BAY AREA WATER SUPPLY AND CONSERVATION AGENCY
BOARD OF DIRECTORS MEETING

November 13, 2020

Correspondence and media coverage of interest between October 26, 2020 and November 9, 2020

Press Release

Date: October 26, 2020
Subject: Reclamation and partners synchronize Sacramento River water diversions to benefit salmon

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Article: California's climate agenda likely to get big boost from Biden – look for reversal of Trump policies

Date: November 9, 2020
Source: Water Management and Finance
Article: AMWA: Closely divided Congress complicates policy landscape for 2021

Date: October 26, 2020
Source: Institutional Investor
Article: California's Complex Water Market Faces New Challenges

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For Release: October 26, 2020

Reclamation and partners synchronize Sacramento River water diversions to benefit salmon

Calif. - Reclamation, working with the Sacramento River Settlement Contractors and federal and state fish and wildlife agencies, are implementing fall water operations to benefit salmon populations in the Sacramento River.

Reclamation is coordinating with the Sacramento River Settlement Contractors to voluntarily delay a portion of their water diversions from October 16-31 until November 1-23, allowing Reclamation to further reduce flows in the Sacramento River in mid-October. The delayed water diversions and corresponding early flow reductions are anticipated to prevent the dewatering of 2.2% of fall-run Chinook salmon redds (group of eggs in gravel nests), which is approximately 200 redds or 1 million eggs.

In turn, the revised schedule allows the Sacramento River Settlement Contractors to prolong the time period for rice decomposition in Sacramento Valley rice fields. Rice decomposition is an essential food source for Pacific Flyway waterfowl.

“This fall diversion schedule was coordinated in close collaboration with federal and state agencies as well as the Sacramento River Settlement Contractors; it highlights the importance of partnerships in water resource management,” said Regional Director Ernest Conant. “Reclamation greatly appreciates the teamwork and commitment necessary to act in real-time and deliver water in a manner that not only benefits fish and wildlife but also preserves cold water in Shasta Reservoir through the end of October for temperature requirements.”

The fall water operation is being implemented in accordance with the 2019 Biological Opinions for the Coordinated Operation of the Central Valley Project and State Water Project.

“I applaud the Sacramento River Settlement Contractors and our agency partners for developing this plan to quickly adapt to changing water conditions in a way that ensures efficient water supply management and benefits fish and wildlife habitat,” said Paul Souza, Regional Director of Fish and Wildlife Service's Pacific Southwest division. “This is truly a win-win situation.”

In addition to delaying water diversions to November for salmon populations, the Sacramento River Settlement Contractors are helping nearby National Wildlife Refuges. Water for Sacramento, Delevan, and Colusa National Wildlife Refuges is being delivered through the Glenn-Colusa Irrigation District facilities as birds migrate down the Pacific Flyway into the Sacramento Valley.

“The Sacramento River Settlement Contractors are fully committed to multi-benefit water management along the Sacramento River,” said President Roger Cornwell. “We appreciate the collaboration and coordination with Reclamation and the fishery agencies to carefully manage water for the benefit of both winter- and fall-run salmon as part of our salmon recovery efforts and to serve important water for birds along the Pacific Flyway.”

For additional information, call or email Reclamation Bay-Delta Office Manager, David Mooney at 916-414-2400; dmmooney@usbr.gov.

