



# The Water Report™

*Water Rights, Water Quality & Water Solutions in the West*

## In This Issue:

**Willamette Valley  
Project ..... 1**

**Adaptive  
Management  
& Science ..... 7**

**PFAS:  
Senate Hearing ..... 15**

**Water Briefs ..... 23**

**Calendar ..... 27**

## Upcoming Stories:

**Snake River Dams**

**Ogallala Aquifer  
Decline**

**& More!**

## WILLAMETTE VALLEY WATER

WILLAMETTE VALLEY PROJECT REALLOCATION & LITIGATION UPDATE

by Richard M. Glick and Olivier Jamin, Davis Wright Tremaine (Portland, OR)

### Introduction

“Battles over water in the West are always about something more. At their most elemental, they are about survival.” With this quote, journalist Bettina Boxall captured in a simple way the essence of water allocation in the West. Sadly, this concept becomes more and more evident as extreme drought increases pressure on existing water systems. The Klamath River Basin traversing Oregon and California is experiencing an historic drought threatening fish, tribal sustenance, and farmers’ livelihood. Lake Mead, the reservoir created by the Hoover Dam on the Colorado River, is at a historically low 35% capacity as of July 6th, while Colorado, California, and Arizona are bracing for an exceptionally dry summer season. Indeed, intense competition for increasingly limited water supply threatens economies and ecosystems throughout the West.

Perhaps then it is not surprising that the over 20-year effort to equitably apportion federally stored water in the Willamette Basin for the benefit of fish and wildlife, agricultural irrigation, and municipal and industrial uses has proven to be a complex and contentious task. While this region is not experiencing quite as intense a drought as others, the Willamette Basin is home to a big majority of the Oregon population and its richest farm and vineyard land, making the stewardship of its water resources critical to Oregon’s present and future.

This article provides a brief history of the Willamette Valley Project (WVP or Project), operated by the US Army Corps of Engineers (Corps); an update on the status of the reallocation efforts; an overview of recent litigation in the Willamette Basin; and a summary of related legislation. Two cases in particular reflect the difficulty in managing water resources to the satisfaction of multiple stakeholders with different interests: litigation under the federal Endangered Species Act (ESA) concerning continuing operation of the WVP, and litigation concerning the final reallocation report issued by the Corps. The latter case resulted in congressional authorization for reallocation under the 2020 Water Resources Development Act and voluntary dismissal of the case. The former case is ongoing and will certainly result in significant new protections for fish and wildlife, and itself requires state legislation to implement.

### Background on the Willamette Valley Project and Reallocation Efforts

The WVP is a 13-dam water resource management system providing flood risk management, power generation, water quality improvement, irrigation, fish and wildlife habitat, and recreation for the Willamette River and many of its tributaries. The last unit, Blue River Dam, was completed by the Corps in 1969. Aside from the dams and associated reservoirs, the WVP consists of several fish hatcheries and approximately 92 miles of riverbank protection projects in the southern and central areas of the Willamette River watershed.

## Willamette Basin Project

### Purposes

### ESA Listings

### NMFS BiOp

### USFWS BiOp

### Corps Sued

## The Water Report

(ISSN 1946-116X)

is published monthly by  
Envirotech Publications, Inc.  
260 North Polk Street,  
Eugene, OR 97402

**Editors:** David Light  
David Moon

**Phone**  
541/ 517-5608

**Fax**  
541/ 683-8279

**email**  
TheWaterReport@yahoo.com  
**website:**  
www.TheWaterReport.com

**Subscription Rates:**  
\$299 per year  
Multiple & Electronic  
Subscription Rates Available

**Postmaster:** Please send  
address corrections to  
The Water Report  
260 North Polk Street  
Eugene, OR 97402

Copyright© 2021 *Envirotech  
Publications, Incorporated*

As authorized by Congress, the Corps manages the Project during Oregon's rainy season to reduce risks associated with flooding, and stores water for release during the summer months to improve water quality and conditions for migrating and spawning fish. The Corps also releases water from April to November for power generation and irrigation. Managing these uses requires collaboration between federal, state, and local agencies, tribal entities, and other stakeholders, especially as drought conditions intensify.

In 1996, efforts began to investigate future Willamette River Basin water demand, but these efforts were put on hold when the US Fish and Wildlife Service (USFWS) listed the bull trout as threatened under the ESA and the National Marine Fisheries Service (NMFS) listed both the Upper Willamette River (UWR) spring Chinook salmon and UWR winter-run steelhead as threatened species. Those listings required an evaluation of the impacts of the continued operation of the WVP on the subject species through a formal ESA Section 7 consultation.

Relevant action agencies prepared a Biological Assessment (BA) in 2000 that was later supplemented in 2007. The BA identified several measures that action agencies would have the authority to implement, including: changes to WVP reservoir management; selective withdrawals to address fish passage at Cougar and Blue River dams; habitat restoration activities, and others. The ensuing 2008 final NMFS Biological Opinion (BiOp) concluded that continued operation of the WVP would cause jeopardy to the UWR Chinook and winter-run steelhead and provided reasonable and prudent alternatives (RPAs) to mitigate that risk. These RPAs included: fish passage at three dams; temperature improvements downstream of another dam; improvements in downstream flows; screening of irrigation diversions; improving hatchery practices and facilities; habitat improvement projects; and ongoing study and monitoring. The USFWS BiOp concluded that continued operation would not cause jeopardy to the bull trout so long as the RPA from the NMFS BiOp was implemented. In response, the Corps developed in collaboration with other federal and state agencies a WVP flow management strategy to meet flow objectives and operate the WVP for more than 15 years.

### 2008 BiOp Litigation

The Northwest Environmental Defense Center (NEDC) sued the Corps over its operation of Detroit Dam, Cougar Dam, Lookout Point Dam, and Blue River Dam. More specifically, NEDC argued that the Corps had failed to meet certain deadlines under the 2008 Willamette River BiOp. *Northwest Environmental Defense Center v. U.S. Army Corps of Engineers*, Case No. 3:18-cv-00437-HZ (D. Or. 2020). Marion County and the City of Salem joined the suit to protect their drinking water supply and important revenues generated by recreation, illustrating the variety of interests at stake in water management policy.

In the 2008 BiOp, NMFS had directed the Corps to implement RPAs to mitigate impacts and ensure survival of the UWR Chinook and winter-run steelhead with an adequate potential for recovery. With regard to Detroit Dam for example, the 2008 BiOp directed the Corps to implement "structural modifications or major operational changes for improved water quality to at least one of the Project dams," with Detroit Dam being the highest priority for "construction of a temperature control structure or operational changes to achieve temperature control." See 2008 BiOp, at 9-82.

In 2017, the Corps signaled it would move forward with changes at Detroit Dam by publishing its "Notice of Intent to Prepare an Environmental Impact Statement for the Detroit Dam Downstream Passage Project" (EIS Notice) in the Federal Register. 82 Fed. Reg. 55,830 (Nov. 24, 2017). The Corps solicited comments from the public and stakeholders to identify issues and alternatives during the Corps' development of the EIS. *Id.* The Corps announced it would consider operational as well as structural changes as part of the EIS, but in January 2018 proposed to drain Detroit Lake entirely in order to build a 300-foot water temperature control tower.

Marion County and the City of Salem intervened in the lawsuit and cross claimed against the Corps for violating the National Environmental Policy Act (NEPA) by failing to consider reasonable alternatives that do not involve draining Detroit Lake, on which the City relies for drinking water and the County relies on to support the recreation economy established at the lake. The County and City also argued that the Corps had violated the ESA by continuing to commit resources to the water temperature control project at Detroit Dam despite having reinitiated consultation for a new BiOp that could provide new RPAs, in an argument presaging a suit brought by WaterWatch against the Corps (described below).

Judge Hernandez found that the Corps had violated the ESA by failing to meet certain 2008 BiOp deadlines, finding that "[t]he record demonstrates that the listed salmonids are in a more precarious condition today than they were at the time NMFS issued the 2008 BiOp." *Northwest Environmental Defense Center v. U.S. Army Corps of Engineers*, 479 F.Supp. 3d 1003, 1017 (D. Or. 2020). The judge engaged a special fishery biology expert to develop suitable remedies. At the time this article was written, the parties were still negotiating appropriate remedies under the supervision of the court.



Perhaps in response to this lawsuit and the court’s order, the Corps announced on November 9, 2020 that it would not operate turbines at Detroit Dam from November 1, 2020 to February 1, 2021 from 6 a.m. to 10 a.m. and 6 p.m. to 10 p.m. in an effort to improve juvenile salmon survival. This decision drew its own lawsuit from the Public Power Council (PCC), which claimed that the Corps had violated the Administrative Procedure Act, the Flood Control Acts of 1938, 1948, and 1950, NEPA, and the federal Water Resources Development Act. This case is still ongoing. *Public Power Council v. U.S. Army Corps of Engineers*, Case No. 3:21-cv-00032 (D. Or. \_\_\_\_).

**The 2019 BiOp**

A reallocation feasibility study was re-initiated in 2013 with the goal of reallocating the WVP conservation storage capacity — totaling approximately 1,590,000 acre-feet — for the benefit of fish and wildlife, agricultural irrigation, and municipal and industrial water supply. What became known as the Willamette Basin Review Feasibility Study (Study) analyzed current water uses in the basin for each of those uses and provided projected water demand for each for the foreseeable future. The Study recommended a reallocation of the stored water as follows: 1,102,600 acre-feet (69%) to fish and wildlife protection; 327,650 acre-feet (21%) to agriculture and irrigation uses; and 159,750 acre-feet (10%) to municipal and industrial uses. The Study was a cooperative effort and funded jointly by the federal and state governments.

**Reallocation Plan**

As part of the reallocation process, the Corps consulted with NMFS on the effect of the reallocation plan on the ESA-listed species, resulting in a biological opinion specific to the Study’s reallocation plan — the June 28, 2019 Bi-Op. The 2019 Bi-Op concluded that although the proposed action under the plan might jeopardize the continued existence of UWR Chinook and steelhead, jeopardy could be avoided with adoption of several RPAs. The first RPA would have the Corps recommend to Congress that the Corps retain local authority of the reallocation plan so that adjustments could be made without the need for additional congressional approval. The District Engineer included this RPA in his report to the Corps’ Chief of Engineers (2019).

**Assumptions**

NMFS’s conclusions were based in part on assumptions of the likelihood of the occurrence of future events. When NMFS’s assessment includes unknown information, NMFS makes conservative assumptions that give the benefit of the doubt to listed species. For example, NMFS was concerned about the uncertainty surrounding the transfer of storage water rights to instream fish flows under state law. The Bi-Op included five RPAs to avoid jeopardizing UWR Chinook and UWR steelhead:

**RPAs**

- Under Measure 1, the Corps would retain sufficient local authority to modify the reallocation without further Congressional action.
- Under Measure 2, the Corps will not enter into new municipal and industrial storage contracts for more than 11,000 acre-feet until the Oregon Water Resources Department has developed, to NMFS’ satisfaction, written institutional mechanisms to carry out a plan for instream flow protection in the Willamette Basin, and has implemented the plan consistent with state and federal law.
- Under Measure 3, the BiOp proposed that new Corps contracts for municipal and industrial water storage supply include a number of restrictions and safeguards to protect listed species, including options to curtail or cease deliveries when required to meet flow targets, or completing studies in advance showing that water is available for municipal and industrial use at no harm to fish. Measure 3 will allow the Corps to limit water deliveries to municipal and industrial users if shortages occur.

## Willamette Basin Project

### Annual Report

### “Chief’s Report”

### Reallocation Finality

### WaterWatch Lawsuit

### Congressional Authority

### RPA’s Revived

- Under Measure 4, the Corps must modify its proposed adaptive management process for reservoir operations and flow releases so it can meet fish flow objectives. RPA 4 provides details about specific actions included in this requirement, including a determination that 2008 BiOp minimum flow objectives will be met, and a curtailment of municipal and industrial, and agricultural water uses if those minimum flow objectives are not met.
- Under Measure 5, the Corps must prepare an annual “Willamette Basin Year in Review Report” and participate in an annual coordination meeting with NMFS. The information required to be in the report includes: information about the estimated flow and storage needs for each tributary and reservoirs; individual project and system flow objectives; a copy of the notice provided to irrigation and municipal and storage contract holders regarding supply deficiencies during deficit years; a record of adaptive management decisions; and dates that minimum flow objectives were not met.

On December 18, 2019, the Corps’ Chief of Engineers issued his report on the Study (“Chief’s Report”) to the Secretary of the Army for transmission to Congress, which in the normal course would adopt the Chief’s recommendations as part of the next Water Resources Development Act. The Chief’s Report recommended the reallocation plan described above, and adoption of all RPAs but the first. The RPA to retain local authority was rejected because it would inappropriately limit congressional discretion, and it would “add unacceptable risk for the reliability of the new storage levels once authorized by Congress.” *See* Chief’s Report, page 2.

The reliability and finality of the reallocated storage in the WVP is significant for many stakeholders, and in particular agricultural and municipal and industrial users who would rely on that reallocation to invest public dollars in planning, seek regulatory approvals, secure water rights, and construct infrastructure in reliance on the amount of stored water recommended by the Study and Chief’s Report.

#### 2019 BiOp Litigation

In early 2020, WaterWatch of Oregon, partly because of the rejection of RPA 1 of the 2019 BiOp, and dissatisfied with the amount of water allocated to fish and wildlife, sued the Corps in federal court to request a preliminary injunction to prevent the Chief of Engineers from submitting the Chief’s Report to Congress and to “disavow and/or rescind” the report, on the ground that the reallocation plan would prejudice ongoing consultation over the Willamette Project by precluding several RPA measures and limiting the Corps’ ability to comply with ESA Section 7(d). *WaterWatch of Oregon v. U.S. Army Corps of Engineers*, Case No. 3:20-cv-00413 (D. Or. \_\_\_\_).

The Corps, and intervenors Oregon Water Utility Council (representing municipal water providers), and the Oregon Farm Bureau (representing agricultural users), opposed the motion for preliminary injunction on the ground that blocking the submission of the Chief’s Report to Congress would constitute an unwarranted intrusion into a political question reserved to Congress. The intervenors’ argument was that projects such as the reallocation plan at issue in the case are the result of a long, expensive, and detailed process in which Congress retains ultimate authority. Once a water resource problem is first identified, stakeholders may ask Congress to grant the authority to perform a feasibility study. A preliminary analysis is conducted before the full-blown feasibility study takes place, including various economic and environmental analyses, leading to the development of a final feasibility report reviewed by the Corps headquarters and state and other federal agencies. Based on the study and reports from the various agencies, the Chief of Engineers writes a report making recommendations to Congress, which may approve the recommendations made in the report, or not. Intervenors argued that plaintiff’s request for a preliminary injunction came after years of efforts from all the agencies and stakeholders who have an interest in the WVP and was an improper insertion into a political process.

The court did not have to directly address this question, however. As the Chief’s Report made its way through Congress, some changes were made to the ultimate recommendations that resolved most of the plaintiff’s concerns regarding the allocation. *See* Water Resources Development Act of 2020, H.R. 7575, 116th Cong. 401-02 (as passed by House, July 29, 2020). Specifically, language was added to allow the Secretary to adjust some of the allocation plan without any congressional action if such reallocation is consistent with the on-going ESA consultation related to the Willamette Valley System operations. In essence, this language revived RPA 1.

The relevant language is:

- (2) The Secretary may reallocate not more than 10% of overall storage in the joint conservation pool, as authorized by this Act and without further congressional action, if such reallocation is consistent with the on-going consultation under section 7(a) of the Endangered Species Act of 1973 related to Willamette Valley System operations. (3) The Secretary shall ensure that the revised reallocation is not reallocated from a single storage use, does not seriously affect authorized project purposes, and does not otherwise involve major operational changes to the project.

**Willamette Basin Project**

**Case Dismissed**

**Transfer Change of Use**

**Stored Water**

**Implementation Issue**

**State Authority**

**Conversion Process Problems**

**Secondary Water Rights**

**Character of Use Transfers**

**Legislation**

Specifically, this language allows the Corps to reallocate part of the storage allocated to agricultural users and municipal and industrial users to fish and wildlife, thus alleviating some of plaintiff’s concern in the case. Following adoption of the Water Resources Development Act and the reallocation study, plaintiff WaterWatch voluntarily dismissed the case. However, the reallocation saga is not quite over yet, as relevant state and federal agencies must now implement the plan — which itself requires some modifications to Oregon law.

