The Water Report

Water Rights, Water Quality & Water Solutions in the West

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COLORADO BASIN AGRICULTURE

THE IMPORTANCE OF IRRIGATED AGRICULTURE IN THE COLORADO RIVER BASIN & THE WESTERN UNITED STATES

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Editors' Note: This is a special issue dedicated to articles that analyze Colorado River Basin challenges from different perspectives including: agricultural, academic, legal, and geographical. The Water Report will resume with regular content next month covering a variety of water industry topics.

Introduction

Water is the key to the American West. Food security is as vital to our homeland security as our nation's other strategic interests, and the production of food and fiber on Western irrigated lands is critical to our nation's ability to feed itself. Food production in the Colorado River Basin is a critically important part of this equation.

However, in the United States — and especially in the Colorado River Basin — a bewildering set of forces appear to be aligned against keeping domestic agricultural lands in production, even as our country is now importing more agricultural products than it exports.

Another record-breaking drought is now in the rearview mirror for many parts of the Western US. Undoubtedly, drought reduced the amount of water available for many users, including irrigated agriculture. However, in places like California and Oregon, much of the water that once flowed to farms and ranches is currently being re-directed by the federal government for environmental purposes. In other words, federal water policy is shutting down water availability for hundreds of thousands of acres of productive farmland. In the Colorado River Basin, competing interests have mounted a sustained campaign on agricultural water use, and often point to alfalfa as an example of one crop that uses too much water and should no longer be produced.

At a time of record food prices and when other countries' ability to help feed the outside world is at risk, our ability to increase agricultural productivity is being further curtailed — due in part to our own government and competing demands. This article seeks to explain this critical issue further and provides examples of how Western water managers and producers are solving local water challenges, as a growing number of faraway critics downplay and even criticize the importance of using water to produce affordable and safe food and fiber.

In recent years, we've actually seen large Western water projects (e.g., California's Central Valley Project and the Klamath Project in California in Oregon) that were originally authorized and constructed to supply farms with irrigation water receive zero allocations for agriculture, with available supplies solely used for environmental applications. This article also explains why that is happening in certain regions and underscores the importance of restoring irrigation as a top priority in Western water management.

About the Family Farm Alliance

The Family Farm Alliance (Alliance) is a grassroots organization of family farmers, ranchers, irrigation districts, and allied industries in 16 Western states. We are committed

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Agriculture

Policy Papers

Balanced Solutions

to the fundamental proposition that Western irrigated agriculture must be preserved and protected for a host of economic, sociological, environmental, and national security reasons — many of which are often overlooked in the context of other national policy decisions. The American food consumer has access to affordable fruits, vegetables, nuts, grains, and beef throughout the year largely because of Western irrigated agriculture and the projects that provide water to these farmers and ranchers.

The Alliance advocates in Washington, DC on legislation, regulations, and policies that have an impact on our collective Western membership. We work closely with those agencies within the executive branch that have jurisdiction on Western water matters, including: the Department of Interior (DOI); the Bureau of Reclamation (Reclamation); the Department of Agriculture; the Environmental Protection Agency; and the White House. We work in a bipartisan, bicameral manner with Congress. Alliance representatives have testified 98 times before Congressional committees since 2005. Over the past three years, much of our work on Capitol Hill has been associated with the Western drought, water infrastructure, food insecurity, and the Colorado River.

The Alliance has members in each of the seven Colorado River Basin states, where individual perspectives clearly demonstrate the amazing diversity in views on Colorado River policy matters. Within the Basin, all of the various water users' perspectives are shaped by geography: whether they are in the Upper or Lower Basin, within or outside of the natural hydrologic basin boundaries, in which state, and the priority of their use within their state. Figure 1 demonstrates the diverse interests with the Family Farm Alliance membership.

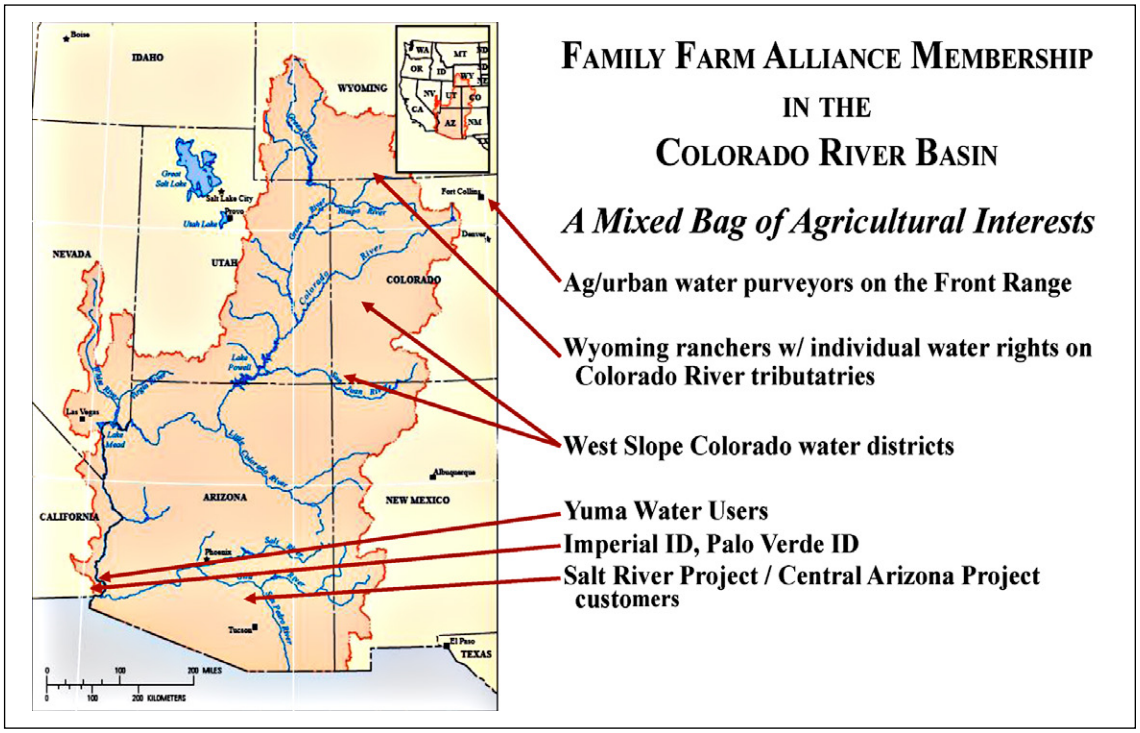

Figure 1.

Despite the diversity of Colorado River policy opinions within our membership, the Alliance board of directors in 2015 (Family Farm Alliance 2015 (*see* References below)) and again in 2022 (Family Farm Alliance 2022) adopted principles and recommendations intended to guide state and federal decision-makers as they negotiate a long-term operating agreement on the Colorado River. The 2022 policy paper — which has also been adopted by several water agencies served by the Colorado River — has as its top principle the need to "recognize that Western irrigated agriculture is a strategic and irreplaceable national resource." This means that to ensure balanced solutions are achieved, agricultural producers throughout the Basin must be represented at the decision-making table, where the full value of irrigation must be accurately and fairly considered.

The Importance of Colorado River Basin Agriculture

Water used to grow farm products doesn't stay on the farm. It becomes part of the food we eat and the clothing we wear.

For example, alfalfa is a foundational crop and is the basis for the West's beef and dairy production.

Agriculture

Alfalfa Yield

Alfalfa is grown as livestock feed for the beef and dairy industries, both of which contribute to a balanced diet. This includes high protein foods like beef and milk, and milk products, such as yogurt, butter, cheese, ice cream, cottage cheese, and more. Western alfalfa farms out-produce the rest of the country, with Arizona and California alfalfa growers leading the nation in crop yield, averaging 8.4 and 7.1 tons per acre respectively since 2016. Other states in the Lower and Upper Colorado River basins produce 2.9 to 5 tons per acre on average, with the national average of just 3.3 tons per acre (Keppen & Wade, November 2022). California is the third ranking producer of alfalfa in the country. California also happens to be the number one dairy state in the nation and leads the nation in the production of milk (18.5% of US 2021 output), butter, ice cream, and yogurt.

Yuma Crops

While alfalfa is often fodder for sensational media coverage (Thompson 2022, Shaw 2023), there are other important agricultural products grown in the Colorado River Basin that are critically important to our country's well-being. Consider the Yuma, Arizona region, where agriculture is a $3 billion annual industry. In Yuma, over 175 different crops are grown, including lettuce, other leafy greens, broccoli, cauliflower, celery, onions, beets, melons, dates, seed crops, lemons, wheat, cotton, and grasses. In the Yuma area and the Imperial Valley, two growing seasons means agriculture is a year-round business. Importantly, 80-90% of the nation's leafy greens and other vegetables for the winter months (November – March/April) are grown in the Yuma area. Producers there grow more than one billion pounds of lettuce per growing season. That equates to more than 15 servings of lettuce per growing season for every person in the US (Scott 2023).

Ag Hubs

In places like Yuma and the Imperial Valley, the combination of soils, water, climate, infrastructure, innovation, and labor force have created agricultural hubs that are irreplaceable. Ultimately, agriculture in the Imperial Valley, Yuma area, and other efficient agriculture users across the Lower Basin could not continue to thrive with less water. A reduction in water use very clearly results in less production and directly impacts the US food supply (Scott 2023).

Supply & Demand

Farmers and ranchers only grow crops and raise livestock that other people buy as their food source. Current vegetable and value-added farm and ranch products are subject to the same supply and demand dynamics as American manufacturers. With the current backdrop of severe drought conditions in the West, significantly inflated food costs, global food supply challenges, and a looming global famine, the importance of Western agricultural production has never been greater and should be carefully and thoughtfully valued. Reliable water for Western irrigated agriculture is a critical component in that equation.

Demonization of Western Irrigated Agriculture

Water for Products

In California's Central Valley and in the Klamath River Basin straddling the California-Oregon border, agricultural diversions have been unfairly blamed for declining Pacific coast salmon runs (Cavallo 2023). In the Colorado River Basin, competing water user interests have mounted a sustained campaign against agricultural water use in the Basin, often pointing to alfalfa as an example of one crop that uses too much water and should no longer be produced (Entsminger 2022, Southern Nevada Water Authority 2022). The same is true in the Rio Grande Basin, plagued for more than ten years with Supreme Court litigation among the states where the primary focus has remained on agriculture and "high water use" crops. This conflict is fueled by misinformation put forward by other, more junior, water users. [Editor's Note: Under the Prior Appropriation Doctrine used for water management in the West, those with "senior" water rights have priority over "junior" water rights holders with regard to water use.]

Western irrigated agriculture is criticized by some because of the amount of water that is required to grow food and fiber. In reality, however, it is not the farmers that are "consuming" the water. As discussed in the previous section, it's the customers who consume the products that farmers and ranchers provide.

Crop Value

Water developed for Western irrigated agriculture is often eyed by other sectors competing for water as the default "reservoir" to meet needs — such as sustaining urban growth. Alfalfa is a favorite target of some academics, journalists, and other critics of irrigated agriculture. Such critics include anti-animal agriculture extremists and Western cities, who use varying levels of sophistication to justify their criticisms of growing a forage crop in the West, particularly in times of drought. Some like to play the role of social engineer and suggest that alfalfa production be abandoned in favor of "higher value" crops or crops that use less water. These simplistic examinations of alfalfa in terms of water demand vs. supply must be enhanced and balanced with discussion of productivity, economic return, food production, and the environment to be truly productive (Keppen 2022).

The favorable attributes of alfalfa (Keppen and Wade 2022, Miller 2020), especially considering its adaptable irrigation needs (Orloff and Putnam 2010), indicate that much of the media discourse surrounding its production in places like Imperial County is ignorant or dismissive of the advantages seen by growers (Boozarpour 2023).

Agriculture

Food Prices

Input Costs

Inflation

Disposable Income

Affordable Food

Changing Land Use

Water Supply

Foreign Ownership

A Perfect Storm: Western Drought, Inflation, Vanishing Farmland

The multiple-year drought we have recently faced in many parts of the Western US — coupled with other domestic and global developments — is already affecting the availability and price of food for many Americans (Reiley 2022). Rising food prices and global hunger are linked to the war in Ukraine, extreme climate events like the Western US drought, and other global stressors. All of these factors have combined to cause significant inflation and global food shortages that loom on the horizon.

RISING COST OF GROWING FOOD = RISING FOOD PRICES

Those Western producers who did have water last year saw production costs increase by as much as 25%, because of rising fuel prices and transportation costs. Rising input costs (fuel, pesticides, fertilizers, equipment repairs), combined with the ongoing energy and supply chain crises, continue to impact food supply and demand (Benson, 2022). Since January 2021, many fertilizer types have tripled or quadrupled in price and prices remain high (Hebebrand and Laborde 2022).

Inflation was higher in 2021 and 2022 than in any other years of the previous four decades, as measured by the price index for personal consumption expenditures. Inflation in recent months has been cooling across the economy, according to data from the Labor Department. Food prices, which are some of the inflation costs that consumers feel most acutely, are still running much hotter than inflation overall (Burns 2023).

In 2005, Americans paid about 6.2% of disposable income on food and non-alcoholic beverages. That means that, for every $1,000 of disposable income, only $62 was being spent on food. That frees up a tremendous amount of additional capital for other needs, like buying a new car, investing in your children's education, or going on vacation. Globally, people paid roughly 10.2% on the same products. Now, the US average has increased to 13.2% with other countries following suit (Food Expenditures Data Set, ERS, USDA). This is concerning for our national economy since less domestic food production means more global competition and higher prices for American consumers.

