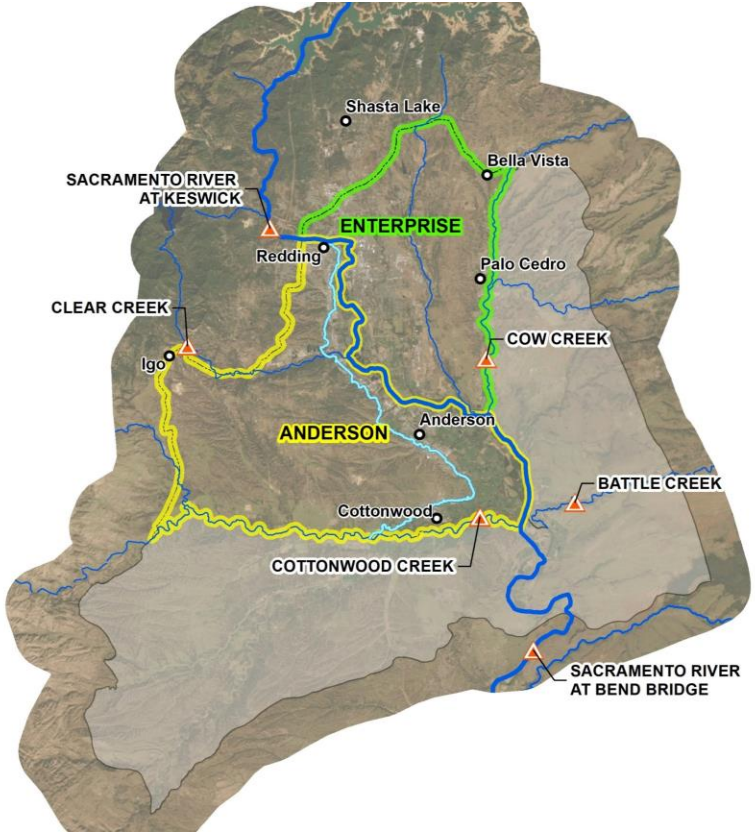
Sacramento River Streamflow Gains ~2 MAF as River Passes Through Redding Basin





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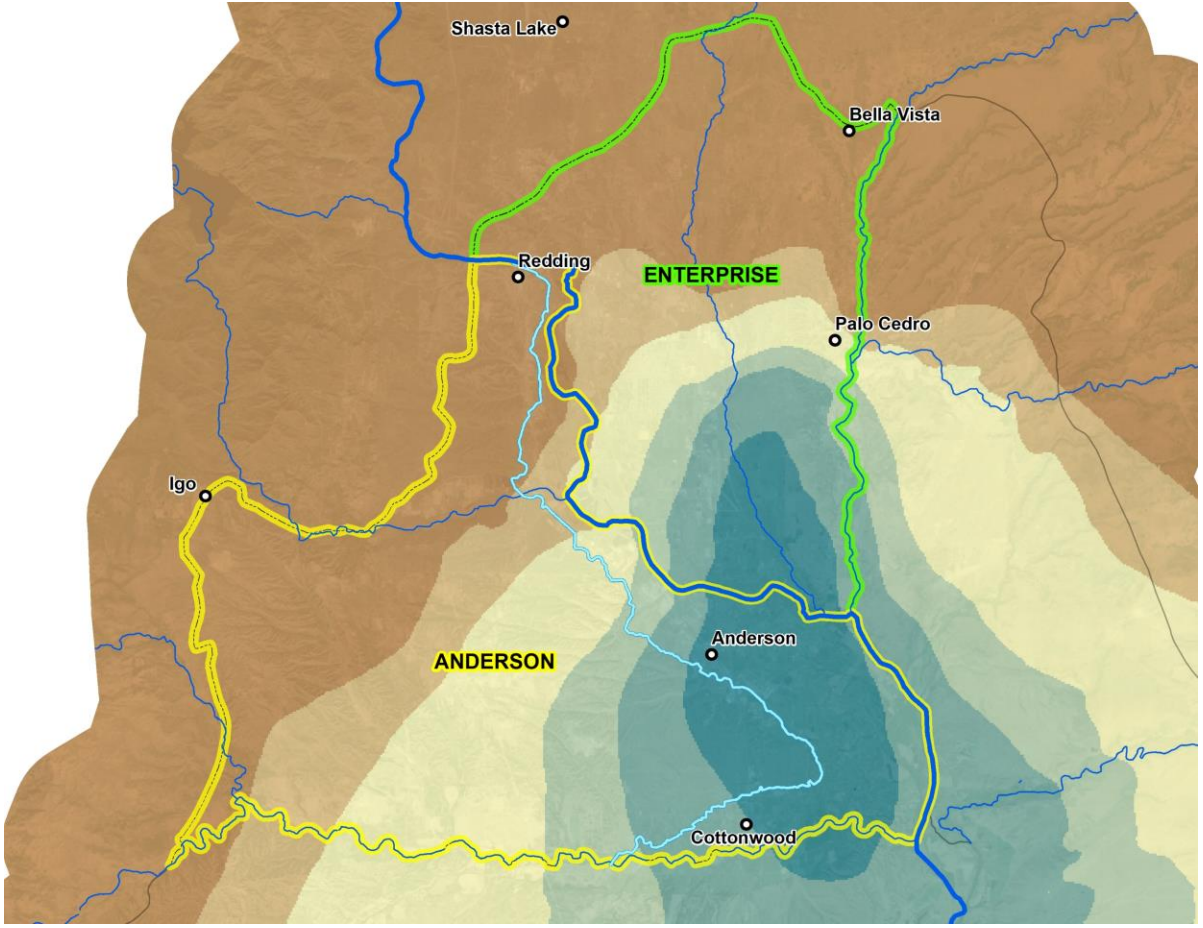
Aquifer Transmissivity (Productivity)



Gallons/Day/Foot

- <= 100
- 100.1 - 500
- 500.1 - 1,000
- 1,000.1 - 5,000
- 5,000.1 - 10,000
- 10,000.1 - 25,000
- 25,000.1 - 70,308.8

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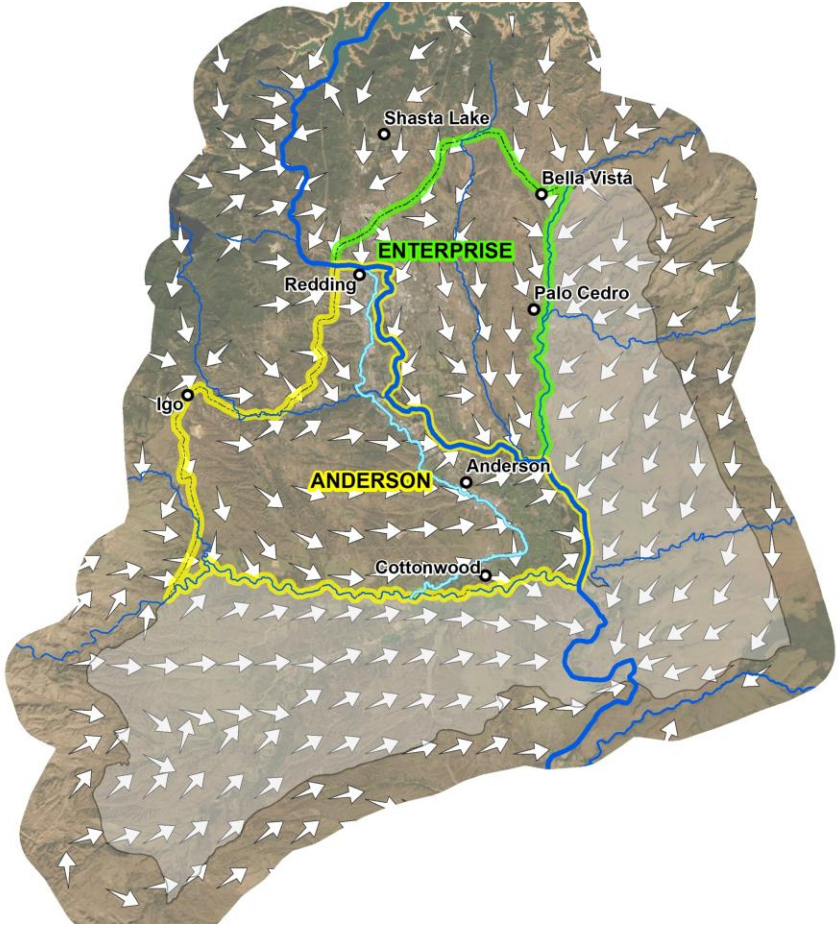
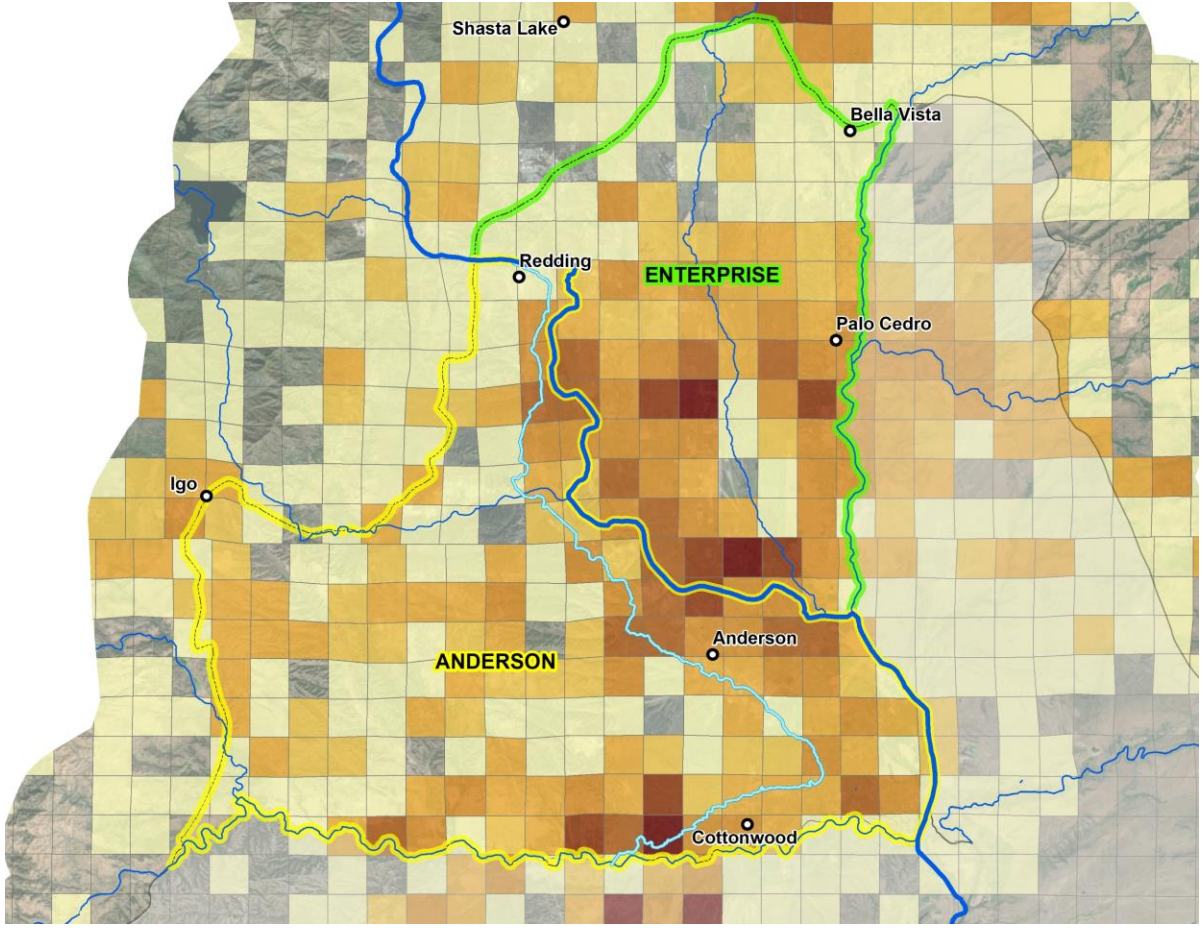
Groundwater Flow Directions



Domestic Well Count



Well Count

- 0
- 1 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 145

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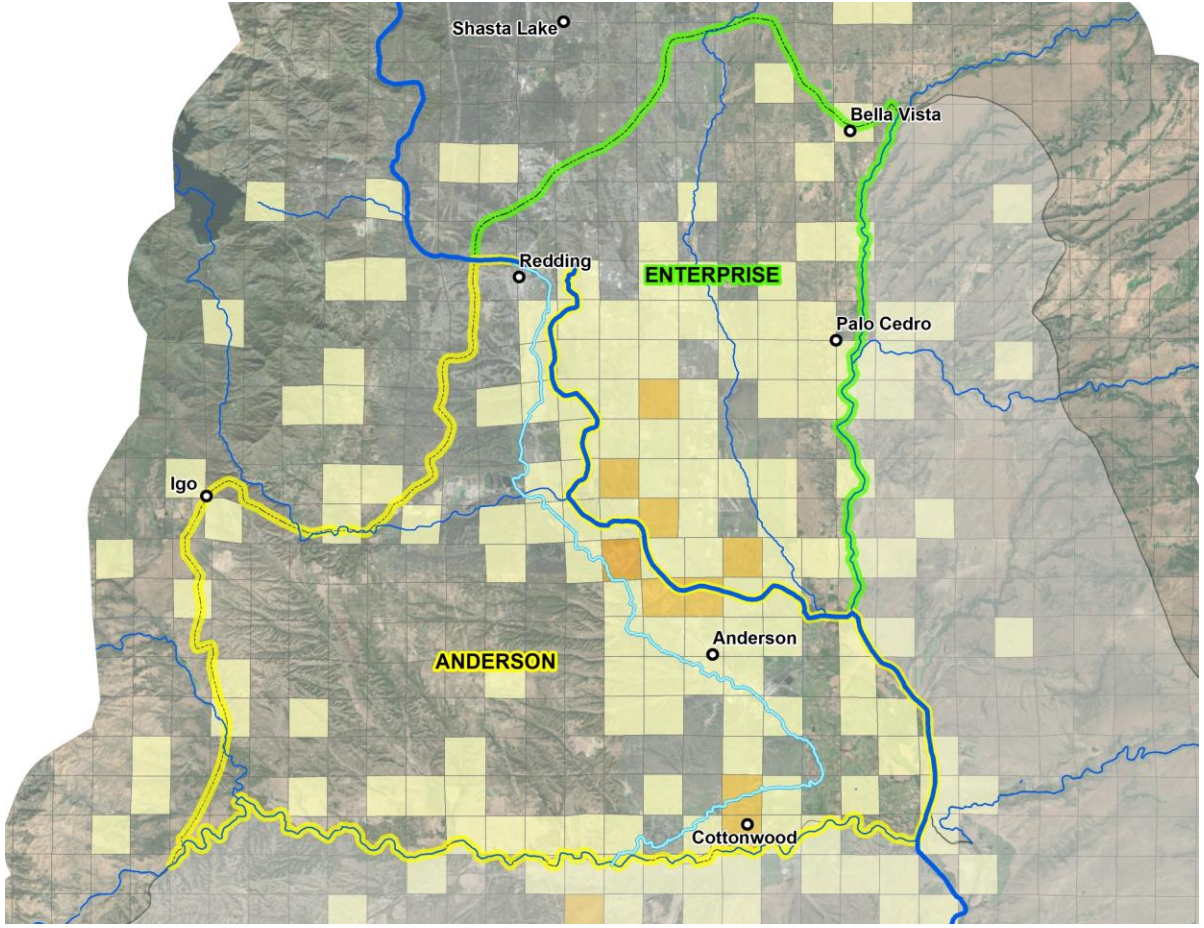
Production Well Count



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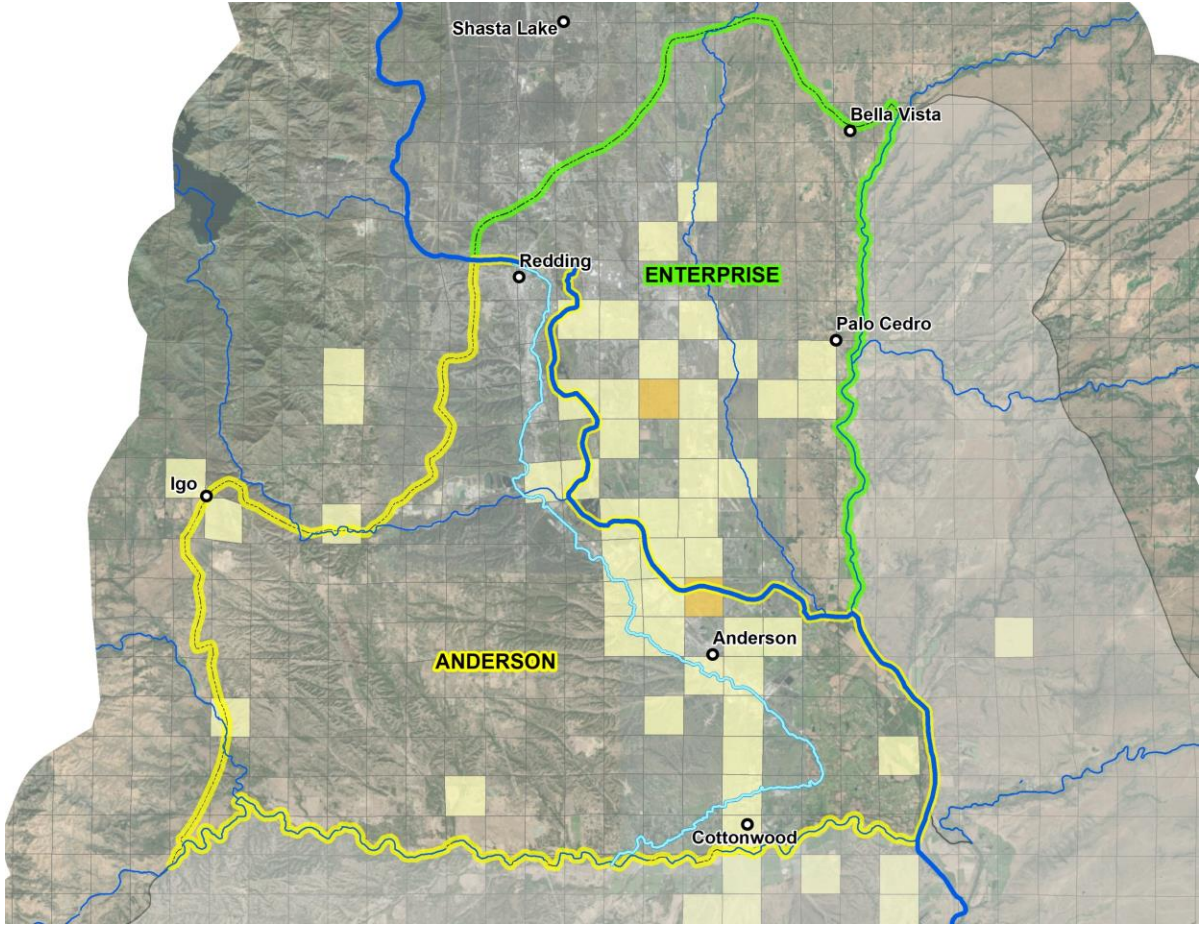
Public Well Count



