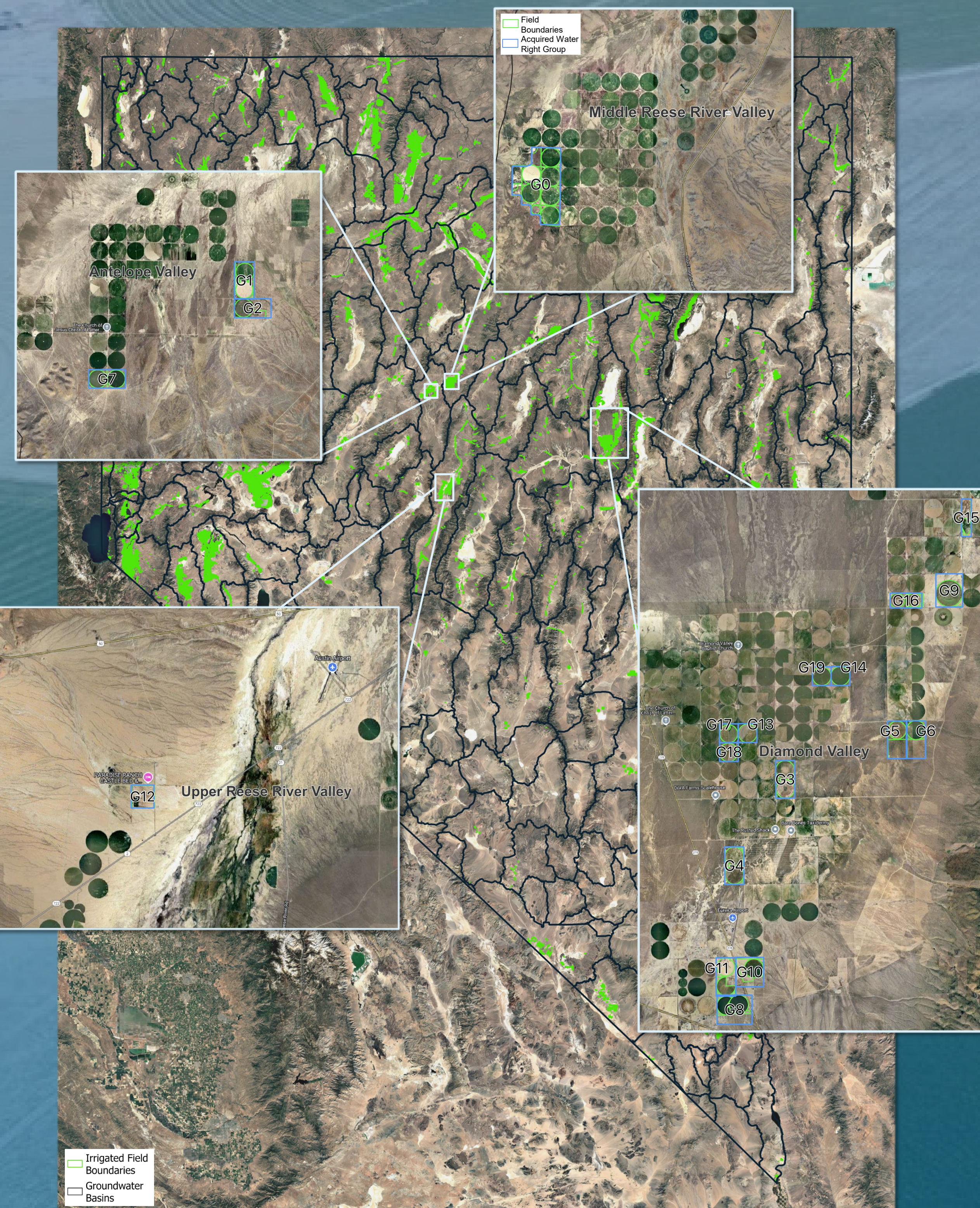


Project Background

Water right buybacks are becoming more common in the western U.S. due to water allocations exceeding water availability. In Nevada, \$25M of American Rescue Plan Act funding was allocated through the Department of Conservation and Natural Resources (DCNR) to develop a Voluntary Water Rights Retirement Program (VWRRP) to purchase and retire water rights in hydrographic areas that are over appropriated.

