

Upper Feather River Integrated Regional Water Management Plan Proposition 50 Grant Agreement No. 4600007650

Project Performance & Monitoring Report

Project No./Name: Sierra Valley Well Assessment and Basin Management Project

Project Proponent: County of Plumas

Progress Report No.: 3

Reporting Period: 2020

Date of Post-Performance Report: 5/7/2021

Project Specific Output Signatures			
	Yes	No	Comments
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The Project is two studies. N/A
Project Specific Outcome Indicators			
	Yes	No	Comments
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The Project is two studies. Not directly applicable. See narrative below.
Did you meet the goal of your project? If yes, please provide a brief description stating how you achieved this goal. If no, please comment as to why the goal was not achieved.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See narrative below.
Other Standard Reporting Requirements: Please indicate other monitoring/reporting requirements you may already be required to do independent from DWR contractual obligations. For example: CDPH Title 22 Ch. 15 "Domestic Water Quality AND Monitoring Regulations," NPDES, GAMA, CASGEM, or other internal reporting requirements that may yield valuable data.			
	Yes	No	Comments
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The Project is two studies. Not directly applicable. See narrative below.
What Upper Feather River IRWM Plan Objectives did your project address to support implementation of the Plan?			
	Yes	No	Comments
Restore natural hydrologic functions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See narrative below.
Reduce potential for catastrophic wildland fires in the Region	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A
Balance the needs of forest health, habitat preservation, fuels reduction, forest fire prevention, and economic activity in the Upper Feather River Region	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A
Build communications and collaboration among water resources stakeholders in the Region	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See narrative below.
Work with Department of Water Resources to develop strategies and actions for the management, operation,	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A

Sierra Valley Well Assessment and Basin Management Project

and control of the State Water Project facilities in the Upper Feather River Watershed in order to increase water supply, recreational and environmental benefits to the Region			
Encourage municipal service providers to participate in regional water management actions that improve water supply and water quality	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A
Continue to actively engage in FERC relicensing of hydroelectric facilities in the Region	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A
Address economic challenges of municipal service providers to serve customers	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A
Protect, restore, and enhance the quality of surface and groundwater resources for all beneficial uses, consistent with the Central Valley Regional Water Control Board Basin Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Project has provided valuable information for the Sierra Valley Groundwater Management District to achieve compliance with SGMA regulations. See narrative.
Address water resources and wastewater needs of Disadvantaged Communities (DACs) and Native Americans	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Project has provided valuable information for the Sierra Valley Groundwater Management District to achieve compliance with SGMA regulations. See narrative.
Coordinate management of recharge areas and protect groundwater resources	<input checked="" type="checkbox"/>	<input type="checkbox"/>	This is the Project goal. See narrative below.
Improve coordination of land use and water resources planning	<input checked="" type="checkbox"/>	<input type="checkbox"/>	This is the Project goal. See narrative below.
Maximize agricultural, environmental and municipal water use efficiency	<input checked="" type="checkbox"/>	<input type="checkbox"/>	This is the Project goal. See narrative below.
Effectively address climate change adaptation and/or mitigation in water resource management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Project was implemented in coordination with the Upper Middle Fork modeling and climate study.
Improve efficiency and reliability of water supply and other water-related infrastructure	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A
Enhance public awareness and understanding of water management issues and needs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Project has provided valuable information for the Sierra Valley Groundwater Management District to achieve compliance with SGMA regulations. See narrative below.
Address economic challenges of agricultural producers	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A
Work with counties, communities, and groups to make sure staff capacity exists for actual administration and implementation of grant funding	<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A

1. Summary of the operations of the project.

The goal of the Sierra Valley Well Assessment and Basin Management Project is to provide more sophisticated decision support tools and information based on technical studies to help the Sierra Valley Groundwater Management District (SVGMD) and Plumas County, as co-Groundwater Sustainability Agencies (GSAs), in addition to Sierra County, more actively manage the Sierra Valley Subbasin 5-012.01 (SVSB) given the legislative requirements of the Sustainable Groundwater Management Act (SGMA) and the need to prepare a Groundwater Sustainability Plan (GSP) no later than January 31, 2022, based on SVSB's medium priority basin designation.