# # #

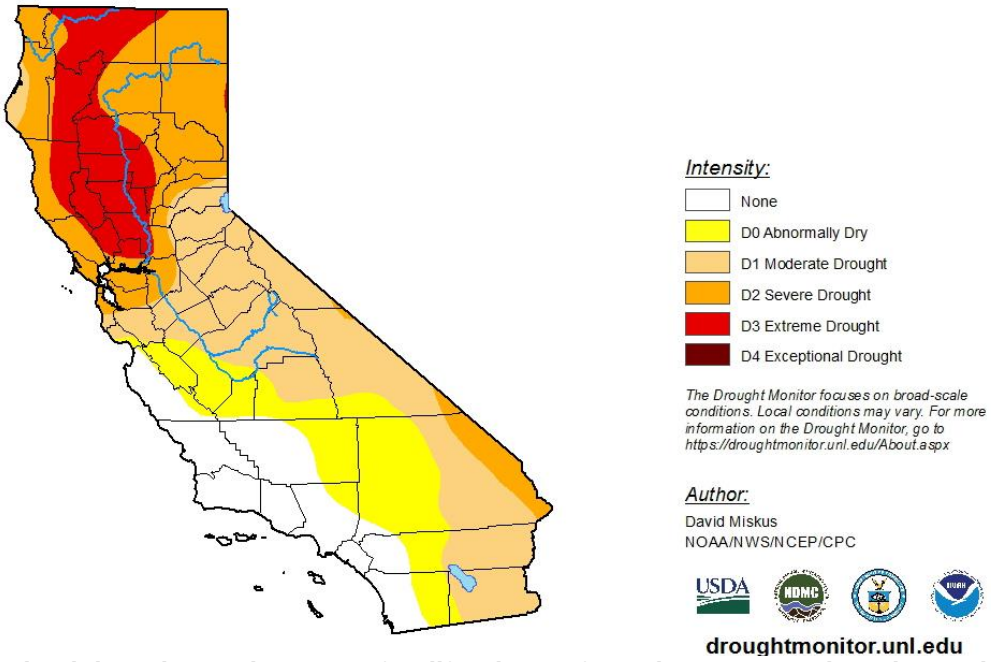
After Another Dry October, Have Water Worries Returned?
Bay Nature | November 2, 2020 | Eric Simons

The orange sky got more attention, but the relentless blue skies of October might portend longer-term consequences.

San Francisco has weather records stretching back to 1850. Only once in that time period has the city recorded 0.01 inches of rain or less back-to-back in the month of October, in 1965-1967, according to rainfall records kept by Jan Null of Golden Gate Weather. We've just tied that record. Downtown San Francisco recorded 0.01 inches of rain in October 2019 and again in October 2020; the weather station at the San Francisco airport, and several other stations around the Bay Area, have registered 0.00 back-to-back, according to the National Weather Service.

Though the monthly average is just over 1 inch, October is a highly variable month, and it's not unusual to end the month with little or no rain in the Bay Area. It is however exceptionally bad timing to do it twice in a row for only the second time in the last 170 years, as the state reels from fires, heat and smoke, on the heels of a record-breaking dry winter and as most forecasts call for a drier than normal winter ahead. And while there is an element of misfortune to this dry streak, University of Texas climate scientist Geeta Persad said climate change is also loading the dice, making extremely dry seasons and back-to-back dry autumns more probable.

"Yes, absolutely we'll have glorious years in the future," she said. "But when we think about the resilience our system has right now, we saw in the 2012-2016 drought it really only took the first two years for California to decide to pass the most comprehensive groundwater management law that had ever passed in California. It doesn't take many years of bad conditions where that type of transformative change is necessary."



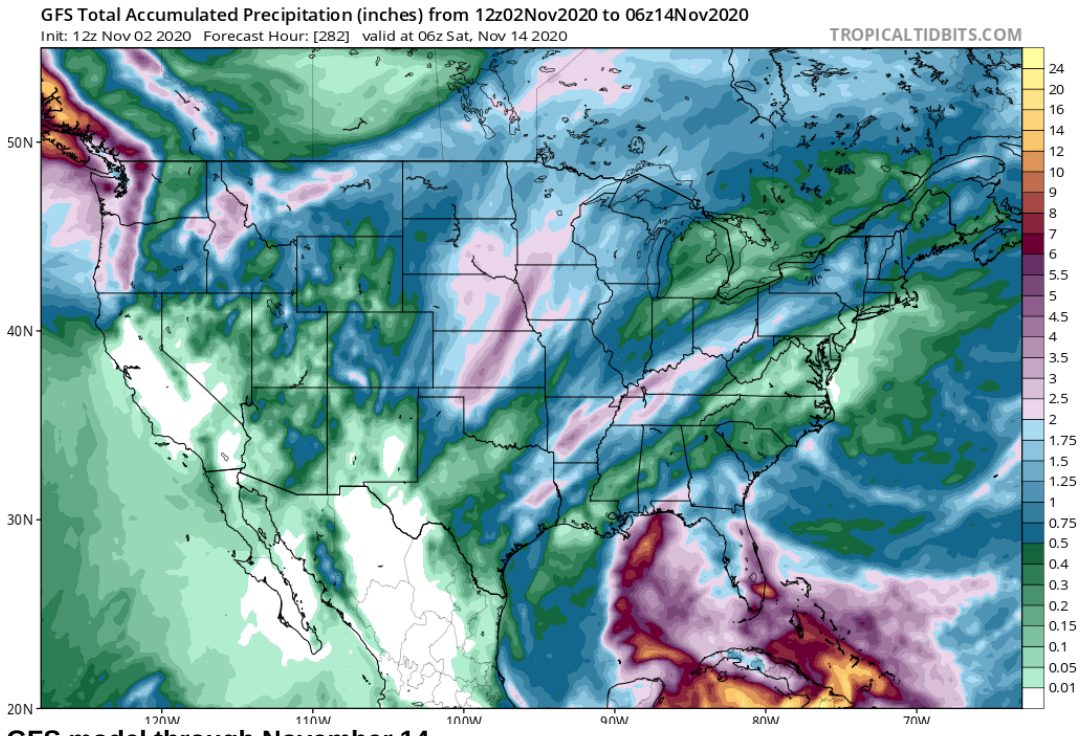
Federal drought monitor map of California as of October 29, 2020. (Map by David Miskus, NOAA / NWS / NCEP / CPC)

