The Water Report

Water Rights, Water Quality & Water Solutions in the West

In This Issue

Upcoming Stories

Aging Infrastructure

Utah Water Markets

Special Interview

& More!

FLOOD CONTROL BENEFITS AND INCENTIVIZED MANAGED AQUIFER RECHARGE — A POWERFUL COMBINATION

by David R. Tuthill, Jr. and Ronald D. Carlson,
Recharge Development Corporation (Boise, ID)

Introduction

This year has provided a powerful reminder for many basins in the Western United States that Mother Nature can switch from times of drought to times of plenty very quickly.

Advanced runoff forecasting can allow for orderly **i**ncentivized **m**anaged **a**quifer **r**echarge (IMAR) of early season flows in aquifers with existing canals and pre-arranged basins — as well as fields prior to canals carrying full irrigation flows. This management can reduce flooding event peaks.

On one hand, not all flooding can be predicted and managed in advance. On the other hand, proper management can provide some flood mitigation while improving aquifer levels as a symbiotic combination.

This article explores opportunities for implementing such combinations in one Idaho basin. Similar opportunities exist elsewhere.

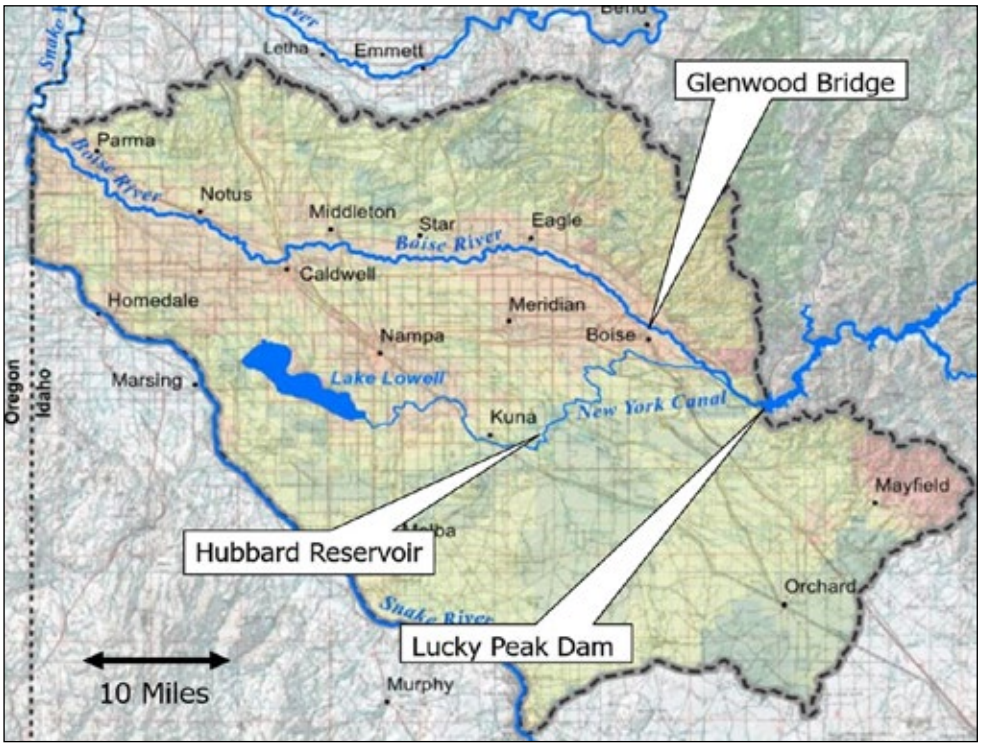

Figure 1. Boise River Basin in Southwest Idaho

The Water Report
(ISSN 1946-116X)
is published monthly by
Sky Island Insights LLC

Editors
Shaina Shay,
David Light,
David Moon

Phone
602/ 456-2127

Email
Info@TheWaterReport.com

Website
www.TheWaterReport.com

Subscription Rates
$299 per year
Multiple & Electronic
Subscription Rates
Available

Postmaster
Please send address
corrections to
The Water Report
3615 W. Hills of Gold Dr.
Tucson, AZ 85745

IMAR

Floodplain

The Problem of Too Much Water

The Boise River Basin is an example of a basin that has too much water sometimes, as well as areas of declining aquifers.

"We are one rain storm away from a major flood on the Boise River" were the worried words of Bill Clayton, long-time Board Chair of Flood Control District 10 on the Boise River, in May, 2011.

How could this be? After the flood of 1943, Idaho had sought and obtained Congressional funding for a new flood control reservoir to prevent major flooding in the Treasure Valley (the Boise River Basin downstream from Lucky Peak Dam) from Boise to Garden City to Eagle and beyond. As vividly portrayed in Susan Stacy's book "When the River Rises" (1993), the flooding issues in the Boise River were thought to be solved by the construction of Lucky Peak Reservoir (*see* References, below). When it was dedicated in 1955 a Corps official said the dam made the Boise one of the "most nearly perfect flood-controlled rivers in the country."

Since then, flooding has threatened the Treasure Valley periodically. Flood Control District Project Manager Mike Dimmick reports that some minor flooding now occurs at flows starting at 4,500 **c**ubic **f**eet per **s**econd (cfs) at the Glenwood Bridge even though the 100-year flood flow is estimated to be 16,600 cfs.

Figure 2. Flood Control District 10 Project Manager surveying flooding in low-lying areas in the spring of 2017.

Over time, the likelihood of flood damages has worsened. As depicted in Figure 3, construction in the floodway through the years has been so extensive that the City of Garden City is now mostly within the 100-year floodplain as mapped by the Federal Emergency Management Agency.

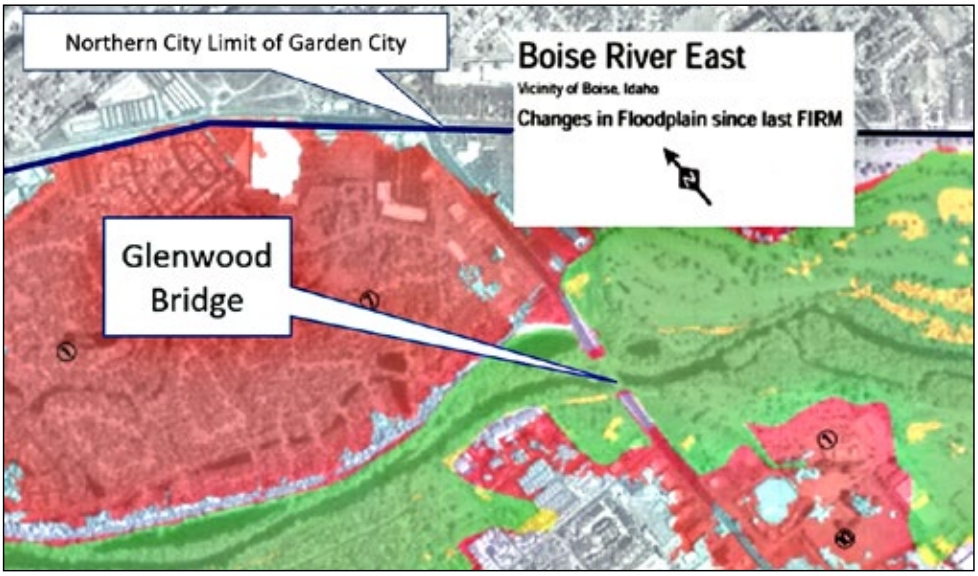

Figure 3. Portion of a Boise River Floodplain Map, 2003 in green, 2012 in green plus red.

IMAR

Historic Flows

As shown in the hydrograph in Figure 4, the flows at Glenwood Bridge exceeded 4,500 cfs during 22 years between 1982 and 2022. Springtime flows in the Boise River downstream from Glenwood Bridge are partially diverted for irrigation, totaling about 1,500 cfs. However, during a high water influx these flows are tributary to the Snake River. During the spring months of wet water years, the many hydropower plants downstream on the Snake River (thence through the Columbia River) are also supplied by high flows from other tributaries — so additional hydropower generation from Boise River water would be minimal while benefits from aquifer recharge are significant.

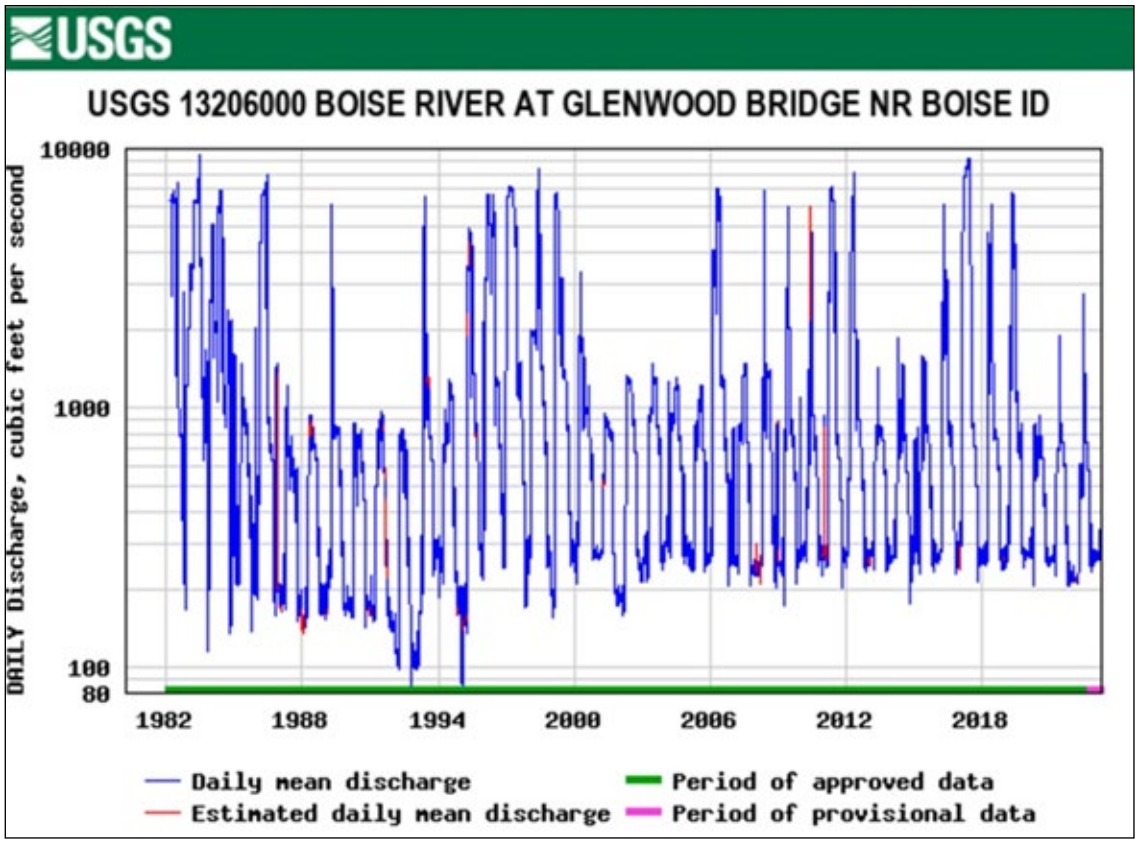

Figure 4. Hydrograph of the Boise River at Glenwood Bridge, 1982 – 2022.

The Problem of Not Enough Water

Increasing Demands

Increasing Water Requirements

The population in the Treasure Valley is rapidly growing. A study prepared by SPF Water Engineering for the Idaho Water Resource Board and the Idaho Department of Water Resources in 2016 found the net demand for domestic, commercial, municipal, and industrial needs in the valley is predicted to increase by amounts ranging from 109,000 to 188,000 acre-feet per year by 2065. Seeking to address groundwater availability concerns, the Idaho Water Resource Board commissioned a study completed in 2020 by Brown and Caldwell entitled "Treasure Valley Managed Recharge Study" (*see* References). This study provides a comprehensive overview of **m**anaged **a**quifer **r**echarge (MAR) options throughout the basin. While additional water supplies can be made available, costs are high in many cases.

Declining Groundwater

Lowering Water Levels

In recent years, water levels in portions of the Boise River basin have declined, causing the need to redrill many domestic wells. In 2022 Ada County, which covers most of the eastern portion of the basin, commissioned a groundwater study to determine causes of water level declines in parts of the basin. This study is anticipated to be completed later this year by HDR. Early findings indicate part of the problem is the conversion from flood irrigation to supplying water for subdivisions as the area urbanizes. As an example, Figure 5 depicts the lowering water table of a well in southern Ada County.

IMAR

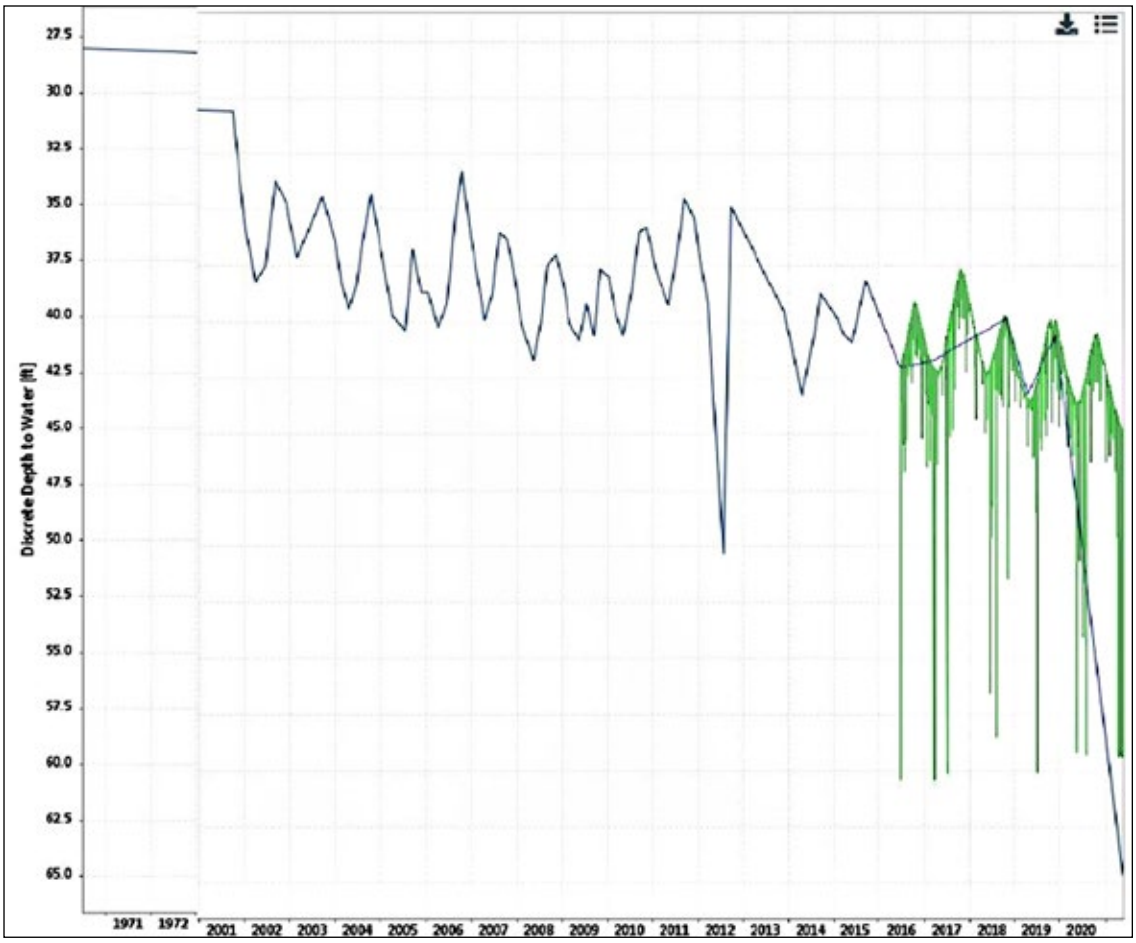

Figure 5. Hydrograph of depths to water for a well in southern Ada County, T3N R1E S15, B.M. CBD1

Conjunctive Management

Conjunctive Administration of Surface Water and Groundwater

Idaho has been steadily moving toward conjunctive administration of surface water and groundwater now that most of the water rights for groundwater use have been adjudicated via the Snake River Basin Adjudication (*see* Rigby, *TWR* #18; Wildman, *TWR* #68; Wolfley, *TWR* #191). Beginning in 2002, water districts were created in aquifers connected to the Snake River in Eastern Idaho for the purpose of conjunctive administration. Administration has been implemented in eastern Idaho and has been initially implemented in the Wood River Basin in south-central Idaho.

