The Water Report™
Water Rights, Water Quality & Water Solutions in the West

In This Issue:

Upcoming Stories:

ESA Update

Climate Mitigation

Demand Management & Speculation

& More!

BRAVE NEW WORLD

WHAT A NEW ADMINISTRATION MEANS IN THE WORLD OF WATER QUALITY

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Introduction

The Trump Administration prioritized and promulgated numerous regulatory policies aimed at promoting energy and other infrastructure development, including Executive Orders, agency rulemakings, and individual project-level decisions. The Trump Administration also touted its desire to focus on rolling back regulations, including with such policies as the "2 for 1" order — an Executive Order requiring agencies to revoke two regulations for every new rule issued.

With the very recent inauguration of President Biden, there is a high expectation and strong indication that the new Administration will pursue countermeasures aimed at pulling back the Trump Administration's actions. Yet, the Biden Administration faces a number of immediate, high-priority issues that compete with this expectation, including: addressing the pandemic and related vaccine rollout; immigration; and the economy.

With respect to environmental regulations, the Biden Administration has highlighted climate change and environmental justice as the pillars of its platform. This article discusses the water quality-related regulatory actions expected from the Biden Administration and when they might occur. It also describes how the water quality regulatory programs may be impacted by the expected climate change and environmental justice program changes.

Regulatory Framework

Before turning to the substance of the regulatory actions that might be taken by the Biden Administration in the water quality context, it is worth considering the changes that the Trump Administration made to regulatory development and how that might impact the actions taken by the Biden Administration.

First, pursuant to Executive Order 13891 issued in October 2019, the Trump Administration required each agency to establish new standards for the development and issuance of guidance documents. The federal Environmental Protection Agency (EPA) adopted a regulation, effective in November 2020, implementing the Executive Order. Under these new regulations, significant guidance documents are subject to a 30-day public comment period. The agency must prepare a response to comments document. These requirements also apply to agency actions to modify or withdraw an active guidance document, or when the agency reinstates a previously rescinded guidance document. *See* 40 CFR § 2.501 *et seq.*

Second, early in Trump's term of office, both the federal Justice Department and EPA issued directives prohibiting settlements of litigation that result in funneling money to third parties. Additionally, under EPA's directive, agency lawyers must seek concurrence from regulated entities before entering into settlements.

Biden Agenda

Dose-Response Data

Impediments

Congressional Review Act

WOTUS & Section 401

WOTUS Process

Finally, in early January 2021, EPA finalized a rule regarding the use of scientific data and information in rulemaking. *See* 40 CFR Part 30, effective January 6, 2021. The final rule provides that EPA will give greater consideration to studies where the underlying dose-response data (which evaluate the connection between the degree of exposure to a given constituent to changes in health or species) are available in a manner sufficient for independent validation. When proposing significant regulatory action, the rule requires EPA to clearly identify and make publicly available the science relied upon in the development to the rule.

All of these changes to the regulatory and guidance development framework may serve as impediments to quick action by the Biden Administration to repeal or revise substantive water quality actions undertaken by the Trump Administration.

Addressing Water Quality Regulatory Actions Taken by the Trump Administration

There are a number of regulatory actions taken by the Trump Administration that the Biden Administration is likely to have a desire to reverse. For rules that were finalized and became effective on or after August 21, 2020, the Biden Adminsitration has the ability to nullify them pursuant to the Congressional Review Act (CRA). Such action requires a Joint Resolution to be passed by both chambers of Congress, and signed by the President. The action must be taken within the first 60 days of the 117th Congress. For rules that were proposed, or finalized but not effective as of January 20, 2021, the Biden Adminsitration has the ability to suspend and revise them. Finally, for rules that were finalized and effective but have been challenged in court, the Biden Adminsitration has the choice to either: 1) stay such litigation and seek to address or revise it as part of a settlement agreement; or 2) allow the cases to proceed and let the courts resolve the issue.

The two rules that have received the greatest attention are the Navigable Waters Protection Rule, which is the Trump Administration's replacement of the Waters of the United States (WOTUS) Rule and the Clean Water Act (CWA) Section 401 Rule.

With respect to the Navigable Waters Protection Rule, it was issued in April 2020 and became effective in June 2020, well outside the reach of repeal through the CRA. Instead, in order to change this rule, the Biden Administration would need to follow the notice and comment process required by the Administrative Procedure Act and provide reasoned support for the modification or withdrawal. The rule replaced the WOTUS Rule enacted under the Obama Administration. RE: WOTUS, *see*: Moon, *TWR* #138; Glick & Atencio, *TWR* #149; Kolanz, *TWR* #160; Glick *TWR* #175; Sensiba & Gerard, *TWR* #179; Eisenberg et al., *TWR* #196; and Roose, *TWR* #200.

A related CWA action is EPA's recently issued guidance (January 14, 2021) interpreting the United States Supreme Court's decision in *County of Maui v. Hawaii Wildlife Fund,* 140 S. Ct. 1462 (2020). *County of Maui* examined the question of whether groundwater is regulated under the CWA and outlined seven non-exclusive factors for consideration in determining whether a discharge of a pollutant from a point source that reaches groundwater is the "functional equivalent" of a direct discharge to a water of the United States. EPA's guidance applies *Maui* to existing federal and state NPDES permitting programs to aid in determining whether a permit is required under several scenarios. RE: *County of Maui, see:* Robb & Leas, *TWR* #170; Robb, *TWRs* #177 & #188; and Water Briefs, this issue.

The CWA Section 401 rule became effective in September 2020, and is now the subject of three federal district court challenges. Although the Section 401 regulations had not been revised in decades, pre-dating the CWA itself, the changes have been challenged by some states and environmental groups. The challenges assert that the changes narrow the authority of states to regulate projects approved through federal permitting or funding decisions. The rule reiterates the one-year time period for state action provided by the CWA, and limits the scope of such state review to water quality impacts, consistent with the language in the Act. Notably, because the 401 Rule became effective after August 21, 2020, it could be repealed through the CRA process. It has been reported, however, that approximately 1,000 rules are also eligible for repeal through the CRA process, so the new Adminsitration and Congressional leadership will be pressed to prioritize which rule nullifications it will bring to a vote. Further, due to the 50-50 split in the Senate, Democrats cannot afford to lose a single Senator on any vote for nullification under the CRA. Some Democrats have expressed an aversion to using the CRA and have weighed in that it may be more appropriate for rules to be reviewed by the courts. Thus, where, as here, litigation is pending, the Adminsitration may opt to address the rule through the court process.

Another action taken during Trump's term was the revision — and perceived relaxation — of the **e**ffluent **l**imitations **g**uidelines (ELGs) for steam electric generating facilities. That regulation has also been challenged. Additionally, the United States Court of Appeals for the Fifth Circuit remanded the ELGs for two of the wastewater streams (legacy wastewater and residual combustion leachate) to EPA. *Southwestern Electric Power Company v. EPA,* 920 F.3d 999 (5th Cir. 2019). Thus, revisiting the steam electric ELGs is likely to be high on the Biden Administration's radar.

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Biden Agenda

APA Processes

Although the expectation may be that the Biden Administration will use the CRA to repeal and replace regulations effective on or after August 21, 2020, or suspend and revise the rules not effective as of January 20, 2021, replacement policies and rules cannot be implented quickly. The requirements of the Administrative Procedure Act, coupled with the changes described above made to the regulatory and guidance development processes, make it difficult for the Biden Administration to move quickly. Additionally, given the certainty that any new regulation is likely to be challenged, the Biden Administration will need to develop a sufficient record to counter that developed for the Trump Administration's regulation before it will be in a position to issue a new regulation. Accordingly, the Biden Administration may be more inclined to agree to a stay of these regulations and negotiate some sort of resolution with interested parties through the litigation proceedings. Although this is also likely to be a longer process, it may be a more productive means to address these actions in the long run.

Potential New Water Quality Policies from the Biden Administration

New Initiatives

Due to the length of time it may take to unwind these existing rulemakings, the Biden administration will need to balance its resources between unwinding Trump-era policies and working on its own new initiatives. Some of the possible new initiatives the Biden Administration may undertake include the following.

Federal Licensing and Permitting Activities

Temperature Standards & Dams

In addition to a desire to address the specific regulatory actions discussed above, another topic likely to be of interest to the Biden team is advancing efforts to apply and enforce water quality standards for temperature. This has been a significant issue in the western United States, where dams are more prevalent. The dams are important for flood relief, water supply, and hydropower projects. Most dams have been in place for decades. However, dams — in certain circumstances — may cause temperature changes due to water storage. The issues associated with temperature standards are also bound up in climate change. Because warmer water is being experienced more generally as the climate warms, the temperature changes associated with dams have a greater impact.

Environmental Baseline

This issue is also wrapped up in the controversy over the Trump Administration's revisions to the National Environmental Policy Act (NEPA) regulations and the Section 401 regulation. Under NEPA, there has long been a question about what is considered the environmental baseline for a project from which to assess the impacts of a given federal action. When it comes to large infrastructure projects, like dams, the infrastructure has often been in place for decades. So, regarding NEPA review for a federal permit pertaining to the operation of the dam, the question arises: is the existence of the dam part of the baseline or part of the action to be assessed? FERC, in its licensing responsibilities for hydropower projects, has a long-standing position that NEPA environmental baseline is current conditions, and not a speculative effort of recreating prevailing conditions prior to initial dam construction. FERC's view on this issue has been upheld on judicial review repeatedly. *See, e.g., American Rivers v. FERC*, 187 F3d 1007, *amnded and rehearing denied,* 201 F.3d 1186 (9th Cir. 1999); *Conservation Law Foundation v. FERC,* 216 F.3d 41 (D.C. Cir. 2000). However, the revisions to NEPA, which included an attempt to address this question, are being challenged in court. RE: NEPA, *see*: Kade et al., *TWR* #198.

Judicial Review

Water Quality Impacts

Under Section 401, as noted above, EPA's regulatory revisions limit state review to water quality impacts, and specifically impacts resulting from any point source discharge associated with the project. The temperature impacts associated with dams are not associated with the wastewater discharge for those projects. However, states have imposed temperature-related conditions in their 401 certifications for federally operated dams. *See* https://ecology.wa.gov/Regulations-Permits/Permits-certifications/401-Water-quality-certification. Those conditions have been challenged. *Id.* During the Trump Administration, EPA issued a **t**otal **m**aximum **d**aily **l**oad (TMDL) for temperature in certain rivers in Washington and Oregon (*TMDL for Temperature in the Columbia and Lower Snake Rivers*, May 18, 2020; *see*: www.epa.gov/columbiariver/tmdl-temperature-columbia-and-lower-snake-rivers). Many of these issues are bound up in that TMDL as well. State plans to implement the TMDL will likely be controversial.

TMDLs

Regulatory Rules Freeze

On January 20, President Biden's Administration issued a Memorandum for the heads of executive departments and federal agencies entitled "Regulatory Freeze Pending Review." On behalf of the President, Ronald Klain (Biden's Chief of Staff) informed the various administration officials to "propose or issue no rule in any manner — including by sending a rule to the Office of the Federal Register (the "OFR") — until a department or agency head appointed or designated by the President after noon on January 20, 2021, reviews and approves the rule." Other steps were spelled out in the Memorandum "[I]n order to ensure that the President's appointees or designees have the opportunity to review any new or pending rules". Also included was the following admonition: "Should actions be identified that were undertaken before noon on January 20, 2021, to frustrate the purpose underlying this memorandum, I may modify or extend this memorandum, pursuant to the direction of the President, to request that agency heads consider taking steps to address those actions."

For info: Memorandum available at: www.whitehouse.gov >> Briefing Room >> Presidential Actions - Page 5

Biden Agenda

Drinking Water

Lead & Copper

PFAS

Aging Infrastructure

Enforcement Increase?

Environmental Justice

Climate Change Focus

Coastal Zone Impacts

Justice Initiatives

Given this backdrop, it is possible the Biden Administration will be interested in furthering the implementation of TMDLs and other plans for how to address temperature, particularly in the West. The Biden Administration will also need to continue to navigate how implementation of these plans fits within the NEPA review process, TMDL development and implementation, and the 401 certification process.

Drinking Water and Water/Wastewater Infrastructure

As discussed in more detail below, it is likely that Biden's environmental agenda will be driven by the twin pillars of environmental justice and climate change. In that vein, the Biden Administration is likely to continue the Trump Administration's focus on Safe Drinking Water Act (SDWA)-related regulations and to promote improved drinking water quality and modernized drinking water and wastewater infrastructure. Minority, low income, or otherwise disadvantaged communities will receive particular scrutiny. Under the SDWA efforts, we will likely see an early push to revise and issue the Lead and Copper Rule and focus on updating and adding additional regulation of drinking water constituents.

Similarly, developing a comprehensive regulatory program focused on **p**er- and **p**oly**f**luoroalkyl **s**ubstances (PFAS) and related constituents is likely to be high on the Biden priority list. Given that this was also a concern and focus of the Trump Administration, this topic may also be an easier and quicker initiative to advance. RE: PFAS, *see*: Kray, *TWR* #182; McKnight, *TWR* #195.

There is also likely to be increased emphasis on the regulation of toxic constituents in wastewater, and drinking water standards for such toxics and for other emerging contaminants.

Finally, the Biden Administration is expected to focus on efforts to improve aging wastewater and drinking water infrastructure. This is another initiative that was a focus of the Trump Administration, which may make this an easier effort to advance early in the new president's term. Determining the funding needs in these areas, appropriating funds, and overhauling the criteria used for grant and loan issuance to prioritize environmental justice communities are all likely actions to be taken early in the Administration.

Enforcement

Under the Trump Administration, environmental groups have claimed that there was a relaxation of enforcement across all environmental programs. Based on this perception and the messaging from these groups, enforcement is expected to increase under the Biden Administration and it is likely that an effort will be made to bring a high-profile enforcement case early in the term. A return to sector- or topic-specific enforcement initiatives is expected. In the water area, it is likely that the focus will be on the wetland program, the agriculture sector, and the utility sector. There could also be enforcement relating to SDWA violations, focused on certain priority contaminants and significant noncompliance over extended periods of time. The enforcement in the context of the SDWA, and on agricultural operations, will likely be tied to the environmental justice goals of the new Administration.

Environmental justice may also drive changes in the penalty calculations for enforcement actions. Actions causing adverse impacts to environmental justice communities may receive greater penalties. There may also be increased emphasis on use of supplemental environmental projects to address such adverse environmental impacts.

Climate Change and Water Quality

As mentioned earlier in this article, climate change is a central pillar of the Biden Administration's environmental platform. Most of the actions are expected to focus on: promotion of renewable energy; increased regulation of power sources relying on fossil fuel; and development of job creation and job training programs in the renewable energy sector. These latter initiatives will likely be coupled with environmental justice initiatives to bring more opportunity to environmental justice communities.