**Implementing the Reallocation: Transfer to Other Uses**

Now that a federal authorization exists for the reallocation, there must also be a legal mechanism to transfer storage water rights to other uses like fish and wildlife, and municipal and industrial, in addition to the other existing uses of the Project, i.e. irrigation, flood control, recreation, or power generation. However, the Oregon Water Resources Department (OWRD) opined in a one-page handout dated February 7, 2018 that it did not have the authority to approve the transfer of storage water rights, a departure from historical practices and interpretation. The Oregon Department of Justice (ODOJ) then supported OWRD’s opinion in a letter opinion dated August 31, 2018. The basis of the argument is that storage of water is not a “use” because usage of stored water is through secondary water rights; therefore, storage water rights do not qualify as a “use subject to transfer” under ORS 540.510.

This interpretation does not square with decades of OWRD practice routinely approving storage water right transfers. It was particularly surprising since OWRD contributed significant public funds to perform the Feasibility Study, presumably on the assumption it had the authority to approve the necessary transfers to change the uses. At this moment, according to OWRD, there is no legal mechanism to implement the RPA’s in the 2019 BiOp, let alone provide municipal water providers access to WVP storage capacity.

Current law provides two mechanisms to implement the reallocation. One is through conversion of minimum perennial streamflows (MPSFs) to instream water rights, the other through issuance of secondary water rights. Both are ill-advised for the purposes of the reallocation, and legislative efforts are ongoing to clarify OWRD’s authority to in fact approve the transfer of storage water rights.

The conversion of MPSFs to instream water rights is problematic in part because it would rely on an outdated process that does not explicitly allow for public participation. The MPSFs were established in 1964, but the supporting data are lost. Much has changed since then and the scientific support for these MPSFs is no longer discernable. Trying to redo them now would be a major undertaking, both costly and time consuming. In addition, in an omnibus housekeeping bill, the ODOJ stripped public hearings from the conversion process. Another issue with this conversion process is that live-flow water rights in the Willamette Basin were issued on the basis of “natural flow” — which *includes* water released from storage for which no federal contracts have been issued. If OWRD were to convert the stored water component of the MPSFs and protect that water instream, it could result in natural flow water users being “regulated off” — i.e., those natural flow users would run the risk of having their water rights curtailed in favor of the instream rights. As a result, the conversion of the stored water component of the MPSFs may impact the reliability of some water rights in the Willamette Basin.

Another approach to implement the reallocation plan would be to transfer stored water rights to instream uses by applying for secondary water rights to use stored water for fish and wildlife. However, OWRD is able to issue a secondary water right only for the purposes for which water is stored. As a result, OWRD currently could not issue a secondary water right for instream, or municipal and industrial purposes for the use of stored water from the WVP because the applicable storage rights authorize it to store water only for later use for irrigation purposes. The US Bureau of Reclamation, which holds the water rights, would need to modify the storage water rights (through the transfer process) to change the authorized purpose, or apply for new storage water rights.

The most efficient approach would be to authorize character of use transfers of stored water rights in accordance with the BiOp and NMFS consultation, a tool that was widely believed to be available before the 2018 OWRD and ODOJ opinions. To this point, a measure (HB 3103) was introduced during the 2021 Oregon Legislative Session that would clarify that OWRD does in fact have the authority to “transfer,” i.e. change the use of approved storage water rights. Another bill, HB 3091, would authorize affected persons to petition the OWRD to issue a declaratory ruling concerning the Department’s authority to approve an application to transfer storage water rights, and then provide for direct review by the Oregon Supreme Court on an expedited basis. While HB 3091 did not make it through the Oregon legislature before the end of the legislative session, both the House and Senate passed HB 3103, which is now awaiting Governor Brown’s signature. This bill is the first step implementing the reallocation, and the process for affecting the transfer of WVP storage rights to instream water rights would require further discussion and rulemaking.

## Willamette Basin Project

### Fish & Wildlife Benefits

### Collaborative Action

### Conclusion

The Willamette Basin provides a perfect illustration of the complexity associated with managing water systems on which many stakeholders rely on for their livelihood, and on which depends the survival of endangered species. As drought conditions intensify throughout the West, the tensions between conservation, power generation, recreation, municipal and industrial, and agricultural uses will remain an overarching feature in the management of those systems. In addition, water law and policy throughout the West has been slow to adapt to diminishing supplies. The “first-in-time, first-in-right” legal structure basic to the law of prior appropriation, which is prevalent in the Western states, rewards non-efficient use of water for fear of loss through non-use. In the Willamette Basin, disputes involving the management of Corps of Engineers dams continue to be front-and-center, often led by environmental groups pushing for more aggressive action to benefit fish and wildlife. While these lawsuits have proven successful in some instances, the flipside is that a change in operation for the benefit of fish and wildlife often results in opposition from other groups, as illustrated by the most recent PCC lawsuit.

Perhaps we will see better ways to address these conflicts in the future. There are models today of collaborative action. One is the settlement agreement reached among Klamath Basin water users, agencies, environmental groups and tribes, to remove four dams owned by PacifiCorp, which will provide better flows for fish recovery. Another is an initiative by the Stanford University Woods Institute called “Uncommon Dialogue.” An unusual collection of national environmental and industry groups have issued a *Joint Statement of Collaboration on U.S. Hydropower: Climate Solution and Conservation Challenge*, pledging to look for alternative approaches to hydropower development that protect fish while providing emission-free electricity.

#### FOR ADDITIONAL INFORMATION:

RICK GLICK, Davis Wright Tremaine LLP, 503/ 778-5210 or richardglick@dwt.com

The authors of this article represented Marion County and the City of Salem in the 2008 BiOp litigation: *Northwest Environmental Defense Center v. U.S. Army Corps of Engineers*, Case No. 3:18-cv-00437-HZ (D. Or. 2020). The authors also represented intervenor Oregon Water Utility Council in the 2019 BiOp litigation: *WaterWatch of Oregon v. U.S. Army Corps of Engineers*, Case No. 3:20-cv-00413 (D. Or. \_\_\_\_).

#### REFERENCES

- Amended Klamath Hydroelectric Settlement Agreement* (2016)  
[www.doi.gov/sites/doi.gov/files/uploads/FINAL%20KHSA%20PDF.pdf](http://www.doi.gov/sites/doi.gov/files/uploads/FINAL%20KHSA%20PDF.pdf)
- Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act* (2008).  
<https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/8227/>
- Climate Change, River Conservation, Hydropower and Public Safety: An Infrastructure Proposal for the Biden Administration and Congress* (April 2021)  
<https://s3.documentcloud.org/documents/20698762/hydropower-proposal.pdf>
- Final Biological Opinion on the Willamette Basin Review Feasibility Study* (June 2019).  
<https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/12488/>
- Final Willamette Basin Chief's Report* (December 2019).  
<https://usace.contentdm.oclc.org/utills/getfile/collection/p16021coll7/id/13272>
- Supplemental Biological Assessment of the Effects of the Willamette River Basin Flood Control Project on Species Listed under the Endangered Species Act* (2007).  
<https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/8226/>
- Willamette Basin Review Feasibility Study* (December 2019).  
<https://usace.contentdm.oclc.org/utills/getfile/collection/p16021coll7/id/13273>

**Rick Glick** is a partner in the Portland office of Davis Wright Tremaine LLP, where he practices water, environmental, and energy law.

Over 37 years of private practice, Rick has advised and represented individual and corporate farms, irrigation districts, and municipal water utilities, and investor-owned utilities to secure and defend water rights. Rick has conducted water rights audits for a number of high-value farmland, vineyard, and aquaculture transactions in Oregon, California, and Washington state. He also counsels clients on regulatory compliance, permitting, and water quality certifications for major infrastructure projects, wetlands, endangered species, and environmental impact review. Rick is a founder and first president of the National Water Law Forum and the American College of Environmental Lawyers.

**Olivier Jamin** is an associate in the Portland office of David Wright Tremaine LLP, where he practices environmental law with a focus on water quality and quantity, land use, and energy law. Olivier advises sellers and purchasers of farmland, and especially vineyards, and provides guidance in dealing with contaminated sites and environmental due diligence in small and large transactions in Oregon, Washington, and California. Olivier also assists clients with regulatory compliance, waste management, land use permitting, and water quality certifications. Olivier has a strong background in wildlife trade, especially dealing with implementation and enforcement of the Convention on International Trade of Endangered Species (CITES).

Adaptive  
Management

## ADAPTIVE WATER MANAGEMENT &amp; SCIENCE



CLIMATE, WATER, AND ADAPTIVE MANAGEMENT: WHY SCIENCE MATTERS

by David L. Wegner, Woolpert Engineering (Tucson, AZ)

*“However beautiful the strategy, you should occasionally look at the results.”*

*Winston Churchill*

Management  
Challenges

## Introduction

Sir Winston Churchill’s statement has significance today, as water management challenges are increasingly complex. Water management has always had its challenges, including: aging infrastructure; water quality; water quantity; public expectations; and environmental concerns. Multiple study approaches have been tried to ascertain how best to address water management issues.

Managing water has also become more complex due to: increased governance requirements; unpredictable and cascading ecosystem responses; and demands from multiple user-sectors. Expanding stressors arising from anthropogenic and system-driven climate change further complicate fashioning appropriate water management. With rising hydrologic complexity comes increasing risk to decision-making.

## “Tipping Points”

A basic concern with aquatic systems is that they can shift quickly into qualitatively different states after small perturbations (Scheffer et al, 2001). Climate change and cascading impacts can drive ecological shifts, thereby limiting the ability of systems to recover from future impacts (Tauro, 2021). There is potential for aquatic systems to cross thresholds or “tipping points” where small hydrologic perturbations would alter their state and lead to chronic water scarcity or flooding. This attribute increases the decision risk managers take to maintain sustainable use of water resources in a changed (and changing) climatic system (Peterson et al 2021).

Adaptive  
Management

Adaptive management emerged in the 1970’s (Williams, et al. 2009) as an alternative approach that allowed for “learning by doing” and assessing ecosystem response. What is different about adaptive management? First off, it is an ongoing process (NAS 2004). Iterative assessment of management actions within a sound science strategy that tests alternative operations produces information that can be transformed into operational decisions. Adaptive management is **not** business as usual for management agencies and is **not** a convenient way to avoid taking actions by continually studying the process itself.

## Benefits

Adaptive management with strategically designed monitoring and research programs can assess the existence of multiple ecosystem equilibrium points. It can identify feedback mechanisms, leading to a better understanding of hydrologic, geomorphic, and biologic responses in different climate regimes. Understanding where the ecosystem thresholds are allows water managers to implement adaptive strategies to effectively respond to climate-driven challenges.

Climate Change  
Uncertainty

An effective response to climate change now requires that water management agencies realize that a static reliance on previous hydrologic assumptions has been replaced in response to uncertainty and extreme events. Many pre-existing ecosystem buffers — such as riparian zones and functional watersheds that slow runoff — have been severely impacted, if not eliminated. Instream habitat diversity needs to be re-established. Overall, the risk to sustainable water management is increasing and more science/data is required to reduce the potential exposure to unforeseen, unwanted, responses to management actions. Water managers need to become more engaged with stakeholders as stakeholder input, understanding, and participation is inherent in an effective adaptive management approach. It is also crucial to remember that it is management, governance, policies, and actions that are intended to be “adapted” — not the science.

The objective of this article is to look at the application of the adaptive management process using four water management case studies where objectives and use of science vary. The discussion will be a focus on why science matters and the identification of implementing components that have proven critical to successful application of adaptive management.

## Critical Elements

Three important elements have emerged from the review of these adaptive management applications and are shown in the four case studies:

- 1) Need for effective project *authority and governance*
- 2) Need for *defined policies* for implementation
- 3) Need for a *rigorous scientific process* built around needs of the program

The remainder of this article is organized into three sections. The first discusses the nature of adaptive management decision-making and the use and interpretation of science. The second section focuses on four adaptive management case studies. The article concludes by discussing factors of success and the role of science.

**Adaptive Management**

**Risk Factors & Old Assumptions**

**Watershed Disturbances**

**Data Techniques**

**Uses of Science**

**Differing Results**

**Dams & Salmon**

**Governance**

**Nature of Decision-Making: Use and Interpretation of Science**

Adaptive management is an approach to collecting, analyzing, and applying natural resources data in water management decisions (Walters, 1997).

Risk in management decisions increases with: hydraulic variability; ecosystem complexity; aging and limited-function infrastructure; population expansion; industrial expansion; reduced capacity for alternative management options; and public safety. The assumptions utilized in the construction of our existing infrastructure were often limited in scope and addressed a narrow range of operational variability. Climate-related impacts are requiring water agencies to reconsider those earlier management assumptions.

Rivers are defined by their watersheds. Historically, there has been a subtle-yet-profound decoupling of watershed dynamics and rivers due to increased infrastructure and hydrologic manipulation. Disturbances in watersheds impact and exacerbate the direct influence of water management decisions. These disturbances — caused by both natural and human forces — leave legacies that impact the long-term sustainability of aquatic and terrestrial ecosystems. Disturbances can include “linked interactions” which alter watershed capacity to endure impacts (*resistance*) and “cascading interactions” which alter the watersheds capacity to recover to pre-impact conditions (*resilience*) (Kleinman et al 2019).

Effective application of adaptive management uses a rigorous scientific approach that yields data that can be translated into direct analyses and used to evaluate alternative operational decisions.

Three techniques typically used to gather and use data in adaptive management include:

- 1) **Monitoring:** analysis to determine whether existing program actions are yielding the desired results
- 2) **Hypotheses-Driven Theoretical and Applied Research:** addressing gaps in knowledge and assessing whether the questions and assumptions in program measures are supported by response data
- 3) **Predictive Models:** to assess whether proposed alternative operations or actions yield potential results that can be used to reduce risk or meet program objectives

To be useful science must be translated into actionable information that supports and guides managers and decision-makers in weighing alternative approaches to address: risk; ecosystem resilience; infrastructure capacity; operational constraints; and stakeholder expectations.

Science yields results in information (data) that can be translated into decisions. How that information is to be used determines the initial approach in the design and rigor necessary in the scientific strategy.

Understanding the expectations on how the science is to be used affects the choice of approach.

Differing uses of science include:

Science for Political Expediency. This is where science process is driven by legislation, political timelines, and/or litigation requirements. It is often initiated as an expedient way to gain approval for moving a management decision forward.

Examples: Are operations endangering species? Is flood risk increasing or decreasing?

Science for Agency Policy Actions. Science used to address water management decisions, such as: when to change operations; where to implement species recovery actions; if/when existing federal Endangered Species Act (ESA) permits need to be reassessed; or how to manage risk.

Examples: Does new information warrant reassessment of a biological opinion? Does science support revision of an operations protocol?

Science for Research Assessment. Species or ecosystem responses are the result of a suite of intersecting factors. Modifying operations or management factors may cause a change in response.

Examples: Does an agency action result in specific species response? How does an operation action impact ecosystem response? How do operational changes impact the agency’s mission?

Science is often heralded as the solution in political debates. A myth exists that all science is the same.

The process may be the same, the analysis may be the same, but the expectation of what that science will provide (results) can determine the type and level of detail and often engenders different outcomes.

**Case Studies**

**EXAMPLES OF HOW SCIENCE IS USED IN COMPLEX WATER MANAGEMENT CHALLENGES**

Adaptive management has been used in multiple applications including: forestry; dam operations; water distribution; species management; infrastructure assets; water quality assessments; and more. This section explores adaptive management use in four different and complex water management decision environments: the Columbia River; the Chesapeake Bay; the Colorado River; and the International Boundary Water Commission.

**Case Study 1: Columbia River**

**ADAPTIVE MANAGEMENT & SALMON RECOVERY**

Federal and private utility dams were constructed in the Columbia River watershed beginning in the early 1900’s. The water-controlling infrastructure was essentially completed in the 1980’s (NWPPC 2021a). In 1980, the Northwest Electric Power Planning and Conservation Act was passed by Congress. The Northwest Power and Conservation Council (NWPPC) was thereby established as the regional entity that would develop and maintain a regional power plan and a fish and wildlife program. The program’s objective: to balance the Northwest’s environment and energy needs with the NWPPC providing *authority and governance* (NWPPC 2021b).



**Adaptive Management**

**Defined Policies**

**Targets & Thresholds**

**Public's Expectations**

**Actions as Experiments**

**Climate Change Impacts**

The NWPPC has two primary roles: 1) development and updating of a 20-year electric power plan; and 2) development and updating of the Fish and Wildlife plan. Both plans are revised every five years and follow decision steps in accordance with *defined policies*. The Fish and Wildlife plan is based on a framework of adaptive management to assess specific management actions implemented by: the Department of Energy's (DOE's) Bonneville Power Administration; the Department of the Interior's (DOI's) Bureau of Reclamation; the US Army Corps of Engineers (Army Corps); and the Federal Energy Regulatory Commission (FERC) and its licensees.