Well Count

- 0
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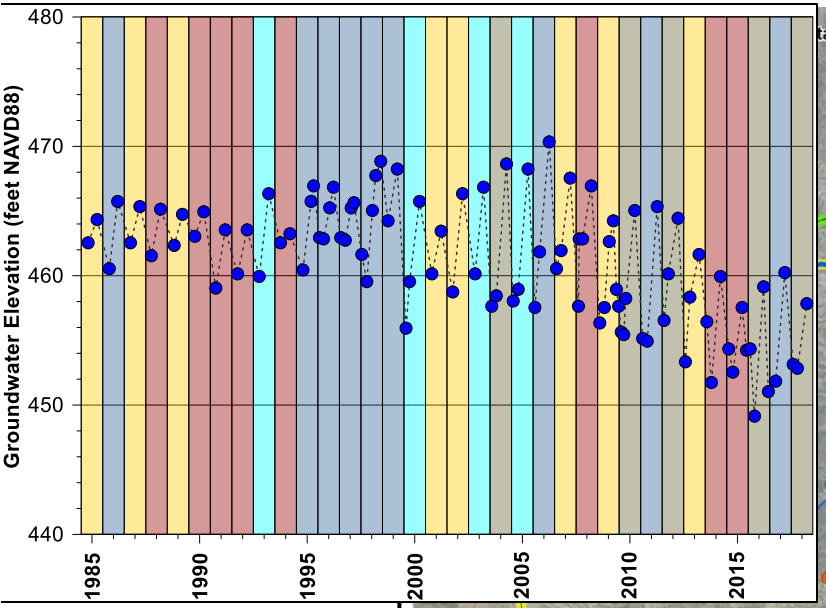
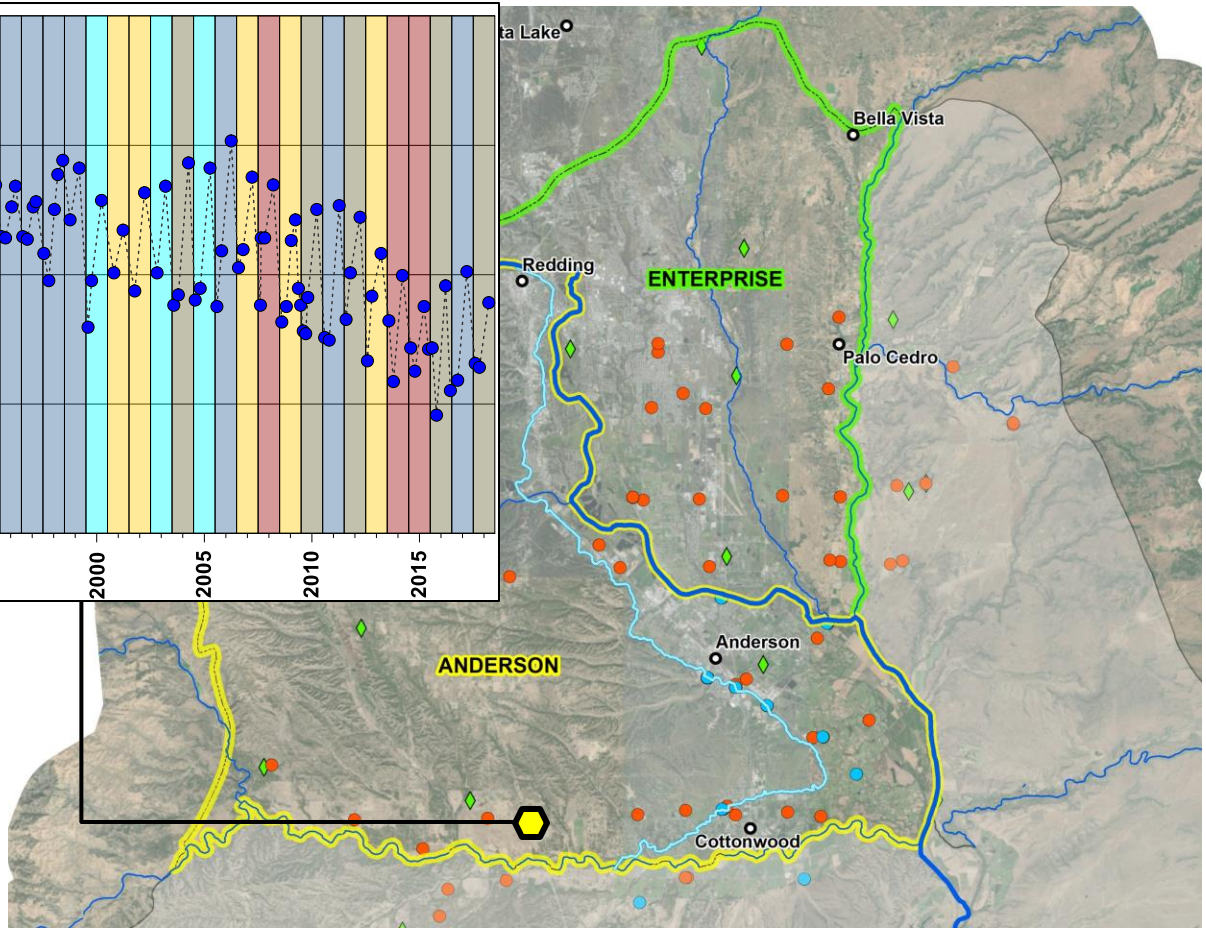
Groundwater-level Trends – Anderson Subbasin





DWR Continouous GW Level Measurement

DWR Periodic GW Level Measurement

USGS Periodic GW Level Measurement

Sacramento Valley Water Year Index

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)

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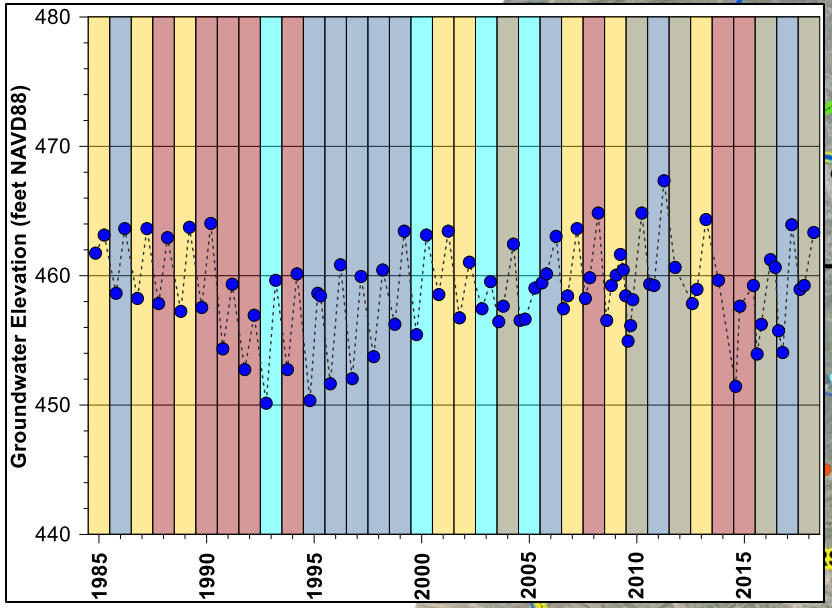
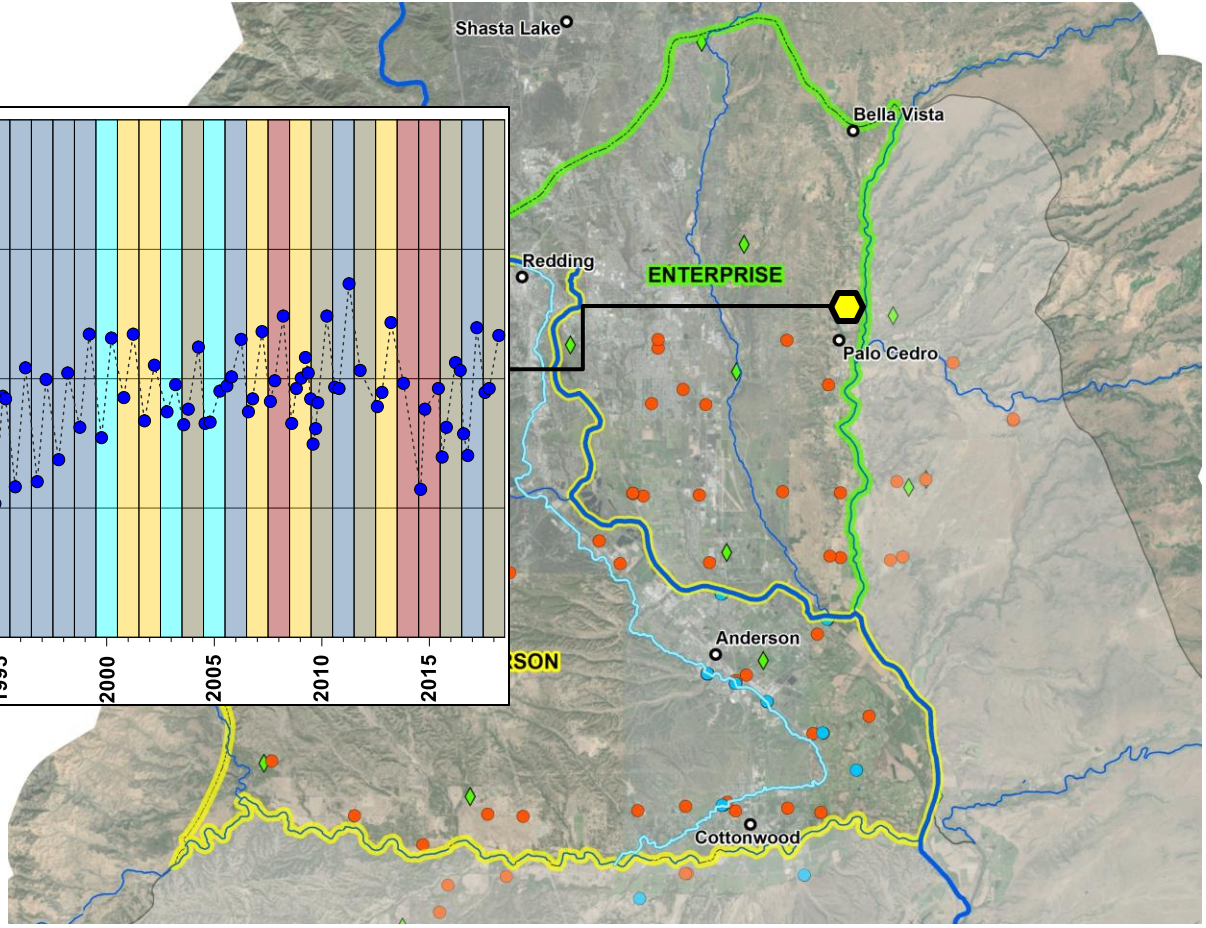
Groundwater-level trends – Enterprise Subbasin





DWR Continouous GW Level Measurement

DWR Periodic GW Level Measurement

USGS Periodic GW Level Measurement

Sacramento Valley Water Year Index

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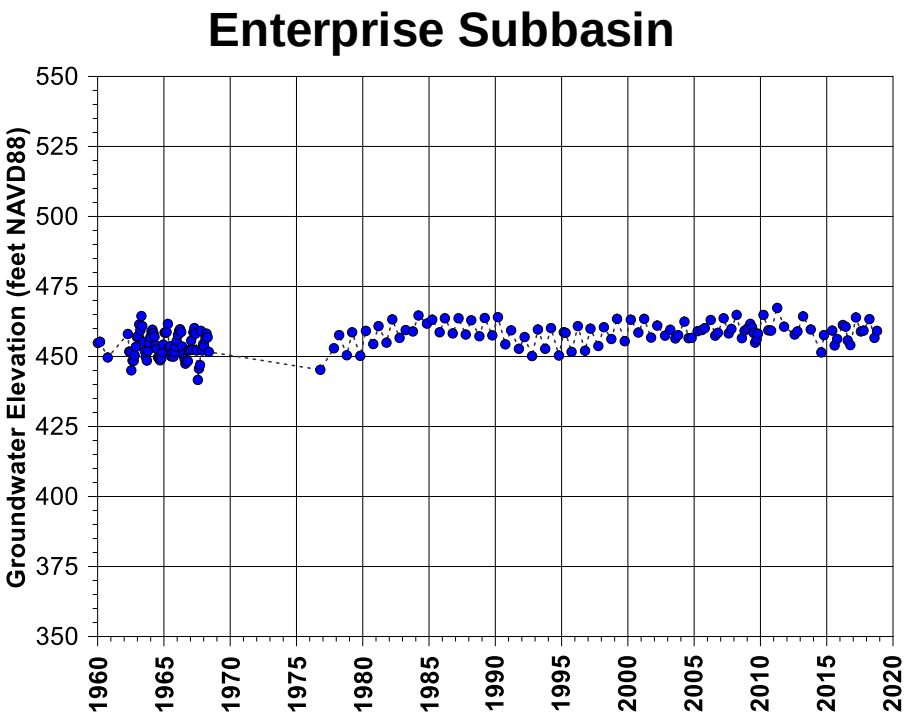
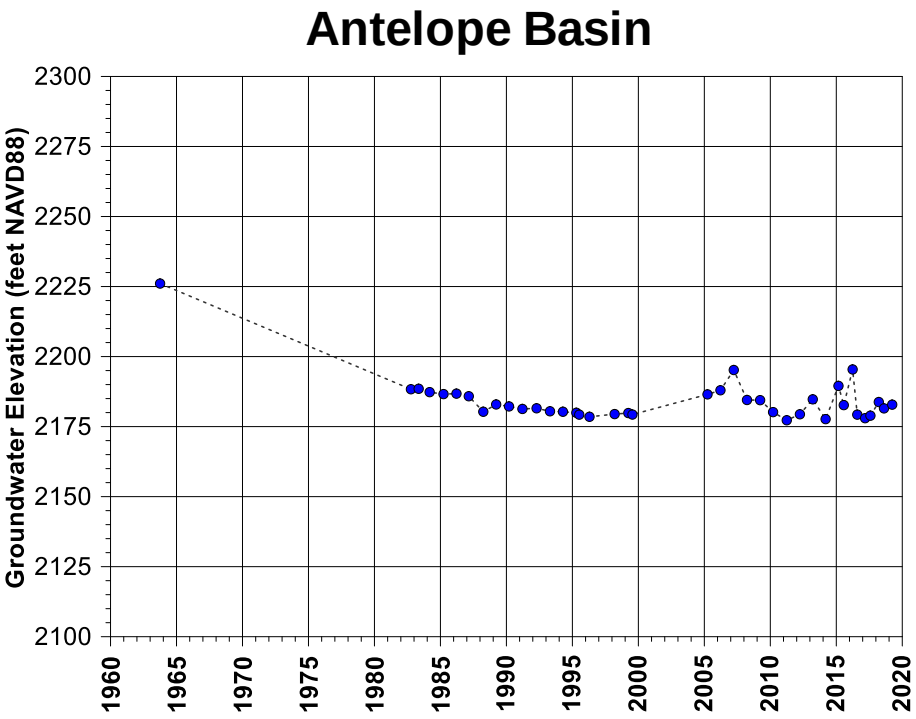
Hydrograph Comparison – Adjudicated Basin Example





