



COLUSA AND GLENN GROUNDWATER AUTHORITIES

Colusa Subbasin
Joint Technical Advisory Committee
GSP Development

August 14, 2020

Discussion Topics

- GSP Development Overview
- Projected Water Budgets
- Groundwater Dependent Ecosystem (GDE) Screening
- Well Monitoring Pilot Program

GSP Development Overview

Knowledge Building

- **Basin Setting**
 - Hydrogeologic Conceptual Model (HCM)
 - Historical and Current Groundwater Conditions
 - Draft Water Budgets
- **Existing Monitoring Network Evaluation**
- **Integrated Hydrologic Model Development and Calibration**
- **Sustainable Management Criteria Approaches**

Initial GSP Development

- **Basin Setting**
 - Groundwater Dependent Ecosystems
 - Updated Water Budgets
 - Management Area Overview
- **Draft GSP Monitoring Network**
- **Draft Sustainable Management Criteria**
- **Initial Projects and Management Actions**

GSP Refinements

- **Basin Setting**
 - Draft Management Areas
- **Draft GSP Chapters**
- **Updated GSP Monitoring Network**
- **Updated Sustainable Management Criteria**
- **Projects and Management Actions (PMAs) Evaluation and Analysis**
- **Draft Funding Mechanisms**

GSP Prep and Adoption

- **Basin Setting**
 - Updated Management Areas
- **Data Management System**
- **Updated PMAs**
- **Updated Funding Mechanisms**
- **Complete Draft GSP**

GSP Adoption and Submittal

Stakeholder Engagement and Outreach

5.a. Projected Water Budgets

Projected Water Budgets

- Draft Water Budget Scenarios Developed for
 - Current Conditions (Lower Bookend)
 - Future Conditions with 2070 Climate Change (Upper Bookend)
- Additional Scenarios under Development
 - Future Conditions without Climate Change
 - Future Conditions with 2030 Climate Change
- Based on Most Recent Model Version
 - Refinements to crop ET and irrigation demands
 - Updated aquifer parameters
 - Updated pumping depths
 - Updated stream parameters

Current Conditions Water Budget

- Recent Land Use, Surface Water Supplies, and Urban Demands
- 50 Years of Historical Hydrology (1966 – 2015)
- Land Use and Surface Water Supplies
 - 2013 Non-Shasta Critical Years
 - 2015 for Shasta Critical Years
- Urban Demands
 - 2015 Population and Per Capita Use

Future Conditions 2070 Water Budget

- Recent Land Use and Surface Water Supplies
- 50 Years of Historical Hydrology (1966 – 2015)*
- Land Use and Surface Water Supplies*
 - 2013 Non-Shasta Critical Years
 - 2015 for Shasta Critical Years
- Urban Demands
 - Projected Population and Per Capita Use

* Historical hydrology and surface water supplies modified based on DWR 2070 Central Tendency climate change projections

Bay-Delta Process Follow Up

- Reviewed Approach to Address Potential Impact of Bay Delta Process in Other Submitted GSPs
 - East San Joaquin
 - Merced
 - North and South Yuba
- East San Joaquin and Merced GSPs refer to process but do not make assumptions about changes
- North and South Yuba GSP does not mention Bay Delta process
- Additional Detail in Meeting Materials

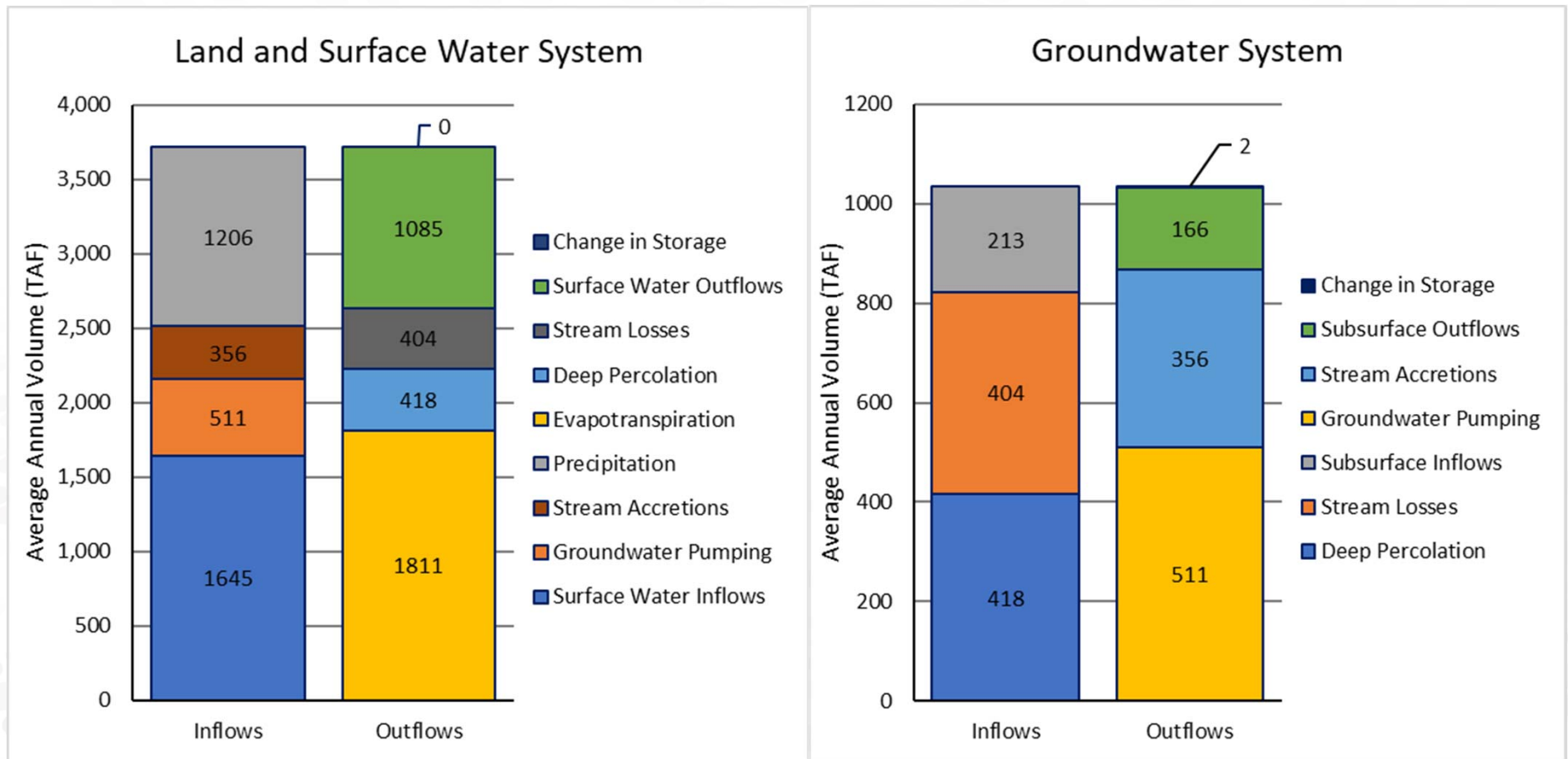
Water Budget 101

- Complete accounting of inflows, outflows, and change in storage
 - $\text{Inflows} - \text{Outflows} = \text{Change in Storage}$
- Includes Land and Surface Water System and Groundwater System
- Estimated using DWR's integrated hydrologic model (C2VSimFG Beta2) with refinements for Colusa Subbasin