Another aspect of climate change, in addition to reducing the creation of greenhouse gases and promoting renewable energy, is addressing the impacts of the effects of climate change. Coastal resiliency and actions to address expected sea level rise, flooding, and other natural disasters, particularly in environmental justice communities, will be a focal point. With respect to water regulatory programs, this means a likely greater emphasis on the Coastal Zone Management Act (CZMA) and its implementation. The elements required to be included in state coastal zone programs, and the evaluations required as part of the CZMA consistency process, could be revised as part of this process. Additionally, a significant infrastructure spend, including an increase in grant and loan programs, is expected to target coastal zone management programs.

Environmental Justice and Water Quality

This article has already touched on several areas where the environmental justice goals of the Biden Administration are likely to involve efforts for water-related regulatory changes. More broadly, it is expected that a series of executive orders will be issued expanding the federal government's environmental justice initiatives. EPA is likely to follow suit with new guidance and direction, as well as an overhaul of the offices within EPA with environmental justice responsibilities. Such changes are more readily implementable, as there is no federal environmental justice statute to implement or regulation to enforce. Rather, federal environmental justice initiatives were undertaken pursuant to Executive Order 12898 issued in 1994 during the Clinton Administration.

Biden Agenda

Public Outreach

Civil Rights

Additional Monitoring

Michael Regan, President Biden's pick to head the EPA, enacted a series of policies in North Carolina to expand public outreach requirements associated with permitting actions and to establish triggers for enhanced environmental justice reviews for such projects. This was done under the authority of Title VI of the Civil Rights Act. Accordingly, we may see a similar approach taken by EPA early in the new Administration's term. Such actions could be taken through reorganization of EPA's environmental justice program and issuance of guidance documents and policies, citing Title VI as the governing authority.

More significantly, it is also likely that EPA will issue a policy or decision reversing its *Select Steel* decision. *St. Francis Prayer Ctr. v. Michigan Department of Environmental Quality*, EPA File No. 5R-98-R5 (Oct. 3, 1998). That decision dates back to 1998, where EPA accepted a Title VI complaint regarding a Michigan environmental agency's decision to issue an air permit for a steel recycling facility in a predominantly African American neighborhood in Flint, Michigan. EPA ruled that there was no violation of civil rights because there was no violation of the air emission standards established under the Clean Air Act. It is expected that EPA may attempt to rescind the *Select Steel* decision, such that compliance with regulatory standards will no longer be a shield or defense against environmental justice claims. Although *Select Steel* was focused on air emissions, recission of this decision will have implications across all media.

Additional monitoring requirements are also expected to be required as part of the environmental justice initiatives. On the water side, there may be more frequent monitoring of effluent and stormwater discharges; additional ambient monitoring to assess water quality; and requirement to make such monitoring results available to the community.

Conclusion

By the time this article is published, we will likely have actual knowledge of the immediate steps the Biden Administration will take on the issues outlined above. While all of the predictions made here may not come to fruition, it is certain that there will be a number of significant changes to the water quality regulatory landscape over the next four years.

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Biden Executive Orders

BEARING ON WATER & ENVIRONMENT

Executive Order 14008:
Tackling the Climate Crisis at Home and Abroad

- Elevates climate change as national-security, foreign-policy priority
- Pauses new oil and gas leasing on US lands/waters
- Establishes National Climate Task Force
- Establishes presidential climate envoy on National Security Council
- Commits to clean infrastructure projects
- Commits to development of emission reduction target
- Commits to environmental Justice

Executive Order 13990:
Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis

[I]t is, therefore, the policy of my Administration to listen to the science; to improve public health and protect our environment; to ensure access to clean air and water; to limit exposure to dangerous chemicals and pesticides; to hold polluters accountable, including those who disproportionately harm communities of color and low-income communities; to reduce greenhouse gas emissions; to bolster resilience to the impacts of climate change; to restore and expand our national treasures and monuments; and to prioritize both environmental justice and the creation of the well-paying union jobs necessary to deliver on these goals.

To that end, this order directs all executive departments and agencies (agencies) to immediately review and, as appropriate and consistent with applicable law, take action to address the promulgation of Federal regulations and other actions during the last 4 years that conflict with these important national objectives...

Executive Order 13992
Revocation of Certain Executive Orders Concerning Federal Regulation

[I]t is the policy of my Administration to use available tools to confront the urgent challenges facing the Nation, including the coronavirus disease 2019 (COVID-19) pandemic, economic recovery, racial justice, and climate change. To tackle these challenges effectively, executive departments and agencies (agencies) must be equipped with the flexibility to use robust regulatory action to address national priorities. This order revokes harmful policies and directives that threaten to frustrate the Federal Government's ability to confront these problems, and empowers agencies to use appropriate regulatory tools to achieve these goals…

For info: White House Website for Presidential Actions: www.whitehouse.gov/briefing-room/presidential-actions/

Biden Agenda

Resources

Biden-Harris Platform: *Plan for a Clean Energy Revolution and Environmental Justice*, *see*: https://joebiden.com/climate-plan/

Biden-Harris Platform: *Plan to Secure Environmental Justice and Equitable Opportunity*, *see*: https://joebiden.com/environmental-justice-plan/

Clean Water Act Section 401 Certification Rule, 85 Fed. Reg. 42210 (July 13, 2020)

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, 59 Fed. Reg. 7629 (Feb. 16, 1994)

Executive Order 13771, *Reducing Regulation and Controlling Regulatory Costs* (Jan. 30, 2017)

Executive Order 13891, *Promoting the Rule of Law Through Improved Agency Guidance Documents*, 84 Fed. Reg. 55235 (Oct. 15, 2019)

Navigable Waters Protection Rule: *Definition of* "*Waters of the United States*" - 85 Fed. Reg. 22250 (April 21, 2020)

Steam Electric Reconsideration Rule, 85 Fed. Reg. 64650 (Oct. 13, 2020)

Strengthening Transparency in Pivotal Science Underlying Significant Regulatory Actions and Influential Scientific Information, 86 Federal Register 469 (Jan. 6, 2021)

TMDL for Temperature in the Columbia and Lower Snake Rivers, May 18, 2020, *see*: www.epa.gov/columbiariver/tmdl-temperature-columbia-and-lower-snake-rivers

US Department of Justice Memorandum for All Component Heads and United States Attorneys, *Prohibition on Settlement Payments to Third Parties*, June 5, 2017

US EPA Administrator Scott Pruitt Memo to EPA Managers: *Adhering to the Fundamental Principles of Due Process, Rule of Law, and Cooperative Federalism in Consent Decrees and Settlement Agreements*, Oct. 16, 2017

US EPA Directive *Promoting Transparency and Public Participation in Consent Decrees and Settlement Agreements*, Oct. 16, 2017

US EPA Guidance; *Administrative Procedures for Issuance and Public Petitions*, 85 Fed. Reg. 66230, Oct. 19, 2020

US EPA Guidance Memorandum, *Applying the Supreme Court's County of Maui v. Hawaii Wildlife Fund Decision in the Clean Water Act Section 402 National Pollutant Discharge Elimination System Permit Program*, Jan. 14, 2021. EPA website: www.epa.gov/npdes/releases-point-source-groundwater

Andrea Wortzel's practice focuses on water quantity and water quality issues, including water rights, water supply planning, and water withdrawal permitting, as well as discharge permitting and TMDL development and implementation. She aids clients in applying for, obtaining, and defending state Clean Water Act Section 401 certifications. Andrea also advises clients on endangered species issues, including strategies for the consultation process and permitting. She has also been involved in ESA-related litigation, including defending against citizen suits for take and defending biological opinions issued for a project.

Chuck Sensiba provides strategic counsel and legal representation to public utility districts, and governmental entities, investor-owned utilities, water districts, and independent power producers and covers the full spectrum of complex licensing, natural resources, and environmental issues related to hydropower development. He has broad experience in matters under the FPA, NEPA, ESA, CWA, NHPA, Federal Land Policy and Management Act and CZMA, and other environmental and natural resource programs. Chuck serves on the Board of Directors for NHA.

Water Reliability

January *Report*

Assessment Available in March

Reclamation Deliverables

Anticipated Changes

Current Drought

Conservation Benefits

WATER RELIABILITY IN THE WEST

EDITED EXCERPTS FROM RECLAMATON'S

"*Water Reliability in the West - 2021 SECURE Water Act Report*"

Editors' Note: On January 19th, the US Bureau of Reclamation announced the release of "*Water Reliability in the West - 2021 SECURE Water Act Report*" — a part of the Bureau's obligation under the Omnibus Public Land Management Act of 2009 to report to the US Congress every five years on projected risks to water supply in the American West and efforts to mitigate those risks. The Report summarizes the more detailed information in associated documents, including Reclamation's "*2021 West-Wide Climate and Hydrology Assessment*" (*2021 Assessment)* evaluating impacts to water demand and supply based future projections, which will be available on Reclamation's SECURE Water Act website (www.usbr.gov/climate/secure) in March. What follows are edited excerpts from the 60-page Report, which is available in full at: www.usbr.gov/climate.

Introduction

The Bureau of Reclamation (Reclamation) is the largest wholesaler of water in the country. Reclamation delivers water for municipal, agricultural, tribal, and environmental water uses, including providing one out of five farmers in the Western United States (West) with irrigation water for 10 million acres of farmland that produce 60 percent of the Nation's vegetables and 25 percent of its fruits and nuts.

This "*Water Reliability in the West - 2021 SECURE Water Act Report*" (*2021 Report*) provides: a West-wide assessment of expected changes to water supplies, uses, and demands; highlights progress; and describes actions taken to increase water supply reliability since the 2016 SECURE Water Act Report.

Changing Conditions

Temperature: Temperatures are projected to increase over the West during the 21st century from the last decade of the 20th century. Projected temperature increases become greater with time.

Precipitation: Precipitation is projected to increase over the northwestern and northcentral portions of the United States and decrease in southwestern and southcentral areas. Projections of future precipitation are more variable and less certain than those for future temperature.

Snowpack: Snowpack is projected to decrease for almost all locations in the West.

Streamflow (runoff): Timing and quantity of streamflow are projected to continue to change as temperature and precipitation levels change. On average, snowmelt is projected to occur sooner, shifting resulting streamflow to earlier in the year.

Droughts: The duration, severity, and frequency of droughts are projected to increase in the future compared to droughts of the distant past.

Water Demands: Increased temperatures and longer growing seasons are projected to result in increased evaporation and irrigation water requirements. The *2021 Assessment* examined turfgrass in urban centers across the West (*see* below).

Groundwater: The amount of water infiltrating into the groundwater system is projected to mirror changes in precipitation with some decreases from increased evapotranspiration. However, unique local precipitation characteristics, topography, land use, and aquifer properties have considerable influence as well.

Collaboration and Science

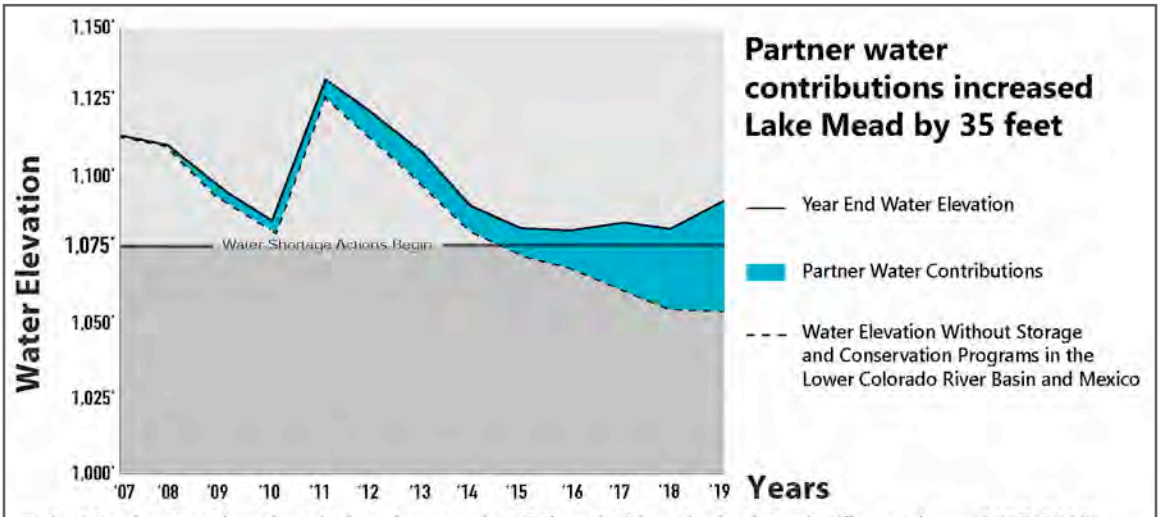
Managing for Drought in the Colorado River Basin

The current drought in the Colorado River Basin has persisted since 2000, leading to great concerns about the long-term reliability of basin water supplies. The period from 2000 through 2020 was the driest 21-year period in the Colorado River Basin in more than 100 years of record-keeping and one of the driest in the past 1,200 years based on paleohydrology data.

In the Colorado River Basin, the benefits of collaboration to address water supply issues are evident. As a result of voluntary water conservation and storage activities by Reclamation, the Basin States, Tribes, and Mexico since 2007, approximately 3 million acre-feet has been conserved in Lake Mead, increasing its elevation by approximately 35 feet. This additional water stored and conserved in Lake Mead has effectively kept the Lower Colorado River Basin out of a shortage condition.

Water Reliability

Lake Mead Conservation



Lake Mead water elevation during the ongoing Colorado River Basin drought (figure shows 2007-2019).

Adapted from *2021 Report*

Navajo-Gallup Project

Providing Water Supplies for Tribal Communities

The Navajo-Gallup Water Supply Project is the cornerstone of the Navajo Nation's Water Rights Settlement Agreement in the San Juan River Basin in New Mexico. Parts of the project have been completed, including the Carson/Huerfano public water system, which started to deliver potable water from the Cutter Lateral Water Treatment Plant on October 27, 2020. When fully completed, the project will include over 300 miles of pipeline, 2 water treatment plants, 19 pumping plants, and several water storage tanks. The project will provide a reliable and clean drinking water supply for 43 Chapters within the Navajo Nation, the southwestern portion of the Jicarilla Apache Reservation, and the City of Gallup. These areas currently rely on rapidly depleting groundwater supplies, some of which are of poor quality. Furthermore, it is estimated that more than 40 percent of Navajo households across the reservation rely on water hauling to meet daily water needs.

Folsom Dam, Central Valley Project, California

Adapted from *2021 Report*

Forecast-Based Efficiencies

Using Improved Forecasting Tools to Address Variable Conditions

For example, improved forecasting and a new auxiliary spillway have combined to support forecast-based reservoir operations at Folsom Dam, part of the Central Valley Project near Sacramento, California.

