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THE BUSINESS CASE FOR INVESTING IN WATER IN OREGON

A STATEWIDE ASSESSMENT OF THE ECONOMIC VALUE OF WATER

by Davíd Pilz J.D. and Sarah Kruse, Ph.D., AMP Insights (Portland, OR)

Introduction

Oregon released a 100-year Water Vision report (Vision) in 2020, at the heart of which was ensuring sufficient water for Oregon's people, economy, and environment now and for future generations. The report also promoted strategic investment in infrastructure and ecosystems to support resilient communities, vibrant local economies, and a healthy environment. Following the release of the Vision — and to further the goals of the Vision — in 2021, the Oregon Legislature appropriated funds for the Oregon Water Resources Department (OWRD) to contract for a statewide business case assessment to examine the economic value of water to Oregon.

AMP Insights, along with One Water Econ and Robert Raucher, Ph.D. (Raucher LLC), were awarded the contract for developing the business case assessment in the spring of 2023; the report was completed on June 30, 2023. This article summarizes the full report: *The Business Case for Investing in Water in Oregon* (the Business Case). The authors would like to acknowledge the work of our collaborators on this project — One Water Econ and Raucher LLC — who contributed substantial research and writing to the effort along with deep expertise and help with the overall approach and conceptual strategy of the work.

Background

Beginning with Indigenous cultures since time immemorial, Oregon's land, people, and environment have always been deeply connected to water. The objective of the Business Case is to highlight the critical value of water to Oregon and clearly articulate the case for making and sustaining investments to protect and manage Oregon's water assets.

Applying a business case perspective provides an objective approach for assessing the beneficial returns that potential water investments might generate and how those benefits are likely to be distributed across Oregon's people, regions, economic sectors, and ecosystems. The goal is to identify options with high returns on investment while recognizing that many returns are not monetary. The Business Case is in large part based on economic considerations but is not constrained by that frame of reference. Compelling reasons to invest in water in Oregon are diverse and include many non-monetary benefits such as spiritual and aesthetic values for water.

The Business Case begins with the risks Oregon faces in maintaining and equitably distributing access to clean, abundant, reliable water supplies as well as the opportunities and benefits of doing so. In Oregon, climate- and human-related stressors manifest in numerous ways. First, most of Oregon's streams and rivers are fully or over-appropriated, and groundwater is not a viable alternative for new water uses in many parts of the state. Another growing water stress for the state is impairment of water quality. A recent study estimated that over 80% of assessed river and stream miles in Oregon were impaired for aquatic life and almost 60% were impaired for recreational uses such as swimming (Environmental Integrity Project 2022).

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Aside from physical stressors related to climate and hydrology, historic and persistent inequities in access to clean, plentiful water and influence over water decision-making also have implications for Oregon's water future. Oregon's Tribes, rural populations, lower-income populations, and populations of color are often exposed to greater water risks, including: lack of access to water and culturally/spiritually important aquatic species that rely on water; unsafe drinking water; and a lack of affordable domestic water supply.

While risk is one part of the business case for water in Oregon, another part is the benefits and opportunities that investing in water affords. Water provides an array of essential and highly valuable services to Oregon's natural and human communities (Figure 1).

Figure 1. Examples of Use Benefits Derived from Water Resources

Oregon's Water Use Context

After describing the drivers for articulating the Business Case, the report describes the various uses and economic values associated with water resources across Oregon. To streamline the Business Case analysis, the project team divided the state into seven regions made up of county groupings (Figure 2). County groupings were used rather than watershed delineations due to the limited timeframe the project team had to complete the report.

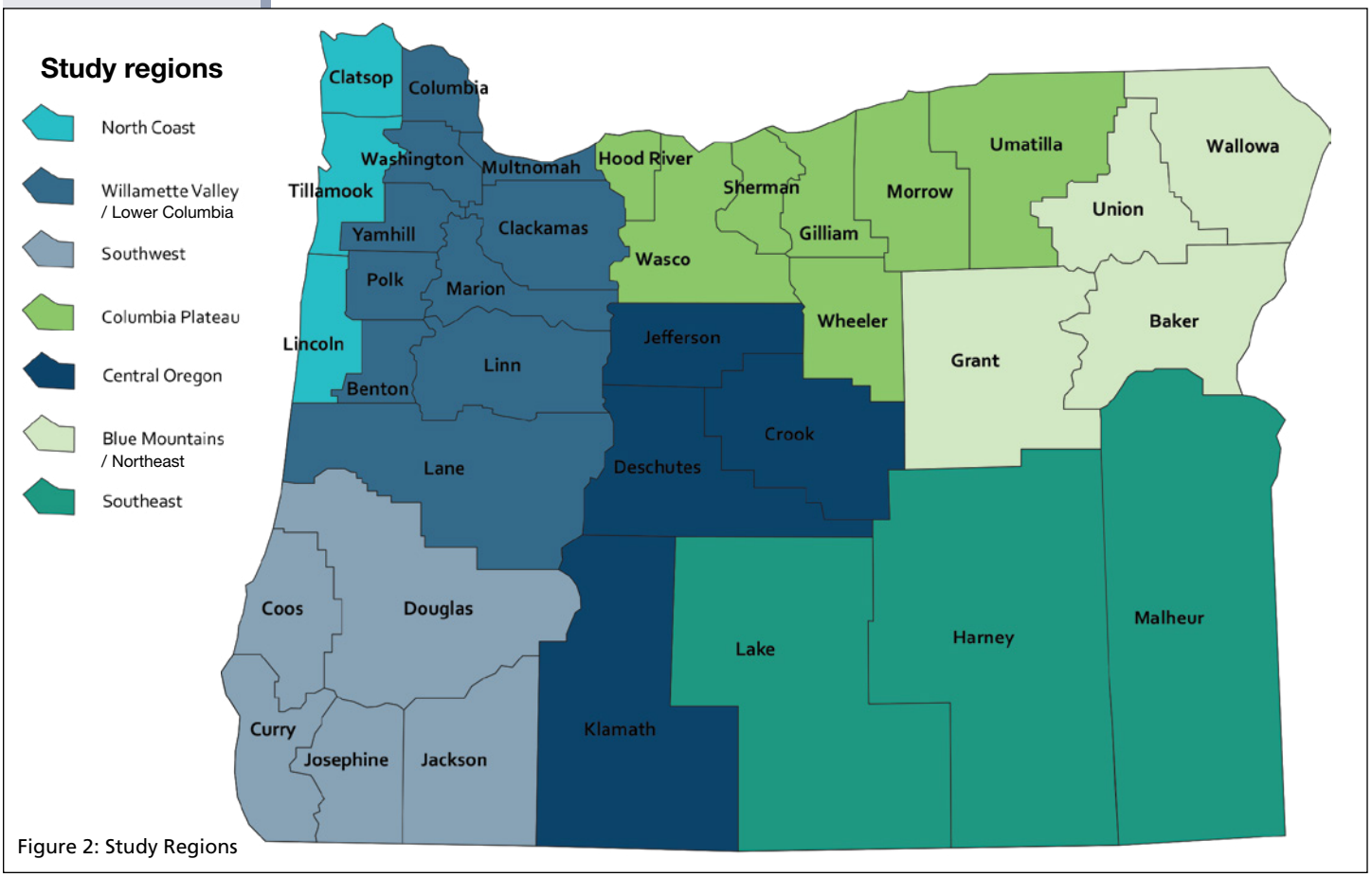

Figure 2: Study Regions

Business Case

Across the state, approximately 78% of total water withdrawals are from surface water sources, while 22% come from groundwater; of the water withdrawn, 78% is used for irrigation (USGS 2023). The balance of water use between irrigation and other uses varies across different regions of the state; in many coastal regions and valleys on the west side of the Cascade Mountains, irrigation is a significant water use sector but to a lesser magnitude than in the drier portion of the state east of the Cascades.

Economic Output

From the data analyzed in the report, a conservative estimate is that businesses that depend on water for production and output in Oregon (including agriculture) contribute approximately half (48%) of the state's total economic output and close to half (44%) of its employment. This estimate is conservative due to differences in how output in these sectors is calculated and differences in available data sources. In addition, to avoid risk of double counting some sectors, the estimate does not include economic contributions from recreation, commercial fishing, hydroelectric power generation, or thermoelectric power generation. The following sub-sections of the Business Case discuss key water-related sectors using both statewide and regional data.

Irrigation Crops

AGRICULTURE

Irrigated agriculture accounts for approximately 80% of the total water use in Oregon (USGS 2020; NOAA 2022). Across the state, 45% of harvested cropland is irrigated, totaling more than 1.3 **m**illion (M) acres (USDA NASS 2017). An additional 338,900 acres of pastureland is also irrigated, although this makes up a very small percentage of the 10.5M total acres of pastureland across the state.

According to the most recent National Agricultural Statistics Service (NASS) Census of Agriculture (CoA), conducted in 2017, forage crops make up the largest percentage of irrigated acreage at 55% and vegetables, grains, and field and grass seed together account for an additional 27%. The makeup of irrigated acreage varies across regions (Figure 3). The Willamette Valley/Lower Columbia and the Columbia Plateau regions both contain a more varied crop mix and are home to many of Oregon's specialty and high-value crops, including orchards (grapes and fruits), vegetables, and field and grass seed. The Willamette Valley/Lower Columbia region is also home to much of the state's irrigated hops, mint, and berry acreage. The Southwest region, while containing substantially fewer irrigated acres overall, also grows berries and orchard crops. In the other regions of the state, irrigated acreage is largely dominated by forage, hay, and grain crops.

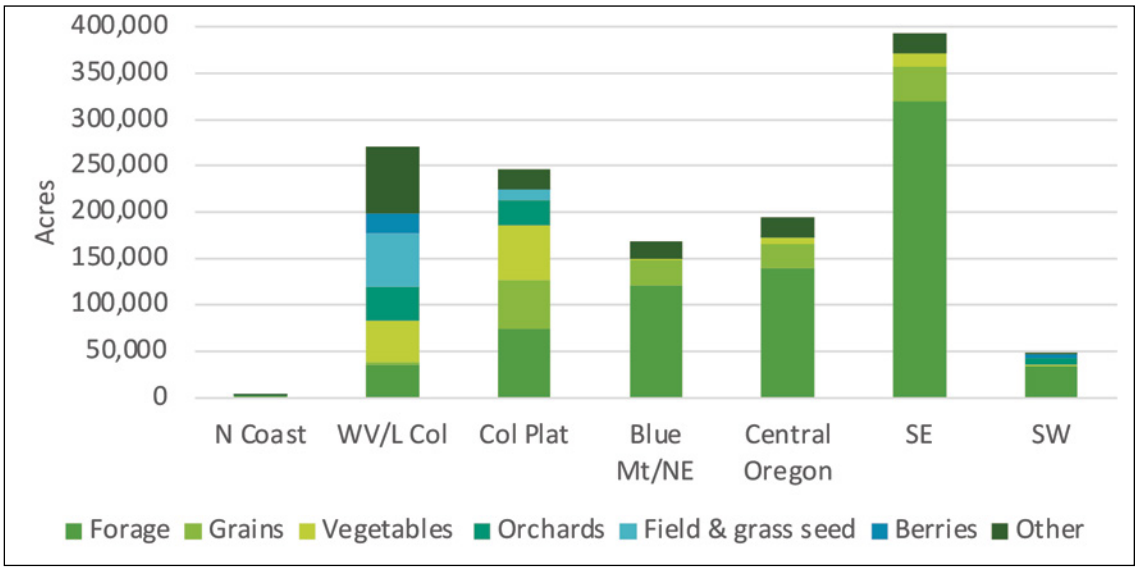

Figure 3. Irrigated Acres by Crop Type and Study Region Source: USDA NASS 2017.

Economic Contributions

NASS CoA data on the value and irrigation of various crops throughout the state was used to estimate the direct value of irrigated agriculture as a percentage of total cropped agricultural production. IMPLAN was then used to modeling the overall economic contribution of irrigated agriculture to Oregon's economy. IMPLAN is a modeling software that quantifies the direct economic activity associated with different sectors in terms of economic output (e.g., total sales), employment, value added (or **g**ross **d**omestic **p**roduct (GDP)), and labor income. It also estimates the economic activity generated by the purchase of intermediate inputs from different sectors (indirect effects) and by spending from individuals employed in affected sectors (induced effects). Table 1 shows the total economic contribution of irrigated agriculture across the state, including direct, indirect, and induced effects.

Business Case

Impact Type	Employment	Labor Income ($M)	Value Added ($M)	Output ($M)
Direct	42,964	$1,494	$1,682	$3,763
Indirect	12,621	$787	$1,041	$1,792
Induced	10,259	$622	$1,077	$1,813
Total - Irrigated Ag	65,844	$2,903	$3,800	$7,368
Irrigated Ag as a % of State Total	2.6%	1.6%	1.4%	1.5%

Table 1. Economic Contribution of Irrigated Agriculture to Oregon's Economy

Source: IMPLAN. Value Added is equivalent to GDP. It includes labor income, taxes and subsidies, and other property income.

