Cuyama Basin Groundwater Sustainability Agency

Sustainability Agency Meeting and Public Workshops

March 6, 2019

WOODARD &CURRAN

Agenda

- Welcome and Introduction
- SGMA Background and GSP Development Overview
- Cuyama Basin Water Budget
- Projects and Management Actions
- GSP Implementation Plan
- Wrap Up and Next Steps

WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Agency

SGMA Background and GSP Development Overview

March 6, 2019

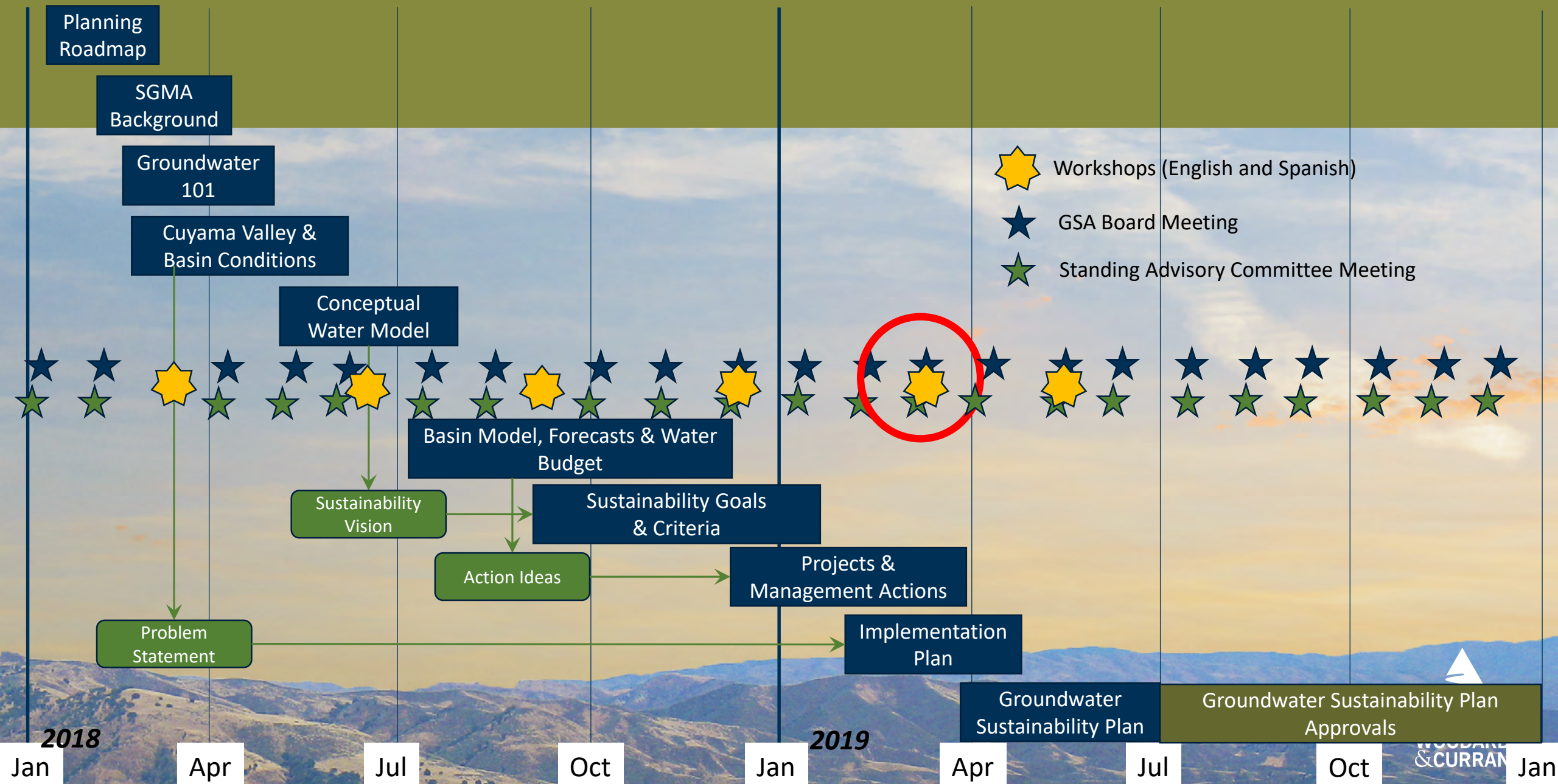
WOODARD &CURRAN

Some SGMA Fundamentals

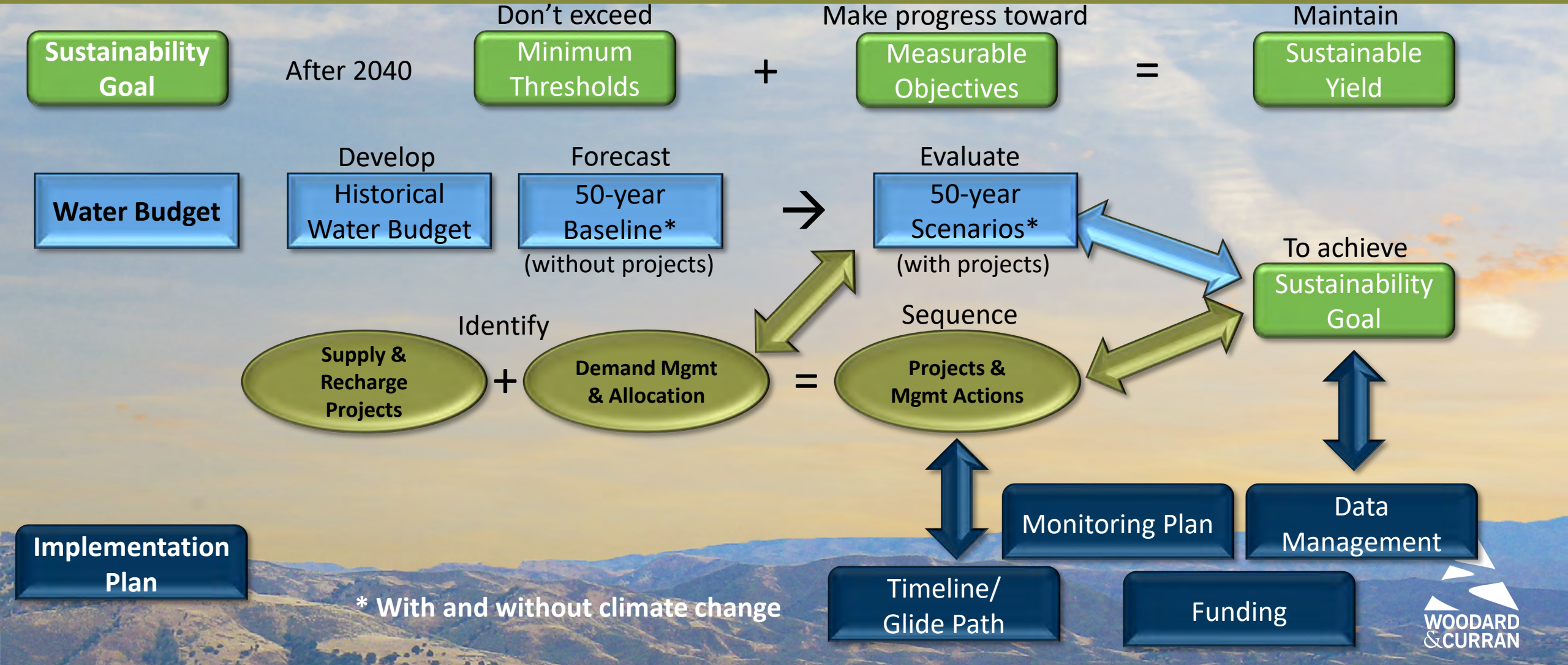
- Requires a Groundwater Sustainability Plan (GSP) be prepared and submitted by January 2020
- Requires Basin become sustainable by January 2040
- Requires GSP development be open and transparent, with stakeholder and public input
- Multiple specific requirements
  - Publicly-accessible database
  - Hydrologic Conceptual Model (HCM)
  - Accounting of all water sources and uses
  - Opportunities for management areas

WOODARD &CURRAN

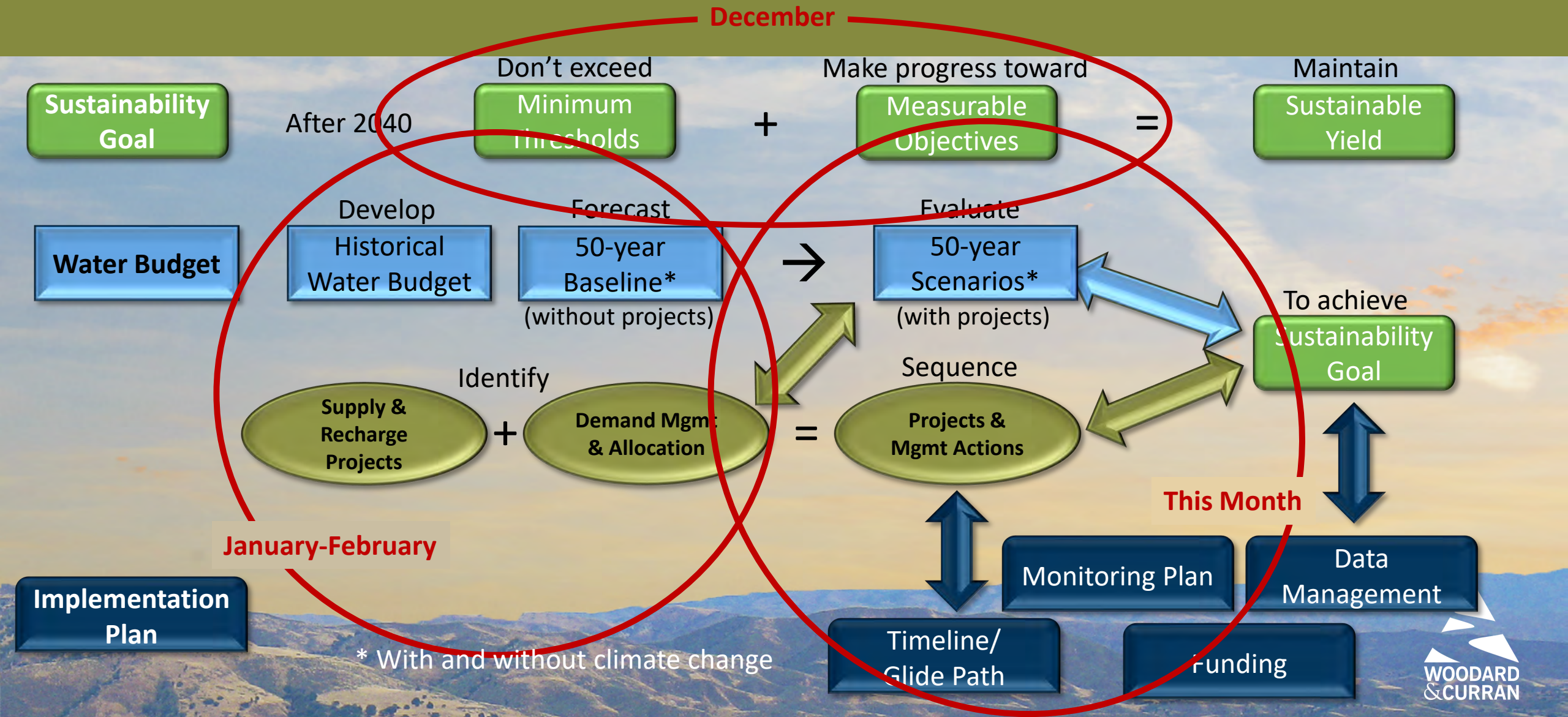
Cuyama Basin Groundwater Sustainability Plan – Planning Roadmap



GSP Discussion Approach & Terminology



GSP Discussion Approach & Terminology



GSP Sections

1. Introduction
   - 1.1 GSA Authority & Structure
   - 1.2 Plan Area
   - 1.3 Outreach Documentation
2. Basin Settings
   - 2.1. HCM
   - 2.2 GW Conditions
   - 2.3 Water Budget
     - *Appendix:* Numerical GW Model Documentation
3. Undesirable Results
   - 3.1 Sustainability Goal
   - 3.2 Narrative/Effects
   - 3.2 ID Current Occurrence
4. Monitoring Networks
   - 4.1 Data Collection/Processing
   - 4.2 GSP Monitoring Networks
5. Sustainability Thresholds
   - 5.1 Threshold Regions
   - 5.2 Minimum Thresholds, Measurable Objectives, Margin of Operational Flexibility, Interim Milestones
6. Data Management System
   - *Appendix:* DMS User Guide
7. Projects & Management Actions
8. GSP Implementation

WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Agency

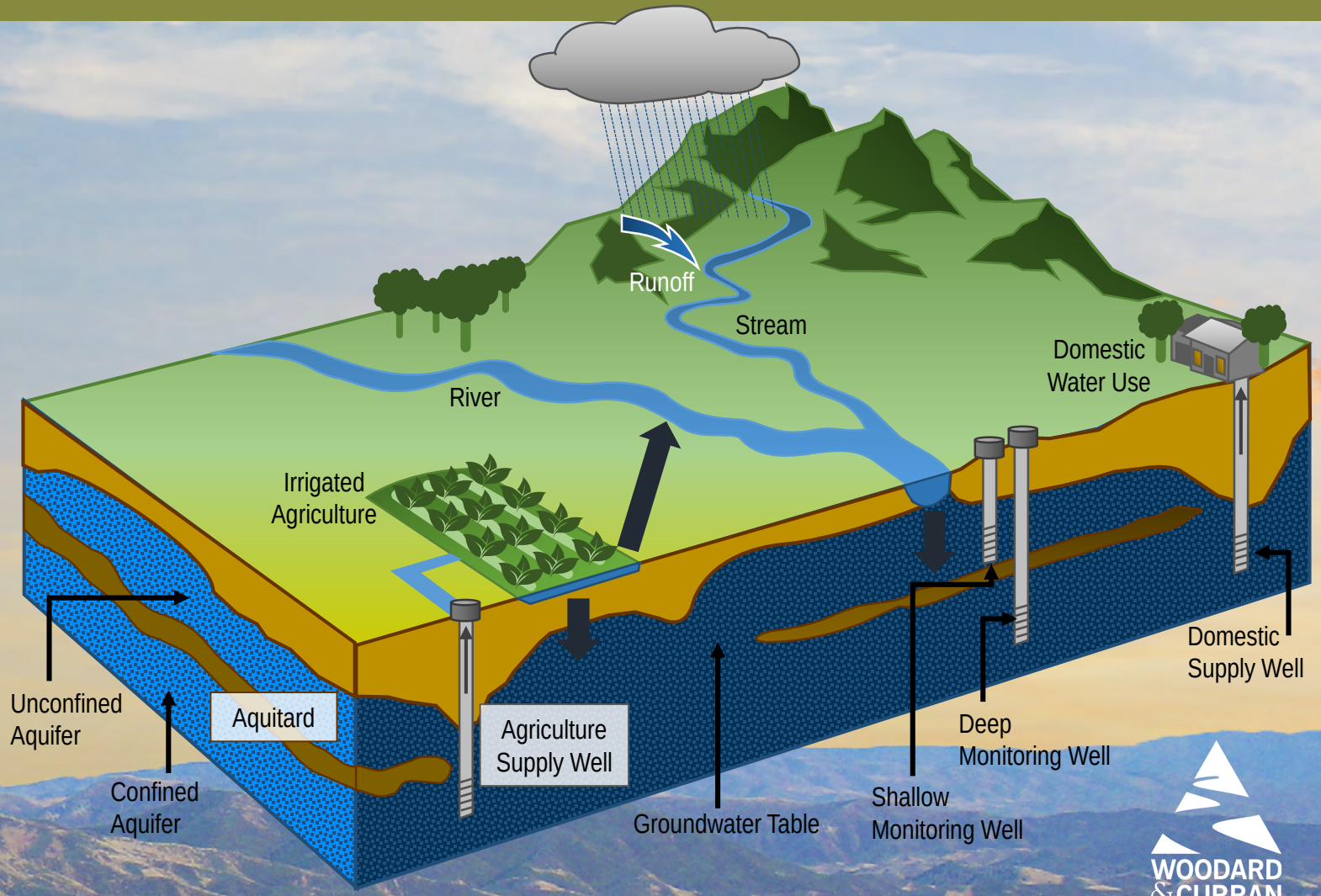
Cuyama Basin Water Budget

March 6, 2019

WOODARD &CURRAN

Approach for Cuyama Basin Model Development

- Develop a Robust and Defensible Integrated Water Resources Model
  - Robust Model Grid
  - Agricultural and Domestic Water Demands
  - Include physical features affecting movement of surface and groundwater
  - Consider interaction between groundwater and surface water systems



WOODARD &CURRAN

Water Budgets - Time Frames

Historical Conditions

Historical hydrology, land use and population (1995-2015)

Current Conditions

2017 land use and population

1967 - 2016 historical hydrology

Future Conditions

Year 2040 land use and population

- Assumed to be the same as Current Conditions

1967- 2016 historical hydrology

With and without climate change

WOODARD &CURRAN

Future Conditions

Annual Precipitation

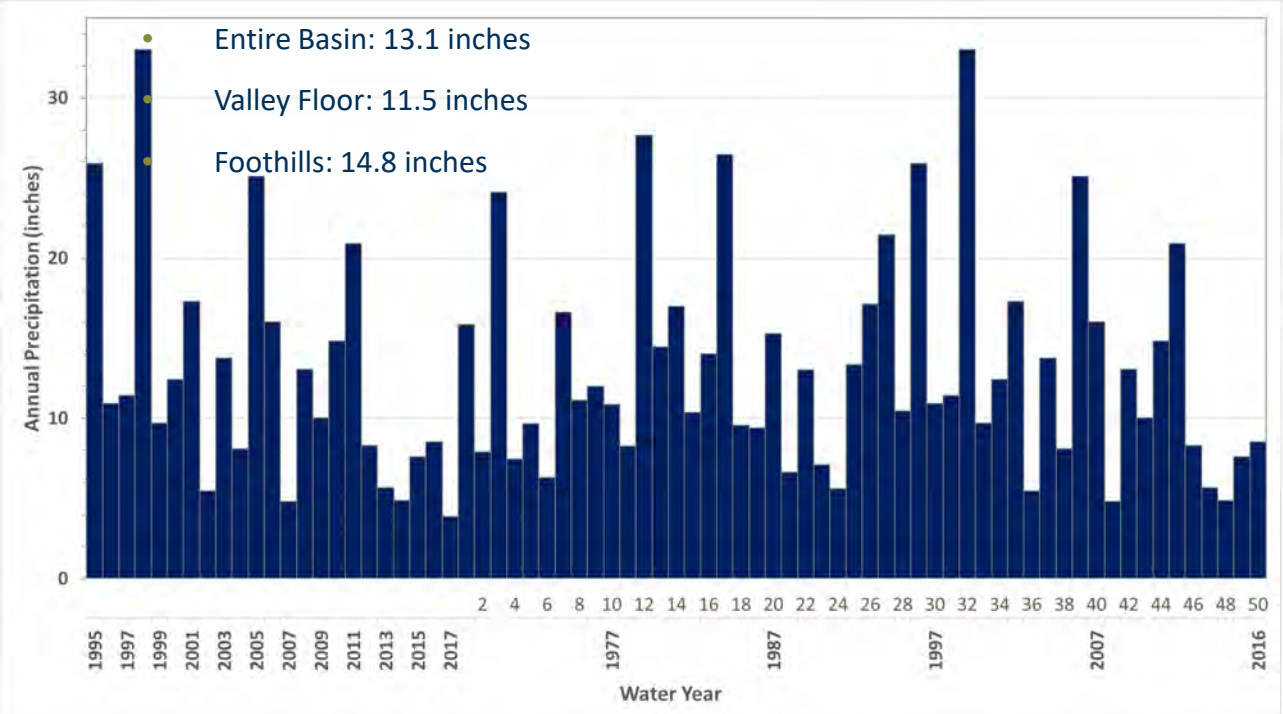
(based on adjusted PRISM dataset)

Average Annual Precipitation (50 years)

Entire Basin: 13.1 inches

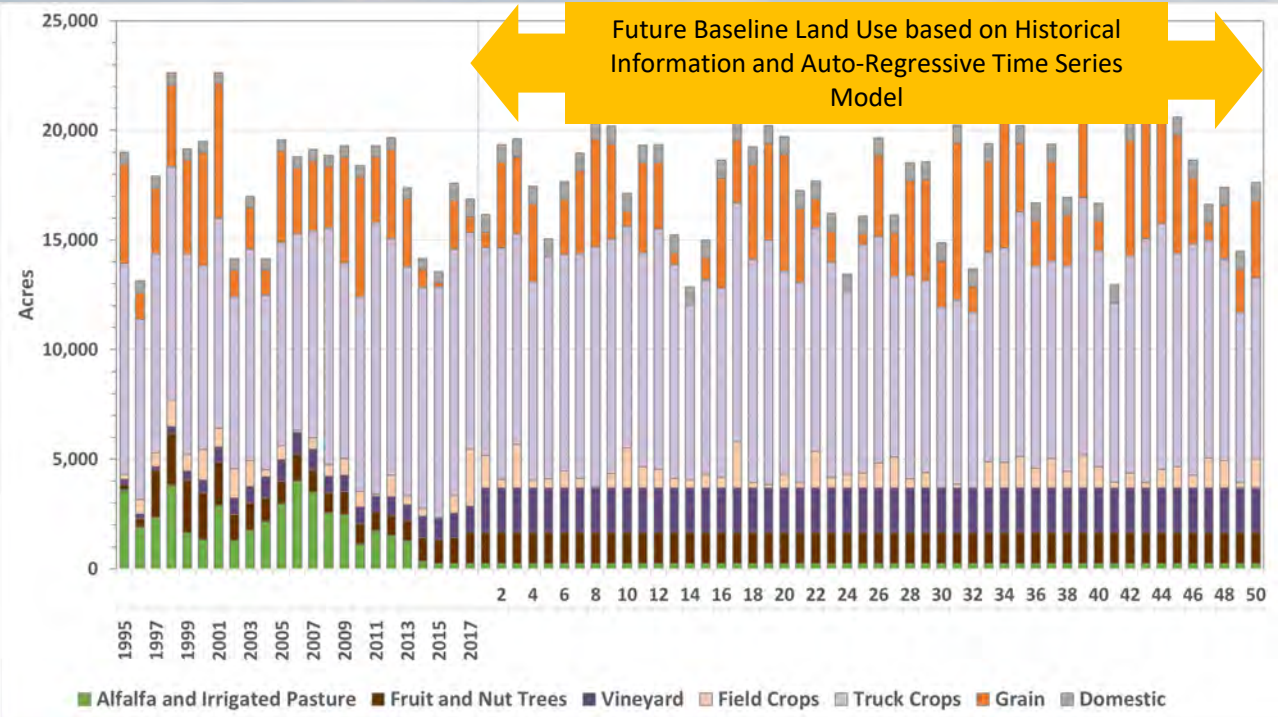
Valley Floor: 11.5 inches

Foothills: 14.8 inches



Land Use

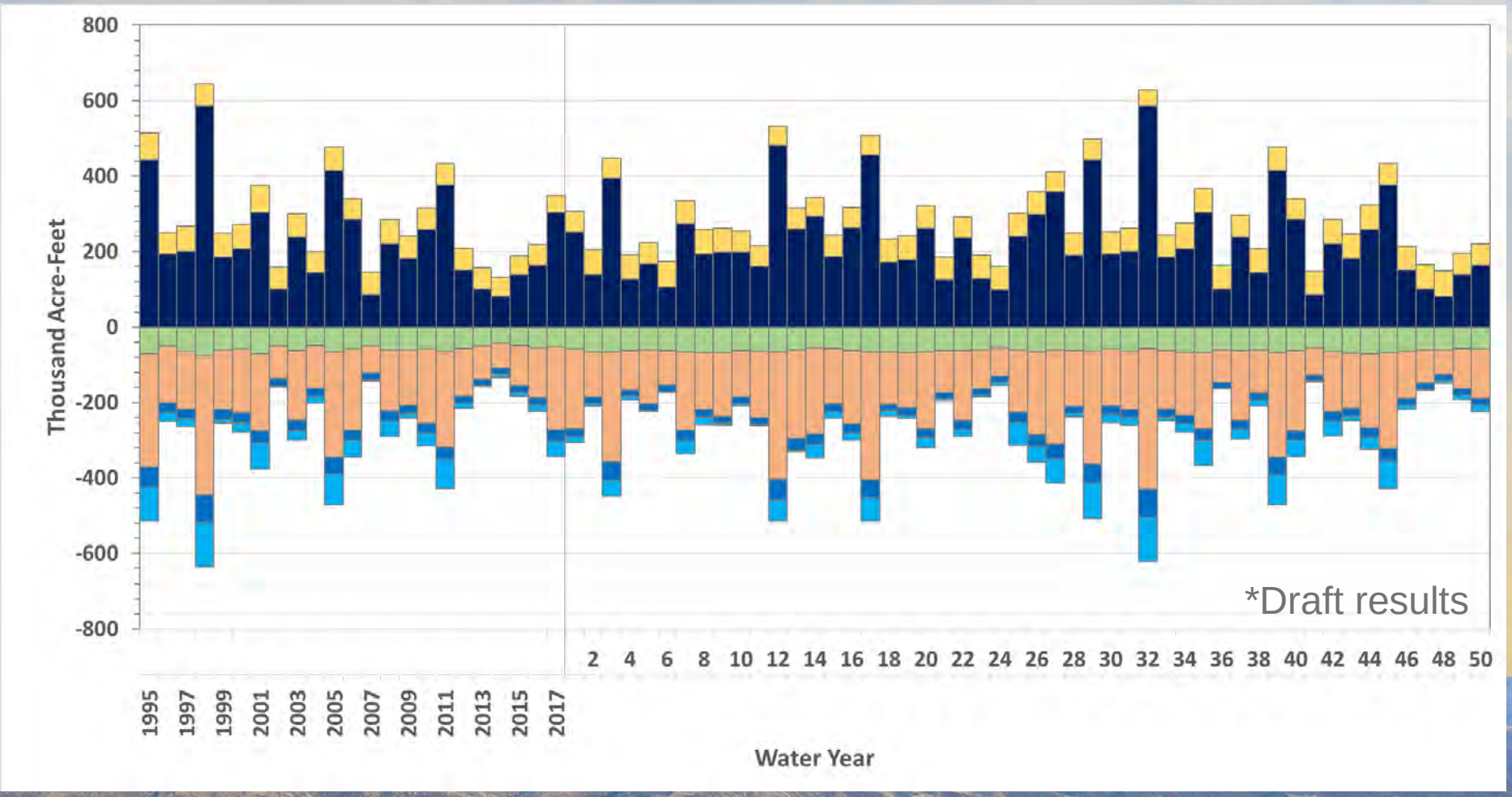
(based on historical information and ARMA Model)