The project has successfully accomplished the following tasks:

- Identified potential Groundwater Sub-basin Management Areas based on hydrogeology and recharge characteristics;
- Developed tools to identify and characterize estimated groundwater drawdown rates and groundwater recharge rates;
- Developed groundwater and surface water budget for the SVSB;
- Developed a 3-D conceptual model of the SVSB aquifers;
- Developed a database that included data on inactive, abandoned, and drinking water wells in Sierra Valley;
- Reviewed historical water quality data;
- Generated a 3-D presentation of groundwater quality data;
- Sampled 27 DWR / SVGMD monitoring wells (previously sampled in 2002) and 51 other monitoring wells (sampled before 2002);
- Assessed groundwater flow by looking at fracture trace analyses and water chemistry/isotope analyses to determining groundwater basin areas with upland recharge/water source areas;
- Collected and analyzed groundwater pumping volumes;
- Created a hydrologic budget;
- Conducted education and outreach;
- Presented project findings and conclusions to SVGMD and Plumas County; and
- Prepared technical reports and public presentation materials that have been used by the SVGMD as decision support and public outreach and engagement tools for SGMA GSP planning.

Data from groundwater level monitoring, in combination with modeling simulations and isotope analyses provided in coordination with the Upper Middle Fork Project model development, have assisted the SVGMD in making scientifically substantiated water management decisions under the SGMA. An example where the studies have continued to prove useful to SVGMD include using the Well Inventory Report to support ordinance development for the restriction of new high-capacity wells in specific areas of the basin experiencing chronic lowering of groundwater levels.

Specifically, the project collected and analyzed data on inactive, abandoned, and active domestic drinking water wells in Sierra Valley. Well inventory records were digitized into a database and historical water quality data was reviewed. Groundwater flow and sources were identified by looking at fracture trace analyses and water chemistry/isotope analyses to determining groundwater basin areas with upland recharge/water source areas. Groundwater pumping volumes were utilized to create a hydrologic assessment of groundwater sources and pathways into and through the SVSB.

Education and outreach and the presentation of project findings and conclusions to SVGMD and Plumas County has been ongoing throughout the study period, and including in 2019, both in reports and through a public workshop (December 2019) that provided the public updates on groundwater conditions, current efforts being made to manage groundwater within the SVSB, and an opportunity for public input on local groundwater impacts.

Specifically, the Sierra Valley Well Inventory and Aquifer Delineation in coordination with the UC Davis Upper Middle Fork watershed/climate models that were also funded with Proposition 50 were utilized as scientific baseline analyses to develop the scope of work for future monitoring and data collection needs for the Sierra Valley GSP Proposition 68 Sustainable Groundwater Management Round 3 planning grant proposal (submitted to DWR in November of 2019 and awarded to the District in March of 2020) or “GSP Development and Critical Programs for Efficient and Effective Sustainable Groundwater Management under an Adaptive Management Approach.”

Well Inventory Study Summary

Sierra and Plumas County GIS parcel maps populated with well locations were reviewed and a scope of work area was defined and mapped. During the inspection, wells of concern were identified by GPS for future mapping, casing diameter measured, and if possible, measured for total depth of well and depth to static water level. Data was collected and documented in a field log. The majority of the wells identified were 3-inch steel-cased wells, ranging from 10 feet deep to over 200 feet deep. The majority of these wells were artesian or had very high static water levels in which a windmill would be installed to pump the water. Over 500 wells were identified and documented in the inventory. Approximately 36 wells were identified for destruction and approximately 36 wells for capping. The remainder of identified wells are being addressed through the SVGMD’s recently adopted Well Registration Ordinance and through conversations with SVSB landowners.