Administration by Priority

The groundwater rights in the Treasure Valley have also been adjudicated but conjunctive administration has not yet been initiated in the basin. According to recently retired Watermaster Rex Barrie in a 2022 interview, the year 2022 was potentially the first year of conjunctive administration in the basin, but the need for this step was averted by a wet spring. Given the experience elsewhere in Idaho, the onset of a drought lasting two or more years will likely trigger a conjunctive administration call in the Treasure Valley. This could require wells which impact flows in the river to be administered on a priority basis according to the senior water rights in the river. The junior priority well owners would be given two choices: (1) curtail water use; or (2) mitigate impacts. Mitigation in the Snake River system has often consisted of acquisition of storage water to provide to the senior surface water rights. During dry periods, however, such water is not typically available in the Boise River basin. This results in a need for other types of mitigation as discussed below.

Solutions to the Problems of Too Much and Not Enough

Seasonal Changes

Flood Control

A Flood Risk Study conducted by the US Bureau of Reclamation for the Boise River in 2008 demonstrated an increased risk of winter and early spring flooding due to climate change. The study found that with climate change the entire hydrograph shifts, so that: (1) peak flows will occur several weeks earlier; and (2) the hydrograph will begin receding earlier. It concluded the existing rules are triggered too late to evacuate the reservoirs, reach maximum drawdown, and begin filling. It also found

Delayed Triggers

IMAR

Management Challenges

that early peak inflows due to climate change will make it more difficult to manage river flows through Boise prior to April 1 (the date for maximum space evacuation). Finally, the study found that existing winter space requirements for November through December were not aggressive enough to prepare for the increased volume of water arriving from January through March.

Here is a description of the challenges from the study:

Balancing flood control with refill will be more challenging with climate change. Good volume forecasts and a knowledge of early peaking may produce reliable refill under the climate change. But runoff due to precipitation is more difficult to predict than that produced by snow accumulation and melt, so volume forecasts are likely to be less reliable. Currently reservoir drawdown begins about the time forecasts are prepared on January 1 when approximately 40% of snow has accumulated. Operators may not be able to justify halting December fill operations when not much snow has accumulated and future precipitation is uncertain. To prepare to manage Boise system reservoirs under climate change, Reclamation will need to:

- revise forecast methods
- adjust rule curves to reflect the observed trends towards earlier runoff
- increase winter space requirements
- start earlier drawdown

Updating Models

The increasing awareness of flood risks on the Boise River led to a joint effort to help anticipate and manage future flood events. During the summer of 2019, Flood Control District 10 reached out to the US Army Corps of Engineers (Army Corps), requesting a river model that could be used to predict flood events. A team of Army Corps engineers constructed a two-dimensional model which has since been calibrated and provided to Flood District 10 for modeling and predictive uses. A large group of participants funded ongoing efforts to develop the Boise River Management Tool (BRMT) which has been instrumental in designing river modifications to reduce flooding. The BRMT can evaluate benefits from flow reduction rates on the Boise River. What it does not consider is the cumulative volume of water released throughout a flood event.

Managed Aquifer Recharge

Increasing Use of Managed Aquifer Recharge Throughout the Western United States and the World

Managed **a**quifer **r**echarge (MAR) is surging throughout the world. As summarized in an excellent article in *The Water Report* by Dr. Sharon Megdal (*see TWR* #220), intentional recharge of water in aquifers is an increasing focus in many communities. This fact is emphasized in the 2022 publication of the International Association of Hydrogeologists entitled *"Managed Aquifer Recharge Overview and Governance"* by Peter Dillon, et. al. (*see* References). The International Symposium of Managed Aquifer Recharge held in Long Beach, CA, in May, 2022, revealed that while most of the MAR in the world is conducted by municipalities and other forms of government, little is conducted by the private sector. Even in Arizona, where the State of Arizona has established some powerful regulatory areas for the management of aquifer recharge, these areas are not formed for all aquifers in the state. Hence there is a remaining need for both public and private MAR.

MAR Success

State of Idaho MAR Recharge Program

The Idaho Water Resource Board (IWRB) has conducted an extremely successful MAR program for many years under the supervision of Wesley Hipke. As of March 31, 2023 the total reported MAR in the Eastern Snake Plain Aquifer under this program was 2,113,000 acre-feet since 2014. This program provides recharge for the general aquifer, with no credit going to an individual water user. The IWRB has expressed a desire to continue this MAR program in other basins within Idaho, including the Treasure Valley. *See* Idaho Department of Water Resources website at https://idwr.idaho.gov/water-rights/aquifer-recharge-districts/.

Private Sector Incentives

Incentivized Managed Aquifer Recharge (IMAR)

Since 2008, private recharge has been conducted side by side with the State of Idaho program in eastern Idaho. This private recharge has been termed **i**ncentivized **m**anaged **a**quifer **r**echarge (IMAR) to designate the private incentive to conduct and receive credit for this recharge. IMAR was developed by Recharge Development Corporation (RDC® — rechargedevelopment.com). IMAR has been described previously in *The Water Repor*t (*see* Tuthill & Carlson, *TWR* #176). That article describes the establishment of a local non-profit — akin to a canal company — that arranges for and measures groundwater recharge into **a**quifer **r**echarge **u**nits (ARUs™). The non-profit tracks delivery of this water to shareholders holding the ARUs, much like delivery of water to shareholders in a canal company. One ARU is equivalent to one acre-foot of space in the aquifer, as shown in Figure 6.

ARU Solution ™

IMAR

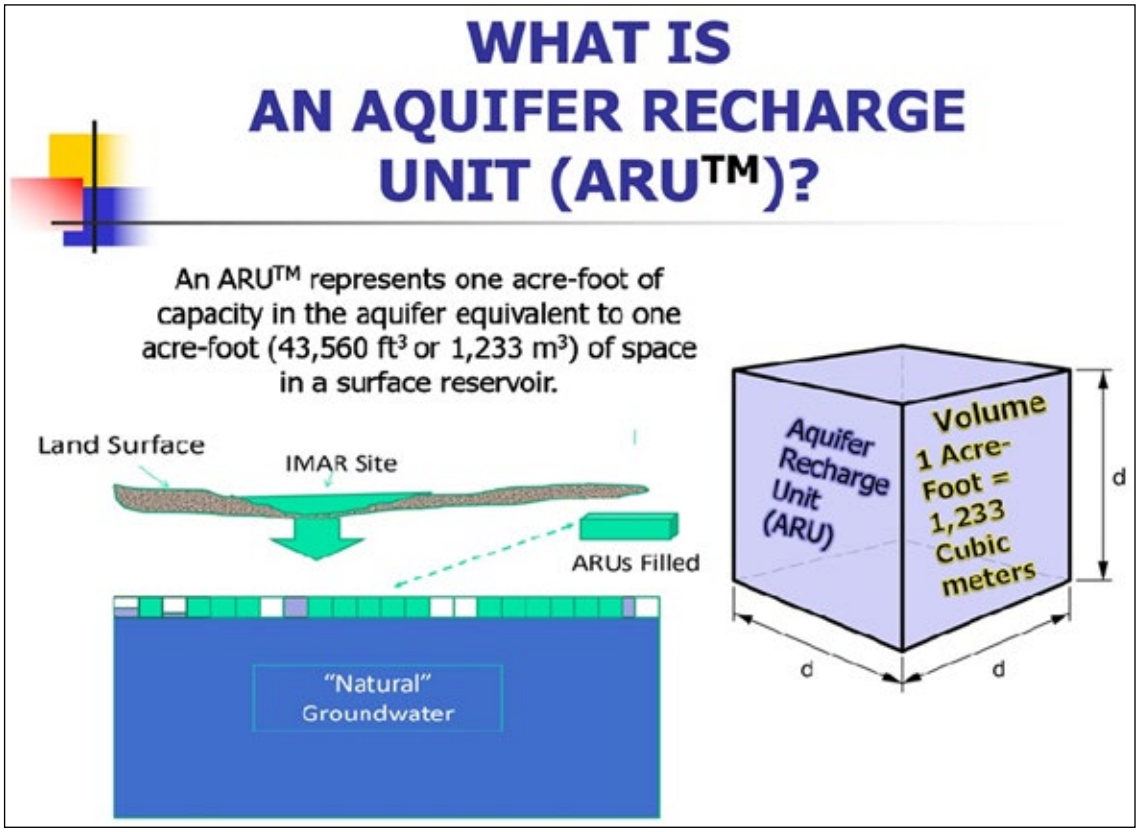

Figure 6. Aquifer Recharge Unit (ARU).

Diversions to recharge are made in accordance with State of Idaho water rights, as are extractions from the aquifer with wells, which require both water rights and state approved mitigation plans. Implementation of this process is termed "The ARU Solution™".

Non-Profit Management

The local non-profit organization created in eastern Idaho for this purpose is the Eastern Snake Plain Aquifer Recharge, Inc. (ESPAR). It has been successfully operating since 2018 with an Executive Director, Keith Esplin, who manages an annual stakeholder meeting, tracks all IMAR and deliveries from ARUs, and builds additional recharge projects each year for the benefit of the shareholders with a trust fund created by the purchase of ARUs.

Where Can Floodwaters be Placed?

Stormwater Retention

Rivers in California have been flooding this year in epic proportions. This has given rise to an extension of the concepts on where floodwaters can be placed. A January, 2023 article by Matt Simon entitled *"How Sensor-Dangling Helicopters Can Help Beat the Water Crisis"* explains how sensors are being used to find optimal areas for MAR. A March article by Amy Taxin entitled *"California Farmers Flood Fields to Boost Groundwater Basin"* describes the practice of flooding fields to enhance aquifer storage (*see* References).

An example of a project presently being constructed by ESPAR is the "ESPAR and Madison County Flood Diversion Project." In 2022 ESPAR applied for and received an Idaho Water Resource Board grant of $47,300 to add to the ESPAR contribution of $52,300, to construct a lateral to convey water from the Wilford Canal to a gravel pit during times of high water for a maximum flow of 50 cfs. As depicted in Figure 7 the project is located near the Teton River, but the gravel pit is dry because the river is not connected to the aquifer in this reach. This project is nearing completion and is anticipated to be ready to accept high flows in the spring of 2023.

IMAR

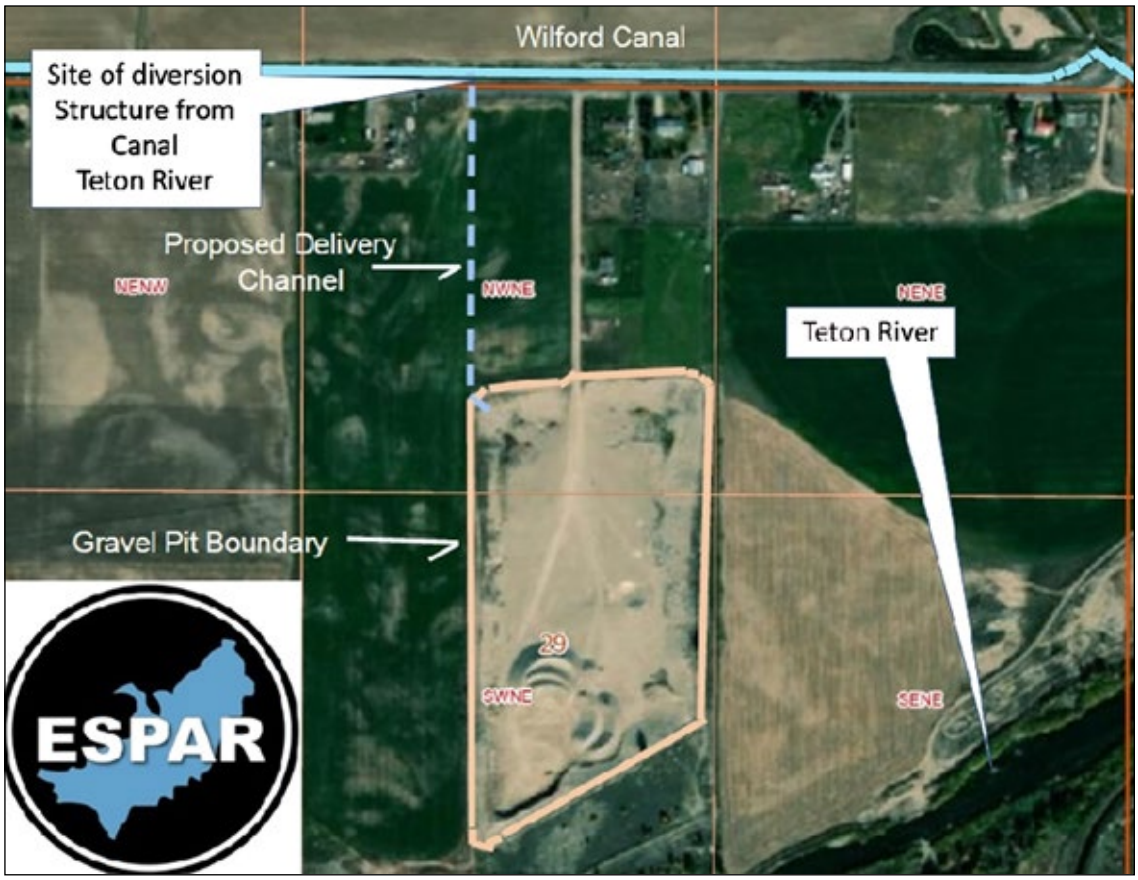

Figure 7. ESPAR and Madison County Project

Roles for State MAR and IMAR

Thus far in the Eastern Snake Plain Aquifer, State MAR efforts and IMAR conducted by ESPAR have been conducted simultaneously. There is ample need for both. The State effort helps to raise the aquifer level for all. The IMAR effort provides mitigation credits for those who need to divert water in addition to their normal allocations. This side-by-side effort will likely continue in other basins including the Treasure Valley.