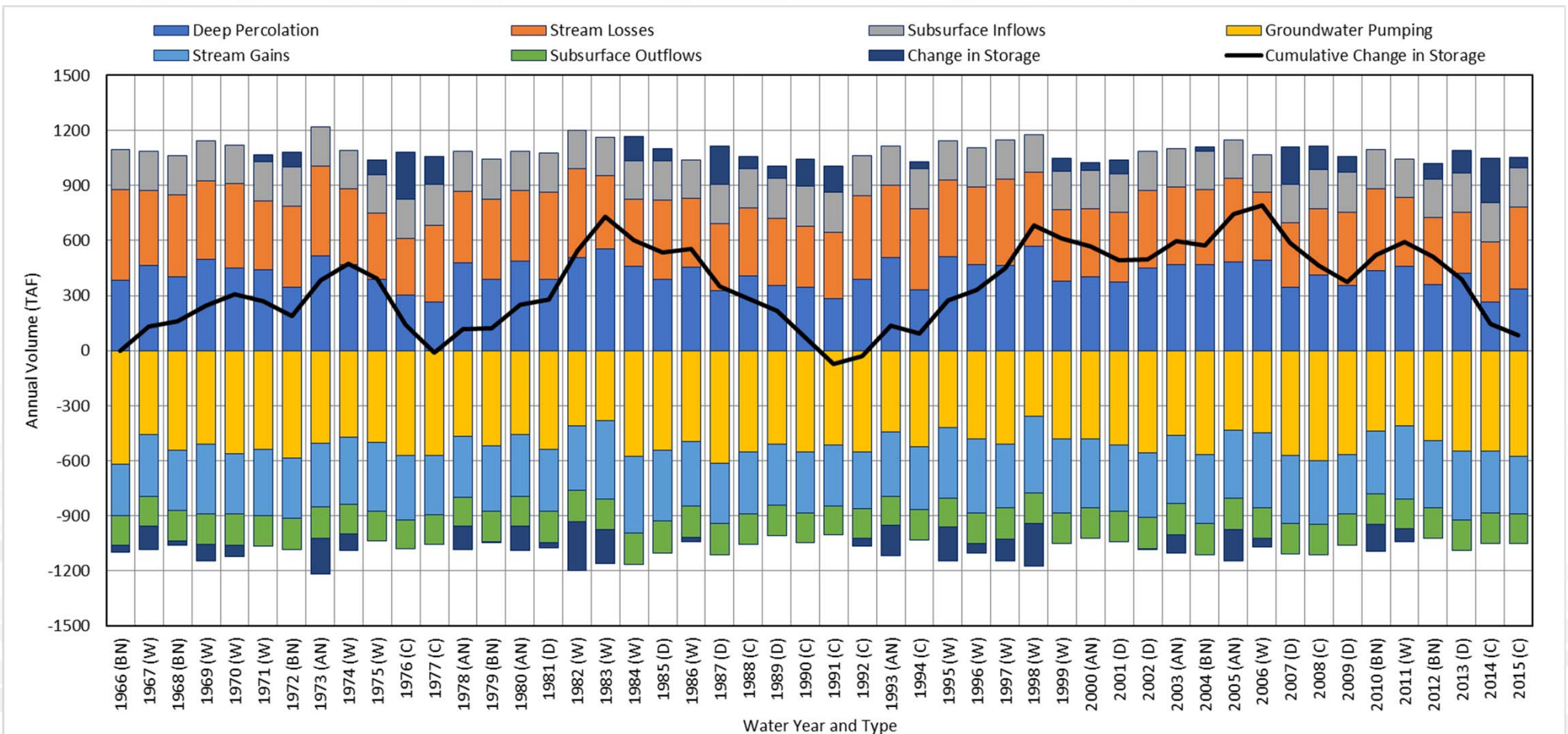
Primary Water Budget Drivers

- Land Use
- Precipitation
- Evapotranspiration
- Surface Water Supplies
- Groundwater Pumping
- Deep Percolation
- Surface Water – Groundwater Interaction
- Interbasin Flows