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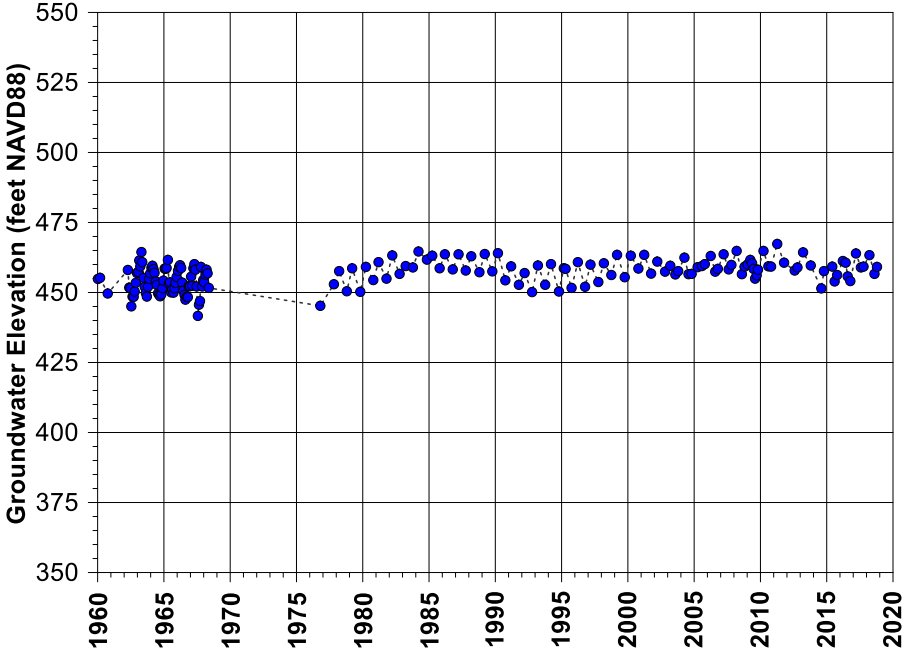
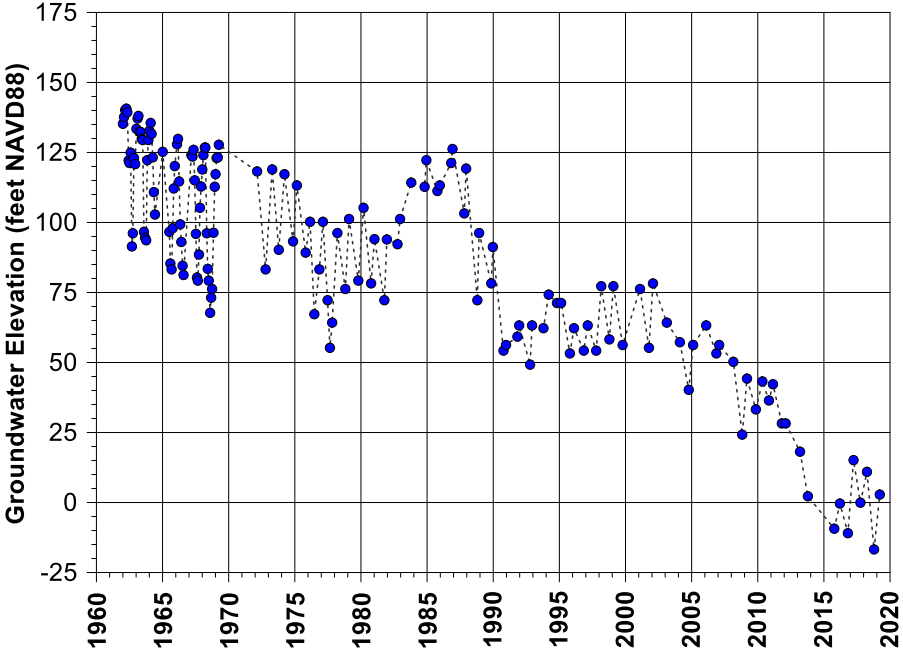
Hydrograph Comparison – Critically Over-drafted Basin Example

Enterprise Subbasin



Merced Subbasin



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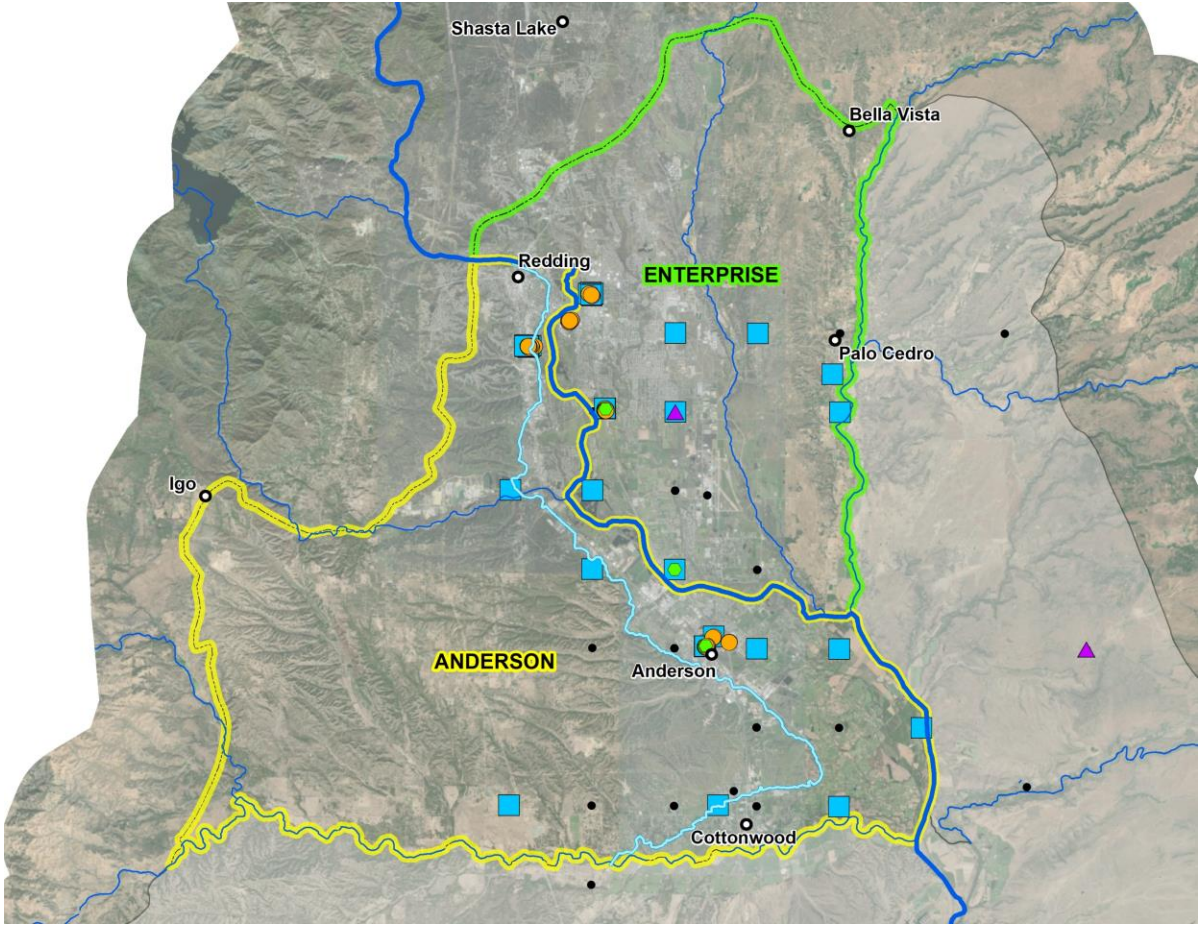
Groundwater Quality Exceedances (2015–2019)



- Arsenic
- VOCs
- Fuels
- Iron/Manganese
- Groundwater Quality Sample Location

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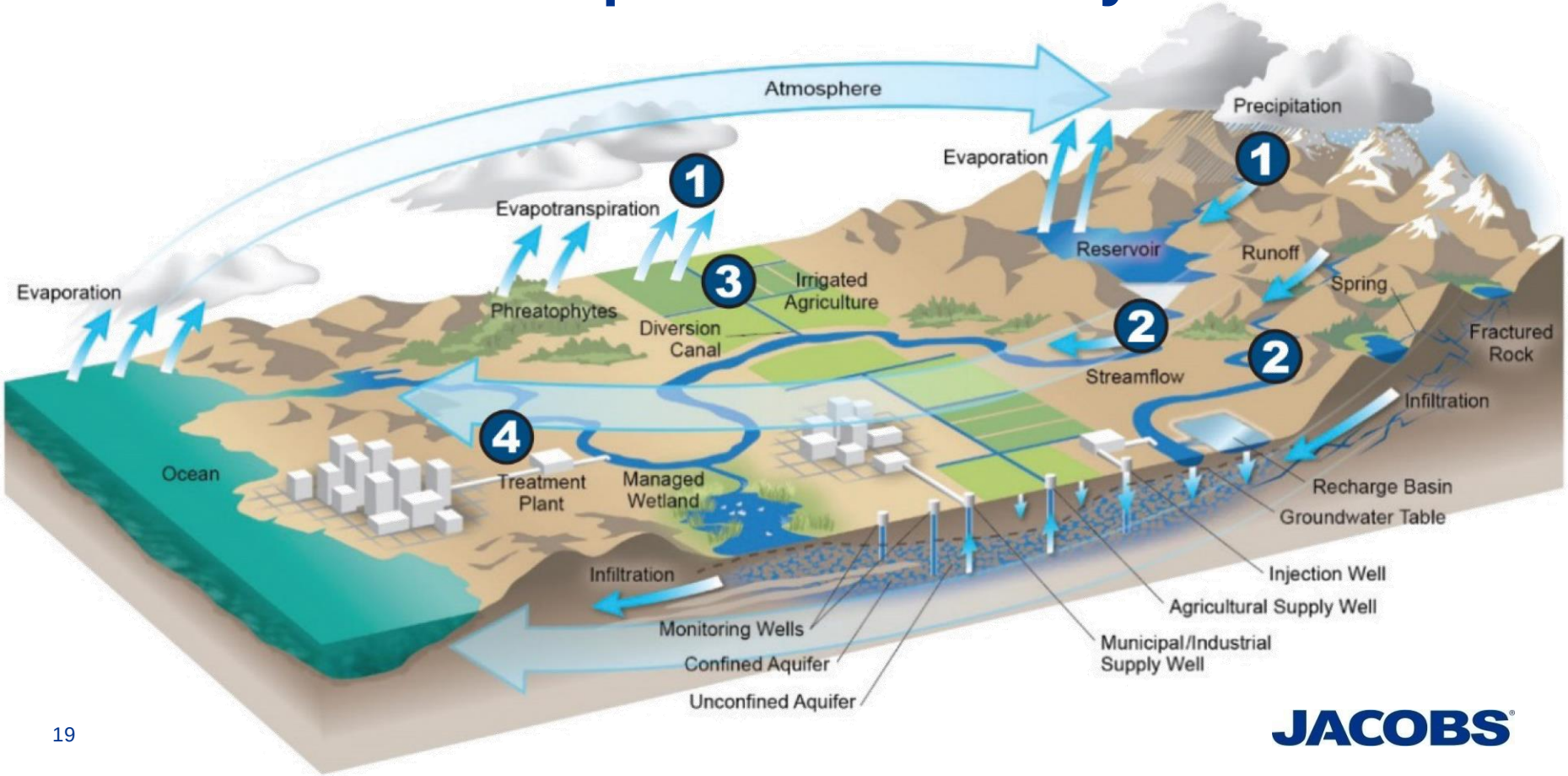
SGMA Data Collection

Groundwater Components for Analysis



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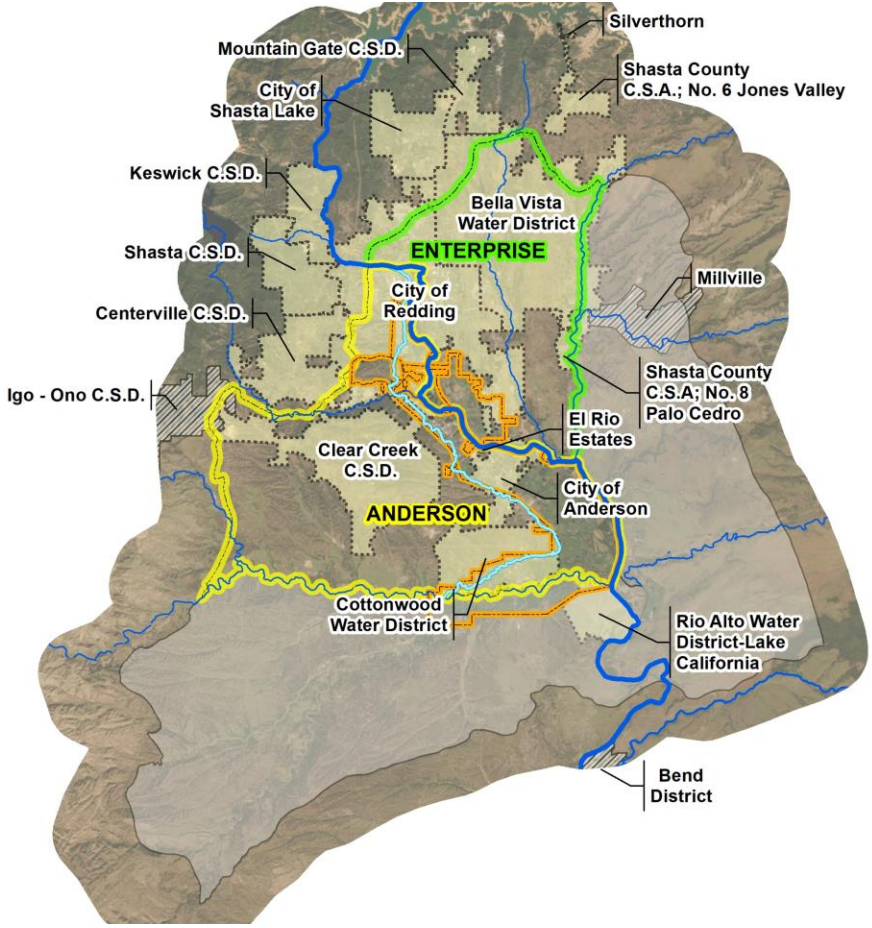
Water Purveyor Data Collection



Data Collection Status

- Water Use/Supply Data Received
- Not Contacted
- A.C.I.D. - SW Diversion Data

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Water Supply/Use Data Collection Types

GW
Pumping

SW
Diversions

WTP
WWTP
Flows

Deliveries

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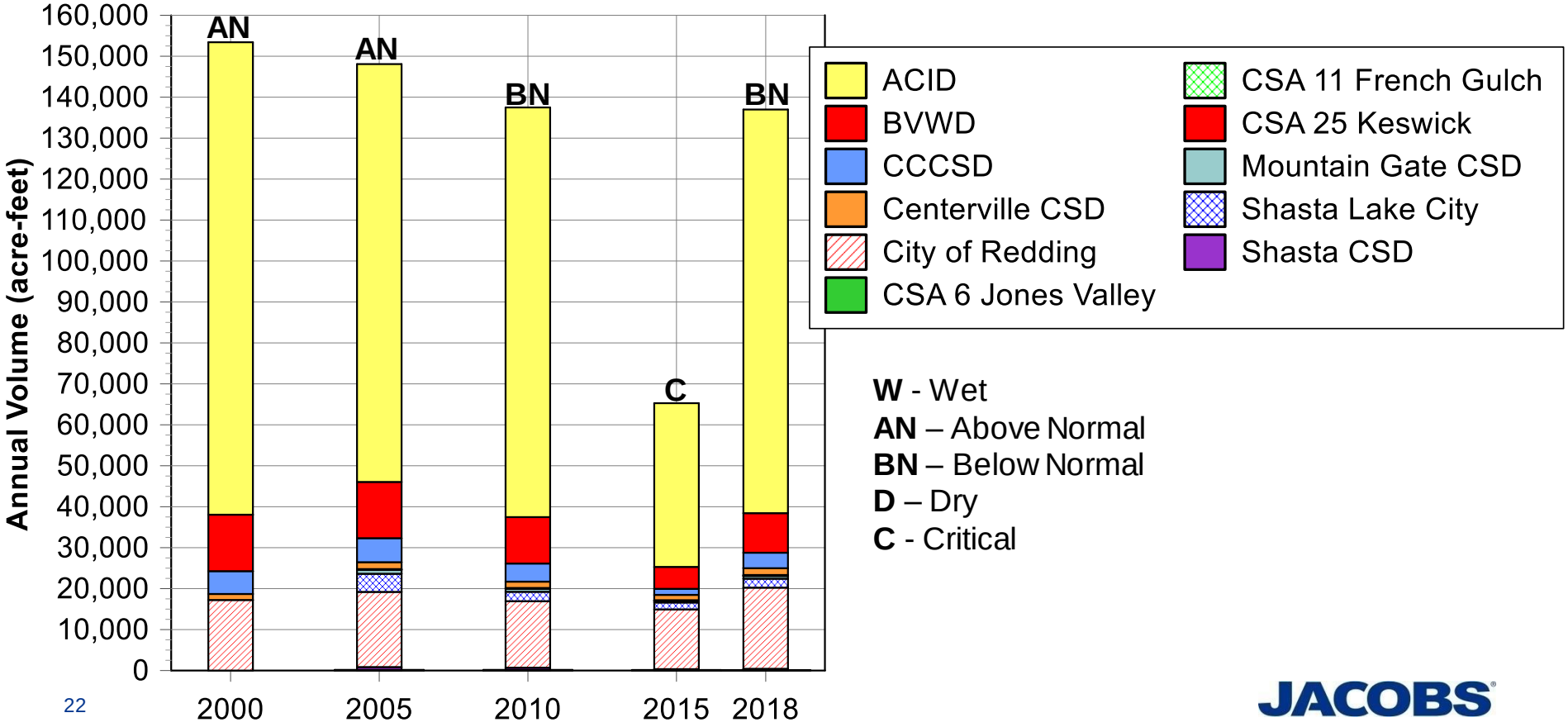
Example – Relative Annual Surface Water Diversion