Projects Combining Flood Control Benefits and IMAR

Storage Reservoirs

Lucky Peak Reservoir

As described previously, Lucky Peak Reservoir was constructed in 1955 by the Army Corps to serve primarily as a flood control reservoir to prevent another disaster akin to the 1943 flood. As is their custom, the Army Corps did not apply for a storage water right for the reservoir — it was constructed for flood control purposes only.

But the Treasure Valley is filled with wonderful farmland — limited only by reliable water supplies. Lucky Peak Reservoir offered a very attractive addition to the existing upstream storage reservoirs, Arrowrock and Anderson Ranch, augmented with the downstream re-regulating reservoir at Lake Lowell. Years after Lucky Peak Dam was constructed the Bureau of Reclamation (Reclamation) filed with the State of Idaho to secure a water right for the project. Reclamation ultimately was awarded a decreed water right in the Snake River Basin Adjudication, Water Right No. 63-3618 with a date of priority of April 12, 1963, in the following amounts:

Reclamation Rights

PURPOSE OF USE	PERIOD OF USE	QUANTITY
Irrigation Storage	1-1 to 12-31	111,950 acre-feet
Irrigation from Storage	3-1 to 11-15	111,950 acre-feet
Recreation Storage	1-1 to 12-31	28,800 acre-feet
Streamflow Maintenance Storage	1-1 to 12-31	152,300 acre-feet
Streamflow Maintenance from Storage	1-1 to 12-31	152,300 acre-feet
Total Capacity		**293,050 acre-feet**

IMAR

Streamflow Maintenance

Water for "Streamflow Maintenance" is used to maintain flows in the Boise River during the winter months for fishery and recreational purposes. Note that the water rights identify more water for this purpose than for irrigation purposes. The tendency is to fill Lucky Peak Reservoir for these purposes if possible, sometimes leaving little space for flood flows if unexpected flows arrive at the reservoir due to late season storms or early hot weather.

Flood Potential

Integration of Flood Reduction and IMAR

One reason the flows in the Boise River are high during half of the years is that during wet spring years the irrigation canals that divert water from the Boise River from Lucky Peak Dam to Middleton — the reach of highest flood damage potential — normally do not open until around the first of April. Until that date there is minimal irrigation demand and hence nowhere to place the water. Reviewing annual hydrographs when high flows have been sent down the river, as one example, in that year the flows at Glenwood Bridge were as depicted in Figure 8.

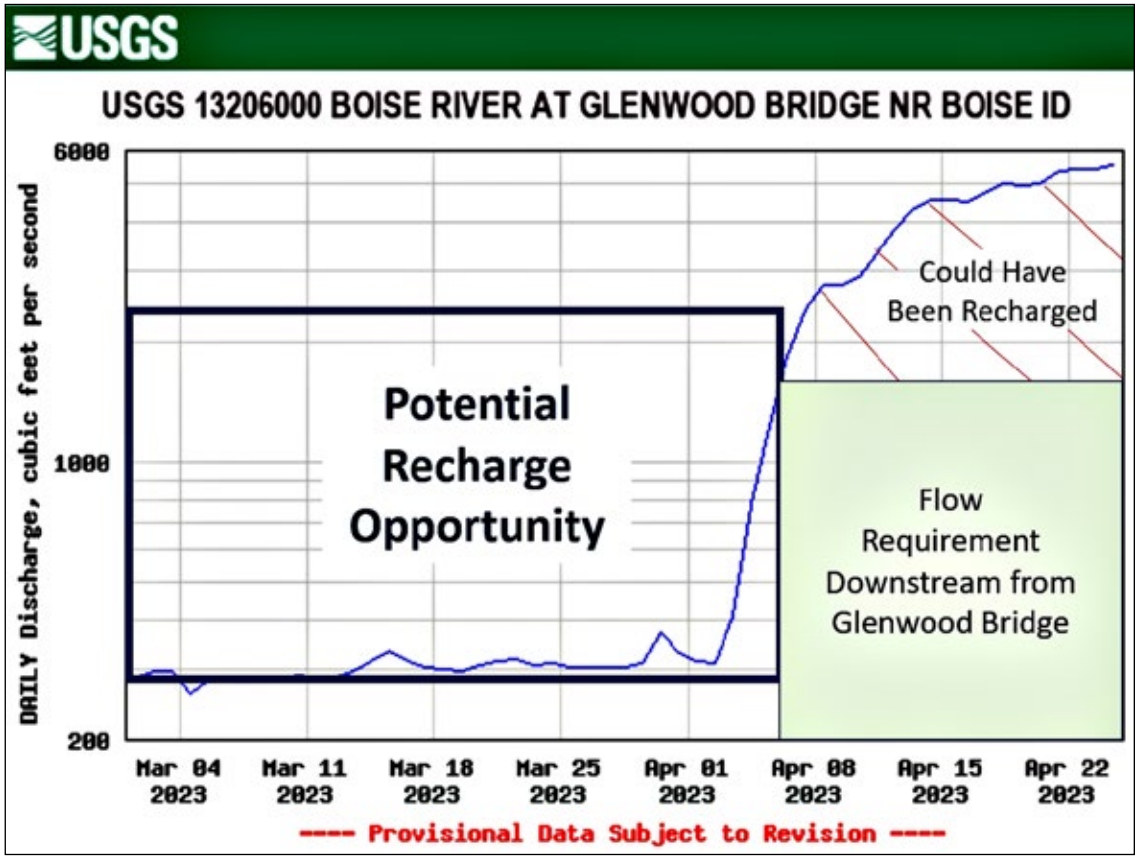

Figure 8. Hydrograph of the Boise River at Glenwood Bridge, 2023, with Potential Recharge Opportunity Outlined. Note that the vertical axis is logarithmic. Hence the volume that could have been recharged is much larger than it first appears.

IMAR Strategy

Thus, during those years when it appears the snowpack is ample, which is roughly half the years, it might be desirable to conduct IMAR during late February, early March, and potentially early April when the canals would otherwise be empty or not filled to capacity.

According to Boise River Watermaster Mike Meyers, the canals that divert from the Boise River between Lucky Peak Dam and Middleton — the primary areas impacted by flood flows — hold about 4,300 cfs during peak diversions. For example, if a concerted effort to find locations for IMAR could enable diversion of half this amount during the period from late February through early April on an above-average snowpack year — leaving about 200 cfs as a normal winter instream flow — then the recharge potential during this period would be: 2,000 cfs times 35 days times 1.98 acre-feet per cfs-day which equals approximately 140,000 acre-feet of storage. That hypothetical situation could improve aquifer storage while making a flood control hole in Lucky Peak Reservoir. The initial assessment in discussions with the Army Corps is that this magnitude of additional flood storage capacity would make a difference and could significantly reduce flooding during some years.

Improved Storage

IMAR

Ready to Test

Applied to Figure 8, if the canals between Lucky Peak and Middleton carried 2,000 cfs to recharge sites this year during the period from March 1st until April 4th — the day when irrigation deliveries began — then an additional hole of 140,000 acre-feet could have been created. We have known for many weeks that the Boise River Basin snow water equivalent in the basin is much above average. As of April 21, 2023 the basin is at 151% of normal, as depicted in Figure 9. It appears that this year would have provided an ideal opportunity to recharge depleted aquifers, but we anticipate increasing opportunities in future years based on studies already cited in this paper.

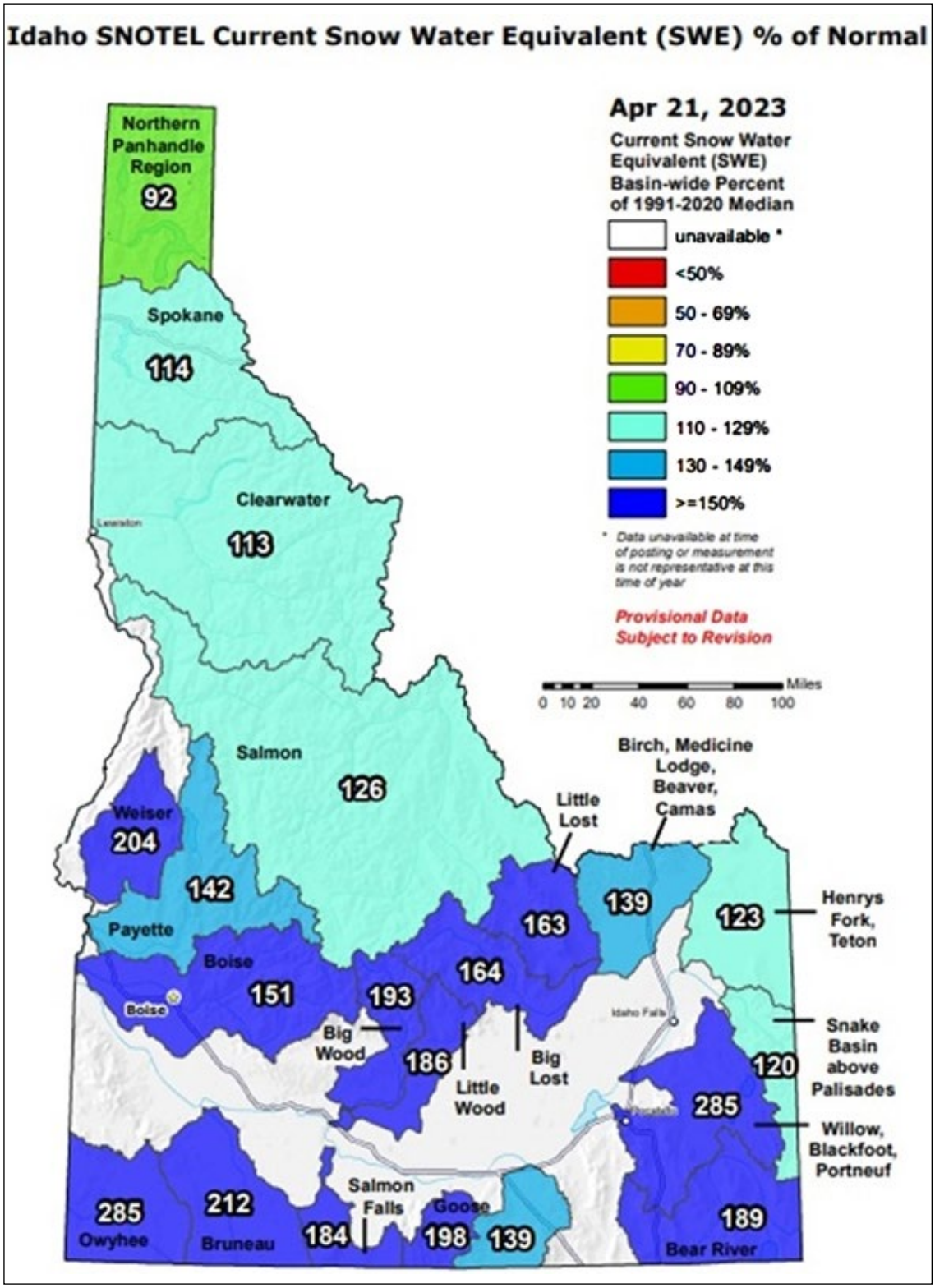

Figure 9. USDANRCS Snotel Map for Idaho as of April 21, 2023.

IMAR

Mitigating Flood Risks

Implementation of forecasting to enable IMAR is a tool that could be considered by some municipalities along the Boise River — such as the City of Garden City — that are presently studying ways to mitigate flooding risks. Some concerns will be raised that reduction of flood flows might disrupt healthy geomorphologic changes. However, any such geomorphologic benefits would be at the cost of increased flooding through existing municipalities. Also, we anticipate times of very high flows when banking in the aquifers will have little impact on the opportunity to prevent flooding, allowing for any desirable geomorphologic changes.

Water Spreading

Hubbard Reservoir

Many potential water spreading areas — including gravel pits and low value land — are located all around the Treasure Valley. One initial example is Hubbard Reservoir, located next to the New York Canal in Southern Ada County (*see* Figure 1). Hubbard Dam was constructed in 1902 with private funding with the intent to use it as a regulating reservoir for irrigation in the Treasure Valley. Water was brought to the reservoir in 1909 when the New York Canal was extended to that location. However, the reservoir was soon abandoned as it did not hold water as hoped.

Fast forward to 2023: Hubbard Reservoir appears to be an ideal location for an IMAR site. While the community has been built around the reservoir, most of the land flooded by the reservoir is now owned by the State of Idaho and leased to Ada County for recreational purposes — as seen in Figure 10. The reservoir is located near areas where the water table has been declining, and the New York Canal still maintains headgates that allow flow into the reservoir. The year 2023 is a prime time for studying this proposition. Initially, the prospects for IMAR at this site appear favorable to serve as a location for placement of water during periods of flooding during the irrigation season, and also possibly as a location to place water prior to the irrigation season.

Figure 10. Hubbard Reservoir in the Treasure Valley.

Future Opportunities

Boise River Basin — Joint Study Including Stakeholders

Funding

As described earlier in this article, beginning in 2019 interested parties worked together to provide funding for the Boise River Management Tool (BRMT). Ultimately, thirteen funding entities contributed $799,496 to construct and implement the tool.

In like manner, discussions have been initiated among interested parties to conduct a similar process for analyzing opportunities for Flood Control Benefits and IMAR. The Idaho Water Resource Board has announced a funding opportunity with a June 2023 deadline. This is a target for efforts to identify stake-

IMAR

holders and seek matching funds from this opportunity. In addition, discussions thus far have included the University of Idaho and Boise State University, entities that were not involved in the BRMT creation.

Program Components

To date, the proposal envisions the following components:

- Prepare a decision support tool of when Hubbard Reservoir could be used for IMAR
- Determine the likely extent of ability to conduct IMAR in Hubbard Reservoir including:
  - Flow rate limitations
  - Flood water season
  - Recharge of storage water
- Use the USGS/IDWR MODFLOW to forecast impacts of recharge including where the water goes
- The extent and location of aquifer storage and reduced depths to water
- The extent and location of increased flow in drains
  - Review the Army Corps Flood Control Curves to see if additional early season space in Lucky Peak might be possible

Potential participants in this effort are outlined in Figure 11.