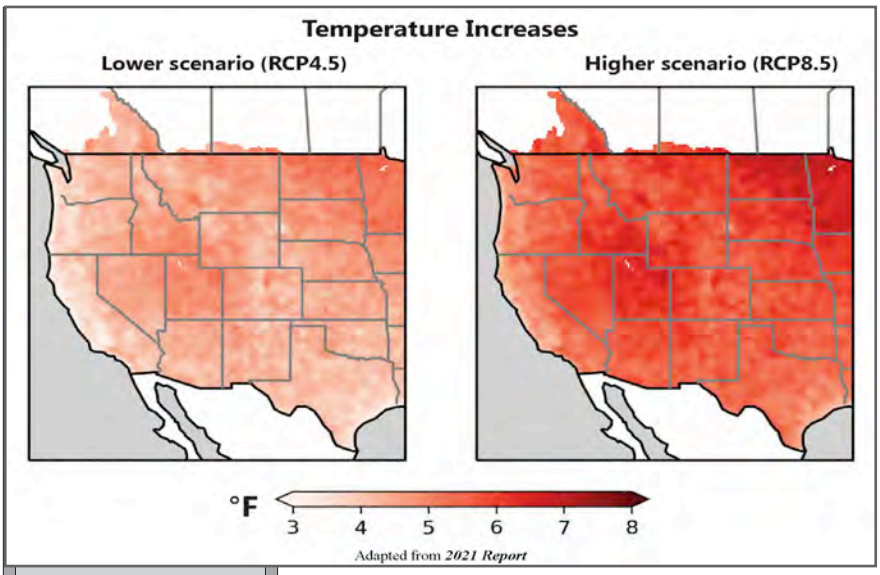
In June 2019, US Army Corps of Engineers (Army Corps) and Reclamation signed an updated Folsom Dam Water Control Manual for Folsom Dam and Lake that allows more accurate release decisions based on weather forecasts and uses the new auxiliary spillway more efficiently. The auxiliary spillway, constructed adjacent to the dam in the fall of 2017, has gates that are 50 feet lower in elevation, making large flood releases possible without waiting for water levels to reach the main gates of Folsom Dam.

Climate Change Projections

West-Wide Climate and Hydrology Summary

Future Projections

The climate change analysis in the *2021 Assessment* summarizes projections of future temperature, precipitation, snowpack, and streamflow across the West. Maps show changes in temperature and precipitation projected to occur around the mid-21st century relative to a baseline of 1970-1999. Under scenarios with higher greenhouse gas concentrations, increases in temperature are more severe than in scenarios with lower greenhouse gas concentrations. In both scenarios, average temperatures are projected to increase across the West and annual precipitation is projected to increase in the Northwest, particularly in the Columbia and Missouri River Basins, and decline in the Southwest. In most river basins, snowpack is projected to decline as more winter precipitation falls as rain and warmer temperatures melt snow sooner. In some high elevation regions, snowpack may increase due to a projected increase in winter precipitation. Throughout the West, seasonal streamflow is projected to occur earlier in the year.



Climate Model Projections

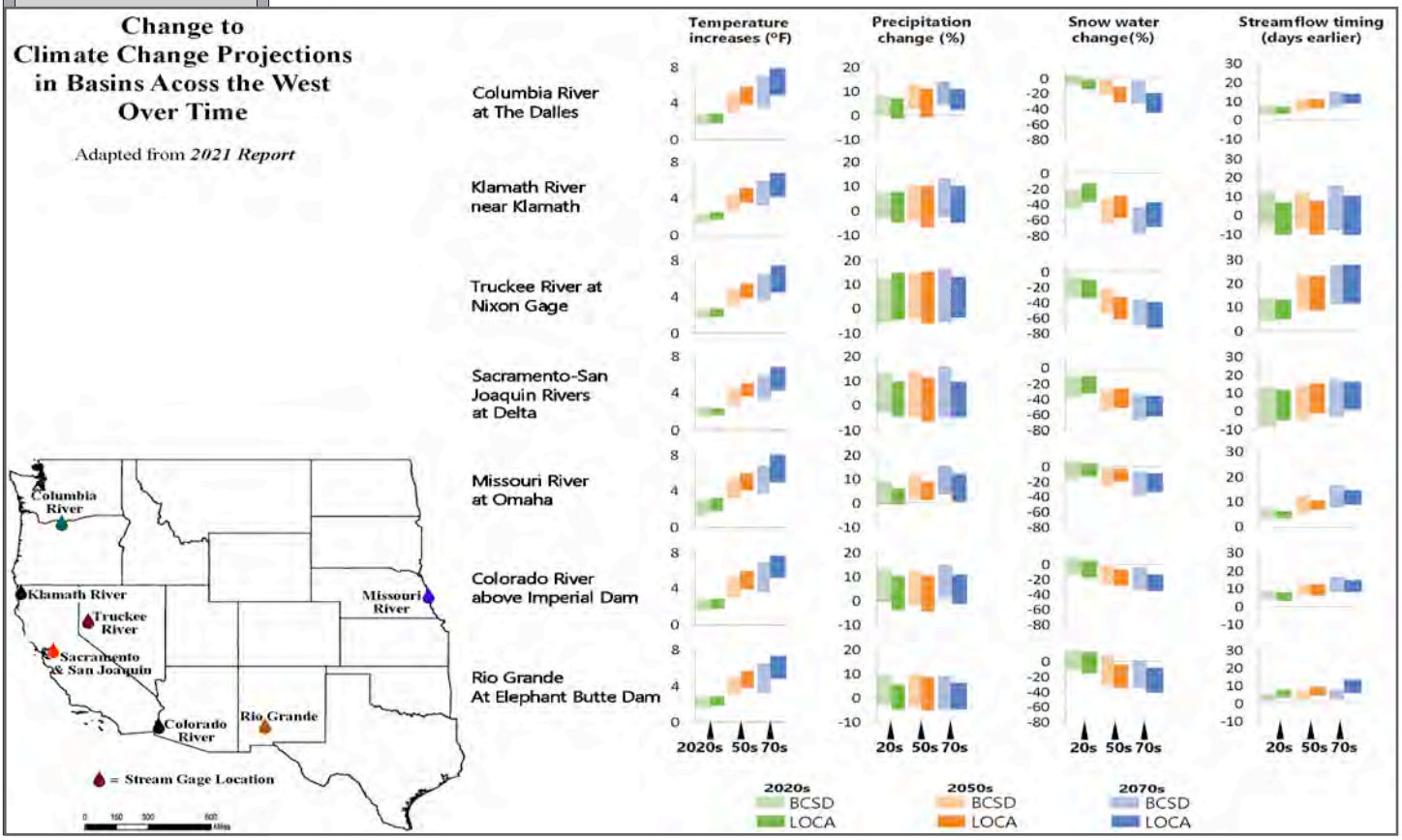
In the *2021 Assessment*, Reclamation is adding the statistical downscaling approach referred to as LOcalized Constructed Analogs (LOCA), to the Bias Correction and Spatial Disaggregation (BCSD) statistical downscaling approach presented in the 2016 Assessment. In general, broad trends of climate and hydrologic variability West-wide are similar using either of these two downscaling methods. There are, however, geographic differences in climate (*e.g.*, precipitation and temperature) and hydrology (*e.g.*, annual runoff) projections using information from the LOCA and BCSD datasets. These differences reflect the uncertainties associated with methodological choices and data sets; accordingly, one projection cannot be characterized as any more likely than the other.

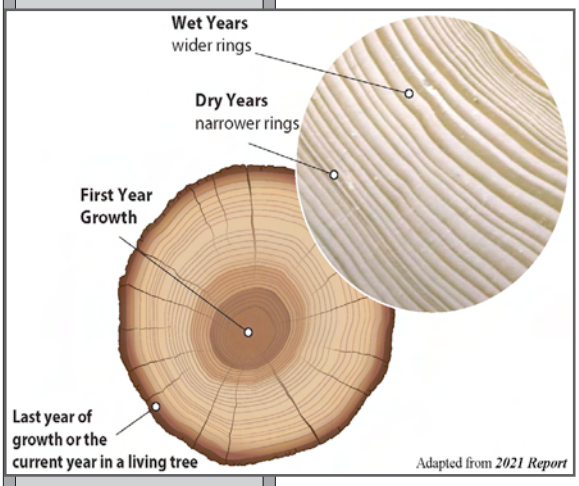
Snowpack & Runoff

Basin-Specific Future Projections

Future climate and hydrology projections were evaluated at specific locations for the 2020s, 2050s, and 2070s. These changes are consistent with those found West-wide — namely increasing temperatures, declining snowpack, and earlier streamflow — all becoming more pronounced in later decades. The magnitudes of change differ depending on location. For example, in the 2070s, projected snow declines for the Truckee River at Truckee River at the Nixon gage are between 39 percent and 74 percent, whereas projected declines for the Rio Grande at Elephant Butte Dam are between 7 percent and 40 percent.

Many locations are likely to experience increased streamflow during December through March (winter) and decreased streamflow during April through July (late spring). For example, the Truckee River at Nixon may experience increased winter streamflow of 104 percent to 296 percent and decreased late spring runoff of 21 percent to 51 percent. The Rio Grande at Elephant Butte Dam may experience a decrease of 4 percent to an increase of 25 percent in runoff in the winter, and a decrease in late spring runoff between 3 percent and 28 percent.





West-Wide Climate and Hydrology Summary

Paleohydrology

Reclamation is incorporating paleohydrology to inform long-term planning in addition to using projections of future climate in the *2021 Assessment*. Paleohydrology uses tree-ring reconstructions to understand wet and dry conditions centuries before stream gages were installed. The reconstructions provide information that complements and adds value to contemporary projections of future climate and hydrology. Paleohydrology has been useful in informing water management and planning in basin-specific studies supported by the WaterSMART Basin Study Program. These longer records inform water managers whether droughts in the distant past were similar to or more severe than observed droughts in the past century. This is especially useful as observations, including stream gages, go back only a hundred years in most cases, capture a limited number of extreme events, and may not contain the full range of droughts and wet periods that have occurred over past centuries.

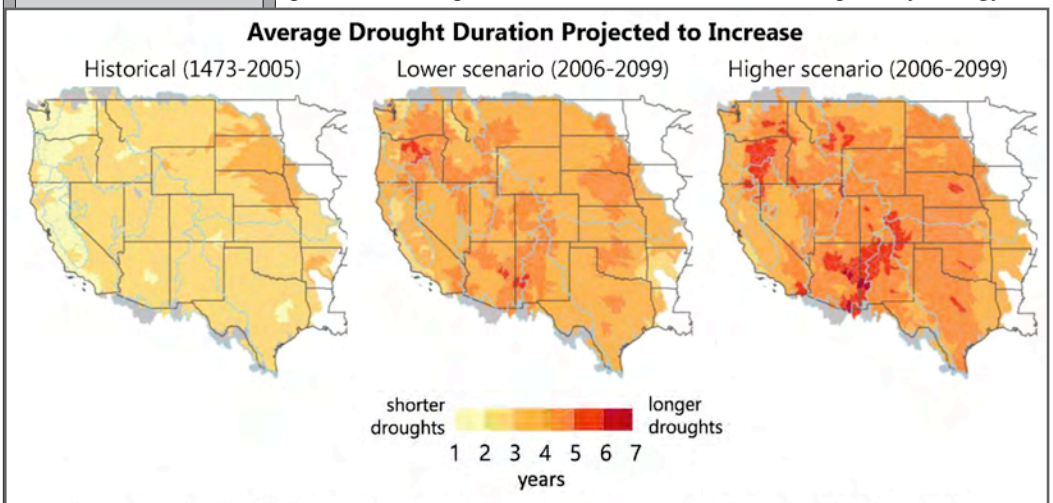
Adaptation

West-Wide Drought Analyses

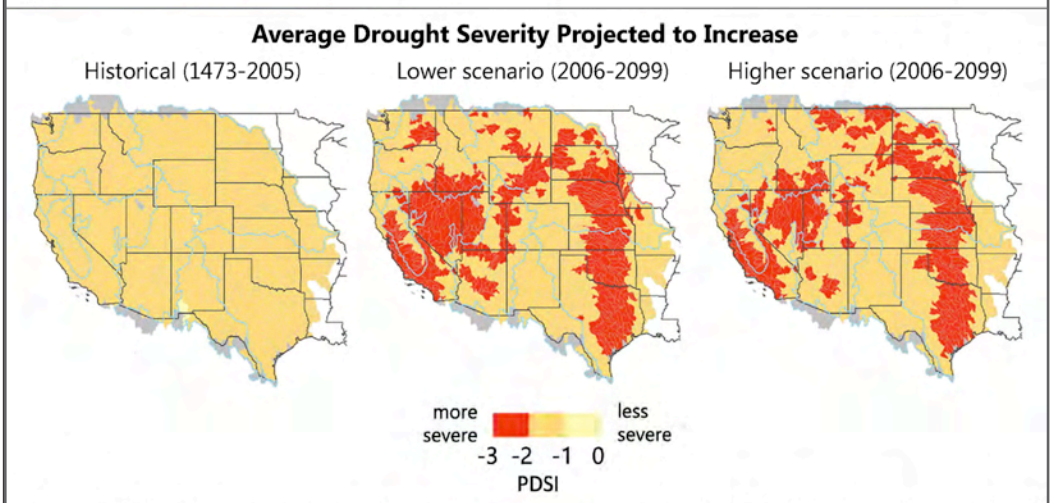
Knowing more about the occurrence of drought events will help farmers, ranchers, municipalities, businesses, and other decision-makers prepare for and adapt to changing conditions. New to the *2021 Assessment*, Reclamation's West-wide drought analyses provide a framework for drought planning and help managers develop water management alternatives with adequate lead times. Reclamation and study partners developed information and tools based on paleohydrology reconstructions to evaluate dry and wet period characteristics and analyze chances of shifting between wet states or dry states, which help inform how these changes might happen in the future.

In addition, two sets of information, drought duration and drought severity, can inform decision-making, especially when understood together. Compared to the distant past, climate model projections indicate an increase in drought duration and severity. Climate models also project that drought duration and severity will be more variable in the future for most of the West.

This drought analysis uses the Palmer Drought Severity Index (PDSI) to identify droughts (defined below). Historically, drought severity as measured by PDSI has ranged from -1 to -2. This PDSI range is defined as Abnormally Dry, leading to "short-term dryness slowing planting, growth of crops or pastures" (United States Drought Monitor 2020). In the future, in some locations the range increases to -2 to -3 PDSI. This range, defined as Moderate Drought, leads to "some damage to crops, pastures; streams, reservoirs, or low wells; some water shortages developing."



Droughts, defined as PDSI values less than or equal to zero, historically last an average of 1 to 4 years. In the future, these conditions are projected to last longer under both the lower and higher scenarios.



Historically, drought severity, including the paleo and observed historical period, is between PDSI values of -1 and -2. In the future, droughts are projected to become more severe under both the lower and higher scenarios.