WOODARD &CURRAN

Future Conditions Land Surface Water Budget: Basin-Wide

DRAFT



Average Annual (50 years)

Inflows

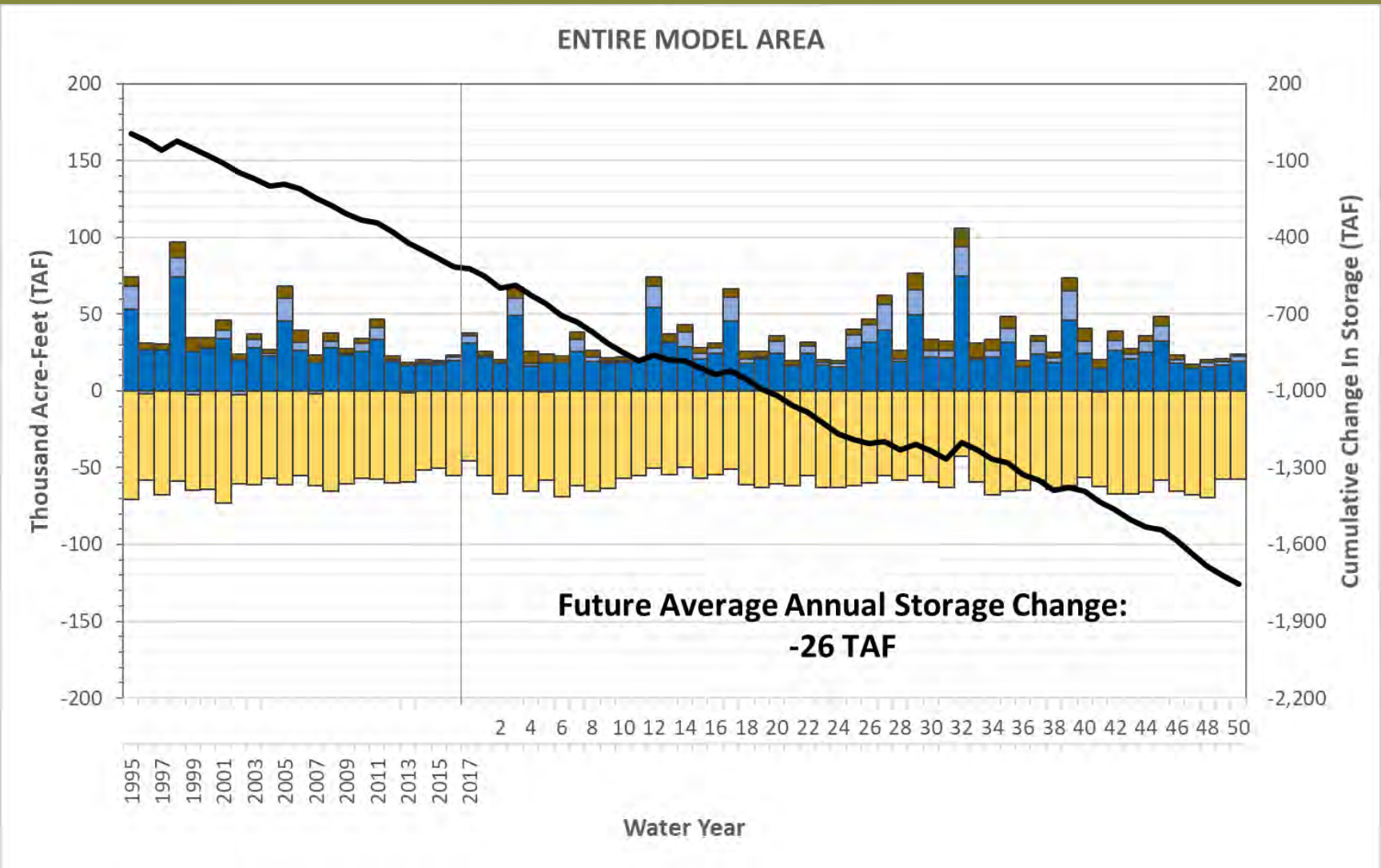
Precipitation (~11.4”)	230 TAF
Applied Water	60 TAF

Outflows

Agriculture Evapotranspiration	57 TAF
Native Vegetation Evapotranspiration	182 TAF
Domestic Evapotranspiration	<0.1 TAF
Deep Percolation	24 TAF
Runoff	27 TAF

WOODARD &CURRAN

Future Conditions Groundwater Budget: Basin-Wide



Average Annual (50 years)

Inflows:

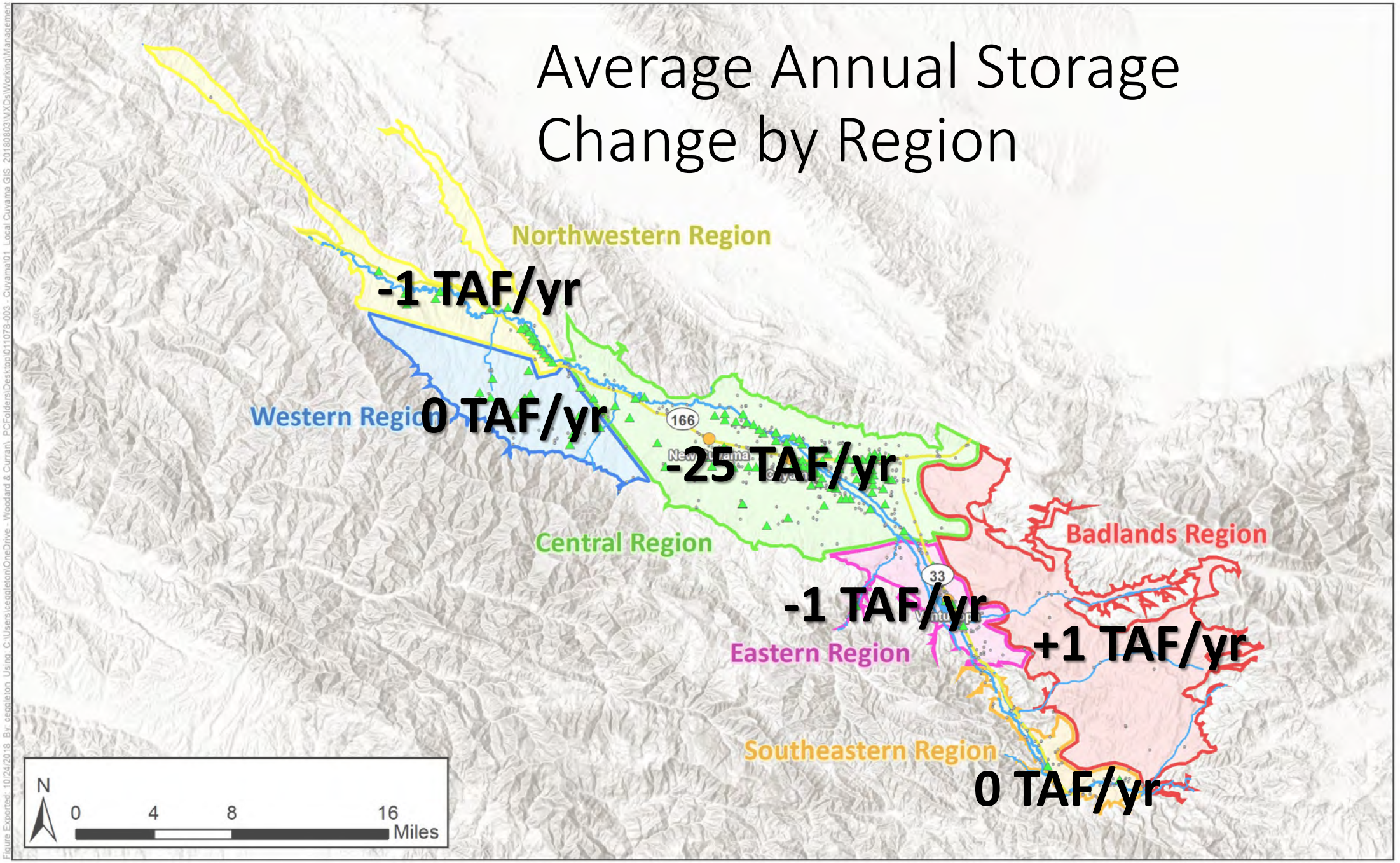
Deep Percolation	24 TAF
Stream Seepage	5 TAF
Boundary Flow	5 TAF

Outflows:

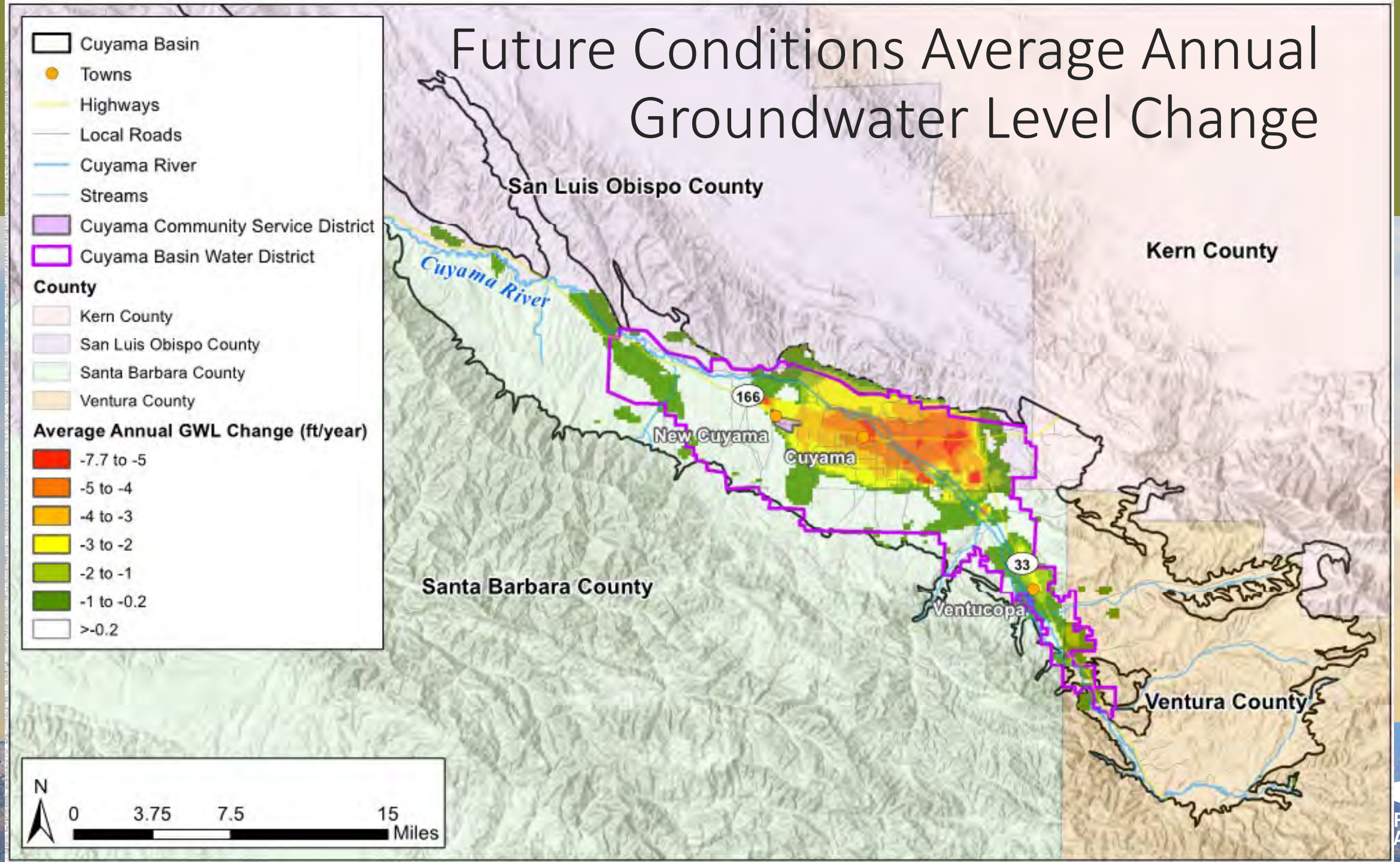
GW Pumping	60 TAF

WOODARD &CURRAN

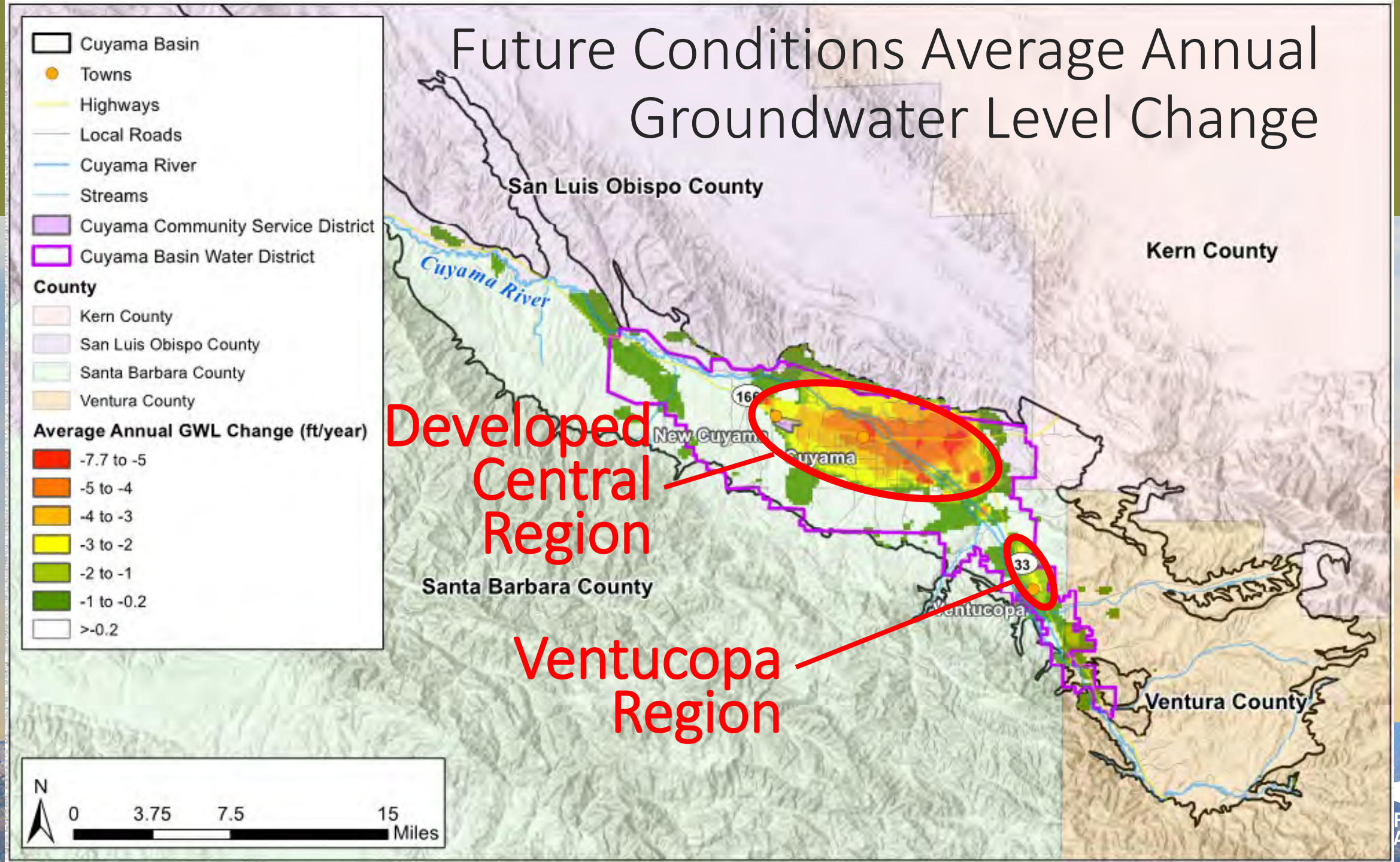
Average Annual Storage Change by Region



Future Conditions Average Annual Groundwater Level Change



Future Conditions Average Annual Groundwater Level Change



Questions and Discussion – Water Budgets

- Clarifying Questions?
  - Projected future conditions and trends
  - Water budgets under current and future conditions

- In addition to what has been presented, what other information would help you understand water resources in the Cuyama Valley?

WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Agency

Cuyama Basin Management Areas

March 6, 2019

WOODARD &CURRAN

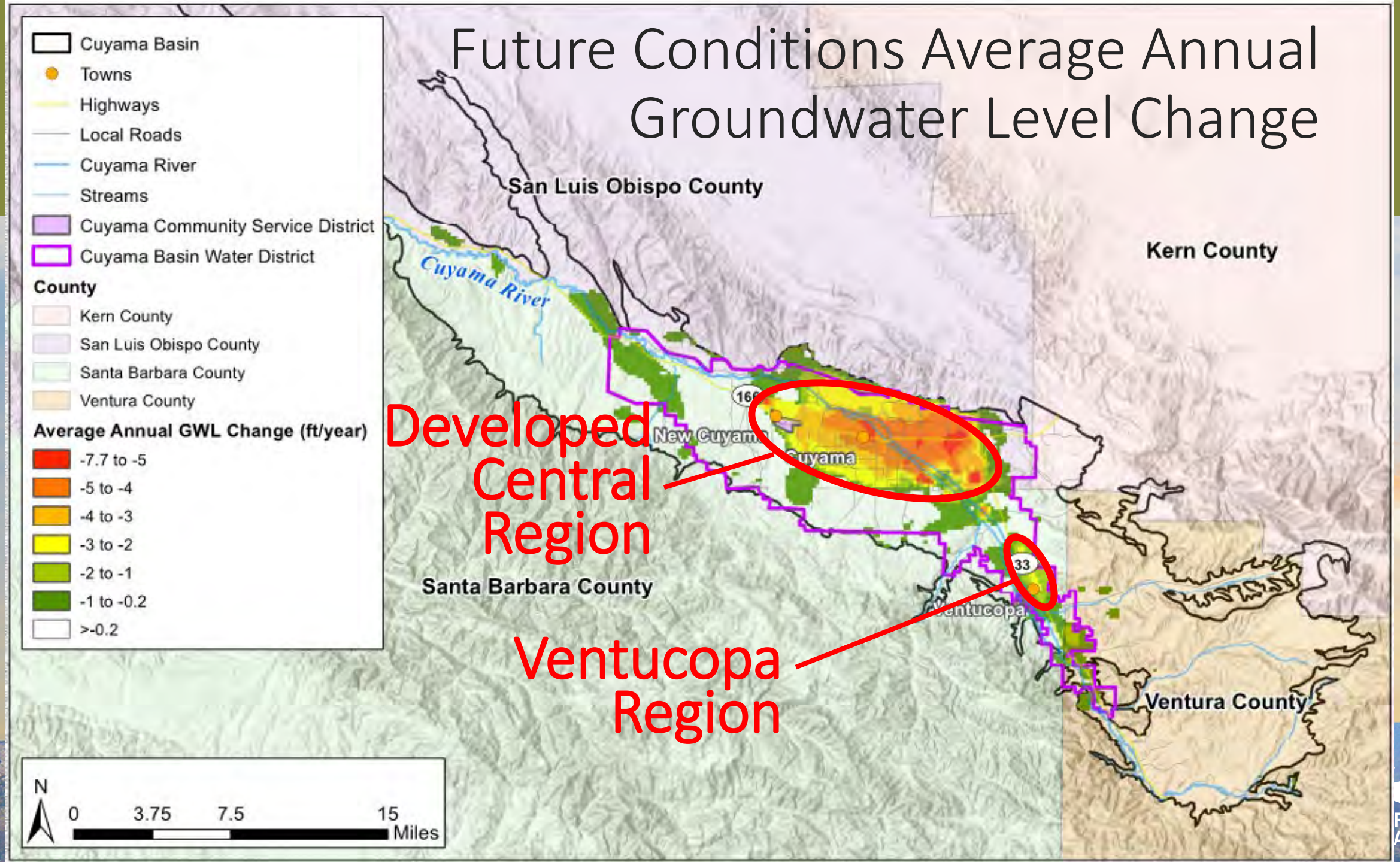
Potential Management Area Uses

- Provided by Regulation
  - Differentiate rationale for Minimum Thresholds and Measurable Objectives
  - Establish different concentration or types of monitoring

- At GSA Board's Discretion
  - At GSA's discretion, Management Areas *could* be used to:
    - Delegate authorities to other jurisdictions
    - Perform projects and management actions discretely by Management Area
      - Allocations
      - Costs

WOODARD &CURRAN

Future Conditions Average Annual Groundwater Level Change



Cuyama Basin Groundwater Sustainability Agency

Projects and Management Actions

March 6, 2019

WOODARD &CURRAN

Projects and Management Actions to Close the Gap Between Water Supplies and Demands

- Demand management actions to reduce groundwater pumping
- Water supply projects to increase available supplies

WOODARD &CURRAN

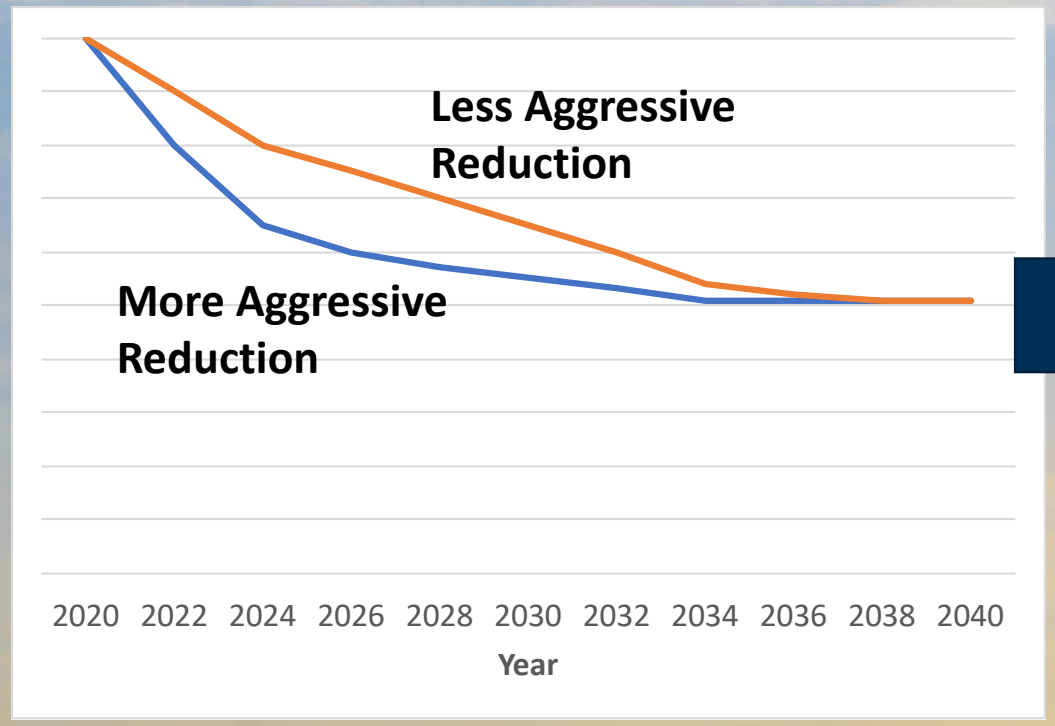
Demand Management/Allocation Approach

- Under SGMA, GSAs have authority to establish groundwater extraction allocations
- SGMA and GSPs adopted under SGMA cannot alter water rights
- Potential components of a demand management approach:
  - Pumping restrictions/allocations
    - Water accounting
    - Water metering
  - Water market
  - Fees
    - By pumping amount or acreage