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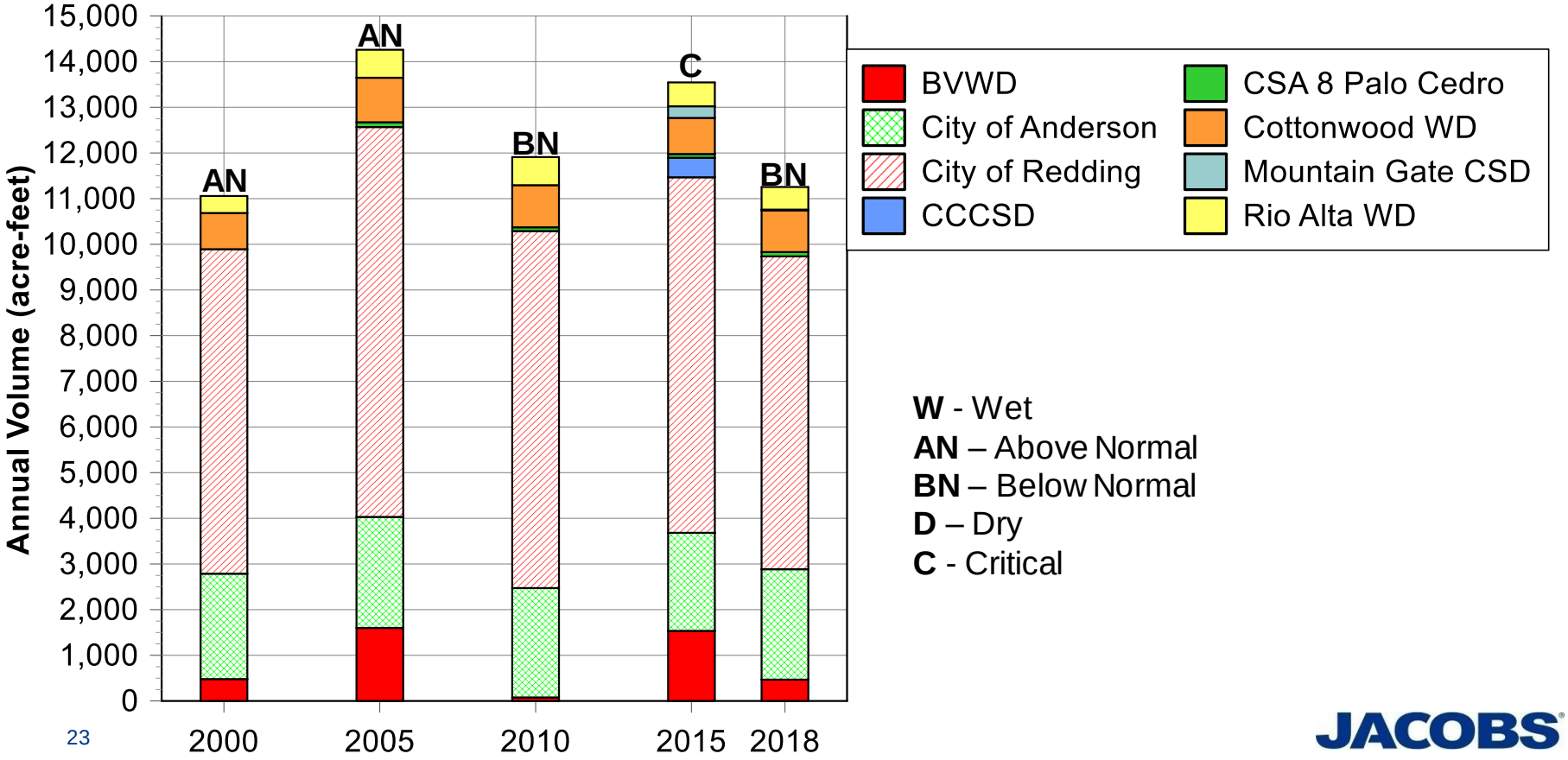
Example – Relative Annual Groundwater Production



W - Wet
AN – Above Normal
BN – Below Normal
D – Dry
C - Critical

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Sustainability Indicators

- Chronic lowering of GW levels
- Significant land subsidence
- Significant reduction of GW storage
- Significant seawater intrusion
- Significant depletions of interconnected SW
- Significant degraded water quality

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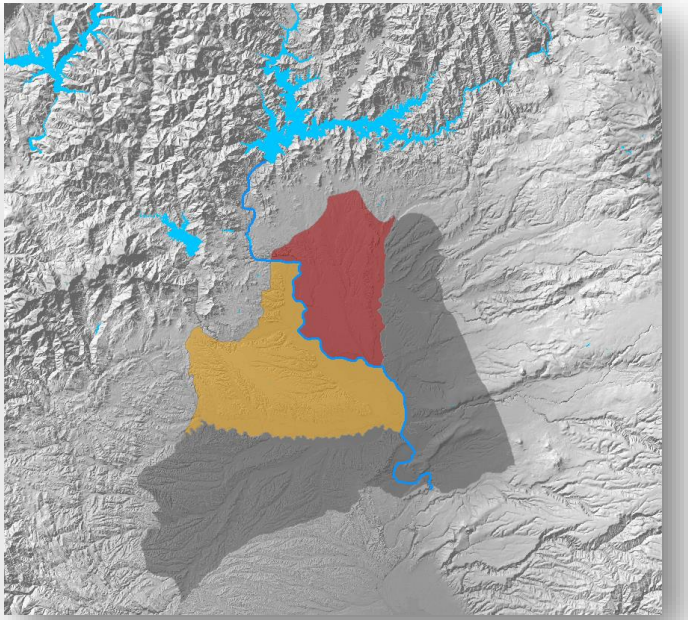
Enterprise and Anderson Subbasins Characteristics Relative to Sustainability Indicators

- Seawater intrusion?
  - Nearest ocean is nearly 100 miles away.
- Land subsidence?
  - Not applicable to Redding Basin aquifers.*



* DWR. 2018. *2017 GPS Survey of the Sacramento Valley Subsidence Network.* December.

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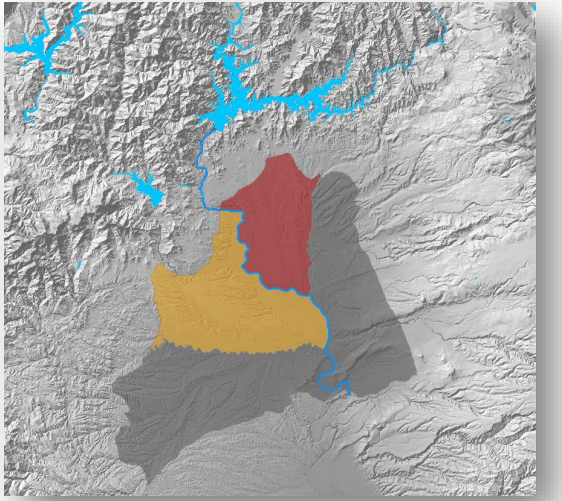
Enterprise and Anderson Subbasins Characteristics Relative to Sustainability Indicators

- Chronic lowering of GW levels?
  - GW levels have been stable over long term.
- Significant reduction of GW storage?
  - GW storage has also been stable over long term.
- Degraded water quality?
  - Water quality is generally good in Redding Basin.
- Depletions of interconnected SW and GW?
  - GW and SW systems are interconnected.



GW-SW interaction will be the more important process to evaluate for the GSPs, because increased reliance on local GW pumping in future could reduce streamflows in Sacramento River and its tributaries.

Management Actions

- SGMA requires that GSPs evaluate potential future conditions that may lead to loss of basin sustainability
- Several scenarios that may lead to potential concerns regarding basin sustainability have been identified

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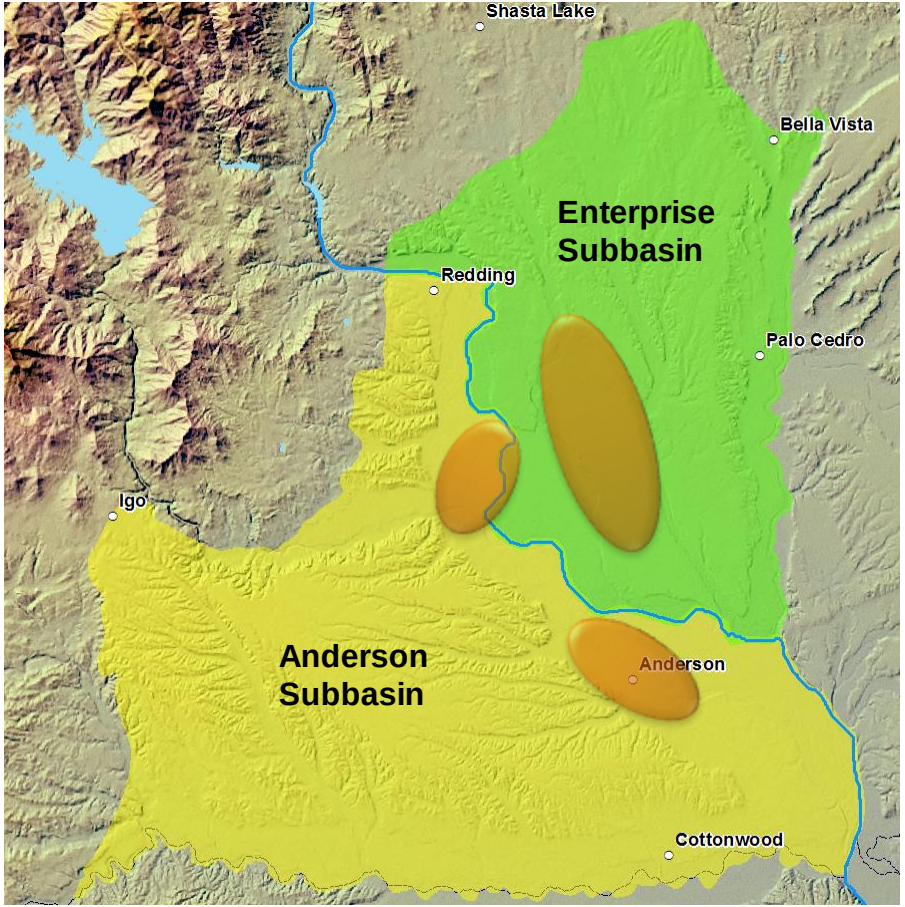
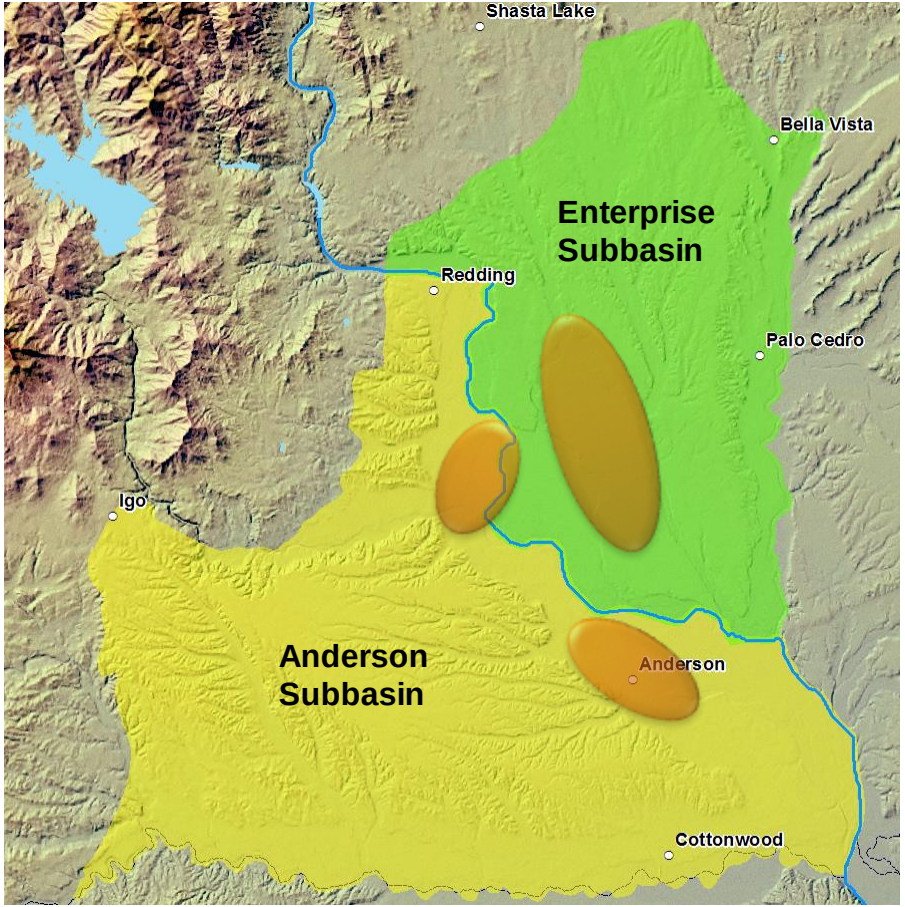
Example Management Action Questions

- Would increased GW use at City well fields from population growth cause *significant and unreasonable* effects?



Example Management Action Questions

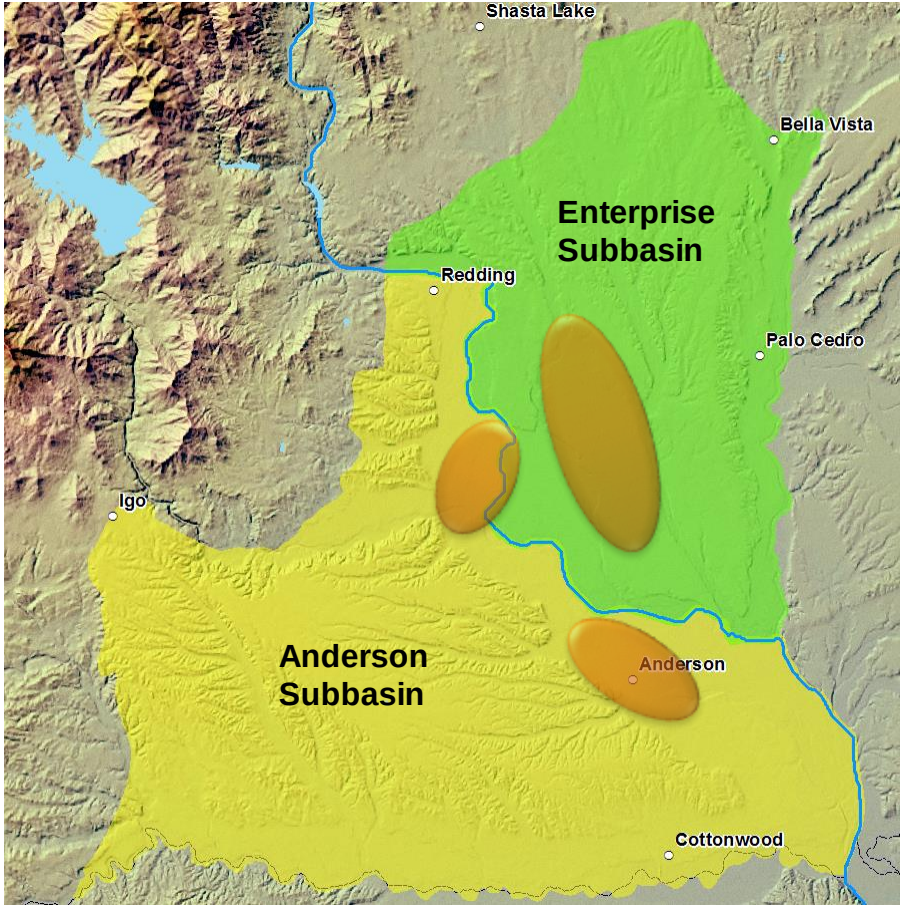
- How much additional GW pumping could be tolerated at City well fields without causing *significant and unreasonable* effects?



Example Management Action Questions

- How might reductions of SW allocations affect subbasin sustainability?
- How might climate change affect water management?

Reminder: GW currently may contribute ~700K AF of water to river between Keswick and Bend Bridge.



Path Forward

- Prepare Hydrogeologic Conceptual Model chapter of GSP
- Develop numerical groundwater flow model of the Redding Area Groundwater Basin
- Develop water budgets for the Enterprise and Anderson Subbasins
- Begin to evaluate management actions

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Thank You!

