

RECHARGE FOR THE RIVER

Incentivizing Groundwater Recharge in Teton Valley, Idaho

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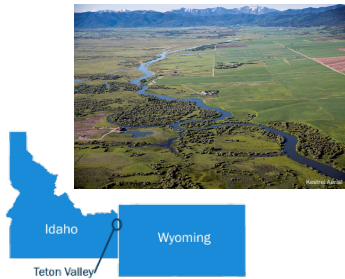
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BACKGROUND

Teton Valley

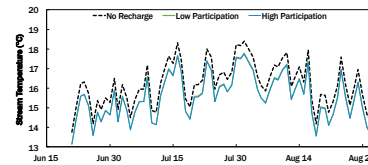
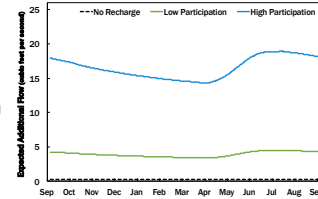
Teton Valley is a historically-agricultural community characterized by its iconic open spaces and mountain views. The Teton River is a dynamic system fed by snowmelt from the Teton and Big Hole Mountains that surround the Valley. Teton Valley is part of the Greater Yellowstone Ecosystem and is home to a number of ecologically-significant fish and wetland species. The Teton River runs through the heart of the Valley and drives the local economy by sustaining agriculture as well as supporting vibrant tourism and recreation industries.



HYDROLOGY

Using an analytical water budget, we found that incidental groundwater recharge will augment late-summer flows in the Teton River. Using a linear regression, we confirmed that these augmented flows will reduce stream temperature.

Modeling shows that augmented flows from incidental groundwater recharge occur in the late summer when they are needed most. The magnitude of additional streamflow is determined by the level of farmer participation.



Modeling shows that augmented flows reduce stream temperature. More recharge results in a greater decrease in temperature in the late summer when fish need it most.



BENEFITS

Farmers

When surface water flows are low, farmers pay for storage water to irrigate their crops. The cost to farmers of conducting incidental recharge is significantly less than the cost of having to rent storage water from a nearby reservoir.

Cost of Rented Water	
Average Price	\$6.00/acre-foot
Cost of Recharge Water	
To Cover Farmers' Costs	\$1.61/acre-foot
To Cover Farmers' Costs and Program Administration	\$3.07/acre-foot

For farmers to avoid renting storage water, recharge quantities must be much greater than what can be accomplished using canals exclusively. Recharge would need to be expanded to include flooding of marginal land. Once this threshold of augmented flows is met, farmers can reduce their irrigation costs by avoiding the rental of storage water.

Minimum Additional Streamflow Needed for Farmers to Benefit
= 58.8 cfs

Environment

7.9% of the time from 1996-2000, water temperatures exceeded the salmonid spawning threshold. Augmented flows from incidental recharge could reduce these exceedances by ½.



Increased flows can improve the fishery by supporting more and larger fish.

Value of an Improved Fishery from a 5% Increase in Angler Days¹

= \$34,400



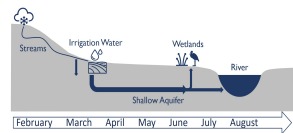
Wetland ecosystem services can be beneficial for the local hydrology, water quality, and local community.

Value of Wetland Ecosystem Services²

= \$1,800 per acre

PROBLEM STATEMENT

Increases in snowpack variability and more efficient irrigation practices have decreased late-summer streamflow in the Teton River, adversely impacting farmers who rely on surface water for irrigation as well as aquatic and wetland species that need adequate flows for critical habitat.



Increasing incidental groundwater recharge can be utilized to change the timing of when water is available in the Teton River. Beginning in April, farmers can divert water from the tributaries into their unlined canals. The water seeps into the ground, flows through the shallow aquifer, and emerges in the wetlands and the Teton River later in the summer when flows are needed most.

OUR SOLUTION

OBJECTIVES

Our goal was to implement an incidental groundwater recharge program to augment late-season flows in the Teton River and buffer against annual hydrologic variability. To do so we needed to:

1. Model hydrologic conditions and the potential impact of recharge on streamflow in the Teton River
2. Quantify economic and environmental benefits of augmented flows

ACKNOWLEDGEMENTS

We would like to extend our deepest thanks to our project partners at LegacyWorks Group, especially Max Ludington. Without his support and guidance, our project would not have been possible. Additionally, we would like to thank our faculty advisor, Dr. Gary Libecap, our PhD advisor, Sam Collie, and our external advisors, Dr. Bruce Aylward and Dr. Rob Van Kirk. We especially appreciate Dr. Van Kirk granting us invaluable access to his Teton Valley Groundwater-Surface Water Model. Finally, we would like to express our gratitude to Amy Verbeten and Friends of the Teton River, as well as all of the wonderful people we met in Teton Valley.

¹ Idaho Department of Fish & Game, (2008). IDFG 2003 Economic Survey Report. Boise, Idaho: IDFG.
² ECONorthwest, (2006). The Economic Value of Water in Wyoming's Green River Basin. Eugene, Oregon: ECONorthwest.

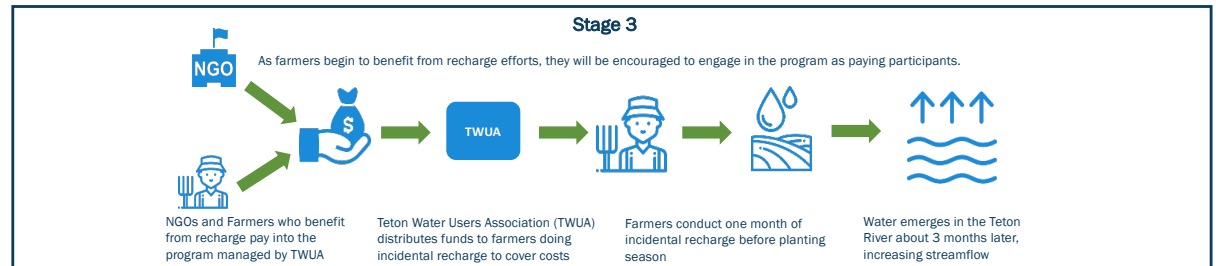
Stage 1

- Two-year pilot project with two irrigation companies
 - Participating farmers reimbursed for the direct costs of conducting incidental groundwater recharge in their canals.
- Stage 1 will demonstrate how much water can be diverted for recharge, as well as the ease and cost of recharging.

Stage 2

- Partnerships with environmental non-governmental organizations (NGOs) whose missions align with the goal of increasing Teton River streamflow
 - NGO funding will be used to continue covering farmers' cost of recharge and expand recharge areas to include flooding of marginal lands and fields
- Stage 2 will determine how much financial benefit farmers will gain from increased flows in the Teton River.

Stage 3



WHY OUR PROJECT MATTERS

Farmers, the local economy, wildlife species, and habitat all stand to benefit from the implementation of an incidental groundwater recharge program in Teton Valley. This innovative solution allows us to work with the natural system to make water available when it is needed most without having to increase water supply through other, more expensive, means. This model demonstrates great promise in meeting economic and environmental needs simultaneously and could be replicated elsewhere in the arid West to increase late-summer streamflow.