Stakeholders

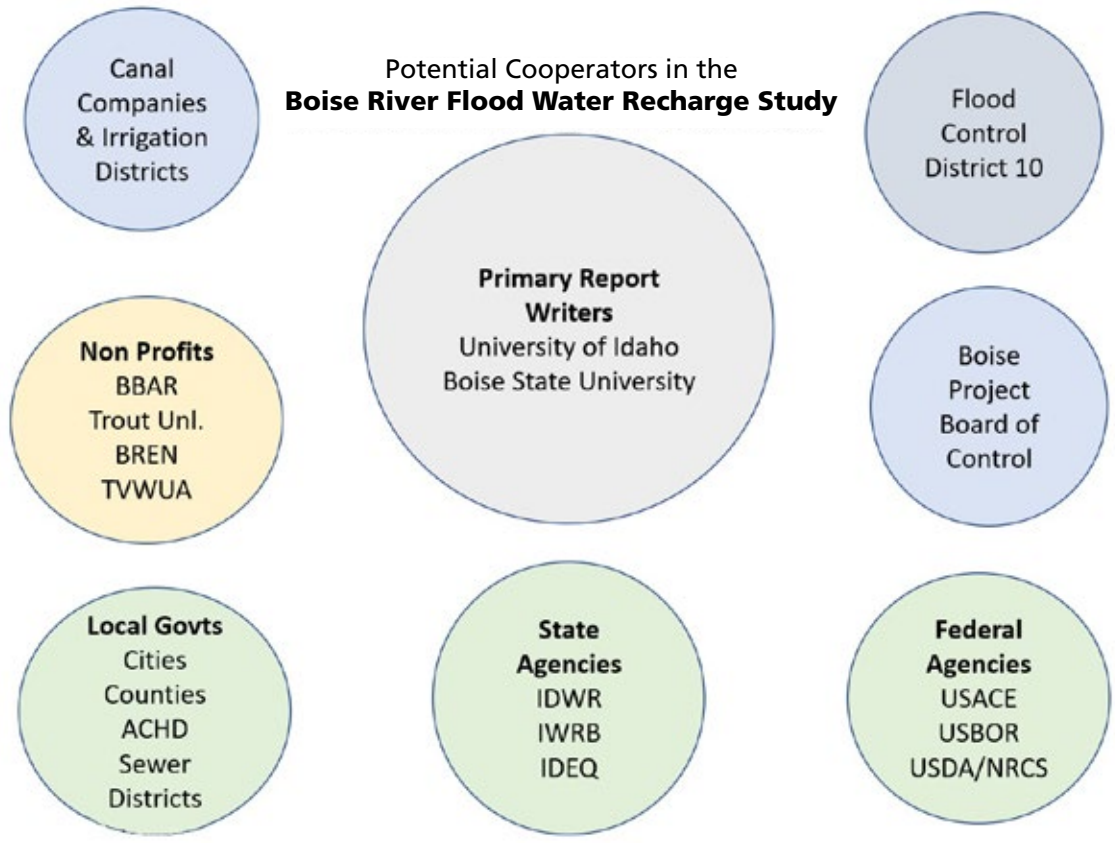

Figure 11. Potential Cooperators in the Boise River Flood Water Recharge Study

Goals

The agencies and organizations identified in Figure 11 have been participating in good faith to initiate this planning effort. In addition, Reclamation recently (2023) received a boost from national headquarters with the adoption of a directive entitled "Climate Change Adaptation Strategy" (*see* References). Of the four goals cited, goals one and two are particularly relevant to this effort:

Goal 1: Increase Water Management Flexibility

Goal 2: Enhance Climate Adaptation Planning

The outcome of pursuing both of these goals is anticipated to encourage flood flow reduction via the banking of water that otherwise would be sent downstream with little benefit to the aquifers.

Other Basins

The Recharge Development Corporation (RDC) created The ARU Solution™ with the intent of applying the techniques to many basins throughout the western United States and wherever in the world credit for recharged water is needed by water users. RDC envisions creating the next local non-profit in the Wood River Basin in Idaho, and is now considering other basins in the northwest as portrayed in Figure 12.

IMAR

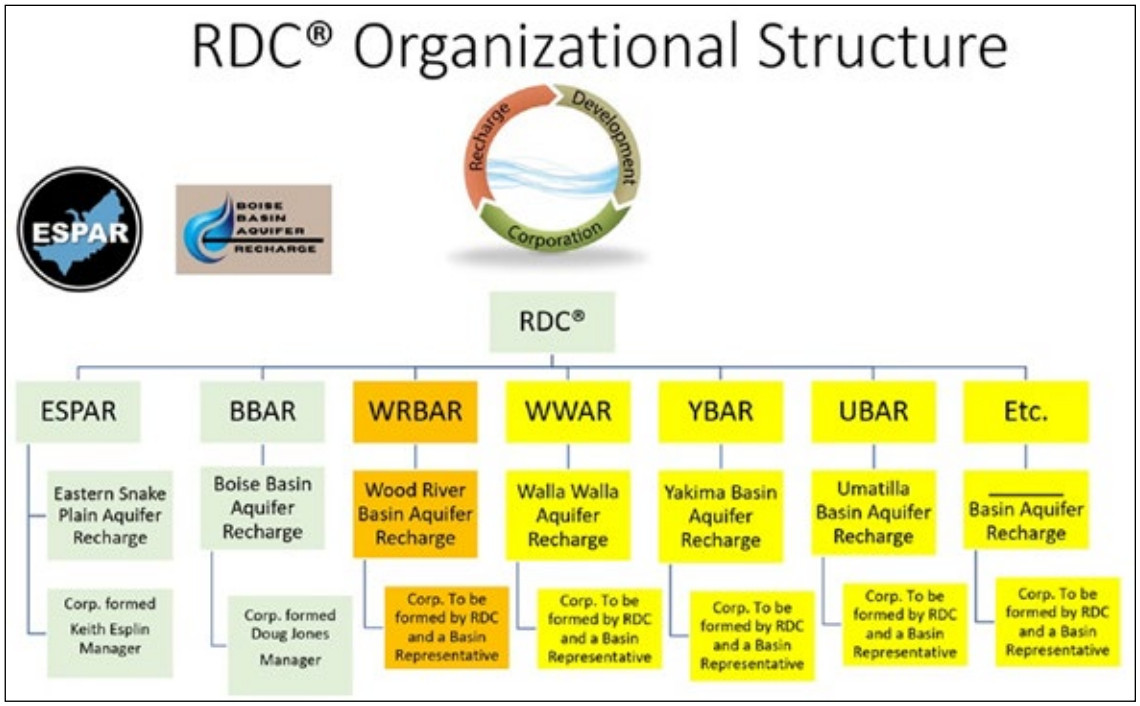

Figure 12. Opportunities to create additional non-profit local organizations.

Public/Private Partnerships

The techniques that have been applied in the Eastern Snake Plain Aquifer Recharge are successful because public private partnerships work. Private ownership of shares in local non-profits that use The ARU Solution™ services provide private incentive for investment in sustainable water supplies. Government is vital, but for long-term success, public private partnerships provide a strong incentive for success in optimizing the use of water resources.

The authors wish to thank Phil Rassier for editing this article, and the members of Recharge Development Corporation, Eastern Snake Plain Aquifer Recharge, Inc., Boise Basin Aquifer Recharge, Inc. and Flood Control District 10 for their contributions to the concepts herein.

For Additional Information:

Dave Tuthill, Recharge Development Corporation, 208/ 870-0345 or dave@idahowaterengineering.com

Dave Tuthill has worked in the field of water resources throughout his career. He earned a B.S. in Agricultural Engineering from Colorado State University, an M.S. in Civil Engineering from the University of Colorado, and a Ph.D. in Civil Engineering from the University of Idaho. He worked for 33 years at the Idaho Department of Water Resources, serving as Director the last two years. In 2009, he founded Idaho Water Engineering, and is a founding member and Vice President of Recharge Development Corporation.

Ron Carlson started his work in the field of water resources as a farmer and surface water irrigator. It was from this vantage point that he commenced a 45-year career in the field of water resource administration and water management. He earned a B.S. and M.S. in Agricultural Engineering from the University of Idaho. He was licensed in the State of Idaho as a professional engineer and land surveyor in 1975. He served as the Watermaster of the Snake River in Idaho for 29 years and while in that capacity implemented automated data gathering and computerized accounting for the water district he was elected to serve. While Watermaster he managed basinwide recharge programs as proof of concept efforts and was successful in establishing the Water Bank and Rental Pool structures in Snake River Water District 1. He also was instrumental in getting the aquifer recognized as a reservoir when the Teton Dam failed in 1976. He is a founding member and Treasurer of Recharge Development Corporation.

IMAR

Reference List

Amali, Said (2009) *"Aquifer Recharge and Recovery: Assessing Potential in the Umatilla Basin" TWR* #60: Feb. 15, 2009.

Brown and Caldwell, 2020, *"Treasure Valley Managed Recharge Feasibility Study"* available from the Idaho Water Resource Board website at: https://idwr.idaho.gov/iwrb/projects/treasure-valley/

Burchenal, Campbell, Hedley, Honn, Reeder and Libecap (2018) "Augmenting Summer Streamflow: Innovative Approach in the Teton River, Idaho" *TWR* #173: July 15, 2018.

Carlson, Ronald D. and D. Tuthill (2018) "Managing Aquifers for Storage" *TWR* #177: Nov. 15, 2018.

Contor, Brice, et al. (2011) *"Managed Aquifer Recharge in the Treasure Valley: A Component of a Comprehensive Management Plan and a Response to Climate Change"* IWRRI Technical Completion Report 201102. IDWR website.

Dillon, Peter, et.al. (2022) *"Managed Aquifer Recharge: Overview and Governance"* International Association of Hydrogeologists, https://recharge.iah.org

McJunkin, Christa and Gila River Water Storage LLC (2014) *"Gila Water Storage: Innovative Banking Creates Long-Term Storage Credits" TWR* #130: Dec. 15, 2014.

Megdal, Sharon B. *"Managed Aquifer Recharge" TWR* #220: June 15, 2022.

Meyer, Christopher C. (2015) *"Mitigation of Injury to Water Rights: Law & Strategies in Idaho" TWR* #142: Dec. 15, 2015.

Mortimer, Evan (2014) *"Managed Aquifer Recharge: An Overview of Laws Affecting Aquifer Recharge in Several Western States" TWR* #127: Sept. 15, 2014.

Mortimer, Evan and D. Tuthill (2014) *"Managed Aquifer Recharge - Part II: Legal Issues in the Western US" TWR* #129: Nov. 15, 2014.

Scott, Peter G. *"Aquifer Recharge and Storage: Ongoing Implementation Concerns" TWR* #54: August 15, 2008)

Simon, Matt, *"How Sensor-Dangling Helicopters Can Help Beat the Water Crisis"*, Science, January 27, 2023, wired.com.

SPF Water Engineering, 2016, *"Treasure Valley DCMI Water-Demand Projections (2015-2065)"* available from the Idaho Water Resource Board website.

Stacy, Susan M. *"When the River Rises: Flood Control on the Boise River, 1943-1985"* Boise State University, 1993.

Steimke, A, B. Han, J. Brandt and A. Flores (2018) *"Climate Change and Curtailment: Evaluating Water Management Practices in the Context of Changing Runoff Regimes in a Snowmelt-Dominated Basin"* Boise State University ScholarWorks 10-2018.

Stewart-Maddox, Thomas, Parham & Hipke (2018) *"Restoring a World Class Aquifer: A Brief History Behind Managed Recharge & Conjunctive Management for Idaho's Eastern Snake Plain Aquifer" TWR* #173: July 15, 2018.

Taxin, Amy, 2023 *"California Farmers Flood Fields to Boost Groundwater Basin"* Associated Press, available on Yahoo News.

Tuthill, D., P. Rassier and H. Anderson (2013) *"Conjunctive Management in Idaho" TWR* #108: Feb. 15, 2013.

Tuthill, D., H. Anderson and M. Comeskey (2014) *"Managed Aquifer Recharge - Benefits of Public-Private Partnership" TWR* #130: Dec. 15, 2014.

Tuthill, D. and R. Carlson (2018) *"Incentivized Managed Aquifer Recharge" TWR* #176: Oct. 15, 2018.

Tuthill, D. and R. Carlson (2019 *"Implementing Incentivized Managed Aquifer Recharge on a Basin Scale"* Paper for the International Symposium for Managed Aquifer Recharge 10, Madrid, Spain, 2019.

US Bureau of Reclamation (2008) *"The Effects of Climate Change on the Operation of Boise River Reservoirs, Initial Assessment Report"* US Department of the Interior.

US Bureau of Reclamation (2023) *"Climate Change Adaption Strategy"* US Department of the Interior. https://www.usbr.gov/climate/docs/2023ccas/CCAS2023Webversion.pdf

Waskom, Reagan M. (2014) *"South Platte Basin Well Management: Colorado Options Analysis" TWR* #122: April 15, 2014.

Water Data

ACCESSIBLE WATER DATA

TOWARD MODERN, ACCESSIBLE WATER DATA FOR THE NATION: **AN INTERNET OF WATER**

by Peter Colohan, Director, Internet of Water Initiative
Center for Geospatial Solutions, Lincoln Institute of Land Policy (Washington, DC)

Introduction

As every water manager knows, finding best-available water resources data for a given location or environmental feature of interest is a tricky task. Fundamental water resources information — about watersheds, rivers, and aquifers, water quality samples and sensors, water rights and diversions, drinking and wastewater services, etc.— is notoriously difficult to find.

Finding Data

Consider the speed and precision of the modern internet — in less than six seconds, one can quickly find a specific brand of garden mulch on a specific shelf at Home Depot. Finding water data today, in contrast, requires knowing exactly what you are looking for and where to look for it. This problem arises because public water data are collected for different purposes, at different scales, and are scattered across multiple platforms with different data standards. As a result, it is difficult for experts — let alone members of the general public — to find all relevant water data about a particular place or environmental feature.

What can be done about this data fragmentation? The answer to this challenge lies in building a sustainable and stakeholder-driven community knowledge network for water resources data that relies on linked data and follows the organizational structure of the internet. In 2017, this idea was infused with new energy at the Aspen Institute Dialog Series on Water Data and formalized in a report — *"The Internet of Water: Sharing and Integrating Water Data for Sustainability"* (Aspen Report) — calling for the creation of such a water data network, along with necessary supporting technologies, and thoughtful stakeholder engagement.

Interconnection Points

Our roads have standard signage, roadway width, and universal rules for use that allow us to move between communities with ease and minimal risk. Similarly, the Internet of Water concept is designed to promote interconnection points that follow common standards to allow for the free flow of water data over the internet.

Internet of Water

The Internet of Water concept is rooted in the idea that improved water data discovery, sharing, and integration is necessary to support major areas of water policy and water mission work including: climate and drought resilience; water equity; clean water; conservation; and regional planning at the land-energy-water nexus. Because data are the food of models, such data sharing is also critical to the science, technology, and modeling activities necessary to achieve policy outcomes.

Water Management and Water Budgeting in the West

Two use cases for an interner of water

Water stress occurring in the Western United States — and within the Colorado River system in particular — is well known. Apart from the respite of a wet 2023, the situation remains dire for all water users. The nation's fragmented system of water data, reflecting its fragmented system of water governance, deepens this problem. Put simply, one reason that answers to the crisis are hard to find is that the data are hard to find and to use.

Water Management

To understand, manage, and adapt to changing atmospheric and hydrologic conditions, water managers from all sectors require information tools that draw on a wide variety of datasets. These datasets include hydrometeorological data — such as streamflow, streamflow forecasts, snow data, precipitation, soil moisture, and evapotranspiration data — as well as data about the impacts of anthropogenic water management and use — such as storage, authorized water withdrawals, points of diversion, place of use, and consumptive use.

Datasets

Yet, these datasets are fragmented and dispersed across numerous platforms from various jurisdictions at the federal, state, and local levels. Relevant data platforms include a dizzying array of acronyms from the Federal government alone, including those managed by the Bureau of Reclamation (Reclamation).