Enterprise Anderson Groundwater Sustainability Agency Board Meeting

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Groundwater Sustainability Planning (GSP)

- GSP Background and Objectives
- Plan Components
- Defining Sustainability
- What to expect during GSP development
- Management Questions for Sustainability
- Groundwater Data to Collect and Analyze

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Discussion items

- Groundwater Sustainability Plan (GSP) update
  - Overview of compiled data
  - Thoughts on GSP preparation and defining sustainability
  - **What to expect during GSP development**
- Next steps
  - Hydrogeologic conceptual model development
  - Numerical modeling to support GSP development
  - Potential DWR Technical Support Services (TSS) funding opportunities
  - Public outreach

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Discussion

- Define what constitutes *significant and unreasonable*
- Assess whether *minimum thresholds* are adequate or too restrictive
- Assess whether *measurable objectives* are reasonable
- Agree on how to combine *minimum thresholds* into *undesirable results*
- Agree what potential *projects and management actions* are necessary
- Decide who will pay for ongoing SGMA-related costs

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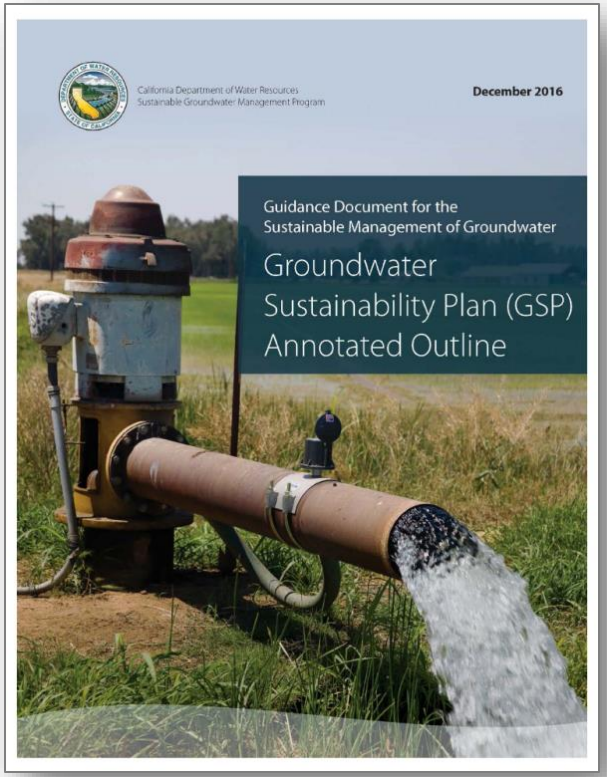
GSP Sections

- **Part 1**: Describe who you are
- **Part 2**: Describe subbasin geology and hydrogeology (with sustainable yield)
- **Part 3**: Define how you will measure sustainability
- **Part 4**: Identify programs and projects that get you to sustainability
- **Part 5**: GSP implementation information



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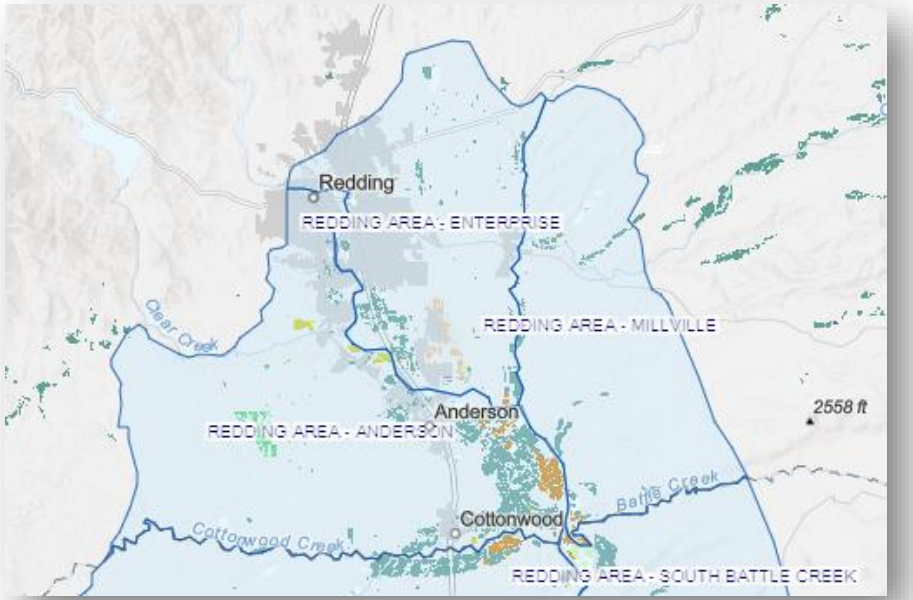
Part 1: Describe Who You Are

- Maps of cities and towns
- Water districts
- Land use
- Well density
- Existing groundwater management activities
- Existing general plans, UWMPs, AWMPs, & IRWMPs



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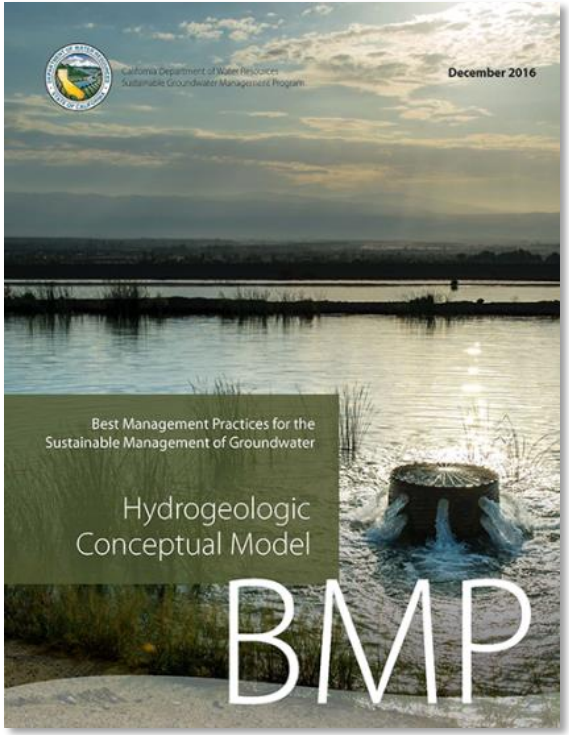
Part 2: Describe the Basin

- Hydrogeologic conceptual model
- Historical and current water budgets
  - Groundwater recharge and pumping
  - Change in groundwater storage
  - Estimate of sustainable yield
- Future groundwater budget
  - Include effects of climate change
- Existing monitoring programs



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Part 3: Define Sustainability and Measurement

- Policy section
- Opportunity for public input and review

Sustainability Indicators

Lowering GW Levels	Reduction of Storage	Seawater Intrusion	Degraded Quality	Land Subsidence	Surface Water Depletion

This is one of the most important sections of the GSP

- Uncertainty in your sustainable yield is OK
- Lack of clarity in how you define sustainability is NOT OK

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Part 4: Projects and Programs for Sustainability

- Technical and policy aspects
- Opportunity for public input and review
- Achieve sustainability in 20 yrs.
- Maintain sustainability for 30 years thereafter
- Funding Plan and beneficiaries

Projects: physical projects that require CEQA.

Management Actions: relate to altering use, changes, implementing conservation strategies, etc. land-use

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Part 5: GSP Implementation

- Implementation schedule
- Implementation costs
- Permitting requirements

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Defining Sustainability Thresholds

- **Minimum Threshold**:

Threshold for significant and unreasonable groundwater levels at selected monitoring points

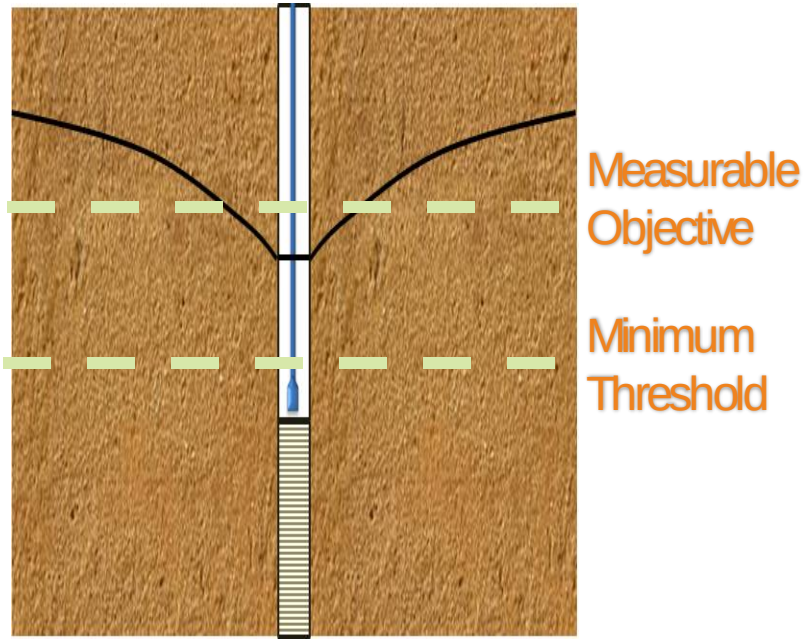
The line we don't want to cross.

- **Measurable Objective**:

Goal. Early warning for approaching minimum threshold.

- **Undesirable Result**:

Combination of *minimum thresholds* at selected monitoring points = sustainability.



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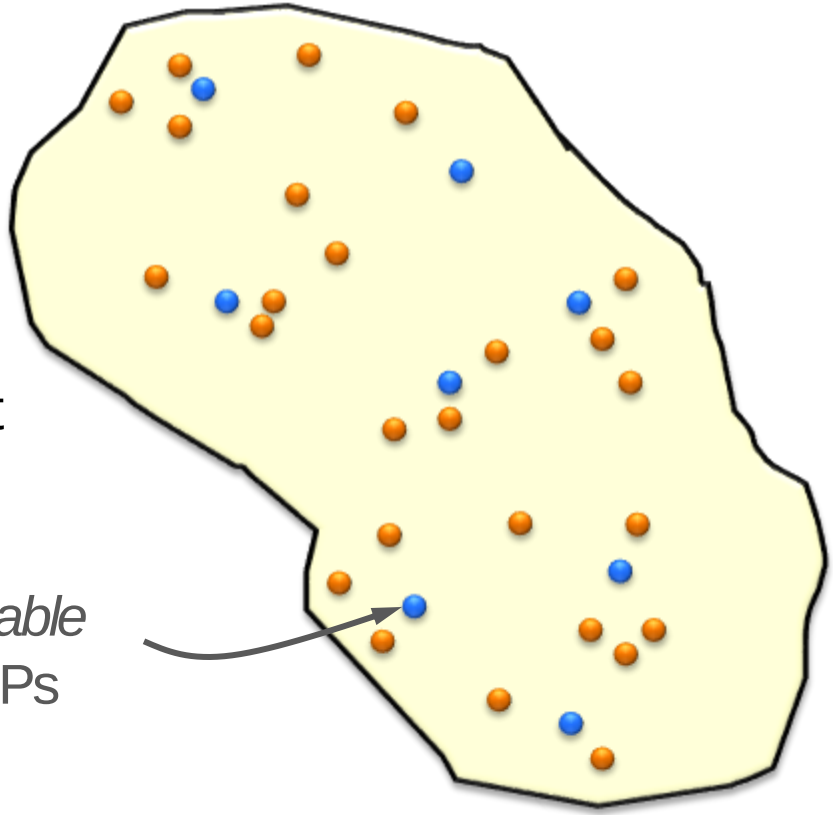
Representative monitoring points

- Representative Monitoring Point (RMP)
- Other Monitoring Point (MP)

Minimum thresholds and *measurable objectives* are only defined at RMPs



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Undesirable results

"The description of undesirable results … shall be based on a quantitative description of the ***combination of minimum threshold exceedances*** *that cause significant and unreasonable effects in the basin."*

Avoiding *undesirable results* is how you prove sustainability.

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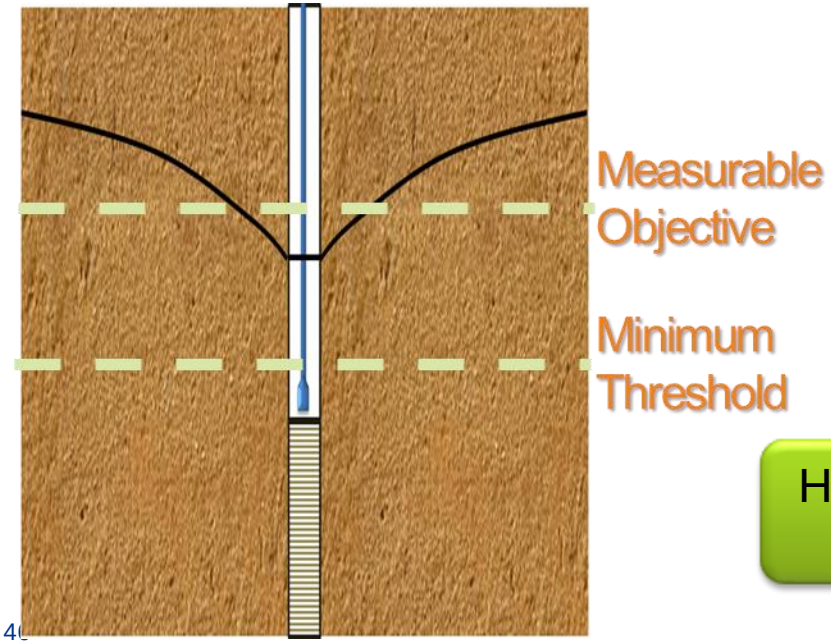
Example

Undesirable result



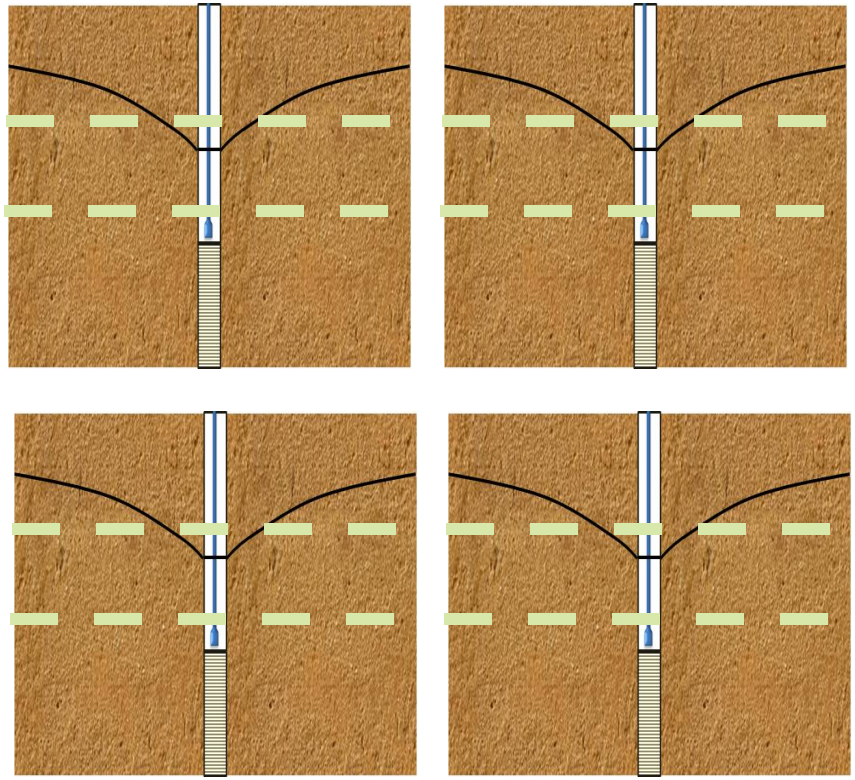
- 10% decrease of groundwater elevations, measured at Representative Monitoring Points, decrease below the *minimum threshold.*

How you define *undesirable results* is how you can accommodate flexibility.

Evidence – based Proof of Sustainability

- Measured groundwater conditions starting in 2020 demonstrate that groundwater levels at the selected monitoring points, in combination, are above the min. thresholds.

- Plan to meet *measurable objectives* in the plan's time horizon.



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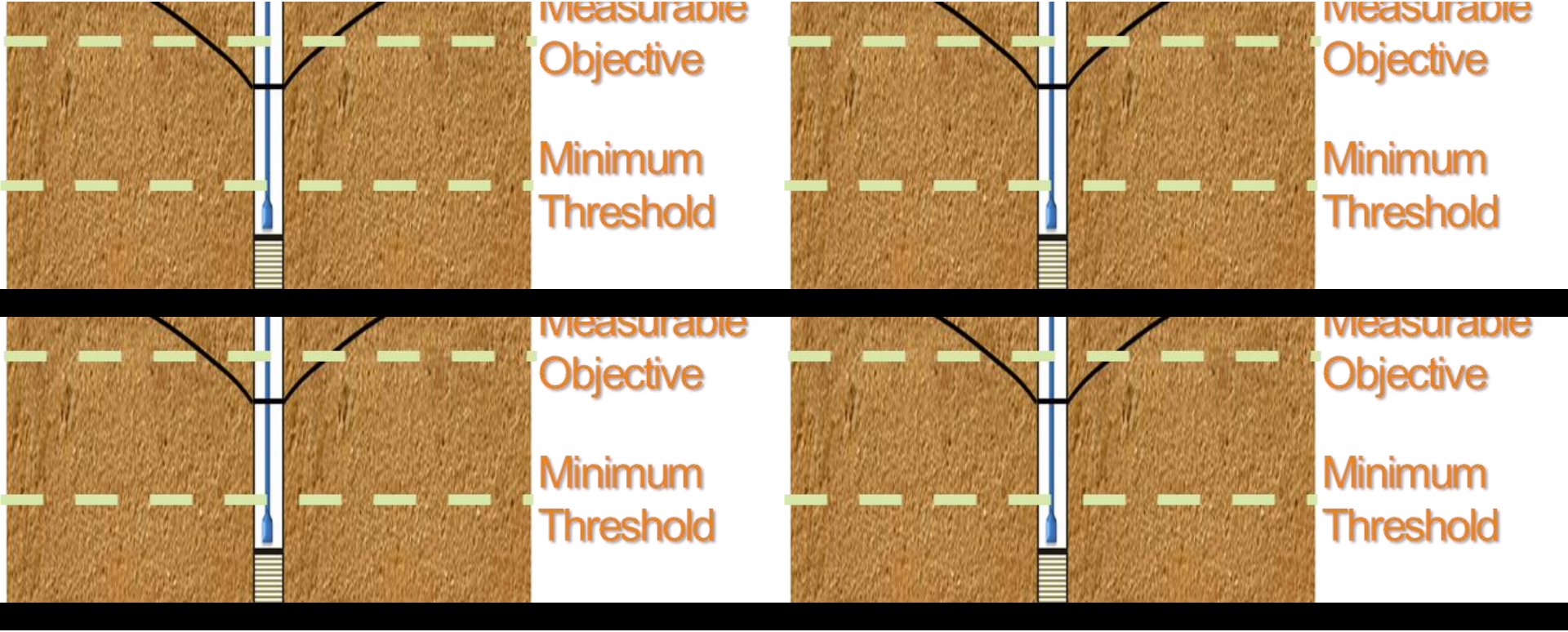
Undesirable Results = Combination of Min. Thresholds