Current Conditions Draft Water Budget Summary



Current Conditions Draft Annual Groundwater Budget



8/14/2020

W = Wet

AN = Above Normal

Joint TAC

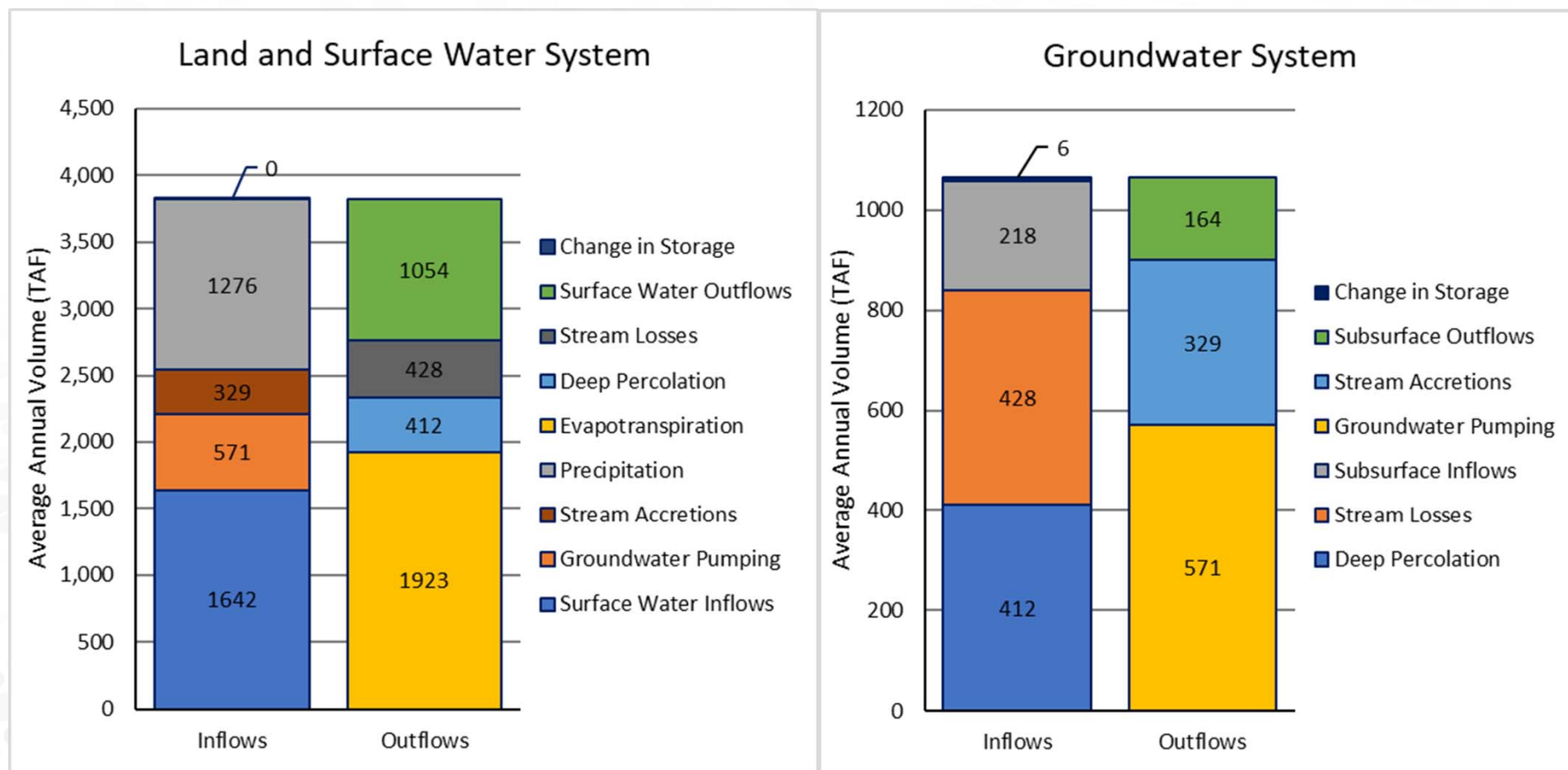
BN = Below Normal

D = Dry

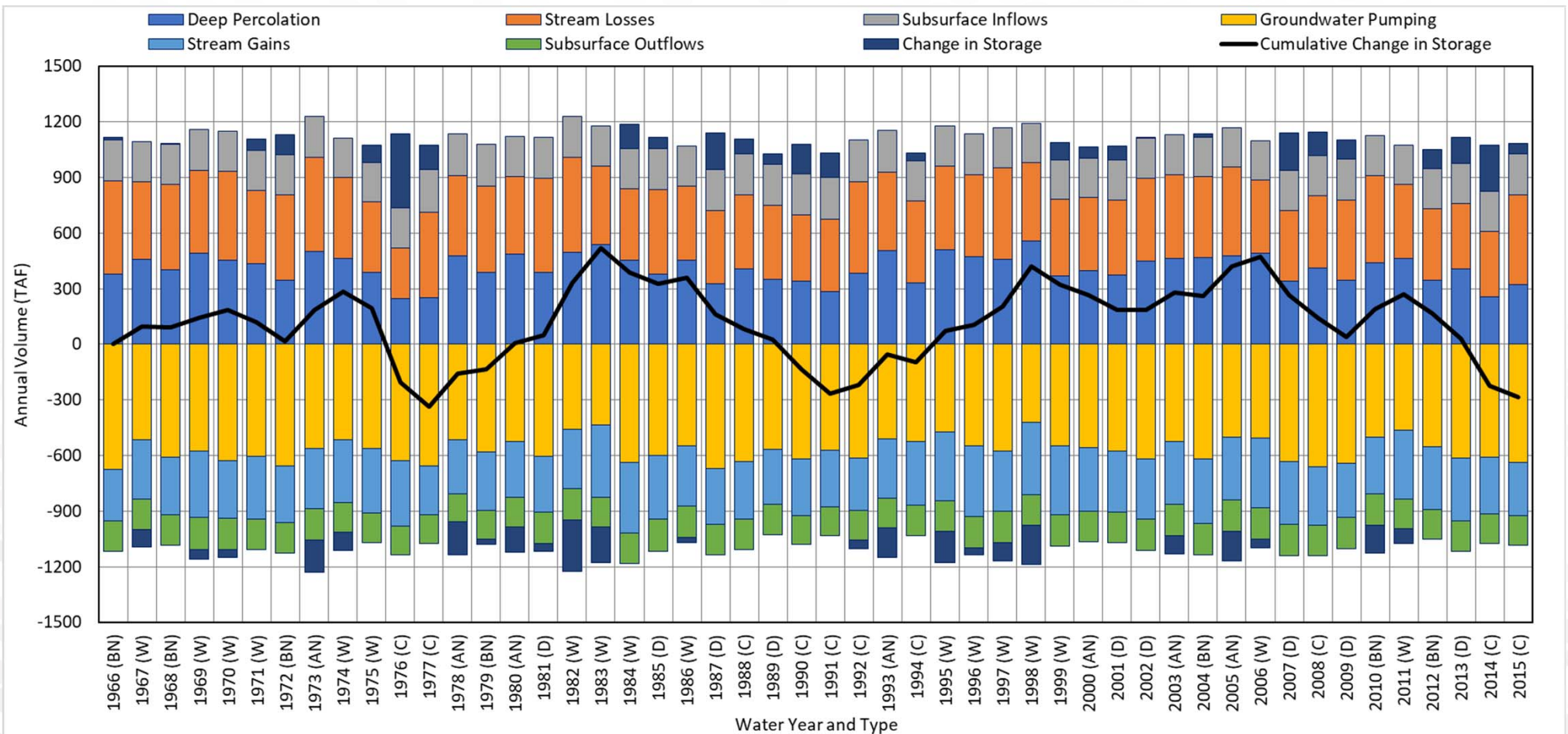
C = Critical

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2070 Conditions Draft Water Budget Summary



2070 Conditions Draft Annual Groundwater Budget



8/14/2020

W = Wet

AN = Above Normal

Joint TAC

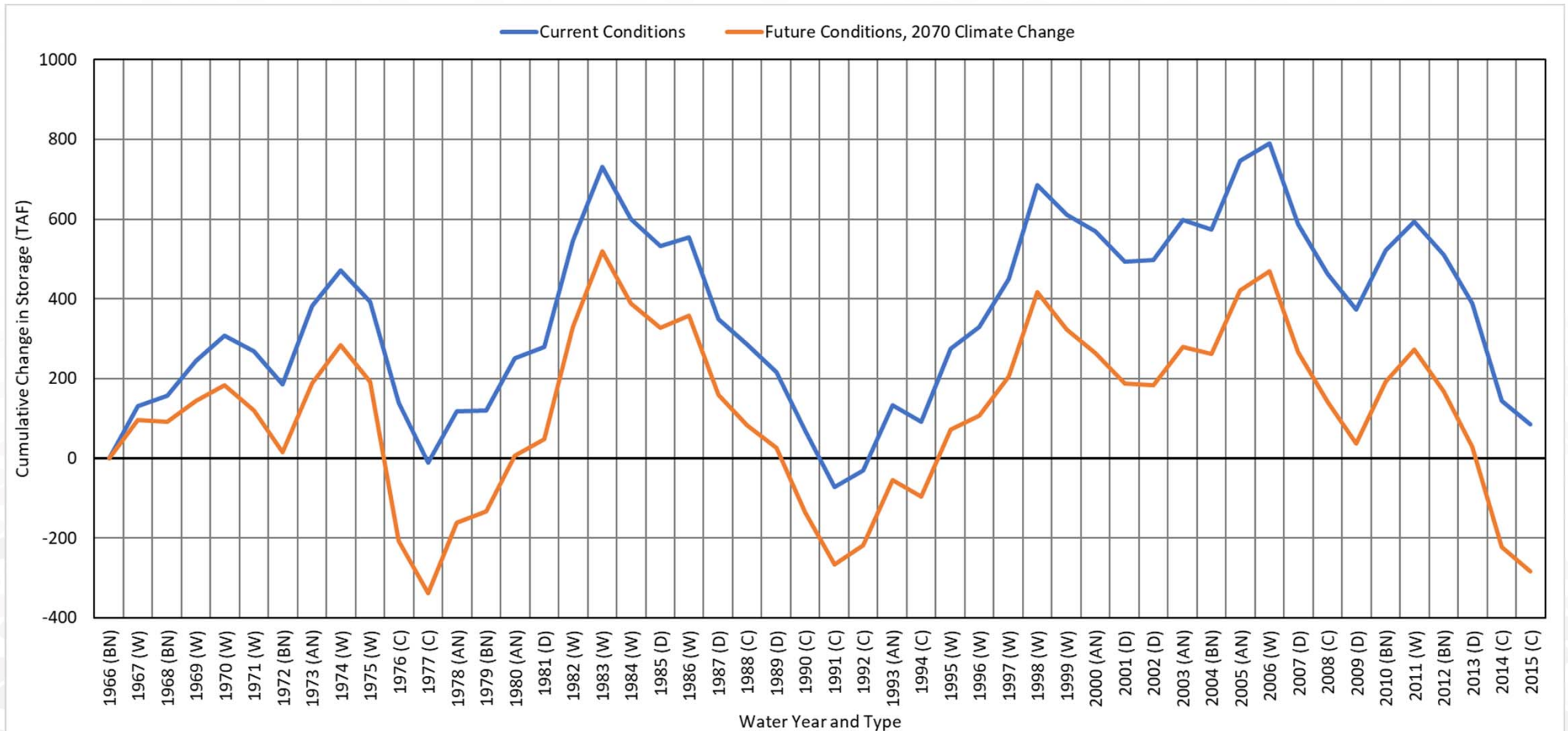
BN = Below Normal

D = Dry

C = Critical

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Draft Cumulative Change in Storage by Scenario



8/14/2020

W = Wet

AN = Above Normal

Joint TAC

BN = Below Normal D = Dry C = Critical

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Draft Observations

- Average annual change in storage differs between scenarios
 - Modest increase in storage under current conditions (+2 TAF/year)
 - Modest decrease in storage under 2070 conditions (-6 TAF/year)
 - Primary driver for difference is increased evapotranspiration and pumping under climate change
- Changes in storage (and groundwater levels) substantial over multi-year wet and dry cycles
- Changes in groundwater storage and levels likely greatest in groundwater dependent areas

Implications

- Multi-year wet and dry cycles should be considered in establishing Sustainable Management Criteria
 - Minimum Thresholds
 - Margin of Operational Flexibility
- Projects and management actions should consider
 - Flexibility to implement opportunistically
 - Accrual of benefits over time, in anticipation of dry cycles and impact on groundwater conditions