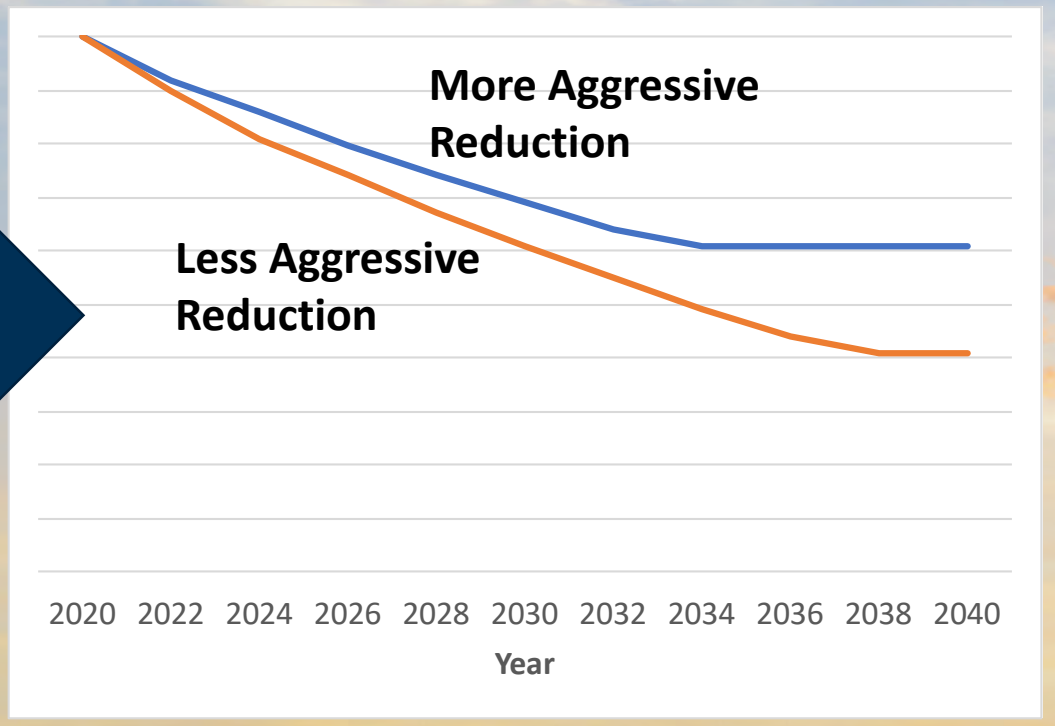
WOODARD &CURRAN

Example Glide Paths

Future Groundwater Pumping Reduction



Future Change in Groundwater Levels

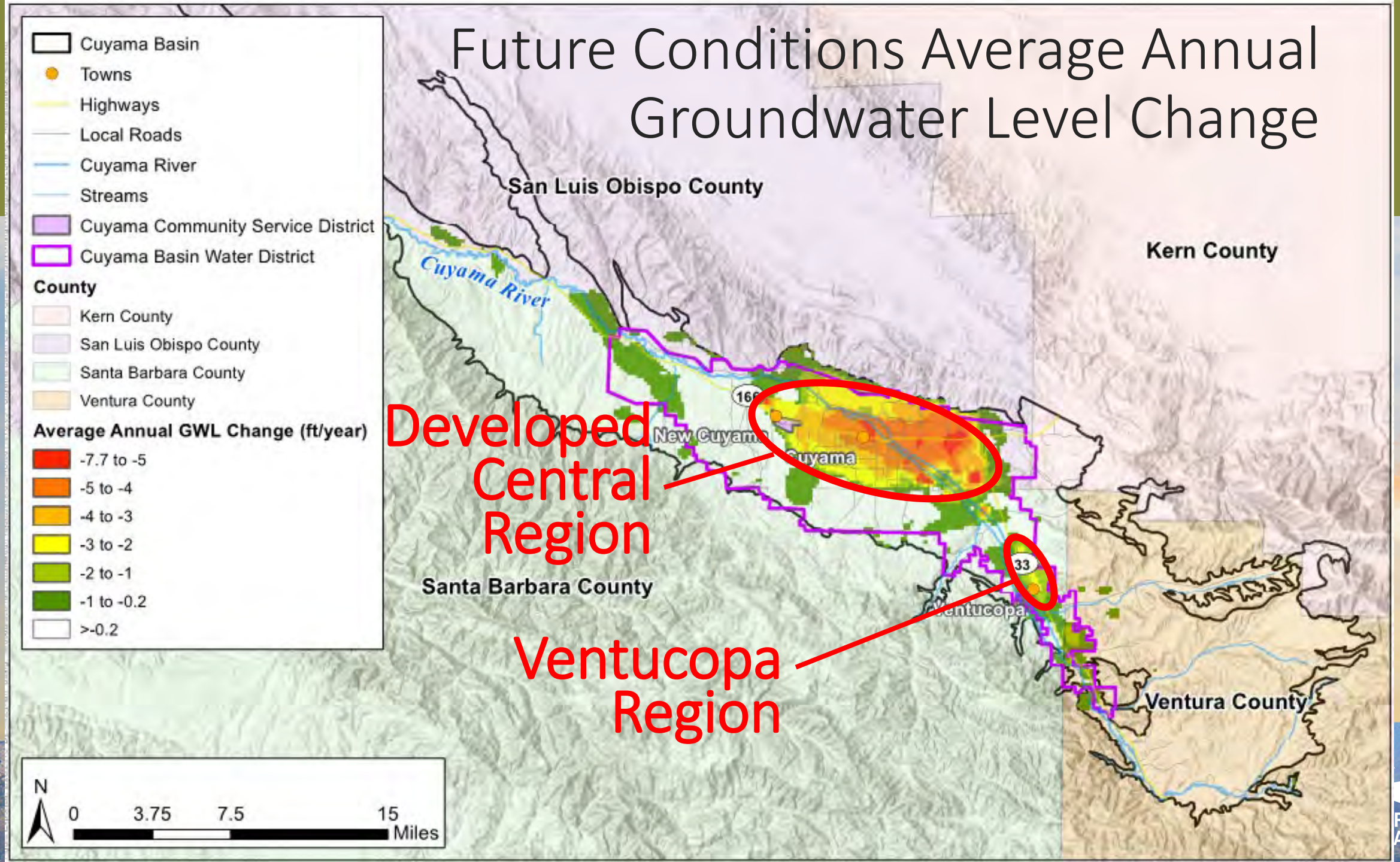


Numerical Modeling Analysis of Pumping Reductions Required to Achieve Sustainability

- Simulated pumping reductions (without water supply projects) to eliminate groundwater overdraft
- Assumptions:
  - Idle lands are converted to native vegetation.
  - In each scenario run, total crop acreage was reduced by a constant percentage through the 50 year period
  - Decrease in crop acreage results in a decrease in groundwater pumping, deep percolation and agricultural evapotranspiration.

WOODARD &CURRAN

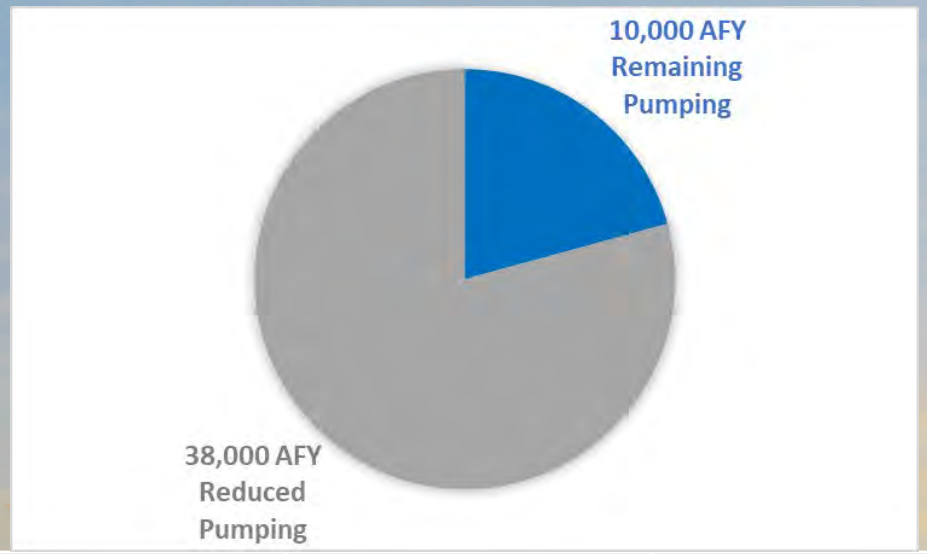
Future Conditions Average Annual Groundwater Level Change



Future Conditions – Pumping Reductions Only Scenario – Central Developed Region

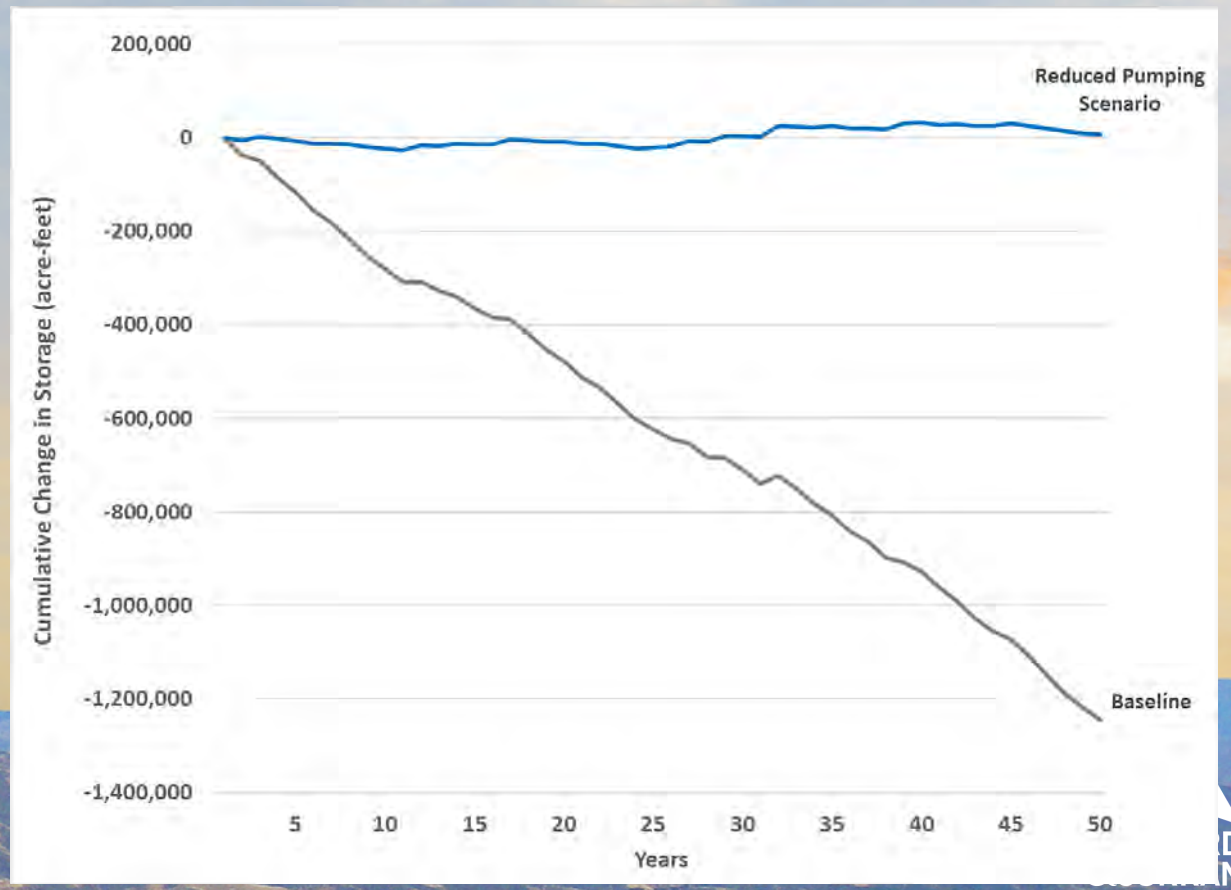
DRAFT

Pumping reductions needed to eliminate cumulative decline in storage



	BASELINE	REDUCED PUMPING SCENARIO
INFLOWS		
Deep Percolation (+)	17,000	4,000
Gain from Stream (+)	5,000	5,000
Subsurface Inflow(+)	1,000	1,000
OUTFLOWS		
Pumping (-)	48,000	10,000
STORAGE CHANGE	**-25,000**	**0**

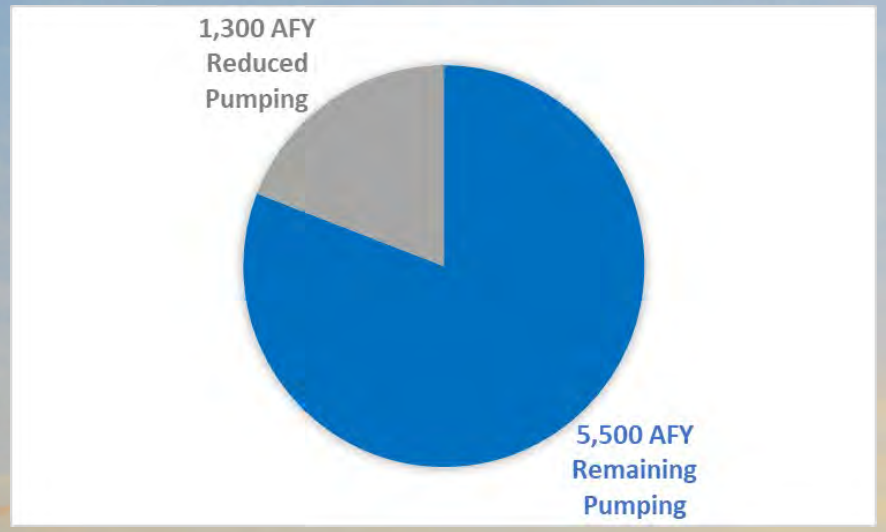
Projected change in Storage under Baseline and reduced pumping conditions



Future Conditions – Pumping Reductions Only Scenario – Ventucopa Region

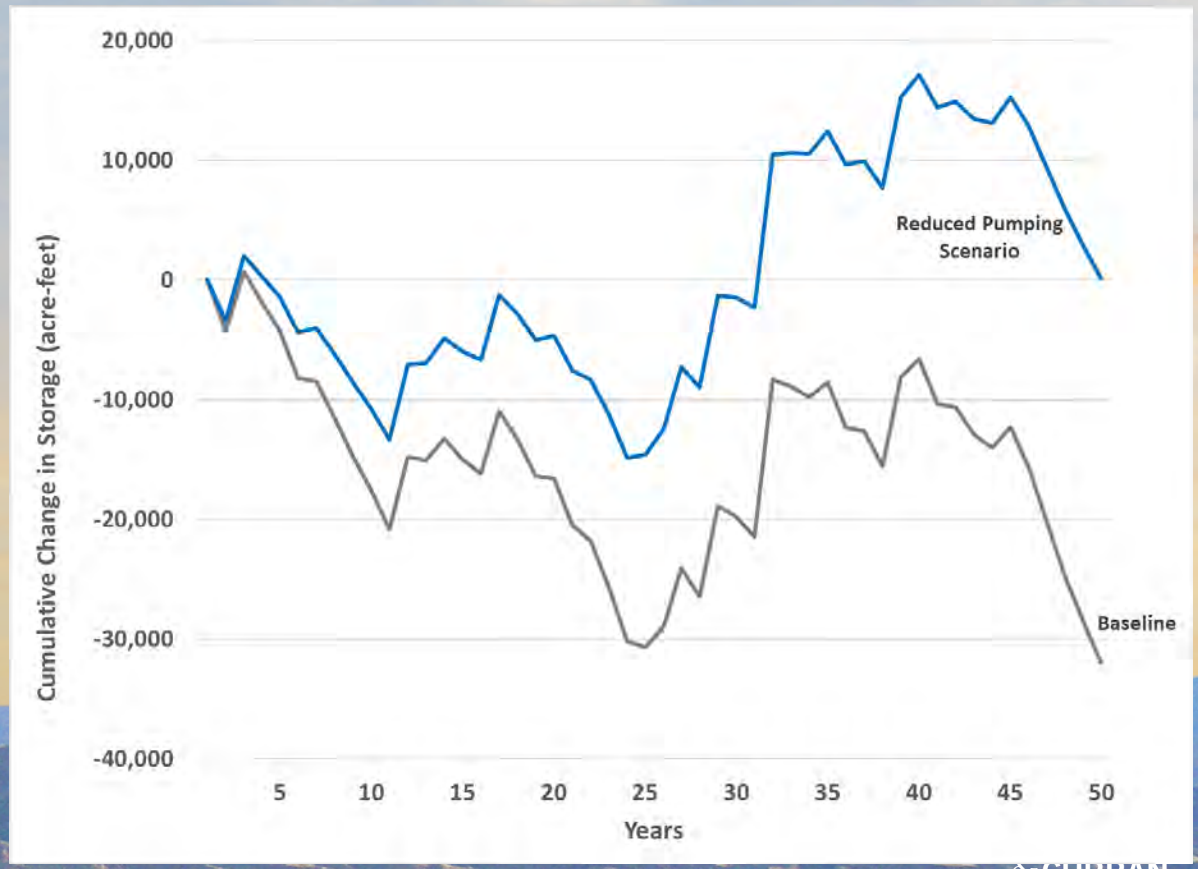
DRAFT

Pumping reductions needed to eliminate cumulative decline in storage



	BASELINE	REDUCED PUMPING SCENARIO
INFLOWS		
Deep Percolation (+)	4,200	3,500
Gain from Stream (+)	1,300	1,300
Subsurface Inflow(+)	700	700
OUTFLOWS		
Pumping (-)	6,800	5,500
STORAGE CHANGE	**-600**	**0**