Bill draft requests (BDRs) focused on water right buybacks and water conservation are being developed and discussed for the 83rd (2025) Nevada Legislative session. A program such as this needs to demonstrate that the program can and will achieve its objective – to reduce consumptive use, conflict, and benefit groundwater basins.



Irrigated areas and groundwater right buyback places of use within four basins - Upper Reese, Antelope, Middle Reese, and Diamond Valley. Water right places of use were grouped (G0-G19) based on water right permits.

Objectives

- Assess how much groundwater pumping for irrigation has occurred from permitted places of use (POUs) participating in the VWRRP
- Quantify and compare historical pumping to purchased water rights for POUs that are participating in the VWRRP
- Identify differences between wet water (pumping) and paper water (acquired water rights) and quantify the basin benefit.
- Demonstrate the use of Nevada Water Initiative science and illustrate POUs that would be optimal for VWRRP, such as POUs where historical pumping has been maximized for irrigation over the long-term and is near an area of conflict.

Nevada Water Initiative, Datasets, & Methods

The Nevada Water Initiative (NWI) - The Nevada Division of Water Resources, collaborating with Desert Research Institute (DRI) and United States Geological Survey (USGS), created the NWI to provide baseline science to improve understanding of water availability and use across the state.

The NWI provides a "science toolbox" of approaches and datasets that can inform programs such as water right buybacks and answer questions like:



"How much pumping for irrigation occurred over last 5 to 10 years?"

"What is the conserved consumptive use and benefit to the basin from buybacks?"

"Which fields have the highest use and can reduce conflict the most through buybacks?"



Datasets - Field boundaries, water rights and places of use, satellite-based evapotranspiration (ET), and climate data was used to estimate pumping. NDWR pumping, purchased water rights (i.e. "Acquired Duty"), and costs were obtained from VWRRP tables provided by DCNR. Acquired water rights were grouped by owner and permit areas (G0-G19).

Methods - Landsat-based OpenET ET data was spatially averaged to field boundaries, and consumptive use was computed for each field from 2013-2023 as annual ET minus effective precipitation (precipitation that is used by the crop). Field-level pumping volumes $[(\text{Field Net ET (ft/yr)} / \text{Irrigation Efficiency}) * \text{Field Area (acres)}]$ were summed for fields that intersected with VWRRP POU water right groupings and were compared to acquired water right duties and NDWR pumping volumes.

Example VWRRP Table and Grouping of Water Rights

Group	Permit	Priority	Quantity	Acquired Duty	Cost
G0

G1

G2

Water Right and Cost Summaries – VWRRP permits were used to identify POUs, respective field boundaries, and summarize NDWR and OpenET pumping and costs by total and per acre-foot volumes for each water right acquisition group. The "Additive Portion" is the "Acquired Duty."

Total & Per Acre-Foot Cost
 Paper = Total Cost / Acquired Duty
 Wet = Total Cost / NDWR Pumping