Next Steps

- Additional Analysis
 - Refinement of model calibration
 - Discretization of stream-aquifer interaction and interbasin flows
 - Comparison and coordination with neighboring basins
- Additional Scenarios
 - Future Conditions without Climate Change
 - Future Conditions with 2030 Climate Change
- Preparation of Draft GSP Section

5.b. Groundwater Dependent Ecosystems

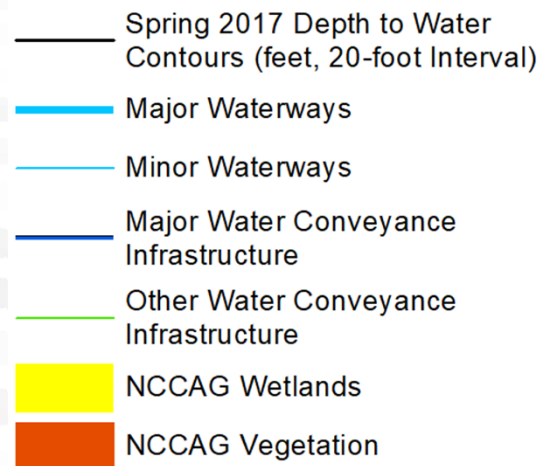
Groundwater Dependent Ecosystems (GDEs)

- Ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface
- Must be identified in Basin Setting chapter of GSP
- Preliminary identification based on Natural Communities Commonly Associated with Groundwater (NCCAG) dataset from DWR/TNC
- Additional refinement included in Proposition 68 grant

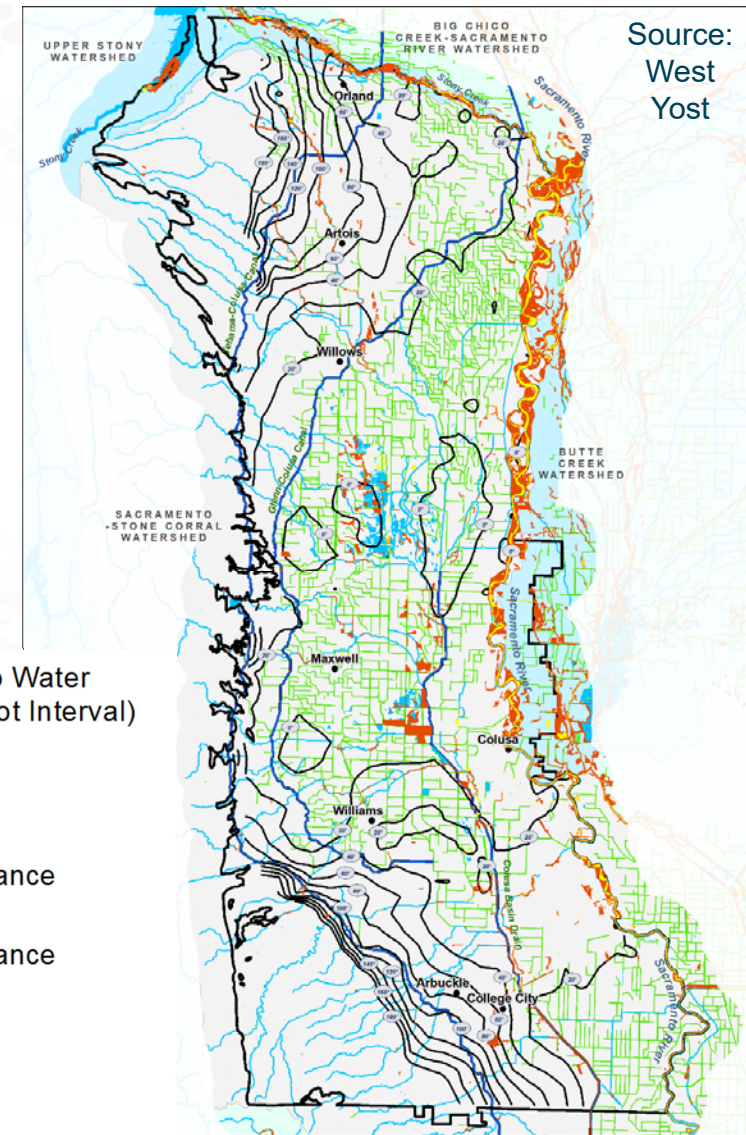
Preliminary GDE Mapping

- Relatively few wetlands mapped
 - mostly in riparian corridors
- 2,795 polygons, 17,748 acres
- Major vegetation categories
 - Cottonwood ~ 31%
 - Bulrush ~22%
 - Willows ~15%
 - Valley Oak ~13%
 - Others ~18% (including Arundo ~4%)

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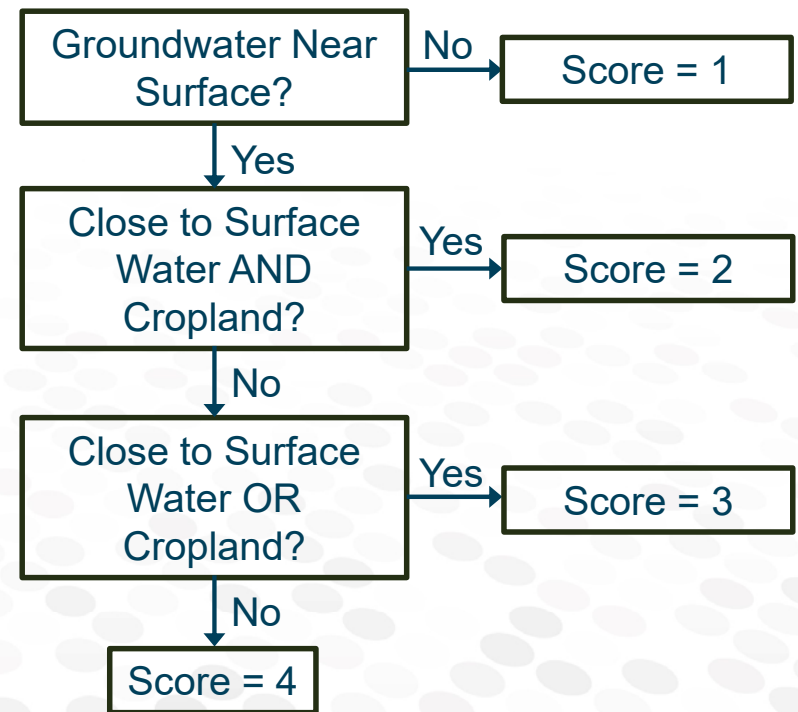


Approach

- Compile additional supporting data (e.g. depth to groundwater, presence of surface water, soil characteristics, etc.)
- Develop and apply criteria to refine characterization of GDEs
- Prepare maps and other supporting data for stakeholder engagement
- Further refine GDE characterization
- Incorporate refinements into appropriate sections of GSP
 - Basin Setting
 - Monitoring Networks
 - Sustainable Management Criteria
 - Projects and Management Actions