Water Reliability

Urban Demand Increases

Urban Water Demands

Irrigated turfgrass is one of the largest irrigated crops in the United States (Milesi et al. 2005). To understand how it will respond to future changes, Reclamation and partners conducted an urban landscape irrigation demand analysis, which complements the agricultural demand analysis conducted in the 2016 SECURE Water Act report. In 68 urban areas across the West, water demands were estimated using an evapotranspiration and irrigation water requirement model representing grass varieties such as Bermuda and Kentucky Bluegrass. The analysis, comparing historical values to projected future changes, found significant increases in both estimated evapotranspiration (from +8 percent to +36 percent) and net irrigation water requirements per acre (from +9 percent to +54 percent) by the 2080s. These increases are largely driven by higher temperatures and longer growing seasons, which could stress water supply systems at times of the year when historical demand for water is low. Precipitation increases in some regions provided some offset — but were typically not enough to compensate for total increases in turfgrass water demand (*see 2021 Assessment*, Chapter 7).

Case Studies

Recharge

Groundwater

Groundwater is an unseen, yet critical, water resource for many communities throughout the West. Groundwater resources in any particular location are challenging to assess given unique aquifer properties, local precipitation, topography, and land use. Since a consistent West-wide analysis was impractical, climate change impacts on groundwater were evaluated through a synthesis of groundwater projects done in collaboration with the United States Geological Survey (USGS) and basin study partners over the last five years.

The *2021 Assessment* illustrates eight case studies that evaluate impacts of climate variability and change to groundwater resources, providing examples of strategies used to assess future changes and highlighting established approaches to hydrology modeling and decision support analysis. Generally, as wet areas get wetter and dry areas get drier, the amount of water recharging the groundwater system will reflect those changes, yet change may be buffered or accentuated by increased evapotranspiration. There are, however, nuances based on location and recharge type (*e.g.*, diffuse or focused recharge). For example, more focused recharge events might increase with precipitation intensity or shifts in precipitation seasonality, even if overall precipitation amounts decline. This work summarizes evaluations of natural changes to groundwater and does not encompass acknowledged impacts to groundwater due to irrigation pumping and other uses (*see 2021 Assessment*, Chapter 8).

Changing Hydrology

Impacts to Water Uses

Water Deliveries

Projected increases in temperatures, decreases in snowpack, and runoff occurring earlier in the year — with a corresponding reduction in supply in summer months — make supplies less predictable and water deliveries more difficult to manage.

Water supplies are increasingly stressed by rapid urban growth, a vital agricultural industry, and environmental needs and obligations. Changing hydrology, including projections of more frequent and more severe droughts, increased temperatures leading to evaporation losses and increased irrigation requirements, and changes to the timing and quantity of runoff, brings added water management challenges. Shifts in runoff timing, longer growing seasons, and greater reliance on limited water storage may increase the potential for water supply shortages. For example, the *Upper Deschutes River Basin Study* (2019) noted an increased reliance on stored water during the summer due to lower natural flows. End-of-water-year storage is projected to decrease in areas, including the reservoirs analyzed in the *Upper Missouri River Basin Impacts Assessment* (2019) and the *Sacramento-San Joaquin Basins Study* (2016).

Water Quality

Anticipated warming water temperatures, sea level rise, and more wildfires will likely impact ecosystem health. Changes in precipitation and runoff will likely affect pollutant transport into and within water bodies.

Wildfire Risks

Sea Water Intrusion

Across the West, increasing wildfire risks increase water quality issues as fire scars may lead to increased ash, large debris, and sediment washing into rivers and reservoirs. In the Sacramento-San Joaquin Rivers Delta, salinity is affected by both sea level rise, as ocean temperatures increase, and by changes in Delta outflow, allowing more sea water intrusion into the Delta. In the Missouri River Basin, water quality characteristics have also changed over the past several decades as a result of land use practices, increased urbanization, atmospheric deposition of pollutants, and dam construction and regulation.

Water Reliability

Recreational Use

Recreation

Reduced reservoir levels and river flows could have negative implications for flow and water-dependent recreational activities.

Climate change may cause fluctuations in water depth and surface acreage, which may affect recreation use and economic value in complex ways. The Rio Chama Economic Study (forthcoming) is finding that higher water levels typically provide greater recreational value. In the Rio Grande Basin, drying wetlands could diminish wildlife watching opportunities, drought conditions could lead to reduced game populations for hunters, and changes in runoff flow and timing could shorten fishing seasons in headwater streams.

Instream Flow Benefits

Fish and Wildlife Habitat

Projected changes to the timing and volume of streamflow, increasing severity and duration of floods and droughts, increasing temperatures, and increasing wildfires create challenging conditions for species and habitat.

As air and water temperatures increase, the timing and magnitude of streamflows change — impacting ecosystems. The Missouri Headwaters Basin Study (Reclamation and the Montana Department of Natural Resources and Conservation 2019) investigated ongoing efforts by the National Drought Resilience Partnership and Reclamation to mitigate impacts of severe drought. The study found that implementation of voluntary instream flow targets for water conservation during drought could provide multiple benefits without substantial impacts to irrigation water users.

Demand Imbalances

Hydropower

Hydropower production faces challenges from longer, more severe droughts and floods, and runoff occurring earlier in the year — decreasing supplies when demand is highest during summer months.

Increasing temperatures, earlier runoff, and lower summer flows may reduce hydropower operational flexibility. Communities dependent on hydropower may encounter power supply and demand imbalances as hydrologic changes could reduce generation capacity during the late-summer periods when energy demands are anticipated to increase.

The effect of prolonged drought on hydropower generation is also still uncertain. Even with efficiency improvements, impacts to hydropower generation are anticipated to continue in the Colorado River Basin with over 20 years of drought. Projections indicate a 0.5 to 2.5 percent loss in power generation from year-to-year over the next five years at Hoover Dam.

Endangered Species Responses

Endangered, Threatened, or Candidate Species

Terrestrial, freshwater, and marine organisms are responding to climate change by altering individual characteristics, the timing of biological events, and their geographic ranges.

Warmer conditions may result in increased stress on fish such as the silvery minnow in the Rio Grande and the Lahontan cutthroat trout in the Truckee River Basin. These warmer conditions may require increased water demands for instream flows for ecosystems. Changes in ambient temperatures and seasonality shifts in streamflow could alter the timing of breeding patterns of aquatic species. The *Truckee River Basin Study* (2015) stated that any impacts on Pyramid Lake elevations could affect cui-ui and Lahontan cutthroat trout spawning and the quality of lake habitat for these listed species.

Flood Risks

Flood Control Management

Precipitation changes are projected to occur, interacting with warming to cause larger and more frequent floods, even in areas where total precipitation is projected to decline.

Operational Flexibility

More operational flexibility may be needed to manage increased risks from flooding. Reservoirs in the Pacific Northwest could experience more floods due to a combination of warming and increased winter precipitation leading to increased rain-on-snow events. The *Crooked River Reservoir Operations Pilot Study* (2020) estimated the potential impacts of climate change on flood control operations on the Crooked River in Oregon. The study found that the wetter climate change scenario resulted in an additional 22 days of flows above flood stage and increased potential for surcharge compared to current conditions. In many Missouri River Basin reservoirs, the average number of spring days per month above flood pool elevation is expected to increase, while the average number of summer days per month above flood pool elevation is projected to decrease, as described in the *Missouri Headwaters Basin Study* (Reclamation and the Montana Department of Natural Resources and Conservation 2019).

Resilience Threshold

Ecological Resilience

Warmer temperatures and changes in precipitation affect the resilience of ecosystems in watersheds, which we rely on for ecosystem services, including water supplies.

As climate change increases the magnitude of disturbances in our natural systems, more ecosystems are approaching — or crossing — resilience thresholds, and therefore changing in basic character. For example, projected climate changes with increased temperatures and decreased available moisture could profoundly affect upland forests throughout the West, adding stress to already disturbed systems. These

Water Reliability

Snowpack

forests accumulate the snowpack that many Reclamation projects depend on for water supply. Resilience thresholds for many of these forests are being surpassed, resulting in extensive loss of forest to bark beetle and other infestations, as well as to growing intensity and size of wildfires. These forest losses expose areas with snow accumulation to increased sunlight, leading to decreased snowpack and Spring runoff. Resilience thresholds are also being approached within our river systems, through increasing temperatures, which decrease oxygen and lead to fish kills, as well as increasing river drying and impacts to riparian systems.

Strategies to Support Reliable Water Deliveries

Reclamation supports reliable water deliveries through hundreds of ongoing construction activities, a range of water management improvements, and building partnerships across the West to maintain streamflow for fish and improve habitat. Reclamation also incorporates climate change information into risk assessments for infrastructure and drought planning, and improved decision support tools to manage risks from wildfires.

Infrastructure Maintenance

Maintaining Reliability through Construction

Reclamation has approximately 350 active construction activities, including new delivery systems and storage, dam safety projects, recreation rehabilitation activities, and other major replacements and repairs. Most of Reclamation's facilities are more than 50 years old, and some dams are more than 100 years old. Preventive maintenance programs, capital improvement planning, and substantial investment in major rehabilitation and replacement all contribute to maintaining infrastructure.

Drinking Water Project

Bringing Safe Drinking Water to Rural Colorado

Now in the final design stage, the Arkansas Valley Conduit, once completed, would provide a safe, long-term water supply to as many as 50,000 people in 40 rural communities along the Arkansas River in Southeastern Colorado. Drinking water now delivered to about 5,200 people in the area does not meet National Primary Drinking Water Regulations due to naturally occurring radionuclides in current groundwater sources, and 17 communities are under state enforcement orders. This project will allow water providers to deliver safe, affordable drinking water and support future growth.

Downstream face of Stampede Dam, California, showing the 11.5-foot-high crest raise (Reclamation).

Increasing Safety from Flood Events

Reclamation crews raised Stampede Dam, near Truckee, California, by 11.5 feet, constructed two small dikes, and reconstructed the spillway to better control outflows during large floods — in less than two years and under $22 million. Investigations indicated a need for this project to prevent potential overtopping of the dam, which could lead to potential failure of both Stampede Dam and Boca Dam six miles downstream that could impact the City of Reno and surrounding areas.

Water Storage

Supporting New Construction with New Authorities

Water storage is an important component of building resiliency in the face of growing water demands and climate variability. The Water Infrastructure Improvements for the Nation (WIIN) Act, Public Law 114-322 (2016), authorizes a new funding model for construction. This allows Reclamation to require non-Federal cost contributions to be paid upfront — in contrast to the financing model requiring Reclamation to fund all project costs, with repayment over time by beneficiaries. Under WIIN Act Section 4007, Congress has appropriated over $600 million to date for water storage projects and multiple projects are underway.

One of these projects, raising the existing Cle Elum Dam by three feet in Washington, is the first new water storage project in the Yakima River Basin in more than 80 years and will provide an additional 14,600 acre-feet of storage capacity, increasing reliability for existing users, and improving instream flows for fish.

Storage Options

WIIN Act funding has also been used to finalize a number of studies identifying more water storage in the West. This includes the *North-of-Delta Off-Stream Storage Investigation*, documenting the potential costs and benefits of the Sites Reservoir Project in northern California. The proposed reservoir, to be located 81 miles northwest of Sacramento, would store water diverted from the Sacramento River for future releases to beneficiaries throughout the state. The reservoir would increase northern California's water storage capacity by up to 15 percent and provide water supply, flood protection, environmental, and recreational benefits.

Water Reliability

Increasing Supplies through Water Management Improvements

Cost Share

WaterSMART

Since 2016, Reclamation has leveraged $365 million in Federal funding with $1.1 billion in non-Federal cost-share funding for 749 WaterSMART projects. These projects support a wide range of water management activities, including water delivery system improvements, drought contingency plans, restoration planning by watershed groups, water reuse and recycling projects, and more. Through WaterSMART, Reclamation provides cost-shared financial assistance to water managers on a competitive basis for projects to conserve water, increase the production of hydropower, develop water marketing strategies, and mitigate the risk of water conflicts.

Conservation Program

Pilot System Conservation Program

The Pilot System Conservation Program in the Colorado River Basin demonstrated that cost-shared conservation projects provide a viable contribution to water savings, and the lessons learned are being applied to possible future demand management. In the Lower Colorado River Basin, agricultural, municipal, and tribal projects in Arizona, California, and Nevada conserved more than 165,000 acre-feet of water in Lake Mead from fiscal year FY2015 to FY2018. In the Upper Colorado River Basin, projects conserved about 47,000 acre-feet through 2018.

Reuse Program

Diversifying Water Supplies through Water Reuse

Water recycling is often drought-resistant, since sources such as treated municipal wastewater continue to be available during periods of water shortage. Reclamation provides grant funding through the Title XVI Water Reclamation and Reuse Program (Title XVI) for projects that reclaim and reuse wastewater and impaired ground and surface water. Since 1992, Reclamation has allocated more than $761 million in Title XVI Program funding. This funding, along with non-Federal cost-shares, has resulted in more than $3.4 billion in total investments in reuse projects. Projects funded through this program delivered over 411,000 acre-feet of recycled water in 2019. For example, the El Paso Water Utilities Public Service Board, in Texas, is constructing the first large-scale, direct-to-distribution potable reuse project in the United States that will produce 13,000 acre-feet of water per year, saving surface and groundwater. This project is tentatively expected to be completed in 2028.

Potable Reuse

In California, the Pure Water Monterey Title XVI Project is expected to produce up to 8,200 acre-feet of water for a reliable, drought-resistant supply for communities in Monterey County. Existing water sources for the area are limited by extended droughts, habitat needs, and groundwater adjudication and overdraft. The Pure Water Monterey project includes collection and conveyance facilities and an advanced water treatment plant. The project will treat secondary effluent from a local wastewater treatment plant, municipal urban runoff, stormwater, and agricultural wash water. The treated water will be used to recharge the Seaside Groundwater basin, precluding seawater intrusion, and will be used as a drinking water source and for agricultural irrigation. The project will receive $19.6 million in Title XVI funding from FY2018 through FY2020, which will be leveraged with more than $59 million in non-Federal cost shares.

Recharge Benefits

Using Groundwater and Surface Water Connections to Manage Supplies

In addition to water conservation and reuse, managing ground and surface water conjunctively can also provide flexibility to prevent water shortages.

Conjunctive Management

Water can be stored underground. For example, in the Yakima River Basin, Reclamation is partnering with the Yakama Nation, irrigation districts, and the Washington Department of Ecology to evaluate diverting water from the Yakima River during the non-irrigation season into canals, allowing the water to seep and travel through the shallow aquifer back to the river to augment supplies in the late summer and fall.

Dry-Year Lease

Groundwater and surface water can be marketed to provide flexible supplies. For example, in the Upper Red and Upper Washita Basins in Oklahoma, ongoing basin studies are carefully evaluating conditions that best predict the onset of critical drought periods, which can inform voluntary “dry-year lease” agreements. Under a dry-year lease agreement, the owner of a surface water permit could pay a groundwater user to curtail pumping at specific times to protect the surface water right.