Projected change in storage under Baseline and reduced pumping conditions

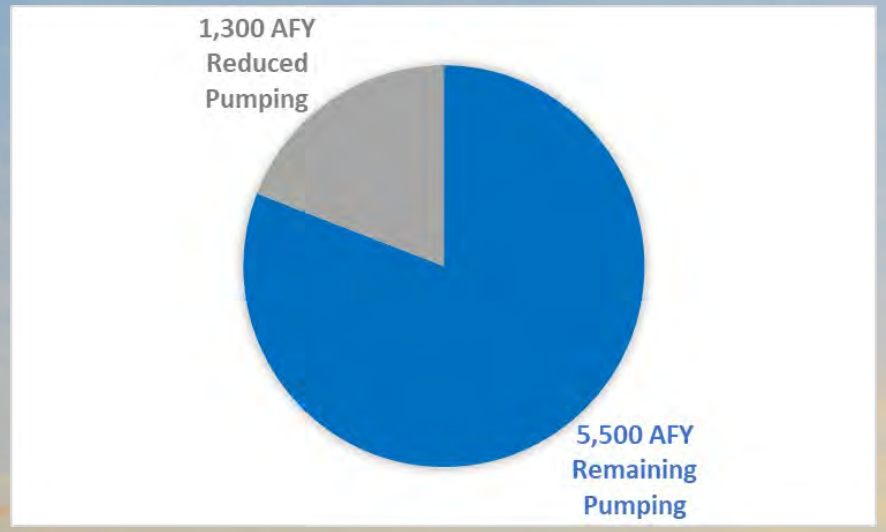


&CURRAN

Future Conditions – Pumping Reductions Only Scenario – Ventucopa Region

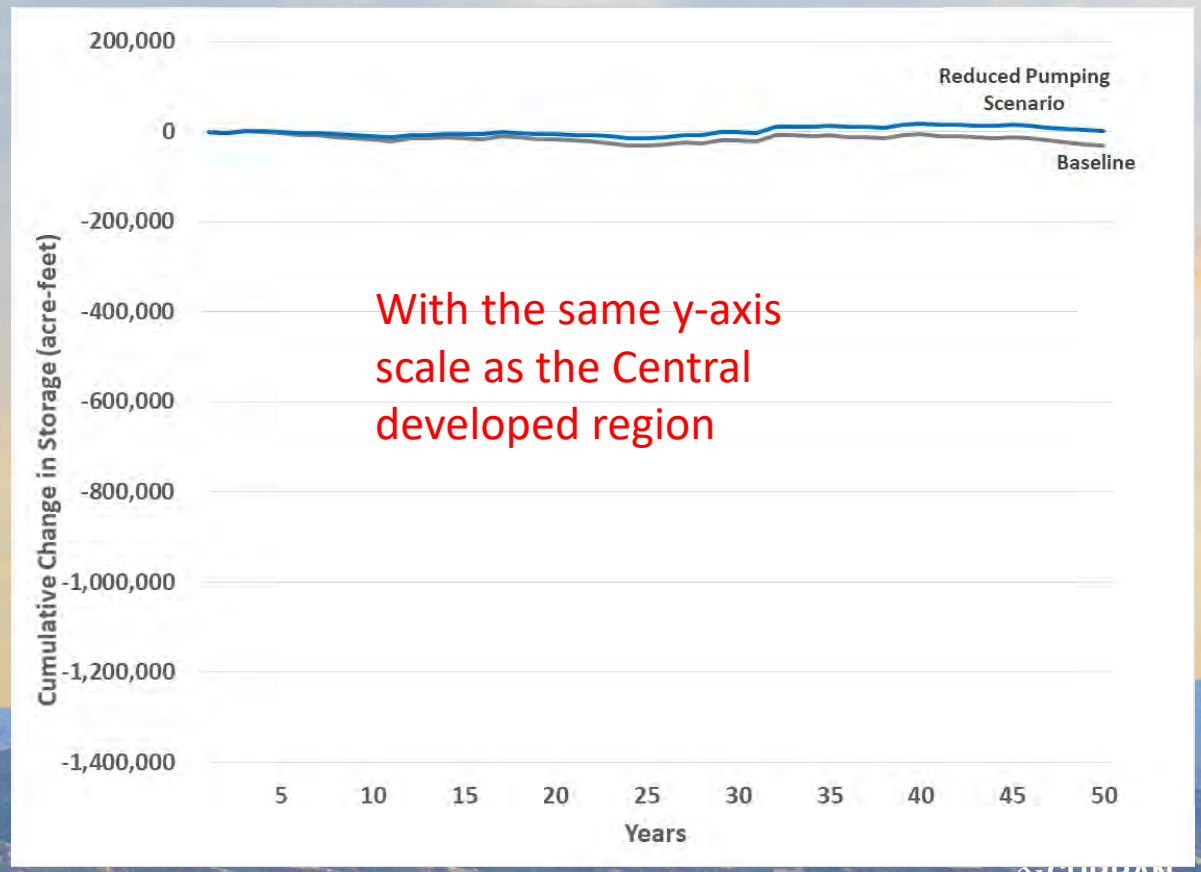
DRAFT

Pumping reductions needed to eliminate cumulative decline in storage



	BASELINE	REDUCED PUMPING SCENARIO
INFLOWS		
Deep Percolation (+)	4,200	3,500
Gain from Stream (+)	1,300	1,300
Subsurface Inflow(+)	700	700
OUTFLOWS		
Pumping (-)	6,800	5,500
STORAGE CHANGE	**-600**	**0**

Projected change in storage under Baseline and reduced pumping conditions



&CURRAN

Projects and Management Actions to Close the Gap Between Water Supplies and Demands

- Demand management actions to reduce groundwater pumping
- Water supply projects to increase available supplies

WOODARD &CURRAN

Potential Water Supply Projects

- GSA support for new pumping wells for local communities
  - Cuyama CSD, towns of Cuyama & Ventucopa
- GSA implementation of projects to increase net Basin water supply
  - Precipitation Enhancement
  - Forest/Rangeland Management
  - Flood/Stormwater Capture
  - Water Supply Imports via Transfer/Exchange

WOODARD &CURRAN

Precipitation Enhancement

- Potential Yield: ~1,000-5,000 AF/year
- Estimated Cost: $20-30/acre-foot
- Planning Horizon: 5-10 years
- Description: The introduction of atmospheric silver iodide to serve as condensation nuclei that would increase snowfall over mountain regions; rainfall could potentially increase by 5-15% in the Cuyama Basin
- Potential Implementation Issues: operational precision; potential concerns about silver toxicity

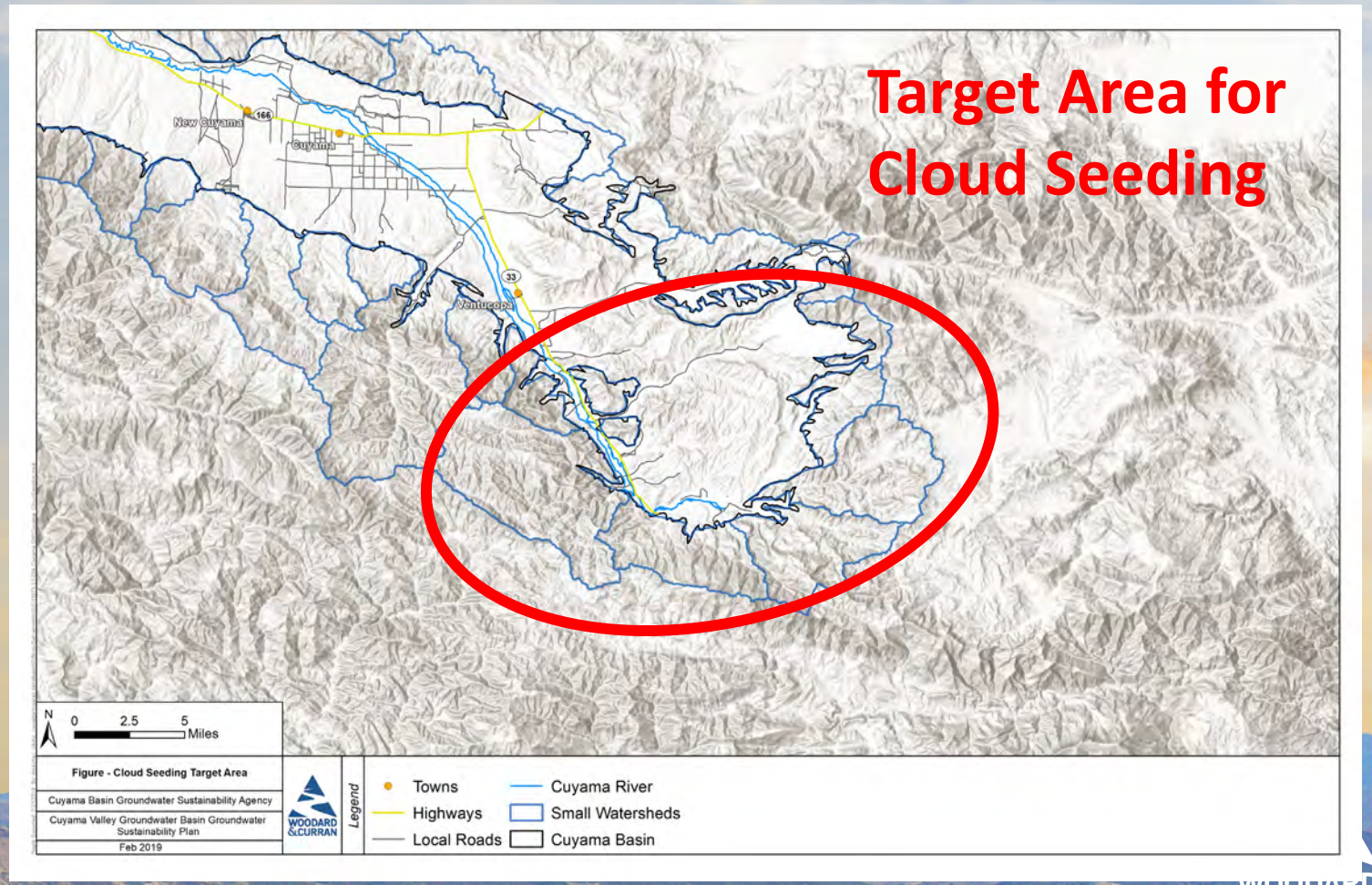
WOODARD &CURRAN

DRAFT

Precipitation Enhancement Modeling Analysis

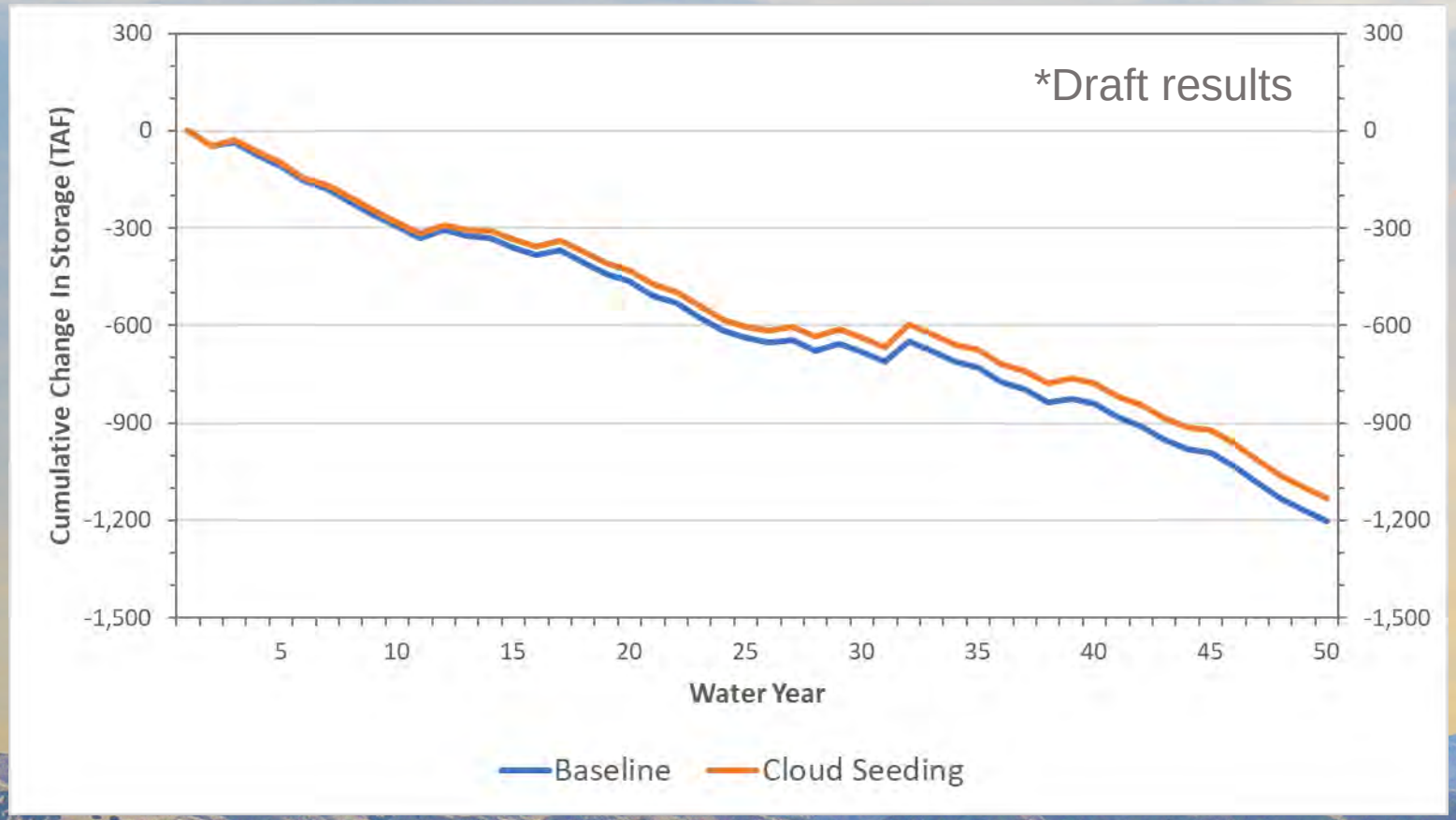
Assumptions:

- 10% precipitation increase on the East for the months November through March.