Persad was the lead author on a paper in the journal Climatic Change in March 2020 that used fine-scale models to look at how and when water is likely to fall in California in the future, and what that means for water supply. The paper found that management is based largely on overly broad models and outdated patterns that don't reflect the extremes headed our way. While water managers might appear prepared for variability because rain and snow in California has always been variable, Persad said future wet and dry swings are going to be more extreme than anything we've seen before.

Climate models show the timing and delivery of California precipitation shifting dramatically, with more very dry years, more water expected as rain as the climate warms, and more of it falling in the core winter months in massive superstorms. As a consequence reservoirs built to slowly capture water from snow might now lose water too rapidly in the heat, while rapidly overtopping and posing flood risks when the rain does fall. Evenly distributed rain that falls gradually over a six-month rainy season recharges groundwater in a way that all that rain falling in a handful of superstorms doesn't.

"We're used to having swings between dry and wet periods," Persad said. "We know we have a dry season and wet season. The population of the West Coast knows more about the phrase El Niño than people in the rest of the country. But just because we've had experience with those swings in the past does not mean we're prepared for the kinds of swings in the future."

While it's still too early to say what this winter will look like, most long-term projections call for it to be drier than average on the West Coast. Almost all of Northern California is already in severe or extreme drought, according to the federal drought monitor. And a dry winter this year could mean even more challenges for already stressed ecosystems and the people who rely on them.



GFS model through November 14

The National Centers for Environmental Prediction GFS model shows rain everywhere in the country except central California through November 14. (Image courtesy Tropical Tidbits)

Larger water systems will likely be fine this year, said Texas A&M postdoctoral research associate Amanda Fencl, who wrote her dissertation on California water management during the 2012-2016 drought. Most major water systems have 3-to-5-year drought plans, Fencl said, and at this point they'll mainly be just watching to see what unfolds this winter. As of November 1 the state's reservoirs are mostly between 70-100 percent of their average historic capacity.

"Most systems feel comfortable being able to weather a 3-5 year drought at this point, especially with the few wet seasons we've had," Fencl said. "It's really only year two that systems start to get extra nervous about whether drought is going to persist or not."

But smaller systems are more vulnerable more quickly, she said. That's especially true in the Central Valley, where Union of Concerned Scientists western states climate scientist Jose Pablo Ortiz Partida said one million people already don't have reliable access to drinking water.

Wells throughout the San Joaquin Valley went dry in the last drought and haven't recharged. Pacific Institute research associate Darcy Bostic said that in many communities that rely on wells, people are still drinking from interim tanks in their yards. And Ortiz added that it's not just water quantity but quality that's lacking — farmworkers often irrigate agricultural fields with water that's cleaner than what's in their wells at home.

"It's not only what is happening, but what already happened," Ortiz said. "We've been mining our aquifers, mainly for agriculture. It's like a bank account. We were lucky to start with a very high balance, but for many years we've been taking way more than the water that comes in and naturally recharges. It's already a problem, particularly in some places in the Central Valley. But it will definitely become a bigger problem in the future in California."

Fencl said that algal blooms in 2015 made it hard for water agencies to treat even the water coming out of reservoirs, and that no matter the size of the agency, in the peak of the drought their plans weren't sufficient for the impacts that arrived. She said she hopes this time around that relationships and blueprints developed in that crisis will make navigating this one easier. It's a "window of opportunity for innovation," she said, and the state could help by funding capital projects.