Much of the science being funded by the DOE, DOI, and the Army Corps is associated with meeting the requirements of Biological Opinions prepared by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA/NMFS) in accordance with ESA mandates and water quality standards implemented under the federal Clean Water Act. The NWPPC expects the agencies and tribes engaged in the Fish and Wildlife Plan to develop actionable targets and science associated with identifying key thresholds such as the relationship between flow levels and salmon survival.

Stakeholder Groups and the Columbia Basin Collaborative

The Columbia River system, including the Snake River, provides: hydropower, irrigation, transportation of commodities from the Pacific Ocean to Lewiston, Idaho; recreation; and social and cultural access for 32 separate tribal peoples (NWPPC 2021c). Expectations of the public have been significant in respect to the goal of maintaining the regions' iconic salmon, sturgeon, lamprey, and marine mammal populations.

Over the last year, four Columbia River Basin states (Washington, Oregon, Idaho, Montana) organized the *Columbia Basin Collaborative* for increased stakeholder engagement on salmon recovery. A significant driver for the organization of the *Collaborative* has been the belief that increased regional collaboration is needed to move faster towards a comprehensive, long-term solution (Columbia Basin Bulletin. 2021a).

Adaptive Management in the Fish and Wildlife Program

Adaptive management is used as a policy framework designed to meet the requirements of the Columbia River Basin Fish and Wildlife Program. The Program goal is to rebuild salmon and steelhead trout populations diminished by more than half a century of hydropower development. One Program challenge is the biological uncertainty associated with species habitats and river flows. Project sponsors use adaptive management to refine work elements in proposals and improve experimental designs in relation to biological objectives. Structured decision-making has been implemented to keep improving water management. By treating Program measures as experiments, it is possible to proceed with rebuilding while learning how to do so more effectively. Disciplined implementation of the Columbia Basin Program can complement advances in management of salmon harvest that have been achieved by state and tribal fisheries agencies.



**Why Science Matters in the Columbia River Basin**

Congress in 1980 directed the implementation of a Columbia River Basin plan and directed a science-based adaptive management program to guide dam and reservoir management options. The implications of failing to manage Columbia Basin water correctly include: potential for violation of the Biological Opinion agreements; impact to ESA-listed species; potential restrictions on hydropower generation; impacts to river-based shipping commerce; and restrictions in the diversion of water from the river to agriculture.

Climate change is already impacting the hydrology of the watershed. Impacts include: reduced base flows from Canadian glaciers; increased annual and seasonal variability in snowpack, rain, and resulting runoff; and increased extreme weather events associated with atmospheric rivers. These impacts are rapidly changing the underlying hydrologic sensitivity and response to watershed and river system-based conditions. A strategic scientific program that embraces the variability and frequency of events is critical to the successful implementation of the NWPPC program goals, meeting stakeholder expectations, and fulfilling tribal treaty obligations.

Highlighting the hydrologic concerns and climate change, the State of Washington released the *2021 Long-Term Water Supply and Demand Forecast* (Columbia Basin Bulletin 2021b) in May 2021. The report concludes that there will be a shift in the timing of peak water supplies and that deficits in instream flows along the Columbia River mainstem could increase as much as 30% by 2040.

**Adaptive Management**

**Estuary Impacts**


**Water Quality & Growth**

**Authority & Governance**

**Coordinated Actions**

**Bay TMDL**

**Restoration Plan**



**Case Study 2: Chesapeake Bay**

**ADAPTIVE MANAGEMENT TO SUPPORT WATER QUALITY & ECOSYSTEM RECOVERY**

Chesapeake Bay is the largest estuary on the East Coast. The estuary is 200 miles long, ranges in width from four to 30 miles, and is the third largest estuary in the world (encompassing 4,480 square miles). Twelve major rivers bring water, sediments, and pollutants into the Bay from a six-state watershed supporting 18 million people. Historically, the Chesapeake Bay watershed has supported: commercial fishing; recreational fishing and hunting; oyster and crab harvesting; and commerce transportation.

Impacts to the Chesapeake Bay include: increased sedimentation; turbidity; and nutrients. Such impacts result in: a decline in dissolved oxygen and sea grass beds; filling of wetlands; and the loss of multiple areas that have traditionally provided protection and habitats for multiple species. The reduction of natural water-bordering biomes (buffering areas) has led to: increased water pollution; debilitating diseases that affect oysters; harmful algal blooms; and diminishment of aquatic and riparian habitats.

Water quality concerns in the Chesapeake Bay became noticeable in the 1950's (MDE, 2021). Growth in the region has resulted in larger urban and agricultural footprints. Growth impacts include increased and faster runoff from urban streets and farmers' fields — bringing more pollutants in the form of oils, pesticides, nutrients, and other chemicals. In 1972, the federal Clean Water Act (CWA) was passed into law (Clean Water Act, 1972), bringing more scrutiny to bear. In 1983, the US Environmental Protection Agency (EPA) signed the first Chesapeake Bay Agreement (Agreement). The Agreement included the states of Maryland, Pennsylvania and Virginia, the District of Columbia, and the Chesapeake Bay Commission (a tri-state legislative body). The Chesapeake Bay Agreement has been updated several times and provides the overall *authority and governance* for implementing actions to clean up the Bay. (Chesapeake Bay Foundation, 2021.)

Authorized by Section 117 of the CWA, 33 U.S.C. Section 1267, the Chesapeake Bay Program (CBP) is responsible for supporting the Chesapeake Executive Council (comprised of the governors of the six watershed states, the District of Columbia, the Chair of the Chesapeake Bay Commission, and EPA's Administrator). The Executive Council directs the coordination of the federal, state, and local efforts and policies to restore and protect living resources and water quality of the Chesapeake Bay and its watershed. The CBP is implementing many of the components of adaptive management to coordinate the partnership's activities at multiple organizational levels. By developing an adaptive management plan for each of its goals, the program can coordinate and strategically manage all individual restoration activities. Reports and assessments are issued annually to provide stakeholders and the public with identified progress towards desired indicators and outcomes.

In December 2010, EPA released a cleanup plan for the Chesapeake Bay based on meeting the Total Maximum Daily Load (Bay TMDL) (EPA, 2020). The Bay TMDL plan established effluent limits for nitrogen, phosphorus, and sediment. The goal was to have practices and controls in place for an expected 60 percent reduction of nutrient and sediment pollution loads by 2017, with all practices and controls installed by 2025 to meet water quality standards in the Bay. Bay watershed jurisdictions developed seven individual Watershed Implementation Plans (WIPs) to address the nutrient and sediment TMDL allocations. The WIPs define specific steps each jurisdiction will take to meet their pollution reduction targets (Chesapeake Bay Foundation, 2021). Two WIPs have recently been developed to account for climate change and the impact of Conowingo Dam sediment and nutrient management.

On June 16, 2014, the Chesapeake Executive Council signed a new voluntary Chesapeake Bay agreement that will guide the CBP partnership's work into the future. Delaware, New York, and West Virginia signed the agreement as full CBP partners. This comprehensive restoration plan for the Chesapeake region provides transparency and accountability for actions. With ten interrelated goals and 31 outcomes, the watershed accord advances the restoration, conservation, and protection of all the lands and waters within the watershed. The accord promotes: sound land use; science-based approaches; improving environmental literacy; stewardship; and coordination with stakeholders and the Chesapeake Bay Foundation 2021.

An adaptive management process is implemented through a Management Board that provides strategic planning, priority setting, and operational guidance through an implementation strategy for the Chesapeake Bay Program. The Board directs and coordinates six Goal Implementation Teams (GITs) and their supporting workgroups. The membership of the GITs and the strategy's Scientific, Technical Assessment, and Reporting Team include federal and non-federal scientists and other experts from throughout the watershed. Each GIT develops its own adaptive management plan.

**Why Science Matters in the Chesapeake Bay?**

The Chesapeake Bay Watershed Agreement recognizes the unique and vital role local governments and stakeholders play and how they are essential to the restoration effort. The TMDLs define the *authority and governance* for the program. Though considerable resources have been committed to the implementation of the Bay TMDL, there is growing concern that it is not resulting in improved attainment of water quality standards in the Bay (Cunningham 2018).

<p><b>Adaptive Management</b></p>	<p>The Chesapeake Bay efforts are designed around defined goals, policies, and timelines for achieving nutrient and sediment reductions. A recent assessment of the 31 desired outcomes concludes that results are mixed and that it is unlikely that goals will be achieved for seven of the goals set for achievement by 2025 (Chesapeake Bay Journal 2021). The states, NOAA, and the DOI's United States Geological Survey (USGS) have implemented monitoring to track progress and are using science-based models to predict future ecological conditions.</p>
<p><b>Desired Outcomes</b></p> <p><b>Stormwater Runoff</b></p>	<p>Climate change is impacting the Chesapeake Bay via increased intense hydrologic events throughout the six-state watershed resulting in stormwater runoff carrying sediments and pollutants into the Bay. Sea level rise is changing the salinity balance within the Bay and higher water levels are leading to inundation and erosion of wetlands and islands. The Chesapeake Bay's condition is a product of the watershed, the topographic situation, and its relationship with a growing region. Science, and its use through adaptive management, is providing actionable science for decision makers and stakeholders.</p>
<p><b>River Uses</b></p> <p><b>Historic Infrastructure</b></p>	<p><b>Case Study 3: The Colorado River.</b>  <b>ADAPTIVE MANAGEMENT TO SUPPORT RIVER MANAGEMENT</b>                  The Colorado River supplies water to over 40 million people in a seven-state region while also providing water to the Republic of Mexico through the 1944 Treaty with Mexico. Over 75% of the river's water is used for irrigation, with the remaining water distributed to urban, municipal, and energy uses. A large amount of river basin infrastructure is required to support delivery of water to users. Today an intricate system of hundreds of dams, tunnels, pumps, siphons, and transbasin diversions control every drop of river water. Most of this infrastructure was designed, built, and operated before the advent of environmental and cultural statutes.</p>
<p><b>Ecosystem Studies</b></p> <p><b>Authority &amp; Governance</b></p>	<p>In the early 1970's concerns about the impact that dam operations and river management were having on the aquatic ecosystem and natural areas of the basin led to: the initiation of several studies on native fish in the upper and lower basins; environmental studies in the Grand Canyon; and the assessment of salinity and water quality concerns. Environmental studies in the Grand Canyon (DOI 1995) and native fish studies gathered baseline scientific and hydrologic data to support review of alternative management options. These programs were examples of individual adaptive management programs.</p> <p>The <i>authority and governance</i> of the adaptive management programs were vested through: federal and state agreements; National Environmental Policy Act (NEPA) documents; and Congressional authorization of agency programs and budgets. As environmental concerns increased, stakeholder groups and the public demanded more input into the decision-making process. Unlike the Columbia River or the Chesapeake Bay, no integrated basin-wide approach exists in the Colorado River watershed.</p>
<p><b>Congressional Direction</b></p>	<p>In 1992 Congress passed P.L. 102-575 (U.S. Congress 1992). This law included Title XVIII, The Grand Canyon Protection Act (<i>authority</i>). The Act directed the completion of a NEPA review of the operations of Glen Canyon Dam and authorized the adoption of alternative operations and plans. The program was to be supported by a long-term monitoring plan that included necessary research and studies to determine the effect of the agencies' decisions on the resources of the Glen Canyon National Recreation Area and Grand Canyon National Park (P.L. 102-575, Title XVIII. 1992). In 1996, at the completion of the Glen Canyon Environmental Studies (1982-1996) and the Glen Canyon Dam EIS (DOI, 1995), an adaptive management program was initiated. The program is directed by the Adaptive Management Work Group with support provided by a DOI-administered science program (<i>governance, defined policies</i>).</p>
<p><b>Adaptive Process</b></p>	<p>This adaptive management program collects data on a variety of physical, biological, cultural, social, and economic issues. These data help guide program recommendations to the federal agencies responsible for the operation and management of Glen Canyon Dam.</p>
<p><b>Climate Impacts</b></p>	<p>Climate change is having a direct impact on the ability of the federal government and the states to meet the legal requirements of the Colorado River Compact (a 1922 water allocation agreement between the seven Colorado Basin states) and the 1944 Treaty with Mexico for the delivery of water (Colorado River Research Group, 2016). A series of hydrologic assumptions have been the basis for the historic management of the Colorado River. A continuing 20-year drought has resulted in total system-wide reservoir storage dropping over 60 percent.</p>
<p><b>Drought Impacts</b></p>	<p>Drought conditions have impacted water deliveries downstream, including treaty releases to Mexico. Reduced flows are impacting the aquatic and riparian and physical systems. The basin states and the Republic of Mexico have increasingly had to implement state and federally supported drought conservation efforts to address the rapidly diminishing levels of stored water in the reservoirs that make up the Colorado River water management system.</p>
<p><b>Monitoring &amp; Research</b></p>	<p><b>Why Science Matters in the Colorado River Basin</b>                  The adaptive management program for the Grand Canyon and the native fish recovery programs in the upper and lower Colorado River basins collect scientific data through monitoring and research. The program uses a variety of models to assist scientists in identifying trends, threshold conditions, and potential impacts to river system components.</p>

**Adaptive Management Models**

**Water Allocation**

**Mexico Treaties**

While water deliveries are the primary goal for management of the Colorado River, understanding the potential impacts to the aquatic and riparian ecosystems and species is necessary in making water management decisions. Two models — the Colorado River Simulation System (CRSS) and the Colorado River Mid-term Modeling System (CRMMS) — are utilized in developing probabilistic projections of future Colorado River system conditions over timeframes of one year to several decades (Bureau of Reclamation, 2020).

The Federal government and the basin states have a collective goal of protecting and stretching the available water supply of the Colorado River. Increasing challenges from structural deficits in water delivery volumes and changing hydrology are forcing the implementation of significant water restrictions (Water Education Foundation, 2019). Science is critical in the accuracy of hydrologic predictive models that are used to determine water allocations, hydropower potential, and environmental management. Science is being called upon to help decipher the potential climate change impacts on water supply, natural resources, and the changing dynamics in watershed integrity.

**Study Case 4: The International Boundary Water Committee**

**ADAPTIVE MANAGEMENT TO SUPPORT TRANSBOUNDARY WATER GOVERNANCE**

The International Boundary Water Commission (IBWC) manages the transboundary waters that make up the Rio Grande and Colorado River systems. The Colorado River system flows through seven states and supports over 40 million people and agriculture in the United States. The Rio Grande flows through three states and forms a common boundary with Mexico and Texas for 1,896 miles. Most of the water of the Rio Grande is used for agriculture in the states of Colorado, New Mexico, and Texas — resulting in less than 20 percent of the river finding its way to the Gulf of Mexico (Carter et al. 2018).

Established in 1889, the IBWC has responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise in their application. The IBWC is an international joint administrative body composed of the United States Section (IBWC) and the Mexican Section: La Comisión Internacional de Límites y Aguas (CILA). The IBWC operates under the foreign policy guidance (*authority and governance*) of the Department of State. The Mexican Section is under the administrative supervision of the Mexican Ministry of Foreign Affairs.

Treaty provisions allow for the development of technical amendments — defined as “Minutes” — to implement and apply actions and policies to specific water management issues including: water quality; groundwater; transboundary watercourses; conservation; implementing shortage criteria; environmental protection; and ecological restoration. This approach to water governance of transboundary rivers is an example of using science and diplomacy to fashion collaborative water management (Gerlak, 2015). The IBWC draws together two conceptual frameworks — water diplomacy and science diplomacy — to determine alternatives and actions to address water-resources problems along the shared border (Wilder, et al., 2020). The IBWC uses

**Colorado River Basin**



<b>Adaptive Management</b>
<b>Hydro Diplomacy Components</b>
<b>Science &amp; Diplomacy</b>
<b>Negotiation &amp; Dialogue</b>
<b>Consistent Themes</b>
<b>Critical Components</b>
<b>Structuring Better Decisions</b>

science to make better management decisions to test and assess water management actions. Specific areas where the IBWC uses science to assist in making management recommendations include: flood predictions and warnings; dam and salinity management; habitat restoration; water quality; and environmental impact statements.