Water Data

Dataset Acronyms

A few such datasets and their acronyms include:

- AgriMet and the Reclamation Information Sharing Environment (RISE)
- The US Geological Survey National Water Information System (NWIS) for streamflow data
- The US Department of Agriculture's Natural Resources Conservation Service (NRCS) Snow Telemetry (SNOTEL) and manual snow course systems
- The NRCS Soil and Climate Analysis Network (SCAN) of soil moisture monitors

Various other research and operational programs of the National Oceanic and Atmospheric Administration (NOAA) and National Weather Service are used to gather hydrometeorological data in the west. Further, the National Atmospheric and Space Administration provides many water-related data sets from space-based satellite sensors, including Landsat thermal infrared imagery used to measure via evapotranspiration and related consumptive agricultural water use.

Budgeting

Water Budgeting

Policymakers at local, state, and regional levels also require better access to data for water budgeting. Water budgeting can be loosely defined as accounting for water into and water out of a defined area. The data needed for water budgeting could include publicly available estimated evapotranspiration measurements and evaporative loss data at the field level as well as data from water conveyances, storage, and carriage losses. A water budgeting exercise could also benefit from more specific data such as evapotranspiration and energy flux data sourced from a growing network of eddy covariant towers managed by the Utah State Climate Center and other networks. For many stakeholders, collecting and processing water data is simply too hard and time-consuming.

It's Not Like the Weather Channel

Weather Enterprise

Because US water data are so difficult to find, access, and use, the water sector is routinely unable to benefit from new data technologies that have transformed other sectors. A case in point is The Weather Channel and other private sector weather data providers, which take free, publicly available data from NOAA and transform these public data into useful weather products. This partnership with the telecommunications and information technology industry is known as the private sector "weather enterprise." This system creates hundreds of millions of user-friendly and user-specific forecasts, maps, analyses, apps, and decision-support tools that reach the great majority of the US population on nearly any device (e.g., television, mobile phone, or tablet). It also provides countless tailored forecasts for agriculture, energy, transportation, recreation, and other sectors that require customized information. This vast and profitable weather-information economy is made possible by modern, integrated public data from NOAA, combined most importantly, the "eyeballs business" stemming from a near universal demand for daily, up to the moment weather forecasts.

Data Transformation

This type of transformation for the water sector — where data are developed into a variety of information types and products — is essential to transform and innovate water management. A similar system could improve water markets, precision irrigation, advanced water treatment, or track real-time environmental conservation actions. Unlike the case with weather data and NOAA, however, the United States does not have an organization whose mission it is to share and integrate water data across jurisdictions. Moreover, the culture of most agencies responsible for managing public water data is to approach the task with a narrowness of purpose, and default toward closed behavior, rather than being open to the extraordinary possibilities that could come from opening, sharing, and reusing water data. Indeed, a broad movement to change cultural norms and behavior across public sector agencies and utilities (i.e., local government water managers) is essential to enable the technical transformation needed to harness the power of water data.

Broad Movement

Evolution of Modern Water Data Exchange

FAIR Data

Greater water data sharing and integration requires water data to become **f**indable, **a**ccessible, **i**nteroperable, and **r**eusable (FAIR). "FAIR" is an idea with a long pedigree. The Internet of Water builds on decades of previous work to address the challenge of FAIR water data.

Water ML Standard

Since the early 2000s, organizations within the federal government and academia have attempted to address certain aspects of the water data challenge. In 2009, the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) took a significant step forward by developing and implementing WaterML, a technical standard for representing time-series water data, which was subsequently adopted as a standard by the Open Geospatial Consortium and later updated in 2012. This breakthrough created the possibility of interoperability among water data sets, laying the groundwork for water data to be shared seamlessly, machine-to-machine, without human intervention.

Water Data

Data Exchange

In 2011, to address growing questions and concerns surrounding water availability in the West, the Western States Water Council, in coordination with the Western Governors' Association, the US Department of Energy National Laboratories, and the Western States Federal Agency Support Team (WestFAST), initiated the Water Data Exchange (WaDE) project to enable the exchange of water planning, water use, and water allocation data between federal, tribal, state, and local agencies, as well as the public. In 2014, as part of the bipartisan open data movement of the federal government, the White House-led National Council on Science and Technology, Subcommittee on Water Availability and Quality, established the Open Water Data Initiative, which led to improved access to water datasets across federal agencies.

IoW Launch

In 2018, one year following the release of the Aspen Report, the Duke University Nicholas Institute for Energy, Environment, and Sustainability launched the Internet of Water (IoW) Project as part of their Water Policy Program. In 2021, following a successful start-up phase — including numerous pilot demonstrations — the Nicholas Institute began partnering with the Lincoln Institute of Land Policy's Center for Geospatial Solutions (CGS) to operationalize the technical innovations developed by the team at the Nicholas Institute in collaboration with the US Geological Survey. CGS is also building a stakeholder network, the IoW Coalition, to promote the uptake of these technologies.

Internet of Water Principles

Principles

To achieve the goals of an Internet of Water, the 2017 Aspen Report articulated a set of principles for water data management and sharing, which were revised and adopted by the IoW Coalition in 2022. They are as follows:

1. Water data are essential for efficient, equitable, sustainable, and resilient water planning, management, and stewardship.
2. Modern data infrastructure increases the usefulness of water data and enables its broadest possible application.
3. Data equity is necessary for water equity; modern data infrastructure should be implemented and governed so that data are usable by and for overburdened communities.
4. All water data produced for the public good should, by default, be **f**indable, **a**ccessible, **i**nteroperable, and **r**eusable (FAIR) for public use or authorized users.
5. Security and privacy risks associated with sharing data can be mitigated using mechanisms for tiered access for authorized users.
6. Commonly accepted data, metadata, and exchange standards should be adopted by water data producers to promote interoperability, efficiency, sharing, and secondary uses of data.
7. Control and responsibility over data are best maintained by data producers.
8. Data producers are responsible for sharing data of known quality and documenting essential metadata; data users are responsible for determining whether data are appropriate for specific purposes and uses.
9. Federated, distributed systems of interoperable public water data generally provide scalability and flexibility to meet the diverse needs of data producers and users.

Internet of Water Data Hubs

Standardization

Usable Data

IoW Data Hubs allow one or more users to publish a variety of water data from disparate sources in one place. IoW Data Hubs can be organized by theme or geography and follow IoW Principles. They ensure that data and metadata from these disparate sources are standardized before they are published so that they can be seamlessly found and used together. Water data producers share their data through hubs where secondary data users can find and access them. Users then transform data into information that decision-makers can use to improve water planning, management, and stewardship. This system of IoW hubs currently includes non-federal and federal thematic hubs. For example, sensor data is collected at CUAHSI, water rights and water use data at WaDE, and community science data at the Water Data Collaborative. Geographic hubs exist in the states of New Mexico and Texas, and there are two hubs in California. There is a growing list of federal hubs that meet FAIR data standards, including the Water Quality Portal, NWIS, RISE, and the Oak Ridge National Laboratory's HydroSource hub for hydropower data.

Geoconnex: The Core Discovery Technology of the Internet of Water

Geographical Data

Internet of Water's flagship technology for water data discovery is Geoconnex (https://internetofwater.org/geoconnex/), being developed at CGS in collaboration with the US Geological Survey (USGS).

The Geoconnex system is designed ultimately to allow for any human user to retrieve water data by a plain-language internet search on a geographic name, such as a river, lake, aquifer, dam, or public water system. Once established, Geoconnex will return a list of water data from all sources, federal, state,

Water Data

Automatable Solutions

Hubkit

Funding

Persistent Identifiers

tribal, or local government, as well as research data sets and community science data. When completed, this geospatial index will be capable of searching and retrieving any water metadata published in the United States, and ultimately North America and beyond.

Geoconnex relies on a distributed linked data system. Such systems are foundational elements of modern internet search technology, allowing for the search and retrieval of millions of records in an instant. Such a linked data system does not yet exist for water data but has been an aspiration of the water data informatics community for some years, and the subject of significant research to date. The Geoconnex concept, first developed at Duke University, was built on fundamental earlier research at USGS: The Environmental Linked Features Interoperability Experiments (ELFIE) (https://link.springer.com/chapter/10.1007/978-3-030-39815-6_18). These experiments, which ran from 2017 to 2020, sought to identify sustainable and automatable solutions to link multi-disciplinary, multi-organization environmental data without the requirement to transfer custody or the burden of data maintenance. This was achieved by relying a system of linked data, enabled by well-described metadata and publication via a suite of pre-existing OGC and W3C standards, allowing for federation across data publishers.

In addition, CGS is developing a supplementary tool called Hubkit has been developed to work in tandem with Geoconnex. Users may contribute and integrate their water data into the Geoconnex system, by following the guidance at geoconnex.us, or by fostering a more comprehensive and up-to-date index.

From Research to Operations: The Critical Role of USGS

USGS Water Mission Area is undergoing a generational modernization of its water data infrastructure, including a complete overhaul of its data cataloging, dissemination, and display capabilities. This modernization includes the development of a National Hydrologic Geospatial Fabric (NHGF), for water information, vital to realizing the vision outlined for the Internet of Water. USGS is also seeking to populate the NHGF with links to all water metadata in the United States, through Geoconnex. Current CGS research on Geoconnex is funded via Duke by the USGS Water Resources Research Institute in North Carolina, leveraging additional private philanthropic funding. It is focused on establishing metadata standards and practices relevant to creating and publishing interoperable data from both observations and hydrologic models.

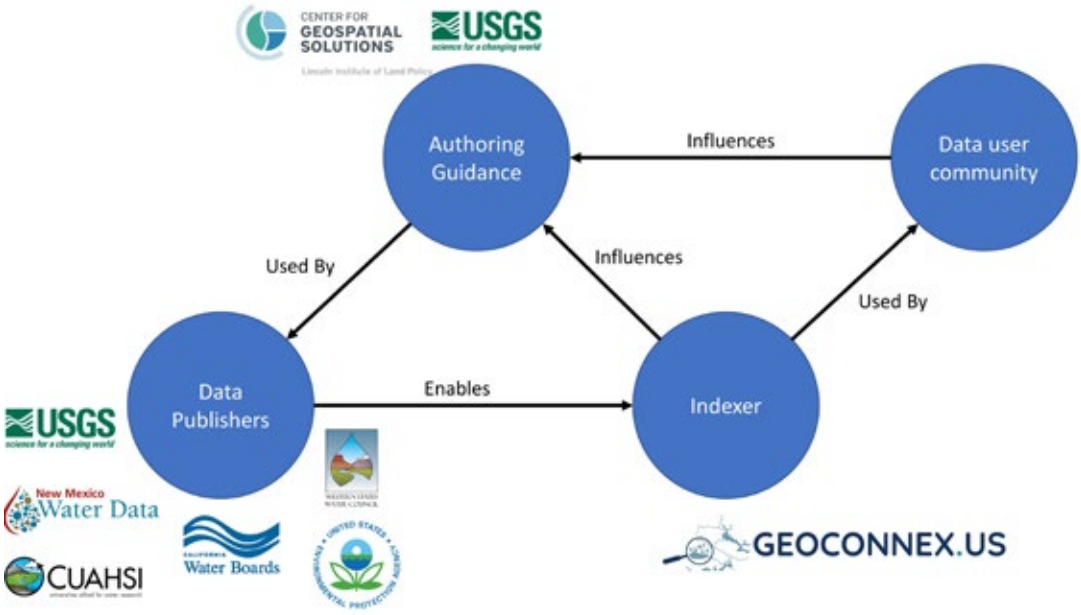

Figure 1: Geoconnex workflow and management

In addition, CGS is also developing feasible options for Geoconnex governance, including mechanisms for answering questions about community reference features and how persistent identifiers about those features are created and managed. All organizations will use these persistently identified features as a reference point for their own data. The governance plan will also address questions about how to manage metadata about those features as well as metadata published by data providers about their own monitoring locations.

In September 2021, Geoconnex contained 1.1 million data elements, which expanded to 5.8 million data elements by March 2023. As the number of data elements continues to rise, the system's utility and

Water Data

Dataset Growth

Adoption

Informing Decisions

Flexible Allocations

Tools for the West

comprehensiveness are enhanced, providing greater value to future users seeking vital water resource information. CGS is collaborating with USGS and other Federal and state agencies to rapidly expand the Geoconnex metadata library, to improve its utility, and to sustain the system over time as an integral, foundational element of water data infrastructure for the Nation.

IoW Technology Adoption and Uptake by States

As the IoW core technologies of Geoconnex and Hubkit become operational, the initiative will now turn its attention to the critical question of technology adoption by states. Four states have taken the lead: New Mexico; California; Texas; and Oregon. This network will be widened in the coming years through a specific program of technology adoption designed to overcome barriers in policy, behavior, technology, culture, and capability, barriers that prevent the modernization of state water data.

Conclusion

Upon the completion of Geoconnex, data analysts working with and advising decision-makers will have easy access to comprehensive water data for any specific query in a given location. This wealth of information will empower them to make informed decisions and develop strategic plans to ensure the long-term sustainability of our precious water resources.

A network like IoW, supported by core technologies, is essential for tackling the pressing water scarcity crisis faced by the Western states, among numerous other critical water-related issues that it can help address. By unlocking effective solutions, the IoW aims to play a vital role in promoting sustainable water management.

Special thanks to Kyle Onda, Associate Director for the Internet of Water Initiative at CGS, and to Dave Blodgett at USGS who co-lead the technical development of geoconnex.us and who contributed significantly to the content of this article.

For Additional Information:

Peter Colohan, Center for Geospatial Solutions, 202/ 441-5340 or pcolohan@lincolninst.edu

Peter Colohan, is the director of the Internet of Water Initiative at the Lincoln Institute's Center for Geospatial Solutions. Following nearly a decade of federal service with the National Oceanic and Atmospheric Administration (NOAA), Peter came to the Lincoln Institute from Duke University, where he collaborated with a team of experts to create the Internet of Water.

WATER MARKETS: THE GOOD, THE BAD, AND THE UGLY

by Vanessa Casado Perez
Professor of Law and Research Associate Professor of Agricultural Economics
Texas A&M University (College Station, TX)

Introduction

Water markets are resource management tools that can be used to help mitigate the effects of the current ongoing megadrought impacting the Western US, as well as the droughts likely to occur in the future. Climate change is worsening the already endemic water scarcity in these arid regions by reducing snowpack, decreasing precipitation, and increasing temperatures. When water is scarce, water supply in the West is allocated based on the temporal priority of previously established rights to use water ("first in time, first in right"). As such, this allocation may not respond to current societal wants and needs. Water markets make allocation more flexible by allowing those in need of water to buy from those who have legal rights to water. If properly structured, water markets can mitigate the consequences of water scarcity in times when our public policies are more reactive than proactive at managing the challenge.

In the last few years, the West has seen efforts to both enhance water markets and to rein them in. Expansion has taken the form of either reducing transaction costs or making water rights more marketable. The "reining-in" has yet to happen, but the entry of certain new actors that approach water as a financial asset to transact has prompted calls for greater regulation of water markets.

Water Markets

This article will briefly introduce the idea of water markets and why they are a necessary tool in the West. It will then present examples of: 1) regulation advancing water markets (the good); 2) regulations bypassing water markets (the ugly); and 3) the attempts at disincentivizing water speculation (the bad).