"It's to the state's collective benefit to think about what kind of infrastructure lift is needed so we're not drilling deeper wells during a drought," Fencl said. "[Now is the time to] think about water alternatives so they're not having to create technical solutions in the middle of a crisis."

Bostic agreed: the state should start preparing now.

"The state never has to wait for the drought to begin," she said. "So much of what I hope happens, happens before drought."

# # #

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Improving Water Resilience for Cities and Farms with Water Partnerships
PPIC | November 2, 2020 | Alvar Escriva-Bou

photo - California Aqueduct Running Along Almond Farms

The San Joaquin Valley and urban Southern California are worlds apart in many ways. Yet each face growing water challenges and a shared interest in ensuring reliable, affordable water supplies to safeguard their people and economies. Both regions' water futures could be more secure if they take advantage of shared water infrastructure to jointly develop and manage some water supplies.

In a new report, we explore partnership opportunities to boost water resilience in both regions. By creating more flexible supplies, such partnerships can help water agencies adapt to the changing conditions expected under climate change. By coordinating the location of infrastructure investments, partnerships can help bring water to where and when it is most needed, at least cost.

Specifically, we look at water co-investments and water sharing agreements that would enhance drought-year supplies in Southern California, while augmenting average water deliveries to the San Joaquin Valley to help address groundwater sustainability. Although we explore some new models for cooperation, the basic idea is not new.

Indeed, water partnerships are already being used by California's urban and agricultural communities to help manage droughts, growing water scarcity, and the high cost of water infrastructure. These partnerships often take advantage of the state's water grid—a network of surface and underground storage and conveyance facilities. Several examples show the benefits of such collaborations:

Underground storage. Groundwater banks recharge aquifers during relatively wet years, so the water is available for use in dry years. The state's largest banks are located in Kern County; others exist elsewhere in the southern San Joaquin Valley and Southern California. By storing water in these banks, distant water districts can help manage water variability, increasing drought resilience. In return, most of these banks have a "leave-behind" rule—a proportion of the water put in storage that may serve to pay for operating the bank, but that also increases water availability in the local basin.

Long-term transfers of dry-year water. The 2008 Yuba Accord created an integrated system of surface and groundwater management within the Yuba Water Agency's service area that provides an array of benefits. During dry years, local farmers switch from surface water to groundwater, enabling higher river flows on the Lower Yuba River to support salmon. This water is subsequently sold to downstream users, generating local revenues for water infrastructure and mitigating shortages south of the Delta.

Interstate and bi-national partnerships to increase flexibility on the Colorado River. Southern California's Metropolitan Water District has stored water in Arizona aquifers. It has also collaborated with the Southern Nevada Water Authority—which serves the Las Vegas area—to find solutions to water quality challenges and to study alternative supply investments. Most recently, cities across the Colorado basin have partnered with farmers to pilot water trades to alleviate system-wide shortages by increasing the amount of water stored in reservoirs. Mexico is also able to participate in water exchanges tied to efficiency investments. All these options are possible because of shared infrastructure on the Colorado River system.

These and other examples show promising models on which to build. To scale up partnership opportunities, interested parties will need to address a range of legal, financial, environmental, and operational complexities. The state can help by assessing regional needs, making trading rules more flexible, and facilitating funding arrangements.

By diversifying water supplies, building connections to share water more flexibly, and preparing for the extreme events to come, such partnerships would support Governor Newsom's Water Resilience Portfolio, and pave the way for a shared effort to make the state's water system more resilient to a changing climate.

# # #

Setting Aside Environmental Water for the San Joaquin River
PPIC | October 26, 2020 | Jeffrey Mount, Ted Grantham, Brian Gray, Ellen Hanak

photo - Salmon Release into San Joaquin River

Protecting the health of California's rivers, estuaries, and wetlands has been the grandest—and perhaps thorniest—of the many challenges facing the state's water managers. The San Joaquin River watershed, the state's third largest and an important water source for irrigating farmland in the San Joaquin Valley, epitomizes this challenge. Yet California is making progress here, bringing a glimmer of hope.

If we can find a way to restore the health of San Joaquin River while preserving the region's social and economic vitality, we can do it anywhere in the state.

The San Joaquin River and its tributaries—the Merced, Tuolumne, and Stanislaus Rivers—have for decades been at the center of the state's running controversy over water allocations to the environment. Most of the flow of these rivers is diverted for farms and cities, water quality is highly impaired, and much of the historic habitat has been lost. Many native species are on the brink of extinction, including iconic runs of Chinook salmon and steelhead.