The United States and Mexico have engaged in this form of hydro diplomacy for more than 75 years. As essential elements of decision-making, the adaptive governance indicators used include: social learning; sustained relationships; flexible governance mechanisms; and state and non-state networks. Research suggests that robust and foundational institutions comprise a key element of adaptive governance in transboundary contexts (Wilder 2020). Both science and diplomacy have been important components underlying the effectiveness of hydro diplomacy in this border region. Bi-national and transboundary networks involving diverse state and non-state actors at multiple scales have increasingly played a pivotal role in shaping desirable water management outcomes in the region.

**Why Science Matters to the IBWC?**

The IBWC has used science and diplomacy to shape transboundary policies to ensure compliance with the Treaty and manage their shared water resources. Examples include Minutes 319 and 323, which have been used to support the release of additional water from Morales Dam at the US Mexico Border to allow for aquatic and riparian ecosystem support in the Colorado River Delta in Mexico. *See Harkins, TWR #203 (Jan. 15, 2021).*

Climate change is having direct effects on the available water supply of both the Colorado River and the Rio Grande. Both rivers are guided by complex legal, institutional, and legislated suite of agreements that require negotiation and dialogue before management actions can be taken. Over the last 50 years water development on both rivers has resulted in structural deficits as demands have outstripped available water supply (Garfin et al 2013). Climate change is driving an intensification of the drought conditions and increased desertification throughout both basins, resulting in increased variability and concerns for meeting water demands on both sides of the border (Mumme et al. 2018). Improved data collection, predictive capacity, and improved adaptive governance/management are necessary in the development of actionable science for decision-makers.

**Summary**

The four case studies illustrate different applications of adaptive management with water issues and the role of science.

The examples illustrate two consistent themes:

Adaptive Management is a Messy Process that requires shifting from traditional agency-directed to collaborative approaches. That requires agencies to share traditional power of decision with a larger group of stakeholders.

Adaptive Management Improves with Science Feedback and as knowledge evolves to address the short and long-term aspects of system response. Increased knowledge provides improved capacity of governance and collaboration to occur.

Science-based adaptive management is crucial to the long-term sustainability of the hydrologic resource. If not implemented successfully, diminished access to adequate and clean water will threaten millions of people and the environmental resources that depend upon water. If not adequately addressed, threats to agriculture, public health, the economic viability of communities, and the environmental integrity of aquatic and riparian systems will impact regional water security.

In all four case studies three components have proven critical in the development of a useful adaptive management program. Without any of these three components, implementing an adaptive management program to support decision makers will have limited success.

**Three Critical Adaptive Management Components are:**

**Defined & Effective Governance/Authority.** Without defined authority it is impossible to establish the structure needed to get the right folks to the table to engage in meaningful discussions. Large scale, multi-state and regional water management efforts generally require legislative or legally mandated authority to act.

**Defined & Implementable Policies.** Adaptive management programs require procedures for implementation, analysis, and structured decision-making. Without criteria for bringing science into the discussion and decision, forum inconsistency will result in stakeholder concern.

**Strategic, Rigorous, and Actionable Science.** The science program for an adaptive management program must be developed around specific questions and expectations. The science should follow a rigorous hypothesis-testing approach.

The goal of any adaptive management process should be to structure better decisions. Differing from traditional, agency-by-agency, “silo-driven” decision processes, adaptive management utilizes diverse stakeholders and works to build knowledge and decision capacity through science. While an adaptive management process does not guarantee no-risk in decision-making, it does reduce the uncertainty and builds a body of knowledge that will aid future decision exercises.

## Adaptive Management

### Science Uses

#### Why Science Matters

Knowledge-based management of water resources requires rigorous science and analysis. Climate change will continue to force water managers to face operational decisions that address increasingly extreme hydrologic conditions. Managing water to address extremes requires flexible, science-based assessments that can be integrated and readily adapted into the management scheme.

Science is needed to enhance predictive capacity to make informed decisions that reduce risk. Science is needed to understand the impact of short-term hydrologic disruptions, which already include: extreme weather; flooding; drought; wildland fires; and other natural disasters. Science is needed to assess options for responding to long-term challenges such as climate change related impacts.

Challenges related to the management of water will test water managers and governments in new and unpredictable ways (Colglazier, 2018). Effective water management must adapt to embrace the unfamiliar hydrologic stressors of today and the unpredictable environment of tomorrow.

#### FOR ADDITIONAL INFORMATION:

DAVE WEGNER, Woolpert Engineering, 970/ 759-0083 or David.L.Wegner@gmail.com

#### References

- Carter, N.T., Stern, C.V., Mulligan, S.P.U.S. 2018. Library of Congress: Congressional Research Service. *Sharing the Colorado River and Rio Grande: Cooperation and Conflict with Mexico*. CRS Report No. R45430.
- Chesapeake Bay Foundation. 2021. *The History of Chesapeake Bay Cleanup Efforts*. [www.cbf.org/how-we-save-the-bay/chesapeake-clean-water-blueprint/the-history-of-bay-cleanup-efforts.html](http://www.cbf.org/how-we-save-the-bay/chesapeake-clean-water-blueprint/the-history-of-bay-cleanup-efforts.html) (visited June 11, 2021)
- Chesapeake Bay Journal. 2021. *Bay Restoration Effort Stumbling in the Race to the 2025 Finish Line*. May 2021. Pages 18-21.
- Colglazier, E.W., 2018. *Science Diplomacy and Future Worlds*. *Sci. Diplomacy*. 2018: 7(3).
- Colorado River Research Group, 2016. *Climate Change and the Colorado River: What We Already Know*. [www.coloradoriverresearchgroup.org/uploads/4/2/3/6/42362959/crrg\\_climate\\_change.pdf](http://www.coloradoriverresearchgroup.org/uploads/4/2/3/6/42362959/crrg_climate_change.pdf)
- Columbia Basin Bulletin. 2021a. *Columbia Basin Collaborative: Second Workshop Focuses on Year-Long Process to Achieve Salmon Recovery Recommendations*. June 11, 2021. [www.cbbulletin.com/columbia-basin-collaborative-second-workshop-focuses-on-year-long-process-to-achieve-salmon-recovery-recommendations/](http://www.cbbulletin.com/columbia-basin-collaborative-second-workshop-focuses-on-year-long-process-to-achieve-salmon-recovery-recommendations/)
- Columbia Basin Bulletin. 2021b. *Washington's Draft Long-Term Water Supply/Demand Report: By 2040 Look for Substantial Decrease in Columbia River Mainstem Flows July, August*. June 3, 2021. [www.cbbulletin.com/washingtons-draft-long-term-water-supply-demand-report-by-2040-look-for-substantial-decrease-in-columbia-river-mainstem-flows-july-august/](http://www.cbbulletin.com/washingtons-draft-long-term-water-supply-demand-report-by-2040-look-for-substantial-decrease-in-columbia-river-mainstem-flows-july-august/)
- Cunningham, Alexis 2018. *Adaptive Management Strategies on the Chesapeake Bay Regarding TMDLs*. University of Delaware. <http://udspace.udel.edu/handle/19716/23920>
- Garfin G., A. Jardine, R. Merideth, M. Black, and S. Leroy. Editors. 2013. *Assessment of Climate Change in the Southwest United States: A report prepared for the National Climate Assessment, Southwest Climate Alliance*. Island Press; Washington, DC. [www.swcarr.arizona.edu/sites/all/themes/files/SW-NCA-color-FINAL.web.pdf](http://www.swcarr.arizona.edu/sites/all/themes/files/SW-NCA-color-FINAL.web.pdf)
- Gerlak, A.K. 2015. *Resistance and Reform: Transboundary Water Governance in the Colorado River Delta*. *Rev. Policy Res.* 32(1):100-123. Doi: 10.1111/ropr.12114. <https://onlinelibrary.wiley.com/doi/abs/10.1111/ropr.12114>
- Kleinman, J.S., J.D. Goode, A. C. Fried, J.L. Hart. 2019. *Ecological Consequences of Compound Disturbances in Forest Ecosystems: A Systematic Review*. *ESA Journal*. November 2019. Vol. 10(11). Article e02962. <https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2962>
- Maryland Department of the Environment. 2021. *The Story of Chesapeake Bay*. <https://mde.maryland.gov/programs/Water/TMDL/TMDLImplementation/Pages/overview.aspx>
- Mumme, S.P., O. Ibanez Hernandez, B. Verdini. 2018. *Extraordinary Drought in the U.S.-Mexico Water Governance*. *Water Law* 26(1):16. [https://www.researchgate.net/publication/328529107\\_Extraordinary\\_Drought\\_in\\_US-Mexico\\_Water\\_Governance](https://www.researchgate.net/publication/328529107_Extraordinary_Drought_in_US-Mexico_Water_Governance)
- National Academy of Sciences. 2004. *Adaptive Management for Water Resources Project Planning*. The National Academies Press. [www.nap.edu/catalog/10972/adaptive-management-for-water-resources-project-planning](http://www.nap.edu/catalog/10972/adaptive-management-for-water-resources-project-planning)
- Northwest Power and Conservation Council. 2021a. *Columbia River Chronology*. [www.nwcouncil.org/reports/columbia-river-history/chronology](http://www.nwcouncil.org/reports/columbia-river-history/chronology)
- Northwest Power and Conservation Council, 2021b. *Pacific Northwest Electric Power Planning & Conservation Act*, U.S.C. § 839-839h, December 5, 1980. [www.nwcouncil.org/reports/poweract/summary](http://www.nwcouncil.org/reports/poweract/summary)
- Northwest Power and Conservation Council. 2021c. *Indian Tribes*. [www.nwcouncil.org/reports/columbia-river-history/indiantribes#:~:text=A%20total%20of%2032%20separate,basin%20dating%20back%2010%2C000%20years.](http://www.nwcouncil.org/reports/columbia-river-history/indiantribes#:~:text=A%20total%20of%2032%20separate,basin%20dating%20back%2010%2C000%20years.)
- Peterson, T.J., M. Saft, M.C. Peel, A. John. 2021. *Watersheds May Not Recover from Drought*. *Science*. 14 May 2021. Vol 372, Issue 6543. DOI: 10.1126/science.abd5085. <https://science.sciencemag.org/content/372/6543/745>
- Scheffer, M., S. Carpenter, J.A. Foley, C. Folke, B. Walker. *Catastrophic Shifts in Ecosystems*. *Nature* 413. 591. [www.nature.com/articles/35098000](http://www.nature.com/articles/35098000)
- Tauro, F. 2021. *River Basins on the Edge of Change*. *Science*. 14 May 2021. Vol. 372, issue 6543. <https://science.sciencemag.org/content/372/6543/680>
- US Bureau of Reclamation. 2020. *Lower Colorado Region. General Modeling Information*. [www.usbr.gov/lc/region/g4000/riverops/model-info.html](http://www.usbr.gov/lc/region/g4000/riverops/model-info.html)
- US Bureau of Reclamation. 1995. *Operation of Glen Canyon Dam. Final Environmental Impact Statement*. US Bureau of Reclamation, Salt Lake City, UT. [www.usbr.gov/uc/envdocs/eis/gcdOpsFEIS.html](http://www.usbr.gov/uc/envdocs/eis/gcdOpsFEIS.html)
- US Congress, 1992. Public Law 102-575. [www.doi.gov/sites/doi.gov/files/pl102-575-amended.pdf#:~:text=PUBLIC%20LAW%20102.575%20%28formerly%20BILL%20H.%20R.%20429%29,House%20of%20Representatives%20of%20the%20United%20States%20of](http://www.doi.gov/sites/doi.gov/files/pl102-575-amended.pdf#:~:text=PUBLIC%20LAW%20102.575%20%28formerly%20BILL%20H.%20R.%20429%29,House%20of%20Representatives%20of%20the%20United%20States%20of)
- US Environmental Protection Agency. 2020. *Chesapeake Bay TMDL Document*. [www.epa.gov/chesapeake-bay-tmdl/chesapeake-bay-tmdl-document](http://www.epa.gov/chesapeake-bay-tmdl/chesapeake-bay-tmdl-document)
- US Environmental Protection Agency, 2021. *Summary of the Clean Water Act* 33 U.S.C. §1251 et seq. (1972). [www.epa.gov/laws-regulations/summary-clean-water-act](http://www.epa.gov/laws-regulations/summary-clean-water-act)
- Walters, C. 1997. *Challenges in Adaptive Management of Riparian and Coastal Ecosystems*. *Conservation Ecology* [online]1(2):1. <http://www.consecol.org/vol1/iss2/art1/>
- Water Education Foundation. 2019. *With Drought Plan in Place, Colorado River Stakeholders Face Even Tougher Talks Ahead on the River's Future*. *Western Water*. May 9, 2019. [www.watereducation.org/western-water/drought-plan-place-colorado-river-stakeholders-face-even-tougher-talks-ahead-rivers](http://www.watereducation.org/western-water/drought-plan-place-colorado-river-stakeholders-face-even-tougher-talks-ahead-rivers)
- Wilder, M.O., R.G. Varady, A.K. Gerlak, S.P. Mumme, K.W. Flessa, A.A. Zuniga-Teran, C.A. Scott, N. Pineda Pablo, and S.B. Megdal. 2020. *Hydrodiplomacy and Adaptive Governance at the U.S.-Mexico Border: 75 Years of Tradition and Innovation in Transboundary Water Management*. *Environ. Sci.Policy*. 220 Oct: 112: 189-202. DOI:10.1016/j.envsci.2020.05.013. [www.sciencedirect.com/science/article/abs/pii/S1462901120301052](http://www.sciencedirect.com/science/article/abs/pii/S1462901120301052)
- Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. *Adaptive Management: The U.S. Department of the Interior Technical Guide*. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC. [www.doi.gov/sites/doi.gov/files/uploads/TechGuide-WebOptimized-2.pdf](http://www.doi.gov/sites/doi.gov/files/uploads/TechGuide-WebOptimized-2.pdf)

**David Wegner** is retired from a senior staff position on water, energy, and transportation committees in the US House of Representatives. In that position he worked on legislation that directly affected administration policy and federal agency actions related to the US Army Corps of Engineers, the US Department of the Interior (DOI), the US Environmental Protection Agency, the Bonneville Power Administration, the Tennessee Valley Authority, and the US Department of Energy. Prior to serving in Washington, DC, he worked for over 20 years for DOI managing water and science programs in the Colorado River basin and the Grand Canyon. During his tenure at DOI he was instrumental in formulating the Adaptive Management approach for other river systems impacted by dams and river operations. From 1997 through 2008 he built a private international environmental company that focused on global water and climate issues. Currently he works as a senior scientist for strategic planning for Woolpert Engineering and provides input and strategic counsel to NASA/JPL, academic institutions, members of Congress and staff, and international organizations focused on water, energy, coastal, reservoir management, and climate issues. Mr. Wegner is a frequent lecturer on the use of science in natural resource management and on the history of western water. He is on the boards of the National Academy of Sciences, Glen Canyon Institute, the Sonoran Institute and mentors several post-docs in the US, Europe, and Asia through the International Association of Hydrologic Research.

**PFAS**

**June Hearing**

**Risks**

**Compounds of Concern**

**States' Policies**

**Regulation Principles**

**Source Water Protection**

**PFAS: US SENATE TESTIMONY**

“PFAS: THE VIEW FROM AFFECTED CITIZENS & STATES”

Compiled by David Light, Editor

**Editor’s Introduction**

On June 9th, the US Senate Committee on Environment and Public Works held a hearing entitled: “PFAS: the View from Affected Citizens and States.”

Polyfluorinated and perfluorinated substances (PFASs) are synthetic chemicals that have many useful properties, including fire resistance and oil, stain, grease, and water repellency. Because of their widespread use and persistence (they do not degrade naturally), PFASs are now found worldwide in the environment, wildlife, and humans. With human exposure, PFASs accumulate in the blood and liver and have been linked to developmental effects to fetuses and infants, cancer, and impacts to the liver, thyroid, immune system, and cholesterol changes. See: Light, *TWR* #177; Kray & Wightman, *TWR* #182; & McKnight, *TWR* #195.

The June 9<sup>th</sup> Senate hearing included testimony from: G. Tracy Mehan III, Executive Director for Government Affairs, American Water Works Association; Joanne Stanton, Co-founder, Buxmont Coalition for Safer Water; James Kenney, Cabinet Secretary, New Mexico Environment Department; and Scott Mandirola, Deputy Secretary for External Affairs, West Virginia Department of Environmental Protection.