Ag Impact

On its own, irrigated agriculture accounts for a relatively small percentage of the state's GDP, equivalent to Value Added in IMPLAN, and total economic output. However, the role of irrigated agriculture in supporting food security for Oregon's residents cannot be understated. According to data from the IMPLAN model, fruits grown in Oregon meet 34% of total demand from businesses and residents in the state, while vegetable and nut production meet 57% and 48% of total demand, respectively. Irrigated agriculture has important forward linkages too, supporting many other industries throughout the state, including wineries and associated tourism activities, breweries, cattle ranching and farming, dairy cattle and milk production, and fruit farms and related specialty products for which Oregon is famous.

Industry Output

WATER-DEPENDENT INDUSTRIES

Water-dependent industries such as manufacturing, health care, and wineries rely heavily on water for key aspects of production. In Oregon, manufacturing is by far the largest economic contributor and employer, with an annual economic output of $89 billion, accounting for 18% of the total state output and 62% of output from only water-dependent industries. Health care services such as hospitals, physicians' offices, and nursing homes contribute $39 billion to the state's economy annually (or approximately 8% and 21% of total output and water-dependent industries output, respectively). Manufacturing and health care services collectively employ over 400,000 people, making up about 16% of the state's total workforce.

Beyond direct economic contribution, water-dependent businesses create additional economic activity in the form of indirect and induced spending. Together, these industries support $221 billion in economic output (46% of the state's total) and $111 billion in total value added (40% of the state's total), supporting just over 1 million jobs (41% of the state's total).

Use Values

FRESHWATER-RELATED RECREATION AND TOURISM

Oregon's diverse geography and ecology create opportunities for a range of outdoor recreation activities including hiking, boating, swimming, fishing, camping, skiing. The state's clean and abundant water sources — including its lakes, rivers, and streams — underpin the values and economic activity associated with many outdoor recreational activities. The inherent value that individuals place on outdoor recreational activities can be difficult to measure, however. Economists have developed non-market valuation techniques to estimate the value of recreational experiences across a range of activities. These studies yield what economists refer to as direct use values, which reflect the maximum amount that individuals would be willing to pay to participate in a recreational activity. The net economic value of a recreation activity equals maximum willingness-to-pay minus any costs incurred to participate. Applying this methodology to a statewide survey of participation in outdoor recreational activities, Rosenberger (2018) estimated that in 2017, Oregonians participated in 1.4 billion outdoor recreation activity days, with a total net economic value of $63 billion.

Direct Revenues

COMMERCIAL SALMON FISHING

The coastal waters off Oregon's shores support vibrant fisheries and fishing communities. Among the iconic commercial fisheries are six runs of anadromous salmonids: Coho, Chinook, Chum, Pink, and Sockeye salmon and steelhead trout. In 2021, Oregon's fishing fleet landed close to 1.8M pounds of salmon, producing more than $6 million in revenue (NOAA Fisheries 2021). Salmon fishing accounted for just over 3% of direct revenues (or ex-vessel sales) from onshore landings along the coast in 2021. Based on data from the IMPLAN model, the salmon fishery supported an estimated 151 direct jobs and over $5 million in labor income (including proprietor income). The employment and labor incomes were

Business Case

estimated based on industry patterns for the commercial fishing sector. The direct economic activity associated with salmon fishing — $24 million — is concentrated in the coastal regions of the state, and in particular, the North Coast region, which is responsible for 89% of total onshore landings across its five ports (ECONorthwest 2019).

Energy

HYDROPOWER

Oregon's rivers provide the state with an immense amount of hydropower. Oregon is the second-largest producer of hydroelectric power in the United States after Washington. In recent years, approximately half of Oregon's electricity generation has come from over 100 hydroelectric facilities located within the state or on its shared borders with Washington and Idaho. This energy has two primary economic signatures; first, and most importantly, it powers homes, businesses, and industries across the state, contributing to statewide and regional economic productivity. Second, hydropower is an industry, with revenues and employment levels that also contribute to the state's economic well-being. The hydropower industry in Oregon employs approximately 1,500 people across the state (Oregon Department of Energy 2022).

Gas Fired Facilities

THERMOELECTRIC POWER GENERATION

Compared to the number of hydroelectric generating facilities, Oregon has relatively few thermoelectric generation stations. There are 13 natural gas–fired facilities, several with multiple generating units, located within the state (Northwest Power and Conservation Council (NPCC) 2023). These plants rely on consistent supplies of fresh water for cooling and steam generation. Water withdrawals from rivers, as well as discharges of heated water by these facilities, can have adverse effects on aquatic fish and habitat (Mehaffey, Neale, and Horvath 2017). Despite their small numbers, thermoelectric generating facilities produced approximately 20M **m**ega**w**att **h**ours (MWh) in 2020, or about 30% of the electricity generated within the state. Oregon power producers also exported approximately 7.5M MWh of natural gas–generated electricity in 2020 (Oregon Department of Energy 2022). In addition, the state's thermoelectric facilities are important contributors to the state and regional economies. In 2022, natural gas–fired power plants directly employed nearly 500 Oregonians, with most of these positions concentrated in the Willamette Valley/Lower Columbia and Plateau regions.

Small v. Large Water Providers

POTABLE WATER SUPPLY

Understanding water use by households and businesses for drinking water and sanitation purposes, as well as the water systems that provide these services, was critical to making the Business Case. Very small public water systems (i.e., those providing water to fewer than 500 people) serve 12%–16% of the population in all regions. The Willamette Valley/Lower Columbia region leans on large and very large systems (i.e., those providing water to over 10,000 and over 100,000 people, respectively) to serve water to 86% of the population. Most of the population in the Blue Mountains/NE, Columbia Plateau, North Coast, and Southeast regions get their water from systems that serve under 10,000 people (EPA 2023).

Relative dependence on public water systems vs. domestic self-suppliers varies across the state. Self-supply is most often from groundwater. The Willamette Valley/Lower Columbia region, with its large population and large and very large water systems is one of the least dependent on domestic self-supply (12%), along with the North Coast region (9%). On the other end of the spectrum, regions such as the Southeast (38%), Blue Mountains/NE (28%), and Southwest (28%) are more dependent on domestic self-supply and, thus, groundwater (USGS 2018).

Additional Benefits

OTHER WATER VALUES

In addition to the sectors described above, there are numerous other benefits of water that either 1) do not fall neatly into a single industry sector (e.g., golf courses, navigation, and transport); 2) represent only a portion of an industry sector (e.g., freshwater aquaculture); or 3) require non-market valuation approaches to estimate (e.g., spiritual, aesthetic and symbolic values, and ecological function values). While not discussed in additional detail here, these benefits are covered in the full report.

Water and Oregon Tribes

Frontline Communities

After presenting the baseline value of water for Oregon as a whole, the Business Case shifts to a discussion of the value of water specifically to Oregon's Indigenous people. The borders of modern-day Oregon are home to nine federally recognized Tribes as well as several Tribes that are not recognized by the US government. Water takes on a special importance for the Indigenous people who live in Oregon because of the implications water has for their culture and their spiritual, economic, and subsistence

Business Case

needs. Tribal communities are also often frontline communities in Oregon, meaning that they experience impacts from degradation of water resources first and worst. It is impossible to make the business case for investing in water in Oregon without recognizing Tribal sovereignty and the imperative of co-managing water resources that sovereignty implies.

Water Relationship

Water is an essential and integrated part of life for Oregon Tribes and has been forever — it is deeply woven into Tribal culture, spirituality, society, identity, and the nourishment of homelands. Broadly speaking, the relationship between Oregon's Indigenous people and water goes beyond viewing water as a resource for human use. It is rooted in stewardship, community, and reverence. Additionally, the culture, health, and well-being of many Indigenous communities in Oregon are integrally tied to salmon; therefore, declining salmon populations directly endanger the health and vitality of these communities.

In September 2021, Oregon's nine federally recognized Tribes signed a joint letter to then-Governor Kate Brown that articulated the extent and importance of Tribal connections to water in Oregon. In their words:

> "Water is sacred. Water is life. Water is the heartbeat of our culture. Our understanding of these truths is based upon a legacy of survival and reliance on our Oregon oceans, rivers, and lakes... Our tribes and their fisheries lived together before Oregon existed. Our ancestors understood that they had to live in a balanced relationship with oceans, rivers, creeks, lakes, springs, marshes, and the flora and fauna that depend upon them. There was, and is, no other way to survive." (The Nine Sovereign Tribes of Oregon 2021)

Connection

The Oregon Tribes also detailed how deep their connection is, and has always been, with steelhead, salmon, lamprey, suckers, and other species:

> "*The extinction of these vital fisheries would equate to the genocide of our people* and the end of our irreplaceable lifeways — because these resources form essential parts of who we are" [emphasis added]. (The Nine Sovereign Tribes of Oregon 2021)

Subsistence

Indigenous communities living in Oregon face the same water-related risks as all Oregonians, but due to the relationship of Tribal history, culture, and health with water resources and aquatic species, these risks take on special urgency. The Fourth National Climate Assessment (Reidmiller et al. 2018) noted that a changing climate "threatens these delicately balanced subsistence networks by, for example, changing the patterns of seasonal timing and availability of culturally important species in traditional hunting, gathering, and fishing areas" (Jantarasami et al. 2018). With this in mind, the Business Case discusses the approaches of two Oregon tribes — the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Confederated Tribes of the Warm Springs (CTWS) — to valuing and managing water and aquatic species. CTUIR's approach is highlighted here.

CTUIR FIRST FOODS

CTUIR explains their view and connection to water on their website, describing that:

> "Water was created first, life and land were created next, land promised to take care of all life, all life promised to take care of the land. Across generations of the CTUIR, Indigenous people promised to... protect the land and have the responsibility to care for her. Water represents an integral link in a world view where water is sacred and extremely important in preserving precious balance. Water is the origin of and essential for the survival of all life." (CTUIR n.d.)

First Foods

In the CTUIR creation belief, the Creator spoke to the foods, asking, "Who will take care of the Indian people?" Salmon stepped forward first with a promise of care, followed by other fish. Then deer, cous (a type of root), and huckleberry stepped forward. Each of these "First Foods" are grouped with other ecologically related foods, and the order in which they stepped forward forms the basis of the ceremonial and ritualistic serving order of meals (Jones et al. 2008).

Robust Watershed

For CTUIR, the long-term protection of water relies on an ecologically healthy and robust watershed, beginning with the Umatilla River that runs through the Tribe's reservation. From the perspective of the river, a dynamic and healthy watershed is rooted in ecological processes and patterns that support enduring production and utilization of First Foods by the CTUIR community (Endress, Quaempts, and Steinmetz 2019). Reliable availability of First Foods — beginning with water and salmon — contributes to the continuation of Tribal ceremonies, knowledge, and traditions that support the physical, mental, spiritual, and relational health of Tribal members. On the other hand, a degraded river leads to loss and decreasing

Business Case

production and availability of First Foods. A reduction in practices around First Foods is linked to a wider and more severe array of health issues for Tribal and community members (Jones et al. 2008).

Therefore, the CTUIR Department of Natural Resources established a mission focused on caring for the minimum ecological products necessary to nourish CTUIR subsistence and cultural needs (Endress, Quaempts, and Steinmetz 2019). The mission has a long-term goal of restoring a network of related foods to continue community expressions of First Foods traditions, provide a diverse table setting of native foods for the Tribal community, and restore First Foods for their respectful use now and into the future (Jones et al. 2008).

Tribal Water Rights in Oregon

After discussing Tribal approaches to water management, the Business Case briefly discusses the status of tribal water rights in Oregon; specifically, the report summarizes the status of water rights for the CTUIR, CTWS, and the Klamath Tribes.

CTUIR WATER RIGHTS

Losses

Between 1906 and 1927 the Bureau of Reclamation (Reclamation) built the Umatilla Basin Project — a series of reservoirs and canal systems — to help provide water for irrigation in and around the towns of Pendleton, Hermiston, and the Port of Morrow (Guaio 2012). The project, combined with increased water use by irrigation and industry in the area, decimated the Umatilla River's Chinook and Coho salmon runs. By 1926, experts observed that the two fish had been extirpated from the river (Guaio 2012). Speaking of this loss, and others, Antone Minthorn, a CTUIR member, noted:

> "The CTUIR lost a tremendous amount of resources and culture from the time of Lewis and Clark in 1804 and the 1855 Treaty signing, but we can never go backward to make things right. That is done. It is over. The only way we are going to recover what we have lost of our original reservation promise is to move forward using the sovereign powers we have retained. We have to learn how to use our sovereign powers to rebuild our nation and take our place in this world." (Minthorn 2006)

Water Exchange

CTUIR applied this same approach to their water rights in the Umatilla Basin, working with area irrigation districts, the State of Oregon, and the federal government in the 1980s and 1990s to develop what are now called the Umatilla Basin Project Phases I and II. These projects were a massive investment in instream flow restoration and irrigation infrastructure to allow for reintroduction of salmon in the Umatilla River. They involve two water exchanges whereby farms that formerly diverted from (and, thus, dewatered) the Umatilla River for irrigation are provided with water pumped from the nearby Columbia River in exchange for letting water flow in the Umatilla to its confluence with the Columbia (Pagel 2016). The result of the exchanges has been a successful restoration of a productive salmon fishery in the Umatilla River (Pagel 2016). Despite the success of these projects, CTUIR does not yet have settled water rights.