Hydropower Strategies

Decreased Production Challenges

As the second largest producer of hydroelectric power in the United States, Reclamation supplies 40 million megawatt-hours (MWh) of electricity each year on average. This hydropower is used to support water deliveries from Reclamation facilities and is marketed to power customers, providing revenues for project repayment. Hydropower production faces challenges from longer, more severe droughts and floods as well as changes to the timing of runoff. In some Western river basins, including the Colorado River and Upper Rio Grande Basins, lower flows and reservoir levels as well as higher water demands associated with climate change are anticipated to decrease hydropower production.

Water Reliability

Hydro Efficiency

Optimizing Hydropower Generation

Reclamation's hydropower decision support tool, HydrOS, uses innovative algorithms to maximize powerplant output, given water input. Thus, Reclamation powerplants need less water to meet power output requirements, conserving water. Between FY2013 and FY2019, HydrOS was deployed at four Reclamation facilities: three control centers (Black Canyon in Idaho, Casper in Wyoming, and Glen Canyon in Nevada) and one stand-alone powerplant (Elephant Butte in New Mexico). HydrOS has improved plant efficiencies by 1.75 percent, on average, equating to over 100,000 MWh in incremental generation in FY2019. In FY2020, Reclamation deployed HydrOS at our largest facility, Grand Coulee Dam west of Spokane, Washington.

Operational Monitoring

Maintaining Hydropower System Infrastructure

Hydropower turbines can be damaged when required to operate during flood and drought conditions. Machine Condition Monitoring (MCM) systems monitor equipment in real time, preventing wear and decreasing maintenance needs and costs by reducing the destructive operation of machinery during less than ideal conditions. Across Reclamation, 35 units now use this technology, and 39 more installations are planned. An MCM system analysis performed in 2019 found that investing almost $1 million resulted in $12 million in benefits — a twelve-fold return on investment.

Habitat, Ecosystems, and Recreation Strategies

ESA Collaboration

Understanding Hydrology to Protect Endangered Species and Habitat

Collaboration and transparency are critical to the success of Reclamation's efforts to support Endangered Species Act-listed species and habitat. A common understanding of the hydrology can provide a vital foundation for habitat conservation. For example, a water system operations model developed for the *Upper Deschutes Basin Study* in Oregon provided a basis for more specific analyses conducted to inform the Habitat Conservation Plan that has recently been developed for the basin. As a result of work done in the basin study to create scenarios of current and future conditions — and improved working relationships developed during those efforts — stakeholders in the planning process started with a common understanding about water operations in the basin. This shared understanding has helped different basin interests work toward strategies to improve streamflow for ecosystem benefits while also recognizing the challenges facing irrigated agriculture.

Demand Management

Managing for Competing Uses

Reclamation and our partners have developed creative approaches on the Rio Grande to address competing demands for water by irrigators and for Endangered Species Act-listed species, such as the silvery minnow. To mimic the flow pulses that historically occurred naturally on the Rio Grande, Reclamation works with water management partners — including the Army Corps, the State of New Mexico, irrigation districts, Tribes, and municipalities — to engineer pulses that create overbank flows in key river reaches to support the spawning of the endangered Rio Grande silvery minnow, without significant impact to irrigators. In extremely low snowmelt runoff years, such as 2020, Reclamation and the Middle Rio Grande Conservancy District cooperate to use the irrigation diversion structures along the river to pass flow pulses through the Middle Rio Grande. These innovative water operations support silvery minnow spawns in the river and allow biologists to capture eggs to raise in hatcheries so that minnows can be released back to the river during better flow conditions.

Watershed Management

Working Together with Watershed Groups

Reclamation's Cooperative Watershed Management Program (CWMP) supports watershed groups to encourage diverse stakeholders to form local solutions for water management. Since 2012, Reclamation has provided $7.7 million in Federal funding to support 85 projects by watershed groups to conduct watershed group development, watershed restoration planning, and watershed management project design. These restoration plans cover 200,000 square miles of watershed area. Reclamation has also provided funding for on-the-ground watershed management projects, representing $2.4 million in collaboratively developed watershed management solutions, including non-Federal cost share contributions.

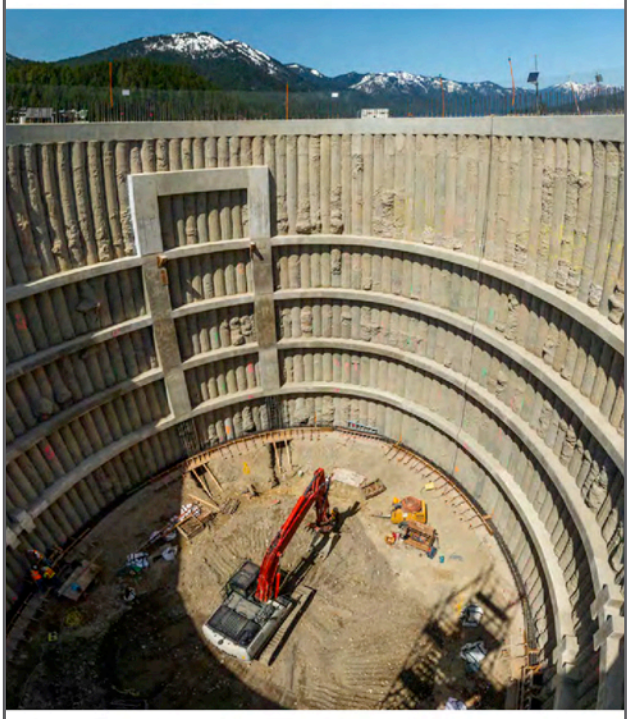
Fish Passage

Protecting Fish through Infrastructure Improvements

Reclamation is improving fish passage to help protect fish as potential increases in temperature and decreases in summer streamflow create challenging conditions. These efforts include the Nation's largest horizontal fish screen, completed in September 2020 at Derby Dam near Reno, Nevada. The $34-million fish screen is a critical investment to modernize the dam to provide reliable water supplies for irrigation customers and restore historic spawning habitat for the threatened Lahontan cutthroat trout.

An innovative helix fish passage design, similar to the spiral ramp in a parking garage is now being installed at Cle Elum Dam in the Yakima Basin in Washington. The new structure will provide permanent fish passage at the facility and support the reintroduction of sockeye that the Yakama Nation and Washington Department of Fish and Wildlife are leading.

New horizontal fish screens at Derby Dam. The dam is part of Reclamation's Newlands Project and is 115 years old. It was one of the first Reclamation projects approved for construction and is part of a system that provides water to 57,000 acres of cropland in the Lahontan Valley in western Nevada.



Panoramic view of the secant at Cle Elum Dam, Washington State. The secant is a very large oval-shaped hole that is stabilized by a concrete wall. It was built in preparation to construct the helix fish passage structure.

Managing for Recreation Uses

Reclamation manages almost eight million acres of land and water, most of which is available for public outdoor recreation, and hosts over 240 developed recreation areas. It is estimated that Reclamation's recreation areas draw more than 45 million visits annually, supporting local economies. In FY2019, Reclamation had a direct economic contribution of $2.26 billion to the recreation sector and a total economic contribution of $5.22 billion, including supporting 35,000 domestic jobs (DOI 2020).

Reduced reservoir levels and river flows could have negative implications for these recreational activities. Reclamation is adjusting to changes by providing adaptable recreation infrastructure.

Risk Management Strategies

Addressing Drought Risks

Proactively preparing for and better understanding drought risks are strategies that can build resilience as the severity, duration, and frequency of drought increases. Severe droughts can last decades, like the one in the Colorado River Basin, where a historic drought has continued since 2000. Reclamation's September 2020 modeling results indicate increased likelihood of reaching the first ever declared shortage conditions in the Lower Colorado River Basin before 2025 if the drought persists.

Planning for Drought

In recent years, Washington State has had record low snowpack followed by hot, dry summers resulting in "snowpack droughts" which pose challenging conditions for communities, farms, and the environment. After the most extreme drought in recent decades, the Washington State Department of Ecology updated its 1992 Washington State Drought Contingency Plan under the WaterSMART Drought Response Program in 2018. This new drought framework prioritizes early action before water supplies reach critical levels and identifies multiple drought indicators. Historically, reliance on the State's legal definition of drought limited agencies from taking certain actions until water supplies were less than 75 percent of normal. In the spring of 2020, the Washington State Legislature adopted several of the key recommendations from the drought plan into State law. This new two-stage drought system allows Washington State to issue a drought advisory when water supply conditions are below normal but not yet at a level where hardship is anticipated.

Increasing Reservoir Operations Flexibility to Respond to Drought

The *Washita Reservoir Operations Pilot Study* (2018) demonstrates how climate projections and paleohydrology can support more flexible reservoir operations for drought management. In the Washita pilot study, Reclamation developed reservoir inflow reconstructions going back 600 years to capture past wet and dry cycles for Foss and Fort Cobb Reservoirs in Oklahoma. The analysis showed that the drought scenarios based on tree-ring reconstructions were more severe than scenarios based on the observed droughts over the 90-year period of record — meaning that the actual risks of drought were greater than previously understood. With stakeholder input, Reclamation selected several drought scenarios based on this analysis to provide benchmarks for real-time delivery of municipal and industrial water supplies during drought.

Incorporating Climate Change into Dam Safety Assessments

Because the risk of dam failure often depends on the risk of flooding, appropriately characterizing the probabilities of extreme floods is crucial. Based on the results of a 2015 Reclamation Dam Safety Office pilot study for Friant Dam in California that explored the potential impacts of climate change, a supplementary climate change analysis is now included in the flood hazard section of dam safety review reports. This analysis includes a summary of the projected monthly and annual streamflow changes for each Reclamation facility, developed from historical and future streamflow projections based on downscaled climate change information.

Water Reliability

Infrastructure Degradation

Investigating How Drought Impacts Infrastructure

Extended periods of low reservoir levels can lead to increased animal burrowing into certain dams and earthen embankments. Increased drying and freeze-thaw cycles can also harm dams. Reclamation is reviewing its entire inventory of dams to identify infrastructure degradation after periods of extended reservoir drawdowns and to formulate strategies to improve drought resiliency.

Wildfire Sedimentation

Managing Risks from Increasing Wildfire

Over the past 20 years, the size and severity of wildland fires in the West have markedly increased. Post-fire debris flow and sedimentation from upstream fires can have adverse and costly impacts to Reclamation's existing infrastructure and reservoir storage capacity. A recent USGS report projected that increases in the frequency and magnitude of wildfires will significantly increase rates of sedimentation in watersheds in the West within the next 33 years. In almost nine out of ten of the watersheds assessed by the USGS, sedimentation could increase by at least ten percent. In some watersheds, erosion and sedimentation could increase by 1,000 percent (Sankey et al. 2017).

GIS Mapping

Reclamation is developing geographic information system (GIS)-based mapping tools to provide information in real-time about the proximity of fires to Reclamation infrastructure. A West-wide map was developed in the summer of 2020 to assess risk during an unprecedented season of wildfires in the West. In Reclamation's Columbia-Pacific Northwest Region, more detailed mapping is underway that, once completed, will display near real-time national fire perimeters, satellite heat signatures, and detailed asset and lands information (mapped jurisdictional lands, restoration sites, bridges, etc.). This map will help staff quickly identify potential impacts to our infrastructure, including post-fire sediment influx.

Next Steps

Looking forward to the next *SECURE Water Act Report* in 2026, Reclamation will focus on expanding the analysis to include new sets of information to inform water management in the West.

Pluvial Periods

Reclamation will perform a deeper analysis of pluvial (wet) periods based on the paleohydrology data sets developed for this report. Additionally, the impacts of climate change to ecological resiliency and groundwater recharge and discharge can be analyzed to better understand how these impacts can be addressed.

Decision Support Tools

Current efforts by Reclamation to develop common datasets and to make data, methodologies, and decision support tools more widely accessible across Reclamation will inform and benefit future efforts. Through the Reclamation Information Sharing Environment (website below), rolled out in 2020, Reclamation has made a selection of our water related data available in open formats online and has created a centralized data portal with query tools and downloadable data. Reclamation also works through the AgriMet program to maintain a cooperative network of agricultural-based weather stations across the West, providing crop consumptive water use data to a variety of users to support efficient irrigation practices.

Geospatial Data

A new GIS program established in 2019 will make Reclamation's geospatial data more accessible through a centralized data portal. Similarly, a new Internal Applied Science Program is funding new modeling, forecasting, and decision support tools. Improving the consistency and availability of data across Reclamation will improve our ability to assess climate change risks and impacts across the West. Reclamation also recognizes the need to explore alternative planning paradigms to consider decision-making under deep uncertainty.

The many collaborative efforts included in this report are the result of work performed by a vast network of Reclamation offices; non-Federal customers, stakeholders, and partners; and Federal agency partners. Sharing this information with Congress and the public serves as an opportunity to showcase products, tools, and information that can benefit Reclamation and our collaborators to help us be more prepared to face the challenges of tomorrow together.

For Additional Information:

Reclamation Websites

Climate Change: www.usbr.gov/climate
Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections: https://gdo-dcp.ucllnl.org
Hydropower Program: www.usbr.gov/power
Reclamation Information Sharing Environment: https://data.usbr.gov
Reservoir Operations Pilots: www.usbr.gov/watersmart/pilots
WaterSMART Basin Studies: www.usbr.gov/watersmart/bsp

Reclamation's "*2021 West-Wide Climate and Hydrology Assessment*" (*2021 Assessment*) will be available in March on Reclamation's SECURE Water Act website: www.usbr.gov/climate/secure.

Tribal Litigation

TRIBAL WATER RIGHTS LITIGATION

LEGAL TENETS UPHOLD TRIBAL WATER RIGHTS / MORE LITIGATION LOOMING

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Introduction

Tribal water rights are governed by federal law and tend to be high priority, often placing them in direct conflict with non-Indian, state law rights. Yet, over the last several decades, federal appellate decisions addressing tribal water rights have been surprisingly scarce. As the impacts of climate change and drought place stress on water resources in the west, it is inevitable that litigation involving tribal water rights will become more frequent. Two recent federal appellate court decisions, *Baley v. United States*, 942 F.3d 1213 (Fed. Cir. 2019), and *United States v. Abouselman*, 976 F.3d 1146 (10th Cir. 2020), involve conflicts between holders of state law water rights and tribes. These two recent decisions, both resolved in favor of the tribal litigants, uphold long-standing, but rarely tested legal tenets governing tribal water rights.

Scarce Appellate Decisions

The Basis for Tribal Rights to Water

Aboriginal Title

Indian tribes can derive water rights both through aboriginal title and from formal actions by the United States, such as by agreement, through a treaty, or through Executive Orders establishing tribal reservations. Aboriginal title "refers to land claimed by a tribe by virtue of its possession and exercise of sovereignty rather than by virtue of letters of patent or any formal conveyance." 1 Cohen's Handbook of Federal Indian Law § 15.04 (2019). Aboriginal title is "considered as sacred as the fee simple of the whites." *Mitchel v. United States*, 34 U.S. (9 Pet.) 711, 745, 9 L.Ed. 283 (1835). Importantly, aboriginal rights are not a grant of rights to tribes, but a reservation of rights already possessed. *United States v. Winans*, 198 U.S. 371 (1905). Only the United States can extinguish aboriginal title. *U.S. v. Adair*, 723 F.2d 1394 (9th Cir. 1983).