Despite promising efforts to reintroduce spring-run Chinook salmon to the mainstem and improve physical habitat, the most intractable issue remains how much water to allocate to the environment. This challenge is compounded by the need to improve water quality and ecosystem conditions downstream in the Sacramento–San Joaquin Delta, which relies on flow from the San Joaquin, and the requirement that groundwater basins in the San Joaquin Valley end their historic overdraft. Both put great pressure on the San Joaquin and its tributaries as a source of water.

In December 2018, the State Water Board updated flow requirements for the river to comply with state and federal water quality laws. The controversial plan requires water users on the tributaries to release or bypass an average of 40% of unimpaired flow (the flow that would occur

if there were no dams or diversions) from February to June to support salmon migration and habitat. This decision effectively doubles the amount of water allocated for the environment—an amount viewed as much too much by the water user community and far too little by the environmental interests.

In response to calls from Governors Brown and Newsom, the board suspended implementation of its order to allow time for parties to negotiate voluntary agreements that would meet the new standards. These negotiations stalled earlier this year, but interest has recently revived.

We recommend that negotiations over the San Joaquin tributaries build upon the board's December 2018 order. Here's why.

In a series of recent PPIC reports we argue that water allocated to the environment should be targeted at restoring specific ecosystem functions. Using functional flows—which mimic the seasonal components of river flow that sustain the biological, chemical, and physical processes upon which native freshwater species depend—is especially important in highly altered river systems like the San Joaquin. In our view, the best way to implement these flows is by setting aside an ecosystem water budget for the environment, which functions like a water right and can be flexibly and adaptively managed. In addition, strategic investments in physical habitat—both in river channels and on floodplains—will make more effective use of this water.

Although many water users have criticized the board's unimpaired flow methodology, a closer reading of the revised water quality plan shows that it can be flexibly implemented using functional flows. The plan allows the volume of water set aside by the unimpaired flow standard to be managed adaptively to meet biological objectives. In other words, although the board does not use this term, this is effectively an ecosystem water budget. In addition, the new policy creates incentives for investments in physical habitat that may ultimately lead to reductions in the amount of water needed to achieve those goals.

The new standards fall short in many ways. Notably, they do not provide sufficient flexibility in how the ecosystem water budget can be managed, and there are gaps in key areas such as governance, accounting, planning, and integration with groundwater management. But the plan creates a foundation for innovative management of water for the environment. These issues—as well as whether water set aside for the environment is too much or too little—are worthy topics to address in negotiations.

Solving the challenge of ecosystem management in the San Joaquin River system is critically important—not just for this system, but for managing rivers throughout the state. For these reasons, we encourage the parties to the negotiations to build on the 2018 revised plan rather than attempt to reinvent it.

# # #

Report: Oroville Dam safe, but still vulnerable
KRCR | November 9, 2020 | Austin Herbaugh

OROVILLE, Calif. — It appears that repair work on the Oroville Dam's damaged spillways has paid off.

A team of experts released their findings Monday, concluding that no urgent repairs are needed right now on the Oroville Dam. The report goes on to say that the largest earthen dam in America is safe to operate. However, the Oroville Dam is not completely in the clear.

Repair work on the damaged main spillway and emergency spillway has been ongoing for more than three years.

Back in February 2017, a gaping hole appeared in the Oroville Dam Spillway in the midst of a record-setting winter.

The California Department of Water Resources cut back the water flow, causing Lake Oroville to flow over the emergency spillway for the first time ever.

The emergency spillway nearly failed the next day. Water was eroding under the emergency spillway, threatening to send a 30-foot wall of water downstream if it collapsed.

Nearly 200,000 living in the shadow of the dam would be evacuated.

Fast forward to 2020-- several risk-reduction projects are in the works, but the integrity of the dam is not immediately at risk.

That's according to the DWR's summary report on the Oroville Dam Safety Comprehensive Needs Assessment, which was initiated back in 2018.

Several 'potential vulnerabilities that require further examination' have been identified, according to the report. Some of the vulnerabilities are "negligible" but aren't deemed "unacceptable."