Unsettled Rights

In 2011, the federal government appointed a team to negotiate with CTUIR, Oregon, and others to settle CTUIR's water rights in the basin. CTUIR is entitled to reserved water rights sufficient to fulfill the purposes of their reservation including reserved rights to support fish populations (CTUIR 2020). The negotiations are ongoing as of the writing of this article (September 2023).

CTWS WATER RIGHTS

Negotiations

The Warm Springs Tribes settled their water rights in the mid-1990s. CTWS had several advantages in negotiating their water rights settlement compared to many other Tribes in the western US. For example, all of the rivers that begin on the reservation also end within the reservation's boundaries; other aspects, such as CTWS's location, geography, hydrology, and land ownership, also made negotiating their water rights less likely to conflict with other water users in the watershed (Guaio 2012).

Cooperative Management

The CTWS along with the State of Oregon and the US government agreed to a settlement of the Tribe's water rights in 1997 (Brunoe, Newton, and Seales 2023). An important focus of the agreement was cooperative management of the Deschutes River and its tributaries for long-term protection of fisheries. A unique facet of the CTWS water rights settlement is that the Tribe agreed that, while the priority date for their reserved water rights would be the earliest in the basin, existing state water rights with a priority prior to January 15, 1991 would not be curtailed to satisfy the Tribal reserved right (Guaio 2012). The Tribe also negotiated the ability to be the sole administrators of their reserved rights on the reservation and to have authority over state water rights on the reservation (Guaio 2012).

Business Case

US v. Adair

Adjudication

Investment Analysis

Goals & Approach

Beneficial Outcomes

TRIBES WATER RIGHTS

The story of the Klamath Tribes' water rights began with an 1864 treaty in which the Tribes gave up their interest in their 22-million-acre homeland to the US government but reserved "the exclusive right of taking fish in the streams and lakes (of the Reservation)..." (Sudbury 2004). More than 100 years later, in 1979, after many of the fish populations on which the Klamath Tribes traditionally depend were in steep decline, a federal District Court in Oregon ruled that the Klamath Tribes' treaty guaranteed an implied right to protect their hunting and fishing rights with a priority date of time immemorial (*United States v. Adair* 1979).

After almost four decades and numerous additional court cases, in 2013 the Klamath Tribes were finally able to enforce their water rights to protect fish in Klamath Basin rivers and streams (Sudbury 2004). The Klamath Tribes hold instream water rights in the Williamson, Sycan, Sprague, and Wood Rivers along with the Klamath Marsh and 140 springs located in the former Klamath Reservation (Native American Rights Fund n.d.). As of this writing (September 2023), the Klamath Tribes' water rights are moving through the final stages of the state adjudication process — a court-led process for finalizing all valid water right claims in a watershed or basin.

Business Case Examples

The next element of the Business Case is a series of regional case studies. Case studies were used to analyze a diverse range of types of investments across each region of the state. Case studies involved specific past or planned investments as well as a general characterization of the value of instream flow in the Southwestern region. These analyses use a combination of quantitative economic analysis and qualitative discussion to weigh costs and benefits of specific investments. Lessons drawn from these case studies provide the platform through which the Business Case demonstrates potential returns — both economic and non-economic — from investing in Oregon's water assets. An example case study from the Business Case, located in the Blue Mountains/Northeast region, is presented here.

BLUE MOUNTAINS/NORTHEAST REGIONAL CASE STUDY: ON-FARM CONSERVATION AND ENVIRONMENTAL WATER TRANSACTIONS IN THE LOSTINE RIVER WATERSHED

The Lostine River begins in the high mountains of the Eagle Cap Wilderness and flows into the Wallowa River near the town of Lostine (Figure 4). The Wallowa River is a tributary of the Grande Ronde River, itself a tributary of the Snake River. The wide valley into which the Lostine River flows is part of the ancestral homelands of the Nez Perce Tribe and the CTUIR. Though Wallowa County is not part of either Tribe's current reservation, both Tribes reserved the right to hunt and fish there (among other lands) as part of treaties signed in the mid-1800s.

This case study describes two types of investments to increase instream flow in the Lostine River while also helping maintain agricultural viability: **e**nvironmental **w**ater **t**ransactions (EWTs); and irrigation infrastructure modernization on family farms. In turn, these investments support and increase the resiliency of a vital Tribal fishery and recovery of Chinook salmon — listed under the Endangered Species Act (ESA) — and reintroduced Coho salmon populations. Given that many of the beneficial outcomes of these investments are non-market or non-use in nature, the case study provides a quantified business case example only for investments in irrigation efficiency upgrades as this particular investment also provides monetizable on-farm benefits.

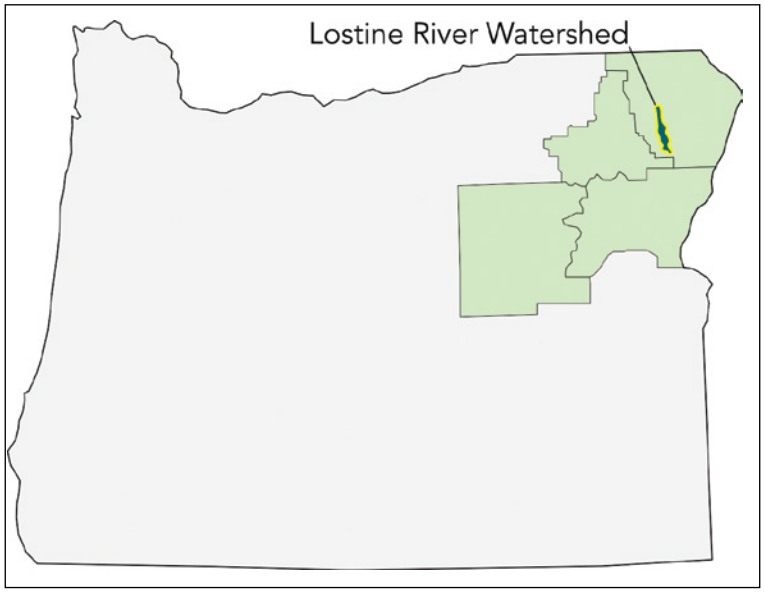

Figure 4: Map of Lostine River Watershed Location

Business Case

Seasonal Demands

Dewatering

Minimum Flows

Compensation

CHALLENGE

The Lostine River provides critical spawning and rearing habitat for spring and fall Snake River Chinook salmon (listed as threatened under ESA), recently reintroduced Coho salmon, steelhead, and bull trout. Salmon hold deep cultural importance for the Nez Perce and CTUIR and have been a primary source of food supply since time immemorial. Chinook salmon exhibit a unique migration pattern on the Lostine. The fish return in two pulses, with the second pulse of returning fish occurring in late August and lasting through the end of September. This migration of Chinook salmon coincides with low late-summer stream flow in the Lostine River. The period is also a time of year when local farms and ranches rely most heavily on the river for water for irrigated agriculture.

Since the late 1800s, water from the Lostine River has been used to irrigate farms growing mostly hay and alfalfa as well as small grains. Diversions from the river can completely dewater the river just above the town of Lostine, making upstream passage to the Lostine River's ideal spawning habitat difficult or impossible for returning adult salmon. Low flows, coupled with changing ocean conditions, the presence of dams on the Snake and Columbia Rivers, and other alterations on the Lostine River, resulted in the disappearance of Coho salmon from the river and severely impacted the spring Chinook salmon population (NOAA 2020). The Nez Perce and the state of Oregon manage a hatchery supplementation program for Chinook salmon on the river, and recently worked with CTUIR to successfully reintroduce Coho salmon.

Water in the Lostine River is in high demand for both farms and fish and has significant economic and cultural value. The challenge for the region is keeping the agricultural heritage and economy of the region whole while better providing for the needs of ESA-listed Chinook salmon, reintroduced Coho salmon, and the cultural and sustaining role these species play for the region's Indigenous Tribes.

INVESTMENTS

While the business case is quantified only for the on-farm irrigation infrastructure modernization investments, investments in EWTs are also described in detail to provide a point of comparison for assessing cost-effectiveness of public investments.

Environmental Water Transactions

Starting in 2005, a unique, voluntary, and cooperative effort was started by the Oregon Water Trust — working with local partners including the Nez Perce — to increase instream flows in the Lostine River during the late summer through an innovative environmental water transaction. Funded by the Columbia Basin Water Transactions Program with money from Bonneville Power Administration, the Oregon Water Trust initiated an agreement with approximately one hundred local landowners organized into five irrigation companies. The agreement provides a minimum flow in the Lostine River of 15 **c**ubic **f**eet per **s**econd (cfs) from mid-August through September. This was accomplished by the five irrigation companies reducing and otherwise managing their diversions to ensure that at least 15 cfs and up to 20 cfs stayed in the river through a reach that was once dry.

The terms of the agreement evolved over time, but for several years settled on a payment of $164,000 per year if the minimum flow was met during the defined late-summer period. A lump sum payment was made each year by the Oregon Water Trust — later The Freshwater Trust and then Trout Unlimited — to the irrigation ditch companies in proportion to the number of participating acres within each company. Payments were then made to individual landowners by the ditch companies on a per-acre basis. Approximately 4,000 acres were enrolled each year. This innovative and successful long-term agreement laid the groundwork for subsequent investments to further increase instream flow in the Lostine River, thereby ensuring that Chinook salmon, and now Coho salmon, can reach their spawning grounds in the late summer.

Irrigation Infrastructure Modernization

Building on the success of the Lostine River minimum flow agreement, in 2016, the Wolfe Ranch — a multi-generational family farm that diverts and uses water from the Lostine River — worked with The Freshwater Trust and other partners to upgrade to center pivot irrigation on several parcels of land. This project was followed by two additional, similar projects. The benefits of these investments are increased on-farm productivity and increased instream flow in the Lostine River to support fish.

ANALYSIS

The business case illustration focuses on the economic costs and benefits of investing in on-farm irrigation infrastructure modernization. The benefits of environmental water transactions are discussed qualitatively but are not directly quantified.

Business Case

Costs

No-Action Alternative

The no-action alternative is for farms to continue their current on-farm irrigation practices with no upgrades. While this no-action alternative does not have an investment cost, there are economic costs associated with not investing. The costs of not investing include inability to realize the benefits the investment: additional water permanently conserved instream, increased hay yields (and associated revenue), and increased value for irrigated acreage. The cost then, is the lost opportunity for greater productivity, revenue, and property value.

Project Examples

Irrigation Infrastructure Modernization

To date, investments have been made in three irrigation efficiency projects on farms that divert water for irrigation from the Lostine River:

1. In 2016, the Wolfe Family Farm Water Conservation Project was funded by OWRD to improve on-farm irrigation efficiency and increase instream flows in the Lostine River. A total of 16 center pivots and nearly 30,000 feet of mainline pipes were installed on 872 acres that had previously been flood-irrigated. This resulted in 1,166 **a**cre-**f**eet (AF) of conserved water. The project also freed up 102.3 acres for conversion to wildlife habitat and dryland farming; water rights from these lands were permanently transferred instream, resulting in an additional 460 AF (2.5 cfs) restored to the river in May through July and 102.3 AF (0.8 cfs) restored to the river in August and September. In total, the project cost just over $2.5M (The Freshwater Trust 2018).
2. In 2020, the Johnston Lane Conservation Project was funded by OWRD to improve on-farm irrigation efficiency and increase instream flows in the Lostine River. Five center pivots were installed, converting 277 acres of formerly flood-irrigated land. Through the project, 353.4 AF (1.94 cfs) were restored to the Lostine River from May through July. In addition, the landowners permanently transferred water rights associated with corners of their fields not accessible by center pivots, to instream flow for an additional 77.55 AF (0.36 cfs) restored instream from May through July and 0.12 cfs in August and September. In total, the project cost just over $930,000 (The Freshwater Trust 2020).

Instream Transfers

3. In 2021, the Fitzpatrick Conservation Project was funded by OWRD with a two-part goal of improving the efficiency of on-farm irrigation infrastructure and permanently transferring water savings instream. More specifically, the project will pipe 3,100 feet of irrigation ditch and replace flood irrigation with center pivot irrigation on 127 acres owned by the Rocking M Cattle Company. All water conserved as part of the irrigation infrastructure modernization will be permanently protected instream, resulting in improved flow and aquatic habitat. The project is projected to saved 207 AF of (senior priority) water that will be protected at a rate of 1.13 cfs from May to July in the Lostine River. At the time the OWRD grant proposal was submitted, the estimated total cost for the project was just over $763,000 (in 2022 dollars) (Trout Unlimited 2021).