Precipitation Enhancement Modeling Analysis
Basin-Wide Cumulative Storage Change

DRAFT



Average Annual (50 years)

Inflows:

- Deep Percolation +400 AF
- Stream Seepage +400 AF
- Boundary Flow +700 AF
- **Change in Storage +1,500 AF**

Change in Cuyama River Outflow +2,700 AF

Total Potential Benefit: 4,200 AF

WOODARD &CURRAN

Forest/Rangeland Management

- Potential Yield: up to ~3,000 AF/year
- Estimated Cost: $500-600/acre-foot
- Planning Horizon: 5-10 years
- Description: Removal of native vegetation in forest or rangeland areas through controlled burning could reduce water consumption through decreased evapotranspiration
- Potential Implementation Issues: potential adverse effects on wildlife habitat; air quality concerns from smoke and dust; potential increase in flood flows due to reduced water interception

Sources:

- USBR, *Truckee Basin Study*, Dec 2015
- Bales et al., *Forests and Water in the Sierra Nevada*, Nov 2011

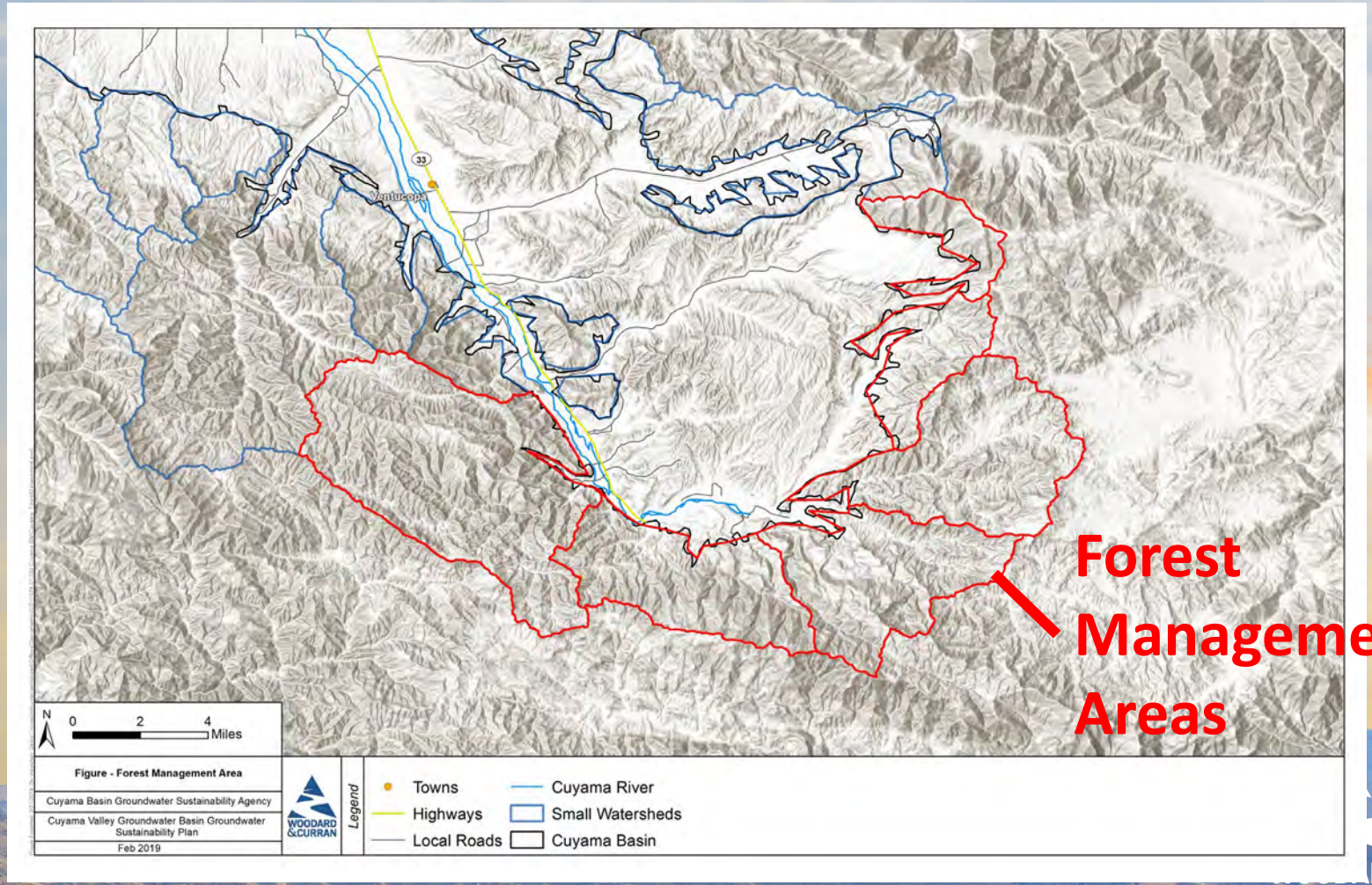
WOODARD &CURRAN

DRAFT

Forest/Rangeland Management Modeling Analysis

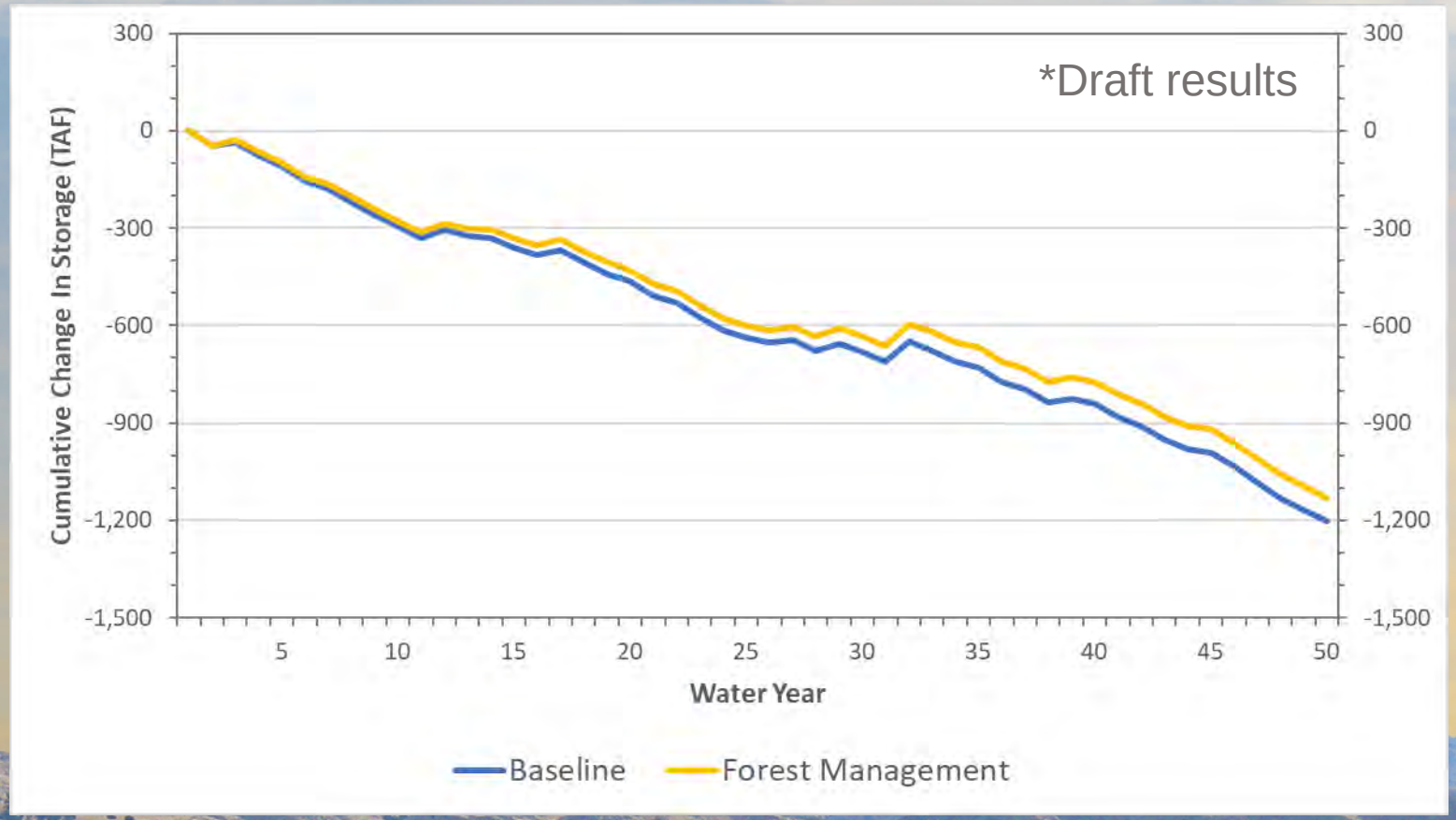
Assumptions:

- 4% decrease in native vegetation ET at the eastern small watersheds.



Future Conditions – Forest/Rangeland Management Basin-Wide Cumulative Storage Change

DRAFT



Average Annual (50 years)

Inflows:

- Boundary Flow +2,300 AF
- Stream Seepage -800 AF
- **Change in Storage +1,500 AF**

Change in Cuyama River Outflow

+1,400 AF

Total Potential Benefit: 2,900 AF

WOODARD &CURRAN

Flood/Stormwater Capture

- Potential Yield: up to 4,400 AF/year
- Estimated Cost: $600-800/acre-foot
- Planning Horizon: 5-10 years
- Description: The addition of surface water into a groundwater aquifer through surface infiltration. Recharge locations would be determined based on soil properties, current groundwater conditions and projected surface flow conditions.
- Potential Implementation Issues: Water available for recharge may be limited by downstream water rights; requires acquisition of land for spreading grounds

Source: Santa Barbara County, *Long Term Supplemental Water Supply Alternatives Report*, December 2015

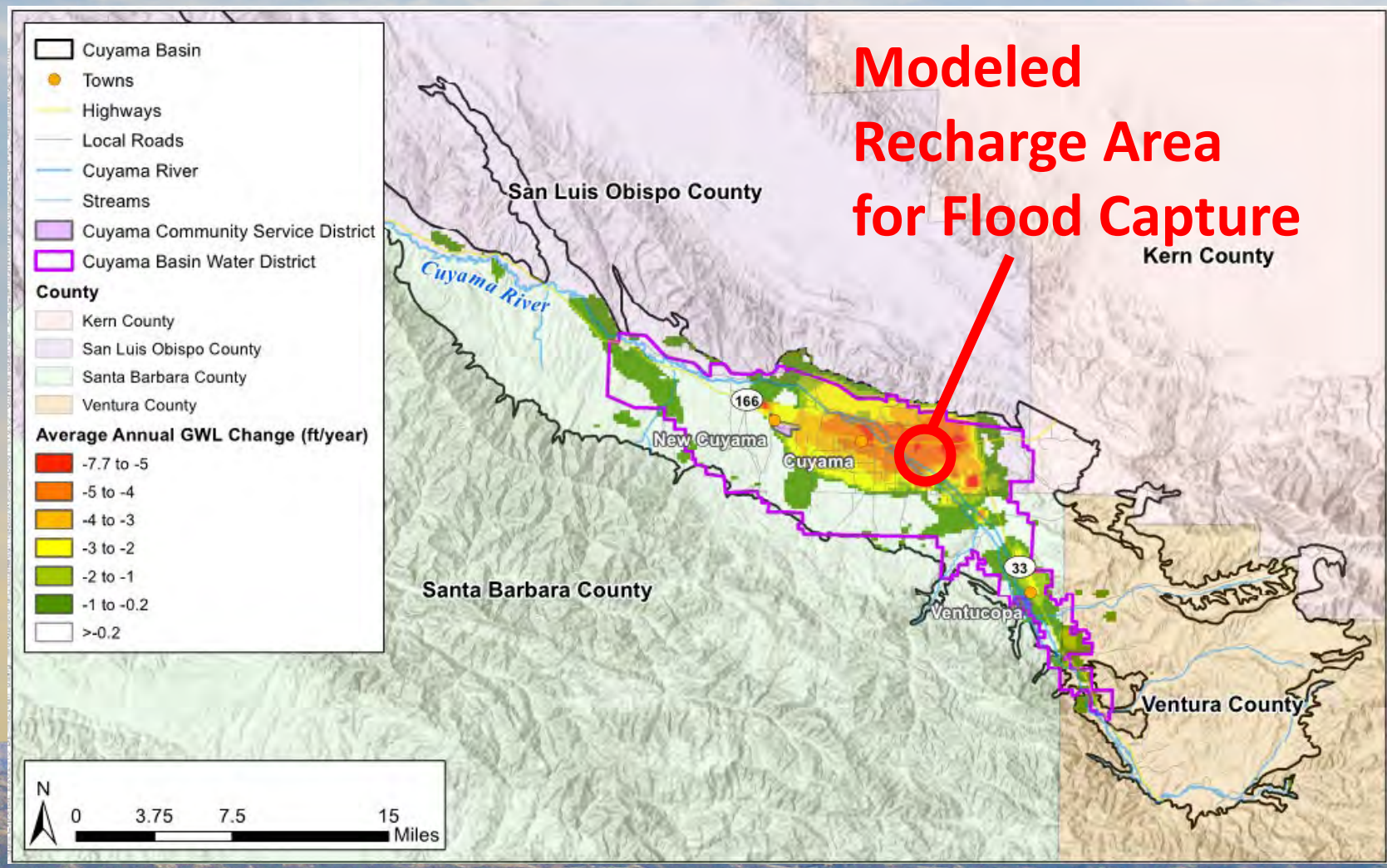
WOODARD &CURRAN

Stormwater Capture Modeling Analysis

DRAFT

Assumptions:

- Capture from 100 - 200 CFS flows in Cuyama River and recharge groundwater over ~200 acres.
- During any period with appropriate flows for diversion.