Federal Reserved Rights

In addition to their aboriginal rights, many tribes have federal reserved water rights. It is settled federal law that when the United States created Indian reservations, whether by Executive Order, act of Congress, or treaty, it impliedly reserved water rights necessary to fulfill the purposes of those reservations. This principle, commonly referred to as the *Winters* doctrine, was first established in the foundational case of *Winters v. United States*, 207 U.S. 564 (1908), and it has been applied and affirmed consistently and repeatedly for more than a century. *See*, *e.g., Cappaert v. United States*, 426 U.S. 128, 138-143 (1976); *Arizona v. California*, 373 U.S. 546, 598-600 (1963); and *Colville Confederated Tribes v. Walton*, 752 F.2d 397 (9th Cir. 1985).

Winters Rights

Winters involved water rights associated with the Fort Belknap Indian Reservation, which was established by the United States in 1888 as "a permanent home and abiding place" for certain Indians in Montana. *Winters*, 207 U.S. at 565. Portions of the Fort Belknap Reservation — those lying near the Milk River, which served as the Reservation's northern boundary — were suitable for pasturing stock and were used for that purpose from the time of the Reservation's establishment. *Id*. at 566. Other parts of the Reservation were potentially suitable for agriculture, but those lands were "of dry and arid character, and, in order to make them productive, require[d] large quantities of water for the purpose of irrigating them." *Id*. To make use of that land, Indians living on the Fort Belknap Reservation began in 1898 — well after the Reservation's establishment — to divert water from the Milk River to irrigate roughly 30,000 acres. *Id*. While the Indians of the Fort Belknap Reservation were not diverting the entire flow of the Milk River, both they and the United States contended that "all of the waters of the river [we]re necessary for…the purposes for which the reservation was created." *Id*. at 567. Accordingly, when upstream parties began diverting water from the river, the United States sued to enjoin their interference with its and the Indians' water rights. *Id*. In response, the defendants argued that: (1) they had acquired valid, state law riparian rights to the waters of the Milk River after the creation of the Fort Belknap Reservation by diverting water from the river before the Indians began doing so; (2) their rights were thus senior and superior to any rights held by the Indians; (3) other springs and streams were available within the Reservation to supply the Indians' needs; and (4) a ruling in favor of the United States would render the defendants' lands valueless and destroy communities of "thousands of people," thereby defeating the government's purpose in opening the lands upstream of the Reservation for public settlement. *Id*. at 568-570.

Reservation Purposes

Non-Indian Assertions

Federal Policy

The *Winters* Court rejected all of the defendants' arguments. It observed that the Reservation was but a small part of a much larger area previously occupied by the "nomadic and uncivilized" Indians, and that "it was the policy of the government…to change those habits and [for the Indians] to become a pastoral

Tribal Litigation

Nonuse Rejected

Permanent Reservation

***Winters* Doctrine**

Future Needs

Key Principles

Non-Consumptive Rights

Permanence & Geographic Scope

and civilized people." *Id*. at 576. The Supreme Court (Court) further recognized that, in order to become a "pastoral … people" on a small fraction of their traditional lands, the Indians would need to take up agriculture on lands that "were arid, and, without irrigation, were practically valueless." *Id*. Finally, with respect to the defendants' argument that the Indians had lost any rights to Milk River water through nonuse and should have to rely on other springs and streams within their Reservation for water, the Court squarely rejected the notion that the defendants' state law riparian rights could ever trump the federal reservation of rights. *Id*. at 577 ("The power of the government to reserve the waters and exempt them from appropriation under the state laws is not denied, and could not be." (citations omitted)).

In light of these facts and legal tenets, the Court held that the Indians of the Fort Belknap Reservation retained rights to the waters of the Milk River to the extent necessary to irrigate their reservation and that those rights were reserved and held by the United States as of the date of the Reservation's establishment "for a use which would be necessarily continued through years." *Id*. at 576-577. This principle — that a federal reservation of lands impliedly includes the immediate and permanent reservation of water rights in an amount necessary to accomplish the reservation's purpose — is now known as the *Winters* doctrine.

The Supreme Court reaffirmed the *Winters* doctrine 55 years later in the landmark case of *Arizona v. California*. There, the Court considered various parties' rights to the water of the Colorado River, including the United States' assertion of *Winters* rights on behalf of five tribes in Arizona, California, and Nevada. *Arizona*, 373 U.S. at 595-596. Over numerous objections by the State of Arizona, the Supreme Court affirmed a Special Master's determination "as a matter of fact and law that when the United States created these reservations or added to them, it reserved not only land but also the use of enough water from the Colorado [River] to irrigate the irrigable portions of the reserved lands." *Id*. at 596.

The *Arizona* Court found it "impossible to believe" that the President would have created Indian reservations "unaware that most of the lands were of the desert kind — hot, scorching sands — and that water from the river would be essential to the life of the Indian people…and the crops they raised." *Id*. at 599. Accordingly, the Court held that "the United States did reserve the water rights for the Indians effective as of the time the Indian Reservations were created" and that "the water was intended to satisfy the future as well as the present needs of the Indian Reservations." *Id*. at 600. Emphasizing that the reserved rights must take into account both the contemporaneous and future needs of the reservations, the Court finally concluded that water was reserved in an amount sufficient "to irrigate all of the practicably irrigable acreage on the reservations." *Id*. Arizona thus clarified and reinforced both the applicability and the application of the *Winters* doctrine as a means of ensuring that Indian reservations include a permanent right to adequate water supplies for all of their present and future needs.

Subsequent judicial decisions have clarified and reaffirmed key legal principles of the *Winters* doctrine and *Winters* rights. The doctrine's central tenets include: (a) it is a doctrine of federal law, and neither it nor water rights that it recognizes are subject to or preempted by state law; (b) it creates immediately and fully vested, permanent rights in water sufficient to supply a reservation's current and future needs; (c) the rights that it creates are not dependent upon whether or how a tribe was using water at the time of the reservation and cannot be lost by nonuse; and (d) it applies to all available and appurtenant sources of water, including groundwater. *See Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water District*, 849 F.3d 1262 (9th Cir. 2017).

Some tribes also possess non-consumptive rights entitling them to prevent other appropriators from depletion of streams. Rather than a right to withdraw water from the stream for agricultural, industrial, or other consumptive uses (absent independent consumptive rights), the entitlement consists of the right to prevent other appropriators from depleting the stream's waters below a protected level in any area where the non-consumptive right applies. *See, e.g., U.S. v. Adair*, 723 F.2d 1394 (9th Cir. 1983).

Tribal Instream Flow Rights

Non-consumptive tribal water rights were in the spotlight recently in late 2019, when the Federal Circuit Court of Appeals decided *Baley v. United States*, 942 F.3d 1213 (Fed. Cir. 2019). Specifically, *Baley* involved the interplay of tribal and state-law based rights in the context of the United States' administration of the Klamath River Basin project. The decision was a favorable one for tribes, addressing both the permanent nature and extensive geographic scope of *Winters* rights as well as the United States' role as both administrator of non-Indian water rights and as trustee of tribal water rights.

Baley involves the Klamath River Basin reclamation project (Klamath Project) which straddles the southern Oregon and northern California borders. Project water is stored in the Upper Klamath Lake in Oregon and then diverted into the Klamath River, which flows from Oregon to California. The US Bureau of Reclamation (Reclamation) manages and operates the Project, which supplies water to approximately 200,000 acres of agricultural land.

Tribal Litigation

Tribal Trust

Depletion Protection

ESA Obligations

"Taking" Alleged

Irrigators' Argument

Tribal History

Scope of Tribal Rights

Preventing Depletion

Necessity of Water

Salmon Habitat

State Water Law

Reclamation also manages the Klamath Project to protect the tribal trust resources of Native American tribes, specifically, the Klamath Tribes situated in Oregon and the Yurok and the Hoopa Valley tribes in California, each of whom hold rights to take fish from water resources on their reservations. The tribes hold non-consumptive rights that enable them to prevent other appropriators from depleting the stream waters below a protected level in certain areas in order to protect the fish. The Klamath Tribes' fishing rights arise from an 1864 treaty that guaranteed them "the exclusive right of taking fish in the streams and lakes, included in said reservation." *Baley*, 942 F.3d at 1322. The Ninth Circuit Court of Appeals has held in a separate proceeding that the Klamath Tribes' water rights carry a priority date of time immemorial. *See Adair*, 723 F.2d 1394. The rights of the Yurok and Hoopa Valley tribes, both located in California, were secured by presidential executive orders setting aside their reservations in the late 1800s. *Baley*, 942 F.3d at 1323. Federal and state courts have recognized the rights of the Yurok and Hoopa Valley Tribes to take fish from the Klamath River, but the tribes' rights have never been adjudicated and quantified. *Id*.

In 2001, Reclamation temporarily halted water deliveries to farmers and irrigation districts to meet the requirements of the federal Endangered Species Act (ESA) and to meet its tribal trust obligations, specifically to prevent junior appropriators from withdrawing water from the Klamath River in amounts that would cause the endangerment and extinction of the Lost River and short nose suckers and Southern Oregon Northern California Coast coho salmon, which are of importance to the tribes. In October 2001, fourteen irrigation organizations and thirteen individual farmers (the irrigators) filed suit in the United States Court of Federal Claims alleging that Reclamation's action in temporarily halting their water deliveries constituted a "taking" of their water rights without just compensation in violation of the Fifth Amendment of the United States Constitution. The Court of Federal Claims held that while the plaintiffs had cognizable property interests for which they may seek compensation, those property interests were inferior to the Tribes' non-consumptive water rights — another, more senior property interest.

The irrigators made three main arguments on appeal. First, they argued that the tribes' "reasonable livelihood" or "moderate living" needs did not require that Reclamation halt water deliveries to the extent required to comply with the ESA. *Id*. at 1332. Relying upon *Washington v. Washington State Commercial Passenger Fishing Vessel Association*, 443 U.S. 658, 695 (1979), the irrigators asserted that the tribes' water rights only entitled them to catch what was adequate to support a "reasonable livelihood" or a moderate living. *Id*. They argued that the Klamath Tribes do not fish or use the suckers for any purpose today and that the Yurok and Hoopa tribes rely upon chinook salmon, not coho salmon. The Federal Circuit rejected this argument, pointing to the fact that these fish played an important part in the tribes' history. *Id*. at 1336. Moreover, at a bare minimum, the tribes' rights entitle them to the government's compliance with the ESA to avoid placing the existence of their important tribal resources in jeopardy. *Id*. at 1337.

Second, the irrigators contended that the tribes could not have senior rights in the Klamath Project water because their water rights were established before the Klamath Project existed. *Id*. at 1333. The irrigators argued that the Klamath Tribes' rights extend only to the water within their former reservation, which did not include Upper Klamath Lake. *Id*. With respect to the Yurok and Hoopa Valley tribes, the appellants contended that because the tribes' reservations are situated 200 miles downstream of Upper Klamath Lake, the Klamath project water is not "appurtenant" to their reservations as required by *Winters*. *Id*. at 1334.

The Court of Appeals disagreed. It explained that the Klamath Tribes have an implied right to water to the extent necessary for them to accomplish hunting, fishing, and gathering on the former reservation. *Id*. at 1337-38. This entitlement includes the right to prevent other appropriators from using water in a way that depletes adjoined water sources to a level that damages the habitat of the fish they have a right to take. *Id*. And even though the Klamath Project did not exist at the time of the treaty, Klamath Lake undoubtedly did, and the Klamath Tribes' water rights extended to it. *Id*. at 1338. The Court of Appeals further clarified that even if the Klamath Tribes' fishing rights were limited to streams and lakes on their former reservation, the water reserved for the Klamath Tribes is not limited. *Id*. The Court of Appeals explained that since the *Winters* doctrine is based on the necessity of water, water outside the Klamath Tribes' former reservation is necessary for the purposes of the tribes' reservation — to secure their traditional hunting and fishing lifestyles. *Id*. Likewise, the Court of Appeals did not view the distance between Upper Klamath Lake and the Yurok and Hoopa Valley Tribes' reservations to mean that the Klamath Project water is not subject to those tribes' reserved water rights. *Id*. at 1338-39. The Court of Appeals explained that while the fish may be taken by the members of the tribes on their reservations, the habitat of the coho salmon includes waters both downstream and upstream from the reservations. *Id*. at 1339.

Third, the irrigators argued that Reclamation should not have taken unilateral action with respect to curtailing deliveries of Project water, and instead should have sought a judicial determination of the water rights in conformance with state law. *Id*. at 1334. They further asserted that the Yurok and Hoopa Valley

Tribal Litigation

Federal Rights

Extinguishment of Rights

Aboriginal Water Rights

Sovereign Dominion

Extinguished?

Appeals Court Reverses

Title Persists

Intent to Extinguish

Established Legal Tenets

Tribes waived their water rights by not participating in the Oregon based state-law adjudication of the Klamath Basin. *Id*. The Court Appeals disagreed, citing well-established precedent that tribal water rights arising from federal reservations are federal water rights not governed by state law. *Id*. at 1340. Because the volume and scope of particular reserved rights are federal questions, there is no reason for a state adjudication to occur before federal reserved rights are recognized, nor any need for a federal reserved rights holder to subject its rights to state law determination. *Id*.

Aboriginal Rights to Water

The Tenth Circuit Court of Appeals recently addressed the situations under which a sovereign will be held to have extinguished tribal aboriginal rights. *United States v. Abouselman*, 976 F.2d 1146 (10th Cir. 2020), involves an allocation of water rights to the Jemez River in New Mexico among the Pueblos of Jemez, Santa Ana, and Zia (Pueblo Tribes), the United States, a coalition of water users, and New Mexico. Originating in federal district court in 1983, the case is being litigated in stages, with most of it remaining unresolved.

Following briefing by the parties on a variety of issues, the district court held that the Pueblo Tribes had aboriginal water rights, but that those rights were extinguished by Spain's assertion of sovereignty in the region in the 1500s. While the district court found that the Spanish government intended to extinguish the Pueblo Tribes' right to increase their use of public waters, it allowed the Pueblo Tribes to continue their existing water use and took no affirmative action to decrease the amount of water the Pueblo Tribes were using. The district court thus held that Spain's mere assertion of sovereign dominion over the right to use public waters adverse to the Pueblo Tribes' aboriginal rights was sufficient to extinguish the Pueblo Tribes' rights. Because this foundational legal issue was critical to the case, the parties jointly asked the trial court to certify the question for interlocutory appeal. [Editor's Note: Interlocutory appeal occurs when a legal ruling by a trial court is appealed to a higher court for determination, while other aspects of the case are still proceeding].