Market Examples

Increased Efficiency

The most active US water markets — Texas, Arizona, and California — never trade more than two to four percent of the total water used in the respective state. However, that two percent can make a difference when facing a crisis. A prime motivation behind water markets is that regulators have their hands tied when it comes to reallocating water from some users to others, and water will be more efficiently allocated if private parties can engage in transactions. Furthermore, much of the water in the West is used in agriculture, and many have claimed that the agricultural sector is inefficient in its water use. Whether that is true or not, it is clear that the price we pay for water does not capture the real value of the resource. Water markets enable farmers to realize opportunity costs. Accordingly, it may be the case that it is more sensible for them to sell or lease their water right than grow a crop in a given year.

Exchanging Rights

The exchange of water rights is far different than the purchase of most goods. Water markets are regulated to ensure that third parties and the environment are not harmed as a result of water transactions. This type of regulation — often referred to as the "no-injury rule" — takes the form of transaction review by a water agency or water court. An exchange will not be approved unless there are no injuries to third parties and the environment. The review process can be the source of high transaction costs and may discourage some trades.

Water banks are a mechanism designed to reduce those transaction costs. Water banks can be privately or publicly run. Banks are a mechanism to connect buyers and sellers efficiently. These actors do not necessarily negotiate with each other; instead, the operator of the bank coordinates trades. Banks increase transparency by offering information about available water and prices, which reduces transaction costs for private parties.

What is a Water Bank?

A water bank is a mechanism designed to facilitate the transfer of water use entitlements from one location or use to another. A water bank functions like an intermediary, or broker, similar in some ways to a financial bank that acts as a broker or clearinghouse between savers and borrowers. In the case of water banks — and unlike some brokers — there is some kind of public sanction for its activities.

A valid water use entitlement can be "deposited" with the water bank, making it available for withdrawal by others for a fee. If the deposit is withdrawn from the water bank, the depositor is paid an amount corresponding to what the renter paid (less some fee for the services provided by the water bank). The incentive to deposit is in the hope of earning more from the renter than from using the water themself. Similarly, the incentive for the renter is in finding water at a low enough cost to make the rental attractive.

The bank or facilitator serves an important role, determining which water rights can be banked, and the amount of water corresponding to a given water right entitlement. It also decides who can rent, and establishes the process and terms for these agreements. In addition to this oversight, water transfers are generally also regulated by state laws.

The temporary transfer of water among irrigators within an irrigation district is nothing new. What distinguishes recent developments in this area from traditional forms is the transfer to uses outside an irrigation district, or for uses other than irrigation.

Source: Oregon State University website

See: https://agsci.oregonstate.edu/appliedecon/public-policy-and-economic-analysis-water

Third-Party Impacts

When a water bank is run by a public institution, the bank can act as a one-stop shop where the intermediary — the public agency — also ensures third parties are not affected by the transaction. Some states offer even more advantages for water banks. In Washington, for example, once a water bank has been approved, the water the bank sells can be used anywhere in a geographic area already defined and transactions are assumed to not injure third parties. The approval defines the area where, if the water to be sold were put to use, third parties and the environment will not be affected. Several states have in recent years regulated and promoted water banks to facilitate water transactions. For example, Utah's 2020 Water Banking Act regulated the creation of local water banks.

Water Markets

Utah's Water Bank

Utah enhanced water markets as part of the quest to save the Great Salt Lake. Preventing the ecological and human disaster that a dry Great Salt Lake will entail requires employing various management tools, among them, water markets. Utah's HB33 expanded the definition of beneficial use and the parties who are able to apply for, and hold an instream water right — a right to maintain water instream for public use without diversion — so that farmers and ranchers can now lease the water to fill the Great Salt Lake.

Prioritizing Social Value

Also connected to markets is the regulation in Utah that — while respecting the principle of first in time, first in right in prior appropriation — has superposed a new priority system based on the social value of certain uses, such as domestic uses, in times of emergency. This regulation is a way of recognizing that water markets cannot mitigate certain situations because of the high prices water may be valued at in transactions. According to this regulation, the type of uses deemed priorities in time of emergency can buy water from those with the legal right to receive water. It becomes a forced sale or, some may say, an exercise of eminent domain delegated to private parties. The provision reads:

Eminent Domain

> A person using water preferentially during a temporary water shortage emergency shall pay the appropriator whose water use is interrupted the reasonable value of the water use interrupted, crop losses, and other consequential damages incurred as a result of the interruption interruption (Utah Code Title 73. Water and Irrigation § 73-3-21.1.).

Maximizing Benefits

This reform is effective in May 2023. The key variable would be how the reasonable value is regulated by the state engineer. The Utah legislation recognizes that the current system of temporal priority does not maximize our social benefits. It is either inefficient because urban areas value water more or inequitable because we should not let industrial uses continue while people can hardly satisfy their basic domestic needs. The possibility for a municipal utility buying water from the agricultural sector has always existed but the prices for some of these old water rights can be exorbitant. For example, California examined the idea of buying senior pre-1914 water rights but the cost for the state was found to be unbearable. Thus, Utah's legislation is reducing the need for markets by using a sort of eminent domain. The owner of the older water right who uses it for a non-priority use cannot refuse to sell for the price deemed reasonable by the state engineer, a mechanism very similar to eminent domain procedures.

Limiting Markets

Wall Street Investors

The strongest call to limit water markets, beyond those who starkly opposed markets as a form of commodification of water, is the result of the relatively recent interest in water by financial investors. Wall Street-like companies are making true the adage that water is the new oil. Wall Street and billionaires like Bill Gates are investing in both water rights and land with attached water rights because they know it is one of the few assets that can only appreciate. This interest has become a concern in many states in the West and has translated into discussions of legislative reform.

Beneficial Use

Water Asset Management, a company based in New York City, started buying water in the Grand Valley Water Users Association and in Grand Valley Irrigation Company Canal. This company circumvented the anti-speculation principle enshrined in the Prior Appropriation Doctrine. According to this doctrine, water rights can be forfeited if they are not put to a "beneficial use." Under the Prior Appropriation Doctrine, a fundamental principle is that water rights must be based on actual — not speculative — needs of a water user. Buying and holding water rights for speculative purposes is not considered a beneficial use and is, therefore, not allowed. [Editor's Note: For a thorough explanation regarding speculation and beneficial use, *see* Hobbs *TWR* #137]. Water Asset Management is not going to use the water itself for a beneficial use; it is only investing in it. Instead, Water Asset Management is leasing it back to farmers, thus complying with the letter but not the spirit of the Prior Appropriation Doctrine. The motivation behind Water Management's transactions is none other than profit. What remains unclear is how such a profit will be realized.

Speculation

Some suggest Water Asset Management is waiting until growing cities need their water. Others suggest that Water Asset Management will want to participate in future Colorado buyback programs, as Colorado will have to buy water to comply with its obligations to other Colorado River Basin states. The idea of water being purely an investment asset rather than an input of production is appalling to many. Similarly, many believe that this situation of speculative investment is not the same as the situation where a farmer, after realizing his crop will not be profitable, sells his water right. No matter one's position in this debate, the presence of large investors may carry risks of monopolistic (non-competitive) and

Water Markets

monopsonistic (single-buyer) power. Deep-pocket investors might control the market and influence the price to their benefit but to the detriment of society. Beyond these market inefficiencies, many believe it goes against the nature of prior appropriation to treat water as an investment in and of itself. They fear the peak in prices and the impacts on communities if large financial interests take water rights away.

Colorado Market Evaluation

Addressing Speculation

Colorado has wrestled with the problem of water speculation since 2020. In the summer of 2020, the legislature enacted legislation creating a working group (Workgroup) to study this speculative phenomenon (Senate Bill 20-048). The Workgroup delivered a report in August 2021. The Workgroup, comprised of a broad range of Colorado water interests and backgrounds, was unable to reach a consensus on how to act. The Report analyzed nineteen measures and put forward eight of them, without endorsing any particular one. The Workgroup considered and discarded measures such as creating a fund to buy water rights targeted by speculators or disallowing out-of-state entities from buying water rights.

The eight measures that were advanced included:

- tying water to land to make investment more onerous and transactions more complex
- taxing profits derived from the sale or lease of water rights previously purchased for speculation purposes
- establishing a maximum rate of water right price increases, then imposing higher taxes when that rate is exceeded
- establishing a statewide process to identify and prohibit investment with speculative purposes in water

Concentration & Scale

There are two things to note about this report. First, while the Workgroup tackled water speculation, some of the strategies focused on either "concentration" or "scale" since both appear to be interconnected. For example, one of the measures considered was to trigger heightened scrutiny of any water right transfer that exceeds a certain volume, rate, or seniority. Concentration refers to market power: that is the possibility for large investors to control enough water rights that they can influence the performance of the market. The pattern these investors follow suggests that they need a certain scale to be profitable and that the more power they hold, the better for their prospects. Antitrust regulation normally deals with market concentration in most markets. Whether or not a market is too concentrated may depend on the geographic definition of that market. As such, the larger we define the water market at stake, the more diluted the effects of those large players may look even if locally their power has effects. These local effects may partially explain why in some natural resources markets — like fishing quotas or oil and gas rights on federal lands — there are limits of how many rights someone can hold. Another reason for these limits is the fear that the federal government's interests may be hampered by private control of resources that are vital and a national security concern.

Geographic Boundaries

Defining Speculation

Second, many of the measures require a workable definition of what constitutes speculation. The report differentiated between traditional speculation and investment speculation. Both definitions boil down to the idea that water is a production input, not an investment asset — but investment speculation is not addressed by current regulation. Traditional speculation is defined as appropriation of water without a plan to put it to a state-designated beneficial use. Thus, it connects with prior appropriation's forfeiture doctrine that entails the loss of the right for non-use. Investment speculation, in contrast, does not require a physical manifestation of non-use. In fact, it does not have one. Investment speculation deals with the motives. The report defines investment speculation as "appropriating or purchasing water rights with the primary motivation of profiting from a later transaction such as sale, lease, or payment for non-diversion of those rights — even if they have a current plan to beneficially use the water rights." Policing motives and intent has never been an easy task. From an outsider perspective, it is very difficult to distinguish between the farmer who has decided that agricultural markets do not produce sufficient return after years of hard work and wants to sell his water rights from that of a user who bought the water a couple of years ago, leased it, and then sold it when the market price was high.

Colorado Water Market Legislation

Legislation

In Colorado, many agreed that something needed to be done about water speculation at the legislative level, but few agreed on what to do — as happened with Colorado's Workgroup (above). In January 2022, a bill was introduced to curb investment water speculation, but the bill died at the end of the legislative session despite amendment attempts.

This unsuccessful Colorado bill prohibited investment water speculation, which it understood as purchasing agricultural water rights with the intent at the time of the purchase to profit from an increase in water's price in a subsequent transaction, or by receiving payment by a third party, including the

government, for not using that water. The bill allowed each mutual water district (the most common type of irrigation organization in Colorado) to decide what percentage of water rights someone must hold to trigger the presumption that the holder is engaging in water speculation. The bill used concentration as a proxy for speculation. If the state engineer found the purchaser to be engaged in water speculation, the purchaser could face a fine of up to $10,000 and stricter controls over his future transactions. Furthermore, the bill tried to reduce the risk of spiteful and unfounded claims: the state engineer could refer a frivolous or harassing complaint to the state attorney general, who could then bring a civil action against the complainant. This iteration of the anti-speculation measures did not advance in part due to opposition from farming and ranching interests. Like some of the measures analyzed in the Workgroup's Report, the bill would have somewhat restricted the marketability of their rights, something they sought to preserve as insurance for rough times.

Washington State Market Reform

Another state that has embraced water markets and is now looking to define their limits is the state of Washington. Washington has embraced water markets in the form of water banks. A water bank has been described as "a mechanism designed to facilitate the transfer of water use entitlements from one location or use to another. A water bank functions like an intermediary, similar in some ways to a financial bank that acts as a broker or clearinghouse between savers and borrowers." *See* OSU definition on page 19.

Water Banks have proliferated in Washington. There are publicly sponsored banks and private ones; the latter often criticized for excess profit. Parties who want to establish a water bank buy water rights and apply for the approval of the water bank. In the approval, the Washington State Department of Ecology (Ecology) defines which area can buy water from the bank to mitigate new uses or expand existing uses.

The Trust Water Right Program (Program) is one of the strategies Washington has adopted to provide water for environmental needs. Established in 1989, the Program allows users to donate water rights permanently or temporarily to the Trust. While banked in the Trust Program, water rights are not subject to forfeiture for non-use. Bank sponsors often use the Trust Water Right Program to protect their water rights while they set up the bank, wait for approvals, while no transactions take place, or until the time to sell at a good profit arises.

One of the largest water rights in the state was owned by TransAlta, a power company. As a result of regulation phasing out coal-fired plants, TransAlta no longer needed their water right, which was used to cool off the plant. TransAlta has started to sell their water right in chunks via a water bank near Centralia. Many criticize this large player, but the situation is different than the one of Water Asset Management because TransAlta, like farmers who own water rights and decide to sell water after an irrigation system improvement, had been using the right and they invested in it for productive uses before deciding to sell it.

Recently, Wall Street has also descended upon Washington. Investors aim to profit from this connection between banks and the Trust Program. Crown Columbia Water Resources (subsidiary of a firm owned by retired Goldman Sacks partners) has invested about five million dollars in water rights across the state, accumulating more than 7,000 acre-feet. Crown Columbia plans to sell these water rights, but, in the meantime, it has securely parked the rights in the Trust Water Right Program. These rights are protected in the Program for up to twenty years — i.e., far more than the use-it-or-lose-it doctrine would allow.

The presence of the Trust Program makes it unnecessary for Crown to use Water Asset Management's strategy of leasing out the acquired rights to avoid forfeiture. Crown Columbia submitted an application to create a water bank in the Columbia River basin. Banks are subject to approval by Ecology, which decided to suspend the application in March 2021 to have further discussions with stakeholders, as Washington's Water Code requires. The Crown Columbia saga triggered the Washington legislature to discuss how to address speculation, but nothing was decided. Initially Senate Bill 6494 amended several provisions regarding both the Trust Program and water banking; but it ended up being modified to the establishment of a brain trust to study how to regulate these issues. Other bills introduced but not enacted include: Senate Bill 6292 discouraging the transactions traditionally associated with speculation; and Senate Bill 6278 prohibiting water bottling plants. Bottling water can certainly have similar effects to those transactions where the water ends up in some distant urban area because once water is bottled it can easily leave the basin to be consumed elsewhere.

Water Markets

Water Export

Fair Market Value

Market Opportunities

Legal Tension

Arizona Water Markets

The role of large commercial interests is also the talk further south, in Arizona, albeit without a speculative element.

In Arizona, there are concerns about who can own or lease agricultural land because such a sale or lease grants access to unregulated groundwater. In several areas in Arizona, large farming corporations are absorbing small agricultural land holdings. Such changes usually don't raise many eyebrows given that agribusinesses play an important role in our agricultural markets. However, in this case the large farms belong to Middle Eastern corporations growing animal feed — a crop of low return and high-water consumption — to export back to the Middle East where drought conditions have prompted the banning of such crops. This global production has a large water footprint and could be characterized as what some people call a virtual water export. The Arizona Attorney General is looking at a lease of state trust lands below market price to a Saudi alfalfa producer to assess whether it violates the gift clause in the Arizona Constitution. The gift clause prohibits state entities from subsidizing private companies. The Arizona Supreme Court in *Shires v. Carlat,* No. CV-20-0027-PR (2/8/2021), stated that public entities are to receive fair market value for the benefit proportional to the consideration. In this case, the Saudi company was paying very little for the state land leased and accessing groundwater for free.