Below is an excerpt of the report going into specific detail:

> *After evaluating all 129 PFMs (Potential Failure Modes) developed, the CNA (Comprehensive Needs Assessment) project team found that none of the PFMs represented an unacceptable risk, although two PFMs were on the borderline. As a result, no dam safety issues were identified that exhibit a need for immediate risk reduction actions. The vast majority of the PFM risk estimates were found to have tolerable, or even negligible risks. However, while no unacceptable risks were found, there were several PFMs/ potential vulnerabilities that will require further consideration, including examining potential risk reduction measures to reduce risks to even lower levels and to implement these measures if they are found to be reasonably practicable.*

Simply stated, the independent board looked at everything that could possibly go wrong. They found the following potential weaknesses:

- The possibility that erosion on the unlined emergency spillway could flood the Hyatt Powerplant, causing an extended outage limiting water flow out of Lake Oroville in an emergency.
- Structural vulnerabilities that could lead to the inability to operate the gate or even the failure of the gates, or the potential failure of the headworks structure itself, which could lead to an uncontrolled release of water.
- The possibility that a rare, extreme storm could cause water to flow over the Oroville Dam resulting in a breach.
- The possibility that internal erosion could occur within the upper portion of the dam.

The report made the following recommendations to reduce risks:

- Build major new facilities such as a new gated concrete spillway to replace the emergency spillway, or a new tunnel to release additional water.
- Structural improvements to the Flood Control Outlet and Hyatt Powerplant to ensure long-term reliability.
- Rock slope stabilization at the outlet portals to reduce the potential for landslides.
- Modifications to the upper portion of the Oroville Dam to reduce the risk of internal erosion or a breach.
- Armoring measures for the unlined portion of the emergency spillway channel to reduce the risk of erosion into the Diversion Pool, which would threaten to flood the Hyatt Powerplant.
-

These projects would cost anywhere from $2 million to over $2 billion.

Right now, there are several risk reduction projects planned. Crews will be installing new water pressure measurement devices to monitor seepage. A state-of-the-art seismic stability analysis will also be performed.

In addition to that, the DWR plans to:

- Recommend raising the Parish Camp Saddle Dam by three feet
- Line the Palermo Canal to reduce leakage and improve rock slope stability
- Install new remote starter and power connections to the spillway gates to improve reliability

The report is based on the condition of the Oroville Dam right now. The upkeeping of the dam requires constant monitoring and risk assessment, according to the DWR.

This report will be submitted to the Oroville Citizens Advisory Commission for input on Friday, Nov. 13.

A full copy of the report has been posted online as well.

# # #

DWR Certifies Final EIR for Delta's Largest Tidal Habitat Restoration Project
DWR | November 04, 2020

The habitat surrounding the future location of the Lookout Slough Tidal Restoration Project, located in the Cache Slough complex within the southern part of the Yolo Bypass in Solano County on October 13, 2020.
The habitat surrounding the future location of the Lookout Slough Tidal Restoration Project, located in southern part of the Yolo Bypass in Solano County on Oct. 13, 2020. DWR/2020

The Department of Water Resources (DWR) has moved one step closer to starting construction on the Delta's largest multi-benefit tidal restoration and flood improvement project – Lookout Slough (LOS).

The final Environmental Impact Report (EIR) has been released and certified, clearing the project to move forward with completing the California Environmental Quality Act (CEQA) process and getting approvals for final construction permits.

As part of its ongoing commitment to restore Delta ecosystems, DWR has worked through an innovative public-private partnership with Ecosystem Investment Partners (EIP), a national company specializing in quality ecological restoration and conservation, to plan and design this large-scale multibenefit project.

"Lookout Slough demonstrates that projects with a bold vision for the future of the Delta are possible" said Kris Tjernell, DWR's Deputy Director of Integrated Watershed Management. "This effort aims to achieve both habitat restoration and flood risk reduction goals on a regional scale, while protecting local sustainability. We celebrate this milestone and look forward to continuing the creative and thoughtful planning with our partners to realize these benefits on the ground."

Lookout Slough is located in unincorporated Solano County, near the border of Yolo County. It is adjacent to additional tidal habitat restoration efforts being implemented by DWR, including Yolo Flyway Farms and Lower Yolo Ranch, to create a contiguous tidal wetland restoration complex spanning 16,000 acres in the Cache Slough region of the Sacramento-San Joaquin Delta. Once completed, Lookout Slough will be the Delta's largest single tidal habitat restoration project to date.

The project will restore approximately 3,000 acres of tidal wetland in the Cache Slough region, creating habitat that is beneficial to native fish and wildlife. In addition to restoring tidal wetlands, the project will also create a new setback levee to provide residents in the surrounding area greater flood protection.