Progress Since Last Meeting

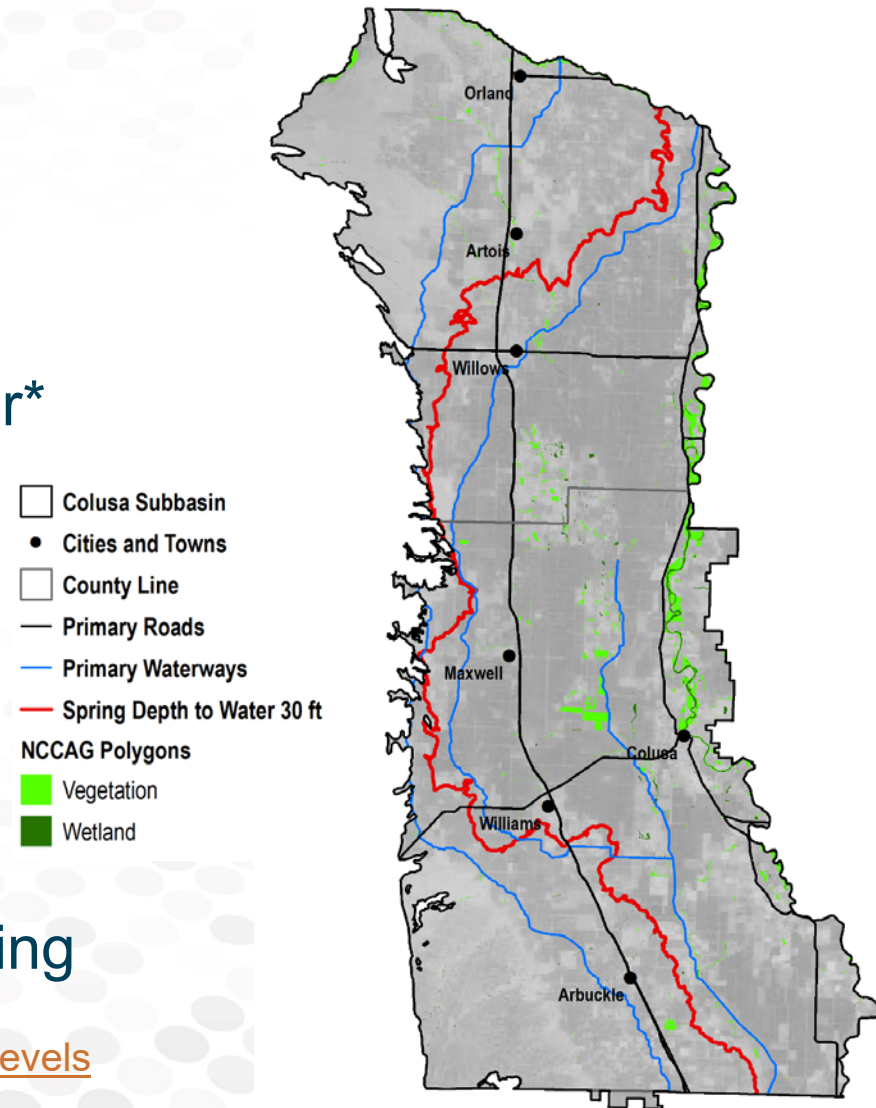
- Compiled Additional, Supporting Information
 - Depth to groundwater
 - Proximity to surface water
 - Proximity to irrigated cropland
- Developed Preliminary Scoring Criteria
 - Range from 1 to 4
 - 1 = less likely
 - 4 = more likely

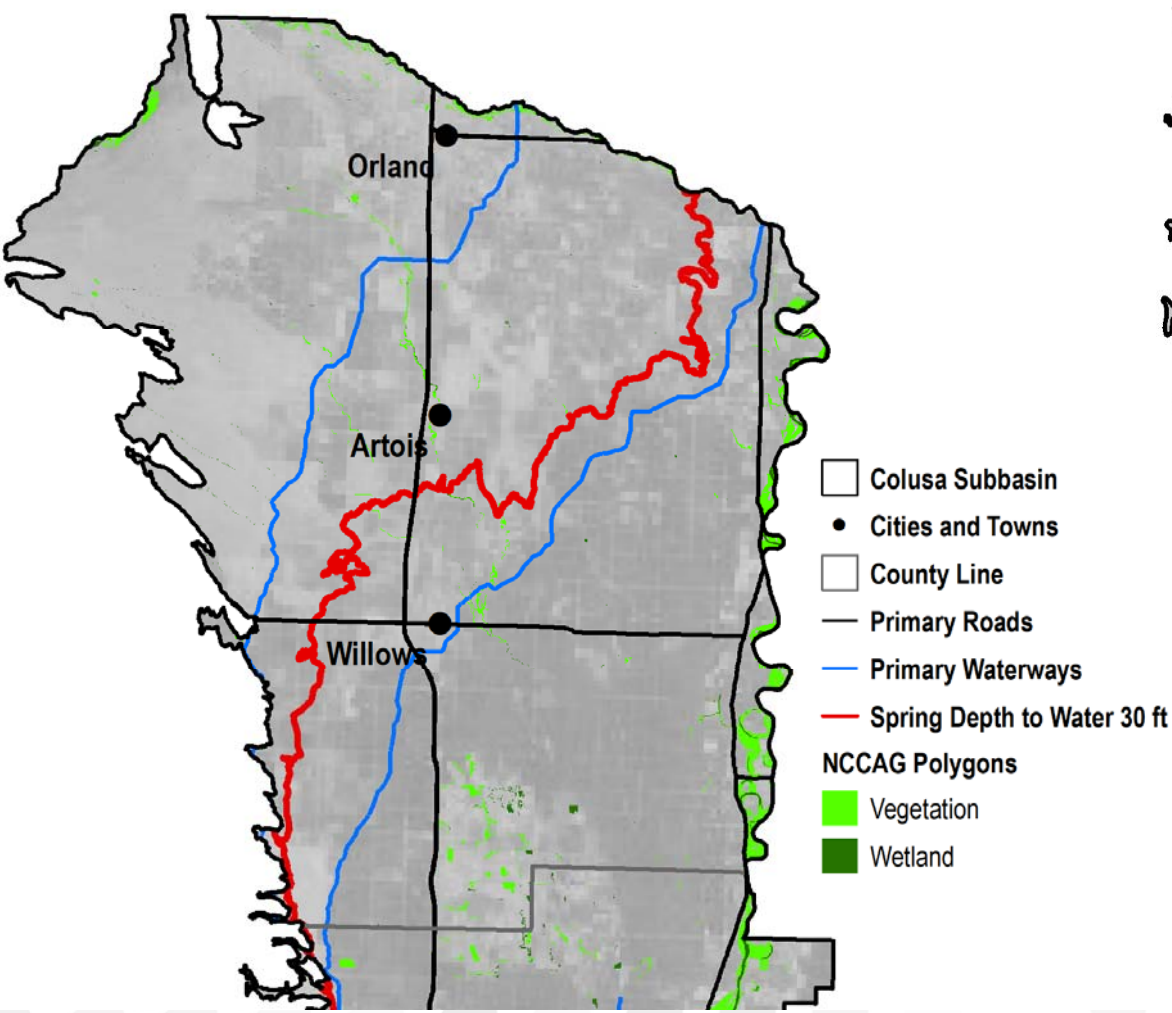


Depth to Groundwater

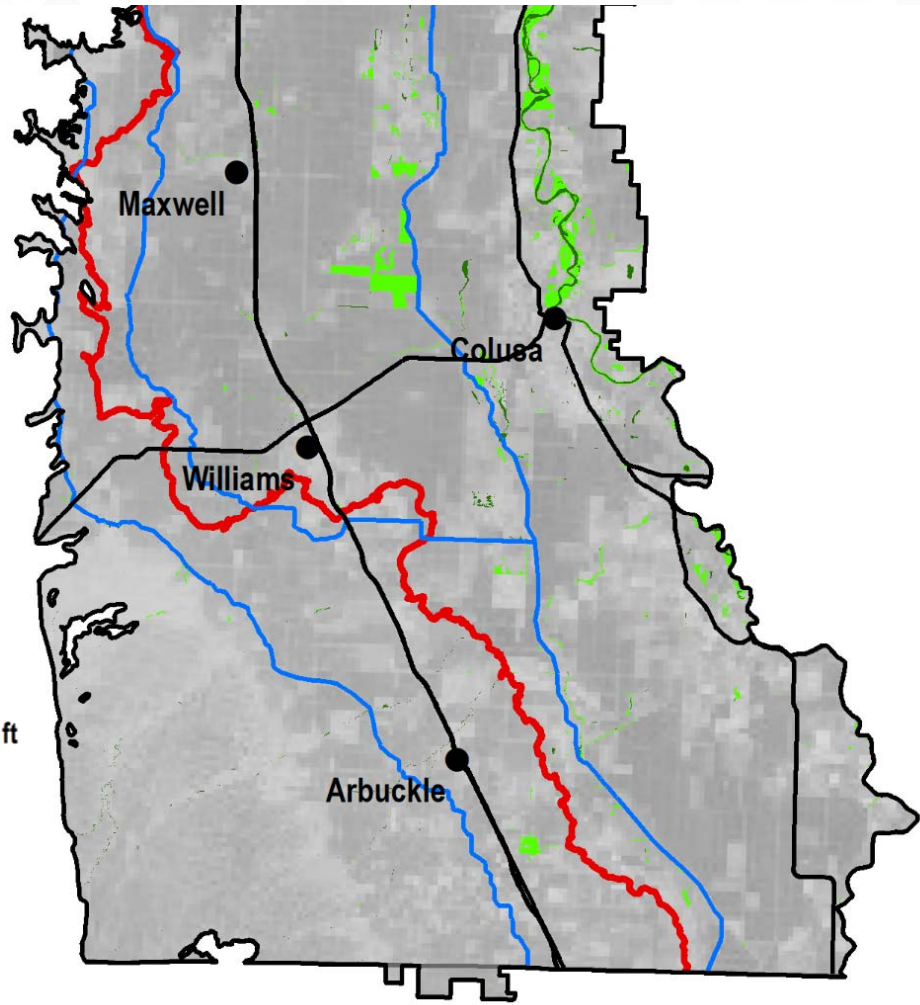
- Based on DWR Groundwater Monitoring Data
 - Accessed via DWR SGMA Data Viewer*
 - Spring measurements
 - 5-Year period from 2014 – 2018
- Characterize Areas with Depth Greater than 30 Feet
 - Consistent with TNC GDE guidance
 - Corresponds to expected deepest rooting