Beyond this particular case there are calls for regulation for deals involving state trust lands because groundwater depletion — to which these large foreign farming interests are contributing — is a problem of staggering proportions.

Conclusion

The new normal in the West is a normal where water is always scarce — scarcer than ever before. Water markets could help mitigate the effects of scarcity. Accordingly, states have promoted them. However, those markets have opened the door to large interests; often interests that treat water as a financial investment rather than an input of production.

Regulated water markets are generally good. While some large transactions, like TransAlta, may look ugly, they are not against the principles of prior appropriation per se. However, investments in water by financial firms where the purpose is not using water as a production asset but as an investment may be labelled as "bad" because while they comply with the letter of the law, they may subvert the anti-speculation ethos of prior appropriation. Many argue that this new challenge and the challenges created by large players requires greater state regulation. Such regulation needs to be specifically tied to whatever goals we want to achieve with water markets and which transactions we want to target. Ultimately, the disagreement over how much or how little to regulate reflects the core tension of the American West's water laws — i.e., the tension between water as a public resource stewarded by the state and water rights managed as private property.

For Additional Information:

Vanessa Casado Pérez, Vcasado@law.tamu.edu, 312/ 662-8525

Vanessa Casado Pérez, is a Professor and Dean's Research Chair at Texas A&M School of Law and a Research Associate Professor at Texas A&M Department of Agricultural Economics. Her scholarship focuses on property and natural resources law. She was the 18th Annual Stegner Center Young Scholar at the University of Utah S.J. Quinney's College of Law and the Pace-Haub Environmental Law 2021-22 Distinguished Junior Scholar. Her research has been published, among others, by NYU Law Review, Northwestern Law Review, Iowa Law Review, and University of Southern California Law Review.

WATER BRIEFS

TRIBAL NATION WATERWAYS US

NEW PROTECTIONS

On May 3, the US Environmental Protection Agency (EPA) announced proposed federal baseline water quality standards for waterbodies on Indian reservations that do not have Clean Water Act standards, ensuring protections for over half a million people living on Indian reservations as well as critical aquatic ecosystems.

Fifty years ago, Congress established a goal in the Clean Water Act (CWA) that waters should support fishing and swimming wherever attainable. All states and 47 Tribes have established standards consistent with that goal. However, the majority of US Tribes with Indian reservations lack such water quality standards. This proposal would extend the same framework of water quality protection that currently exists for most other waters of the United States to waters of over 250 Tribes and is the result of decades of coordination and partnership with Tribes.

If finalized, this proposal would safeguard water quality on Indian reservations until Tribes are able to adopt their own CWA standards for their water bodies. EPA estimates this proposed water quality standard will increase protections for 76,000 miles of rivers and streams and 1.9 million acres of lakes, reservoirs, and other open surface waters within Indian reservations, protecting aquatic life and the health of over half-a-million residents living within reservation boundaries.

Water quality standards (WQS) define the goals for the condition of a water body by (1) designating its uses, such as fishing and swimming, (2) establishing maximum levels (or water quality "criteria") for pollutants that protect those uses, and (3) outlining policies that protect water quality from degradation. The proposed baseline WQS would provide a common set of designated uses, criteria, and antidegradation policies for Tribal waters, with certain built-in flexibilities to enable EPA to tailor the standards where needed to best protect local circumstances.

This proposal carries out the commitments to honor the federal trust responsibility and protect Tribal water resources outlined in EPA's 2021 action plan, Strengthening the Nation-to-Nation Relationship with Tribes to Secure a Sustainable Water Future. It also delivers on the Biden-Harris Administration's commitment to uphold the United States' treaty and trust responsibilities to the 574 federally recognized Tribes.

"The National Tribal Water Council fully supports federal baseline WQS for all of Indian country not already covered by tribal WQS (TWQS)," said Ken Norton, Chairman for the National Tribal Water Council. "While the Council advocates for tribal environmental self-determination through TWQS, we endorse EPA's proposed rule that discharges the federal government's trust responsibility to tribes by filling longstanding regulatory gaps in Indian country, using standards that support the unique traditional and cultural uses indigenous peoples make of aquatic ecosystems."

"The Navajo Nation has water quality standards that were approved under both the Navajo and federal Clean Water Acts and are supported by EPA," said Yolanda Barney, Environmental Department Manager, Surface and Ground Water Protection Department, Navajo Nation Environmental Protection Agency. "It is imperative that EPA continue to support tribal efforts to protect tribal waters. Working with neighboring states Arizona, New Mexico and Utah as well as EPA, the Navajo Nation ensures that its waters are protected from pollution to the greatest extent possible.

"The promulgation of Tribal Baseline WQS is necessary to protect tribes without federal standards from transboundary pollution released from off-reservation polluters and addresses EPA's duty to fill the regulatory water quality protection gaps in Indian country," said Michael Bolt, Vice-Chair of the National Tribal Water Council and Water Quality Section Supervisor, Eastern Band of Cherokee Indians.

"The Poarch Band of Creek Indians, the only federally recognized Tribe in Alabama, has developed a robust surface water quality-monitoring program throughout the last decade," said Stephanie A. Bryan, Tribal Chair and CEO, Poarch Band of Creek Indians. This program has helped our Tribe defend its lands and waters, but we also recognize not all Tribes have had this same opportunity. The Poarch Band of Creek Indians support any attempt to develop National Water Quality Standards to help Tribes safely preserve and protect their water rights now and into the future."

"I appreciate that EPA recognizes that most tribes do not have WQS in place. This baseline will provide protection for fish, wildlife and tribal communities that depend on clean water," said Russell N. Hepfer, Vice Chairman, Lower Elwha Tribal Community. "Each tribe is unique, most not having the programs or funding to ensure the baseline is met. Moving forward, EPA should consult with and support tribes with funding for implementation and enforcement."

The Agency will accept comments on this proposal for 90 days. EPA will also hold two online public hearings on this proposal.

FOR INFO www.epa.gov/wqs-tech/promulgation-tribal-baseline-water-quality-standards-under-clean-water-act

FUNDING US

DRINKING WATER

On April 4, the US Environmental Protection Agency (EPA) announced over $6.5 billion for states, Tribes, and territories for essential drinking water infrastructure upgrades across the nation through the Drinking Water State Revolving Fund (DWSRF).

These DWSRF allotments to states are based on the results of EPA's 7th Drinking Water Infrastructure Needs Survey and Assessment (DWINSA). The survey, which is required by the 1996 Safe Drinking Water Act, assesses the nation's public water systems' infrastructure needs every four years and the findings are used to allocate DWSRF grants to states. The drinking water utilities need $625 billion in infrastructure investments over the next 20 years to ensure the nation's public health, security, and economic well-being.

At the direction of Congress, EPA's 7th Drinking Water Assessment, for the first time included a survey on lead service lines and is projecting a national total of 9.2 million lead service lines across the country. This best available national and state-level projections of service line counts will help advance a unique opportunity to employ a separate lead service line allotment formula for the Bipartisan Infrastructure Law DWSRF Lead Service Line Replacement Funding that is based on need. Almost $3 billion of the funding announced today will be provided specifically for lead service line identification and replacement, taking a key step toward the Biden-Harris Administration's goal of achieving 100% lead free water systems.

President Biden's Bipartisan Infrastructure Law is investing over $50 billion in water and wastewater infrastructure improvements across the country between FY 2022 and FY 2026. In its second year of implementation, $6 billion of Bipartisan Infrastructure Law funding will be available to states, Tribes, and territories through the DWSRF. Of that funding, the Bipartisan Infrastructure Law will invest $3 billion in lead service line identification and improvement, $800 million to address PFAS and other emerging contaminants, and $2.2 billion in other critical drinking water system improvements. Additionally, approximately $500 million will also be available through the DWSRF annual appropriations, established by the Safe Drinking Water Act.

FOR INFO www.epa.gov/dwsrf/annual-allotment-federal-funds-states-tribes-and-territories

WATER QUALITY US

PROPOSED RULEMAKING

On March 28, the US Environmental Protection Agency (EPA) announced a Notice of Proposed Rulemaking that would strengthen the Consumer Confidence Report (CCR) Rule making annual drinking water quality reports with important public health information more accessible to residents and businesses across the country. A Consumer Confidence Report, sometimes called an "Annual Drinking Water Quality Report," summarizes information about the local drinking water for the previous year. EPA's proposal would support public education by more clearly communicating important information in water quality reports and improving access to the reports.

"The Consumer Confidence Report is the primary way local water systems communicate with the people they serve, and EPA's proposed rule would improve the information communities receive, in

addition to making it more accessible," said EPA Assistant Administrator for Water Radhika Fox.

When finalized, EPA's proposal would:

- Improve the readability and clarity of water quality reports
- Enhance risk communication
- Encourage modern electronic delivery options
- Clarify information regarding lead levels and efforts to reduce lead in drinking water
- Provide translation for customers with limited English proficiency
- Require reports be issued twice a year (for systems that serve 10,000 or more people)

Additionally, EPA's proposal would require states to submit compliance monitoring data to EPA. While states already collect compliance monitoring data, current EPA regulations limit the data available to the EPA. When final, this action will help EPA identify trends both geographically and demographically, which will improve transparency and accountability, and amplify best practices that maximize direct benefits in communities.

FOR INFO https://www.epa.gov/ccr/consumer-confidence-report-rule-revisions

CLEAN WATER US

INFRASTRUCTURE UPGRADES

The US Environmental Protection Agency (EPA) announced on March 31 that over $775 million from the 2023 Consolidated Appropriations Act for states, Tribes, and territories through this year's Clean Water State Revolving Fund (CWSRF). The funding will help communities upgrade essential wastewater and stormwater systems to protect public health and treasured water bodies across the nation.

The announcement builds on the second wave of $2.4 billion EPA announced for clean water infrastructure upgrades through President Biden's Bipartisan Infrastructure Law in February. Over $3.2 billion will be provided to the CWSRF when combined with Fiscal Year 2023 funding available through the Bipartisan Infrastructure Law. This investment reflects the Biden Administration's commitment to strengthening the nation's wastewater and stormwater systems, while providing significant resources for mitigating nonpoint source pollution and improving energy and water efficiency. It also addresses key challenges, including climate change and emerging contaminants like per- and poly-fluoroalkyl substances (PFAS).

FOR INFO EPA Press Office, press@epa.gov or https://www.epa.gov/cwsrf/clean-water-state-revolving-fund-cwsrf-implementation#annual

WIFA AZ

CONSERVATION GRANT FUNDING

The Arizona Water Infrastructure Finance Authority (WIFA) announced on April 18 that it will begin accepting applications to fund $200 million in grants for water conservation projects.

The Water Conservation Grant Fund (WCGF) provides funding to conserve Arizona's water supply. Eligible entities may apply for up to $3,000,000 to fund conservation activities that facilitate voluntary reductions in water use, increase water use efficiency, and improve reliability in water systems.

The WCGF is one of three new funds made available by the Arizona Legislature last year when it invested over $1 billion to help secure Arizona's water future.

The first round of WCGF applications will open on April 18, 2023 and are due on May 19, 2023. Additional four-week application periods will open on a regular basis while funding is available.

FOR INFO https://azwifa.gov >> Funding Options

CHINOOK SALMON CA

INSTREAM FLOWS

An unprecedented collaboration among government, nonprofit and private sectors has led to the one of the first acquisitions of water rights dedicated to instream flows in California. The environmental milestone for fish and wildlife preservation was announced jointly by Friends of Butte Creek (FBC), Resource Renewal Institute (RRI) and the California Department of Fish and Wildlife (CDFW).

The new owner of the rights is Friends of Butte Creek, a nonprofit organization and longtime advocate for the Butte Creek watershed. "This is a historic event," explained FBC executive director, Allen Harthorn. "We look forward to continuing to work with local landowners and farmers to protect California's last stronghold of wild, naturally spawned, spring run Chinook salmon and steelhead by purchasing or leasing from willing sellers of water rights that can be dedicated to instream flows in Butte Creek."

The passage of Proposition 1 – the Water Quality, Supply, and Infrastructure Improvement Act of 2014 – by California's voters provided CDFW with grant funding to acquire water rights for instream flows in California streams. CDFW used some of this funding to support FBC's purchase of water rights from RRI, a Bay Area environmental organization that previously had these water rights dedicated to instream flows in Butte Creek. CDFW steered a rigorous two-year process to document the presence of, and appraise the value of, the water rights. CDFW also carefully built additional legal protections into the acquisition to guarantee that the water rights will be permanently dedicated to instream flows.

As the new owner of the water rights, FBC will assume responsibility for paying the annual fee to the California Department of Water Resources watermaster, who performs the critical roles of monitoring instream flows in Butte Creek and preventing unlawful diversions. Gayland Taylor, retired Butte County warden and long-time advocate for salmon and steelhead protection, offers that, "this increase in availability of flowing water, especially in low flow periods, will keep the stream alive for fish and "wildlife."

The achievement has been a long time coming. Over three decades, RRI sought to prove that securing water rights for wildlife could revolutionize habitat and wildlife conservation activities in California. Modeled after the land trust concept he created at the Trust for Public Land, environmental pioneer, former California Secretary of Resources and RRI founder, Huey Johnson envisioned a parallel program that would permanently safeguard water rights for instream flows. He found his test case on Butte Creek and purchased water rights from two conservation-minded landowners who were retiring from farming. Then in 1998, RRI obtained an order from the Butte County Superior Court dedicating these water rights to instream uses (for fish and other aquatic wildlife) under California Water Code section 1707. RRI began searching for a buyer that could permanently hold and protect these water rights. Working with RRI during the entire 33-year process (including the last three years on a pro bono basis), veteran water-rights attorney, Alan Lilly, helped RRI navigate the endless complexities of California water law. Lilly describes the long-awaited water rights transfer as "well worth the effort. We knew it was possible, but we had no idea how long it would take."

FOR INFO Allen Harthorn, Executive Director, Friends of Butte Creek allen@buttecreek.org or 530/228-5342

GRIC WEST

CO RIVER CONSERVATION

Following a visit to the Gila River Indian Community, Deputy Secretary of the Interior Tommy Beaudreau, Senior Advisor to the President and White House Infrastructure Implementation Coordinator Mitch Landrieu, and Deputy Bureau of Reclamation Commissioner David Palumbo announced on April 6 up to $233 million in historic funding and conservation agreements to help the Gila River Indian Community and water users across the Colorado River Basin protect the stability and sustainability of the Colorado River System. They were joined by federal, state, local, and Tribal leaders.

The Gila River Indian Community will receive $50 million in funding from the Inflation Reduction Act via the Lower Colorado River Basin System Conservation and Efficiency Program, which will help finance a system conservation agreement to protect Colorado River reservoir storage volumes amid persistent climate change-driven drought conditions. This conservation initiative will result in nearly 2 feet of elevation in Lake Mead for the benefit of the Colorado River System. The agreement also includes the creation of up to 125,000 acre-feet of system conservation water in both 2024 and 2025, with an investment of an additional $50 million for each additional year. This is among the first allocations for a system conservation agreement from the Lower Colorado River Basin System Conservation and Efficiency Program.