The Tenth Circuit described the issue before it as: "[W]hether the Pueblos' aboriginal water rights were extinguished by the imposition of Spanish authority without any affirmative act." *Id*. at 1150. In considering this issue, the Court of Appeals first provided an overview of Spanish sovereignty in the area in the 1500s. *Id*. at 1154-55. Spain arrived in the Jemez River Basin in 1598 holding the political theory that the Spanish crown exercised supreme power of the administration over certain kinds of resources, including public waters. *Id*. The Crown insisted on the principle that it had the right to intervene judicially to allocate water. *Id*. While it did not always call for an allocation of a water source, and never did so with respect to the Jemez River water used by the Pueblo Tribe, Spain typically called for Indian resources to be respected. *Id*. Therefore, the Court of Appeals agreed with the district court that the governments had not acted to reduce or modify the Pueblo Tribes' use of water. *Id*. at 1555.

Turning to the question of aboriginal title, the Tenth Circuit explained that a factual showing is typically necessary for a tribe to prove it has aboriginal title. A tribe must prove it had "actual, exclusive and continuous use and occupancy for a long time." *Id*. at 1556. No party challenged the finding that the Pueblo Tribes had aboriginal title in the Jemez River. *Id*.

Once established, aboriginal title persists until it is extinguished by a sovereign. Courts have long held that a sovereign can extinguish aboriginal title "by treaty, by the sword, by purchase, by the exercise of complete dominion adverse to the right of occupancy, or otherwise." *Id*. Further, the sovereign's intent to extinguish must be clear and unambiguous, with any doubt being resolved in favor of the maintaining aboriginal title. *Id*. The Tenth Circuit held that an intent to extinguish can only be found when there is "an affirmative sovereign action focused on a specific right that is held by an Indian tribe that was intended to, and did in fact, have a sufficient adverse impact on the right at issue." *Id*. at 1158 (citing examples such as by treaty, purchase, or congressional act). While Spain generally asserted the right to allocate water, it never exercised that right with respect to the Pueblos or otherwise expressed a clear and unequivocal intent to eliminate their aboriginal rights. *Id*. at 1160. Therefore, the Tenth Circuit held that Spain's generalized assertion of authority was insufficient to extinguish the Pueblo Tribes' aboriginal water rights. *Id*.

The Tenth Circuit's decision is consistent with the established legal tenets governing tribal rights, generally requiring a clear and equivocal intent to extinguish those rights. The requirement of an affirmative act by the sovereign while consistent with past decisions, heightens the requisite showing required for extinguishment. The Court explained its reasoning: "Without an affirmative adverse act, there is neither directed sovereign action nor consequences from that action from which a court may find a clear and plain indication that the sovereign intended to extinguish aboriginal title." *Id*. at 1159.

Tribal Litigation

Off-Reservation Water

Principles Threatened

"Settled Expectations"

Adjudication Issue

Conclusion

Both *Baley* and *Abouselman* uphold long-standing principles governing tribal water rights. *Baley* confirms that *Winters* rights are based on necessity of water and thus are not limited in geographic scope, so they may include water resources situated far from the reservations. It also confirms the long-standing principle that tribal water rights are governed by federal, not state law, and thus need not be adjudicated in a state proceeding to be protected. Similarly, *Abouselman* clarifies that a sovereign can indicate a clear and equivocal intent to extinguish aboriginal rights only through an affirmative act, arguably heightening the previously established standard.

Notwithstanding that these rulings favor tribal water rights, as demands on limited water resources continue to grow and expectations surrounding non-Indian tribal water rights are settled, efforts to undermine these long-established principles will likely continue. The dissenting opinion in *Abouselman*, for example, urges that with respect to quantification of the Pueblo Tribes' rights, the district court should carefully consider the "settled expectations" of other water users. *Abouselman*, 976 F.3d at 1163. In other words, while the aboriginal rights may not have been extinguished, the dissent suggests that they may have been modified based on the expectations of non-Indian water users, a concept that has never been applied in the context of tribal water rights. And after the Federal Circuit issued its opinion favoring tribal rights in *Baley*, the former Secretary of Interior formally opined that water stored in Upper Klamath Lake is in fact not available to the Hoopa Valley and Yurok Tribes until their rights are quantified, consistent with Oregon state law. This recent development appears to be directly contrary to Reclamation's prior operating principles with respect to tribal trust assets and the principles re-affirmed in *Baley*, and will likely result in further litigation.

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WATER BRIEFS

NPDES GUIDANCE **US**

POINT SOURCE TO GROUNDWATER

On January 14, EPA issued guidance that clarifies how the Supreme Court's *County of Maui v. Hawaii Wildlife Fund*, 140 S. Ct. 1462 (2020) (*Maui*), decision should be applied under the Section 402 NPDES permit program. This guidance will help clarify when a NPDES permit is necessary under the Clean Water Act. The Federal Register, however, noted that the "guidance does not have the force and effect of law and it does not bind the public in any way. By issuing this guidance, the Agency intends only to provide clarity to the public regarding existing requirements under the law or Agency policies." It is also difficult to say at this point if the guidance will change under the Biden Administration.

In its *Maui* decision, the Supreme Court held that a NPDES permit is required for a discharge of pollutants from a point source that reaches "waters of the United States" after traveling through groundwater if that discharge is the "functional equivalent of a direct discharge from the point source into navigable waters."

EPA's eight-page guidance places the "functional equivalent" analysis into context within the agency's NPDES permit program. The guidance reiterates the threshold conditions for triggering the requirement for a NPDES permit — an actual discharge of pollutants from a point source to a water of the United States.

The Supreme Court outlined a non-exclusive list of seven factors for consideration in the functional equivalent analysis: (1) transit time; (2) distance traveled; (3) nature of the material through which the pollutant travels; (4) extent to which the pollutant is diluted or chemically changed as it travels; (5) the amount of pollutant entering the navigable waters relative to the amount of the pollutant that leaves the point source; (6) the manner by or area in which the pollutant enters the navigable waters; and (7) the degree to which the pollution (at that point) has maintained its specific identity.

The guidance explained that "the Agency has identified an additional factor that may prove relevant and thus should be considered when performing a 'functional equivalent' analysis: the design and performance of the system or facility from which the pollutant is released." Guidance at 7.

EPA on page 3 of the Guidance explained its purpose. "This guidance provides EPA's guidance to assist the regulated community and permitting authorities with applying the *Maui* holding in existing CWA NPDES permit programs and authorized state programs. Importantly, the *Maui* decision did not change the overall statutory or regulatory structure of the NPDES permit program, and EPA cannot modify the NPDES program through guidance. *See* 40 CFR Parts 122-24. *Maui*, however, identified an additional analysis that should be conducted in certain factual scenarios to determine whether an NPDES permit is required. This guidance is intended to inform how the Court's 'functional equivalent' analysis may be applied within the framework of the longstanding NPDES permit program. This guidance first reiterates the basic principles that govern whether a facility owner or operator may need an NPDES permit, and then identifies an additional factor that the regulated community and permitting authorities should consider when evaluating whether discharges of pollutants from point sources that travel through groundwater before reaching waters of the United States might require NPDES permit coverage."

For info: Federal Register Notice, Guidance Memorandum and Supreme Court's *Maui* decision are available at: www.epa.gov/npdes/releases-point-source-groundwater

24-MONTH STUDY **WEST**

COLORADO RIVER FORECAST

On January 15, the Bureau of Reclamation (Reclamation) issued its latest "24-Month Study," reporting a dire forecast for the Colorado River, which has put into action the Upper Basin Drought Contingency Plan (DCP) for the first time. Part of the Upper Basin DCP states that negotiations among Upper Basin states and the Department of Interior will commence once Lake Powell is projected to drop to a target elevation of 3,525 feet over the subsequent 24-month period.

The 24-Month Study of January 15th (pages 6-7) sets out what comes next due to the forecast. "Under the January minimum probable 24-Month Study, the January minimum probable forecast projects Lake Powell's water surface elevation to fall below 3,525 feet in 2022. This model result initiates enhanced monitoring and coordination under the Agreement for Drought Response Operations at the Initial Units of the Colorado River Storage Project Act (Drought Response Operations Agreement "DROA"). Notification went out to the Basin States (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming) and the Upper Colorado River Commission (UCRC) informing them of this event. This model result does not initiate operational changes to Reclamation facilities."

Monthly 24-Month Study reports present hydrologic descriptions and projected operations for the Colorado River system reservoirs for the next two years. The 24-Month Study Report is a combination of a write up of recent, current, and potential future operations and a listing of the 24-Month Study computer model output. The 24-Month Study computer model projects future reservoir conditions and potential dam operations for the system reservoirs given existing reservoir conditions; inflow forecasts and projections; and a variety of operational policies and guidelines. Monthly reservoir inflow forecasts and projections are produced by the National Weather Service, Colorado Basin River Forecast Center CBRFC).

The 24-Month Study model is updated at the beginning of each month upon receipt of the monthly inflow forecast from CBRFC. The CBRFC reservoir inflow forecasts extend from three to seven months based on the time of year. Values used in the model beyond that are based on historic statistical averages. For most months, the CBRFC reservoir inflow forecast

is only produced for the most probable (50% probability of exceedance), however, for the months of August, October, January and April minimum probable (90% exceedance) and maximum probable (10% exceedance) inflow forecasts are produced by CBRFC. For these months, minimum, most and maximum probable runs of the model are conducted producing a range of potential future reservoir conditions and operations.

The Study also noted how the Basin arrived at this point (p. 7): "Upper Colorado River Basin regularly experiences significant year to year hydrologic variability. During the 21-year period 2000 to 2020, however, the unregulated inflow to Lake Powell, which is a good measure of hydrologic conditions in the Colorado River Basin, was above average in only 4 out of the past 19 years. The period 2000-2020 is the lowest 21-year period since the closure of Glen Canyon Dam in 1963, with an average unregulated inflow of 8.62 maf, or 80 percent of the 30-year average (1981-2010)."

The Study laid out the parameters going forward. "The DROA coordination will continue until either (i) the minimum probable projected elevation remains above 3,525 feet for 24 months or (ii) the process moves to the next step when the most probable projected elevation indicates Powell elevations below 3,525 feet and a Drought Response Operations Plan is implemented." *Id*.

For info: 24-Month study of January 15 available at: www.usbr.gov/uc/water/crsp/studies/24Month_01.pdf

DAMS REMOVAL CA/OR

RESTORATION DESIGN - KLAMATH

Texas-based Resource Environmental Solutions (RES) and the Klamath River Renewal Corporation (KRRC) announced on January 29th that they have signed a contract for RES to provide restoration services in connection with the removal of four dams on the Klamath River. The agreement between RES and KRRC finalizes habitat restoration, maintenance, and liability transfer responsibilities for a fixed price, opening the door to a successful restoration of native vegetation and anadromous fish habitat along the historical, pre-dam path of the Klamath River.

The agreement confirms RES' role as lead restoration contractor. The design and management plans described in the agreement fulfill the stringent permitting criteria of regulatory agencies involved in the project, including the Federal Energy Regulatory Commission (FERC), fisheries agencies in California and Oregon, and the U.S. Army Corps of Engineers, according to RES.

"We are proud to have RES as our partner in accomplishing our shared vision of a renewed river system," said Mark Bransom, CEO of the Klamath River Renewal Corporation. "Restoration is not some small task tagged on to a dam removal project. Extensively treating the thousands of acres in the project footprint following dam deconstruction — from planting native vegetation and stabilizing soils to ensuring tributary connectivity and controlling invasive species — is vital to achieving our overarching goal of recovering declining fish populations. We selected RES because of their successful track record permitting thousands of projects, many at the landscape-level, creating rich, high-functioning ecosystems with each one."

The primary goal of the dam removal is reopening access to more than 400 miles of historical anadromous fish habitat, including critical spawning areas. Achieving that goal includes reconnecting tributaries to the Klamath River, and the restoration contract covers the design, construction, and long-term management of 18,000 feet of high-priority tributaries. It also includes revegetation of 2,200 acres of new ground set to be exposed once reservoirs behind the dams are drawn down. The restoration plan minimizes temporary impacts on landowners, agriculture, and recreational users of the river while accelerating its return to the full ecological functioning of historical times. As part of the contract, RES voluntarily assumes liability for the success of the ecological restoration, including responsibility for one of the project's primary post-dam removal challenges: the stabilization of sediment left behind after reservoirs are drawn down.

"Our vision for this project encompasses both RES' experience in restoration at scale, and the ecological knowledge of the Native American tribes whose culture and livelihood depend on a healthy river and salmon population," said Sam Burley, RES general counsel. "Part of our excitement about this project reflects our deep engagement with the Yurok, Karuk, and other Tribes. We believe it is critical to integrate their knowledge into our plan as we move to implement a shared vision of renewal for the Klamath River and the species and communities that depend on it."

For info: Dave Meurer, KRRC 530/941-3155 or dave@klamathrenewal.org; Gaye Denley, RES, 303/ 815-5211 or gdenley@res.us

ENFORCEMENT REPORT US EPA FY 2020

The EPA recently released "*EPA Enforcement Annual Report FY 2020*" which shows data on enforcement and compliance actions during fiscal year 2020, including information on criminal enforcement cases, civil enforcement results, Superfund actions, and its COVID response. The Report touts EPA's actions and compares them in many instances to previous year's actions.

"In FY 2020, EPA's enforcement and compliance assurance actions resulted in:

- Commitments to reduce, treat, or eliminate over 426 million pounds of pollution, the most in a single year since 2015.
- Proper treatment, minimization, or disposal of 1.6 billion pounds of hazardous and non-hazardous waste, more than in all but two of the past eight years.
- Clean up of 104 million cubic yards of contaminated soil and water, more

WATER BRIEFS

than in FY 2019.
- Prevention of 18.2 million pounds of air pollutants by preventing, reducing, treating, or eliminating emissions from vehicle and engine air sources through resolution of 31 civil enforcement cases for tampering and aftermarket defeat devices — the most for any one year in the agency's history.
- 247 new criminal cases opened, 77 more than in FY 2019 and the most since 2014.
- Superfund response and cash-out settlements of over $636 million for cleanup work, $65 million more than FY 2019, as well as $178.4 million for EPA's costs."

As far as criminal enforcement was concerned, "[I]n FY 2020, the criminal program opened 247 cases (146 since March 2020). In 89% of the criminal cases charged last year, an individual defendant was prosecuted, and those prosecutions generated a total 94% conviction rate."

EPA also laid out its civil enforcement results. "Despite tremendous challenges in FY 2020, EPA's enforcement program continued to bring impactful cases to return violators to compliance and protect human health and the environment. In FY 2020, EPA achieved:
- Commitments to reduce, treat, or eliminate over 426 million pounds of pollution.
- Proper treatment, minimization, or disposal of 1.6 billion pounds of hazardous and non-hazardous waste.
- Prevention of 18.2 million pounds of air pollutants by preventing, reducing, treating, or eliminating emissions from vehicles and engines.
- Commitments of more than $2.5 billion to return facilities to compliance.
- Assessment of nearly $160 million in penalties."