Our economy depends on an affordable high-quality food supply for which we spend less of our disposable income than any country in the world. This leaves much more disposable income available for other needs and wants fueling our economy. This investment in food for our families is made possible because farmers and ranchers have made significant changes in water use practices and investments in technological water efficiency tools. While some say growing crops in the arid West is not "sustainable," available land, growing conditions, work force, and access to transportation have proven this region to be a prosperous agricultural and economic engine. The ability to control water application in the arid West is critical to producing the quality of product needed in the nation's supermarkets.

VANISHING AMERICAN FARMLAND

The American Farmland Trust (AFT 2022) reported that Americans are paving over agricultural land at a rapid pace. From 2001-2016, our nation lost or compromised 2,000 acres of farmland and ranchland every day. The AFT report shows we are on track to convert over 18 million acres of farmland and ranchland from 2016-2040 — an area the size of South Carolina. If recent trends continue, 797,400 acres of California's farmland and ranchland in 2040 will be converted to uses that jeopardize agriculture. The latest study from AFT shows that Arizona and California are paving over and compromising productive farmland at the fastest rate in the US. According to the AFT report, Maricopa County, Arizona is losing farmland at a faster rate than any other county in the nation. Fresno County in California's Central Valley — the nation's leading agricultural county by gross value — is the 17th fastest in the nation in terms of farmland lost to other uses.

According to its state water plan, Colorado could lose nearly 25% of irrigated agricultural land by the year 2050. The Colorado Agricultural Water Alliance claims that 40% of the state's irrigated agriculture will be lost. Crowley County, Colorado had its water supply purchased out from under it by growing metropolitan areas. The county now has the highest poverty rate in the state, impacting over 40% of the population.

According to recent and alarming data from the US Department of Agriculture, foreign ownership and investment in US agricultural land has nearly doubled over the past decade (2010 through 2020). As of December 31, 2020, 2.9 percent of all privately held agricultural land in the United States is held in foreign ownership. One of the largest groups of foreign investors are renewable energy companies, causing some to raise concerns that farmland will be further removed from production to meet renewable energy goals.

Agriculture

Fallowing

Drought Impacts

Infrastructure

Bureau of Reclamation

Environmental Laws

FARMLAND FALLOWING DUE TO DROUGHT

The Western US faced yet another record-breaking drought year in 2022. Farmers and ranchers in some areas of this region received little to no water from federal water projects during the summer. Major resevoirs in California, along the Rio Grande, and Colorado River approached or reached historic lows. Central Arizona Project (CAP) irrigators expect about 100,000 acres of farmland will be fallowed in 2023 due to water shortage operating guidelines on the Colorado River. In recent years, these producers have been drilling new wells to replace this lost Colorado River water. Most of these lands (approximately 40,000 acres) currently produce cotton, but roughly 20,000 acres — according to CAP producers — will be alfalfa fields.

In 2022, California faced another year of punishing drought. A research team from the University of California (UC) Merced studying the California drought found that the 2022 water deficit in the Central Valley was 2.6 million acre-feet. This shortage resulted in 695,000 idled acres of farmland, with additional acreage impacted (KFSN, 2022). The drought left hundreds of thousands of acres of Sacramento Valley farmland unplanted in 2023, causing dramatic harm to people, fish, waterfowl, shorebirds, and other wildlife. California rice production was down 50% in 2022. Researchers at UC Davis published a report which projected that the 2022 drought impacts on farm production were likely to cause a loss of about 14,300 jobs and about $1.315 billion in economic value across the Sacramento Valley (Sumner et al. 2022). While critics of California agriculture suggest that increasing agricultural production in other states is a solution, the reality is that other states simply cannot replace California's lost fruit and vegetable production.

California's water management system was designed specifically to manage volatile hydrology by storing wet year water to be used in dry years. But currently, even California's amazing system of dams and canals cannot meet the state's water needs. This is because decades after they were built, the government will no longer allow California's water infrastructure to operate the way it was intended.

The foreseeable future hydrology of the Colorado River is likely going to result in permanent loss of water supply to current agricultural production throughout the entire Basin. Drought has, and will continue to, reduce farmland in the Upper Basin of the Colorado River.

Communities will likely also continue to lose farmland as other economies move in and replace traditional cultural practices. We may need to be more innovative in finding appropriate incentives to maintain free enterprise food production.

Prioritizing Environmental Water Use Over Food Production

Undoubtedly, the Western drought has reduced the amount of water available for many users, including irrigated agriculture. However, in places like California and Oregon — where environmental priorities for anadromous fish stand supreme — much of the water that once flowed to farms and ranches is being redirected by the federal government for environmental purposes. In other words, federal water policy is shutting down water availability for hundreds of thousands of acres of productive farmland.

Historically, Reclamation has been the federal agency partner to step up and assist with the construction and initial financing of water projects that continue to serve agricultural water users in the Western United States. The Reclamation Act of 1902 is the federal law that funded irrigation projects for the arid lands of 20 states in the American West. The language of the Reclamation Act of 1902, before subsequent amendments, provided wide discretion to the executive branch to withdraw land, and to study and construct projects. Many of these projects were constructed with the primary purpose of supplying water to agricultural water users, thus building communities in the West and feeding the nation and the world.

CHANGING SOCIETAL PRIORITIES

Decades ago, the failure of Teton Dam in Idaho, the emergence of the environmental movement, and the announcement of President Jimmy Carter's "hit list" on water projects profoundly affected the direction of Reclamation's programs and activities in the United States. For many reasons — political, economic, and social — the priority of serving reliable water supplies from federal water projects to Western agricultural irrigators has been significantly diminished (see www.usbr.gov/history/borhist.html).

Certainly, enactment of well-intended federal laws like the Clean Water Act, Endangered Species Act (ESA), and National Environmental Policy Act and the effective litigation undertaken by critics of irrigated agriculture employing those laws has chipped away at the once-reliable stored water supply irrigators had depended on for decades. The federal government has effectively redirected water use, primarily for fisheries protection under the ESA. Many times this has occurred with little if any scientific justification or positive results.

Agriculture

Water Delivery

Instream Use

Reliability

Regional Management

Funding & Agreements

Conservation

Perhaps the most dramatic legislative action taken to move towards multipurpose management of federal water was the Central Valley Project Improvement Act (CVPIA), signed into law in 1992. The CVPIA mandated balancing competing demands for a limited supply of water — a balance that included meeting the requirements of: fish and wildlife; agriculture; and municipal, industrial and power contractors.

REGULATORY FOCUS OF CALIFORNIA'S BAY-DELTA ENVIRONMENTAL CHALLENGE

Between 1990 and 2014, a number of regulatory and policy decisions were enacted across the Central Valley Project (CVP) south of the Delta impacting water management. The results of these decisions have reduced the average water supply for agricultural water service and repayment contractors — farmers and ranchers in the San Joaquin Valley who receive water from the CVP — from 100% of their contracted deliveries (except under the worst drought in California's history in 1976-77), to an average of 35% of contracted supply. With each subsequent policy decision, more water was allocated to instream use and away from other uses, such as municipal and agricultural uses (*see* Keppen & Dutcher 2015). Last year, south-of-Delta agricultural service contractors located on the west side of the San Joaquin Valley received a 0% water allocation. That was the fourth time in a decade that those water users received a 0% allocation, resulting in the fallowing of hundreds of thousands of acres of farmland in one of the most productive agricultural regions in the world. The operations of the California State Water Project (SWP) — which provides water to millions of residents in Southern California — are also impacted by environmental priorities established for the Bay-Delta (*see* Metropolitan Water District 2008).

In short, state and federal regulations have reduced water supply availability. During the 1952-1990 time period, farmers had a sense of reliability and certainty regarding their CVP water contracts and annual water deliveries. But those water deliveries have decreased over time as policy and legal actions were taken to crush that certainty. Presently, agriculture in California does not have a reliable supply of water. This undermines the industry's ability to make long-term decisions regarding adaptation and resilience. The frustrating fact to agricultural producers is that the severe water cutbacks that have already occurred are not increasing the populations of fish species listed for protection under the ESA (*see* California Department of Fish and Game (2014a, 2014b), Pacific Fisheries Marine Council (2014), and Lee (2023)).

WHY CALIFORNIA'S BAY-DELTA MATTERS TO THE COLORADO RIVER BASIN

There is a need to manage interconnected and adjacent systems — such as the California State Water Project (SWP) and the Lower Colorado River — to explore the potential impacts of allied water systems. Colorado River Basin management actions are interconnected with federal water management decisions made in both tributary and adjacent river basins. Restrictions on other non-connected water sources can limit opportunities to manage Colorado River water more effectively in a drought.

For example, the reductions in water provided by the SWP to the Metropolitan Water District of Southern California will impact the demand, and reliance on, Colorado River supplies. Interestingly, while the linkage between California's Bay-Delta and much of the West should be obvious given daily headlines, many do not see the connection. In order to fix the larger problem facing the entire region, California and the federal government need to resolve Bay-Delta water management.

Recent Developments on Colorado River Operations

In May 2023, the Lower Basin States (Arizona, California, and Nevada) and the Biden Administration coalesced around a short-term plan to voluntarily conserve three million acre-feet of water over the next three years in exchange for more than $1 billion in federal funds. The weather has improved markedly over the past winter, with plentiful snow covering much of the Rockies and water reservoir storage levels starting to rise. Over $12 billion from the federal government is being made available through the Bipartisan Infrastructure Law and the Inflation Reduction Act (IRA) has reserved $4 billion in funding for the Colorado River. Improved hydrologic conditions combined with funding meant that it was worthwhile for users to voluntarily give up their allocation of Colorado River water on a temporary basis. So, improved hydrology and abundant federal funding helped grease this agreement.

LOWER BASIN WATER USER ACTIONS

The Lower Basin Plan proposes to conserve 3 million acre-feet of Colorado River water through 2026, with at least 1.5 million acre-feet of that total being conserved by the end of calendar year 2024. Agricultural water users, municipal purveyors, and tribes are anticipated to assist in meeting California's conservation volumes and utilize IRA funding. Arizona and Nevada water users have committed to conserve the balance of the 3 million acre-feet of voluntary conservation, in addition to their existing

Agriculture

Hydrology

Forego Water Use

Snowpack

Storage

Mulit-Purpose Management

shortage reduction volumes and contributions under the 2007 Interim Guidelines and 2019 Drought Contingency Plan. DOI announced more than $157 million will be paid to Phoenix, Tucson, and six other Arizona communities if they save up to 393,000 acre-feet through 2025. The Gila River Indian Community will also receive up to $150 million to conserve up to 375,000 acre-feet of reservoir water.

UPPER BASIN DEVELOPMENTS

In May 2023, Reclamation began implementation of the 2023 Drought Response Operations Plan (Operations Plan) in the Upper Basin. The Operations Plan allows upstream reservoirs to recover additional water previously sent downstream to Lake Powell, which is not expected to need a boost from upstream reservoirs this year. That is due to high snowpack this past winter and projected high runoff this spring. Lake Powell's projected inflow for September 30, 2023 is just over 14 million acre-feet of water — that's more than the last three years combined (see Reclamation 2023).

Another Upper Basin program — the System Conservation Pilot Program — would pay farmers and ranchers willing to forgo their use of water. This program has struggled, with few people applying so far in 2023. Between the four Upper Basin states, 88 applications came in offering to save some water. The Upper Colorado River Commission approved more than 80% of them. However, if each of the program's approved applications works out as expected, the Upper Basin can expect to save about 39,000 acre-feet — less than 2% of the smallest amount of water federal officials had hoped to save — at a cost of about $16 million (Swanson 2023).

Conservation and other demand management actions undertaken in the Upper Basin — such as in the agricultural-rich Western Slope of the Rockies — differ from Lower Basin actions because those farmers and ranchers do not live and work below major reservoirs like Lakes Mead and Powell. In the Upper Basin, the snowpack of high-elevation forests is the largest reservoir of water, providing only a single year or partial year supply; once the snow has melted or sublimated, that largest storage bucket is gone (see Mueller 2023).

Manmade storage is a foundational piece of the management strategies on which Western Slope water managers have relied. It benefits productive agriculture, municipal water systems, recreation, and environmental programs. Many major streams do not even have small capacity reservoirs to assist with mitigating the impacts of hotter, drier years. Many of the small existing reservoirs were built over 100 years ago and need enlargement or significant rehabilitation.

In the Upper Basin, local water management priorities are focusing on developing "small-bucket" storage on some of those streams. This includes managing high-elevation forests to support healthy watersheds, and implementing watershed planning and irrigation modernization projects using recently beefed-up federal conservation programs like the Small Watershed Rehabilitation Program (authorized under Public Law 566 (PL 566)).

Managing Western Water and Landscapes for Agriculture and the Environment

Many Alliance members in the West — particularly in California and the Pacific Northwest — question our water management system. Fish populations continue to struggle, farmers must fallow land, and businesses and residents face continuing water restrictions. That's because management is based on decades-old, siloed, scientific hypotheses embedded in a top-down regulatory system that lacks the ability to incorporate new science as it becomes available. Fortunately, there are examples in California, Oregon, Washington State, and other parts of the West that suggest other paths might be taken. True multi-purpose management of water resources that yields benefits to both agriculture and the environment is proving possible.