Comparison of Acquired Water Rights vs. Historical Pumping

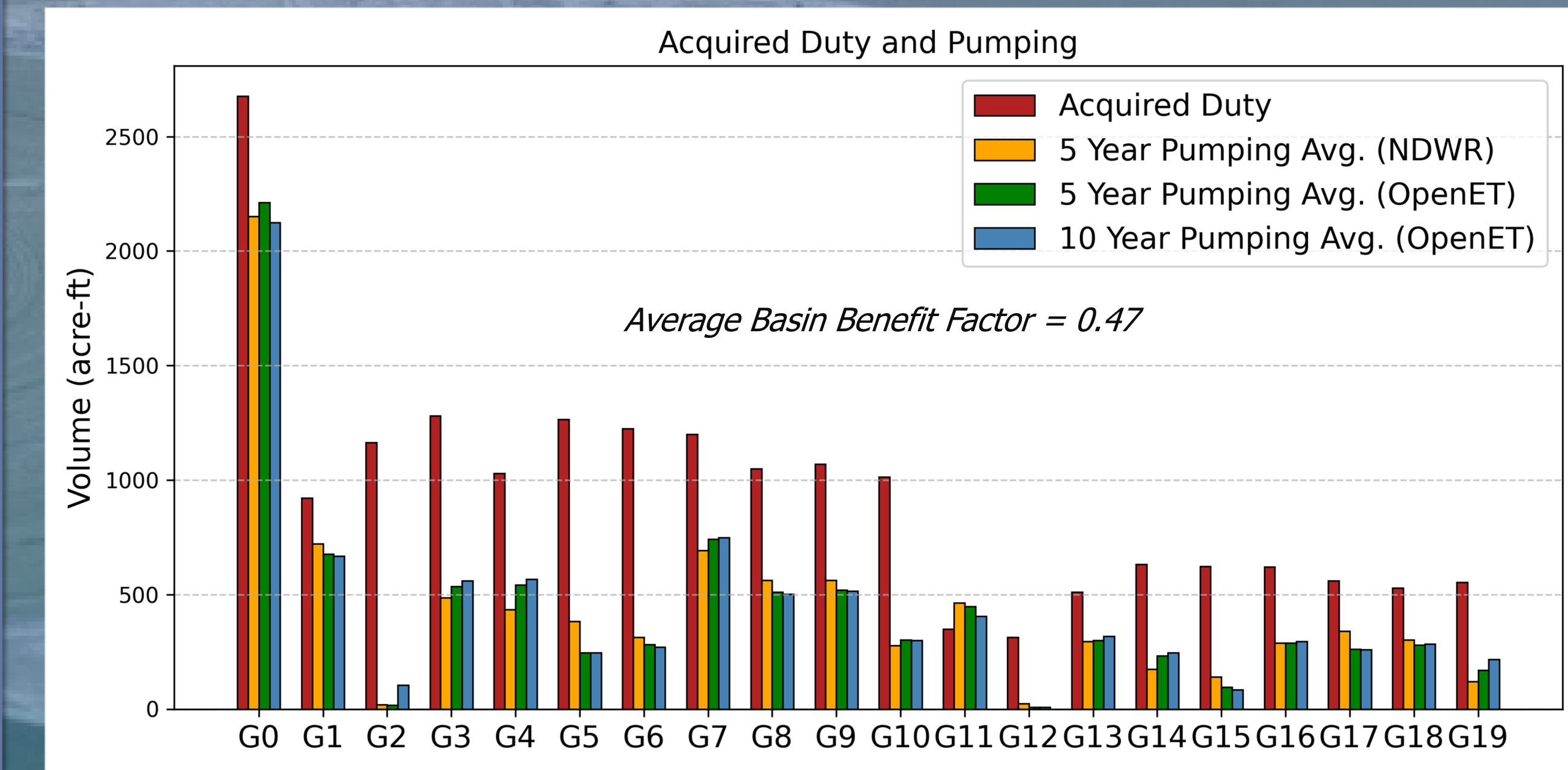
Satellite-based pumping $[(\text{OpenET ET} - \text{Effective PPT}) / \text{Field Efficiency}]$ compared to NDWR pumping and acquired water rights



Buybacks, Pumping, & Basin Benefit

Acquired water rights (paper water) and pumping (wet water) was summarized for each VWRRP and a Basin Benefit Factor (BBF = Pumping / Acquired Water Right) was computed. Ideally the BBF is near 1.