* <https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels>





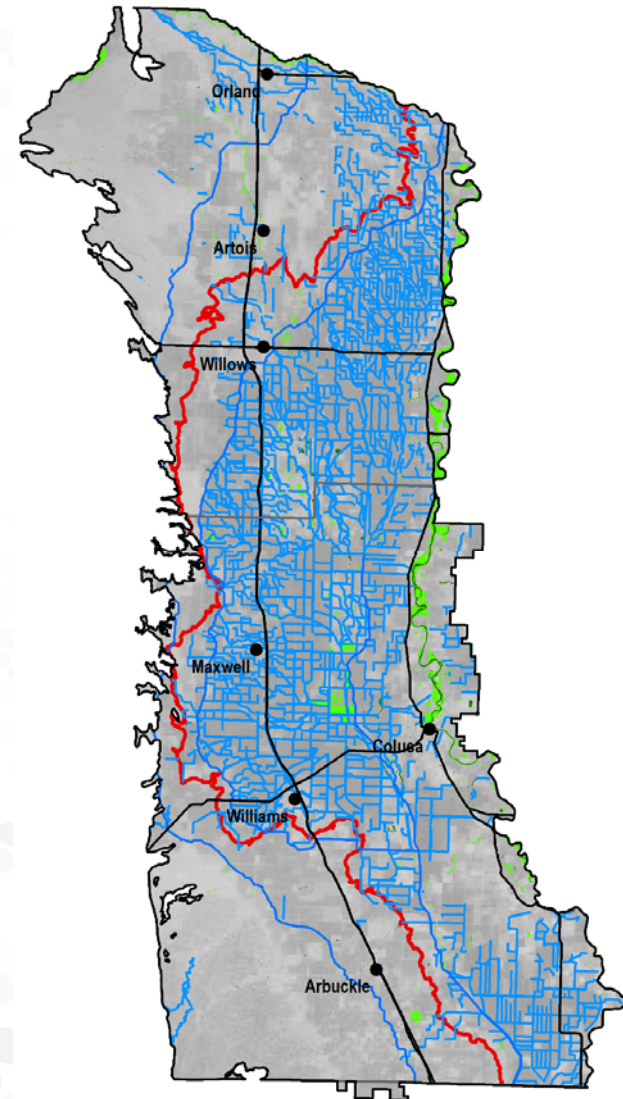
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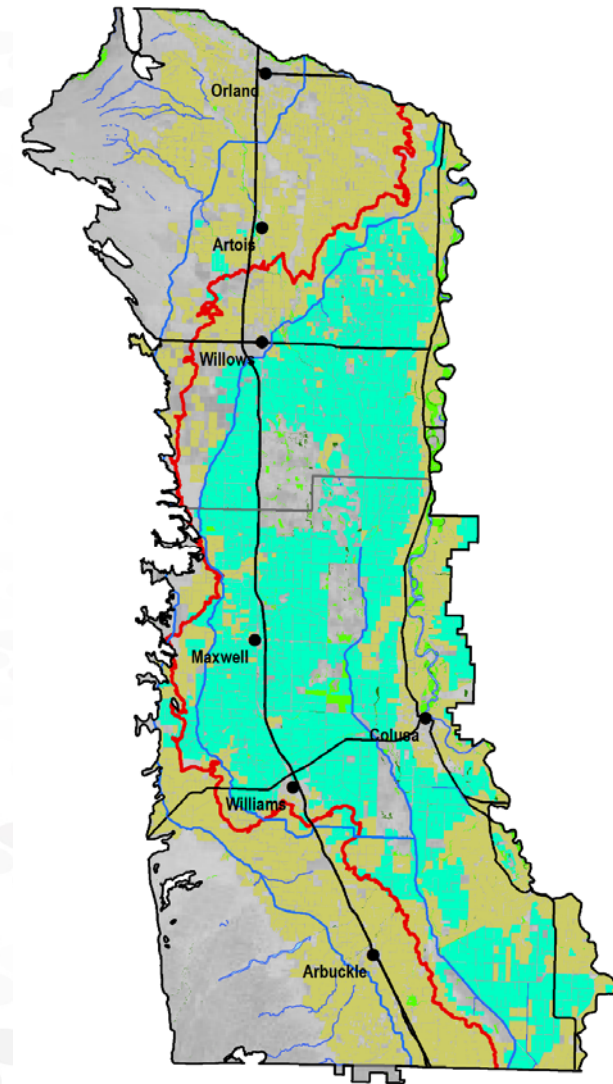
Proximity to Surface Water

- Canals, ditches, and perennial streams identified based on National Hydrography Dataset
- Polygons within 150 feet of surface water assumed to potentially have access to surface water



Proximity to Irrigated Cropland

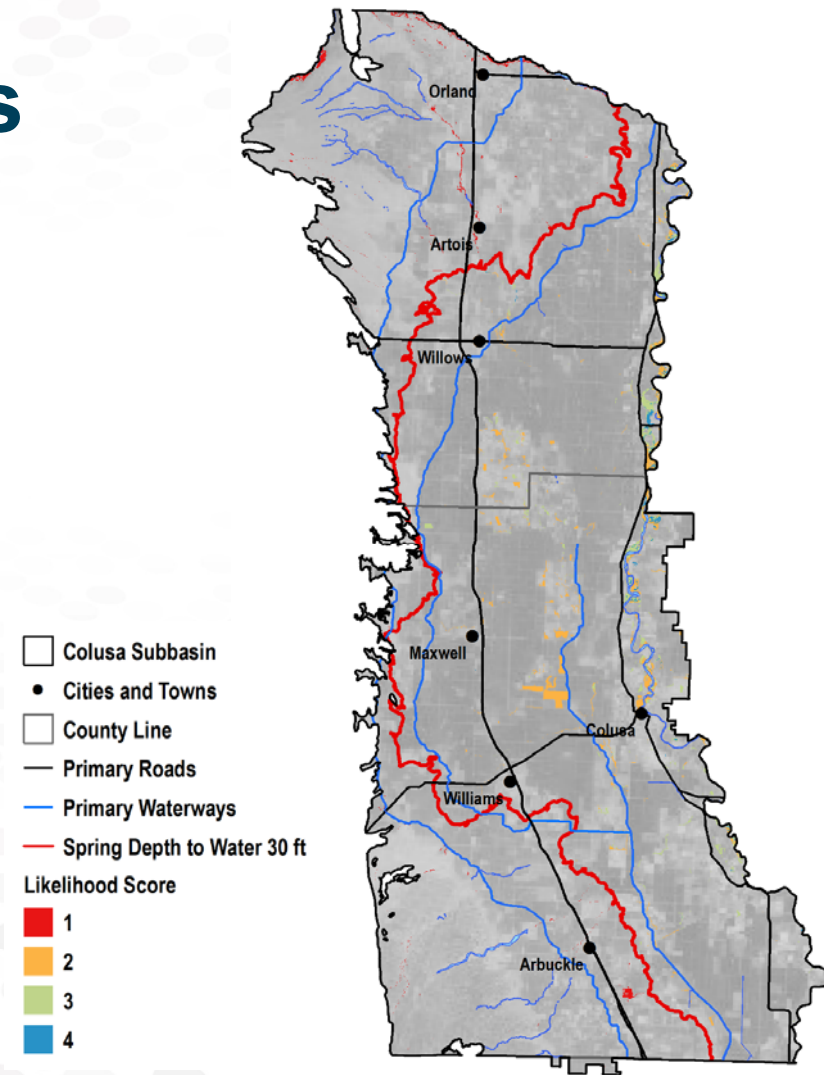
- Irrigated cropland identified based on DWR land use survey data
- Polygons near irrigated fields assumed to potentially have access to surface water
 - Rice: 150 foot buffer
 - Other crops: 50 foot buffer