SCIENTIFIC STUDY + PROVEN RESULTS = SMARTER WATER MANAGEMENT

Science has been telling us for some time that fish need more than water to survive. Habitat restoration and improvement, predator control, and food supply are also critically important. In California's Sacramento Valley, on-the-ground projects have generated results to prove a multi-dimensional management approach works.

Agriculture

Successful Projects

Accomplishments include:

- Partnerships to Implement New Science on Butte Creek Turned 100 Salmon into 10,000
- Operation FatFish - Scientists Teamed Up with Farms to Produce a New Food Supply for Fish
- Boulders & Branches - Experiments with Fish Habitat Have Produced Improving Salmon Populations
- Painter's Riffle - Biologists Urged Restoration of Spawning Grounds, Leading to Successful Collaborative Projects
- On-Demand Water - Focus on Providing Water for Fish in the Right Place at the Right Time

These examples — and several new projects promoting recovery of Chinook salmon by providing additional spawning and rearing habitat — are implemented through a collaboration of Sacramento River Settlement Contractors. The collaboration represents various irrigation districts, reclamation districts, mutual water companies, partnerships, corporations, and individuals situated in the Sacramento Valley who hold senior water rights along with conservation organizations and state and federal agencies. These efforts are part of the comprehensive Sacramento Valley Salmon Recovery Program. By following the path that science has laid out, these collaborative efforts demonstrate that we can improve the environment while increasing water availability and reliability for all water users.

Collaboration

WATER RELIABILITY AND WATER FOR ENDANGERED SPECIES

Farmers in the Deschutes Basin of Central Oregon have been dealing with water supply risks and uncertainties for years. The US Fish and Wildlife Service listed the bull trout and the Oregon spotted frog as "threatened" under the Endangered Species Act (ESA), while the National Marine Fisheries Service listed the Mid-Columbia steelhead as "threatened" under the ESA as well. All three species are present in the Deschutes Basin. These ESA listings ultimately culminated in a lawsuit, whereby environmental groups sought a court order to effectively end all irrigation storage in the Deschutes Basin. The water users fought back and defeated the environmental groups' motion for injunctive relief that would have put at risk the water supplies for some 150,000 acres of irrigated farmland (*Center for Biological Diversity et al. v. U.S. Bureau of Reclamation, et al.,* Case No.: 6:15-cv-02358-JR, consolidated with 6:16-cv-00035-JR, D. Or.). The water users and their irrigation districts took matters into their own hands, as they developed a long-term plan that would both provide certainty for agricultural water supplies, while at the same time, producing a plan that would provide water for and benefit the listed species.

Legal Action

The Deschutes Basin Habitat Conservation Plan was the product of 12 years of scientific study, hard work, and collaboration between irrigators, federal and state agencies, the Confederated Tribes of the Warm Springs Reservation, cities, counties, multiple non-governmental organizations, and the general public in the Deschutes Basin. Finalized in 2020, the Habitat Conservation Plan sets the course for conservation efforts in the Deschutes Basin for the next 30 years. It provides the eight irrigation districts in the basin (organized as the Deschutes Basin Board of Control) with both a pathway and time for modernizing their water delivery systems through canal piping and other projects.

Regional Plan

"WATER 4" — CONSERVATION THAT PROVIDES MULTIPLE BENEFITS TO PEOPLE AND WILDLIFE

Irrigated lands comprise over 60 percent of wetland habitat in the snowpack-driven systems of the Intermountain West. These lands provide vital habitat for migratory birds, sustain floodplain function, and recharge aquifers, but are at risk of fragmentation from rural subdivision, competing water demands, and the ongoing impacts of climate change. The Alliance works closely with the Intermountain West Joint Venture (IWJV), a leader in utilizing science and technology advancements to link agriculture, hydrology, and wildlife habitat conservation. The IWJV's Water 4 Initiative is focused on the importance of maintaining agricultural land for habitat conservation and landscape resiliency within Western states (*see* https://iwjv.org/water/).

Resiliency

YAKIMA RIVER BASIN INTEGRATED PLAN

The Yakima River Basin in Washington State supports a $4.5 billion-dollar agricultural economy and historically produced significant salmon and steelhead runs. The Yakima Basin Integrated Plan (YBIP) is a collaborative 30-year plan developed and implemented by YBIP partners including the Yakama Nation, irrigation districts, cities and counties, conservation groups, the federal government and the State of Washington, among others. The YBIP has provided opportunities in the Yakima River Basin for local, state, and federal partnerships to allow member irrigation districts — including the Sunnyside Valley Irrigation District, the Roza Irrigation District, the Yakima Tieton Irrigation District, the Kittitas Reclamation District and others — to work aggressively on a drought resiliency strategy to modernize their water delivery systems to conserve water to the benefit of both fish and farmers. Modernization of

Modernize Delivery

Agriculture

these important irrigation water delivery systems is providing the means to ensure reliable and consistent irrigation water delivery to basin farmers. The YBIP has embraced a new drought emergency water storage project at Kachess Reservoir, as well as new fish passage, habitat, water and groundwater supply, and headwaters restoration projects in the Yakima River Basin that benefit and promote healthy fish, farms and communities. *See* Malloch et al, *TWRs* #106, #108, #135 & #186.

FOREST MANAGEMENT IMPACTS ON UPPER WATERSHED WATER SUPPLIES

Sublimation

It is hard to overstate the importance of snowmelt as a source of freshwater in parts of the Rocky Mountain West and great attention is paid to ecosystem water cycles in this region. Some of the snow that falls in the mountains goes directly from crystalline snow to water vapor, bypassing the liquid water phase. This phenomenon — sublimation — accounts for the loss of a large portion of the snowfall during the winter months in the Rocky Mountains. Snow intercepted by tree branches sublimates the fastest, often disappearing within a few days of a snowfall. Recently published work (*see* Rocky Mountain Research Station, 2021) teases apart how the loss of spruce canopy affects the sublimation rates for snow both in the canopy and on the ground in these ecosystems. These findings have some important implications regarding snow interception and retention. Research conducted by the Forest Service on the Upper North Platte River shows that management restricting timber harvest had already severely impacted the watershed and water yield to the tune of a minimum of 160,000 acre feet (AF) per year (*see* Troendle & Nankervis, 2000). There are other models that can be used to quantify the amount of water removed from Wyoming's water supply by dying forests and invasive species like the bark beetle, as well as anecdotal reports from around the West of water yield increases resulting from clearing pinon and juniper stands (*see* Petrakis et al, 2016).

Integrated Management

Family Farm Alliance President Patrick O'Toole's own family is helping to lead an effort to design a comprehensive, multi-stakeholder, large landscape initiative to restore two severely degraded (non-functioning) 50,000-acre watersheds: one in the Medicine Bow National Forest in Wyoming and a second in the Routt National Forest in Colorado. Their vision is to restore two forested rangelands to a resilient state that filters and stores water, produces protein, sustains wildlife and fisheries, sinks carbon, produces renewable energy feedstocks, and enables economically viable rural communities to thrive.

There are other proven examples of where food producers, water managers, and conservationists can work together in a way that benefits agriculture and the environment (Family Farm Alliance 2019, 2023). We must continue to do more of this type of work, where environmental objectives can be reached without taking water away from farmers and ranchers.

Conclusion

Multiple Needs

In order for irrigated agriculture to exist into the future, we need to enhance management of water supplies and delivery. We must maximize the benefits from our available water to meet multiple needs. In spite of the water conservation success stories from Western municipalities like Los Angeles and Las Vegas — where growth has continued (unabated) while per-capita water consumption has decreased — we must learn to overcome our addiction to population growth, not only in the arid West, but also at the national and global levels. Similarly, all environmental water uses (instream flows for ecologic and recreational purposes, wetland development, water consumed by non-crop plants, etc.) must be closely scrutinized and managed to the same degree we are asking of our agricultural and municipal water users.

We should not specifically plan to take more water from farms. Agriculture cannot be the default "reservoir" of choice to satisfy the demands of competing sectors.

Conserving Together

Growers across the West are stepping up, at their own expense and in partnership with state and federal funding programs, to provide solutions for the viability of their basins and the communities those basins serve. In many cases, that means senior water rights holders are voluntarily making water supplies available to junior water users, thus preventing cuts otherwise required. There are other collaborative efforts underway to fund on-farm conservation projects that are helping reduce demand. Urban, agricultural, and environmental water users would all benefit from such efforts in the short and long term.

Impacts of Change

What does not help is the relentless finger-pointing by non-agricultural water agencies and critics of agriculture, saying that farmers aren't doing enough and what they are doing is killing fish. Critics of irrigated agriculture in the Colorado River Basin continue to shame farmers for growing crops, such as alfalfa, saying they should fallow their fields or switch to crops that use less water, which fixes nothing. The Western agricultural system was built on local supply of feed and food. Shifting production to other states adds additional food delivery miles, greenhouse gas emissions from transportation, and ultimately higher costs and/or emptier shelves at the grocery store. Locally grown food for humans, dairy, and animal proteins results in lower costs to producers and consumers.

Agriculture

Water & Food

Many agricultural regions of the West do not have an economic base that can absorb additional unemployment, business closures, and the loss of tax revenue that come with fallowing. Agricultural regions, such as the central valleys of California and Arizona, are facing a future of dwindling and unsustainable groundwater supplies as they look to replace potential shortages from traditional sources like the Bay-Delta and the Colorado River. Entire communities are at risk of closing, bankrupting their populations.

We have some decisions to make. Are we going to wake up and realize the world has drifted far from the stability we have known for our lifetimes and make required course corrections? Or do we remain committed to our own demise and continue on a crash course with what may likely be the greatest food shortage in global history? Fallowing Western farmland means increased reliance on food production in other countries with lower or non-existent production standards. Fallowing any land during a time of crisis should be temporary, or we risk losing control of our ability to provide a reliable and safe US-grown food supply.

Imperial Irrigation District General Manager Enrique Martinez said it best in a late 2022 interview with the *Desert Sun:* "You've got to...keep listening to the farmers, because ultimately, you don't want to get to the point of creating a food crisis to solve a water crisis."

Agricultural production in the West is an irreplaceable, strategic national resource that is vital to US food security, the ecosystem, and overall drought resilience. The role of the federal government in the 21st Century should be to protect and enhance that resource by doing whatever it can to ensure that water remains on farms. At a time of unprecedented change, one certainty holds firm and true — our nation's most valuable natural resource must be preserved.

For Additional Information:

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Dan Keppen is Executive Director for the Family Farm Alliance, a non-profit association that advocates for family farmers, ranchers, irrigation districts and allied industries in 17 Western States. He has thirty-four years of experience in Western water resources engineering and policy matters. Since 1997, he has worked primarily in advocacy positions with the Northern California Water Association, and as executive director of the Klamath Water Users Association. Prior to that time, Keppen was a water resources engineer for Tehama County, California and Portland, Oregon. He is a registered civil engineer in California. Keppen received his M.S in Water Resources Engineering from Oregon State University (OSU) and his B.S. in Petroleum Engineering from the University of Wyoming.

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Basin Update

COLORADO RIVER BASIN UPDATE

THE PURSUIT OF BALANCE

by Lawrence J. MacDonnell, Senior Fellow
Getches-Wilkinson Center for Natural Resources, Energy, and the Environment (Boulder, CO)

Introduction

Drought

The period from 2000 through 2022 was the driest 23-year period in the Colorado River Basin in more than a century and one of the driest periods in the last 1,200 years (Congressional Research Service, *Management of the Colorado River: Water Allocations, Drought, and the Federal Role,* updated February 6, 2023). Even with the remarkable winter snowpack of 2022-23, basin reservoirs are still dangerously low. Despite widespread recognition that basin water uses exceed water supply, efforts to reduce uses have struggled. The hope of finding an acceptable basis for bringing the system closer to balance remains elusive.

This article begins with a brief review of the current situation in the basin and then turns to a review of how we got to this place. Emphasis is placed on the efforts over the past 20 years to respond to the dramatic decline in water availability. Finally, the article turns to recent proposals to bridge the gap until more lasting measures can be agreed upon.

Where Are We Now?

Basin Storage

Between water year 1999 and 2022, the combined storage of water in Lakes Powell and Mead — the two giant storage reservoirs on the Colorado River — declined from 92% to 26% of total capacity. While storage is expected to rebound to 35% in 2023, this change reflects the 20% decline in water supply during this period and continued substantial releases to meet demands (see Figure 1).