For info: Report available at: www.epa.gov/enforcement/ enforcement-annual-results-fiscal year-2020

SMALL-SCALE PROGRAM US WATER EFFICIENCY GRANTS

The Bureau of Reclamation has published a notice of funding opportunity for the WaterSMART Small-Scale Water Efficiency Projects. The notice of funding opportunity is available on grants.gov by searching for opportunity number R21AS00257. Applications are due on March 18, 2020, at 4 p.m. MDT.

Through the WaterSMART Small-Scale Water Efficiency Projects, Reclamation provides 50/50 cost share funding to irrigation and water districts, tribes, states and other entities with water or power delivery authority for small water efficiency improvements that have been identified through previous planning efforts. Projects eligible for funding include installation of flow measurement or automation in a specific part of a water delivery system, lining of a section of a canal to address seepage, or other similar projects that are limited in scope.

For info: www.usbr.gov/watersmart/swep/index.html

NASA CONTAMINATION US FINANCIAL LIABILITIES

The National Aeronautics and Space Administration's (NASA's) reported financial liabilities have grown and several factors contribute to future uncertainties, according to a General Accounting Office (GAO) report published January 15, 2021. Decades of NASA's research for space exploration relied on some chemicals that can be hazardous to human health and the environment. NASA's environmental liabilities estimate is reported annually in the agency's financial statement. Federal accounting standards require agencies responsible for contamination to estimate and report their future cleanup costs when they are both probable and reasonably estimable.

This report describes: (1) NASA's environmental liabilities for restoration projects from fiscal years 2014 to 2019 — the most recent data available; and (2) factors that could contribute to uncertainties in NASA's current or future environmental liabilities. GAO reviewed NASA financial statements, guidance, and other relevant reports and interviewed NASA officials from headquarters and three centers, selected because of changes in their reported liabilities.

GAO found that NASA estimated cleanup and restoration across the agency would cost $1.9 billion as of fiscal year 2020, up from $1.7 billion in fiscal year 2019. This reflects an increase of $724 million, or 61%, from 2014. NASA identified contamination at 14 centers around the country with hazardous chemicals that require environmental cleanup and restoration, as of 2019. Five of the 14 centers decreased their environmental liabilities from 2014 to 2019, but liability growth at the other centers offset those decreases and contributed to a net increase in environmental liabilities. Santa Susana Field Laboratory, California, had about $502 million in environmental liabilities growth during this period. Nearly all this growth resulted from California soil cleanup requirements that NASA did not anticipate.

NASA's reported FY 2019 environmental liabilities estimate for restoration projects does not include certain costs, and some factors may affect NASA's future liabilities, potentially increasing or decreasing the agency's fiscal exposure. Certain costs are not included in the FY 2019 estimate because some projects are in a developing stage where NASA needs to gather more information to fully estimate cleanup costs. Further, NASA limits its restoration project estimates to 30 years, as the agency views anything beyond 30 years as not reasonably estimable. Sixty of NASA's 115 open restoration projects in FY 2019 are expected to last longer than 30 years.

NASA is assessing contamination of some chemicals it had not previously identified but does not yet know the impact of associated cleanup will have in part because standards for cleaning up these chemicals do not yet exist. New cleanup requirements for emerging contaminants could increase NASA's environmental liabilities and create

additional fiscal exposure. Additionally, NASA is committed, through an agreement with California, to clean soil at Santa Susana Field Laboratory to a certain standard, but the agency issued a decision in September 2020 to pursue a risk-based cleanup standard, which California has opposed. According to NASA, a risk-based cleanup standard at Santa Susana Field Laboratory could decrease NASA's environmental liabilities and reduce fiscal exposure by about $355 million.
For info: Allison Bawden, GAO, 202/ 512-3841 or bawdena@gao.gov; Report available at: www.gao.gov/products/GAO-21-205

UTILITY SHUTOFFS US
MORATORIA REDUCED COVID

Policies that helped financially struggling Americans stay in their homes and keep access to water and electricity during the COVID-19 pandemic also helped reduce the spread of the virus, according to an analysis by Duke University researchers. Eviction moratoria and relief from utility disconnections reduced COVID-19 cases by 8.2% from the onset of the pandemic through the end of November 2020, the authors found. The findings were published as a National Bureau of Economic Research working paper. "*Housing Precarity & the COVID-19 Pandemic: Impacts of Utility Disconnection and Eviction Moratoria on Infections and Deaths Across US Counties*," Kay Jowers, Christopher Timmins, Nrupen Bhavsar, Qihui Hu & Julia Marshall (Jan. 25, 2021), National Bureau of Economic Research. DOI: 10.3386/w28394.

President Biden signed an executive order on his first day in office extending the federal eviction moratorium through March 31, 2021. The relief package he unveiled last week calls on Congress to further extend the moratorium through September 30. President Biden has proposed a $1.9 trillion relief package to provide rental and utility assistance for those hardest hit by the pandemic's economic fallout.

The analysis utilized daily reports of confirmed COVID-19 infections in each of the US' 3,141 counties from March 1 to November 28, 2020. Controlling for demographic, health, and environmental factors, the interdisciplinary research team examined how the number of cases and deaths from COVID-19 was affected by policies intended to prevent evictions or shutoff of essential services such as water and electricity. The authors focused on the effects of local eviction and utility disconnection moratoria. Even after accounting for varied federal- and state-level interventions, local eviction moratoria reduced the number of COVID-19 cases by 3.8% and COVID-related deaths by 11%, the authors found. Utility disconnection moratoria reduced cases by 4.4% and deaths by 7.4%.

Both types of measures have varied widely in duration and scope, often being introduced late in the pandemic. If such measures had been implemented nationwide on March 1, 2020, eviction moratoria would have resulted in a 14.2% decrease in cases and a decrease in deaths as high as 40.7%, the authors found. Utility shutoff moratoria would have cut infections by 8.7% and deaths by 14.8%.
For info: Study available at: www.nber.org/papers/w28394

PESTICIDES US
USGS PESTICIDES IN GROUNDWATER RESEARCH

The US Geological Survey (USGS) recently published research on pesticide concentrations in groundwater used for public water supply. They frequently found evidence of the chemicals, especially in shallow wells, but in low concentrations.

This is the first assessment of groundwater from public-supply wells across the United States to analyze for >100 pesticide degradates and to provide human-health context for degradates without benchmarks. Samples from 1204 wells in aquifers representing 70% of the volume pumped for drinking supply were analyzed for 109 pesticides (active ingredients) and 116 degradates. Among the 41% of wells where pesticide compounds were detected, nearly two-thirds contained compound mixtures and three-quarters contained degradates. Atrazine, hexazinone, prometon, tebuthiuron, four atrazine degradates, and one metolachlor degradate were each detected in >5% of wells. Detection frequencies were largest for aquifers with more shallow, unconfined wells producing modern-age groundwater.
For info: Research at https://pus.acs.org/doi/10.1021/acs.est.0c05793

SEDIMENT CLEANUP WA
SEATTLE RIVER CLEANUP PROPOSAL ONLINE INFO FB 17TH

The Lower Duwamish Waterway Superfund site is a five-mile segment of Seattle's only river, the Duwamish. The river flows between the neighborhoods of South Park and Georgetown and through the industrial core of Seattle into Elliott Bay. Because of past industrial and other processes there are high levels of chemicals in the river sediments, water, and fish. These contaminants pose a risk to the environment and to people's health, especially for those who eat resident fish from the waterway. In 2014 the US Environmental Protection Agency (EPA) issued a final cleanup plan for 411 acres of contaminated Waterway sediments.

Along with PCBs, dioxins/furans, arsenic, and other contaminants, cPAHs are targeted for cleanup in the Lower Duwamish Waterway. EPA is proposing changes to the cPAH levels in the cleanup plan to incorporate updated health risk information. These changes are described in a proposed Explanation of Significant Differences (ESD).

The chemical benzo(a)pyrene (BaP) is one of seven carcinogenic polycyclic aromatic hydrocarbons (cPAHs). In 2017 EPA scientists finalized an update to the 1987 health risk information for BaP following extensive technical review. The update indicated that the cancer risk associated with BaP is less than previous estimates.

The proposed ESD is available for review and comment until March 8, 2021. EPA will present information, and answer questions, about the proposed ESD at an online community meeting on February 17, 2021 from 5:30 – 7:00 PM (https://zoom.us/j/362818756; Meeting ID: 362 818 756).
For info: EPA Lower Duwamish website: www.epa.gov/superfund/lower-duwamish

CALENDAR

February 17 WEB
Putting and End to PFAS – Emerging Technologies: PFAS Destruction Systems With No Toxic Byproducts, Northwest Environmental Business Council Event. For info: www.nebc.org/event/

February 17 WEB
Cost-Benefit Analysis and the Environment - Virtual Event, 12:00 pm - 1:30 pm Eastern Time. Must Register by Feb. 15. For info: www.eli.org/events/cost-benefit-analysis-and-environment

February 18 WEB
Water Trust Wine Tasting - Virtual Tasting with Bookcliff Vineyards, Starting at 5 pm Mountain Time. Fundraiser Hosted by Colorado Water Trust. For info: Collin Hiew, 720/ 570-2897, chiew@coloradowatertrust.org or www.coloradowatertrust.org

February 18 WEB
Environmental Applications & Implications of Artificial Intelligence Workshop, 2:00 - 3:15 pm Eastern Time. Presented by Environmental Law Institute & GreenTech. For info: www.eli.org

February 18-19 WEB
Family Farm Alliance 2021 Annual Meeting: Bridge Over Trouble Water (Virtual Conference), 8 am - Noon Pacific Time. For info: www.familyfarmalliance.org/events/

February 19 WEB
The Future of Hydraulic Fracturing in the United States and Colorado - Zoom, 1:00 pm - 3:00 pm Mountain Standard Time. Presented by Colorado Local Science Engagement Network. For info: https://coloradolsen.quorum.us/event/7007/

February 22 WEB
Floodplain Regulation Development in Oregon & Washington Public Ports: Weekly Four Part Series Webinar, Remainder of Series: March 1, 8 & 15. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

February 22-25 WEB
International Erosion Control Association Annual Conference & Expo, For info: www.ieca.org

February 23 WEB
WIFIA Eligibility for Financing Webinar - Water Infrastructure Finance & Innovation Act, 2:00 pm - 3:30 pm Eastern Standard Time. Presented by EPA Office of Wastewater Management. For info: Arielle Gerstein, EPA, 202/ 566-1868 or wifia@epa.gov

February 23-24 WEB
10th Annual World Water-Tech Innovation Summit: "Aligning Digital Innovation with Strategic Vision", For info: https://worldwatertechinnovation.com

March 1 WEB
Floodplain Regulation Development in Oregon & Washington Public Ports: Weekly Four Part Series Webinar, Remainder of Series: March 8 & 15. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

March 4-5 OR & WEB
The Mighty Columbia Seminar, Portland. Hotel Monaco, 506 SW Washington Street. Available Via Live Webcast; PROMO Code SPP50 for $50 off for TWR Readers. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

March 5 OR
Oregon Association of Water Utilities Sunriver Conference 2021, Sunriver. Water Law Class Presentations. For info: www.water-law.com/coming-events/?event_id1=6495

March 8 WEB
Floodplain Regulation Development in Oregon & Washington Public Ports: Weekly Four Part Series Webinar, Remainder of Series: March 15. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

March 11-12 WEB
International Conference on Fresh Water Resources Management and Technology, World Academy of Science, Engineering & Technology Event. For info: https://waset.org

March 11-12 WEB
Law of the Colorado River. Legal Issues, Conservation, and Management of the Colorado River, For info: CLE International, 800/ 873-7130 or www.cle.com

March 15 WEB
Floodplain Regulation Development in Oregon & Washington Public Ports: Weekly Four Part Series Webinar, For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

March 15-25 WEB
36th Annual WateReuse Symposium, Virtual Conference. For info: https://watereuse.org/news-events/conferences/

March 16-17 WEB
Association of Metropolitan Water Agencies Annual Water Policy Conference: Legislative Plans - Inside the Biden Administration, For info: www.amwa.net/2021WPC

March 16-23 & 30 WEB
17th Western Boot Camp on Environmental Law - Virtual Event, Registration Deadline: For CLE, Register by 2/26. All Others, Register by March 2nd. Presented by the Environmental Law Institute: Three Day Immersion. For info: www.eli.org/boot-camp/western-bootcamp-environmental-law

March 17-18 VA
2021 Association of Clean Water Administrators Mid-Year Meeting, Alexandria. Hilton Alexandria Old Town. For info: www.acwa-us.org

March 18-19 MT
Real Estate & Land Use Law in Montana, Missoula. TBA. For info: The Seminar Group, 800/ 574-4852, info@theseminargroup.net or www.theseminargroup.net

March 23-26 TX
Western States Water Council Spring 2021 (195th) Meeting, El Paso. Hopes to Return to In-Person Meeting. For info: www.westernstateswater.org/upcoming-meetings/

March 31 WEB
Staying Ahead of PFAS Using AWWA's Drinking Water Treatment for PFAS Selection Guide Webinar, American Water Works Association Event. For info: www.awwa.org/Events-Education/Events-Calendar

April 1 WEB
Dam, Dam Go Away: Wild & Scenic Look at What That Means for Us Today - Webinar, Delaware River: Last of Four-Part Webinar. Presented by American Rivers & the Stroud Water Research Center. For info: Amy Kober, outreach@americanrivers.org

April 6-8 AZ
Arizona Water 2021 Conference & Exhibition, Phoenix. Phoenix Convention Center & Virtual Options. Presented by the Arizzona Water Association. For info: www.azwater.org/group/annualconference

April 6-8 WEB
The WaterNow Alliance Virtual Summit: Accelerating Sustainable Water Innovation to Build Safe, Healthy and Prosperous Communities, For info: https://waternow.org/event/waternow-alliance-summit/

April 7-8 DC
Council of Infrastructure Financing Authorities (CIFA) Water Infrastructure Summit, Washington. Hyatt Regency at Capitol Hill. RE: Clean Water and Drinking Water State Revolving Funds (SRFs), Public Finance Sector, Federal Government and Broader Water Community. For info: www.cifanet.org/conferences

The Water Report
Water Rights, Water Quality & Water Solutions in the West
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CALENDAR

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April 8-9 WEB
Project Management for Water and Wastewater Utilities Webinar: Defining & Closing a Project, For info: EUCI: www.euci.com/event_post/0421-water-project-management/

April 15-16 WEB
Interstate Council on Water Policy's 2021 Washington DC Roundtable - Virtual Event, 4/15: Noon - 3:30 pm Central Time; 4/16: 9 am - 12:30 pm CT. For info: www.icwp.org

April 19 WEB
12th National Water Quality Monitoring Conference - "Working Together for Clean Water", National Water Quality Monitoring Council Event. For info: www.nalms.org/2021nmc/