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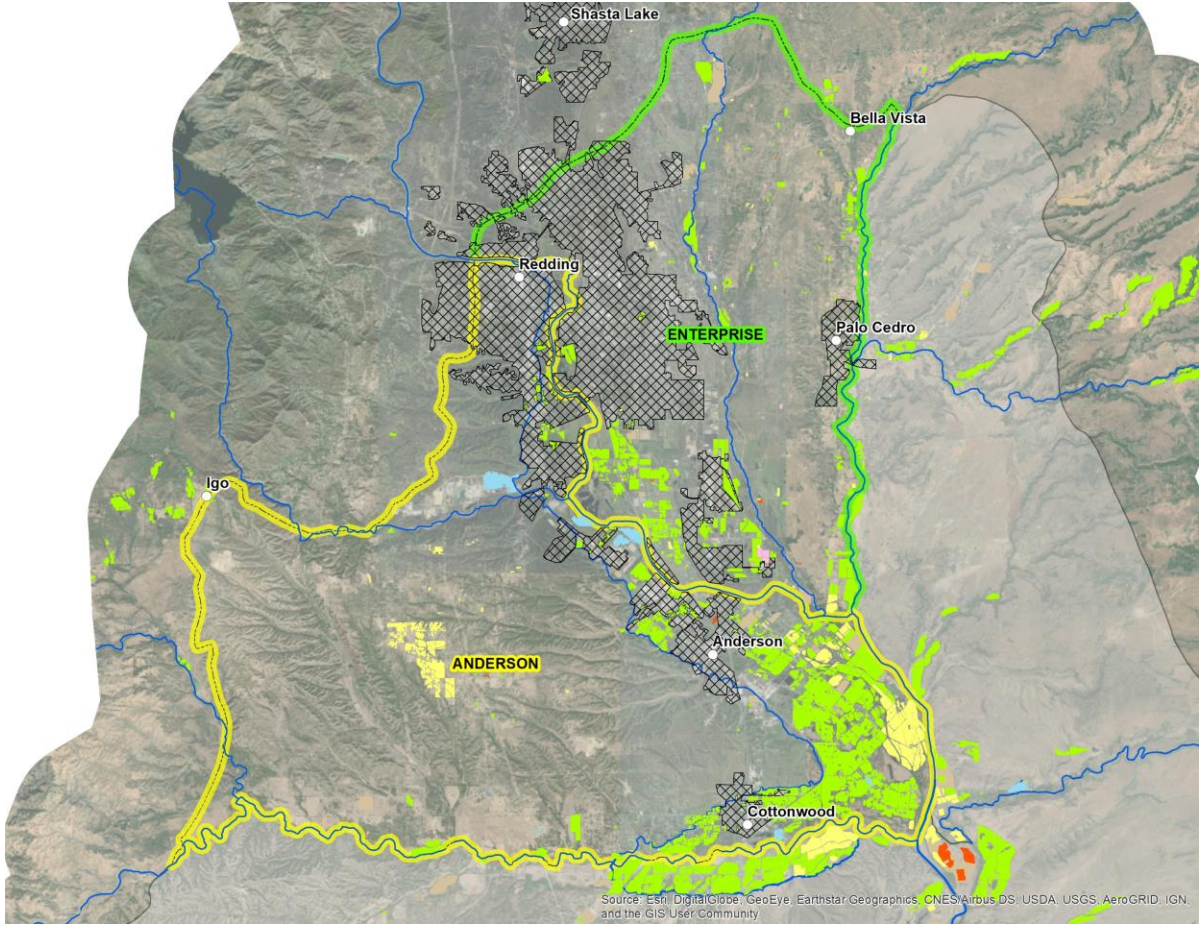
Land Use - 2014



Land Use

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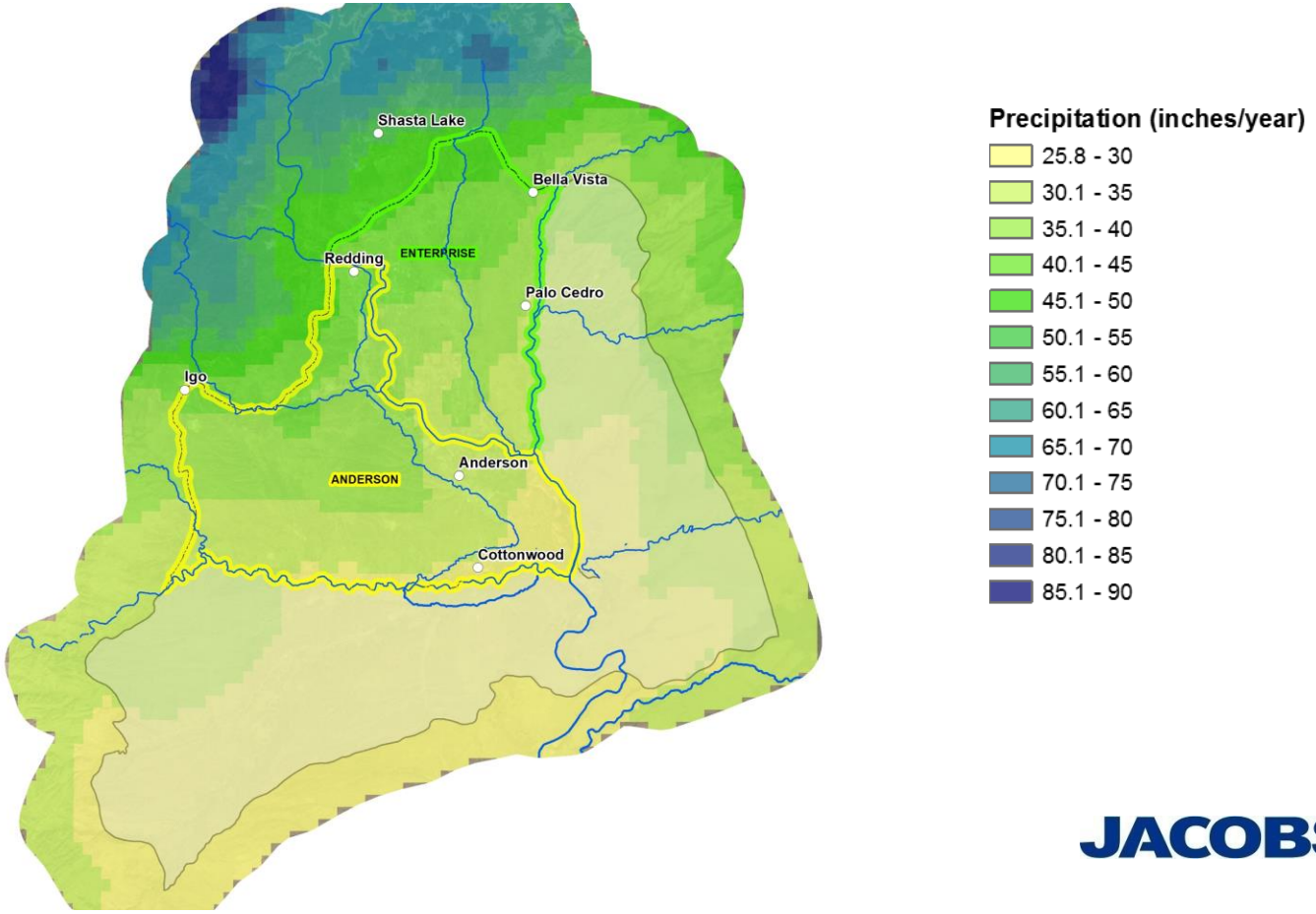
Average annual precipitation (1980–2010)



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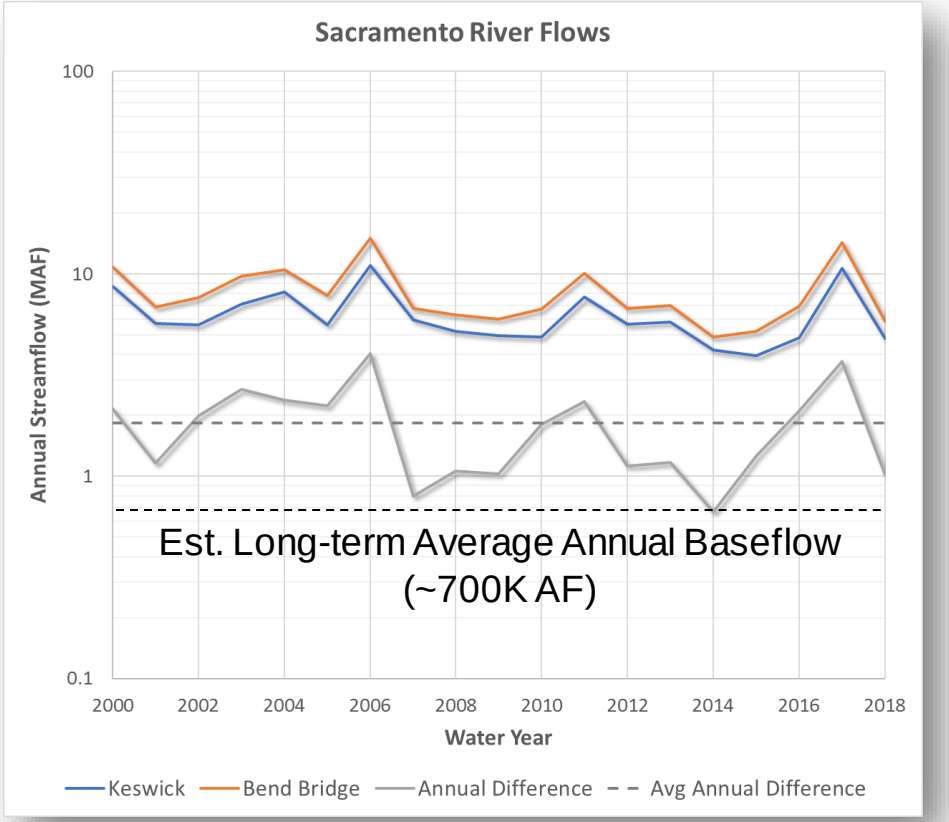
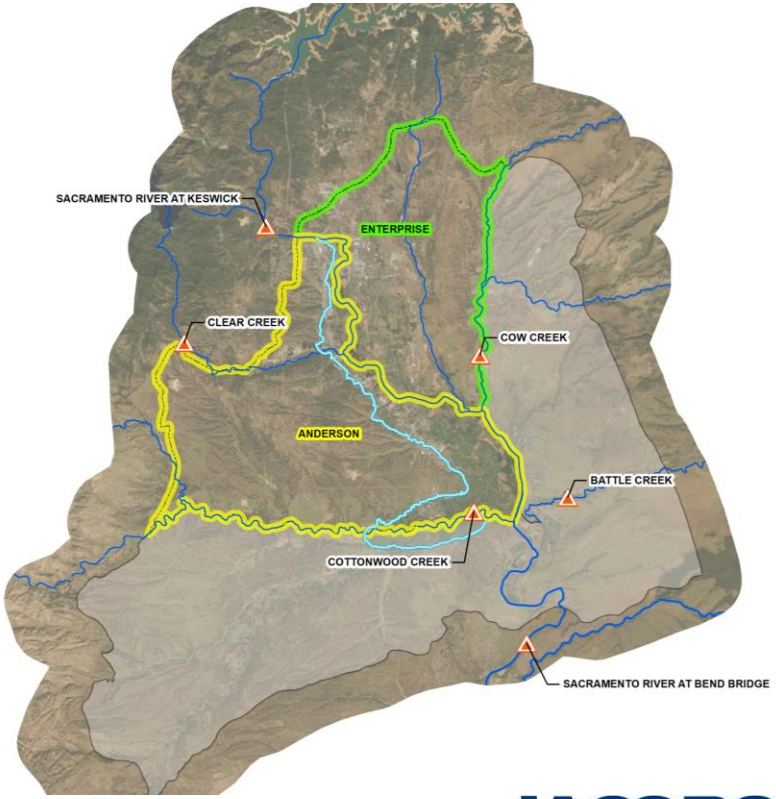
Sacramento River streamflows gain ~2 MAF as river passes through Redding Basin





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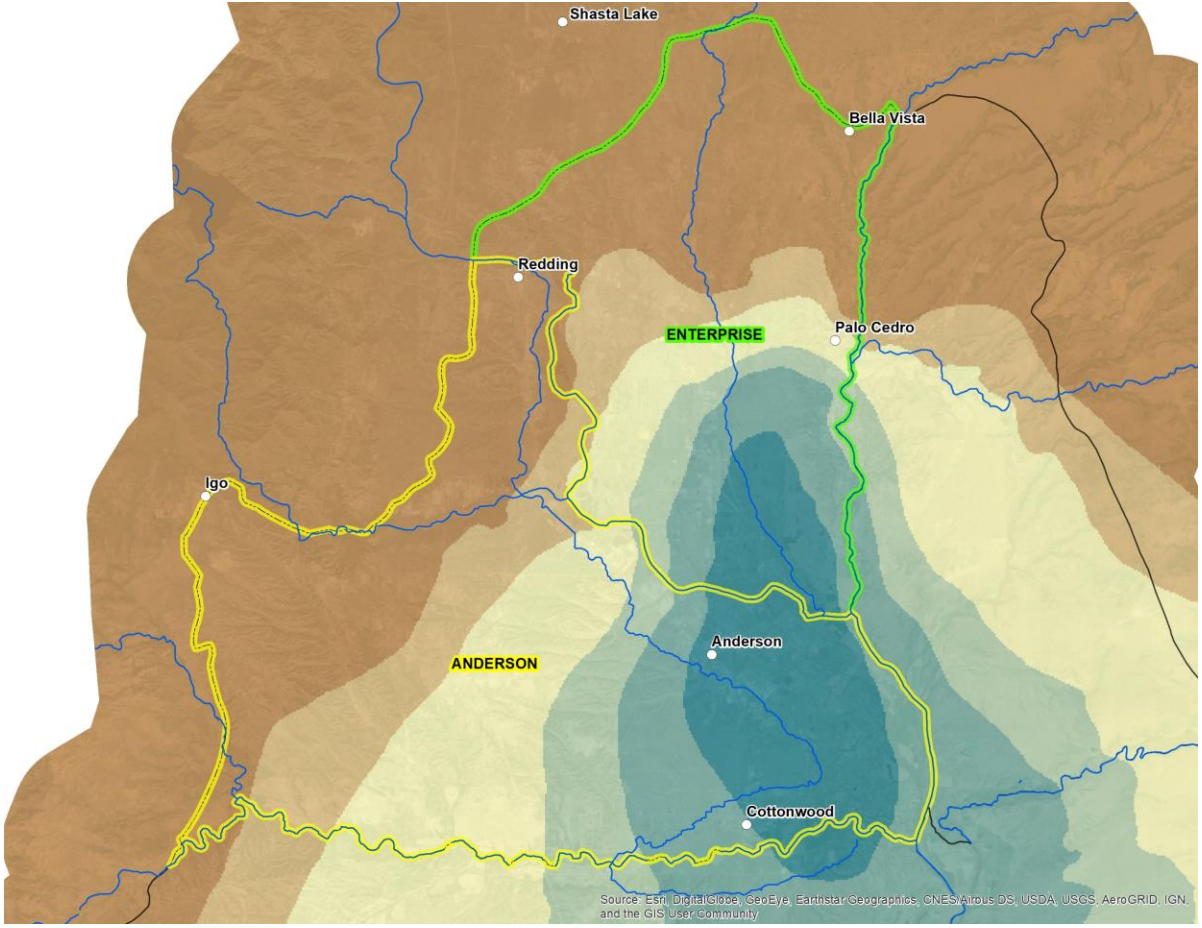
Aquifer transmissivity (productivity)



Gallons/Day/Foot

- <= 100
- 100.1 - 500
- 500.1 - 1,000
- 1,000.1 - 5,000
- 5,000.1 - 10,000
- 10,000.1 - 25,000
- 25,000.1 - 70,308.8

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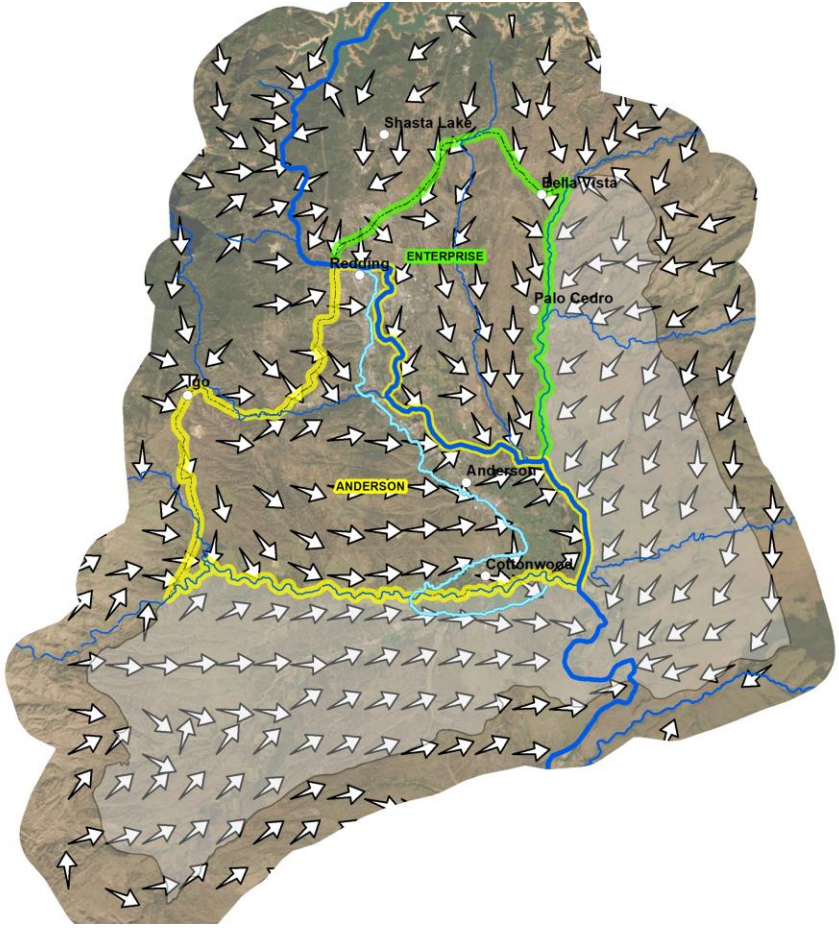
Groundwater flow directions