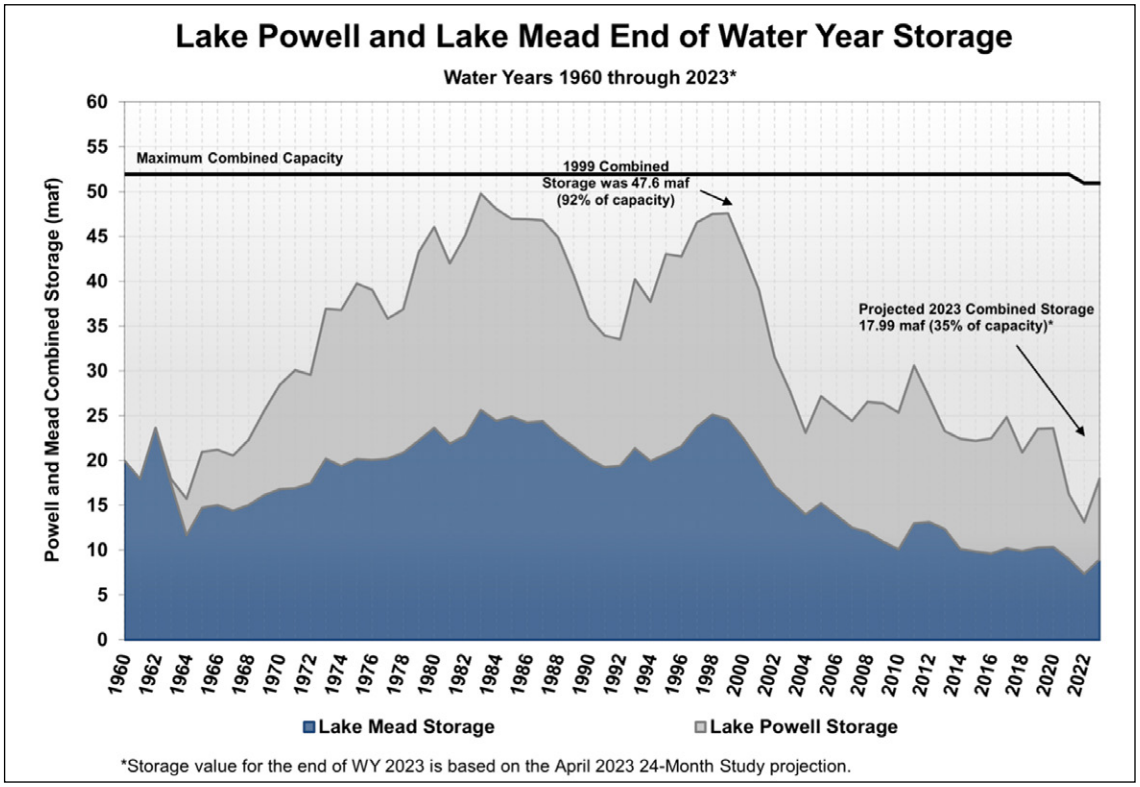

Figure 1. Lake Powell and Lake Mead Water Storage

Shortage

Declines in storage elevations in Lake Mead led to a first-time Secretarial declaration of shortage conditions for calendar year 2022 in the Lower Colorado Basin and larger shortage reductions for 2023 (Arizona 592,000 acre-feet, Nevada 25,000 acre-feet, and Mexico 104,000 acre-feet) under operating rules first established in 2007 and modified in 2019 (Department of the Interior, Interior Department Announces Actions to Protect Colorado River System, Sets 2023 Operating Conditions for Lake Powell and Lake Mead, August 16, 2022).

Basin Update

Plan for Reductions

Proposal

Geography

Declines in water elevations in Lake Powell in 2022 threatened the ability to generate hydroelectric power. Until the recent reprieve, projections indicated further substantial reductions in water deliveries from the Colorado River in the Lower Basin and Mexico. In June 2022, US Bureau of Reclamation (Reclamation) Commissioner Touton called on Colorado River Basin states to develop a plan for reducing basin water uses by two-to-four **m**illion **a**cre-**f**eet per year (MAF/year) (*see* Statement of Camille Calimlim Touton, Reclamation Commissioner, before the Senate Committee on Energy and Natural Resources, June 14, 2022, https://www.energy.senate.gov/services/files/6CB52BDD-57B8-4358-BF6B-72E40F86F510).

After a few false starts, the Lower Basin states have offered a proposal that would temporarily reduce uses by up to three MAF over three years (letter from the Colorado River Basin States Representatives of Arizona, California, and Nevada to Commissioner Camille Calimlim Touton, Bureau of Reclamation, May 22, 2023). This proposal is discussed further later in this article.

Basin Overview

The Colorado River Basin encompasses parts of seven states in the western United States and two states in Mexico. There are 30 Indian reservations fully or partly in the basin. Basin headwaters almost entirely originate in the mountains of Colorado and Wyoming, pass through the Colorado Plateau and the Grand Canyon, and head to the border with Mexico where essentially all remaining water is diverted for use in the US and Mexico — leaving none for the Colorado River Delta and the Gulf of California. Arizona essentially fully consumes the water of the Gila River Basin, the largest tributary in the Lower

Figure 2: Colorado River Basin Map

Basin Update

Basin Uses

Basin. The basin's water provides at least a portion of the domestic and industrial uses of some 30 to 40 million people both within and outside the hydrologic basin, including the cities of Denver, Salt Lake, Las Vegas, Phoenix, and Los Angeles. Stored water is used to generate large amounts of hydroelectricity, especially at Glen Canyon and Hoover Dams. The primary user of basin water is agriculture, irrigating as much as five million acres of land within and outside the basin, accounting for approximately 70% of all water consumption (Congressional Research Service, *Management of the Colorado River: Water Allocations, Drought, and the Federal Role,* updated February 6, 2023).

How Did We Get Here?

Limited uses of basin water for irrigation along a few tributaries of the Colorado River to irrigate adjacent lands began in the 1870s. The scale of development increased dramatically in the early 1900s with the diversion of Colorado River water for use in Imperial Valley and the Mexicali Valley and with construction of new irrigation projects in the basin by the newly created Reclamation Service. Recognizing the likelihood of conflicts among users in seven states, basin leaders negotiated a compact in 1922 apportioning the beneficial consumptive use of up to 7.5 MAF/year to states in the Upper Basin (Arizona, Colorado, New Mexico, Utah, and Wyoming) and up to 8.5 MAF/year to states in the Lower Basin (Arizona, California, and Nevada) (Colorado River Compact, 1922, Articles III (a) & (b)).

1922 Compact

While the 1922 Compact apportioned a maximum of 8.5 MAF for beneficial consumptive use of Colorado River system water, the US Supreme Court in *Arizona v. California* decided that Congress apportioned the use of 7.5 MAF from the main Colorado River to the Lower Basin. It left use of the tributaries in the Lower Basin to the states in which they flow (*Arizona v. California*, 373 US at 567 (1963)).

The Upper and Lower Basins are separated hydrologically at Lee Ferry in northern Arizona. Because virtually all the water originates in the Upper Basin, it was agreed in the Compact that at least 75 MAF would pass Lee Ferry every consecutive ten-year period (Colorado River Compact, Article III (d)).

Hoover Dam

Construction of Hoover Dam near Las Vegas in the 1930s greatly facilitated additional water development and use in the Lower Basin, especially in Imperial Valley (*see* Lawrence J. MacDonnell, Colorado River Basin, *Waters and Water Rights,* Lexis-Nexus, CORB-1, 2021, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3780342). During that same decade, Los Angeles and the Metropolitan Water District of Southern California built a 242-mile-long aqueduct taking Colorado River water to cities along the south coast of California. In the 1940s the United States and Mexico agreed to a treaty that ensured availability of 1.5 MAF/year of water to Mexico (*see* Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Treaty Between the United States of America and Mexico, February 3, 1944).

US/Mexico Treaty

Following World War II, Reclamation turned its attention to the Upper Basin. As a preliminary step, the Upper Basin states negotiated a compact allocating use of that basin's apportionment on a percentage basis, with Colorado receiving 51.75%, Utah 23%, Wyoming 14%, and New Mexico 11.25% (*see* Article III, Upper Colorado River Basin Compact, 1948, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3780342). In 1956, Congress authorized Reclamation to build Glen Canyon Dam in southern Utah, along with several other participating units (*see* Colorado River Project Storage Act, https://www.usbr.gov/lc/region/g1000/pdfiles/crspuc.pdf).

Upper Basin Allocations

In addition, Congress authorized potential construction of numerous irrigation projects in the Upper Basin, only a few of which were built. Reclamation also constructed the San Juan-Chama Project, taking basin water to the Rio Grande for use in New Mexico as well as the Central Utah Project, taking water out of the basin for use in the Wasatch Front of Utah. Other projects in Colorado already moved water out of the basin for use in Front Range Colorado. In 1963, the United States Supreme Court decided that Congress in the 1928 Boulder Canyon Project Act had allocated consumptive beneficial use of the 7.5 MAF/year apportioned in the 1922 Compact to the Lower Basin, with Arizona having use of up to 2.8 MAF/year from the Colorado River, California the use of up to 4.4 MAF/year, and Nevada use of 300,000 acre-feet per year (*Arizona v. California,* 373 US 546 (1963)). In 1968, Congress authorized what was probably the last great Reclamation project, the Central Arizona Project, moving water 336 miles uphill from the Colorado River to central and southern Arizona (*see* Colorado River Basin Projects Act, www.usbr.gov/lc/region/pao/pdfiles/crbproj.pdf. For a more comprehensive history of the Colorado River Basin see John C. Schmidt et al. *The Colorado River Water Crisis: Its Origin and the Future,* June 17, 2023 (https://www.usgs.gov/publications/colorado-river-water-crisis-its-origin-and-future).

Lower Basin Allocations

It was a remarkable century of water development, helping to fuel economic development and growth in the southwest United States. In many respects, it fulfilled a longstanding dream of comprehensive river basin development to promote economic growth. For a river thought to average 15 MAF of inflows annually, it put in place 60 MAF of storage. It made real the then widely-held sentiment that any water

Water Storage

Basin Update

reaching the ocean was wasted water. After construction of Glen Canyon Dam in the early 1960s, all river water not put to consumptive use or lost to evaporation was stored in basin reservoirs for the future. It seemed we had at last demonstrated our ability to fully control and put to human use all the water resources of a great river basin.

Consumptive Uses

As shown in the following table, consumptive uses of Colorado River system water in the Upper Basin and the Colorado River mainstream grew consistently across the 20th century. In 1920, uses in the Upper and Lower Basins were nearly equivalent. By 2000, total uses had grown to over 12 MAF, with two thirds of that use occurring out of the Lower Basin mainstream. It was no surprise that Lower Basin uses grew more rapidly than uses in the Upper Basin. There is considerably more irrigable acreage in the Lower Basin, and much of this land can grow crops year-round.

Consumptive Uses of Basin Water 1920 to 2000

Calendar Year	MAF Consumptive Use	Upper Basin MAF	Lower Basin MAF
1920	4.7	2.2	2.5
1930	5.2	1.8	3.4
1940	4.9	1.5	3.4
1950	6.4	1.8	4.6
1960	8.1	2.0	6.1
1970	8.9	2.6	6.0
1980	9.2	3.2	6.0
1990	11.5	3.8	7.7
2000	12.3	4.0	8.3

Despite Lower Basin uses in 2000 substantially exceeding its basic apportionment of 7.5 MAF/year, basin reservoirs were essentially full, and the Upper Basin was consuming only a little more than half its apportionment. The system seemed sound.

2000-2021: Period of Severe Sustained Drought and Creative Incrementalism

All was not well, however. As the Central Arizona Project (CAP) came online in the 1990s enabling Arizona to make full use of its allocation from the Colorado River, attention turned to reducing California's uses that had grown to over 5.2 MAF/year down to its 4.4 MAF/year basic allocation (*see* Lawrence J. MacDonnell, *The Law of the Colorado River: Coping with Severe Sustained Drought, Part II* (March 23, 2021) https://ssrn.com/abstract=3811024). Initially it was hoped that California would have time to gradually make that reduction, but severe water shortages in the first years of the early 2000s forced more immediate action.

Reductions

The result was the Quantification Settlement Agreement (QSA) providing for the compensated movement of some water from agriculture to urban uses in California to ease the cutbacks (*see* www.iid.com/water/library/qsa-water-transfer). Continued drought forced negotiations that for the first time tied deliveries of water from Lake Mead to Lower Basin users to levels of storage in Lake Mead and that directly linked management of Lakes Powell and Mead. These negotiations resulted in the Interim Shortage Guidelines (*see* Secretary of the Interior, Record of Decision, Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, December 2007, www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf). Growing recognition that basin water uses were exceeding water supplies led to a comprehensive study by Reclamation, completed in 2012, called the *Colorado River Basin Supply and Demand Study* (*see* Jerla et al., *TWR* #100; *Study* available at: https://www.usbr.gov/lc/region/programs/crbstudy/finalreport/Study%20Report/CRBS_Study_Report_FINAL.pdf).

Shortage Guidelines

The Study projected a supply-demand imbalance of 3.2 MAF/year by 2060. Mexico's need for storage space in Lake Mead led to an agreement providing that Mexico also would share shortages (*see* Minute 319, Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California https://ibwc.gov/Treaties_Minutes/Minutes.html). Recognizing that the 2007 Interim Guidelines were no longer sufficient, the basin states and Reclamation agreed to Drought Contingency Plans (DCP) in 2019 that provided, among other things, for

DCP

larger reductions in deliveries from Lake Mead as reservoir elevations declined (*see* www.usbr.gov/dcp/finaldocs.html). As noted above, the Secretary declared the first shortage under these guidelines in 2022 as storage levels in Lake Mead dropped below a level not seen since the reservoir first filled in the 1930s.

The journey over the first two decades of the 21st century in the Colorado River Basin has been unprecedented. Never have basin leaders been so hard pressed to make continued adjustments in water storage and water deliveries in an attempt to keep up with a declining water supply. At each of these decision points, basin leaders have shown an ability to work collaboratively to find short-term fixes that they hoped might be all that was needed. Nevertheless, consumptive uses in the basin did not decrease much during this period, relying instead on drawing down the considerable amount of water in storage in basin reservoirs to maintain uses.