Total costs for all three projects was just over $4.2M, with at least 25% of costs covered by match funding and/or in-kind contributions from the landowners.

Additional Benefits

Land under these projects converted from flood to pivot irrigation is expected to be more productive, with hay yields increasing from 1.5 to 3 tons per acre depending on the farm (each farm reported different increases in their funding proposals). Additionally, hay quality can be improved because of better moisture management. Finally, the new efficient irrigation infrastructure is also expected to increase the value of the irrigated land itself — by as much as 5%–20% (Trout Unlimited 2021; The Freshwater Trust 2020; 2018).

Increased Yield

Using price data from the 2022 Oregon Annual Statistical Bulletin, the impact of increased yield on farm revenues was estimated using the following assumptions for two scenarios: (1) Low Hay Price: Price: $215/ton; Pivot system life span: 19 years and (2) High Hay Price: Price: $255/ton; Pivot system life span: 27.5 years.

These are conservative estimates; the price data may underestimate true conditions for some of the farms described here in certain years. Based on these assumptions and the expected yield increase for each farm, total on-farm benefits for all three projects is estimated to be over $500,000 per year even under the low scenario and as high as $630,000 under the high scenario (Table 2).

Project	Acres	Increased Yield (tons/acre)	Scenario	
			Low	High
Fitzpatrick	127	2.5	$68,260	$80,960
Wolfe Family Farm	872	2	$374,960	$444,720
Johnston Lane	277	1.5	$89,330	$105,950
		Total	$532,550	$631,630

Table 2. Estimated Annual On-Farm Benefits

Business Case

Value

Assuming a 19-year lifespan for center pivot irrigation infrastructure, the estimated **n**et **p**resent **v**alue (NPV) of these direct benefits are $7.6M for the low scenario and $9.0M for the high scenario, both of which are greater than the investment cost of the project. Assuming a longer lifespan of 27 years for the irrigation infrastructure, the estimated NPV of direct benefits ranges from $9.9M to $11.7M. The increased value of the land itself would only be realized if the land were sold. However, based on 2022 irrigated land prices for the state of Oregon (i.e., $6,350 per acre), a 10% increase in value would be worth an over $800,000 increase across all three farms (USDA, NASS 2022).

As highlighted in Figure 5, there are also numerous benefits that are not easily monetizable, including perhaps most importantly, the cultural and subsistence values of the Lostine River and its salmon runs to the local Tribes. In the Pacific Northwest, salmon is also an iconic species and popular for both recreational and commercial fishing.

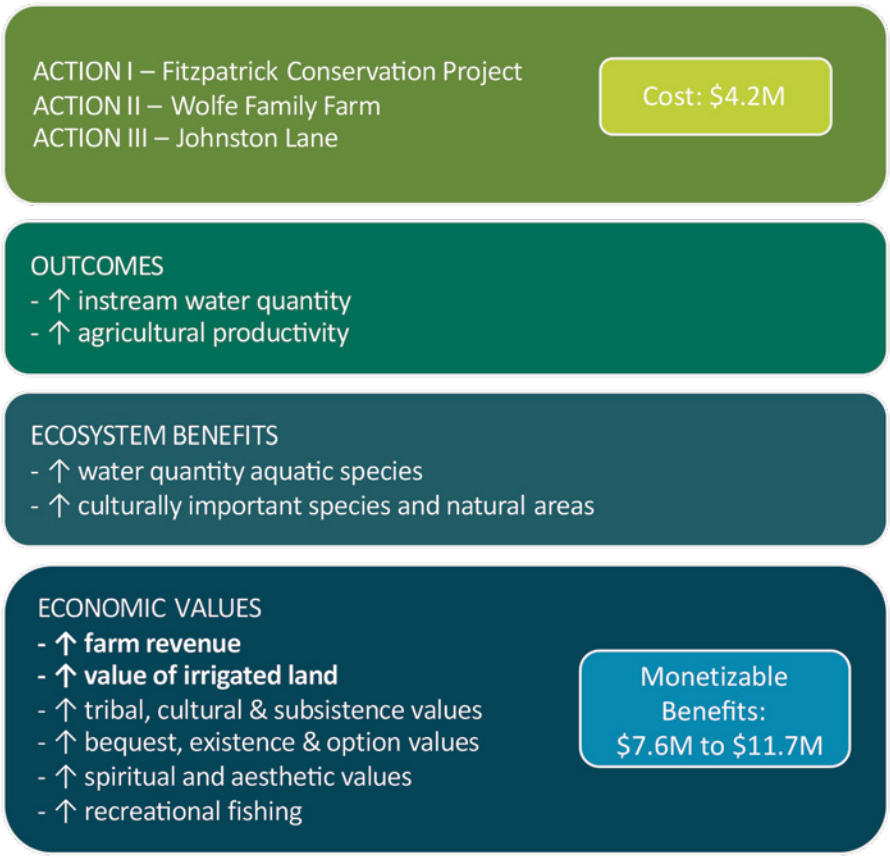

Figure 5. Lostine Summary

LCOW Metric

COST-EFFECTIVENESS

In a multicriteria project evaluation process, economic data can be used to evaluate economic feasibility of available alternatives to inform water-related investments, alongside other criteria. Economic feasibility can be measured a variety of ways, however, making it difficult or impossible to compare alternatives in an effective and useful way.

The **l**evelized **c**ost **o**f **w**ater (LCOW) metric is the most robust approach to estimate cost-effectiveness across projects with differing lifespans and cost/benefit streams and is straightforward to apply in practice. LCOW is calculated as the discounted NPV of costs less any monetizable benefits, divided by the NPV water benefits (for the Business Case, acre-feet was the physical unit chosen). Using a 3% discount rate and a conservative 19-year lifespan for center pivots, the LCOW for each project was calculated (Table 3).

Project	Cost ($2022M)	Water Conserved (AF/year)	LCOW ($/AF)
Fitzpatrick	0.8	207	$257
Wolfe Family Farm	2.5	1,167	$152
Johnston Lane	0.9	431	$151

Table 3. Project Comparison

Business Case

BENEFITS OF ENVIRONMENTAL WATER TRANSACTIONS

The benefits of the Lostine Minimum Flow Agreement are improved conditions for ESA-listed Chinook salmon and recently reintroduced Coho salmon, along with other aquatic species such as steelhead. These fish are of immense cultural importance to the Nez Perce Tribe and CTUIR and are a key part of both Tribes' traditional diets and practices. The Tribes, along with ODFW, have invested heavily in hatchery augmentation of Chinook and reintroduction of Coho; these investments are partially secured by instream flows from EWTs.

Private Liability

Supporting ESA-listed Chinook salmon by implementing EWTs alongside other conservation actions can help avoid private liability under the ESA. While not likely, individual liability — including fines and other punitive remedies — can be levied under the ESA for so-called "take of listed species." In an extreme scenario where low flows persist and seriously jeopardize listed Chinook, diversion and irrigation from the Lostine River could be curtailed, resulting in devastating economic impacts for the local community from crop losses and property devaluation. While unlikely, the history of successfully restoring flows through the Lostine Minimum Flow Agreement provides a layer of informal protection against this worst-case outcome.

Finally, the Lostine's fish species are important to the region's non-Tribal residents. Many area farmers recall being able to see and fish for abundant salmon in the Lostine and want their children and visitors to have the same experience.

Discussion

The Lostine River does double duty as a vital water source for area farms and as habitat for fish species that have, culturally and literally, sustained both the Nez Perce and Umatilla Tribes since time immemorial. For much of the 19th and 20th centuries, diversions from the river decimated Chinook and Coho salmon populations, effectively extirpating Coho and coming close to the same for Chinook. The community upset the status quo in 2005 by agreeing to an innovative water use agreement to try to reset the balance between fish and farms. The success of this EWT led to more water in the Lostine during critical times of year but also catalyzed additional investment in on-farm efficiency upgrades.

Key takeaways from this case study include:

Irrigation Upgrades

- In the right conditions, investments in irrigation infrastructure modernization make economic sense simply in the context of farm profitability — suggesting that this might be a prudent investment even if farmers were to pursue it on their own. These results suggest that even if the farmer pays the full cost, over the lifespan of the upgraded irrigation system the resulting increase in yield (and profitability) could outweigh the initial cost of installation. This finding suggests that farmers in similar situations should consider upgrading their irrigation infrastructure even if their only motivation is financial. State support, however, may be necessary to lower the barriers to entry presented by the large upfront costs for these projects.
- Farmers may not be aware that efficiency upgrades can result in improved yield and profitability. Therefore, outreach and technical information may be useful.

Farmer Assistance

- Farmers may not have the upfront capital to cover the cost of upgrades, which this case study showed can be substantial. Assistance in covering costs (even partially) and/or providing low- or no-interest loans may be beneficial.
- Farming communities value rivers for more than irrigation water. Close to one hundred individual landowners signed the original Lostine Minimum Flow Agreement, demonstrating that they were willing to try something different. Memories of a river full of Chinook salmon inspired not only the area's Indigenous people, but also many in the farming and ranching community.
- Environmental Water Transactions are innovation catalysts. Engaging with farms and communities on innovative, voluntary agreements to restore instream flow inspires creativity; when people see positive results from giving back to the river, their willingness to consider innovation increases.

Case Study Insights

In addition to the Lostine case study excerpted above, the Business Case presented seven other cases (Table 4). The dominant theme that emerged from the investments analyzed in the report's case studies is that they increase resiliency and flexibility, enhancing Oregon's ability to withstand or recover from shocks and challenges, both predictable and unpredictable.

Business Case

Region	Case Study	Water Use Sector(s)	Investment Focus
North Coast	Addressing Flooding, Diminished Critical Habitat and Other Impacts of Declining Watershed Health	Municipal, Aquatic Species/Habitat	Floodplain restoration and upland forest restoration
Willamette Valley/Lower Columbia	Investing in Water Reuse for Supply Diversification and Reliability to Support Households, Businesses, Agriculture and the Environment	Municipal, Aquatic Species/Habitat, Wetland Restoration	Using highly purified wastewater for various fit-for-purpose irrigation uses
Columbia Plateau	Farmer's Irrigation District Reservoir Expansion Project	Agriculture, Aquatic Species/Habitat	Expanding existing reservoir storage
	Nitrate Contamination in Groundwater-Sourced Drinking Water	Individual Domestic Use, Municipal, Agriculture	Immediate treatment technology and long-term best management practices; water justice
Blue Mountains/Northeast	Investing in Conservation and Environmental Water Transactions to Support Farms Culturally and Ecologically Important Chinook Salmon	Agriculture, Aquatic Species/Habitat	On-farm water conservation and environmental water transactions
Southeast	Groundwater Overdraft and Threats to the Local Economy and Environment	Agriculture, Individual Domestic, Wildlife, Wildlife Viewing	Payments to retire groundwater rights
Central	Addressing Impacts to Agriculture and Aquatic Species from Long-Term Drought Through Conservation and Innovative Governance	Agriculture, Aquatic Species/Habitat	Piping large irrigation canals and developing innovative governance approaches (water banking)
Southwest	Characterizing the Value of Water for Recreation on the Rogue River	Recreation	River restoration actions to address water quality, quantity and instream barriers

Table 4: Summary of Case Studies from the Business Case

Important high-level observations from the cases include:

Climate Impacts

- Aridification may be the new normal for much of Oregon east of the Cascades, underlining the importance of aggressive conservation and flexible innovations in governance to weather unpredictable future changes.
- Too much water (flooding), not just drought, will stress public water systems and watersheds as the climate changes.
- Wildfires impact watersheds in many ways that can harm water quality and reduce the landscape's ability to store water in soils. Limiting wildfire risk is critical to limiting risks to both human and natural communities that depend on forested watersheds.

Co-Benefits

- Whole-watershed and nature-based approaches are effective and leverage investment by generating co-benefits.
- Modernizing infrastructure across the landscape, from diversions and canals to farm fields to dams, supports a range of productive economic water uses.
- In many places in Oregon, agriculture can benefit from testing more heat- and drought-tolerant crops and cropping patterns — including dryland agriculture — to keep agriculture viable despite growing water scarcity.
- Even partial solutions to some of Oregon's water supply challenges are likely to be expensive.
- Groundwater is one of the most difficult resources to manage because it is hidden, and some impacts

Business Case

Vulnerability

Collaboration

Key Lessons

of groundwater pumping don't manifest immediately or in the places they are expected.