The new setback levee will meet objectives of the Central Valley Flood Protection Plan and the tidal restoration will provide a healthy food web and other benefits to important listed species, including delta smelt, giant garter snake and other native salmonids.

The restoration of tidal wetlands will work by allowing breaches in the existing Yolo Bypass West Levee along Shag Slough. The new setback levee will provide 100-year flood protection with additional height for climate change and sea level rise resiliency.

The Draft EIR was released for public review and comment by DWR in December of 2019 and a public meeting was held in January 2020 in Dixon.

Under CEQA, an EIR must be prepared whenever there is evidence that a project may impact the environment - including recreation, agricultural, water quality, or air quality.

“The final EIR shows the project meets all goals and objectives, and has no significant environmental impacts,” said Bonnie Irving, DWR project manager. “We are on track to start construction in 2021 and completing the project in 2023.”

During the EIR process, DWR completed a regional salinity study to analyze potential impacts of the project on water quality. The findings from the regional modeling study, which include other planned and completed restoration efforts, showed the project will stay within compliance of current water quality standards.

DWR was also able to utilize non-traditional mitigation measures to help upgrade adjacent dry pasture to prime agricultural land by adding irrigation.

Lookout Slough is part of the California EcoRestore initiative to advance at least 30,000 acres of critical habitat restoration in the Delta. This project will partially fulfill DWR’s 8,000-acre tidal habitat restoration obligations pursuant to the U.S. Fish and Wildlife Service (USFWS) Delta Smelt Biological Opinion (BiOp) and is consistent with the National Marine Fisheries Service (NMFS) Salmonid BiOp and California Department of Fish and Wildlife Incidental Take Permit for long-term coordinated operations of the State Water Project (SWP) under DWR’s Fish Restoration Program.

“With the creation of 3,000 acres of tidal wetlands habitat, this multi-benefit project is vital to ensure DWR meets its environmental obligations for continued operations of the SWP,” said Ted Craddock, DWR’s Deputy Director of the SWP. “This project marks a significant step towards balancing the needs of delivering water to millions of Californians through the SWP and being good stewards of the environment.”

Funding for the project is provided through two separate sources based on specific benefits. The habitat restoration objectives of the project will be funded by the SWP and State Water Contractors ($97,000,000), and the flood protection objectives will be funded by Proposition 1 – for multi-benefit and systemwide flood improvements ($21,865,000).

The project is expected to be complete by the end of 2023, with long term maintenance and biological monitoring continuing post construction.

# # #

Accusations and Denials Arise Over Bond Sale Plans For Delta Tunnel
The Independent | November 4, 2020 | Ron McNicoll

REGIONAL — A declaration suit filed in Superior Court in Sacramento by attorneys for some of the leading environmental groups in America accuses the California Department of Water Resources (DWR) of trying to prevent anyone in California from filing a court action challenging the bonds after the bond sales are underway.

Referring to the DWR's court filing in August, the environmental groups' Oct. 29 suit says it amounts to the DWR writing a "blank check" to finance the project.

The controversy is connected to the financing of a single tunnel that would be built under the Delta for 35 miles. The tunnel would make it easier for the state to bypass sensitive times for spawning Delta fish so water can be pumped to water agencies without harming the fish.

Originally, two tunnels had been proposed by Jerry Brown when he was governor, but Gov. Gavin Newsom cut the plan to one tunnel. He estimates it will cost $16 billion. Including interest, its backers say it will reach $25 billion. Opponents, such as Restore the Delta (RTD), say it would be closer to $40 billion.

Signers of the environmental declaration that said the DWR wrongly filed its declaration in August include representatives of the Sierra Club, Natural Resources Defense Council (NRDC), Center for Biological Diversity (CBD), and the Planning and Conservation League (PCL).

Tim Stroshane, a policy analyst for RTD, said in a news release that DWR "put the cart before the horse." It's all right to file a declaration suit about bond sales, but in his opinion, the way DWR did it violates the law because it does not really have any project yet.

Stroshane stated, "There is no final Delta tunnel plan, no environmental impact report, no permit from the State Water Resources Control Board, and no federal permits. They don't even have a federal partner for the project."

Stroshane continued, "They don't know which route the tunnel will be built through, and they do not have a finalized community mitigation plan. Worse, they don't know how much water will be available to move through the tunnel."

The tunnel makes "less sense than ever," said Stroshane.