And then it got worse. The basin added only about 9.6 MAF in 2020, 6.3 MAF in 2021, and 9.8 MAF in 2022 (*see* Reclamation, Colorado River Basin Natural Flow and Salt Data, Corrected Provisional Natural Flow Data, 1906 to 2022, www.usbr.gov/lc/region/g4000/NaturalFlow/provisional.html). At the end of July 2022, Lake Mead had dropped to elevation 1040 (i.e., 1040 feet about sea level) which represented about 27% of capacity. This was the lowest elevation recorded since it was first filled. Lake Powell dropped to elevation 3525, the point at which hydroelectric power generation begins to become seriously affected, and it was projected to decline to levels that could make any releases difficult. It was at this point that Reclamation Commissioner announced the need for basin water uses to be reduced by 2 to 4 million acre-feet. The following figure shows annual inflows to the Upper Basin between 2000 and 2022. As illustrated, only four years out of 23 years exceeded the 15 MAF average inflows during the 20th century.

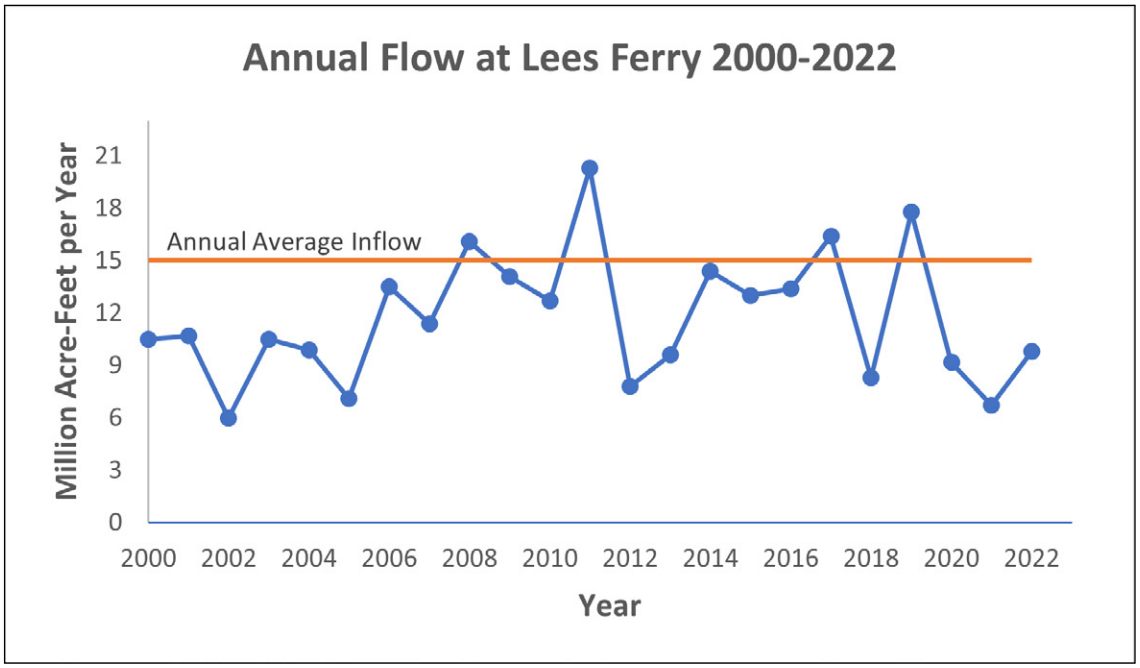

Figure 3.

Where Are We Today?

Despite 20 years of hard work by basin leaders to find ways to deal with declining water availability, it was clear by 2022 these efforts weren't enough. Low priority agricultural users in Arizona saw reductions in water available from the CAP, causing most of them to revert to groundwater use. The actual reductions in Arizona were cushioned by voluntary agreements with two tribes not to take the full amount of water to which they were entitled (*see* Jake Bittle, *"US Turns to Tribes to Help Arizona Survive Colorado River Cuts,"* Grist, April 11, 2023, https://grist.org/indigenous/colorado-river-arizona-tribes-wategila-river-conservation-deal-biden/). Nevada had already reduced its uses and stored enough of this water as "incidentally conserved surplus" to more than offset its reduced delivery.

Basin Update

Incidentally Conserved Surplus

Incidentally conserved surplus is a mechanism authorized in the 2007 Interim Shortage Guidelines under which users of water from Lake Mead may voluntarily forgo use of a water in a year and store that water in Lake Mead for future use.

California has not yet faced additional reductions because of agreements reached in Congress in conjunction with authorization of the Central Arizona Project (*see* Section 301 (b), Colorado River Basin Project Act, www.usbr.gov/lc/region/g1000/pdfiles/crbproj.pdf). In short, at least in the United States, virtually no user involuntarily went without water.

Continued Shortages

Nevertheless, Reclamation tried to make clear that there would be continued shortages — serious enough that the various contingency arrangements that had been made in the previous two decades were inadequate. After Commissioner Touton's request for plans from the basin states to make large-scale reductions in consumptive water use went unanswered, Reclamation initiated a **s**upplemental **e**nvironmental **i**mpact **s**tatement (SEIS) process to evaluate ways to achieve the reductions needed to enable the system to continue to function. Nevada and the Southern Nevada Water Authority attempted to gain support for a plan for each of the three Lower Basin states to offset a share of the evaporation from Lake Mead and other lower basin reservoirs. California offered an alternative approach. A comprehensive discussion of the evaporation issue is provided in John Fleck & Eric Kuhn, *An Historical Perspective on the Accounting for Evaporation and System Losses in the Lower Colorado River Basin,* June 1, 2023 (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4466530).

SEIS

These proposals went nowhere. Reclamation released its draft SEIS in March 2023. In addition to a no-action alternative, it proposed two contrasting approaches. The first would be to modify existing operating rules to provide for further shortage reductions as Lake Mead goes below elevation 1025 and to use existing legal arrangements to determine how to implement reductions, including reducing junior CAP deliveries and reducing water to the Metropolitan Water District and Las Vegas. Under this option, agricultural users with senior water rights would be the last to take shortages. The second alternative would be to apply a sliding-percentage-scale annual reduction in consumption according to actual annual water supply — essentially some version of "share the pain." It projected that this approach would have much less effect on urban users and would require agricultural users to make reductions sooner.

Options

As expected, none of the Lower Basin states liked either of these alternatives. Instead, they came together with a proposal submitted to Reclamation in May 2023 (*see* letter from the Colorado River Basin States Representatives of Arizona, California, and Nevada to Commissioner Camille Calimlim Touton, Bureau of Reclamation, May 22, 2023 https://www.doi.gov/sites/doi.gov/files/lower-basin-plan-letter-5-22-2023.pdf). The three states offered temporary reduction of consumptive uses of at least 3 MAF between 2024 and the end of 2026, including a reduction of 1.5 MAF by the end of 2024. In response, Reclamation withdrew its draft SEIS (no longer available online) and initiated review of the new proposal.

Temporary Reductions

Where We Are Going

The Lower Basin states proposal is only a bridge, not a solution. It is intended to get us through 2026 at which point it is hoped that the basin states and Interior will have agreed to new guidelines for operation of basin reservoirs and other necessary actions. As reflected in their May 2023 proposal, the Lower Basin states believe their users can ride out this period without having to make involuntary cuts in use. The states are essentially proposing an approach under which they will use short-term agreements to forgo consumptive use as necessary to keep reservoir elevations in Lake Powell and Lake Mead from falling below critical levels. In addition, the Interior Department has just announced initiation of a supplemental environmental impact process associated with developing new guidelines for the operation of basin reservoirs to replace those expiring at the end of 2026 (*see* https://public-inspection.federalregister.gov/2023-12923.pdf). It is likely that the content of the new guidelines will depend considerably on the extent of inflows to the Upper Basin in 2024, 2025, and 2026.

New Guidelines

Of course, nobody knows for sure how much water will be available for use in the Lower Basin between now and the end of 2026. Climate scientists continue to warn us that continued global warming is almost certain to mean a declining water supply, despite the remarkable winter of 2022-23. While the word "crisis" started to be widely used in 2022, it is probably premature to say we have reached that point in the basin. It will be legitimate to say crisis when a substantial number of water users in the Lower Basin are involuntarily forced to reduce or stop their uses of Colorado River water. It will be

Water Availability

Basin Update

legitimate to say we are in a crisis when we can no longer generate hydroelectricity at Hoover and/or Glen Canyon Dams. It will be a crisis in the Upper Basin when the ten-year flow obligation at Lee Ferry goes below 82.5 MAF — the 82.5 MAF number reflects the 75 MAF/10 years committed in the Compact as well as an additional 750,000 acre-feet per year to account for a presumed Upper Basin obligation to Mexico — and an even greater dilemma if the ten-year flows go below 75 MAF.

Conclusion

Avoiding Crisis

Given the enormous challenges entailed in making the kind of long-term reductions in consumptive use of Colorado River water that will be necessary, we cannot afford to wait until we reach the point of true crisis. A useful short-term target is to make a permanent reduction in Lower Basin mainstream consumptive use of 1.2 MAF, the amount long identified as the "structural deficit" that represents the difference between the amount of water that would be available in the Lower Basin under normal conditions and the amount of use that would occur under normal conditions (Congressional Research Service, *Responding to Drought in the Colorado River Basin: Federal and State Efforts*, updated February 1, 2023).

Objective

A mid-term objective might be to reduce total basin consumptive uses and losses by an additional 1.5 MAF within a decade. A long-term objective might be to have in place the ability to reduce uses and losses of up to 4 MAF/year as needed to keep the reservoirs in operation.

Challenges

Our project to make the desert bloom with water from the Colorado River system succeeded all too well. There is more land under irrigation with Colorado River system water, both within and outside the basin, than can be sustained with current and projected water supplies. If Reclamation is correct that we will need to permanently reduce consumptive uses and losses of Colorado River system water by 2 – 4 MAF/year, the challenge is enormous. There is probably not a water user in the basin who does not feel they need more water, not less. Because irrigation, both on-farm and on lawns and golf courses, accounts for the great bulk of basin water use, inevitably much of the water will need to come from these uses. But so too must cities reduce water uses even more than they have in recent years. Las Vegas and the Southern Nevada Water Authority are leading the way (see Southern Nevada Water Authority, *What We're Doing to Conserve*, www.snwa.com/water-resources/responding-to-drought/index.html).

No water manager, no governor, wants to tell their people that they are going to have to live with less water. And yet, this is exactly what they must do. Some agricultural lands will need to be retired. We will need to grow less hay, alfalfa, and cotton in the basin. We will need to give up lawns that need to be irrigated. We will need to give up private swimming pools. We will need to live in more densely developed cities and suburbs. Difficult as they will be, we know how to make these changes, and in fact many such changes are already underway.

We want to continue to live and work in what many of us feel is the most beautiful part of the United States. To do so, we must come to terms with the reality that our climate is changing, temperatures are rising, precipitation is declining, and we have less water. We will have to adapt.

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Lawrence J. MacDonnell, Senior Fellow at the Getches-Wilkinson Center, is an attorney and consultant in Boulder who retired in 2013 as a professor of law at the University of Wyoming College of Law where he taught water law, public land law, and natural resources law. He is an emeritus member of the Colorado River Research Group, He was the first director of the Natural Resources Law Center at the University of Colorado School of Law, a position he held between 1983 and 1994. Between 1995 and 2009 he worked as an attorney and consultant in Boulder, Colorado. His work focused primarily on water resources and on ways to make natural resource development more environmentally compatible. He has focused primarily on issues related to the Colorado River in recent years. His publications include numerous books, law review articles, other journal articles, and research reports. He has given over 250 invited presentations.

Law of the River

THE LAW OF THE COLORADO RIVER

OVERVIEW & KEY COMPONENTS

by Jennifer Diffley, Culp & Kelly, LLP (Phoenix, AZ)

Editors' Note: This article was adapted from a summary initially prepared for and included in the course materials for CLE International's Law of the Colorado River conference (May 18-19, 2023).

Introduction

The Law of the Colorado River is a complex body of law that governs the management and use of the Colorado River. It allocates water among seven US states and Mexico. The Law of the Colorado River is comprised of a collection of federal laws, regulations, interstate compacts, court decisions, administrative decisions and operating criteria, international treaties, and contracts.

Body of Law

This short summary provides an overview of just a few of the key components within the complex and evolving body of law that is the Law of the Colorado River. Where available, links to the primary legal resources are included in the "References" below as is additional Law of the River information.

Colorado River Compact (1922)

Upper/Lower Basins

The 1922 Compact divided the US portion of the Colorado River Basin into two sections, with the dividing line at Lee's Ferry, Arizona. The Upper Basin consists of Colorado, Wyoming, Utah, New Mexico, and a small section of Arizona. The Lower Basin consists of California, the remainder of Arizona, and Nevada. The Compact allocated to each Basin the right to an annual "beneficial consumptive use" of 7.5 million acre-feet of Colorado River water. The Compact also recognized a potential allocation of water for Mexico. *See* ch. 72, 42 Stat. 171 (1921) (authorizing the states to enter into a compact); *see also* Colorado River Compact, Colo. Rev. Stat. § 37-61-101.

Boulder Canyon Project Act (1928)

Water Projects

The Boulder Canyon Project Act (Act) authorized construction of Hoover Dam and the All-American Canal, beginning an era of massive federal water projects that transformed the Lower Colorado into its present, highly controlled state. The Act authorized the Lower Basin states to enter into a compact to apportion water among the Lower Basin states along specific guidelines. The Act also established the Secretary of the Interior as the "watermaster" for the Lower Colorado, authorizing the Secretary to enter into permanent water delivery contracts with water users in the Lower Basin. *See* Boulder Canyon Project Act, Pub. L. No. 70-642, 46 Stat. 1057 (1928) (codified as amended at 43 U.S.C. § 617).