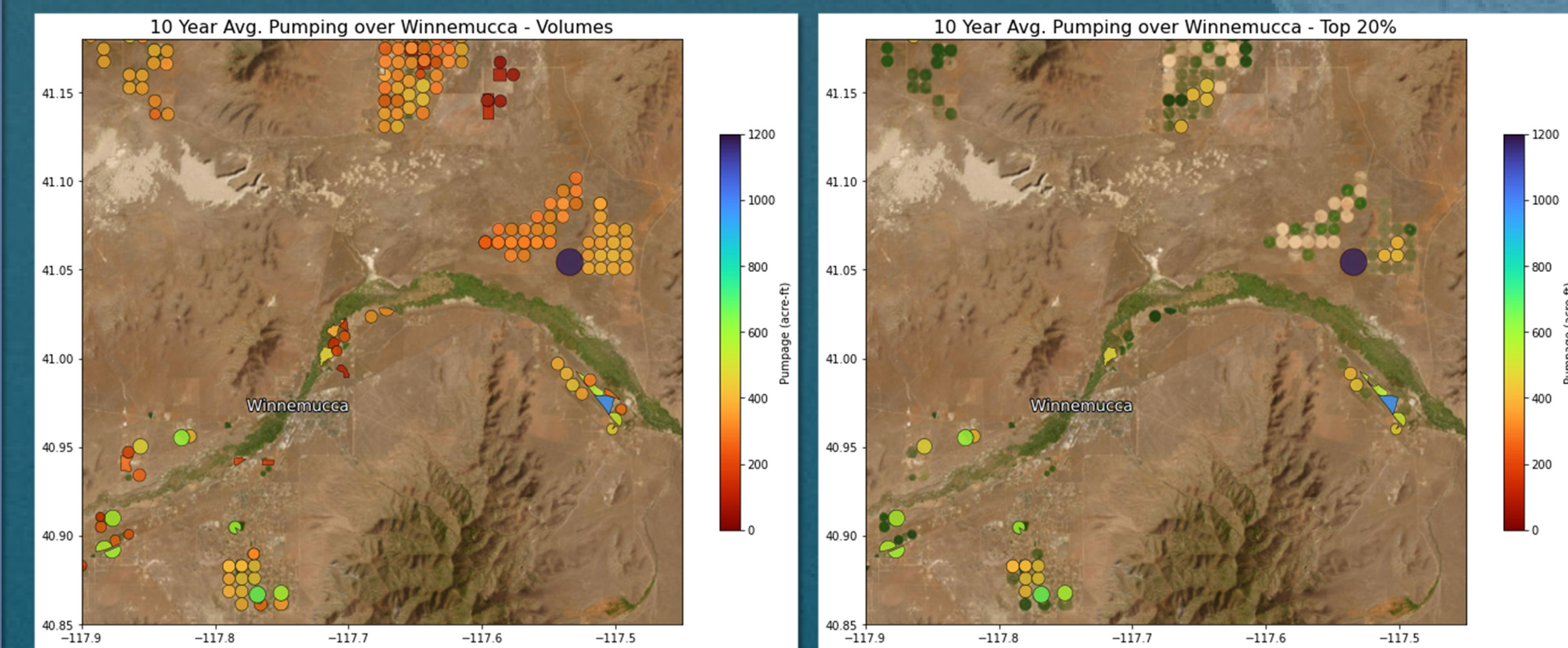
Acquired water right compared to 5 and 10 year average pumping



	Acre-Feet Per Year	Cost
Total Acquired Water Right Duty (Paper Water)	18,600	\$900/ac-ft
Total 5 Year Avg. NDWR Pumping (Wet Water)	8,800	\$1,800/ac-ft
Total 5 Year Avg. OpenET Pumping (Wet Water)	8,700	\$1,900/ac-ft
Total 10 Year Avg. OpenET Pumping (Wet Water)	8,700	\$1,900/ac-ft
Total Cost		\$16,000,000

Identifying & Maximizing Basin Benefit

Agricultural fields where historical water use has been maximized over the long-term and located in areas of conflict can be easily identified from satellite-based pumping. VWRRP purchases should aim to maximize the BBF.



Average satellite-based field pumping volumes for 2012-2023 (left), and fields with the top 20% pumping volumes (right) near Winnemucca and areas of conflict on the Humboldt River.

Conclusion

A water rights buyback program needs to be supported by science so the program can and will achieve its objectives. Almost all POUs participating in the VWRRP have used substantially less water than purchased ~47% on average. This difference needs to be identified and accounted for and is necessary for water budget accounting and meeting goals and objectives of the VWRRP. The NWI "science toolbox" and products fill large science and data gaps required for successful programs such as the VWRRP.

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