- Frontline communities are especially vulnerable. Due to language and other barriers, some members of these communities may not know a problem exists, while those who are aware may not have the resources, time, or capacity to access information and assistance.
- Indigenous Tribes face similar water risks to all Oregonians but with enhanced urgency and import because of their especially deep cultural and spiritual ties to water and fish species that rely on water.
- Many uses of water have lagging impacts or impacts that compound over time. It is critical to identify these types of potential impacts and design approaches for managing them now rather than waiting for their full impact to appear years later. For example, groundwater pumping can impact surface water long after a pump is turned on.
- Collaboration is powerful; trust built over time between collaborators increases resiliency by reducing conflict and providing a basis for the level of commitment that is required to tackle future challenges.

The Business Case further distills these observations into five guideposts that support investing to increase resiliency and flexibility with the urgency that Oregon's current and future water-related challenges merit:

1. Invest in whole-watershed and nature-based approaches for a range of benefits including avoided future costs of potential negative impacts from climate change.
2. Fund innovative governance and policy adaptations to increase the flexibility of water management and capitalize on collaboration and creativity.
3. Focus on modernizing infrastructure across the landscape in ways that help address specific risks such as flooding, stormwater management, reduced summer baseflow, shrinking glaciers, and fish passage.
4. Enhance water justice by authentically engaging frontline communities in policy and power and targeting investment so that benefits are distributed equitably to these and other communities.
5. Recognize and invest to support Tribal economic, spiritual, and cultural values for water and fish and engage with Tribes as sovereign co-managers of the resource.

Conclusions

The Business Case that emerged from the project team's intense three-month effort is straightforward. Water provides countless benefits — economic and non-economic — and defines Oregon's sense of place; it has been this way since the ancestors of Oregon's Indigenous people first called the land home. But these benefits are at risk; Oregon faces significant threats to its environment, economy, and way of life from current and future water-related risks and challenges. Oregonians have demonstrated that they have many of the required strategies and tools at hand as well as the expertise and motivation to develop new approaches when necessary. Wielding the tools and deploying the strategies, however, requires major investment — not just once but for the foreseeable future. The necessary investment cannot be underestimated and requires determination, commitment, and engagement across all sectors, agencies, communities, and levels of government and power. Importantly, it also requires inclusion of frontline communities that have been traditionally left out of decision-making and power over water, including Tribes, low-income communities, rural communities, and communities of color. If the aim of a Business Case assessment is to answer the question of whether investment is wise, the answer to whether Oregon should invest in its water resources is an emphatic "Yes." At its core, the Business Case for investing in water is that Oregon simply is not Oregon without clean, abundant water.

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Potable Reuse

Recycled Water

Obstacles

Guidebook

Reuse Projects

Research

COMMUNICATION STRATEGIES FOR ADVANCING PUBLIC ACCEPTANCE OF POTABLE REUSE PROJECTS

A VITAL TASK FOR OUR WATER FUTURE

by Barry Dugan, with contributions from Mark Millan
Data Instincts, Public Outreach Consultants, (Windsor, CA)

Introduction

Potable reuse is an emerging solution for communities anywhere in the world that need access to a safe, reliable, locally controlled source of drinking water. Direct and indirect potable reuse are two methods of recycling highly treated (purified) wastewater for potable purposes. In **i**ndirect **p**otable **r**euse (IPR) the purified water is introduced to an environmental buffer — such as a surface water reservoir or a groundwater aquifer — that provides an additional barrier for protection of public health. **D**irect **p**otable **r**euse (DPR) takes purified water and introduces it — with or without the use of an engineered buffer — into the raw water supply of a water treatment plant or into the distribution system downstream of a water treatment plant.

One of the greatest obstacles to the implementation of potable reuse projects is public perception. When potable reuse projects run into opposition, it is never because of problems with the technology; instead, the biggest barrier is usually public and political opposition. Public agencies considering potable reuse projects can take advantage of research carried out by the Water Research Foundation (WRF). The WRF also provides communications strategies and methods that have been proven to achieve public acceptance of advance purified water projects.

The report *Model Public Communication Plan for Advancing Direct Potable Reuse (DPR) Acceptance* [3] (WRF-13-02) was published in 2015 by the WateReuse Research Foundation (now the Water Research Foundation) and co-authored by Mark Millan, Patricia Tennyson, and Dr. Shane Snyder. The project unveils strategic methods to communicate with communities that are evaluating potable reuse — both indirect and direct — to meet their future water supply needs. Although first introduced in 2015, it continues to provide guidance and strategic value in successfully advancing public acceptance of potable reuse.

Knowing what works well — and what doesn't — are critical elements in the communications and outreach process when introducing potable reuse projects to the public. Since the publication of WRF-13-02 — currently referenced as WRF-4540 by the Water Research Foundation — Mark Millan and his team at Data Instincts have tested, explored, and put into practice findings from this research to advance challenging potable reuse projects. They have consulted on numerous potable reuse projects in the US, including:

- Pure Water Monterey — One Water Monterey
- Pure Water SF — San Francisco Public Utility Commission
- Pure Water Westminster — Westminster, Maryland
- OneWater Nevada — Truckee Meadows Water Authority, Reno, Sparks, Washoe County
- Pure Water Soquel — Soquel Creek Water District
- Purified Water Program — Santa Clara Valley Water District

WRF-13-02 Report

The WRF-13-02 report outlines a carefully crafted and methodical strategy that utilizes previous theoretical research, tests, and supplements in combination with an extensive literature review, in-depth interviews, focus groups, and public opinion surveys. In-depth interviews were conducted with water agencies in various parts of the US and Australia, as well as with legislators, health professionals, and representatives of special interest groups. Feedback was used to identify key concerns and develop initial messaging. The messages were then tested using focus groups in selected communities in California where potable reuse was being considered, in order to obtain a representative sampling. Telephone surveys were also used for further testing of messages.

The findings from these information-gathering activities were used to develop a communication framework for outreach plans that could be used as a model for communities worldwide that seek to introduce and initiate potable reuse awareness and acceptance. Each community has its own challenges; therefore, outreach efforts should be tailored to local conditions to remain relevant. [2] [3] [4] [5] [6 [7]

Potable Reuse

Strategies

How-To Guide

Acceptance

Outreach Plan

Best Practices

OBJECTIVE

The core objective of WRF-13-02 was to advance acceptance of potable reuse projects by (1) Building awareness and support of existing and planned potable reuse projects, and (2) Fostering an understanding of the need to continue expanding our water supplies.

To achieve this objective, communication plans and strategies for public outreach that could be adapted and utilized at local and regional levels were developed. Lessons learned and insights from previous projects that could be universally applicable were also collected. [4]

In addition to public outreach strategies, the communication plans include messaging platform components with public outreach tools and tactics. The plans are flexible documents that can be adapted to the specific needs and situations of individual communities. [3]

METHODOLOGY

The WRF-13-02 project team initially conducted an extensive literature review of previous research related to potable reuse acceptance and attempted approaches for communication. Next, a series of one-on-one meetings were held with individuals involved in potable reuse projects in their communities (e.g., general managers and communications staff from various utilities) to gain an understanding of communication challenges and successes they experienced. Interviews were also conducted with legislators and special interest groups in California to learn about their attitudes, perceptions, and support for potable reuse projects. The findings from the literature review and interviews were used to develop a set of messages that were then tested in focus groups and in telephone surveys in two communities (the city of San Diego and the service area of the Santa Clara Valley Water District). The research team surmised that these two regions reflected California's overall demographic at the time (2014).

During each step of the project, the guiding principle was to "Listen, Learn, Retool, and Engage." Each data set fed into the next data set, and team members adjusted their approach as new information was received. All the information from the research was then used to formulate a universal Communication Plan framework. The end product is a "how-to guide" for potable reuse communications that is applicable to a myriad of communities in any country. [2] [3] [5] [7]

ADDRESSING THE "YUCK FACTOR"

Potable reuse involves the use of proven and reliable technology to purify recycled water so it can safely supplement the drinking water supplies of communities. It is especially valuable to communities in water-scarce regions. Experience among water agencies and municipalities has shown, however, that public acceptance of potable reuse is one of the primary challenges facing this source of water supply.

The concept of drinking water recently processed from sewage has been a difficult hurdle for utilities to clear. Overcoming the so-called "yuck factor" associated with potable reuse is the primary focus of research currently underway in the water reuse industry. [7] [3] [8]

One of the elements studies have identified as critical to build support and acceptance of potable reuse is a detailed communication plan for public outreach that describes how to engage the various target audiences who can help to make or break a potable reuse program or project. The identified results consist of communication plans that include messaging platform components with public outreach tools and tactics. The plans are flexible documents that can be adapted to the specific needs and situations of individual communities.

KEY FINDINGS AND RESULTS

The key findings of the combination of the literature review, one-on-one meetings, and public opinion research indicate that public acceptance of potable reuse can be achieved by implementing a coordinated, consistent, and transparent communication plan. Some of the key findings to achieving public acceptance include:

- Develop trust (e.g., build relationships, offer plant tours)
- Be consistent with outreach (e.g., start early, continue throughout project)
- Provide information about potable reuse and where it is in use to increase familiarity
- Be consistent with messaging and terminology
- Instill confidence in the quality of water (e.g., talk about the treatment process)
- Be transparent (e.g., discuss costs, water quality, safety, environment)
- Be prepared for tough questions and misinformation

A key finding of the focus groups and telephone survey showed that after receiving additional information about potable reuse and the multi-stage treatment process used to make the water safe

Potable Reuse

to drink, most participants became more comfortable with the idea of potable reuse. In addition, participants in the focus groups favored the use of "purified water" as a term to describe the potable reuse water.

Recent Public Education Efforts and Successes

Reduce Opposition

The recent success of potable reuse projects has reinforced the findings of WRF-13-02. Success is demonstrated by a lack of organized opposition to project development and implementation, which is significant considering that public opposition is what has historically stalled or cancelled projects. Another key metric is increase in acceptance after engagement. The WRF 13-02 survey, conducted in 2014, showed approximately a 20% bump in acceptance after introducing outreach and education in a community. These same findings have been shown in various surveys conducted around the country for potable reuse project since. Below are several recent examples of successful public education and outreach efforts that utilize hands-on exhibits, tours, and finished water tastings that engage the public and are a critical element of any public outreach campaign.

Pure Water Soquel, Soquel, CA — Water Education Trailer

The Pure Water Soquel Project (currently under construction) is Soquel Creek Water District's (District) groundwater replenishment and seawater intrusion prevention project. The project will take highly treated wastewater and purify it using a three-step advanced treatment process consisting of microfiltration, reverse osmosis, and ultraviolet light with hydrogen peroxide. This high-quality water will replenish the critically over-drafted groundwater basin and prevent further saltwater intrusion of the water supply.

Mobile Museum

The District utilizes a Water Education Trailer as a mobile museum exhibit that displays the Community Water Plan supply options in an interactive way and shows the steps involved in advanced water treatment to replenish and recharge the groundwater basin. Visitors can see a reverse osmosis filter unrolled and the cross-section of a microfiltration tube. A short video shown in the trailer summarizes the water projects the District studied to protect and restore the groundwater basin. Other videos on the project website show how wastewater can be purified to drinking water standards (*see* https://vimeo.com/269738733). The District conducts surveys of its customers every five years to gauge customer sentiments and effectiveness of outreach initiatives, (*see* Figure 1).

2020 Survey

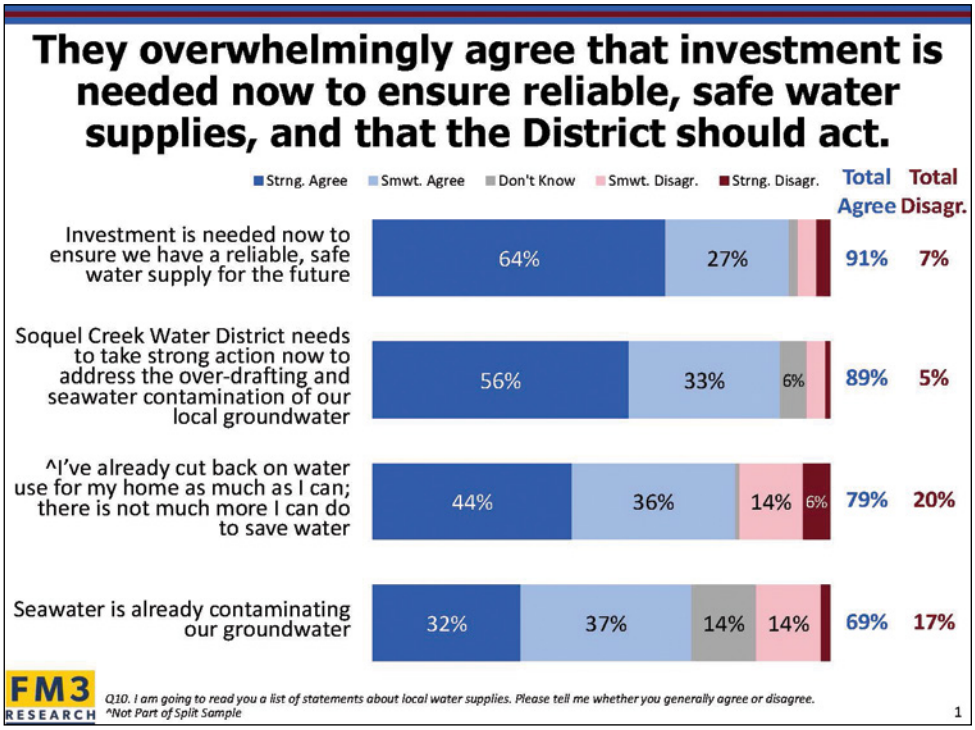

Figure 1: Findings from 2020 survey for the Pure Water Soquel project in Soquel, CA.