Planning for well monitoring and assessment continued in 2020 as part of the Proposition 68 planning grant scope of work (Category (d): Monitoring/Assessment). Defining the monitoring networks (e.g., subsidence network, groundwater well network expansion utilizing CASGEM, agricultural pump flow metering program, and groundwater dependent ecosystems (GDE)) and data management that involves monitoring protocols, data and reporting standards, the data management system (DMS) are included, in addition to, as part of the agricultural pump flow metering program. The scope of work directs standard operating procedures (SOPs) to be developed and ensures flow meters are installed in compliance with manufacturers specifications, working properly, and properly calibrated. Lastly, a groundwater pumping reduction assessment will be conducted to investigate opportunities or methods to reduce and optimize groundwater pumping practices. Deliverables for Category (d) of the GSP Proposition 68 Sustainable Groundwater Management grant include items such as technical memorandums on development of DMS, the monitoring networks, and a fiscal and economic resource assessment; an engineering packet with monitoring network, meter installation information, and SOPs; and technical results and recommendations for a groundwater pumping optimization work plan.

Aquifer Delineation Study Summary

Ongoing interpretation of groundwater chemistry and isotope data continued in 2019 and Plumas Geo-Hydrology prepared a technical white paper as a follow up to the prior 2016 paper, *Forest and Water Balances, an Exploratory Study: Concepts of the Upper Feather River Basin Uplands Hydrology*, to document findings including matching isotope and chemistry data with the depth in selected wells to assess the hydraulic connection between deep and shallow aquifers. Additionally, further assessment of groundwater quality was conducted. Various sources in southern Sierra Valley were sampled to obtain more representative samples of geothermal water.

Throughout the project water chemistry and isotope data were entered into a database for analysis and further assessment of groundwater quality was conducted. Various sources in southern Sierra Valley were sampled to obtain more representative samples of geothermal water. The distribution of nitrate and boron data in Sierra Valley groundwater were analyzed and compared to geothermal sample data. This new geothermal water data indicated that there is a deep source of water, the origin of which cannot be pinpointed anywhere in the region surrounding the Sierra Valley Basin. The deep water did not have the isotope characteristics typical of geothermal water and appeared to mix with recharge water flowing into the basin. More than 230 isotope data points (including at least 20 literature isotope data sets), and more than 70 water chemistry data sets were obtained for this analysis. Characterizing the relationship between deep and shallow aquifer sections, by identifying vertical groundwater mixing trends, proved to be quite challenging.

Two major sources of water in Sierra Valley were identified through the project. One source of groundwater in the northern valley floor is the highlands that make Dixie Mountain. The second source is associated with groundwater discharge in southern Sierra Valley, in particular Cold Creek and the Yuba Pass area. Finally, the project identified a new SVSB contaminant. A combination of water chemistry and isotope data revealed high TDS waters in the northern valley floor, near Beckworth north of State Highway 70. Its source is not clear, but it was not originating from geothermal water because it lacked the oxygen shift which is characteristic of geothermal water.

2. Discuss project benefits to water quality, water supply, and the environment.

The Project continues to provide a scientific basis for the SVGMD ordinance development and management actions needed to develop the SVSB GSP and reduce undesirable results under SGMA.

Plumas Geo-Hydrology, Bachand & Associates, and Carlton Hydrology helped frame the rationale for additional studies and data collection for the Sierra Valley GSP development process.

Specifically, the project has accomplished the following:

- Generated useful information about the complexity and the non-uniformity of shallow and deep aquifer interactions in the SVSB;
- Assisted in the identification and ranking (by volume) of SVSB shallow and deep groundwater recharge sources;
- Assisted in the identification of naturally occurring and anthropogenic constituent sources, and in the preliminary conceptual characterization of groundwater storage, and groundwater flow pathways;
- Identified research gaps and research needs relating to the conservation of freshwater marsh ecology in the SVSB and the identification of upland spring habitats and upland recharge areas important for sustaining the ecology values and the generally high ambient water quality in the SVSB; and
- Provided a foundational basis for the SVSB GSP planning grant scope of work, especially in the areas of the water budget, monitoring network, and upland recharge elements of the GSP in addition to groundwater relationships to pumping, precipitation, and geology in the high-elevation basin.

3. Comparison and explanation of any differences between expected versus actual project success in meeting IRWM priorities as stated in the original IRWM Implementation Grant application.

Although the project pre-dates SGMA legislation and regulations, the project has provided both documentation and scientific justification for determining that the SVSB is a closed basin, and as such, is not beset with problems associated with managing interconnected groundwater basins under SGMA. On

the other hand, characterizing groundwater dynamics and especially “safe yield” under post-project SGMA regulations has proved to be more challenging. In hindsight, the two project studies would have benefited from SGMA Best Management Practice (BMP) guidance and regulations that was unavailable during the timeframe of the project.