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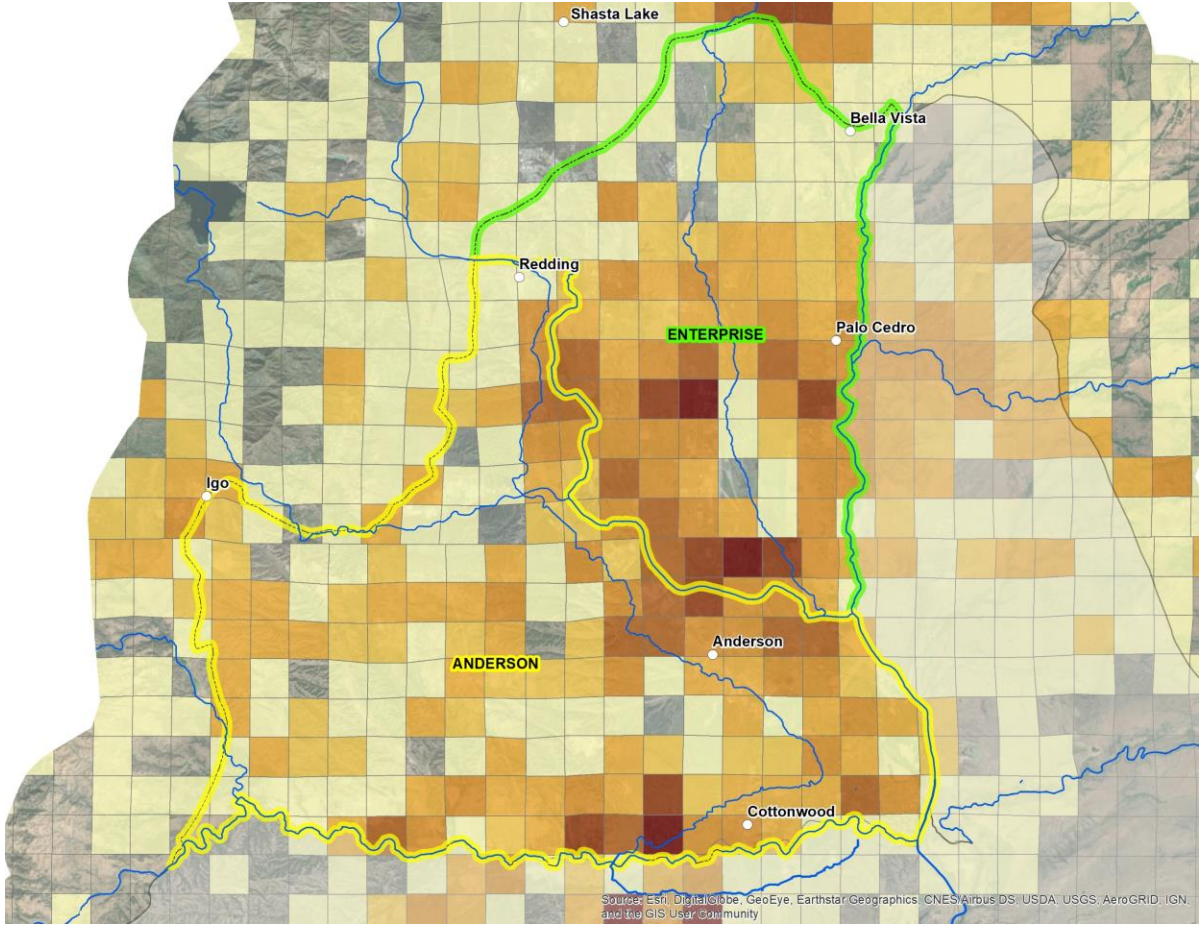
Domestic well count



Well Count

- 0
- 1 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 145

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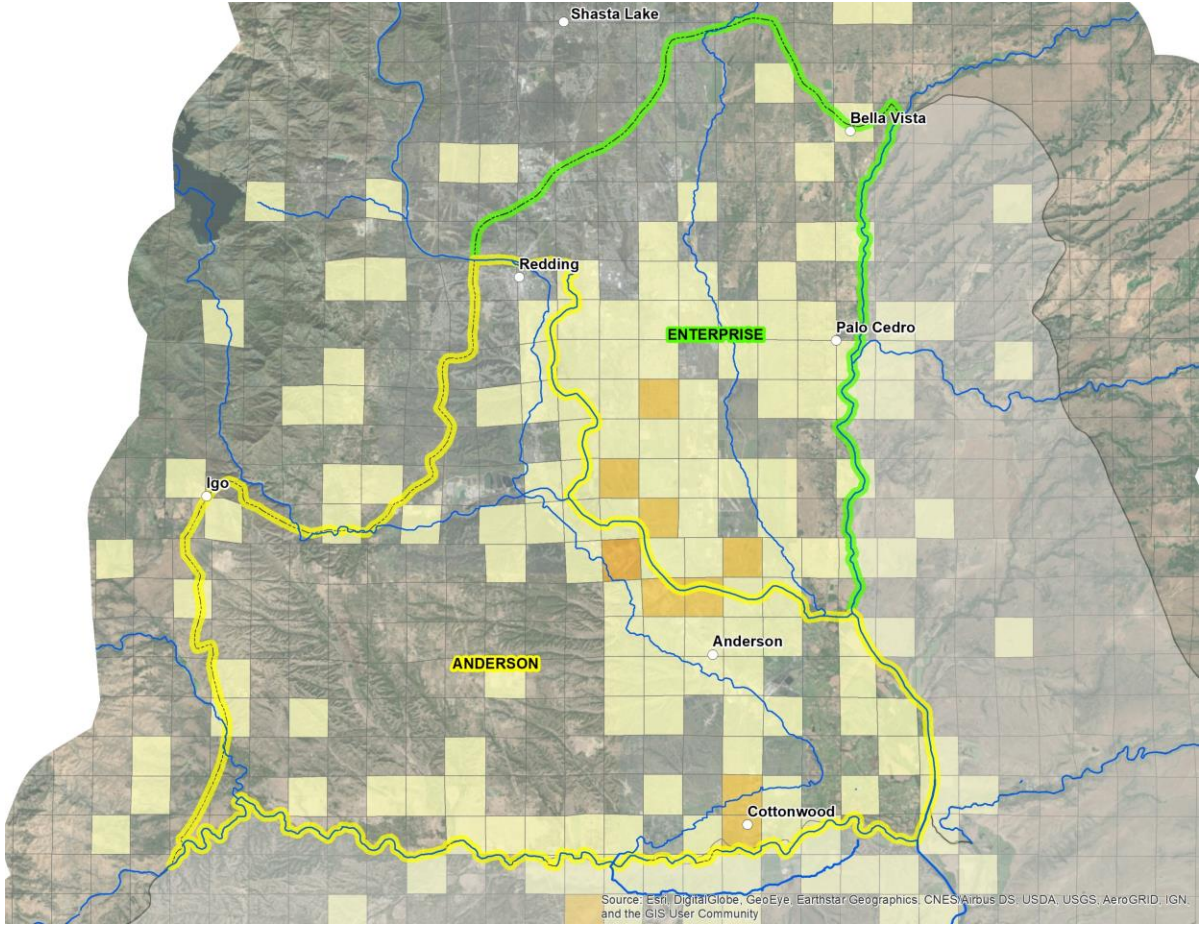
Production well count



Well Count

- 0
- 1 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 145

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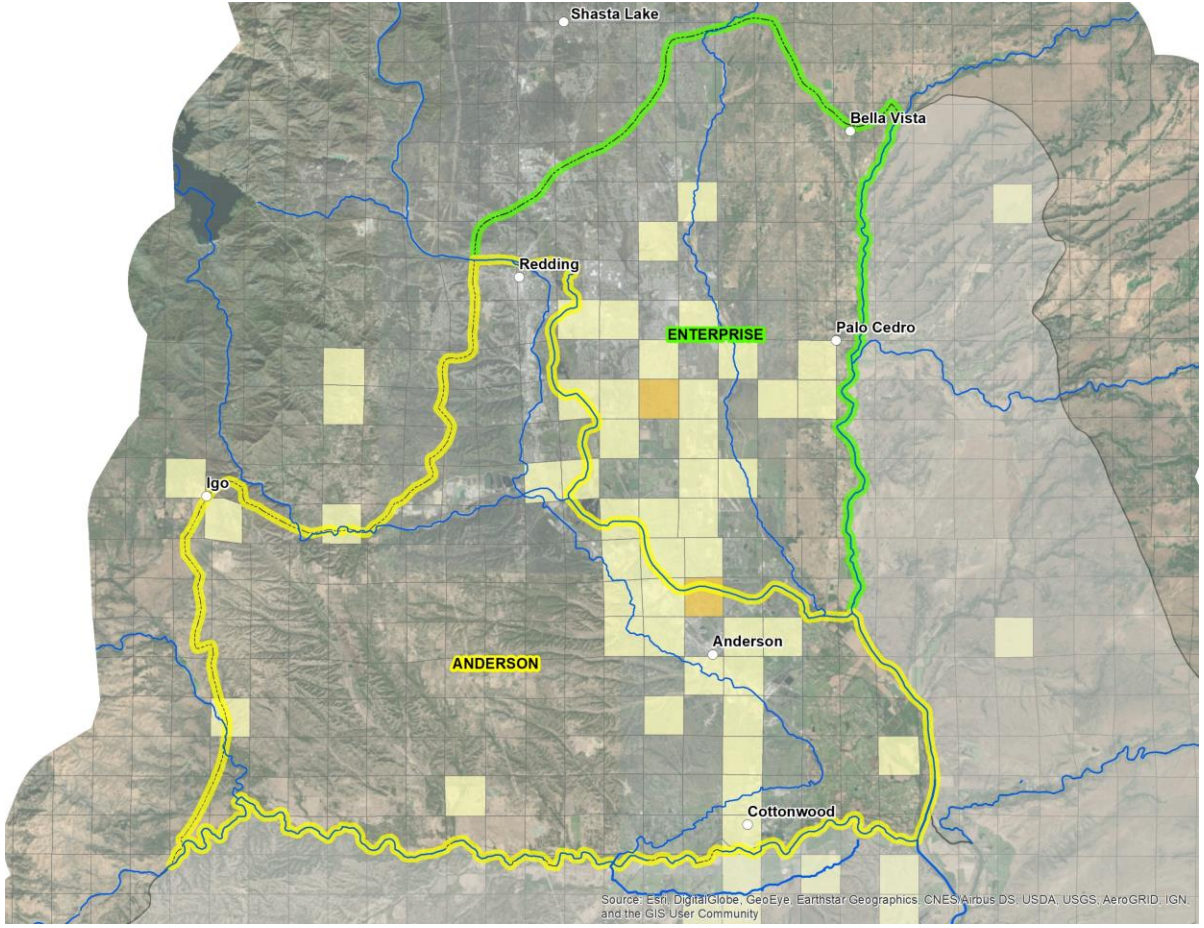
Public well count



Well Count

- 0
- 1 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 100
- 101 - 145

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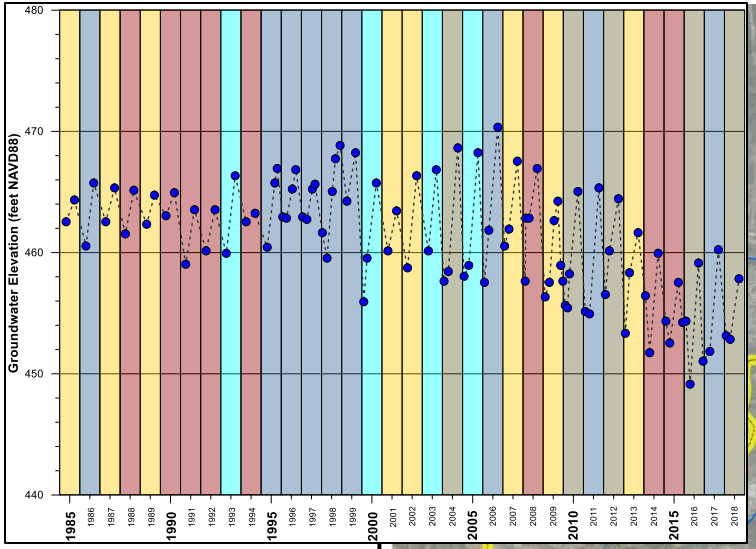
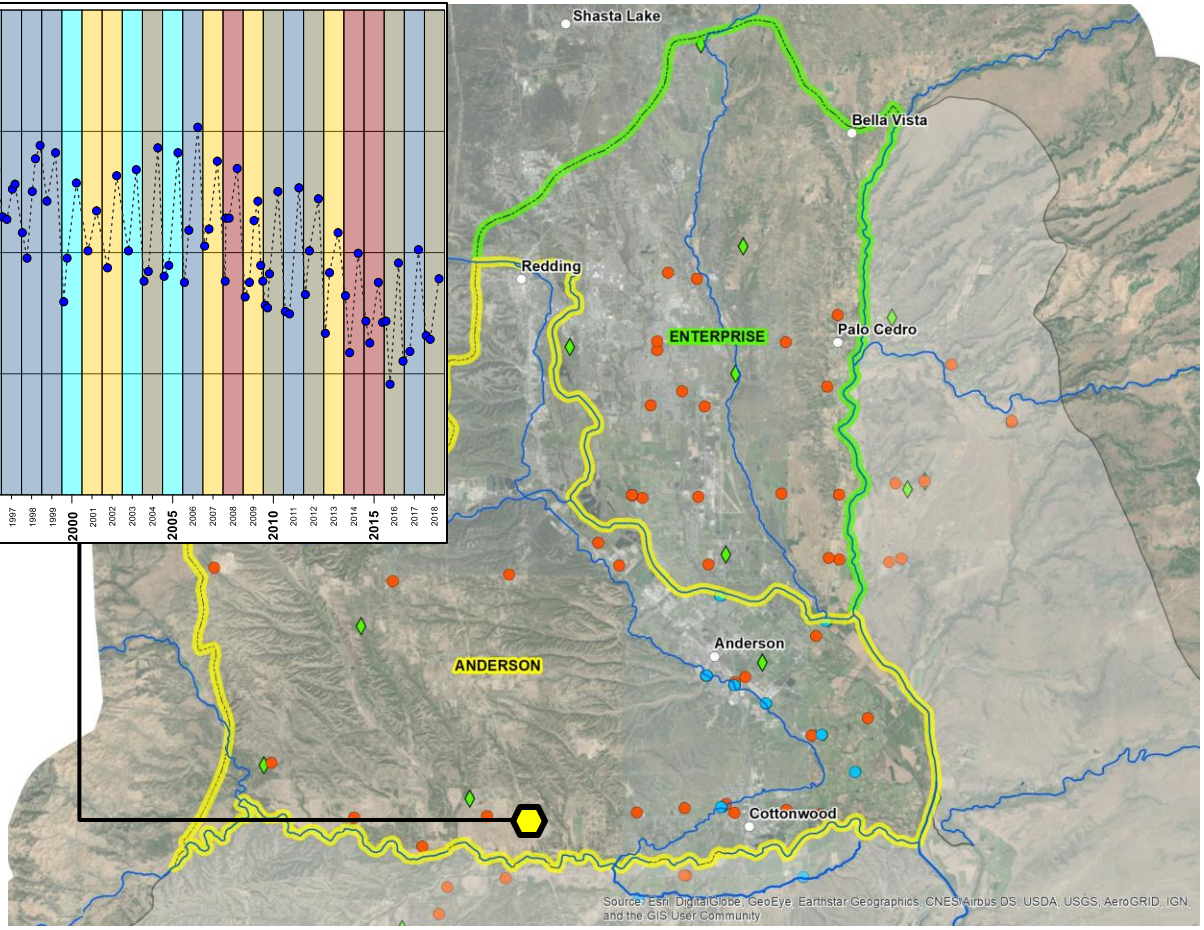
Groundwater-level trends – Anderson Subbasin





DWR Continouous GW Level Measurement

DWR Periodic GW Level Measurement

USGS Periodic GW Level Measurement

Sacramento Valley Water Year Index

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)

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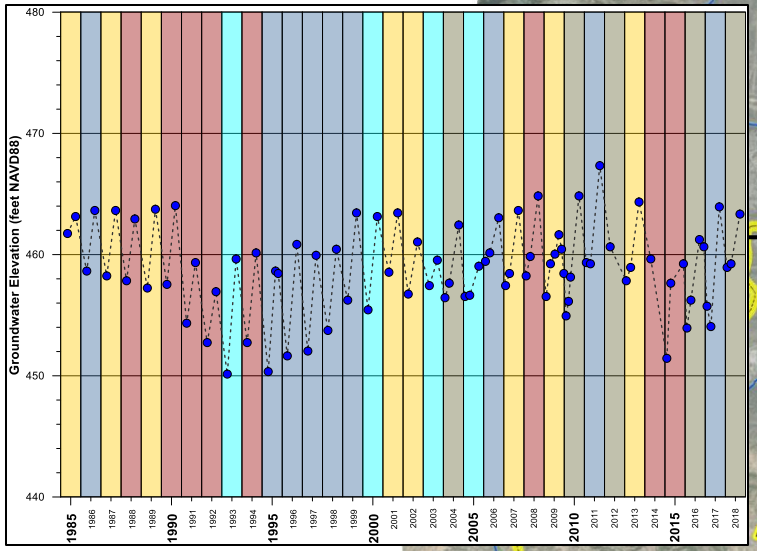
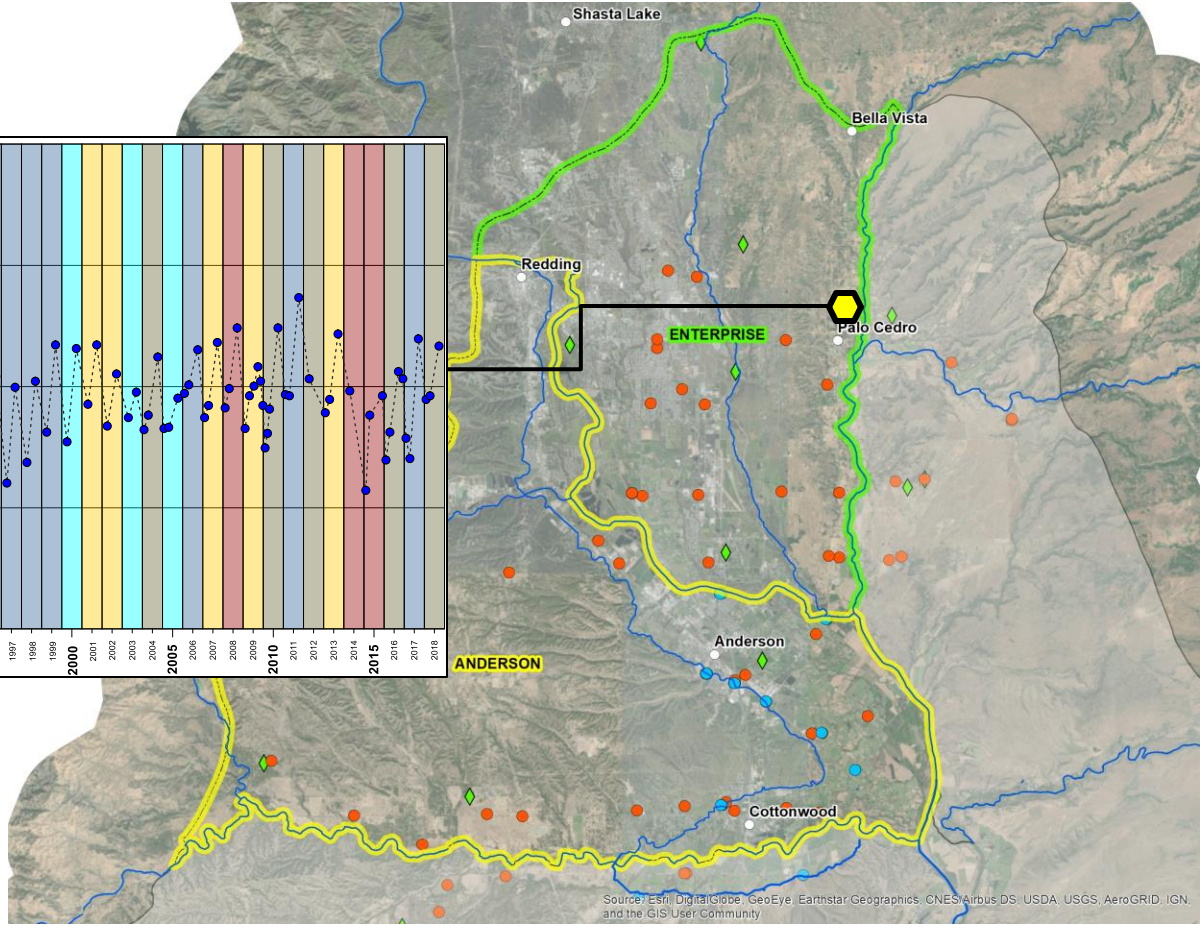
Groundwater-level trends – Enterprise Subbasin