Preliminary Scoring Results

- Polygons and Acres by Scoring Category:

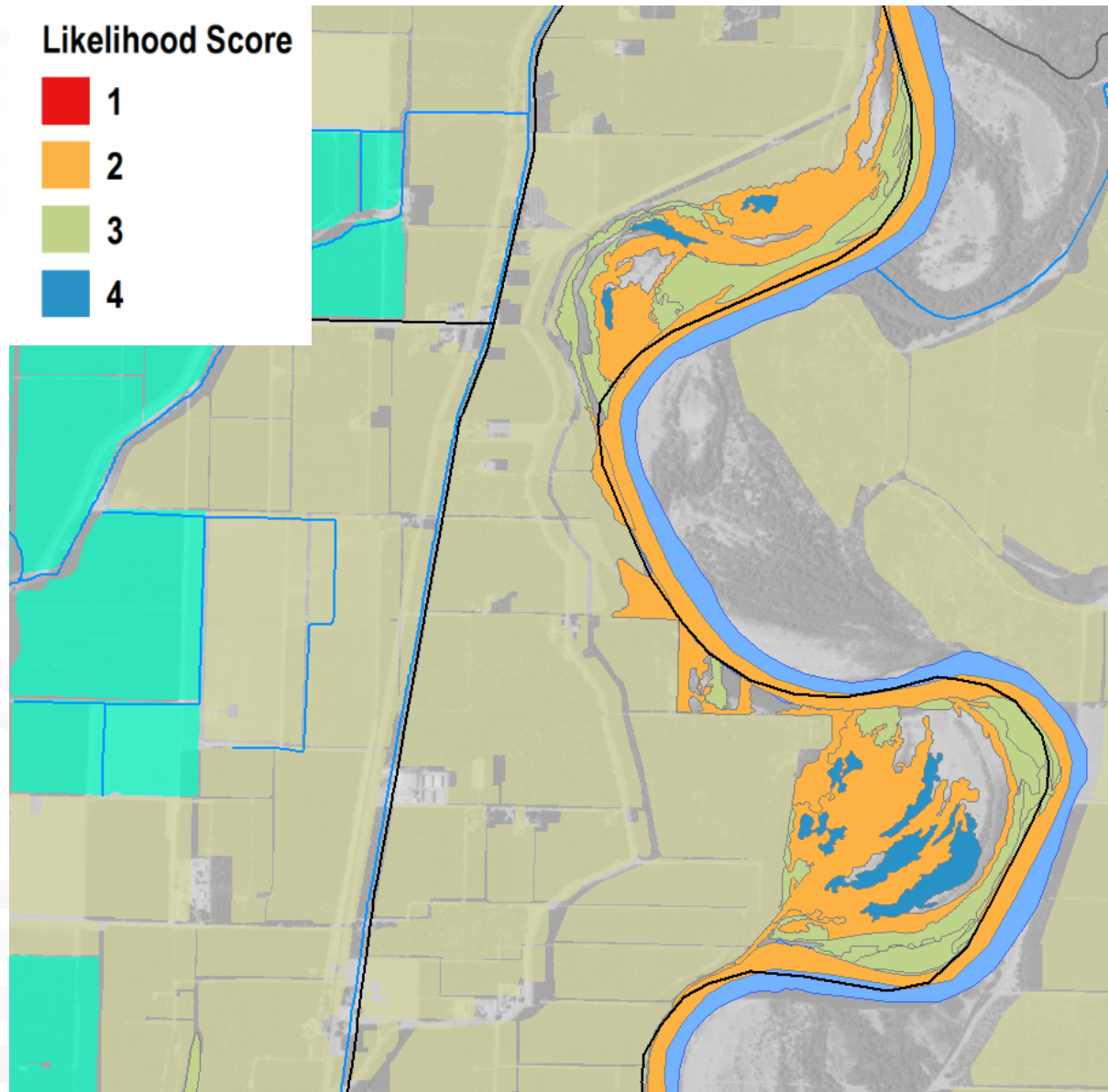
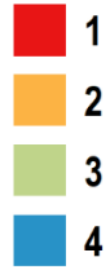
Score	Polygons	Acres
1 (less likely)	798	2,543
2	634	8,708
3	1,091	5,578
4 (more likely)	272	920
Total	2,795	17,748



Example

- Sacramento River Corridor near Glenn

Likelihood Score

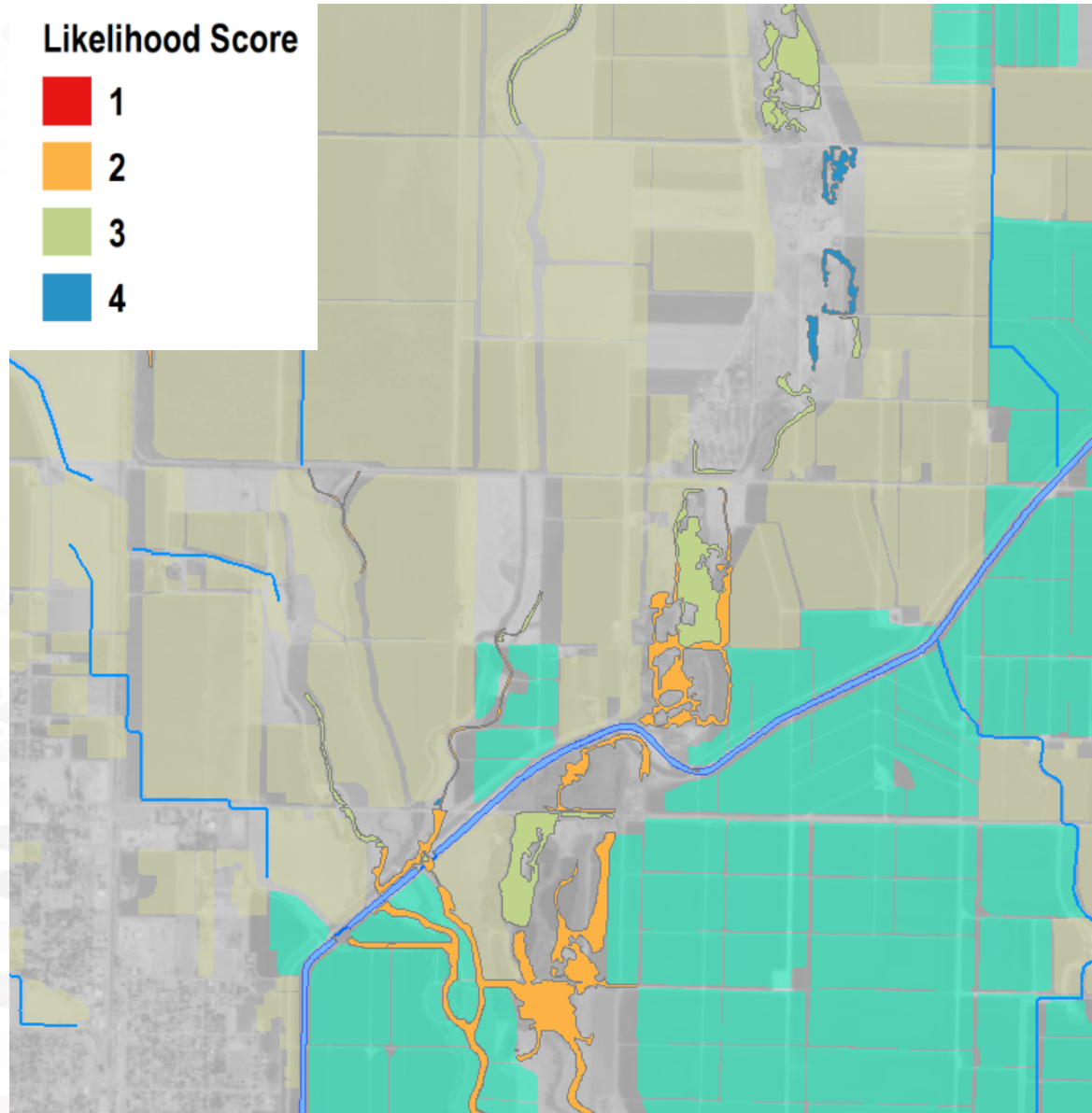
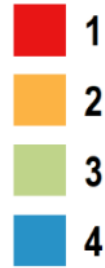