Given the complexity of groundwater dynamics in the SVSB, providing SGMA-specific decision support tools would have still been difficult within the Proposition 50 funding and time constraints even if SGMA had preceded rather than followed Proposition 50 funding support.

The project has determined that the SVSB is not a uniform basin structurally or hydrologically. Therefore, desirable and undesirable “results” and their enhancement or reversal under SGMA will not be uniform. The water budget work undertaken by the project with Proposition 50 funds and in coordination with the Proposition 50-funded Upper Middle Fork watershed and climate model will be continued by the SVGMD and Plumas County through the GSP planning grant development process.

4. Summary of any additional costs and/or benefits deriving from the project.

Subsequent to the completion of the project, Plumas County, the SVGMD, and Plumas Geo-Hydrology have developed a study concept for refining the existing water budget for the SVSB for the purpose of supporting sub-basin groundwater recharge and storage analysis for interested overlying landowners and the SVGMD. The water budget refinement study concept and the post-Project PowerPoint presentations on the project are available from Plumas County.

Further, the Feather River Land Trust (FRLT), an overlying landowner in the SVSB and holder of multiple agricultural conservation easements, was able to solicit and receive funding from a charitable foundation for more in-depth recharge analysis in the SVSB for the SVGMD.

When the active recharge potential in the Sierra Valley floor was determined to be inadequate to justify further analysis and development, the FRLT was able to negotiate a change in the work scope for the grant funding to support the successful development of the Sierra Valley GSP Proposition 68 proposal for the GSP planning grant solicitation by DWR, as well as to conduct a one-year irrigation efficiency study evaluating Low Elevation Spray Application systems and to summarize and draw conclusions from all published studies on the groundwater in the SVSB. Bachand & Associates presented findings from the science review and gap analysis for available baseline SVSB data and studies, including project studies, at meetings before the SVGMD in 2019 and 2020.

5. Additional information relevant to or generated by the continued operation of the project.

Bachand & Associates and Carlton Hydrology prepared two reports in 2019 that were finalized in 2020:

- Bachand, P.A.M., Burt, K.S., Carlton, S. and Bachand, S.M., 2020. *Sierra Valley, CA—A white paper on the opportunities and challenges for management of groundwater under SGMA.* <http://aquaticcommons.org/27006/1/SV%20White%20Paper%202020-02-14%20BA%20SECURE.pdf>
- Bachand, P.A.M. and Burt, K.S. and Carlton, S. and Bachand, S.M., 2020. *Groundwater relationships to pumping, precipitation and geology in high-elevation basin, Sierra Valley, CA.* Davis, CA, Bachand & Associates, 58pp. <http://aquaticcommons.org/27004/1/Sierra%20Valley%20Recharge%20FINAL%202020-03-10%20SECURE.pdf>

These reports are on file with the SVGMD and Plumas County and will be used as background documentation for the development of the GSP.

The white paper on the opportunities and challenges for management of groundwater under SGMA makes eight recommendations to advance groundwater management in Sierra Valley:

1. Create management areas that correspond to differing conditions in Sierra Valley
2. Develop more robust monitoring networks
3. Improve groundwater level and pumping data
4. Implement more consistent surface water sampling
5. Standardize data sampling and reporting
6. Implement an adaptive management approach for sustainable groundwater management
7. Investigate promising mitigation strategies
8. Broaden stakeholder participation

The study groundwater relationships to pumping, precipitation and geology in high-elevation basin, Sierra Valley concludes with the idea that for sustainable groundwater management, a number of actions are potentially available to increase water supply and to reduce water demand, including:

- Improving efficiencies of irrigation systems
- Using organic amendment to improve water holding capacity
- Increasing multipurpose forest restoration programs to increase forest health, reduce fuels, reduce runoff and increase groundwater recharge
- Operational changes to Frenchman Dam to increase recharge opportunities

The majority of land in Sierra Valley is privately held. The development and adoption of a collective GSP strategy will require broad stakeholder input to address SGMA and the long-term management needs in the SVSB.