Potable Reuse

Talking Treatment

Educating Media

Taste Tests

Confidence

OneWater Nevada, Reno, NV — Pilot Treatment Lab

OneWater Nevada is a collaboration of agencies in the Reno area that have been exploring how to turn wastewater into advanced purified water and inject it into the groundwater, where it will later be extracted for future drinking water supply. Project leaders acknowledge that making consumers feel comfortable about drinking treated effluent might be the biggest hurdle to their project, especially since it is an inland project not utilizing reverse osmosis. That's why the project team conducted a pilot project using a series of three semi-trailers to demonstrate their unique treatment process to key stakeholders and elected officials (see https://www.youtube.com/watch?v=pRw-0h82Fw0). When people begin to understand the purification process, they become much more comfortable with the treatment process and the final product. Like the Soquel project, the OneWater Nevada project currently has a mobile education vehicle to share its unique purification system at community events.

Figure 2: Demonstration sites allow visitors to see how water is purified, and many allow for sampling of purified water.

Monterey One Water, Monterey, CA — Demonstration Facility

Monterey One Water is another project in a historically water-challenged region that is a collaborative effort among numerous agencies. Using a proven, multi-stage treatment process, Pure Water Monterey turns wastewater into a safe, reliable, and sustainable water supply that complies with and exceeds strict state and federal drinking water standards. After production, the purified water is used for groundwater replenishment of the Seaside Groundwater Basin. During the project planning and review process, the Pure Water Monterey Demonstration Facility was critical to public approval of the project by providing tours of a multi-media education center that also featured water tastings of the finished product at the completion of the tour. Even though the advanced purification facility is now fully operational (since 2019), the demonstration component still plays a vital role in sharing the project's story with visitors including media.

Pure Water Project Las Virgenes-Triunfo, Calabasas, CA — Pure Water Demonstration Facility

The Pure Water Project will use proven technology to provide safe, clean, pure water through the construction of an advanced water purification plant that will thoroughly treat recycled water. The purified water will be distributed to Las Virgenes Reservoir where it will blend with the existing imported water already in storage. All reservoir water will be retreated to drinking water standards before it is safely delivered to homes and businesses. The project offers tours at its Pure Water Demonstration Facility where the advanced treatment process is explained and demonstrated with interactive exhibits and graphics. At the end of every Pure Water Demonstration Facility tour, guests are invited to taste the advanced purified recycled water and have their photos taken and added to the photo display of previous visitors.

Lessons from Research and Implementation

FOCUS GROUPS AND SURVEYS

Overall, focus group participants had highly positive impressions of recycled water. Most saw it as a prudent and worthwhile way to expand water supplies and viewed it as a cost-saving measure compared to purchasing additional water from the state or other utilities. Additionally, most were even comfortable with the idea of indirect reuse of recycled water for drinking. However, most expressed initial discomfort with the idea of DPR of recycled water. As much as they could believe it was technologically feasible to make wastewater safe for drinking, they simply lacked confidence that their community was ready to make it an immediate reality.

Over the course of the focus group session, however — and after exposure to detailed messaging — most participants became more much comfortable with the idea of DPR, particularly after hearing the details of the multi-stage treatment process applied to wastewater to make it safe to drink.

Potable Reuse

Findings

Findings from the focus groups include:

- Indirect reuse of recycled water had significant initial appeal, while direct reuse of recycled water was initially divisive.
- "Purified Water" and "Certified Water" were clear standouts as terms to describe the product of DPR treatment, but participants also gravitated toward "Advanced Purified Water" as a preferred term.
- Visuals were extremely helpful in building understanding and support for DPR.
- The strongest messages in favor of DPR focused on the safety of the purification process and the importance of developing high-quality water supplies to meet the challenges of growth and drought.
- Participants were comfortable with the amount of energy use involved in DPR.
- Messaging increased overall acceptance of DPR. At the conclusion of the sessions, most participants were open to DPR, but had lingering reservations. [3]

Do's & Don'ts

Communication recommendations from the telephone surveys:

What to Do

- DO leverage public concern about ongoing water shortages to consolidate support for DPR, without relying on a current drought.
- DO emphasize the role of water agencies, as opposed to other levels of government, in overseeing the process.
- In particular, DO emphasize the role of scientists and public health professionals in designing and monitoring the process.
- DO place a special emphasis on communications with women, communities of color, non-English speakers, seniors, and less-well-educated and less-affluent communities.
- DO continue to use "purified water" and "advanced purified water" as terms for the product of potable reuse.
- DO highlight the frequency and sophistication of monitoring and testing processes.
- DO note that public health and environmental protection agencies have reviewed and approved the DPR process.
- DO use images to reinforce the effectiveness and complexity of the treatment process.
- DO highlight the successful implementation of potable reuse in other communities.
- DO draw comparisons to the health and safety of bottled water.
- DO appeal to the broader principles of environmental protection and recycling as rationales for expanding the use of recycled water.
- DO emphasize the stages of your proposed treatment process.

What NOT to Do

- DO NOT rely on such words as "microfiltration, reverse osmosis, and ultraviolet light" alone — provide some brief explanation and show images of treatment processes.
- DO NOT simply assert that technology has already made it possible to make any water safe to drink.
- DO NOT rely on arguments that potable reuse will end up reducing rates.
- DO NOT rely on elected officials, taxpayer advocates, or business owners as messengers — they do not speak to the health issues at the core of public concerns. [3]

Effective Messages

KEY MESSAGES FOR IMPLEMENTATION

- Potable reuse provides a safe, reliable, and sustainable drinking water supply.
- Using advanced purified water is good for the environment.
- Potable reuse provides a locally controlled, drought-resilient water supply. [3]

SUPPORTING INFORMATION

- The purification process produces water that is purer than most bottled water.
- Purified water:
  - Will comply with or exceed strict state and federal drinking water standards.
  - Will be tested, in real-time, with online sensors and be strictly monitored by the Department of Health.
  - Is currently used to supplement drinking water in many communities in the US and around the world.
  - There have been no reported health issues from this use of purified water.
- Environmental benefit:
  - The more recycled water we use, the less we need to take out of rivers, streams, and our scarce groundwater supplies. This is good for rivers and streams and the fish, plants, and wildlife that rely upon them.

Potable Reuse

- We all recycle as often as we can — glass, plastic, paper, and even yard waste — which is the right thing to do. For the same reason, we should recycle and reuse as much of our limited water supplies as we possibly can. Water is too valuable to be used just once.

- A locally controlled, drought-resilient water supply:
  - Purified water is independent of climate or weather in other locations.
  - Purified water enhances water supply reliability and helps protect us from droughts by diversifying supply sources — keeping us from relying too much on any one source of water that may run low in a drought.
  - Purified water provides a community with a constant source of water. [3]

Conclusion

The *Model Public Communication Plan for Advancing DPR Acceptance* offers strategic methods to introduce and communicate the concept of potable reuse and its importance in meeting the future water supply needs of communities. This report establishes the strategic groundwork toward fostering public acceptance of potable reuse. The survey research conducted provides a baseline from which to evaluate the effectiveness of the communication programs.

Roadmap

This research provides the water reuse industry with a roadmap for outreach to decision makers, regulators, stakeholders, and the public about the capabilities of advanced purification treatment, real-time monitoring, and the safeguards the water industry will undertake to produce safe drinking water from wastewater. While the focus of this research at the time (2015) was driven by the regulatory timetable in California, this work has proven to be a model that can be adapted to utilities, cities, and agencies across the world. [2] [3]

The findings from WRF-13-02 have been used to develop communications plans and outreach tools for use in communities considering potable reuse projects. The results were further distilled into a guidance document entitled, *One Glass at a Time, Helping People Understand Potable Reuse. A Flexible Communication Plan for use by Public Information Professionals* (2015). [8]

Pure Water

One key finding was that "Pure Water" was a signature term that resonated with the vast majority of those participating in the focus groups and surveys. Fast forward to today, and we are now seeing this term applied to naming and branding in recent projects being developed and some that are already operational, such as: Pure Water Monterey, Pure Water Oceanside, Pure Water San Diego, PureWater SF, and Pure Water Soquel. [3] [4] [5]

Figure 4: The branding of potable reuse projects has proven to be a highly effective marketing tool toward garnering support.

Impact

But how do you get a concept like "Pure Water" accepted in a community? The key is in conveying in straightforward, clear language and images — tailored to the specific project — how treatment trains work and how they clean water and ensure its safety for the intended use.

Using clear and consistent terminology, branding, infographics, animations, and videos in combination with learning centers and demonstration sites has proven effective.

Overall, the tools and methods described in WRF-13-02 and in the *One Glass at a Time* booklet are applicable for any agency, utility, or water purveyor seeking to plan and execute an effective communication and outreach program. These tools will support the challenges of gaining public awareness and acceptance needed for the successful implementation of potable reuse projects. These lessons are applicable to coastal communities where brine discharge is possible, to inland projects where new innovative treatment schemes are necessary for a future that must consider extreme weather variability and looming droughts. [1] [2] [3] [4] [5] [6] [7] [8].

Acknowledgments

A special thanks to the co-authors of *Model Communication Plans for Increasing Awareness and Fostering Acceptance of Direct Potable Reuse*; Patricia A. Tennyson, Katz & Associates, Vice-President U.S.A. and Dr. Shane Snyder, Professor and Executive Director - Nanyang Environment & Water Research Institute (NEWRI) at Nanyang Technological University (NTU), Singapore.

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Mark Millan is the founder and principal of Data Instincts, a professional consultancy specializing in public outreach for implementing recycled water projects, including both Indirect and Direct Potable Reuse. He has been a strategic advisor and coordinator of public outreach for dozens of reuse projects throughout the United States and has advised on reuse internationally. He currently serves on the Board of Trustees for WateReuse California. Mark co-authored the following WateReuse Research Foundation research papers: *Developing Model Communication Plans for Advancing Awareness and Fostering Acceptance of Direct Potable Reuse* and *Risk Assessment Study of PPCPs in Recycled Water to Support Public Review*. Mark was also a contributing writer to the World Health Organization's *Guidelines for Potable Reuse*, (Chapter 7, the Art of Public Engagement). Mark has also been an elected official, having served on the city council for the Town of Windsor in California, and was Mayor in 2016.

Barry Dugan is an experienced writer and journalist who has more than 40 years of experience in communications and public outreach. Barry spent 25 years as a reporter and editor at community newspapers, where he reported on a wide range of issues including water resources, municipal government, and environmental issues. He also spent eight years with the Sonoma County Water Agency conducting public outreach and communications on a variety of topics, including water supply, wastewater, recycled water, stormwater and flood control projects. During his time with Data Instincts, he has done public outreach on a variety of water reuse projects, and participated in research projects on communications. He received a BA in Liberal Studies from Sonoma State University and holds certifications in emergency management and communications.

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WATER BRIEFS

CLEAN WATER ACT US
FINAL RULE

On Sept. 14, the US Environmental Protection Agency (EPA) announced a final rule to restore the fundamental authority granted by Congress to states, territories, and Tribes to protect water resources that are essential to healthy people and thriving communities. The agency's final Clean Water Act Section 401 Water Quality Certification Improvement Rule will support clear, efficient, and focused water quality reviews of infrastructure and development projects that are key to economic growth.

For 50 years, the Clean Water Act has protected water resources that are essential to thriving communities, vibrant ecosystems, and sustainable growth. This final rule strengthens that foundation while recognizing the essential partnership among the federal government, states, territories, and Tribes in protecting our waters.

Clean Water Act (CWA) Section 401 enables states, territories, and authorized Tribes to protect their water quality from adverse impacts of construction or operation of federally permitted projects. Under Section 401 of the Act, a federal agency may not issue a license or permit to conduct any activity that may result in any discharge into a water of the United States, unless the appropriate state, territory, or authorized Tribe issues a CWA Section 401 water quality certification or waives certification. EPA's 2023 rule realigns the scope of Section 401 certification with decades of established practice and restores and strengthens the role of states, territories, and authorized Tribes.

The rule enhances certification review and provides regulatory certainty to advance federally permitted projects. For example, the rule establishes a 6-month default timeframe (when the federal agency and certifying authority fail to reach an agreement) and a 1-year maximum timeframe for certification review (the statutory maximum). The rule emphasizes that states, territories, and Tribes may only consider the adverse water quality-impacts from the activity. To limit delays, the rule also provides a clear approach to defining the required contents in a request for certification.