Mexican Water Treaty (1944)

IBWC Sections

In 1944, the President of the United States and the President of Mexico signed a treaty obligating the US to deliver at least 1.5 million acre-feet per year to Mexico, and up to 1.7 million acre-feet in surplus years. The Treaty also expanded and empowered the International Boundary and Water Commission (IBWC) to assist in the management of trans-border resources. The IBWC has authority over boundary sections of the Colorado River and the Rio Grande, projects related to treaty compliance, and negotiation/settlement of disputes and further agreements regarding the treaty and international waters. The IBWC is composed of a US section under the US Department of State and a corresponding Mexican section. *See* Treaty for the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, U.S.-Mex., Feb. 3, 1944, 59 Stat. 1219. *See also* US & Mexico: Boundary Waters Q&A with Commissioner Maria-Elena Giner of the International Boundary & Water Commission (TWR #217, March 15, 2022).

Upper Colorado River Basin Compact (1948)

Water Shares

The Upper Basin states divided their share of Colorado River water in a subsequent interstate compact, signed in 1948. Under this agreement, each state receives a specific share of the 7.5 million acre-feet allotted to the Upper Basin:

- Colorado: 51.75%
- New Mexico, 11.25%
- Utah, 23%
- Wyoming, 14%
- Arizona, 50,000 acre-feet

State law largely regulates appropriations within each Upper Basin state. *See* Upper Colorado River Basin Compact, N.M. Stat. Ann. § 72-15-26

Law of the River

Arizona v. California (1963-2006)

Lower Basin Allocations

Arizona v. California is a series of legal cases that were litigated in the United States Supreme Court to determine the allocation of Colorado River water among the states of the Lower Basin. These cases included:

- *Arizona v. California,* 373 U.S. 546 (1963): establishing the basic framework for the allocation of Colorado River water among the states of the Lower Basin
- *Arizona v. California,* 460 U.S. 605 (1983): clarifying certain aspects of the Court's prior decision and establishing additional rights and obligations among the parties
- *Arizona v. California,* 530 U.S. 392 (2000): addressing issues related to Indian water rights and providing additional guidance for the implementation of the Court's prior decisions

In 1964, the Court issued a decree setting out the basic legal framework for the Secretary to manage the Lower Colorado River. That 1964 Decree was amended in 1966, supplemented in 1979, and later decrees were added in, all of which were incorporated into the 2006 Consolidated Decree (547 U.S. 150 (2006)).

Colorado River Basin Project Act (1968)

CAP & Priority

The Colorado River Basin Project Act (CRBPA) authorized the Central Arizona Project (CAP) canal, fulfilling Arizona's long-standing desire to utilize a portion of its allocation in the central part of the state. In exchange for the authorization of the CAP, the CRBPA established a priority for all of California's 4.4 million acre-feet apportionment and other pre-1968 rights in times of shortage. As a result, CAP and other similar users are the first water users to have their deliveries reduced in the event of a Lower Basin shortage. CRBPA also creates an obligation for the US to augment the Colorado River supply to meet Mexican Treaty obligations and authorized the Secretary of the Interior to develop "Long Range Operating Criteria" to govern the operation of the US reservoir system. *See* Colorado River Basin Project Act, Pub. L. No. 90-537, 82 Stat. 885 (1968).

Long Range Operating Criteria (1970)

Operating Plan

The Long Range Operating Criteria specify required release volumes from Glen Canyon Dam, and the factors to be considered when deviating from them, in times of surplus or shortage on the River. Based on the Operating Criteria, the Secretary develops an Annual Operating Plan to govern reservoir operations each year. The annual target release at Glen Canyon is 8.23 million acre-feet, and the Secretary can only exceed this volume under "surplus" or flood conditions that justify the release of additional water into the Lower Basin. *See* Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs Pursuant to the Colorado River Basin Project Act of September 30, 1968 (P.L. 90-537) (1970) (amended in 2005).

Grand Canyon Protection Act (1992) & Glen Canyon Dam Adaptive Management Program

The construction and ongoing operation of Glen Canyon Dam (Dam) has fundamentally altered the Colorado River ecosystem downstream of the Dam and through the nationally-important Grand Canyon National Park. In 1982, the Bureau of Reclamation initiated a multi-agency, interdisciplinary program to address concerns regarding impacts from operating Glen Canyon Dam. The Grand Canyon Protection Act of 1992 (Act) directed the Secretary of interior to manage the Dam in such a way as to "protect, mitigate adverse impacts to and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established" (Grand Canyon Protection Act, Pub. L. No. 102-575, 106 Stat. 4600 (1992)).

Adaptive Management

In order to carry out the process of "adaptive management" described in the Act, the Glen Canyon Dam Adaptive Management Program (guided by an Environmental Impact Statement and resource analysis completed in 1996) continually monitors and assesses dam operations on downstream resources. Downstream resources monitored include water, sediment, fish, vegetation, wildlife and habitat, endangered and other special status species, cultural resources, air quality, recreation, hydropower, and other values. *See* Bureau of Reclamation, Glen Canyon Dam Adaptive Management Program website https://www.usbr.gov/uc/progact/amp/index.html.

Quantification Settlement Agreement (2003)

The Quantification Settlement Agreement (QSA) was negotiated to amend the 1931 California Seven-Party Agreement, which established the relative priorities between the various California water users. Under the Seven-Party Agreement, Metropolitan Water District and San Diego County Water Authority

Law of the River

California Allocation

had the lowest priority to water, standing to lose a significant amount of supply if California needed to reduce its overall use to comply with its 4.4 million acre-feet apportionment. The QSA changed this through a series of "quantifications" of high-priority agricultural users and water transfers, allowing California's major interests' use to "fit" within California's 4.4 million acre-feet apportionment without endangering urban water supplies, while also resolving other outstanding legal issues and planning for mitigation of environmental impacts at the Salton Sea. The QSA is comprised of several federal, state, and inter-agency agreements (primary resources/agreements are available via various individual agencies; *see* i.e., USBR LCR Reports Archive, IID QSA library).

Interim Guidelines for Lower Basin Shortages and Coordinated Reservoir Operations (2007)

Shortage Operations

The 2007 Interim Guidelines defined for the first time how the major system reservoirs would be operated in the face of declining reservoir levels and shortage risk. The guidelines provide for Lakes Mead and Powell to be operated in a coordinated fashion, such that in the event of extended dry conditions, they will be drawn down together to protect against both Lower Basin shortages and the potential for a Compact "call" — a situation in which Upper Basin users must curtail their uses in order to meet required deliveries to the Lower Basin under the 1922 Compact. The guidelines also provide parameters for the implementation of "shortage" deliveries in the Lower Basin (i.e., how and when deliveries are reduced) and create a storage mechanism to incentivize reduced use in the Lower Basin and protect reservoir levels. *See* Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, Record of Decision (Dec. 2007).

Drought Contingency Plans (2019)

Use Reductions

The Drought Contingency Plan (DCP) adopted a series of additional measures that supplemented the 2007 Interim Guidelines in the face of rapidly declining reservoir levels, including significantly increased interstate commitments to reduce Lower Basin water use. The DCP is composed of a series of additional agreements and arrangements between the states and the Bureau of Reclamation, as well as implementing agreements within the affected states. Authorized by the Secretary of the Interior under the authority of the Colorado River Basin Project Act, Pub. L. No. 90-537, 82 Stat. 885 (1968), as amended by the Consolidated Appropriations Act, 2019, Pub. L. No. 116-6, 133 Stat. 13, and by the Colorado River Drought Contingency Plan Authorization Act, Pub. L. No. 116-14, 133 Stat. 801 (2019).

Key Minutes to the Mexican Water Treaty

Salinity

Minute 242 (1973)

Requires the US to meet certain salinity standards for water being delivered to Mexico at Morelos Dam, and requires the US to take actions to reduce salinity.

Long-term Agreement

Minute 319 (2012) and Minute 323 (2017)

Minute 319 interpreted and expanded key elements of the 1944 Treaty in a manner that complemented the 2007 Interim Guidelines. The Minute embraced a series of agreements, operational measures, and cooperative projects undertaken by the US and Mexico over a five-year period, to be replaced by a longer term agreement by 2017. Minute 323 expanded and replaced Minute 319 in 2017, with provisions that were intended to complement a domestic drought contingency plan in the US. The agreements carried out in both minutes are based on a principle of shared burden and benefit, and include provisions for reductions in Mexican deliveries during shortage conditions and increased deliveries during surplus, provisions for Mexico to store conserved water in US reservoirs, binational conservation investments and water exchanges, and a joint commitment to provide water to the Colorado River Delta ecosystem.

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Geography

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MAPPING THE COLORADO RIVER BASIN IN THE 21ST CENTURY

by Zach Sugg, Associate Director for Research, Babbitt Center for Land and Water Policy

A New Map of the Colorado River Basin

Complex Waterway

The Colorado River is one of the most geographically, historically, politically, and culturally complex waterways. Weaving through two countries and across a diverse range of cultures, the Colorado River (River) is a source of both unity and controversy. In the 21st century, it has become ground zero in the West for addressing challenges such as urban growth, drought, food security, environmental justice, and climate change. As a result, creating an accurate map of the basin — the vast area of land drained by the river and its tributaries — is not a simple undertaking.

Boundaries

Flaws

Commonly used maps of the region vary widely, even on basic details like the boundaries of the basin, and most haven't kept up with changing realities — like the fact that the overtapped waterway no longer reaches its outlet at the sea. At the Babbitt Center, we began to hear a common refrain as we worked on water and planning integration efforts with stakeholders throughout the West: people frequently pointed out the flaws in available maps and suggested that addressing them could contribute to more effective water management decisions, but no one seemed to have the capacity to fix them. So, with the help of the Lincoln Institute's newly established Center for Geospatial Solutions, we embarked on a mapping project of our own.

The newly published peer-reviewed Colorado River Basin map seeks to correct several common errors in popular maps while providing an updated resource for water managers, tribal leaders, and others confronting critical issues related to growth, resource management, climate change, and sustainability. It is a physical and political map of the entire Colorado River Basin, including the location of the 30 federally recognized tribal nations; dams, reservoirs, transbasin diversions, and canals; federal protected areas; and natural waterways with indications of year-round or intermittent streamflow.

Free Map

The Babbitt Center for Land and Water Policy is making the map freely available with the hope that it will become a widely used resource, both within the basin and beyond.

If you want your own hard copy of this poster sized map, please contact Nina Gruber at ngruber@lincolninst.edu or download a PDF version here:
https://www.lincolninst.edu/publications/maps-infographics/map-colorado-river-basin

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Geography

The Babbitt Center for Land and Water Policy has a mission to advance the integration of land and water management to meet the current and future water needs of Colorado River Basin communities, economies, and the environment. Our work is focused throughout the seven Colorado River Basin states, bi-nationally across the Basin into Mexico, and with 30 Native American Tribes, helping communities be more resilient and building an exchange of transformative ideas globally with other arid and semiarid regions.

WATER BRIEFS

NEW WOTUS RULE US

SEPTEMBER 1ST ISSUANCE

The Environmental Protection Agency and the US Department of the Army (agencies) are in receipt of the US Supreme Court's May 25, 2023, decision in the case of *Sackett v. Environmental Protection Agency*. In light of this decision, the agencies are interpreting the phrase "Waters of the United States" consistent with the Supreme Court's decision in *Sackett*. The agencies are developing a rule to amend the final "Revised Definition of 'Waters of the United States'" rule, published in the Federal Register on January 18, 2023, consistent with the US Supreme Court's May 25, 2023 decision in the case of *Sackett v. Environmental Protection Agency*. The agencies intend to issue a final rule by September 1, 2023.
FOR INFO www.epa.gov/wotus/amendments-2023-rule

INFRASTRUCTURE AK

TRIBAL FUNDING

On June 29 — during a visit with the Lummi Nation in Bellingham, Washington — US Environmental Protection Agency Assistant Administrator for Water Radhika Fox, announced more than $278 million in funding for American Indian Tribes and Alaska Native Villages to improve water infrastructure.

"The Lummi Nation's Gooseberry Point Wastewater Treatment Plant is a great example of the power of partnerships and how federal, state, and tribal resources pay dividends for the health of Puget Sound," said Casey Sixkiller, EPA Region 10 Regional Administrator. "Funding from the Bipartisan Infrastructure Law is improving wastewater service to the growing Lummi community while also protecting surrounding shellfish beds critical to the cultural and economic health of the Tribe."

Specifically, the Alaska Rural and Native Villages Grant Program will receive $39.6 million in FY 2023 through annual appropriation funds. These funds may be used for construction of high priority drinking water and wastewater facilities in rural Alaska, training, technical assistance, and educational programs in support of sustainable water systems.

In addition to household drinking water and wastewater services, tribes may use funds to reduce exposure to emerging contaminants, such as PFAS, and replace lead service lines.