What follows are selected excerpts from 34 pages of written testimony, minimally edited to better fit our format. Full testimony can be accessed from the Senate Committee’s website: [www.epw.senate.gov/public/index.cfm/2021/6/pfas-the-view-from-affected-citizens-and-states](http://www.epw.senate.gov/public/index.cfm/2021/6/pfas-the-view-from-affected-citizens-and-states)

**Testimony of G. Tracy Mehan III**

Executive Director for Government Affairs, American Water Works Association

[The American Water Works Association’s] 50,000 members represent the full spectrum of water utilities — small and large, rural and urban, municipal and investor-owned. We are an international, non-profit, scientific, and educational society dedicated to protecting public health through the provision of safe drinking water. While AWWA is primarily a drinking water association, about 60 percent of our utility members are dual utilities, that is they have a division of drinking water and a division of wastewater and possibly stormwater as well. I speak not only from the perspective of AWWA, but as a former state and federal regulator and an adjunct professor of environmental law.

We understand and appreciate the committee’s concerns that PFAS compounds pose both human health and ecological risks that warrant greater attention and management. As you probably know, PFAS compounds are a group of more than 3,000 man-made chemicals manufactured in the United States and other countries since the 1940s. In 2019, the US Environmental Protection Agency (EPA) reported that more than 1,200 PFAS compounds had been used in commerce, and that about 600 are still in use. They may be found in food packaging, non-stick products, stain- and water-repellent products, fire-fighting foams, polishes, cleaning agents and other commercial products. The most well-known and common of these compounds are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). Related compounds are also causing concern: perfluorononanoic acid (PFNA), perfluorohexanoic acid (PFHxA), perfluorohexanesulfonic acid (PFHxS), perfluorodecanoic acid (PFDA), perfluorobutanesulfonic acid (PFBS) and fluoropolymers known as GenX. Much of our current data is focused on long-chain PFAS compounds, which have largely been replaced with less-researched, short-chain PFAS. Two of these compounds — PFOA and PFOS — were voluntarily phased out by the primary manufacturers nearly two decades ago, but still remain in use by many industries today.

Currently, more than half of the states in this country have developed policies to address PFAS contamination in the environment and, in particular, drinking water. Since 2018, six states have developed drinking water standards for PFAS and several more are assessing standards of their own. At the same time, a broader group of states have developed policies addressing PFAS in groundwater and surface water with the objective of protecting drinking water sources. The overwhelming majority of these policies include (but are not limited to) PFOA and PFOS and other long-chain PFAS such as PFNA and PFHxS.

**AWWA Guiding Principles on PFAS Regulation**

Because control of PFAS contamination is such an important, complex issue, AWWA developed the following principles for PFAS regulation to guide our discussions with regulators and other stakeholders:  
Commitment to Public Health Protection

Protecting public health is AWWA’s first core principle concerning PFAS and all drinking water matters.  
Fidelity to Scientific Process

The Safe Drinking Water Act (SDWA) mandates a consistent, transparent, and science-based process for the consideration of new regulations. AWWA supports following the essential SDWA steps — without undue delay — to assure PFAS risks are effectively and efficiently reduced.

Protection of Source Water

The best way to keep drinking water safe is to protect it at its source. AWWA believes EPA should utilize existing laws to understand and control PFAS risks before harmful substances are introduced into

<p><b>PFAS</b></p>	<p>commerce, and that PFAS producers — not consumers and water utilities — should be liable for cleaning up drinking water and the environment.</p>
	<p>Investment in Research                  More funding for research is needed to assess and address the human health effects of exposure to PFAS; identify analytical methods that quantify levels of PFAS in source water, drinking water and wastewater; and further develop technologies to cost-effectively remove PFAS compounds to levels that do not pose health concerns.</p>
<p><b>Research Needs</b></p>	<p><b>Use of Existing Authorities to Address PFAS</b></p>
<p><b>Data Needs</b></p>	<p>Drinking water utilities and state environmental agencies need to know where to focus monitoring resources to understand what risks may be in source waters. We need to know where PFAS compounds have been produced and in what volumes. There are existing tools that EPA could be using to a greater degree to help address such concerns regarding PFAS. In particular, there is the Toxic Substances Control Act (TSCA). TSCA has data-gathering authority that the agency could use to garner more information from the manufacturing sector about the number of PFAS compounds that have been developed, in what quantities they were produced and where they were produced. TSCA data indicates that manufacturers have already discontinued the use of a number of PFAS compounds, but state and local risk managers need more information than is currently available to manage legacy compounds and proactively manage PFAS that are currently in use. Deploying TSCA authorities in the service of safe drinking water is “source water protection” at the strategic level.</p>
<p><b>Existing Tools</b></p>	<p>The Clean Water Act (CWA) can come into play in controlling PFAS as well. Information gleaned via TSCA to target assessments of PFAS in the environment will assist in the development of industrial pre-treatment actions under that act. CWA authority will also come into play in the development of analytical methods for PFAS in industrial wastewaters and in development of appropriate and reliable treatment methods.</p>
<p><b>TSCA</b></p>	<p>EPA has yet to take substantial action under TSCA, nor the CWA, to collect substantial data on PFAS in the United States. In contrast, EPA recently proposed a rule that places the responsibility on public water systems to take the lead to identify potential sources of PFAS in the environment as opposed to taking action under TSCA and CWA to substantively identify these sources. This will once again place the burden onto public water systems — and their customers — to address the PFAS issue that was borne by polluters.</p>
<p><b>CWA</b></p>	<p>In testimony to this subcommittee in June 2019, AWWA emphasized the need for EPA to take action under TSCA and other authorities to collect data on aspects of the use of PFAS in the United States to support state and other stakeholders in identifying potential sources. Progress to date is limited to the addition of certain PFAS to the Toxics Release Inventory, which was a provision from the National Defense Authorization Act for Fiscal Year 2020. The first year of data under this program is due next month. AWWA hopes the data provides some clarity on potential sources, but we have previously raised concerns about limitations of the previous administration’s implementation of this provision.</p>
<p><b>EPA Inaction</b></p>	<p>Utilizing its oversight authority over federal agencies, we once again urge Congress to work closely with EPA career staff to ensure that the agency takes full advantage of existing authorities under TSCA and the Safe Drinking Water Act to manage risks posed by PFAS compounds. Using such authorities, the agency should provide a report in one year and update it every two years describing:</p>
<p><b>Local Burdens</b></p>	<ul style="list-style-type: none"> <li>• the location of current and past PFAS production, import, processing and use in the United States for individual PFAS compounds based on data collected through TSCA;</li> <li>• appropriate actions taken or planned under TSCA to restrict production, use and import of PFAS and support improved risk communications with the public;</li> <li>• actions taken by other federal agencies, and in particular the departments of Defense and Health and Human Services, to address PFAS concerns; and</li> <li>• a summary of statutory and non-statutory barriers encountered in gathering and distributing information on PFAS in order to inform risk management decisions by EPA, states and local risk managers.</li> </ul>
<p><b>Potential Sources</b></p>	<p>We understand the interest in designating at least some PFAS compounds as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). If any PFAS compounds are to be designated hazardous substances under CERCLA, we urge Congress to keep liability for PFAS cleanup with PFAS manufacturers and formulators.</p>
<p><b>EPA Authorities</b></p>	<p>Designating PFAS as a CERCLA hazardous substance would help communities that have a known responsible party with financial means to pay for cleanup. However, it could also create liability for communities that encounter PFAS in their water treatment activities. Once PFAS is removed from water, it then must be disposed of. A water utility that properly disposes of residuals containing PFAS, in a manner consistent with applicable laws, must not be held liable under CERCLA for future costs associated with PFAS cleanup. Those costs and responsibilities must remain with the original polluters that introduced PFAS into the environment. Failure to protect water utilities from this liability would victimize the public twice — once when they are forced to pay to remove PFAS from their water, and again when they are forced to pay to clean up PFAS elsewhere.</p>
<p><b>EPA Reporting Needed</b></p>	<p>Wastewater utilities receive and treat water from a range of sources from homeowners to industries. That water may contain PFAS compounds. Even though they are not the source of these compounds,</p>
<p><b>CERCLA Uses &amp; Liability Concern</b></p>	
<p><b>Wastewater Impacts</b></p>	



<p><b>PFAS</b></p>	<p>wastewater or stormwater utilities could end up liable for cleaning up these substances. If biosolids from wastewater treatment plants have been applied to land as fertilizer, such liability increases. Removing PFAS from wastewater requires advanced technologies, such as granular activated carbon, ion exchange or reverse osmosis. Then, as with advance drinking water treatment techniques, there is the issue of how to dispose of the concentrated PFAS mix. A recent report found that the impacts of this could include more than a 35% increase in disposal costs for biosolids.</p>
<p><b>Disposal Costs</b></p>	<p>If Congress does designate PFAS as a hazardous substance under CERCLA, an exemption for water and wastewater treatment residuals should be included. Some parties have argued this is unnecessary because EPA has never gone after municipalities in CERCLA actions before. However, in the past, “potentially responsible parties” in CERCLA actions have sued more than 650 municipalities and counties in 12 states for contributions for cleanup costs (Salzman &amp; Thompson, 2019).</p>
<p><b>Utility Exemption</b></p>	<p><b>The Importance of the SDWA Process</b></p>
<p><b>Drinking Water Regulation</b></p>	<p>The process for determining which substances EPA should regulate in drinking water and how they should be regulated are of course extremely important public health issues. We witnessed what happened with the 1986 amendments to the Safe Drinking Water Act (SDWA), in which EPA faced a mandate to regulate 25 new contaminants every three years. That quota-driven process bogged down into something unmanageable at the federal and state level.</p>
<p><b>Prioritizing Process Needs</b></p>	<p>Robert Perciasepe, EPA Assistant Administrator for Water in 1996, noted at that time, “The current requirement to regulate 25 new contaminants every 3 years needs to be replaced with a scientifically defensible, risk-based approach. The current regulatory treadmill dilutes limited resources on lower priority contaminants, and as a consequence may hinder more rapid progress on high priority contaminants. A new selection process should maintain a mandatory duty to collect data, conduct research, and make publicly accountable decisions on whether or not regulations are needed.”</p>
<p><b>Treatment Issues</b></p>	<p>EPA, state drinking water agencies and drinking water utilities do need to know where to focus resources to address the greatest risks to public health. This led to the process that was developed for the 1996 amendments to the SDWA, in which occurrence and health effects data is gathered before making a determination to regulate a particular substance based on the substance’s potential risk to public health. We understand that this process can be frustratingly slow. However, a scientific, risk-based and data-driven process is indeed going to take a significant amount of time. By-passing such processes may result in ineffective use of limited resources.</p>
<p><b>Treatment Costs</b></p>	<p>That said, we are eager to follow the data on potentially harmful substances, wherever it may go in the investigative process so that we may know how to best protect public health. We will then prepare our members to comply with any new regulations.</p>
<p><b>Infrastructure Costs</b></p>	<p>Removing PFAS compounds from water typically requires treatment techniques such as filtration through granular activated carbon or ion exchange. While these advanced technologies can be effective, they are also expensive, and generate waste streams that require specialized disposal methods that are not readily available across the country.</p>
<p><b>Risk-Based Approach</b></p>	<p>Recently, my staff did a preliminary analysis for the Congressional Budget Office on the potential national costs associated with implementing drinking water treatment to remove PFOA and PFOS. While there are, of course, hundreds of PFAS in commerce, these two are known concerns, and this allowed us to make some calculations. The costs to remove PFOA and PFOS from drinking water would quickly exceed \$3 billion if the standard is to be based on EPA’s current health advisory, which has been largely ignored by states, which are regulating at even lower limits. If EPA were to move closer to the standard used by states such as New Jersey, capital costs quickly exceed \$38 billion. These figures do not include operating costs and waste management, which would likely exceed \$1 billion annually, again, depending on the regulatory standard and waste management requirements currently under consideration by Congress and EPA. If PFOA, PFOS and other contaminants are designated as hazardous wastes or substances under RCRA and Superfund, respectively, costs skyrocket.</p>

**PFAS**

**Health Risk Reduction**

**Research Needs**

**EPA Strategy Development**

**Firefighting Foam**

**Community Contamination**

**Health Effects**

**Brain Tumors**

**Disclosure Lack**

**Research**

Research is key in addressing substances for potential regulation. The lack of clear health effects data on most substances has long held back regulatory determinations under the SDWA. Before a substance can be regulated, the SDWA requires that it “is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and in the sole judgment of the Administrator, regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems.”

Different substances have unique structures and unique chemical properties that impact the development of analytical methods, their fate and degradation in the environment and the effectiveness of different treatment technologies. To effectively manage new contaminants, the environmental engineering community needs each piece of information to guide design and operation of treatment technologies.

Research to provide information necessary to make informed risk management decisions is expensive and has been inadequately funded. However, extensive research programs are needed in these areas:

- Health effects data to identify substances that pose a human health risk;
- Analytical methods to quantify levels of such contaminants in environmental samples (natural waters, wastewaters, soil, finished water);
- Technologies to cost-effectively remove problematic contaminants from drinking water to levels that do not pose public health concerns.
- Waste management strategies to ensure contaminated wastes can safely be managed.

We urge Congress to ensure that the EPA and other relevant agencies or research bodies have the tools and resources they need to answer the needs listed above.

**Setting Achievable Expectations**

It is important that the committee request and examine technical and economic analysis from career staff at EPA before proceeding with any legislation to regulate PFAS compounds. For example, the SDWA framework does not require a binary decision between setting standards for individual compounds one-by-one, and requiring treatment for all PFAS as a class. Taking steps to control PFAS exposure will shift public resources from other essential tasks. To do so warrants understanding the practical implications of legislative language. AWWA recommends that Congress allow EPA to develop regulations and guidance that target steps that provide a meaningful opportunity for health risk reduction.

**Testimony of Joanne Stanton**

Co-founder, Buxmont Coalition for Safer Water

I grew up in Warminster, Pa., about two miles down the road from two separate military bases that used aqueous film-forming foam, the foam used by firefighters.

My PFAS story started when I was a young mother. I was naïve. I thought that if water came out of my kitchen faucet, it had to be safe. I had no idea just how weak our chemical laws are, and how many untested and unregulated chemicals, like PFAS, can easily make their way into our drinking water. I learned the hard way how important our environmental laws are in safeguarding our health, especially the health of our children.

Seven years ago, my community of Warminster was devastated to discover that our drinking water had been highly contaminated with PFAS for 50 years, with some of the highest levels of PFAS pollution ever detected from public drinking water wells.

I started to read everything I could get my hands on about PFAS. When I began researching the health effects, I learned that some of these chemicals can cross the placenta and affect a developing fetus. Animal studies showed they caused tumors, cancer, neurodevelopmental problems and even second-generation health effects.

The magnitude of what I was uncovering hit me like a ton of bricks. I vividly remember the day I realized what I was reading, falling to my knees and crying, as my mind raced back to when my oldest son was diagnosed with a cancerous brain tumor at age six.

Back then, after my son’s brain surgery, epidemiologists came into our hospital room and began pummeling my husband and me with very pointed questions: Where do you live?, they wanted to know. Where was your early pregnancy? Have you or your husband ever worked with chemicals or pesticides? They told us they’d found embryonic tissue in the center of my son’s cancerous tumor. That meant it had started to form during my pregnancy.

There are three of us who grew up in Warminster — on the same street, in fact, within a few houses of each other. All three of us have children of our own with brain tumors. All of them were cancerous, and all of them had embryonic tissue at the core. Doctors immediately questioned our environmental exposures, and we realized we all drank PFAS-contaminated water throughout our entire childhood, and we all drank it during our pregnancies.

As a mother, it was gut-wrenching for me to be told that my exposure might have caused my child’s cancer. But what truly sickened me was learning that both the Defense Department and the chemical manufacturers had known since the 1970s just how poisonous PFAS are. Yet they chose to be silent. They

<b>PFAS EPA Failure</b>
<b>Cancers</b>
<b>Military Pollution</b>
<b>Accountability Needed</b>
<b>Congressional Options</b>
<b>Regulations &amp; Deadlines</b>
<b>Dire Consequences</b>
<b>Actions Needed</b>
<b>Federal Direction Needed</b>
<b>States' Patchwork</b>

chose to watch people in the surrounding communities get sick, and in some cases die, without warning us.

I then came to find that the EPA also knew, and had known since 1998, just how toxic PFAS are. The EPA too failed to protect us.

Where does that leave us today?

In my town, where I grew up, there are 3-year-olds today with kidney cancer who may never get a chance to do something as simple as ride a bike and put their first tooth under their pillow.

There are new moms who don't feel they can safely breastfeed their babies because of the high levels of PFAS in their breast milk.

And today the Defense Department is refusing to clean up legacy pollution across the country.

It's been eight years since we learned about PFAS at our two military sites, yet the chemicals are still polluting our public waterways. Within the past couple of years, PFAS groundwater levels on base measured 329,500 ppt — 4,000 times EPA's health advisory for drinking water. And discharge levels coming off base were more than 3,000 ppt, levels far exceeding limits set in temporary discharge permits. Yet no one — no one — seems to have the power to hold them accountable.