FOR INFO https://www.epa.gov/cwa-401

WATER CAREERS US
FEDERAL FUNDING

The US Environmental Protection Agency (EPA) is announcing the availability of over $20 million in grant funding to support training for workers who protect and treat our nation's drinking water and provide critical wastewater services. Through the Innovative Water Infrastructure Workforce Development Grant program, EPA will support training and career opportunities in the water sector. With the Biden-Harris Administration's historic investment in water infrastructure, growing and sustaining the water sector workforce is more important than ever for ensuring clean and safe water for generations to come.

Frontline workers at water and wastewater treatment utilities across the country are central to public health, environmental, and economic well-being in all communities, big and small. The water industry is facing widespread shortages of qualified workers due to expected retirements, needed investments in the nation's infrastructure, and new technical and scientific skill sets required to operate and maintain these systems. Current estimates indicate that as many as one-third of water workers will be eligible to retire within the next 5 to 10 years.

The focus of the Innovative Water Infrastructure Workforce Development Grant program is to build a strong pool of skilled and diverse workers in the water and wastewater utilities sector. This grant program supports collaboration among federal, state, and local governments and institutions of higher education, apprentice programs, labor organizations, high schools, and other community-based organizations to provide access to workforce opportunities and build career pipelines in the water sector.

There are six program areas:

- Targeted internships/apprenticeships for skilled water utility trades.
- Education programs designed for elementary, secondary, and higher education students.
- Regional industry and workforce development collaborations to hiring qualified candidates.
- Leadership development, occupational training, mentoring, or cross-training programs that support career advancement.
- Education and training programs designed for decentralized (septic) water workers to support public health for communities that rely on private wells for drinking water or septic systems.
- Training and development for workforce development programs that reduce greenhouse gas emissions and other air pollutants to benefit disadvantaged communities.

Applications must be received by EPA by November 17, 2023.

FOR INFO https://www.epa.gov/sustainable-water-infrastructure/innovative-water-infrastructure-workforce-development-program

COLUMBIA RIVER WA
MANAGEMENT

Jarred-Michael Erickson, Chairman of the Sinixt (Arrow Lakes) Confederacy (Confederacy) and the Confederated Tribes of the Colville Reservation (CTCR), is calling for change on the Columbia River system in Canada after Sinixt/Arrow Lakes staff recently viewed the impacts of low water levels on the Arrow Lakes.

Chairman Erickson said the Confederacy and CTCR are very concerned about the low water levels on the Arrow Lakes after fisheries and archaeology staff — based out of their new Nelson office — toured the lower Arrow Lake:

"We share the concern of local residents about the impacts of low water levels in the Arrow Lakes, which is the heart of our traditional territory in Canada. The ramifications of raising and lowering water levels include a broad range of ecosystem impacts, ranging from fish kills and stranding, preventing access to spawning streams for Kokanee, and changes in water temperature and predation issues. In addition, we are very concerned about impacts on Sinixt archaeological resources. It is well documented that 80–90% of our archaeology, including multiple village sites and gravesites, were inundated by the various dams along the Columbia River system, without any effort of relocation or even consultation with the Sinixt. To this day, our ancestors continue to be uncovered without acknowledgement of that history, and a steadfast refusal to let us take the lead in their repatriation"

Chairman Erickson added that the low

water levels are only one aspect of a larger and more fundamental issue — the complete exclusion of the Sinixt from discussions and decision-making about the impacts of the dams, despite the Supreme Court of Canada's landmark decision in *R. v. Desautel:*

"It has been two and half years since the Desautel decision was handed down, where the Supreme Court of Canada recognized the Sinixt as an Aboriginal Peoples of Canada, and acknowledged the truth of our history and traditional territory. Yet the Sinixt continue to be on the outside looking in, while we watch other Nations receive financial payouts for impacts occurring predominantly in our territory. This despite the fact that we have considerable experience and expertise in managing and mitigating these issues in Lake Roosevelt behind the Grand Coulee Dam in Washington State. This has to change, and change now.

Chairman Erickson says that the Confederacy and CTCR are calling on the federal and provincial governments, along with BC Hydro, to immediately convene a negotiating table to begin working through these important issues.

"The Sinixt are still here, and always will be. If we don't see immediate action, we will return to court. Change will come, one way or the other."

FOR INFO Neeka Somday 509/ 632-2213

INFRASTRUCTURE US

FUNDING

On Sept. 21, the US Environmental Protection Agency (EPA) announced $7.5 billion in available Water Infrastructure Finance and Innovation Act (WIFIA) funding. This innovative low-interest loan program helps communities invest in drinking water, wastewater, and stormwater infrastructure while saving millions of dollars and creating good-paying local jobs. To date, EPA's WIFIA program has announced $19 billion to help finance 109 projects across the country. These projects are creating over 60,000 jobs. The announcement furthers the Biden-Harris Administration's commitment to ensuring all people and all communities have access to clean and safe water.

This announcement initiates EPA's 7th round of WIFIA financing with $6.5 billion available through the WIFIA program and $1 billion available through the State WIFIA (SWIFIA) program, which provides loans exclusively for State infrastructure financing authority borrowers. EPA is currently accepting letters of interest for both WIFIA and SWIFIA loans. Prospective borrowers can also receive technical assistance to develop a funding request that meets the WIFIA program's requirements. This assistance will help small and disadvantaged communities benefit from WIFIA funding.

For this new round of funding, EPA has identified priority areas such as: increasing investment in economically stressed communities; making rapid progress on lead service line replacement; addressing PFAS and emerging contaminants; mitigating the impacts of drought, and supporting water innovation and resilience.

FOR INFO https://www.epa.gov/wifia

GROUNDWATER US

RECHARGE RESEARCH

On Sept. 21, the US Environmental Protection Agency (EPA) announced $7,837,196 in funding to four institutions to research the use and risks of **e**nhanced **a**quifer **r**echarge (EAR) to improve groundwater availability and quality.

EAR is the practice of using water sources to replenish and supplement existing groundwater supplies for storage, potential reuse, and to restore streamflow. While EAR implementation and management has been an active topic of research for many years, significant knowledge gaps remain concerning best practices in the design, siting, performance (hydrologic and water quality), longevity, maintenance, and monitoring of EAR in different land use and hydrogeologic settings. Other terms that are used interchangeably with EAR include managed aquifer recharge, artificial recharge, and aquifer storage and recovery.

With the Science to Achieve Results (STAR) research funding announcement, investigators will assist communities throughout the United States in evaluating whether and how to invest in safe and sustainable EAR strategies for many goals including enhancing water supplies, protecting water quality, maintaining aquatic ecosystems, reducing sinking land and avoiding sea water intrusion. This research will enable state, Tribal, and local water quality managers to adopt safe EAR practices while understanding the risks, benefits, and consequences from of using different source waters and given differing subsurface geology and groundwater end use.

The following institutions are receiving awards:

- County of Los Angeles, Department of Public Works, Alhambra, Calif., to explore the long-term regional potential for groundwater recharge through urban best management practices and develop a free and open-source user-friendly tool for evaluation of performance of EAR practices.
- Oklahoma State University, Stillwater, Okla., to test the effectiveness and impacts of rural EAR structures and determine if they can be deployed for rural land management strategies to safely increase groundwater supplies.
- Carnegie Mellon University, Pittsburgh, Pa., to increase EAR adoption by better understanding the potential mobilization of contaminants and their risks to water quality in key aquifer systems across the US.
- Virginia Polytechnic Institute and State University. Blacksburg, Va., to develop a web-based decision support tool to guide communities, agencies, and practitioners to design safe and sustainable implementation of EAR in the US Coastal Plain and in regions with similar hydrogeology.

FOR INFO: https://www.epa.gov/water-research/enhanced-aquifer-recharge-research and update the link

DRINKING WATER US

FUNDING

On Sept. 7, the US Environmental Protection Agency (EPA) announced $19 million in new grant funding that will work to improve the climate resilience of the nation's water infrastructure. EPA's Drinking Water System Infrastructure Resilience and Sustainability grant program will support drinking water systems in underserved, small, and disadvantaged communities that are working to prepare for and reduce vulnerability to impacts from climate change ranging from extreme flooding to extreme drought.

Environmental justice and equity are a central part of EPA's programs and this action advances progress under President Biden's EJ Strong Initiative by investing in communities with a legacy of environmental injustice concerns. Through this grant, EPA is seeking applications for projects that will benefit underserved, small, and disadvantaged communities.

This grant will be made available

through a competitive Request for Application process. Eligible applicants for this funding opportunity include public water systems, a water system located in an area governed by an Indian Tribe, eligible territories, and states on behalf of communities that are underserved and small or disadvantaged. Eligible activities for funding include planning, design, construction, implementation, operation, or maintenance of a program or project that increases drinking water system resilience to natural hazards.

FOR INFO: https://www.grants.gov/web/grants/view-opportunity.html?oppId=350091

GRANT PROGRAM US

ENVIRONMENTAL EDUCATION

On Sept. 14, the US Environmental Protection Agency (EPA) announced that up to $3.6 million in funding for locally focused environmental education grants is now available under the 2023 Environmental Education (EE) Local Grant Program. EPA will award grants in each of EPA's 10 Regions, between $50,000 and $100,000 each, for a total of 30-40 grants nationwide. The program includes support for projects that reflect the intersection of environmental issues with climate change adaptation and mitigation strategies, preventing future water quality and human health issues, in addition to other environmental topics.

Funded projects will increase public awareness of those topics and help participants to develop the skills needed to make informed decisions. Each of the 10 EPA Regions published a solicitation notice with their respective regional details. Applicants must apply to the regional **n**otice of **f**unding **o**pportunity (NOFO) that corresponds with the location of their proposed project. Through this grant program, EPA intends to provide financial support for projects that design, demonstrate, and/or disseminate environmental education practices, methods, or techniques, that will serve to increase environmental literacy and encourage behavior that will benefit the environment in local communities, especially underserved communities. This grant program recognizes underserved communities as high-poverty areas, persistent poverty counties, communities the Council on Environmental Quality's Climate and Economic Justice Screening Tool identifies as disadvantaged communities, and Title I schools.

Applications are due on November 8, 2023.

FOR INFO: https://www.epa.gov/education/environmental-education-ee-grant-solicitation-notice

CARBON SEQUESTRATION US

NEW TECHNOLOGY

A novel system, developed by startup Ebb Carbon — in partnership with various research institutions and funded by organizations like NOAA and the US Department of Energy — is making significant strides in addressing climate change and ocean acidification. Located at the US Department of Energy's Pacific Northwest National Laboratory (PNNL) facility in Sequim, Washington, this system is approximately the size of a shipping container and removes acid from seawater. The primary objective is to enable seawater to absorb and store carbon dioxide (CO_2) from the atmosphere.

Marine carbon dioxide removal is crucial in mitigating climate change, and it aligns with the Intergovernmental Panel on Climate Change's target of limiting global warming to 1.5°C. However, there are still many unanswered questions in this field.

Ebb's technology operates by processing seawater from Sequim Bay at the PNNL-Sequim marine lab. The seawater passes through membranes that act as filters, removing acid. Once the acid is eliminated, the seawater can absorb additional CO_2 from the air and store it as bicarbonate — a natural form of carbon storage in the ocean. The treated seawater is held in open-air tanks for research purposes before returning to the ocean via PNNL's wastewater system. The research team is exploring the possibility of powering the Ebb system using various forms of marine energy.

The system produces low-carbon acid, which can be used to neutralize alkaline wastewater locally. Ebb is in discussions with local sand and gravel operations to use the acid for neutralizing alkaline stormwater.

The technology could accelerate the natural process of restoring ocean chemistry by neutralizing excess acidity. On a larger scale, this technology could contribute to removing billions of tons of CO_2 from the Earth's atmosphere each year, an essential step in meeting climate targets.

FOR INFO: https://research.noaa.gov/2023/09/08/new-system-uses-seawater-to-capture-and-store-co2/

TRIBAL SETTLEMENT AZ

HUALAPAI RIGHTS

Department of the Interior Deputy Secretary Tommy Beaudreau and Assistant Secretary for Indian Affairs Bryan Newland joined members of the Hualapai Tribe on Aug. 30 for a celebration of the Tribe's historic $312 million water rights settlement.

The Hualapai Tribe Water Rights Settlement Act of 2022 settled the Tribe's water rights claims in Arizona and was the result of over a decade of negotiations between the federal government, Tribal leaders, state of Arizona, and other parties. The law approved a settlement agreement that will provide much needed water to the Tribe and established a $312 million trust fund for the Tribe to develop water infrastructure on its reservation. The settlement's provisions will help provide certainty to the Tribe and surrounding communities regarding access to water resources, enable Tribal economic growth, and promote Tribal sovereignty and self-sufficiency.