The total amount is EPA's largest ever investment of annual water infrastructure funding to tribes and Alaska Native Villages. It includes approximately $38 million from a new Emerging Contaminants in Small or Disadvantaged Communities Tribal Grant Program to address emerging contaminants, including PFAS, in drinking water systems serving tribal populations.
FOR INFO https://www.epa.gov/tribaldrinkingwater or https://www.epa.gov/small-and-rural-wastewater-systems/clean-water-indian-set-aside-program

PCE BAN US

CONSUMER PROTECTION

On June 8, the US Environmental Protection Agency (EPA) announced another action to protect public health under the Toxic Substances Control Act (TSCA), proposing a ban on most uses of perchloroethylene (PCE), a chemical known to cause serious health risks such as neurotoxicity and cancer. The proposal would protect people from these risks by banning all consumer uses while allowing for many industrial/commercial uses to continue only where strict workplace controls could be implemented, including uses related to national security, aviation and other critical infrastructure, and the Agency's efforts to combat the climate crisis.

"We know that exposure to PCE is dangerous for people's health, and today's rule is an important first step to keeping communities and workers safe," said Assistant Administrator for the Office of Chemical Safety and Pollution Prevention Michal Freedhoff. "We've proposed to ban the uses we know can't continue safely, and we've made sure that stringent controls are in place to protect workers for the uses that remain."

PCE is a solvent that is widely used for consumer uses such as brake cleaners and adhesives, commercial applications such as dry cleaning, and in many industrial settings. For example, PCE is used as a chemical intermediate in the production of two chemical substances regulated under the American Innovation and Manufacturing Act. This rule proposes to allow for continued processing of PCE to manufacture hydrofluorocarbons (HFC)-125 and HFC-134a in tandem with strict workplace controls, as the two can be mixed with other substances to make more climate-friendly refrigerants. Additionally, the rule proposes to continue to allow the industrial and commercial use of PCE in petrochemical manufacturing, the manufacture of coatings for aircraft skins, and vapor degreasing with PCE to make aerospace parts and engines, as examples of other uses not proposed for prohibition.

EPA determined that PCE presents unreasonable risk to health, driven by risks associated with exposure to the chemical by workers, occupational non-users (workers nearby but not in direct contact with this chemical), consumers, and those in close proximity to a consumer use. EPA identified risks for adverse human health effects, including neurotoxicity from inhalation and dermal exposures as well as cancer effects from chronic inhalation exposure. While EPA identified potential risks to fenceline communities in a small number of instances, the prohibitions and other requirements in EPA's proposed rule are expected to mitigate to a great extent the potential risks to the neighboring communities.

EPA's proposed risk management rule would rapidly phase down manufacturing, processing and distribution of PCE for all consumer uses and many industrial and commercial uses, most of which would be fully phased out in 24 months. The uses subject to the proposed prohibitions represent less than 20% of the annual production volume of PCE. For most of the uses of PCE that EPA is proposing to prohibit, EPA's analysis also found that alternative products with similar costs and efficacy to PCE are reasonably available.

EPA is proposing a 10-year phaseout for the use of PCE in dry cleaning, with compliance dates depending on the type of machine in which PCE is used. The proposed phaseout of PCE in dry cleaning would eliminate unreasonable risk for people who work at or spend considerable time at dry cleaning facilities. This phaseout period would provide dry cleaners, many of which are small businesses, time to transition to an alternative process, and stakeholders have already noted an overall year-to-year decline in the use of PCE in dry cleaning. In addition, President Biden's Fiscal Year 2024 budget request proposed funding for new pollution prevention grants that would support small businesses with transitioning to TSCA compliant practices and mitigate economic impacts. If implemented, these grants could be used to support small businesses like dry cleaners in their transition away from PCE.

For the industrial manufacturing, industrial processing and other uses of PCE that EPA is not proposing to prohibit, EPA is proposing a workplace chemical protection program with a strict inhalation exposure limit and requirements to prevent skin exposure to ensure protection for workers. EPA has received data from industry that indicate many workplaces already have controls in place that may reduce exposures sufficient to meet the inhalation exposure limit in the proposed rule or to prevent direct skin contact with PCE.

EPA encourages members of the public to read and comment on the proposed rule. EPA is especially interested in hearing perspectives on the feasibility and efficacy of the proposed requirements for worker protections from entities that would be required to implement the proposed program and the timeline for the phaseout of PCE use in dry cleaning. In the coming weeks, EPA will host a public webinar targeted to employers and workers, but useful for anyone looking for an overview of the proposed regulatory action to discuss the proposed program. The date, time and registration information will be announced soon. EPA will accept public comments on the proposed rule for PCE for 60 days following publication in the Federal Register via docket EPA-HQ-OPPT-2020-0720 at www.regulations.gov.
FOR INFO https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-perchloroethylene-pce

AZ V. NAVAJO NATION WEST

COURT DECISION

On June 22, the Supreme Court addressed a legal dispute between the Navajo Tribe and the United States concerning water rights. The case centered around the 1868 peace treaty that established the Navajo Reservation, covering 17 million acres in the Colorado River Basin.

The Navajo Tribe argued that the United States had not fulfilled its obligations under the treaty to provide sufficient water resources. They filed a lawsuit seeking affirmative actions from the government to secure water for the tribe, including assessing water needs and developing infrastructure.

Intervening in the case were the states of Arizona, Nevada, and Colorado, safeguarding their interests in Colorado River water. Initially, the US District Court dismissed the tribe's complaint, but the Ninth Circuit Court of Appeals overturned the decision, stating that the United States had a duty to secure water for the Navajos under the treaty.

However, the Supreme Court reached a different conclusion. It ruled that the 1868 treaty reserved necessary water for the Navajo Reservation but did not impose an affirmative duty on the United States to secure water for the tribe. The Court emphasized that treaties must be interpreted based on their explicit terms and cannot be expanded beyond their original intent.

The Court acknowledged that a treaty enacted in 1868 could not anticipate present-day water needs, and it highlighted the responsibility of Congress and the President to update federal law to address evolving water demands.

The Supreme Court's decision underscores the need for specific obligations to be expressly stated in treaties, statutes, or regulations. While a general trust relationship exists between the United States and Indian tribes, the Court clarified that it must be based on explicit language and cannot be inferred solely from control over resources.

This ruling has significant implications for the Navajo Tribe and other Native American communities grappling with water scarcity. It highlights the importance of legislative action to address contemporary water challenges effectively. Look for an upcoming article on this case in *The Water Report.*

FOR INFO: https://www.supremecourt.gov/opinions/22pdf/21-1484_aplc.pdf

WATERSMART US

GRANT FUNDING

Reclamation announced on June 29 a funding opportunity through President Biden's Bipartisan Infrastructure Law and the WaterSMART Basin Study Program for the development of hydrologic information and water management tools that improve modeling and forecasting capabilities.

The tools being funded through these grants should improve hydrologic information, or develop decision support tools to improve water management, including improved modeling and forecasting capabilities to support water operations or water management. They may also support the application of nature-based solutions, such as modeling or data tools necessary for habitat improvements, or for improving stream conditions for ecological values. Results from these projects will be used by water managers to increase water supply reliability, provide flexibility in water operations, and improve water management.

The requesting entity must provide a 25 or 50-percent cost-share depending on the project type. Eligible states and US Territories include Alaska, Arizona, California, Colorado, Hawaii, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming, American Samoa, Guam, the Northern Mariana Islands, the Virgin Islands, and Puerto Rico. Applied Science Grants with primarily ecological benefits and/or nature-based solutions, that are based on a collaborative planning process and meet other requirements in the funding opportunity, are eligible for up to 75% federal cost-share contribution. All other projects are eligible for a 50% federal cost-share contribution. Entities can apply under one of two categories:

Category A: Entities eligible to apply under Category A of the funding opportunity include states, Tribes, irrigation and water districts, state, regional, or local authorities, which include one or more organizations with water or power delivery authority as members, and other organizations with water or power delivery authority.

Category B: Entities eligible to apply under Category B of the funding opportunity include universities, nonprofit research institutions, federally funded research and development centers, and non-profit entities. All Category B applicants must act in partnership with and with the agreement of an entity described in Category A, documented by a letter from the Category A partner.

Reclamation's WaterSMART Applied Science Grants are providing up to $5 million, with funding for each project limited to no more than $400,000. The funding opportunity is available at www.grants.gov by searching for funding opportunity number R23AS00446. Applications are due by 5 pm MDT, October 17, 2023.

FOR INFO: https://www.usbr.gov/watersmart/appliedscience/index.html

BEAVERS CA

PROTECTION & MANAGEMENT

The California Department of Fish and Wildlife (CDFW) has implemented a new policy recognizing the ecological benefits of beavers while mitigating conflict over damage to land and property (depredation). CDFW's new policy builds upon its existing beaver management policies and lays the groundwork for projects that harness beavers' natural ability to help protect biodiversity, restore habitat, and build wildfire-resilient landscapes. This includes a process that enables beaver relocation as a restoration tool and a new non-lethal option. The policy also outlines a process to mitigate beaver depredation conflict, prioritizes the use of nonlethal deterrents whenever possible, and ensures that lethal removal of depredation beavers is done in a humane manner.

The new policy, signed by CDFW Director Charlton H. Bonham on June 5, is available on CDFW's beaver web page. Here are a few key take-aways related to depredation permits:

- CDFW shall document all nonlethal measures taken by the landowner to prevent damage prior to requesting a depredation permit.
- CDFW shall require implementation of feasible nonlethal corrective actions by the landowner to prevent future beaver damage.
- CDFW shall determine whether a property is located within the range of listed species and add permit terms and conditions to protect native wildlife.
- CDFW shall continue to prioritize issuance of depredation permits if it determines that an imminent threat to public safety exists, such as flooding or catastrophic infrastructure damage.

"Beavers help improve habitat restoration and water quality, restore ecosystem processes and bolster wildfire resiliency," said Director Bonham. "This new policy formally recognizes beavers as a keystone species and ecosystem engineers in California. They are truly the Swiss army knife of native species due to their ability to provide so many nature-based ecosystem services."

CDFW is committed to ensuring that humans and beavers can safely coexist when and where possible, and continues to prioritize communication, staff training, public education and outreach to reduce human/beaver conflict. CDFW staff will provide technical assistance to landowners to prevent future occurrence of beaver damage. In 2020, the CDFW Human-Wildlife Conflict Program created a comprehensive online Human-Wildlife Conflict Toolkit that includes accessible resources with logistically and economically feasible options to help property owners prevent damage due to beaver activity.

On May 24, a consortium of advocates representing the Beaver Policy Working Group and the Placer Land Trust hosted a field trip for legislators and agency representatives including CDFW to Doty Ravine in Placer County to see beaver restoration at work. The field trip served to highlight the state's Natural and Working Lands Climate Smart Strategy (Executive Order N-82-20) in action. The California Natural Resources Agency's YouTube page features an interview from the field trip (Video) with CDFW Beaver Restoration Program Manager Valerie Cook.

On May 25, CDFW hosted its first virtual informational meeting (webinar) to celebrate the formal launch of the new Beaver Restoration Program. More than 250 people including media outlets attended this webinar to learn more about this historic program. Program staff will collaborate with diverse partners to translocate beavers into watersheds where their dams can help restore hydrologic connectivity, ecological processes, and natural habitat. A recording of the webinar is available on CDFW's beaver web page under the "Beaver-assisted Restoration" tab.

FOR INFO: Ken Paglia, CDFW Communications, 916/ 825-7120

GIS DATA CA

TRIBAL LAND MAPPING

The Yurok Tribe received a contract from the US Geological Survey - 3D Elevation Program to collect and process 320,000 acres of lidar data on biologically diverse forests and salmon-bearing streams in Yurok ancestral territory.

"This project will benefit the Tribe in different ways. In addition to strengthening our sovereignty, the data we collected will enhance ongoing efforts to holistically manage our landscape, mitigate for climate change, and create a prosperous tribal nation," said Yurok Vice-Chairman Frankie Myers. "I would like to thank USGS, North Coast Resource Partnership and the California Natural Resources Agency for partnering with us on this project."

USGS's 3D Elevation Program, also known as 3DEP, is a nationwide effort to collect a baseline of consistent high-resolution topographic elevation data that can be used to inform critical decisions ranging from immediate safety of life, property, and environment to long term planning for infrastructure projects.

The Yurok Tribe's Fisheries Department and the Condor Aviation Enterprise Program captured the data via a fixed-wing aircraft equipped with high resolution remote sensing technology. The 500-square-mile project encompasses the Yurok Reservation and top half of Yurok ancestral territory in far Northern California. This ecologically unique landscape includes the lower 44 miles of the Klamath River, the Yurok Tribe's 15,000-acre Blue Creek Salmon Sanctuary, and one of the few remaining old-growth redwood stands on earth. The processed lidar data will aid in the design of fish habitat restoration projects on the Klamath River, which is the lifeline of the Yurok people and one of the last wild salmon strongholds on the West Coast. Additionally, the Tribe will integrate the precise geospatial information into the planning of much-needed housing, road, and utility infrastructure projects on the reservation.

Funded by the US Geological Survey, North Coast Resource Partnership, California Natural Resources Agency, and other stakeholders, the Yurok project is one component of a larger initiative to capture 17,000 square miles of lidar data in Northern California. The Northern California Airborne Lidar Project aims to establish the foundational data required to prioritize critical investments in the following areas: community health and safety, natural resource management, environmental restoration, forest fuel load reduction, water quality and quantity, climate change resiliency, and more.

Across Northern California, tribal, federal and state land managers are implementing a series of interventions, such as prescribed burning and fish habitat construction projects, to rebuild salmon runs as well as make forests more resilient to climate change and less prone to catastrophic wildfire. The use of lidar data and its derivative products will increase the efficacy of these pivotal projects, while also minimizing cost. Prior to the Northern California Airborne Lidar Project, the Yurok Fisheries Department and the Yurok Tribe Construction Corporation, in collaboration with state and federal agencies, had used lidar information collected by the Condor Aviation Program to bolster the design of highly successful, reach-scale river restoration projects in the Klamath Basin.