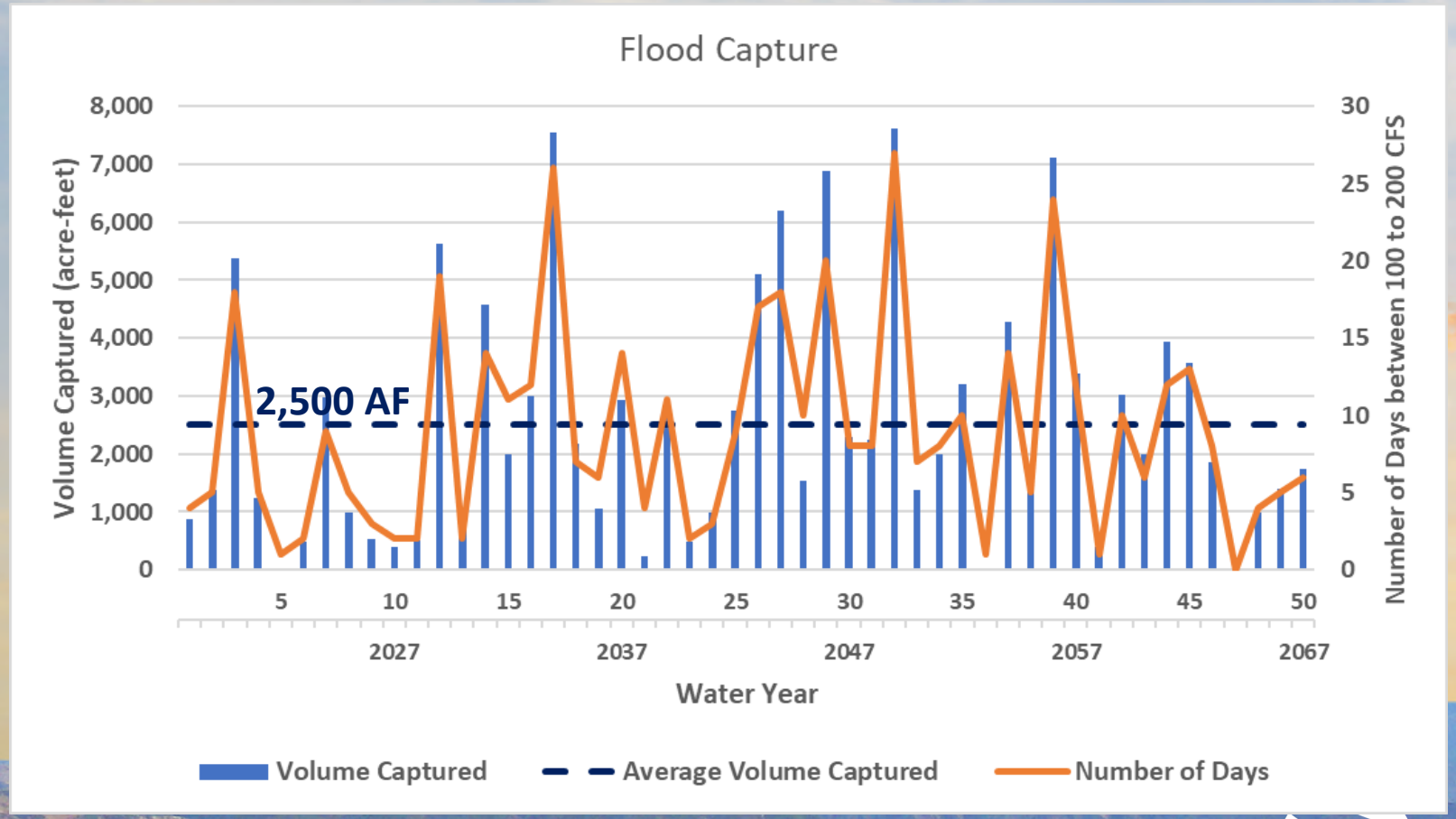


DRAFT

Stormwater Capture Modeling Analysis

Average Number of Days in WY: 9 days/yr.

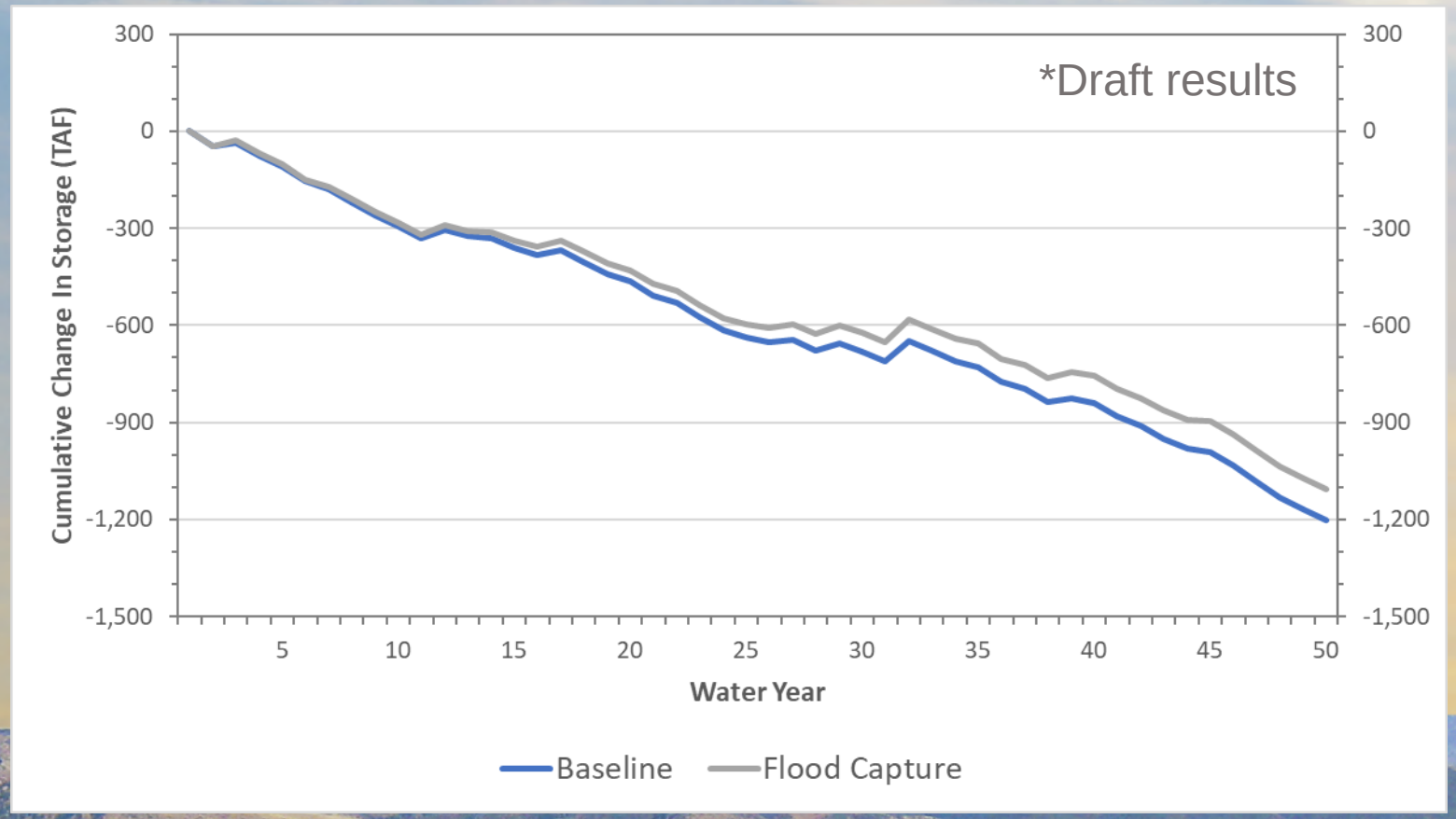
Average Volume Captured: 2,500 AF/yr



WOODARD &CURRAN

Stormwater Capture Modeling Analysis
Basin-Wide Cumulative Storage Change

DRAFT



Average Annual (50 years)

Inflows:

- Flood Capture +2,500 AF
- Stream Seepage -600 AF
- **Change in Storage +1,900 AF**

Change in Cuyama River Outflow

-1,500 AF

(will need to consider effects on downstream users)

WOODARD &CURRAN

Water Supply Imports via Exchange

- Potential Yield: undetermined
- Estimated Cost: $600-$2,800/acre-foot
- Planning Horizon: 10-20 years
- Description: Purchase water transfer or excess SWP water and exchange with water users downstream of Lake Twitchell to allow for greater floodwater capture upstream
- Potential Implementation Issues: High cost, willingness of downstream users to enter exchange program
- Recommendation: Include for consideration for future study as part of stormwater capture analysis during GSP implementation phase

WOODARD &CURRAN

Summary of Water Supply Project Benefits

	Change in Storage	Change in Cuyama River Outflow
Precipitation Enhancement	**+1,500 AF**	**+2,700 AF**
Forest/Rangeland Management	**+1,500 AF**	**+1,400 AF**
Flood/Stormwater Capture	**+1,900 AF**	**-1,500 AF**

Total Potential Benefit: 5,000 to 9,000 AF per year

WOODARD &CURRAN

Questions and Discussion – Projects and Management Actions

- Clarifying Questions?
  - Approaches for reducing groundwater pumping
  - Analysis of potential projects and actions

- In addition to what has been presented, what other information would help you understand how sustainability can be achieved in the Cuyama Valley?

WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Agency

GSP Implementation Plan

March 6, 2019

WOODARD &CURRAN

Key Implementation Plan Components

- Detailed analysis of potential projects/actions
- Implementation schedule for management actions and projects
- Establishment of Monitoring Program
  - Coordination with monitoring entities
  - Agreements with local landowners
- Data Collection and Analysis
  - Water levels, water quality, subsidence
- Annual reporting
- GSP Five-year Update
  - Re-evaluation of thresholds
  - Review/update of numerical model
- Ongoing GSA Administration
  - Maintenance of DMS, website
  - Board/SAC meetings and other stakeholder outreach
- Financing Plan

WOODARD &CURRAN

Conceptual Project Implementation Timeline

Conceptual GSP Implementation Timeline

Implementation will be phased over 20 years, with 5-year updates.

2020 2025 2030 2035 2040

Monitoring and Reporting	Preparation for Allocations and Low Capital Outlay Projects	Prepare for Sustainability	Implement Sustainable Operations
• Establish monitoring network • Install new wells	• **GSA conducts 5-year evaluation/update** • Monitoring and reporting continues • Evaluate/refine thresholds and monitoring network • Refine water budget	• **GSA conducts 5-year evaluation/update** • Monitoring and reporting continues • Evaluate/refine thresholds and monitoring network • Refine water budget	• **GSA conducts 5-year evaluation/update** • Monitoring and reporting continues • Evaluate/refine thresholds and monitoring network • Refine water budget
• Develop pumping monitoring program* • Set up and initiate pumping allocation program*	• Pumping monitoring program continues* • Continue implementation of pumping allocation program*	• Pumping monitoring program continues* • Continue implementation of pumping allocation program*	• Pumping monitoring program continues* • Pumping allocation program fully implemented*
• Project analysis and feasibility	• Plan/design/construct small to medium sized projects*	• Plan/design/construct larger projects*	• Project implementation completed*
• Extensive public outreach	• Outreach continues	• Outreach continues	• Outreach continues

***Potential management area specific implementation**

WOODARD &CURRAN

Financing Plan Elements

Basin-wide

- GSA Admin
- Monitoring
- Reporting
- GSP Updates

By Management Area

- Management Actions
- Water Supply Projects

By Beneficiary

- New Wells

Funding Mechanisms

- Pumping Fees
- Assessments
- Grants & Loans

WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Agency

Wrap Up and Next Steps

March 6, 2019

WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Plan – Planning Roadmap