To date, the Biden-Harris administration has allocated more than $3.1 billion to fund Indian water rights settlements, more than any other administration in history. This includes more than $2 billion through the President's Bipartisan Infrastructure Law to implement the Indian Water Rights Settlement Completion Fund, which is helping deliver long-promised water resources to Tribes, certainty to surrounding communities, and a solid foundation for future economic development for entire communities dependent on common water resources.

Indian water rights settlements help ensure that Tribal Nations have safe, reliable water supplies, improve environmental and health concerns on reservations, and enable economic growth. These settlements have the potential to end decades of controversy and contention among Tribal Nations and neighboring communities, and promote cooperation in the management of water resources. Indian water rights settlements also promote community and economic development for regions surrounding Tribal communities, as conflicts are resolved and vital infrastructure is developed.

FOR INFO: https://www.govinfo.gov/content/pkg/COMPS-17384/pdf/COMPS-17384.pdf

UTAH LAWSUIT UT

SALT LAKE

In a historic legal action aimed at safeguarding the ecological and economic vitality of the Great Salt Lake, a coalition of environmental organizations has filed a lawsuit against the State of Utah's Department of Natural Resources, Division of Forestry, Fire, and State Lands, and Division of Water Rights. The plaintiffs consist of local environmental groups, Utah Physicians for a Healthy Environment, and the Utah Rivers Council as well as national organizations — the Center for Biological Diversity, American Bird Conservancy, and Sierra Club. The plaintiffs assert that the state agencies have failed in their duty to ensure the preservation of the Great Salt Lake's water level, which is essential for vital ecosystems and the well-being of Utah's residents.

Pursuant to the Public Trust Doctrine — which obliges the state to protect navigable waters like the Great Salt Lake for the benefit of its citizens — the plaintiffs contend that excessive upstream diversions have led to a significant reduction in the lake's water levels. This practice has resulted in approximately two-thirds of the lake's natural water inflow being redirected upstream, causing a perilous drop in water levels. This decline adversely affects crucial habitats, Utah's economy, and the recreational activities of residents, including fishing.

The lawsuit, filed on Sept. 6, seeks accountability from the state agencies by setting a minimum elevation level of 4,198 feet for the Great Salt Lake, as opposed to its current level of 4,192 feet. To achieve this, the plaintiffs demand declaratory relief, acknowledging the public trust responsibilities of the agencies and their alleged breaches. They also seek injunctive relief, mandating the agencies to halt further declines in the lake's elevation within two years and work towards restoring the lake to the minimum elevation level of 4,198 feet within a decade.

Additionally, the plaintiffs are petitioning the court to compel the agencies to:

1. Review all existing water diversions originating from the Great Salt Lake watershed.
2. Modify diversions that hinder the lake's restoration and maintenance.
3. Maintain ongoing monitoring of water usage to safeguard the lake's water levels.
4. Foster public engagement in the decision-making process.

This lawsuit has far-reaching implications for individuals and industries involved in activities that impact the Great Salt Lake. It necessitates a comprehensive review and potential modification of tens of thousands of water rights, especially those held by agricultural and extractive industries. The lawsuit also delves into the intricate balance between the Public Trust Doctrine and constitutionally protected private property rights. Beyond water rights, this legal action may affect wastewater treatment facilities, industrial entities, and industries with a stake in the lake's health and sustainability.

The lawsuit follows extensive national and local media coverage highlighting the potential ecological collapse and public health ramifications arising from declining lake levels. Given its overarching significance and the potential to establish groundbreaking legal precedents, this lawsuit warrants close scrutiny by all stakeholders with interests linked to the Great Salt Lake and its associated activities.

FOR INFO: https://earthjustice.org/wp-content/uploads/2023/09/2023-0906-great-salt-lake-complaint.pdf

KLAMATH PROJECT WEST

ALLOCATION

Reclamation announced on Sept. 5 that the Klamath Project water supply allocation, originally announced on April 13 and increased on May 19, will remain at 260,000 acre-feet and no reductions will be made to Klamath Project water users.

Irrigation districts and Tribes were notified on Aug. 18 that a curtailment may be necessary due to a potential shortfall in water supply. Due to improved hydrology in the Klamath Basin over the last two weeks, opportunities for Upper Klamath Lake water conservation this fall and winter, and coordination with Tribal partners and water users, no curtailments will be necessary.

Reclamation is required to meet a minimum water elevation in Upper Klamath Lake for endangered Lost River and shortnose suckers, as well as to provide streamflows in the Klamath River for threatened salmon.

Reclamation continues to monitor hydrologic conditions and plan for end-of-season activities as the water year comes to a close.

FOR INFO: https://www.usbr.gov/mp/kbao/

WATER RECYCLING US

FUNDING

The Department of the Interior announced on Sept. 7 the launch of a new large-scale water recycling program and made $180 million in initial funding from President Biden's Bipartisan Infrastructure Law available for projects aimed at creating new water supplies that are less vulnerable to drought and climate change. To date, the Bureau of Reclamation (Reclamation) has invested $310 million from the Bipartisan Infrastructure Law for projects that advance water recycling and reuse. The new program will incentivize projects at a larger scale, with no cap on project size, and will play an important role in helping communities develop local, drought-resistant water supplies by turning unusable water sources into clean, reliable ones.

Through the Bipartisan Infrastructure Law, Reclamation is investing a total of $8.3 billion over five years for water infrastructure projects, including water purification and reuse, water storage and conveyance, desalination, and dam safety. The announcement is one of the many historic investments the Biden-Harris administration is implementing as part of an all-of-government effort to make the Colorado River Basin and all the communities that rely on it more resilient to climate change, including the ongoing drought in the West.

The funding opportunity — part of Reclamation's WaterSMART program — is aimed at water management agencies considering or planning larger water reuse projects as part of strategies to address projected water supply shortages. The initial investment of $180 million announced is part of a total $450 million for this new program.

In order to allow more flexibility in application, this opportunity has multiple application deadlines in 2023 and 2024. Projects that secure and stretch reliable water supplies for drought-stricken states and communities, provide water quality improvements, reduce impacts on projects owned by federal or state agencies, or provide benefits to disadvantaged, underserved and Tribal communities will be prioritized.

FOR INFO: www.grants.gov >> search R23AS00433

CALENDAR

October 17-18 MT

Montana Water Law Seminar, Helena. Delta Hotels Helena Colonial. For info: The Seminar Group: 206/ 463-4400, info@theseminargroup.net or https://www.theseminargroup.net/

October 18 WEB

Investing in Local Leadership to Advocate for Equitable Climate Resilience, Virtual. Presented by Urban Waters Learning Network. For info: www.urbanwaterslearningnetwork.org/

October 18 WEB

Earmarks and the State Revolving Funds (SRFs), Virtual. Presented by the American Water Works Association. For info: https://www.awwa.org/ >> Events

October 18-20 CA

Northern California Water Tour: Water Education Foundation Event, Sacramento. Tour Across the Sacramento Valley From Oroville to Shasta Lake Examining the State Water Project & the Central Valley Project. Presented by Water Education Foundation. For info: https://www.watereducation.org/water-tours

October 19 WEB

Living River: The Promise of the Mighty Colorado, Virtual. Presented by the Wallace Stegner Center. For info: https://sjquinney.utah.edu/event/living-river-the-promise-of-the-mighty-colorado/

October 23-25 OR

Oregon Brownfields & Infrastructure Summit, Bend. Riverhouse on the Deschutes. Presented by the Northwest Environmental Business Council. For info: https://theoregonsummit.com

October 24 DC

Environmental Law Institute Annual Award Dinner, Washington. Omni Shoreham Hotel. For info: https://www.eli.org/award-ceremony-registration

October 25 CA

Water Summit: Taking On the Improbable in Western Water, Sacramento. Kimpton Sawyer Hotel. For info: https://www.watereducation.org/foundation-event/water-summit-2023

October 26-27 OR

Oregon Water Law Conference, Portland. Mark Spencer Hotel. For info: The Seminar Group: 206/ 463-4400, info@theseminargroup.net or theseminargroup.net

October 30 UT

Utah Water Law Conference - 29th Annual, Salt Lake City. UT Marriott University Park. For info: https://www.cle.com/

October 30-31 CO

Upper Colorado River Water Forum, Grand Junction. Colorado Mesa University. Hosted by Hutchins Water Center. For info: https://www.coloradomesa.edu/water-center/forum/

November 1-2 WEB

Asset Management for Water Utilities, Virtual. Hosted by EUCI. For info: https://www.euci.com/event_post/1123-water-asset-management/

November 2-3 IL

PFAS: Navigating Legal, Financial and Technological Challenges, Chicago. Hilton Chicago. Presented by the American Water Works Association. For info: https://www.awwa.org/Events-Education/Legal-Finance-Roundtables

November 2-3 AZ

Water Law Institute, Chandler. Wild Horse Pass Resort. Presented by The Foundation for Natural Resources and Energy Law. For info: https://www.fnrel.org/programs/wl23/overview

November 5-7 CA

2023 WateReuse California Annual Conference, Indian Wells. The Hyatt Regency. Presented by WateReuse. For info: www.watereuse.org

November 5-9 TX

Water Quality Technology Conference, Dallas. Sheraton Dallas Hotel. Presented by American Water Works Association; Practical Forum for Water Technology Professionals to Exchange Latest Research & Information. For info: www.awwa.org/Events-Education/Water-Quality-Technology

November 6-7 NM

Tribal Water Law, Santa Fe. Hilton Historic Plaza. For info: http://www.cle.com/

November 6-8 TX

Pipeline Condition Assessment Seminar: Developing Water Utility Action Plans, Dallas. Sheraton Dallas Hotel. Presented by American Water Works Association. For info: https://www.awwa.org/Events-Education/Pipeline-Condition-Assessment

November 6-8 WY

Western Governors Association Meeting, Jackson Hole. Walk Festival Hall. For info: www.westgov.org

November 6-8 NC

American Water Resources Association 2023 Annual Conference, Raleigh. Embassy Suites by Hilton-Raleigh Durham Research Triangle. Innovative, Practical & Applied Water Management Solutions, Techniques & Research. For info: https://members.awra.org >> Events and Education

November 6-9 NE

Aquatech Amsterdam, Amsterdam. RAI Amsterdam. World's Largest Trade Exhibition for Water Technology. For info: Annelie Koomen, Aquatech, a.koomen@rai.nl or www.aquatechtrade.com/amsterdam/

November 14 AZ

One Water Summit 2023, Tucson. JW Marriott Starr Pass Resort. Presented by US Water Alliance. For info: https://uswateralliance.org/events

November 14-15 WA

Washington Water Code Conference, Tacoma. Greater Tacoma Convention & Trade Center - Room 318. Law, Policy & Planning. For info: The Seminar Group: 206/ 463-4400, info@theseminargroup.net or www.theseminargroup.net

November 15 WEB

Laboratories of the Future: Tribes and Rights of Nature, Virtual. Presented by the Wallace Stegner Center and Equity, Diversity & Inclusion at Utah Law. For info: https://sjquinney.utah.edu/event/laboratories-of-the-future-tribes-and-rights-of-nature/

November 15 WEB

Centering Those at Risk: The Power of Community-Led Research for Climate Resilience Investments, Virtual. Presented by Urban Waters Learning Network For info: https://urbanwaterslearningnetwork.org/

November 28-30 CA

ACWA 2023 Fall Conference & Exhibition, Indian Wells. Hyatt Regency Indian Wells. Presented by Association of California Water Agencies. For info: https://www.acwa.com/events/

November 28-30 OR

2023 National Clean Water Law & Enforcement Seminar, Ashville, Renaissance Ashville Downtown Hotel. Presented by the National Assoc. of Clean Water Agencies. For info: www.nacwa.org/conferences-events/

December 5-6 VA

P3 Government Conference, Alexandria. The Westin Alexandria. For info: https://www.p3gov.com/

December 5-7 CO

North American Water Loss Conference & Exposition, Denver. Colorado Convention Center. Presented by American Water Works Association. For info: www.awwa.org/Events-Education/Water-Loss

December 6-7 OR

Business & the Environment: Conference & Expo, Portland. Holiday Inn Portland Columbia Riverfront. The Northwest's Largest Environmental Conference & Expo. For info: https://businessandenvironment.com

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

CALENDAR

December 13 **WEB**

Equitable Resilience Planning Frameworks, Virtual. Presented by Urban Waters Learning Network. For info: https://urbanwaterslearningnetwork.org/

December 13-15 **NV**

Colorado River Water Users Association 2023 Conference, Las Vegas. Paris Las Vegas Hotel. For info: https://www.crwua.org/future-conferences.html

December 14 **WEB**

Clean Water, Complicated Laws: Water Quality Ordinances - 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

January 17 **WEB**

Building Climate Resilience: Transforming Communities through Green Workforce Development, Virtual. Presented by Urban Waters Learning Network. For info: https://urbanwaterslearningnetwork.org/