How can this be?

It's the EPA's job to regulate chemicals, to set safe drinking water standards, and to hold polluters accountable — even when the polluter is the Department of Defense (DOD).

And it's your job to hold EPA accountable when the agency fails to act. You have the power to change the course of history.

[Congress has] the power to protect people like me.

- You have the power to designate PFAS a hazardous substance under CERCLA, as Chairman Carper has proposed in the PFAS Action Act, which will ensure that PFAS pollution in communities like mine is treated as an urgent priority.
- You have the power to set a two-year deadline for a federal drinking water standard for PFAS, as Senator Capito proposed in the Protect Drinking Water from PFAS Act, to ensure that my community, and all communities across the country, has safe drinking water. Why should my neighbors in New Jersey, where state regulators have set a drinking water standard for PFAS, have safer drinking water than the people in my town in Pennsylvania?
- You have the power to finally regulate industrial releases of PFAS, as Senator Gillibrand proposed in the Clean Water Standards for PFAS Act. In my community, it is perfectly legal for companies to discharge PFAS into the air our children breathe and the water our children drink with no restrictions at all.
- You have the power to set deadlines to clean up PFAS at military installations, precisely what Senator Gillibrand's Fifty Filthy Act would provide to military communities like mine.

My story is not unique. There are thousands of personal stories like mine across the country — stories of cancer, chronic illness, anger, frustration, loss of income, loss of home value, loss of family pets. But worst of all has been the loss of hope, all at the hands of PFAS.

On a personal note, my son was one of the lucky ones. He survived cancer. But it didn't come without a price. As a mother, watching my bright and vibrant child slowly fade into a disabled adult has been one of the hardest things I've ever had to do. Today he's in his 30s and still lives at home with us. He can't drive. He probably won't marry or have children, or experience many of the joys in life we had dreamed of for him. I now realize that stronger regulations governing environmental pollutants like PFAS could have prevented needless suffering for many, many people in my community.

It may be too late for my son, but it's not for the other kids of this country. But our children can't afford to wait another minute. As a mother, I implore you to act on PFAS with URGENCY and ACTION.

**Testimony of James Kenney**

Cabinet Secretary, New Mexico Environment Department

The mission of the New Mexico Environment Department (NMED) is to protect and restore the environment and to foster a healthy and prosperous New Mexico for present and future generations. New Mexico, like other states, cannot adequately protect its citizens from PFAS exposure without Congress providing immediate direction to federal agencies and direct funding to states.

**A Patchwork of PFAS Approaches**

In 2016, the U.S. Environmental Protection Agency (EPA) issued a non-regulatory and legally unenforceable lifetime health advisory of 70 parts per trillion for two PFAS compounds known as PFOA and PFOS for finished drinking water. Following the establishment of EPA's lifetime health advisory, states responded in different ways. Some states established legally enforceable values for certain PFAS in drinking water, groundwater, surface water, soil, or other environmental media. Some states are spending millions of dollars to develop enforceable PFAS regulatory standards to protect their citizens and environment. Other states are not funded or staffed to develop regulatory and enforceable standards, resulting in less protective public health outcomes for their citizens. The increasingly complex landscape of state activities is making it harder for each state to address its citizens' concerns about PFAS risks.

<b>PFAS</b>
<b>Federal Lawsuit (Military Base)</b>
<b>Current DOJ's Memorandum</b>
<b>Shifting Cleanup Authority</b>
<b>State Efforts Frustrated</b>
<b>Air Force Inconsistency</b>
<b>RCRA Authorities</b>
<b>RCRA Petition</b>
<b>RCRA Hazardous Waste Option</b>
<b>Unregulated Use</b>

In New Mexico, our efforts to protect public health from PFAS contamination have been met with a federal lawsuit challenging our legal authority while leaving New Mexicans to pay for studies and remediation.

**The United States Sues New Mexico to Stop State Action**

In early 2019, the Trump administration's US Department of Justice (DOJ) sued New Mexico on behalf of the US Air Force (USAF) for exercising State authority requiring Cannon Air Force Base to address PFAS contamination under the State's Hazardous Waste Act as it relates to the implementation of the Resource Conservation and Recovery Act (RCRA).

On June 1, 2021, the Biden administration's DOJ filed a memorandum defending its position that the NMED acted arbitrarily and capriciously when it issued a permit requiring the USAF to clean up its PFAS contamination at Cannon Air Force Base that resulted from decades of releases of PFAS containing aqueous firefighting foams (AFFF) under the State's Hazardous Waste Act as it relates to implementing of RCRA.

States have played and should continue to play a vital role in environmental protection, often in partnership with the EPA. However, because an Executive Order replaced the EPA with the US Department of Defense in cleaning up its own pollutants, including PFAS, the federal government has sought to reshape the historic role of the states in playing a role in protecting public health and the environment. Pursuant to Executive Order 12580 as amended, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) abatement and settlement authorities are delegated to the Secretary of Defense and must be exercised in concurrence with EPA.

For the past 30 months, the federal government has been more interested in rewriting the RCRA statute as passed by Congress and preventing New Mexico — a state with RCRA primacy — from meaningfully protecting the approximately 50,000 nearby residents of Curry and Roosevelt Counties from the further migration of PFAS from Cannon Air Force Base through groundwater. This, despite the fact that groundwater serves as the primary source of drinking water for these communities.

On July 30, 2020, the USAF announced it began investigative field work around the former Reese Air Force Base, near Lubbock, Texas, related to PFAS contamination. The USAF stated: "These investigations are part of the PFAS Affected Property Assessment investigation, required by the Resource Conservation and Recovery Act (RCRA) Permit and Compliance Plan issued to the Air Force by the Texas Commission on Environmental Quality." Clearly, the USAF agrees PFAS contamination is subject to RCRA corrective action in Texas.

In enacting RCRA, Congress declared it a national policy "that, wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible. Waste that is nevertheless generated should be treated, stored, or disposed of so as to minimize the present and future threat to human health and the environment." Congress recognized, however, that "the collection of and disposal of solid wastes should continue to be primarily the function of State, regional, and local agencies." Thus, RCRA allows any state to administer and enforce a hazardous waste program subject to authorization from the EPA. The USAF lawsuit against New Mexico is attempting to reshape congressional intent and authority given to the EPA and states.

Similar to New Mexico's science-based recognition of PFAS meeting the congressional language of RCRA and its definition as waste that presents a current and future threat to human health and the environment, the EPA received a petition on January 15, 2020, to regulate PFAS under RCRA. The petition was filed by the Environmental Law Clinic at UC Berkeley and asks the EPA to promulgate regulations designating wastes containing three classes of PFAS as hazardous wastes. The EPA has yet to act on this and another such petition received on September 19, 2019, filed by the Public Employees for Environmental Responsibility.

Congress could take action to list discarded PFAS as a RCRA hazardous waste, thus rendering the petitions EPA received in 2019 and 2020 moot. In doing so, the national RCRA framework, which consists of "cradle-to-grave management" of hazardous wastes, would serve as the uniform approach across states to address PFAS contamination. Moreover, states could incorporate PFAS clean-up into RCRA corrective action permits, similar to the approach New Mexico is taking at Cannon Air Force Base under applicable state law. Such bold action by Congress would incent businesses that use PFAS to find replacements to avoid RCRA regulation all together.

In the event the USAF is successful in their judicial lawsuit in redefining RCRA as written by Congress, as well as preempting the EPA's authority to act on the RCRA petitions and limit state primacy under RCRA, the State of New Mexico will lose a critical regulatory tool for protecting its citizens and environment from PFAS.

**Impacts to our Health, Environment and Economy**

PFAS...continue to find their way into our lives through a variety of pathways.

From a consumer standpoint, water or stain resistant sprays containing PFAS are offered to customers by some retailers who sell furniture, rugs and textiles. When these household goods are purchased, retailers offer and apply water- or stain-resistant sprays containing PFAS. The retailer applies the spray to the household product, cleans up any waste, and disposes of any waste generated from the process. The use of these chemicals by retailers is largely unregulated and may present a risk to consumers, employees,

<p><b>PFAS</b></p>	<p>municipal wastewater treatment facilities, and solid waste management facilities. Ultimately, the consumer may not be aware that their stain- or water-resistant furniture, rug or textile may contain PFAS chemicals. This area needs greater study, disclosure and possibly regulation to prevent human and wildlife exposure.</p>
<p><b>Agricultural Impacts</b></p>	<p>From an economic standpoint, agriculture is part of New Mexico’s cultural and economic identity. According to the most recent census of Agriculture, there are 24,800 farms in the state and agriculture and food products are among the state’s top five exports. The agricultural industry employs over 23,000 people in the state with cash receipts approaching \$3 billion annually. In October of 2018, a Curry County, New Mexico dairy farmer that neighbors Cannon Air Force Base learned his water was contaminated with PFAS.</p>
<p><b>Milk Contamination</b></p>	<p>The milk was tested and the New Mexico Department of Agriculture worked with the US Food and Drug Administration (FDA) to obtain an advisory level of contamination. The milk was immediately pulled off sale. Since then, the dairy farmer dumped tens of millions of gallons of milk, losing millions of dollars in revenue that otherwise would have recirculated in our state and national economy. New Mexico’s agricultural reputation is essential to the nation’s milk supply and our state economy. Other farms near Cannon Air Force Base could face a similar fate. Given that Curry County is one of the nation’s top milk producers, New Mexico continues to safeguard its agricultural products from PFAS contamination through prevention and analytical testing in the absence of clear national standards from the FDA.</p>
<p><b>Tourism Impacts</b></p>	<p>Also essential to New Mexico’s economy is tourism. Visitors spent \$846 million on recreation in the state in 2017, supporting 13,000 direct jobs. As an example of how PFAS contamination could impact tourism, exceedingly high levels of PFAS were detected in Lake Holloman in Otero County, New Mexico, home of Holloman Air Force Base, where PFAS was released into the environment through decades of the USAF’s use of AFFF. Lake Holloman is considered an important habitat for birds, including migrating ducks, shorebirds, and a number of federally listed endangered species and state-listed species of concern. Lake Holloman also serves as a valuable recreational resource to the community surrounding the base. In 2019, the New Mexico Attorney General requested the USAF close Lake Holloman and the New Mexico Department of Health directed the public to avoid all contact with the water in Lake Holloman, including drinking or swimming. Lake Holloman is adjacent to White Sands National Park, which is the most visited National Park in New Mexico, welcoming about 600,000 visitors a year.</p>
<p><b>Absence of Federal Standards</b></p>	<p>Impacts to tourism hurt yet another New Mexico economic sector: outdoor recreation. More than twice as many jobs in New Mexico depend on outdoor recreation than on the energy and mining sectors combined. The New Mexico Department of Game and Fish reports there are 160,000 anglers who fish in New Mexico, spending \$268 million on these activities annually.</p> <p>The nationally leading New Mexico Outdoor Recreation Division, created through legislation in 2019, is tasked with increasing outdoor recreation-based economic development, tourism and ecotourism; recruiting new outdoor recreation business to New Mexico; and promoting education about outdoor recreation’s benefits to public health.</p>
<p><b>Endangerment Complaint</b></p>	<p>The absence of federal PFAS standards and definitive action under RCRA and other federal environmental laws threatens our communities, consumers, workforce, tourists and economy and shifts a huge burden to states and tribes from coast-to-coast. New Mexico will continue to push for a whole-of-government approach from the federal government, in close coordination with states and tribes, with the requisite sense of urgency that these pervasive and persistent contaminants demand.</p> <p><b>An Imminent and Substantial Endangerment to Public Health</b></p>
<p><b>Groundwater Plumes</b></p>	<p>In March of 2019 and after the failure of the USAF to take responsibility for the improper disposal of PFAS-containing firefighting foam and address subsequent PFAS contamination at Cannon and Holloman Air Force Bases, the State of New Mexico filed an imminent and substantial endangerment complaint against the United States and the USAF under the state’s Hazardous Waste Act (HWA).</p> <p>In July of 2019, the State of New Mexico filed an amended complaint to include RCRA authority and sought a preliminary injunction requiring the United States and the US Air Force to immediately begin delineating the groundwater plumes caused by decades of use of PFAS-based firefighting foams at Cannon and Holloman Air Force Bases. The State of New Mexico sought emergency relief that would include groundwater and surface water sampling, alternative water sources and water treatment options be provided to New Mexicans affected by the contamination, voluntary blood tests for residents who may have been exposed to PFAS, and additional documentation on the extent of contamination around the bases.</p>
<p><b>State Investigation Legislation</b></p>	<p>In June of 2020, the State of New Mexico’s imminent and substantial endangerment complaint filed under the HWA and RCRA was transferred to the District of South Carolina as part of multidistrict litigation initiated for products liability claims.</p> <p>In January of 2020, the New Mexico Legislature approved \$1 million for the NMED to begin investigating the PFAS groundwater contamination caused by the USAF at Cannon Air Force Base in Clovis, New Mexico, and Holloman Air Force Base in Alamogordo, New Mexico. Work at both bases is anticipated to finish by the summer of 2022. Once the investigation concludes, NMED will evaluate next steps based on the risk to public health, available funding and any mitigating actions taken by the USAF.</p> <p>In addition to New Mexicans taking the initiative and picking up the tab for this overdue investigation, New Mexico is spending limited state resources on lawsuits with the federal government as opposed to spending time and resources on mitigating the harm to New Mexicans and our economy.</p>

<b>PFAS</b>
<b>Congressional Action Needed</b>
<b>Groundwater Contamination</b>
<b>Drinking Water Source Water</b>
<b>USGS Study</b>
<b>Drinking Water Study</b>
<b>Limits Exceeded</b>
<b>Exposure Limits Development</b>

**Conclusion**

New Mexico and other states have not yet been able to adequately protect their citizens or their environments from PFAS.

To protect public health and the environment, Congress should take the following steps:

- Take immediate action to list discarded PFAS as a RCRA hazardous waste, thus rendering the petitions EPA received in 2019 and 2020 moot, and substantially resolving issues in the pending lawsuits.
- Direct the EPA to develop any necessary regulations related to listing discarded PFAS as a RCRA hazardous waste, but not preventing appropriate state action in the meantime.
- Increase and direct funding to EPA-authorized state RCRA programs to manage PFAS responsibilities.
- Congress should affirm the EPA’s authority in all CERCLA matters. One issue is the USAF’s contention that any state action necessarily interferes with USAF remedial action plans. In New Mexico, no such plans exist.

**Testimony of Scott Mandirola**

Deputy Secretary for External Affairs, West Virginia Department of Environmental Protection  
 Groundwater contamination from PFAS, in excess of the EPA’s health advisory levels, has been discovered in West Virginia around industrial facilities and military installations. The West Virginia Department of Environmental Protection (WVDEP) and the West Virginia Department of Health and Human Resources (WVDHHR) understand the public concern over PFAS contamination in source water and require information on the state-wide distribution of the contamination. In order to study the issue, the State created a West Virginia PFAS Work Group in 2019, consisting of members from the WVDEP, the WVDHHR, and the United States Geological Service (USGS). The Work Group determined early on that the most significant exposure pathway in the State is contaminated drinking water.

Source water for West Virginia’s public water systems (PWS) is pumped from groundwater aquifers or withdrawn from the state’s rivers and streams. These systems provide drinking water to the majority of the state’s population and require constant monitoring for known and emerging contaminants.

Based on that experience and expertise in sampling and analyzing PFAS data, and in order to understand the potential problems with drinking water, the Work Group asked the USGS to create a study plan to sample and analyze every PWS regulated by the WVDHHR, including schools and day care facilities. The project analyzes untreated water from both groundwater and surface water intakes for the presence of 26 PFAS compounds, including PFOA, PFOS and GEN X, as well as a list of field parameters and inorganic elements.

While the Work Group planned its study, the West Virginia Legislature debated action on PFAS in the form of a bill named “The Clean Water Act of 2020” — which requires the WVDEP to develop water quality standards and the WVDHHR to develop maximum contamination levels for at least seven PFAS compounds, including PFOA, PFOS and GEN X. The [state] Senate [also directed] WVDEP and WVDHHR to cooperatively propose and initiate a public source water supply study plan to sample for PFAS substances in all community water systems in West Virginia, including schools and day care facilities that operate treatment systems regulated by the WVDHHR. Our drinking water study began in July 2020. The State’s 279 public water systems will [be] tested for 43 inorganic analytes and 26 PFAS compounds.