In October 2022, the Department announced the creation of the Lower Colorado River Basin System Conservation and Efficiency Program to help increase water conservation, improve water efficiency, and prevent the System's reservoirs from falling to critically low elevations that would threaten water deliveries and power production.

In addition, the Department announced $83 million for the Gila River Indian Community's Reclaimed Water Pipeline Project to expand water reuse and increase Colorado River water conservation. The project will provide a physical

connection of reclaimed water to Pima-Maricopa Irrigation Project facilities. When completed, the project will provide up to 20,000 acre-feet annually for system conservation with a minimum of 78,000 acre-feet committed to remain Lake Mead. Funding for the pipeline project comes from the Bipartisan Infrastructure Law and annual appropriations.

The Bipartisan Infrastructure Law including $8.3 billion for Reclamation water infrastructure projects over five years to advance drought resilience and expand access to clean water for families, farmers and wildlife. The investment will repair aging water delivery systems, secure dams, complete rural water projects, and protect aquatic ecosystems. The Inflation Reduction Act is investing another $4.6 billion to address Western drought.

FOR INFO https://www.usbr.gov/lc/LCBConservation.html

PENALTY CA

SEWAGE SPILL

The City of Los Angeles, which owns and operates the Hyperion Treatment Plant in Playa del Rey, faces a proposed $21.7 million penalty in connection with the plant's release of millions of gallons of raw sewage into the Pacific Ocean in July 2021.

This is the largest penalty the Los Angeles Regional Water Quality Control Board has ever proposed for violations of a waste discharge permit.

An investigation by the Los Angeles Water Board resulted in multiple allegations of permit violations, including unauthorized discharge and monitoring deficiencies, leading to the April 3 issuance of the Administrative Civil Liability Complaint.

The July 11-12 spill at the city's oldest and largest wastewater treatment plant occurred when debris filtering machines, designed to remove plastic and large objects from incoming sewage, became clogged and inoperable, flooding the facility and forcing plant operators to evacuate for their own safety.

To prevent the flooding from impacting additional parts of the plant, the city's sanitation and environment department released over 12 million gallons of untreated wastewater into Santa Monica Bay.

"This was a major incident, one of the largest spills in our region in decades," said Hugh Marley, assistant executive officer of the Los Angeles Water Board. "The direct and associated impacts from the unauthorized discharge of millions of gallons of raw sewage into the ocean threatened the health of nearby communities, as well as fish and wildlife, and violated numerous environmental laws and regulations. The board prioritized its investigation of this matter, and the amount of the proposed penalty reflects the seriousness of the permit violations at the plant and the scale of the harm to our region."

Short-term health impacts from the incident persisted for weeks, with residents complaining of skin rashes, headaches, nausea and noxious odors. The extent of the sewage spill also resulted in multiple beach closures.

State law requires the board to hear the complaint within 90 days unless the parties waive that requirement. Once scheduled, the board will announce the hearing date on its website.

FOR INFO Ailene Voisin, 916/ 324-4775 of Ailene. Voisin@waterboards.ca.gov

SEIS WEST

COLORADO RIVER BASIN

To address the continued potential for low run-off conditions and unprecedented water shortages in the Colorado River Basin, the Department of the Interior's Bureau of Reclamation (Reclamation) released on April 11 a draft Supplemental Environmental Impact Statement (SEIS) to potentially revise the current interim operating guidelines for the near-term operation of Glen Canyon and Hoover Dams.

The draft SEIS analyzes alternatives and measures to address potential shortages in the event that such measures are required to protect Glen Canyon and Hoover Dam operations, system integrity, and public health and safety in 2024 through 2026, after which the current operating guidelines expire. It also ensures Reclamation has the tools to protect continued water deliveries and hydropower production for the 40 million Americans who rely on the Colorado River.

"The Colorado River Basin provides water for more than 40 million Americans. It fuels hydropower resources in eight states, supports agriculture and agricultural communities across the West, and is a crucial resource for 30 Tribal Nations. Failure is not an option," said Deputy Secretary Tommy Beaudreau.

The SEIS process was initiated in October 2022. The release of the draft follows months of intensive discussions and collaborative work with the Basin states and water commissioners, the 30 Basin Tribes, water managers, farmers and irrigators, municipalities, and other stakeholders. The draft alternatives in the SEIS incorporate concepts from many models and proposals received during the scoping period, including from all seven Basin states.

The alternatives presented in the draft SEIS analyze measures that may be taken under Secretary of the Interior Deb Haaland's authorities to protect system operations in the face of unprecedented hydrologic conditions, while providing equitable water allocations to Lower Basin communities that rely on the Colorado River System.

The draft SEIS includes proposed alternatives to revise the December 2007 Record of Decision associated with the Colorado River Interim Guidelines. The 2007 Interim Guidelines provide operating criteria for Lake Powell and Lake Mead. These include provisions designed to provide a greater degree of certainty to water users about timing and volumes of potential water delivery reductions for the Lower Basin States, as well as additional operating flexibility to conserve and store water in the system.

The draft SEIS will be available for public comment for 45 calendar days and the final SEIS is anticipated to be available with a Record of Decision in Summer 2023. This document will inform the August 2023 decisions that will affect 2024 operations for Glen Canyon and Hoover Dams.

This proposal to address immediate water supply challenges complements Reclamation's ongoing process to develop new guidelines for Colorado River Operations when the current interim guidelines expire at the end of 2026.

Draft SEIS Alternatives

The draft SEIS analyzes three alternatives, which reflect input from the Basin states, cooperating agencies, Tribes and other interested parties, including comments submitted during the SEIS public scoping period, including two written proposals from the Basin states that informed the following alternatives considered in this draft SEIS:

- No Action Alternative: The No Action Alternative describes the consequences of continued implementation of existing agreements that control operations of Glen Canyon Dam and Hoover Dam, including under further deteriorating hydrologic conditions and reservoir elevations.
- Action Alternative 1: Action Alternative 1 models potential operational changes to both Glen Canyon Dam and Hoover Dam. Action Alternative 1 includes modeling for reduced releases from Glen Canyon Dam, as well as an analysis of the effects of additional Lower Colorado River Basin shortages based predominately on the priority of water rights. Action Alternative 1 models progressively larger additional shortages as Lake Mead's elevation declines, and larger additional shortages in 2025 and 2026, as compared with 2024. The total shortage contributions in 2024, including those under existing agreements, are limited to 2.083 million-acre-feet because this is the maximum volume analyzed in the 2007 Interim Guidelines final environmental impact statement.
- Action Alternative 2: Action Alternative 2 is similar to Action Alternative 1 in how it models potential operational changes to both Glen Canyon Dam and Hoover Dam. Action Alternative 2 includes modeling for reduced releases from Glen Canyon Dam, as well as an analysis of the effects of additional Lower Colorado River Basin reductions that are distributed in the same percentage across all Lower Basin water users under shortage conditions. While both the 2007 Interim Guidelines and the 2019 Drought Contingency Plan encompass shortages and contributions that reflect the priority system, the incremental, additional shortages identified in Action Alternative 2 for the remainder of the interim period would be distributed in the same percentage across all Lower Basin water users. Action Alternative 2 models progressively larger additional shortages as Lake Mead's elevation declines and models larger Lower Basin shortages in 2025 and 2026 as compared with 2024. The total shortage contributions in 2024, including those under existing agreements, are limited to 2.083 million-are-feet because this is the maximum volume analyzed in the 2007 Interim Guidelines FEIS.

Members of the public interested in providing input on the SEIS can do so through May 30, 2023, per instructions in the *Federal Register* that will be published on April 14, 2023.

FOR INFO https://www.usbr.gov/ColoradoRiverBasin/SEIS.html

CALENDAR

May 15 WEB

From Data to Decisions - Remote Sensing and Wetland Resilience Workshop, 1:00pm-4:30pm Eastern Time. Presented by Environmental Law Institute: Free (Registration by May 10th). For info: www.eli.org/events/data-decisions-remote-sensing-and-wetland-resilience

May 15-16 CA & WEB

Salton Sea Management Program's Phase 1 Plan - Public Workshop, Imperial. Imperial Valley Community College Main Lecture Hall (Room 2734). Held by the California State Water Resources Control Board; Remote Viewing Option. For info: https://www.waterboards.ca.gov/board_info/calendar/docs/2023/notice_ssmp_032023.pdf

May 16-17 TX

Environmental Trade Fair & Conference, Austin. Austin Convention Center. Presented by the Texas Commission on Environmental Quality; Agency Staff Leads Over 100 Courses & Discussions. For info: www.tceq.texas.gov/p2/events/etfc/etf.html

May 16-19 ID

2023 National Pretreatment Workshop, Boise. Grove Hotel. National Association of Clean Water Agencies (NACWA) Event. For info: www.nacwa.org/conferences-events/events/

May 17-19 CA

Bay Delta Water Tour, Sacramento. Tour Travels into the Sacramento-San Joaquin Delta. Presented by Water Education Foundation. For info: www.watereducation.org/tour/bay-delta-tour-2023

May 18-19 AZ

Law of the Colorado River: The Next Century of River Policy - 23rd Annual Conference, Scottsdale. Hilton Hotel. For info: CLE International: 800/ 873-7130 or www.cle.com

May 19 AZ & WEB

Annual Water Utility Leadership Forum - Northern Arizona Municipal Water Users Association (NAMWUA), Flagstaff. High Country Conference Center; Hybrid: In-Person & Virtual Event. Colorado River Projections, Permit Compliance & Reporting Tips. For info: https://namwua.org/water-utilites-leadership-forum

May 21-25 NV

2023 World Environmental & Water Congress Conference, Henderson. Green Valley Ranch Resort Spa and Casino. RE: "Adaptive Planning and Design in an Age of Risk and Uncertainty". For info: www.ewricongress.org

May 22-24 NV

Western States Water Council 2023 Spring (201st) Meetings, Reno. Peppermill Resort Spa Casino. Field Trip 5/22; Meetings 5/23-5/24. For info: https://westernstateswater.org/upcoming-meetings/

May 23 UT

2023 Utah Water Conservation Forum Spring Conference, West Jordan. Conservation Garden Park. RE: Water Conservation Strategies; Tech Comparisons; Ordinances & Standards. For info: www.utahwaterconservationforum.org/

May 23-24 PA

2023 Choose Clean Water Conference, Harrisburg. Hilton Harrisburg. RE: Chesapeake Bay Watershed Efforts. For info: www.choosecleanwater.org

May 23-26 HI

Hawai'i Rural Water Association Training & Technical Conference, Big Island. King Kamehameha's Kona Beach Hotel. RE: Emerging Contaminants, Water & Wastewater Technical Training. For info: www.hrwa.net/hrwa-conference.html

May 24-25 WEB

Long-Term Ecosystem Restoration - Virtual Event, Live Interactive Online Broadcast. For info: Law Seminars Int'l, 206/ 567-4490, registrar@lawseminars.com or www.lawseminars.com

May 31-June 2 ME

Association of Environmental & Resource Economists - Annual Summer Conference, Portland. Holiday Inn by the Bay. For info: www.aere.org/aere-summer-conference

June 1 OR

Immerse 2023: 40 Years to Remember, A Future to Impact - The Freshwater Trust's Celebration, Portland. Castaway Portland; 6:00pm-9:00pm Pacific Time. TFT's 40th Anniversary. For info: www.thefreshwatertrust.org

June 1 WA

Contaminated Properties in the Northwest Conference, Seattle. Courtyard Seattle Downtown/Lake Union. In-Person & Live Webcast. For info: The Seminar Group: 206/ 463-4400, info@theseminargroup.net or www.theseminargroup.net

June 5-8 OR

Eighth Interagency Conference on Research in the Watersheds, Corvallis. LaSells Stewart Center: Oregon State University. Conference & Field Trips. For info: www.ICRWatersheds.org; Krista Jones, USGS, kljones@usgs.gov

June 6 OR

Northwest Toxics Summit: Monitoring, Reducing, Preventing, Educating & Engaging, Portland. Miller Hall - World Forestry Center. For info: Environmental Law Education Center, info@elecenter.com or www.elecenter.com

June 6-7 TX

Texas Groundwater Conference: "Everything Aquifers & Groundwater Management", Austin. Norris Conference Center. Presented by American Ground Water Trust. For info: https://agwt.org/Events

June 6-7 NM

"STRATCOMM: H2O" - 2023 Strategic Water Communications Workshop, Santa Fe. Hilton Santa Fe Historic Plaza. National Association of Clean Water Agencies (NACWA) Event. For info: www.nacwa.org/conferences-events/events/

June 7-8 WEB

Water Law in Washington Seminar, Live Interactive Online Broadcast. For info: Law Seminars Int'l, 206/ 567-4490, registrar@lawseminars.com or www.lawseminars.com

June 7-8 CA

Sustainable Groundwater Management Act (SGMA) Implementation Summit & Workshop, Sacramento. Kimpton Sawyer Hotel. Presented by the Groundwater Resources Assoc. of California & the Assoc. of California Water Agencies. For info: https://www.grac.org/events/492/

June 8 WEB

Clean Water, Complicated Laws: Water Quality Trading & Stormwater In-Lieu Fees - 2023 Water Quality Webinar Series, Free Webinar on Water Quality Issues, Laws & Regulations; 10:00-10:30am Pacific Time. Presented by Best, Best & Krieger. For info: https://bbklaw.com/news-events/webinars/Clean Water

June 8-9 CO

Crisis on the Colorado River: From Short-Term Solutions to Long-Term Sustainability - 43rd Annual Colorado Law Conference on Natural Resources, Boulder. University of Colorado School of Law (Wittemyer Courtroom). Presented by the Getches-Wilkinson Center and the Water & Tribes Initiative. For info: www.getches-wilkinsoncenter.cu.law/Events

June 9-10 WEB

Groundwater Resources Assoc. of California Annual GSA Summit, Virtual Event. For info: https://acwa.com/events/gras-annual-gsa-summit/

June 11-13 ID

Water Law and Resource Issues Seminar, Sun Valley. Presented by the Idaho Water Users Association. For info: www.iwua.org/events

The Water Report
Water Rights, Water Quality & Water Solutions in the West
3615 W. Hills of Gold Dr. Tucson, AZ 85745

CALENDAR

June 11-14 **Canada**

ACE 23: The World's Premier Water Conference, Toronto. Enercare Centre, Beanfield Centre & Headquarter Hotel. Presented by American Water Works Association; Long-Term Vision of the Future of Water - Chart a Course for a Sustainable Water Sector. For info: www.awwa.org/ace

June 13-15 **CO**

Universities Council on Water Resources (UCOWR) Annual Conference, Fort Collins. Colorado State University. Critical Water Issues Facing the Western US, the Continent & Globe. For info: https://ucowr.org/conference/

June 13 **WEB**

Endangered Species Year in Review & Update, Vitual Event. Join the Endangered Species Committee for Review Panel Update. For info: https://www.americanbar.org/groups/environment_energy_resources/events_cle/