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Example

- Northeast of Willows

Likelihood Score



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Summary

- Simple Scoring Approach
- Relies on Public Data
- Potential for Refinements
 - Refined datasets
 - Adjustments to thresholds
 - Incorporation of additional datasets

Discussion Questions

- Comments on preliminary scoring approach and criteria?
- Next steps?

5.c. Well Monitoring Pilot Program

Program Goals

- Encourage Stakeholder Engagement/Involvement
- Collect Groundwater Extraction Volumes
- Collect Water Levels
- Incorporate Available Data into GSP Development
- Identify and Evaluate Options for Basin-Wide Implementation

Program Details

- Timeline
 - Program Development: Now through Dec.
 - Solicitation, Selection, and Installation: Jan. – Mar. 2021
 - Implementation: Mar. 2021 – Dec. 2021 or Later
- Eligibility
 - Willing to Share Data Publicly
 - Accepted Flow Meter
 - Selected Makes/Models
 - Proper Installation
 - Well Sounding Tube for Pressure Transducer
- Incentives: All or Part of Meter/Telemetry Costs

Recommended Flow Meters

- McCrometer
 - Water Specialties
 - McPropeller
- SeaMetrics
 - Ag3000
- Others, As Approved

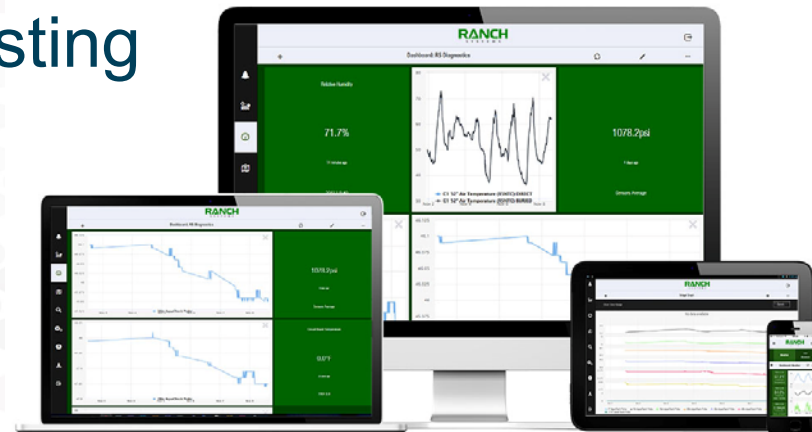


Telemetry Options

- Single Option Selected for Program
- Desired Features
 - Collect Flow and Water Level Data
 - Cellular Communication
 - Solar Powered
 - Near Real-Time Web Access
 - Individual landowner access
 - Public access for all sites
 - Local Support
 - Low Cost

Ranch Systems (www.ranchsystems.com)

- RS130 Telemetry Node
- Two Input Sensors
 - Flow Meter
 - Pressure Transducer
 - Expandable to Add Others
- Optical Sensor for Existing Mechanical Meters
- Mobile, Tablet, and Computer Access



Ranch Systems (www.ranchsystems.com)

- Selected by Fox Canyon Groundwater Management Agency (Ventura County)
 - 70 well pilot program
 - 700 total irrigation wells
- Additional Background
 - Started in Napa/Sonoma
 - Customers include Chico Nut, Bullseye, Harry and David (Oregon)
 - Colusa County Farm Supply is reseller and servicer
- Cost
 - \$2,500 installed with first year data plan (\$240/year thereafter)
 - Includes solar
 - Pressure transducer not included

Wildeye (www.mywildeye.com)

- Two Input Sensors
 - Flow Meter
 - Pressure Transducer
 - Expandable to Add Others
- Requires Flowmeter Signal (modbus or 4-20mA)
- Mobile, Tablet, and Computer Access



Pictured: Outpost Wildeye endpoint hardware, website analysis tools & Smart phone installation tool.

Wildeye (www.mywildeye.com)

- Based in Fresno with Local Rep in Sacramento
- Started in Australia and New Zealand
- Working Locally to Support SB88 Compliance
- Working with Freshwater Trust to Support Water Markets
- Cost
 - \$3,000 installed with first year data plan (\$180/year thereafter)
 - Includes solar
 - Pressure transducer included (200' cable)

Estimated Per-Site Costs

- Similar Cost
 - \$7-8k for Equipment & Data Service
 - \$3-4k Installation
 - \$10-12k Total
- Can Receive Discount for Volume
- Reduce Program Costs By
 - Requiring landowner to install flowmeter
 - Connecting to existing flowmeter

Ranch Systems

Component	Unit Cost	Installation	Total
Flowmeter, 12"	\$2,500	\$2,500	\$5,000
Pressure Transducer, 200'	\$1,250	\$750	\$2,000
Ranch Systems RS130	\$2,500	\$0	\$2,500
Cell Service (1 year)	\$180	\$0	\$180
Subtotal	\$6,430	\$3,250	\$9,680
20% Contingency	\$1,286	\$650	\$1,936
Grand Total	\$7,716	\$3,900	\$11,616

Wildeye

Component	Unit Cost	Installation	Total
Flowmeter, 12"	\$2,500	\$2,500	\$5,000
Pressure Transducer, 200'	\$0	\$0	\$0
Wildeye Outpost	\$3,000	\$0	\$3,000
Cell Service (1 year)	\$180	\$0	\$180
Subtotal	\$5,680	\$2,500	\$8,180
20% Contingency	\$1,136	\$500	\$1,636
Grand Total	\$6,816	\$3,000	\$9,816

Overall Program Cost Estimate

- Assumptions
 - All sites need flowmeters
 - Landowner pays installation cost

Component	Unit Cost	Quantity	Total
Program Design	\$10,000	1	\$10,000
Selection and Site Visits	\$1,250	5	\$6,250
Implementation Support	\$500	5	\$2,500
Program Evaluation	\$10,000	1	\$10,000
Monitoring & Telemetry	\$7,500	5	\$37,500
Total			\$66,250

Overall Program Cost Estimate

- Assumptions
 - Landowner provides flowmeter

Component	Unit Cost	Quantity	Total
Program Design	\$10,000	1	\$10,000
Selection and Site Visits	\$1,250	7	\$8,750
Implementation Support	\$500	7	\$3,500
Program Evaluation	\$10,000	1	\$10,000
Monitoring & Telemetry	\$4,700	7	\$32,900
Total			\$65,150

Discussion Questions

- General comments on program design?
- Thoughts/next steps regarding telemetry options?
- Thoughts regarding incentives?