The USGS completed sampling in May 2021. Of the 277 sites sampled for PFAS, 251 were Community Public Water Systems and 26 were schools or day care facilities. In all, the USGS received preliminary laboratory results for 273 sites. Following final review the data will be uploaded to the USGS NWIS database and, the data will be published in a peer reviewed USGS Data Release.

The study revealed five sites that tested positively for the presence of PFOA and PFOS in excess of the EPA health advisory limit. The Lubeck, Vienna, and Parkersburg Public Water Systems are contaminated by PFOA related to the production and use of C8 at the nearby Washington Works DuPont facility. In Martinsburg, the Public Water System is contaminated primarily by PFOS associated with the historical use of “AFFF fire fighting foam” at a local military installation. The Glenn Dale Public Water System is contaminated by PFOS likely related to the historical use of the compounds in the metal plating industry, although further investigation is under way.

These preliminary results reveal that the two areas of known contamination in West Virginia are the area along the industrialized Ohio River corridor and the eastern panhandle of the State. Fortunately, the rest of West Virginia shows little PFAS contamination.

In summary, thanks to USGS’s work with the State, West Virginia has developed an extensive database of PFAS results to allow it to begin to address the problem areas in the State. The next step in the protection of public health is the development of safe exposure limits for PFAS compounds. Although some states have developed their own Maximum Contaminant Levels (MCLs) and Water Quality Standards (WQSs), West Virginia and many other states are relying on the EPA Office of Research and Development to develop national guidance and regulation for the protection of human health from these chemicals.

**FOR ADDITIONAL INFORMATION:**

Senate Committee on Environment and Public Works website:

[www.epw.senate.gov/public/index.cfm/2021/6/pfas-the-view-from-affected-citizens-and-states](http://www.epw.senate.gov/public/index.cfm/2021/6/pfas-the-view-from-affected-citizens-and-states)

## WATER BRIEFS

**PFAS EXTRACTION CA****WELLHEAD FILTRATION TREATMENT**

The Orange County Water District (OCWD) and the City of Fullerton announced on June 30 that they have begun operation of Orange County's first wellhead filtration treatment plant to remove perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) from local well water at the Kimberly Well 1A PFAS Treatment Plant (Treatment Plant). PFOA and PFOS are manmade, heat-resistant chemicals that are prevalent in the environment and were once commonly used in consumer products to repel water, grease, and oil. They are part of a larger group referred to as per- and polyfluoroalkyl substances (PFAS). Due to their prolonged use, PFAS are being detected in water sources throughout the US, including the Orange County Groundwater Basin.

The Treatment Plant uses an ion exchange treatment system made of highly porous resin that acts like powerful magnets that adsorb and hold onto contaminants. During treatment, contaminants such as PFOA and PFOS are removed. Construction began in November 2020 and the facility treats up to 3,000 gallons of water per minute.

Last year, dozens of wells in Orange County were removed from service after the state of California lowered the Response Level advisories of PFOA and PFOS. This drove local water suppliers to rely on imported water from Northern California and the Colorado River to meet the needs of their customers. "Bringing this treatment facility online is very important. It means Fullerton can increase its use of local groundwater, which is less expensive and more reliable than imported water," said OCWD Director and City of Fullerton Mayor Bruce Whitaker.

The Fullerton facility is the first of 25 PFAS treatment facilities being designed and constructed by OCWD in the next two years. OCWD is funding 100% of design and construction costs and 50% of operation and maintenance costs for its water suppliers like Fullerton. OCWD and ten Orange County public water agencies filed a lawsuit against the manufacturers of PFAS, seeking to protect ratepayers and ensure that the associated costs, including but not limited to treatment and replacement water, are borne by

the companies that developed and manufactured PFAS.

**For info:** Gina Ayala, OCWD, 714/ 378-3323, [gayala@ocwd.com](mailto:gayala@ocwd.com) or [www.ocwd.com/what-we-do/water-quality/pfoapfos](http://www.ocwd.com/what-we-do/water-quality/pfoapfos)

**PFAS STUDY AZ****DOD GRANT - UA**

A \$1.3 million grant from the US Department of Defense's Environmental Security Technology Certification Program will allow University of Arizona researchers to further study how PFAS chemicals move through soil and threaten groundwater.

"We have the long-term persistence, their presence pretty much everywhere in the environment, and the toxicological impacts from exposure. Those three things together make PFAS very critical emerging contaminants of concern," said Mark Brusseau, a professor in the Department of Environmental Science and co-principal investigator on the project.

PFAS have been discovered at several locations in Southern Arizona, including Davis-Monthan Air Force Base, the Tucson International Airport and local wastewater treatment plants. Investigators from the Colorado School of Mines and Jacobs Engineering will focus on PFAS found in the portion of the soil subsurface known as the vadose zone — the area below the land surface that extends to the groundwater table.

As part of the grant from the Department of Defense, the researchers will have an opportunity to test computer models against undisturbed field soils collected from Davis-Monthan Air Force Base. These validated computer models will ultimately help scientists around the United States predict the movement of PFAS underground and help policymakers develop risk assessments and target remediation efforts.

The University of Arizona is a world leader in water research. In the Shanghai Ranking 2021 Global Ranking of Academic Subjects, UArizona is ranked No. 1 in the nation and No. 2 in the world for its water resources research program.

**For info:** Rosemary Brandt, UArizona College of Agriculture and Life Sciences, 520/ 358-9729 or [rjbrandt@email.arizona.edu](mailto:rjbrandt@email.arizona.edu)

**DROUGHT INPUT WEST****USDA REQUESTS LANDOWNER INPUT**

The US Department of Agriculture's (USDA) Climate Hubs, in collaboration with the National Drought Mitigation Center and the National Integrated Drought Information System, are requesting input from states, tribes and others to collect Condition Monitoring Observer Reports (CMOR) on droughts impacting landowners across the country.

The CMOR tool is used to collect on the ground observations from landowners to help inform drought monitoring research. These local drought observations provide input into the US Drought Monitor process and inform agencies that make decisions based on dry and wet conditions.

Landowners can provide input through the online reporting form. The reporting form is mobile friendly and accepts photos. Landowners can comment on crop impacts, livestock impacts such as poor pasture conditions, and whether they are observing low or dry wells.

Landowners are not required to send in data on all aspects but can choose from the impact areas where they have the most direct knowledge. Contact information will not be shared publicly.

**For info:** Scott Oviatt, USDA Hydrologist, 541/ 429-2359 or Scott. [Oviatt@usda.gov](mailto:Oviatt@usda.gov) or FactSheet at: [www.climatehubs.usda.gov/sites/default/files/CMOR%20fact%20sheet.pdf](http://www.climatehubs.usda.gov/sites/default/files/CMOR%20fact%20sheet.pdf)

**SUSTAINABLE FARMING NM****EPA & STATE AGENCY MOU**

The US Environmental Protection Agency (EPA) and the New Mexico Farm & Livestock Bureau (NMF&LB) have signed a three-year Memorandum of Understanding (MOU) to expand joint activities supporting the agencies' shared goal of well-managed, sustainable farms. The MOU formalizes a partnership between the two agencies to expand collaboration communication, education and outreach, and promoting training on agricultural practices that are good for business and the environment. The agencies will also work to recognize and promote examples of environmental stewardship within the agriculture community and to the general public.

WATER BRIEFS

Under the MOU, the agencies intend to: Enhance coordination and communication by holding annual meetings to discuss priorities, activities, effective approaches and opportunities to collaborate; share updates throughout the year on relevant programs, policies and activities and coordinate on areas of common interest

Promote education and outreach to foster open dialog between EPA and the agriculture community; identify success, challenges and opportunities to work together

Recognize agriculture environmental stewardship by developing a new program for these efforts; highlight these achievements to the public and broader agricultural communities.

EPA and NMF&LB also plan to collaborate on an annual report highlighting collective achievements as a result of the MOU and plans for the following year.

**For info:** Jennah Durant at or 214 665-2200 or [r6press@epa.gov](mailto:r6press@epa.gov) or [www.epa.gov/aboutepa/epa-region-6-south-central](http://www.epa.gov/aboutepa/epa-region-6-south-central)

**FARM WATER QUALITY KS**

**EPA GRANT**

EPA has announced the award of \$750,000 to the Kansas Department of Health and Environment (KDHE) as part of EPA’s “Farmer to Farmer” grant program. KDHE’s project supports improving water quality, habitat, resilience, and peer-to-peer information exchange among farmers to benefit people and ecosystems.

“It is critically important that we work with states, nonprofits, and farmers to reduce agriculture-related nutrients in our waters,” said Acting EPA Region 7 Administrator Edward H. Chu. “[This] program generates ideas and action by targeting funds on local solutions where we can make the greatest difference. Funding will go to educate and empower farmers to implement best practices in their operations to reduce nutrient loads and improve water quality in local watersheds.”

Farmers manage millions of acres of privately held working lands. While farmers are working in watersheds to provide the food, fuel, and fiber for the world, they are also managing challenges across the landscape to

minimize pollution occurring from a variety of locations (“nonpoint sources”) — specifically the excess nitrogen and phosphorous that can enter water bodies through runoff or soil erosion. Farmers are often the first line of action in reducing nonpoint source pollution and have developed innovative practices and models to share their knowledge with others.

EPA states that the collaboration of a wide range of stakeholders and organizations across an entire watershed is vital to reducing nutrient pollution to our waters. Farmers can play an important leadership role in these efforts when they get involved and engage with their state governments, farm organizations, conservation groups, educational institutions, nonprofit organizations, and community groups.

The Farmer to Farmer grant funding is available to develop innovative practices within farming communities, measure the results of those practices, and identify how the practices will be incorporated into farming operations. Under this grant program, proposals will carry out project activities using one or more of the following methods: surveys, studies, research, investigation, experimentation, education, training, and/or demonstrations.

This grant program is managed by EPA’s Gulf of Mexico Division, which is a non-regulatory program of EPA founded to facilitate collaborative actions to protect, maintain, and restore the health and productivity of the Gulf of Mexico in ways consistent with the economic well-being of the region. To carry out its mission, the Gulf of Mexico Division continues to maintain and expand partnerships with state and federal agencies, federally recognized tribes, local governments and authorities, academia, regional business and industry, agricultural and environmental organizations, and individual citizens and communities.

**For info:** EPA Gulf of Mexico Division website: [www.epa.gov/gulfofmexico](http://www.epa.gov/gulfofmexico).

**FERC APPROVAL OR/CA**

**KLAMATH DAM REMOVAL**

The Federal Energy Regulatory Commission (FERC) on June 17th approved the transfer of the Lower Klamath Project License from PacifiCorp to the Klamath River Renewal Corporation (KRRC) and the

States of Oregon and California. The vote by FERC marks a key milestone in the decades-long effort to restore the Klamath River for the communities, fish, and wildlife. “This is a crucial and significant step forward in accomplishing KRRC’s core mission to remove the four lower Klamath dams and restore a free-flowing river,” said Jim Root, President of the KRRC Board and a Basin landowner. Root noted that the KRRC project will constitute the largest dam removal and river recovery effort in US history.

“Today’s order confirms that the Renewal Corporation has the ability, financially and otherwise, to undertake dam removal, and with the states, as co-licensees, the necessary legal and technical expertise required for such a huge undertaking. The surrender application is still pending before the Commission and is awaiting further environmental review as required under the National Environmental Policy Act. The Commission will continue to engage with all parties and stakeholders to ensure everyone has an opportunity to participate in the surrender proceeding.” FERC Statement (June 17, 2021).

KRRC and PacifiCorp originally jointly filed a Transfer Application in 2016. In July 2020, FERC issued a ruling that approved partial transfer of the Lower Klamath Project license to KRRC, provided that PacifiCorp remain a co-licensee, which was inconsistent with the 2010 Klamath Hydroelectric Settlement Agreement (KHSA). In order to keep the dam removal effort on track, KRRC, PacifiCorp, and the States signed of a Memorandum of Agreement (MOA) that called for transferring the license from PacifiCorp to KRRC and the States and removing PacifiCorp from the license. KRRC, PacifiCorp and the States jointly submitted a License Transfer Application to FERC in January 2021. The application stipulated that KRRC would lead the effort to remove the four Klamath hydroelectric dams as the “dam removal entity” as called for in the KHSA.

Mark Bransom, the CEO of KRRC, noted what remained to be done for dam removal to occur: “We must also secure FERC’s approval of our Surrender Application, but today’s decision by the Commissioners certainly boosts our optimism about the road ahead.” The Surrender Application includes KRRC’s



## WATER BRIEFS

detailed plan for facilities removal and restoration of the project footprint.

KRRC plans to commence dam removal in 2023 and is doing everything within its power to secure the regulatory approvals needed to meet that goal.

Revitalizing the river begins with dam removal followed immediately by a multi-million dollar restoration effort to restore habitat in areas that were once inundated by the reservoirs behind the dams, according to KRRC.

**For info:** Dave Meurer, KRRC, 530/941-3155, dave@klamathrenewal.org or www.klamathrenewal.org

### CURTAILMENT PETITION CA TRIBE SEEKS KLAMATH BASIN REGULATION

The Klamath Basin is facing some of the worst hydrological conditions in modern history. On July 1, the Karuk Tribe (Tribe) filed a formal petition with the California State Water Resources Control Board (SWRCB) demanding that it use its emergency powers to curtail water use in the Scott River to prevent the extinction of the Southern Oregon-Northern California Coho Salmon (Coho). One of the main tributaries of the Klamath River, the Scott River provides spawning grounds to most of the Coho left in the Basin.

Coho salmon were ESA-listed in 1997. While federal agencies have forced water users on the federal Klamath Irrigation Project along the California/Oregon border to allow downstream flows to protect the fish, other water users' impacts have been ignored. "Coho need water in the mainstem Klamath to migrate to the ocean and back, but they need spawning and rearing habitat in the Scott River too," explains Karuk Senior Biologist Toz Soto.

A massive fish kill is currently underway in the Klamath River that could result in losing an entire generation of Coho and Chinook salmon. On May 10, 2021, Governor Gavin Newsom expanded California's drought emergency declaration to include the Klamath Basin. This granted the Water Board the authority to regulate water use to protect threatened fisheries, but so far the Board has failed to act, according to the Tribe.

Scott Valley water allocations were defined in a 1980 adjudication, but most of the Valley was not included in the decree. "The adjudication failed

to include most of the land in the basin. Over 200 industrial wells have been drilled since with no regulatory oversight. They literally pump the river dry from underneath," explains Karuk Council member and traditional dip net fisherman Troy Hockaday.

Environmental Law Foundation (ELF), which itself has a decade-long history of advocating for a healthy Scott River, is representing the Tribe. "The State Board has the authority and the duty to act and to act right now. We urge the Board to use its well-established power under state law to protect flows in the Scott," said ELF's Executive Director, Nathaniel Kane.

**For info:** Ren Brownell, Karuk Tribe, 530/643-1702, rbrownell@karuk.us or ww.karuk.us

### WATER REUSE SURVEY WEST STATES' REUSE STATUS

In June, the Western States Water Council (WSWC) released its report, *Water Reuse in the West: Western State Water Reuse Governance and Programs*, compiled by Jessica Reimer and Michelle Bushman. This report details water reuse definitions, laws, regulations, and programs, and identifies opportunities and challenges to reuse within each western state. This report is an important resource as states continue to navigate the complexities of water supply and water quality as water resources become increasingly scarce across western states.

In early 2020, WSWC partnered with the Association of Clean Water Administrators (ACWA) to develop a survey of states regarding water reuse laws, regulations, and practices. This was intended to update and build upon the 2011 Report by the WSWC, *Water Reuse in the West: State Programs and Institutional Issues*. Ten years later, water reuse across the west has grown and is maturing. Some states have been practicing various forms of water reuse for decades, whereas others are just starting to explore the practice on the ground. Some have robust legal and regulatory frameworks, whereas others have not yet defined reuse or water reuse practices within their statutes and rules. Regardless of where individual states are along this spectrum, most western states recognize the potential of water reuse to contribute additional water resources to meet growing

urban and rural demands as the West experiences continued drought and as climate and weather patterns become increasingly variable and extreme.