DWR Continouous GW Level Measurement

DWR Periodic GW Level Measurement

USGS Periodic GW Level Measurement

Sacramento Valley Water Year Index

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)

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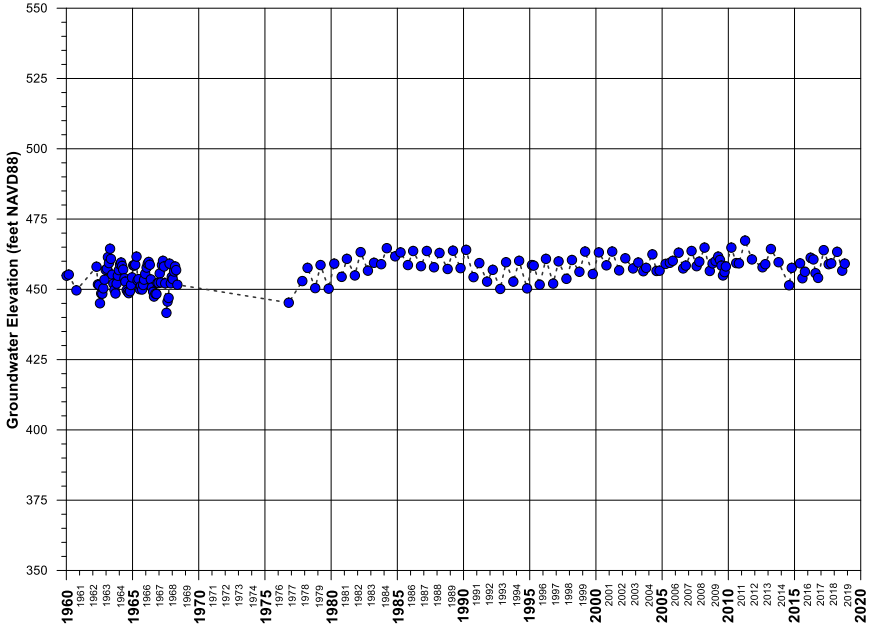
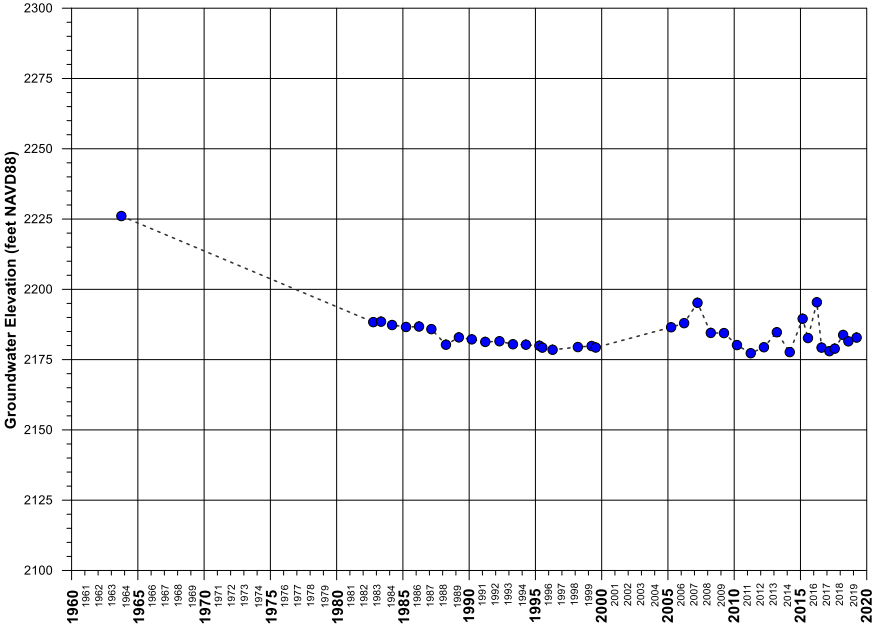
Hydrograph comparison – Adjudicated basin example

Enterprise Subbasin



Antelope Basin



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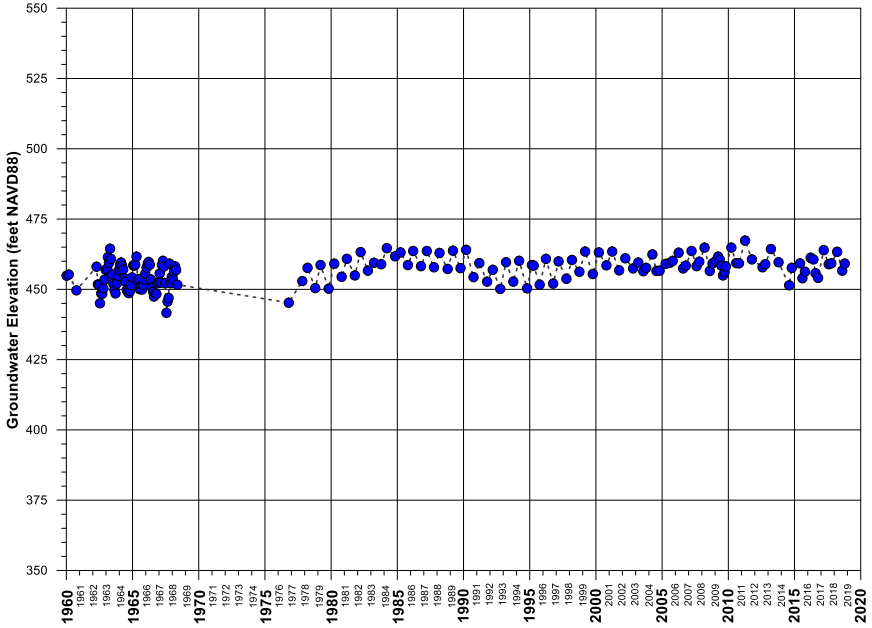
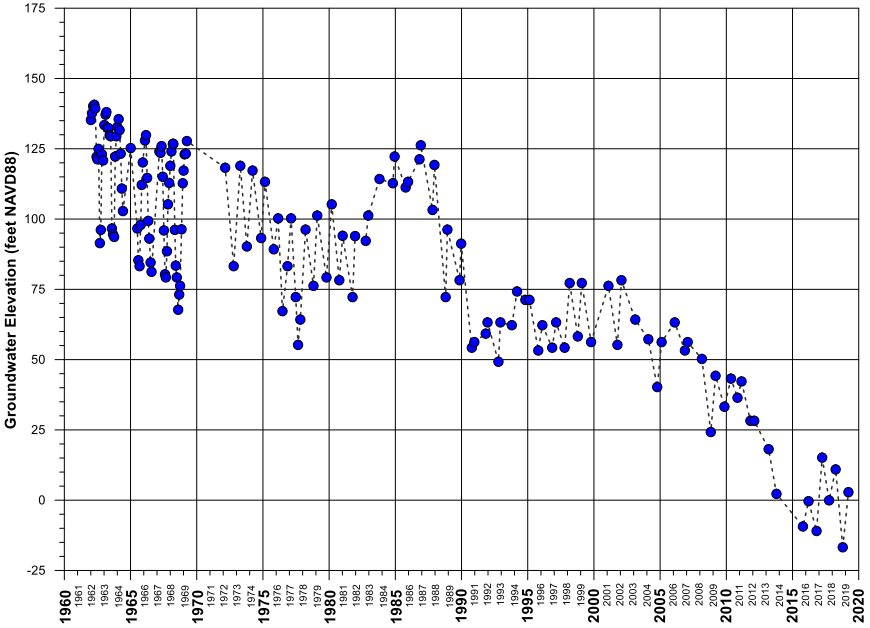
Hydrograph comparison – Critically overdrafted basin example

Enterprise Subbasin



Merced Subbasin



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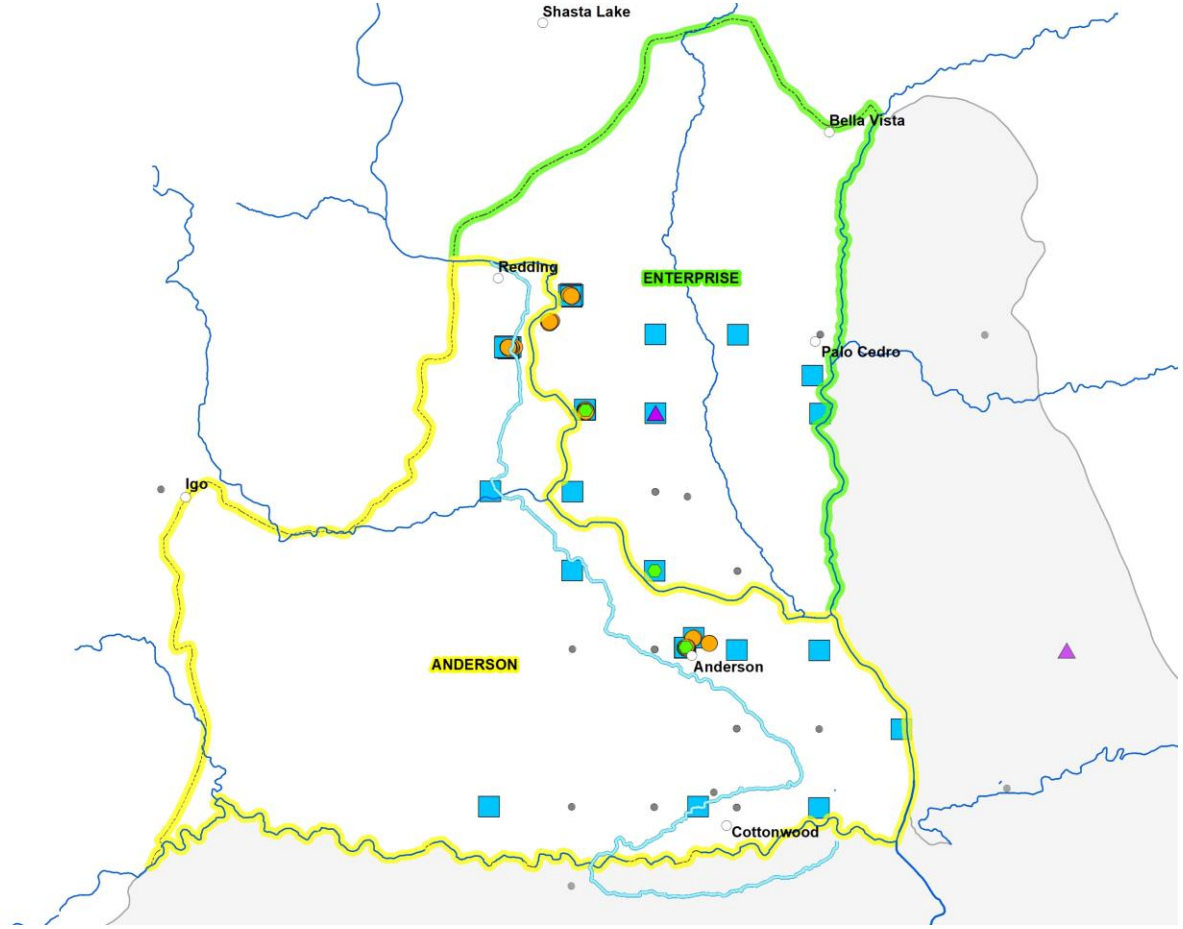
Groundwater quality exceedances (2015–2019)



- Arsenic
- VOCs
- Fuels
- Iron/Manganese
- Groundwater Quality Sample Location

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Discussion items

- Groundwater Sustainability Plan (GSP) update
  - Overview of compiled data
  - Thoughts on GSP preparation and defining sustainability
  - What to expect during GSP development
- Next steps
  - **Hydrogeologic conceptual model development**
  - Numerical modeling to support GSP development
  - Potential DWR Technical Support Services (TSS) funding opportunities
  - Public outreach

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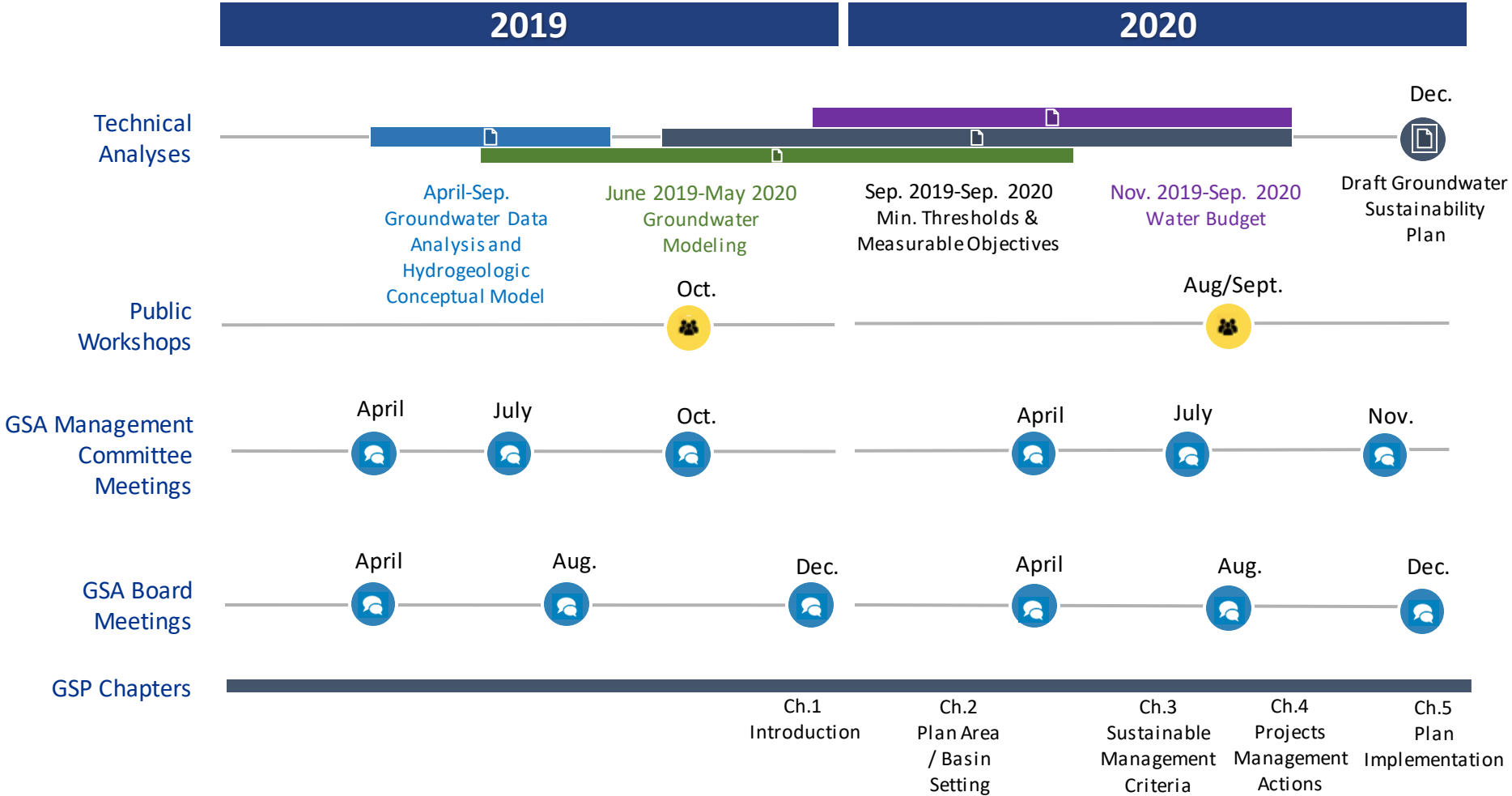
Enterprise Anderson Groundwater Sustainability Planning Schedule