Once the Northern California lidar project is complete, the USGS National Geospatial Program's nationwide 3D Elevation Program will incorporate the digital information into the first-ever national baseline of high-resolution topographic elevation data. Throughout the United States, this invaluable data informs critical decisions concerning a wide variety of issues ranging from the immediate safety of life, property, and the environment to long term planning for infrastructure projects.

Residing along the lower 44 miles of the Klamath River in far Northern California, the Yurok Tribe is the largest federally recognized Tribe in the state. The Condor Aviation Program is a joint collaboration between the Yurok Fisheries Department and Yurok Tribe Construction Corporation. The tribally administered entity owns and operates aircraft equipped with cutting-edge Lidar sensors and high-resolution aerial imagery technology. The Condor Aviation technical team, comprised of geospatial professionals, engineers, GIS specialists, and other technical experts, processes and analyzes Lidar data into a variety of formats.

FOR INFO: Matt Mais, Public Relations Manager, Yurok Tribe, 707/ 954-0976, mmais@yuroktribe.nsn.us or Paul Laustsen, USGS Public Affairs - Western States 650/ 847-8522, plaustsen@usgs.gov

WATERSENSE US

CONSERVATION

The US Environmental Protection Agency (EPA) released its 2022 WaterSense Accomplishments Report on June 14, noting that consumers using WaterSense labeled products saved more than 1.1 trillion gallons of water in 2022. Since, EPA's WaterSense program was launched in 2006, consumers and businesses have saved more than 7.5 trillion gallons of water by purchasing water-saving plumbing fixtures and irrigation products.

WaterSense partners and works with more than 2,000 utilities, communities, manufacturers, home builders, retailers, and other organizations to produce and promote toilets, faucets, showerheads, spray sprinkler bodies, irrigation controllers, and homes that are independently certified to use less water and perform well. Americans can look to the WaterSense label to save water, energy, and money.

Since 2006, WaterSense labeled faucets, faucet accessories, and showerheads have helped American homes save 880 billion kilowatt hours of electricity — enough energy to supply a year's worth of power to nearly 83 million homes — and eliminated 377 million metric tons of greenhouse gas emissions — the equivalent of planting 5.6 billion trees. The energy and water savings associated with WaterSense labeled products has also saved consumers $171 billion in water and energy bills over the past 16 years.

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

INSTREAM FLOWS CA

PURCHASE PROGRAM

The Instream Flow Water Purchase Program (WPP) establishes financial instruments and agreements necessary to ensure water for beneficial instream flows are made available from those with legal rights to use or dedicate water.

Projects must measurably enhance streamflow at a time and location necessary to provide fisheries or ecosystem benefits or that improve upon existing flow conditions. To ensure the greatest environmental benefit, promote the recovery of species, and improve upon existing flow conditions, the Instream Flow Water Purchase Program's focus shall be on funding the acquisition of instream flows in the Sacramento-San Joaquin watershed provided January through June, with priority for flows provided in dry and critically dry water year types. Eligible applicants include individuals, non-profit groups, and public local entities that meet minimum qualifications set forth in these Guidelines.

Minimum qualifications will require applicants to provide at least 2,000 acre-feet of water through sale, lease, license, dedication, or other binding mechanism — including forbearance — for purposes of instream flow enhancement between January 1st and June 30th in every water year type in which the water right holder proposes to provide water. These flows must be provided in the Sacramento-San Joaquin Delta Watershed for at least 10 water years (subject to negotiation if only provided in specific water year types), unless a proponent is seeking to act as a block grantee, in which case the required minimum volume of water provided will be 5,000 acre-feet or greater. In such cases, all other minimum qualifications shall remain the same.

Eligible Applicants include: Businesses, Individuals, Nonprofit Public Agencies, and Tribal Governments. The WPP program shall focus on funding the acquisition of instream flows in the Sacramento-San Joaquin Delta Watershed that can be made available below the furthest downstream reservoirs.

FOR INFO: Steve Rothert, 916/ 539-4400 or Steve.Rothert@water.ca.gov

CALENDAR

July 17-19 CO

American Water Resources Assoc. 2023 Summer Conference, Denver. Hyatt Regency Denver Tech Center. Connecting Land & Water for Healthy Communities. For info: www.awra.org

July 19 WEB

California Water Commission Drought Strategies Workshop: Preparing for Drought in a Non-Drought Year, Virtual Event, 12 pm Pacific Time, Free Event. For info: www.acwa.com/events/

July 19-21 CO

Global Environmental Markets and Finance Summit, Denver. Westin Denver Downtown. Virtual Access Available. For info: https://environmentalmarketsandfinancesummit.com

July 20-22 UT

69th Annual Rocky Mountain Mineral Law Institute, Salt Lake City. Grand America Hotel. Presented by The Foundation for Natural Resources and Energy Law (formerly Rocky Mountain Mineral Law Foundation). For info: https://www.fnrel.org/programs

July 23-25 AZ

Arizona WateReuse 2023 Symposium, Flagstaff. Little America Hotel. For info: wateruse.org/section >> Arizona

July 25 WEB

California Water Commission Drought Strategies Workshop: Preparing for Drought in a Non-Drought Year, Virtual Event, 2 pm Pacific Time, Free Event. For info: www.acwa.com/events/

July 24-26 UT

Potable Reuse & Biological Treatment Symposium, Salt Lake City. Sheraton Salt Lake City Hotel. Presented by American Water Works Association. For info: www.awwa.org/Events-Education

July 26 CO

Confluence - Colorado Water Summit, Loveland. Embassy Suites Loveland. Presented by BizWest. For info: https://events.bizwest.com/confluence-colorado-water-summit/

July 26 TX

Dam Safety Workshop, Conroe. The Lone Star Convention & Expo Center. Presented by Texas Commission on Environmental Quality. For info: https://www.tceq.texas.gov/p2/events/dam-safety.html

July 26 CA

2023 Construction Stormwater General Permit Road Show, Oakland. 1515 Clay Street, Suite 1400. Hybrid Available. For info: https://content.govdelivery.com/attachments/CAWRCB/2023/06/06/file_attachments/2519247/2022%20CGP%20Road%20Show%20Flyer.pdf

July 27 CA

2023 Construction Stormwater General Permit Road Show, San Luis Obispo. 895 Aerovista Place, Suite 101. Hybrid Available. For info: https://content.govdelivery.com/attachments/CAWRCB/2023/06/06/file_attachments/2519247/2022%20CGP%20Road%20Show%20Flyer.pdf

July 27 WEB

California Water Commission Drought Strategies Workshop: Preparing for Drought in a Non-Drought Year, Virtual Event, 9:30 am Pacific Time, Free Event. For info: www.acwa.com/events/

August 2-3 IL

The Water Efficiency and Conservation Symposium, Chicago. Chicago-Kent College of Law. Presented by Alliance for Water Efficiency. For info: https://www.allianceforwaterefficiency.org/members/2023symposium

August 3-4 AZ

Arizona Water Law Conference: Planning for the Next 100 Years, Scottsdale. Hilton Hotel. For info: CLE International: 800/ 873-7130 or www.cle.com

August 8-9 WEB

WSWC-NARF 18th Biennial Indian Reserved Water Rights Symposium, Virtual Event. Sponsored by Western States Water Council and Native American Rights Fund . For info: https://westernstateswater.org/

August 8-9 TX

Public Drinking Water Conference 2023, Austin. Virtual and Renaissance Austin Hotel In-Person. Sponsored by Texas Commission on Environmental Quality. For info: https://www.tceq.texas.gov/drinkingwater/conference.html

August 15-17 CA

2023 Improving Sub-seasonal to Seasonal Precipitation Forecasting to Support Water Management Workshop, San Diego. DoubleTree by Hilton San Diego Downtown. The Western States Water Council (WSWC) and the California Department of Water Resources (CDWR) Cosponsoring Workshop to Continue Dialogue Among Western States, the National Oceanic and Atmospheric Administration (NOAA) & the Research Community. For info: https://westernstateswater.org/events/

August 22-23 WEB

Data Collection Techniques and Analytics for Water Resource Systems and Natural Water Systems. Virtual Event. Presented by EUCI. For info: https://www.euci.com/event_post/0823-water-data-collection/

August 22-23 TX

Texas Groundwater Summit, San Antonio. Hyatt Regency Hill Country Resort. For info: https://texasgroundwater.org/news-events/events/texas-groundwater-summit/

August 22-24 CO

Colorado Water Congress - Summer Conference, Steamboat Springs. The Steamboat Grand. For info: https://www.cowatercongress.org/sc23-registration.html

September 10-13 PA

Water Infrastructure Conference & Exposition, Philadelphia. Sheraton Philadelphia Downtown. For info: https://www.awwa.org/Events-Education/Water-Infrastructure

September 11-13 CA

CASQA 2023 Annual Conference, San Diego. Paradise Point. For info: California Stormwater Quality Association, www.casqa.org

September 12-14 AK

Western States Water Council 2023 Fall Field Trip & Meetings, Anchorage. Aloft Anchorage Hotel. Field Trip 9/12; Meetings 9/13-9/14. For info: https://westernstateswater.org/events/wswc-2023-fall-meetings/

September 12-15 NV

Eastern Sierra Water Tour: Water Education Foundation Event, Reno, Grand Sierra Resort & Casino. Tour From Truckee River to Mono Lake. Presented by Water Education Foundation. For info: www.watereducation.org/tour/eastern-sierra-tour-2023

September 12-14 AK

Western States Water Council 2023 Fall (202nd) Meetings, Anchorage. Aloft Anchorage Hotel. Field Trip 9/13; Meetings 9/14-9/15. For info: https://westernstateswater.org/events/wswc-2023-fall-meetings/

September 14 WEB

Clean Water, Complicated Laws: Infrastructure & Federal Partnerships - 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/resources/clean-water-complicated-laws

September 14-15 NM & WEB

Natural Resources Damages: 16th Annual "Santa Fe" Advanced Conference, Santa Fe. La Fonda Santa Fe Hotel; Interactive Online Broadcast. Legal & Policy Developments, Evolving Roles for States & Tribes, Emerging New Issues & Litigation Strategies. For info: Law Seminars Int'l, 206/ 567-4490, registrar@lawseminars.com or www.lawseminars.com

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

CALENDAR

September 18-19 NM

New Mexico Water Law Conference (30th Annual): Latest Updates on Water Law & Water Quality, Santa Fe. La Fonda on the Plaza. For info: CLE International: 800/ 873-7130 or www.cle.com

September 19 CO

RiverBank Celebration, Denver. Denver Botanic Gardens. Presented by Colorado Water Trust. For info: https://coloradowatertrust.org/riverbank/

September 19 TX

2023 Texas Rainmaker Award Dinner, Austin. Bullock Texas State History Museum. Presented by the Texas Water Foundation. For info: www.texaswater.org

September 20-21 CA

Smart Water Utilities Canada 2023: Reducing Water Leakage Across the Network, Toronto. Delta by Marriott Toronto. Presented by WateReuse. For info: https://canada.smart-water-utilities.com

September 20-22 TX

2023 WateReuse Texas Conference, Frisco. Hyatt Regency Frisco. Presented by WateReuse. For info: www.watereuse.org

September 21 VA

One River's Perspective on a Changing Climate: Potomac River Conference, Lorton. Fairfax Water's Griffith Treatment Plant. Hosted by The Interstate Commission on the Potomac River Basin; 9am-2:30pm Eastern Time. For info: www.potomacriver.org

September 21 WA

Celebrate Waters - Center for Environment & Policy (CELP) Annual Event, Seattle. Ivar's Salmon House. Celebrating Water Hero Award. For info: https://celp.org/

September 21-22 WA

Water Law in Central Washington Seminar, Ellensburg. Central Washington University. For info: The Seminar Group: 206/ 463-4400, info@theseminargroup.net or www.theseminargroup.net

September 23 OR

2023 Celebration of Oregon Rivers, Portland. The World Forestry Center. Hosted by WaterWatch of Oregon. For info: www.waterwatch.org

September 25-27 CO

WaterPro Conference, Aurora. Gaylord Rockies Resort & Convention Center. Industry Event for Networking, Technology & Education. For info: www.WaterProConference.org

September 25-28 CA

WTW 2023 Annual Conference & Exhibition, Saskatoon. TCU Place, Hilton Garden Inn. Presented by Working Together for Water. For info: www.wcwwa.ca

September 26-27 CO

Interstate Council on Water Policy's 2023 Annual Meeting, Denver. SpringHill Suites Denver Downtown. Optional Field Tour Sept. 25th. Presented by Working Together for Water. For info: www.icwp.org

September 27-28 CA

Future Water World Congress, Anaheim. Anaheim Convention Center. For info: https://www.futurewatercongress.com/

September 28 WA

AWRA Washington Chapter State Conference, Seattle. Mountaineers Seattle Program Center, 7700 Sand Point Way NE. Presented by American Water Resources Association - Washington Chapter. For info: Jessica Kuchan, 206/755-4364 or kuchan@confluencelaw.com

October 3-5 NV

WaterSmart Innovations Conference & Trade Show, Las Vegas. South Pointe Hotel & Casino. Founded by Southern Nevada Water Authority (SNWA). For info: www.awwa.org/Events-Education/WaterSmart-Innovations