**For info:** Report at: [https://westernstateswater.org/wp-content/uploads/2019/05/FINAL\\_2021\\_WSWC\\_WaterReuseReport.pdf](https://westernstateswater.org/wp-content/uploads/2019/05/FINAL_2021_WSWC_WaterReuseReport.pdf)

### STOCKWATER RIGHTS WEST GRAZING ON FEDERAL LANDS

The Western States Water Council (WSWC) recently released the *WSWC Grazing Report (March 2021)*. WSWC and WestFAST Non-Tribal Federal Water Rights Workgroup held a series of workshops and other presentations on stockwater rights in 2018 and 2019. The first workshop focused on western state and federal laws, policies, and perspectives. The second workshop included perspectives from stock owner organizations on navigating those complex laws, policies, and relationships to ensure stock have sufficient water to meet their needs. A presentation during a WSWC meeting introduced members of the workgroup to federal conflict resolution programs. WSWC and WestFAST produced the report that compiles information and lessons learned from those presentations and discussions. It is intended to serve as a useful tool to facilitate understanding, and as a springboard to continue conversations to reduce conflicts where possible.

The Non-Tribal Federal Water Rights Workgroup is comprised of members of the Western States Water Council and Western Federal Agency Support Team (WestFAST). The workgroup's primary purpose is to facilitate state-federal communication and to share perspectives, constraints, and opportunities to work together to resolve concerns over federal water rights in western states.

**For info:** Report at: <https://westernstateswater.org/wp-content/uploads/2021/06/WSWC-Grazing-Report.pdf>

### PCB POLLUTION WA CLEANUP PLAN SOUGHT

River advocates are asking a federal judge to rule on their ten year old lawsuit to compel the US Environmental Protection Agency (EPA) to issue a cleanup plan for one of Washington State's most polluted rivers.

## WATER BRIEFS

The plaintiffs' Motion for Summary Judgment was filed on July 2nd. (*Sierra Club, et al. v. Hladick, et al.*, Case No. 11-cv-1759-BJR, W.D. Wash (July 2021); Motion at: [www.waterplanet.ws/pdf/Sierra%20Club\\_v.\\_USEPA\\_MSJ\\_\(7.3.21\).pdf](http://www.waterplanet.ws/pdf/Sierra%20Club_v._USEPA_MSJ_(7.3.21).pdf)). "The extraordinarily degraded state of the river obligates the Department of Ecology (Ecology) to implement a Total Maximum Daily Load (TMDL) program for PCBs to the Spokane River and the Clean Water Act imposes a non-discretionary duty on EPA to prepare its own TMDL where Ecology has no credible plan for finalizing one." Motion at page 1.

The Spokane River is heavily polluted with PCBs. Sierra Club and the Center for Environmental Law & Policy (CELP) filed a citizen lawsuit against EPA in 2011. The Spokane Tribe of Indians intervened in support of the citizen lawsuit, and Ecology, Spokane County and Kaiser intervened to defend EPA. US District Court Judge Barbara Rothstein ruled in March 2015 that EPA's failure to require a clean-up plan was an abuse of discretion and ordered EPA to submit a plan to the Court by July 2015. EPA, Ecology, Kaiser, and Spokane County appealed the ruling, but EPA withdrew its appeal and submitted a document (which fails to require a cleanup plan) to the District Court. In April 2016 the Ninth Circuit Court of Appeals dismissed the Ecology-County-Kaiser appeal in a one-paragraph decision. This meant that the legal challenge to the EPA's "non-cleanup plan" document could move forward in District Court.

During the past five years, Spokane River advocates have waited for Ecology and EPA to complete a cleanup plan and begin its implementation. In the absence of a cleanup plan, Sierra Club and CELP are now asking the federal judge to compel a cleanup plan under the law. "The days of using the Spokane River as a chemical dump are over," said Tom Soeldner of the Spokane River Team. "Year after year we waited patiently. Now we are asking the federal courts to stop polluters from flushing PCBs into the River."

The federal Clean Water Act (CWA), passed in 1972, requires that polluted waters be fishable and swimmable. Although the State of Washington and EPA have been aware of PCB pollution for decades, the

Spokane River still does not have a cleanup plan for PCBs. Ecology, meanwhile, has continued to issue permits to polluters allowing them to dump PCBs into the Spokane River with no controls, according to the plaintiffs. The Washington Department of Health has issued a health advisory on PCB-contaminated fish in the Spokane River that has been in place for many years. PCBs have adverse effects on animals and human populations, and are known to move up the food chain. Low concentrations in river water result in high concentrations in fish and other river life. PCBs are a group of industrial compounds associated with liver dysfunction and cancer, and are now banned in the US.

Sierra Club and CELP are represented by Marc Zemel of Smith & Lowney, a Seattle firm specializing in CWA litigation. The Spokane Tribe of Indians is represented by Ted Knight. **For info:** CELP, [contact@celp.org](mailto:contact@celp.org) or [www.celp.org](http://www.celp.org)

### CYANOTOXINS TOOLKIT US ALGAL BLOOMS RESPONSE

On May 28, EPA posted a Cyanotoxins Preparedness and Response Toolkit (CPRT) online. The CPRT will help EPA's state and tribal partners prepare for potential harmful algal blooms in freshwater bodies and respond to protect public health. Cyanobacterial Harmful Algal Blooms (CyanoHABs) can cause fouling of beaches and shorelines, economic and aesthetic losses, taste and odor problems in drinking water, and direct risks to human, fish, and animal health.

THE CPRT INCLUDES:

- A template to develop Cyanobacteria/Cyanotoxins Management Plans, including worksheets and checklists to assist before and during a bloom event
- Frequently Asked Questions on cyanoHABs, drinking water health advisories, and EPA's Recommended Recreational Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin
- Links to key tools relevant to the development of management plans and effective communication during cyanotoxin events
- An incident response questionnaire to use when a cyanotoxins event is suspected or confirmed

- A post-incident technical support questionnaire to evaluate the effectiveness of the response

The resources in the toolkit can be completed electronically, downloaded, and shared. The CPRT does not cover long-term management actions or the control and mitigation of cyanoHABs. **For info:** EPA's website at: [www.epa.gov/cyanohabs](http://www.epa.gov/cyanohabs)

### STORMWATER TOOL US NEW INFRASTRUCTURE

Stormwater runoff is a major cause of water pollution in urban areas as it can carry trash, bacteria, heavy metals, and other pollutants from the urban landscape into nearby water bodies. Higher flows from heavy rains can also cause erosion and flooding in urban streams, damaging habitat, property, and infrastructure.

Communities are facing decisions on how best to upgrade aging stormwater infrastructure and build new infrastructure to lessen the impacts of stormwater runoff. EPA grantees recently released the Community-Enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC) tool to help water resource managers make decisions with regards to stormwater infrastructure. The tool is available on the website listed below. **For info:** Tool at: [www.epa.gov/sciencematters/epa-grantees-develop-tool-help-water-resources-managers-make-stormwater](http://www.epa.gov/sciencematters/epa-grantees-develop-tool-help-water-resources-managers-make-stormwater)

### CYBERATTACKS US EPA FACT SHEETS

EPA released new fact sheets on funding opportunities with the Clean Water State Revolving Funds concerning cyberattacks. Cyberattacks are a growing threat to critical infrastructure sectors, including wastewater systems. EPA released a new fact sheet that demonstrates how CWSRF funds can be used to fund cybersecurity practices and measures at publicly owned treatment works. It also outlines resources for free vulnerability assessments and cybersecurity trainings, as well as how to report a cybersecurity incident.

**For info:** Fact Sheets available at: [www.epa.gov/cwsrf/supporting-cybersecurity-measures-clean-water-state-revolving-fund](http://www.epa.gov/cwsrf/supporting-cybersecurity-measures-clean-water-state-revolving-fund)



**Water Law**  
*in Central Washington*  
**August 26-27**

**For info: [www.TheSeminarGroup.net](http://www.TheSeminarGroup.net)**

**THE SEMINAR GROUP - RAISING THE BAR OF CONTINUING LEGAL AND PROFESSIONAL EDUCATION**

**TSG**  
Aug. 26 & 27, 2021  
RED LION HOTEL & CONFERENCE CENTER  
Ellensburg, WA  
**ACCREDITATION**  
WA MCLE, OR CLE, ID CLE, CA CLE, WA Water Rights Examiners/Water Conservancy Board Members  
*(see inside for details)*

**July 15** **WEB**

**California Stormwater Quality Assoc. Quarterly Meeting & Construction General Permit Workshop**, Virtual Event. Quarterly Meeting Focused on Stormwater Management: Effecting Change and Making a Difference: 10 am - 3 pm Pacific Time; Bonus Workshop 3:30 pm to 5 pm. For info: [www.casqa.org/events/quarterly-meetings-webcasts/registration-webcast](http://www.casqa.org/events/quarterly-meetings-webcasts/registration-webcast)

**July 15** **WEB**

**Improving Watershed Health Through Agricultural-Municipal Partnerships Webinar**, Presented by EPA Water Infrastructure & Resiliency Finance Center; 3:00 - 4:15 pm Eastern Time; Preregister: Space is Limited. For info: [www.epa.gov/waterfinancecenter](http://www.epa.gov/waterfinancecenter)

**July 19-20** **WEB**

**AWRA Summer Conference: Connecting Land & Water for Healthy Communities**, American Water Resources Association Event. For info: [www.awra.org](http://www.awra.org)

**July 19-26** **WEB**

**Virtual 67th Annual Rocky Mountain Mineral Law Institute**, Presented by Rocky Mountain Mineral Law Foundation. For info: [www.rmmlf.org/programs](http://www.rmmlf.org/programs)

**July 22** **WEB**

**Green Amendments: Vehicles for Environmental Justice? Event**, 12:00 pm - 2:00 pm Eastern Daylight Time. Presented by the Environmental Law Institute; Free But Must Register by July 20. For info: [www.eli.org/events/green-amendments-vehicles-environmental-justice](http://www.eli.org/events/green-amendments-vehicles-environmental-justice)

**July 26-27** **Alberta**

**Montney & Duvernay Shale Water Management 2021: Water Strategies for Northern Alberta & BC, Grande Prairie**. Stonebridge Hotel. For info: [www.alberta.shale-water-management.com/?join=VR](http://www.alberta.shale-water-management.com/?join=VR)

**July 27** **WEB**

**Environmental Justice (ELI Summer School, 2021)**, 12:00 pm - 2:00 pm Eastern Time. Presented by the Environmental Law Institute; Register by July 23. For info: [www.eli.org](http://www.eli.org)

**July 28-30** **OR**

**2021 Association of Clean Water Agencies Summer Conference, Redmond**. Eagle Crest Resort, 1522 Cline Falls Road. Presented by OACWA. For info: <https://oracwa.org/event/acwa-annual-conference-2/>

**August 3-5** **TN**

**Association of Clean Water Administrators Annual Meeting, Memphis**. The Guest House at Graceland. For info: [www.acwa-us.org/event/annual-meeting-2021/](http://www.acwa-us.org/event/annual-meeting-2021/)

**August 10** **WEB**

**Enforcement and Compliance History Online (ECHO) Webinar**, 1:30 - 2:30 pm Eastern Daylight Time. Presentd by EPA Office of Enforcement & Compliance Assurance (OECA). For info: <https://echo.epa.gov/help/training#upcoming>

**August 11** **WEB**

**Discussion on Desalination - Treatments, Research, and the Future Webcast**, 2:00 pm - 3:00 pm Eastern Time. Presented by WaterReuse. For info: <https://watereuse.org/event/desalination-research-and-technology-webcast/>

**August 12-13** **NM/WEB**

**Natural Resource Damages: 14th Annual Advanced Conference on Litigating, Santa Fe**. TBA. Live Online Via Interactive Broadcast. For info: Law Seminars International, 206/567-4490, [registrar@lawseminars.com](mailto:registrar@lawseminars.com) or [www.lawseminars.com](http://www.lawseminars.com)

**August 16-17** **ID**

**2021 Water Law & Resource Issues Seminar, Sun Valley**. The Sun Valley Resort. Presented by the Idaho Water Users Association. For info: [www.iwua.org/2021-water-law-seminar/](http://www.iwua.org/2021-water-law-seminar/)

**August 24-25** **WEB**

**2021 Symposium on the Settlement of Indian Reserved Water Rights Claims**, Virtual Symposium. Presented by the Western States Water Council & the Native American Rights Fund. For info: <https://westernstateswater.org/events/2021-symposium-on-the-settlement-of-indian-reserved-water-rights-claims/>

**August 25** **WA/WEB**

**Contaminated Properties in the Northwest: Navigating the Redevelopment Process - Live Webcast, Seattle**. Washington Athletic Club, 1225 6th Avenue. For info: The Seminar Group, 800/574-4852, [info@theseminargroup.net](mailto:info@theseminargroup.net) or [www.theseminargroup.net](http://www.theseminargroup.net)

**August 25-26** **ND**

**Bakken Oil & Gas: Shale Water Management 2021 - Cost-Effective Water Strategies for North Dakota, Bismarck**. TBA. For info: [www.bakken.shale-water-management.com/?join=VR](http://www.bakken.shale-water-management.com/?join=VR)

**August 25-26** **FL**

**The Water Expo, Miami**. Miami Airport Convention Center. Servicing the US & Latin America. For info: [www.thewaterexpo.com/](http://www.thewaterexpo.com/)

**August 26-27** **AZ**

**Arizona Water Law Conference: Water Shortages, Replacement Supplies & Emerging Policies, Scottsdale**. Hilton Hotel. For info: CLE International, 800/873-7130 or [www.cle.com](http://www.cle.com)



260 N. Polk Street • Eugene, OR 97402

PRSR STD  
US POSTAGE  
PAID  
EUGENE, OR  
PERMIT NO. 921

## CALENDAR

(continued from previous page)

**August 26-27 WA**  
**Fourth Annual Water Law in Central Washington Conference, Ellensburg.** Red Lion Hotel and Conference Center. For info: The Seminar Group, 800/ 574-4852, [info@theseminargroup.net](mailto:info@theseminargroup.net) or [www.theseminargroup.net](http://www.theseminargroup.net)

**August 29-Sept. 1 MO**  
**American Public Works Association Public Works Expo, St. Louis.** Americas Center. For info: <https://px.apwa.net>

**August 31-Sept. 2 TX**  
**10th Annual Texas Groundwater Summit, San Antonio.** Hyatt Regency Hill Country Resort. Texas Alliance of Groundwater Districts Event. For info: <https://texasgroundwater.org/news-events/events/texas-groundwater-summit/>

**September 9 WA**  
**Celebrate Waters - In Person Reception, Seattle.** Ivar's Salmon House. Presented by The Center for Environmental Law & Policy (CELP); CLE Workshop from 4:00 - 5:00 pm; Celebrate Waters from 5:30 - 7:30 pm Pacific Time. For info: Kayla Magers, [development@celp.org](mailto:development@celp.org) or [www.celp.org](http://www.celp.org)

**September 14 TX**  
**Texas Rainmaker Award Dinner, Austin.** Bullock Texas State History Museum. Presented by the Texas Water Foundation. For info: Sarah, TWF, [sarah@texaswater.org](mailto:sarah@texaswater.org) or [www.texaswater.org](http://www.texaswater.org)

**September 14-16 SD**  
**Western States Water Council Fall 2021 (197th) Meetings, Deadwood.** Holiday Inn Express & Suites. For info: <https://westernstateswater.org/events/wswc-fall-2021-197th-meetings/>

**September 16 WEB**  
**Pollution Prevention Waste Management Virtual Workshop,** Presented by Texas Commission on Environmental Quality, US EPA & the University of Texas Arlington. For info: TCEQ, 512/ 239-0010, [P2@tceq.texas.gov](mailto:P2@tceq.texas.gov) or [www.P2workshop.com](http://www.P2workshop.com)

**September 21 CO**  
**RiverBank 2021 Anniversary Bash, Denver.** Denver Botanic Gardens. Fundraising Event for Colorado Water Trust. For info: [www.coloradowatertrust.org](http://www.coloradowatertrust.org)

**September 27-29 TX**  
**Water for Texas 2021 Conference: Clear Vision for the Future, Austin.** TBA: Hoping to Gather in Person. Hosted by the Texas Water Development Board. For info: <https://waterfortexas.twdb.texas.gov/2021/>

**September 28-29 MT**  
**21st Annual Montana Water Law Conference, Helena.** Great Northern Hotel. For info: The Seminar Group, 800/ 574-4852, [info@theseminargroup.net](mailto:info@theseminargroup.net) or [www.theseminargroup.net](http://www.theseminargroup.net)

**2021 AWRA Washington Annual State Conference**  
October 6-7, 2021 (Virtual Webinar)

**Transboundary Water Management  
And Water Market Trends**

**American Water Resources Association**  
Washington Section

Libby Dam and Lake Koocanusa | Ilite Marina, Lake Powell | Steelhead (Columbia River)

Lake Mead 2021  
Photos by Tom Ring and Jason McCormick

Details and Registration at: [www.waawra.org](http://www.waawra.org)