He cited Los Angeles Mayor Eric Garcetti's criticism of the tunnel as being too costly and producing no new water." Stroshane also said municipal water districts throughout the state are "financially strapped."

Ryan Endean, assistant deputy director of the DWR, responded to an email query about the environmental groups' accusations.

"The Department of Water Resources' validation lawsuit and the bond resolutions adopted are for the purpose of confirming the Department's legal authority to authorize and issue bonds,"

said Endean. “Confirmation of the Department's authority to issue bonds does not commit the department to any particular course of action. The department retains its full discretion to approve or reject a project following CEQA review.”

There was also a clarifying statement from a publication of the State Water Contractors (SWC), the potential customers who will pay for a tunnel, if one were built. The Valley’s water wholesaler, Zone 7, is one of the 29 state water contractors. It sells to the Valley’s retailers: Livermore, Pleasanton, Dublin San Ramon Services District (DSRSD), and the privately owned California Water Service, which provides most of Livermore with its water.

The SWC responded to a comment in the NRDC blog published Sept. 28 about the “premature filing” of the DWR declaration suit. SWC said that NDRC knew “full well the contract agreement that was negotiated will ensure only willing participants will pay for and receive the benefits to the project.”

Further, the SWC states, “They know public agencies will be deliberating publicly in the light of each of their own needs, and on behalf of their own ratepayers. To imply every Californian will fund the project, or that a blank check is being sought, is simply dishonest.”

The Valley water retailers and Zone 7 have been meeting over the past couple of years to learn more about future options for the water supply. A study has been underway addressing the cost and safety of treating wastewater with the reverse osmosis membrane, designed to filter out disease-connected impurities. This is one solution most members like, because it would keep Valley control of the water, instead of outside political forces, such as the DWR.

Also under consideration, but not discussed as much, is a plan for a network of pipes that would take brackish water from east of the Carquinez Strait, desalinize it, and bring it to the Tri-Valley and other locales that would share in the cost. The pipe network might be designed so that service interrupted by an earthquake, for example, could be provided from another location in the network.

The group is also looking at working out more water transfers from such places as Los Vaqueros Reservoir in Contra Costa County north of Livermore, and/or a new valley area northeast of Sacramento that would be called the Sites Reservoir.

# # #

Obstacles remain on infrastructure even if Democrats sweep
E&E News | November 3, 2020 | Maxine Joselow

Infrastructure press conference. Photo credit: Francis Chung/E&E News
House Speaker Nancy Pelosi (D-Calif.) and Transportation and Infrastructure Chairman Peter DeFazio (D-Ore.) during a press conference this year on infrastructure legislation. Francis Chung/E&E News

If Democratic presidential nominee Joe Biden wins the election, momentum could build on Capitol Hill for an infrastructure package that combats climate change and helps the economy recover from the COVID-19 pandemic.

But it remains unclear how the package would be paid for — a sticking point that has derailed major action thus far.

Sen. Chris Van Hollen (D-Md.), a member of the Environment and Public Works Committee, said an infrastructure bill should be top of mind for a potential Biden administration.

"If we have a Biden administration, and I certainly hope we will, I do think that we will have a significant infrastructure modernization bill," Van Hollen said during an event hosted by CG/LA Infrastructure, a firm that advises public- and private-sector organizations.

Sen. Cory Gardner (R-Colo.), who is locked in a tight reelection race with former Colorado Gov. John Hickenlooper (D), echoed this sentiment without mentioning a potential change in administration.

"I think we've got to get to that infrastructure bill. ... I hope that that returns as not only a COVID relief package, but also it's something we need to do long term for this country," Gardner said during a separate event hosted by CG/LA Infrastructure last week.

Norman Anderson, the chairman and CEO of CG/LA Infrastructure who moderated the discussions with both lawmakers, told E&E News that the issue has broad appeal among Democrats and Republicans.

"I interviewed both Chris Van Hollen and Cory Gardner. And when you mention infrastructure to these guys, they all become kind of huggable. They see it as a bipartisan issue," Anderson said in an interview.

Climate concerns

Climate change is certain to loom large over any infrastructure negotiations next year, especially if Democrats make expected gains.

Biden's $1.3 trillion infrastructure plan is aimed at advancing key parts of his clean energy agenda, such as strengthening the electric grid and building 500,000 new electric vehicle charging stations.

In addition, Democrats prioritized climate in the "Moving Forward Act," the $1.5 trillion infrastructure package that passed the House in July.

That legislation, H.R. 2, included a $100 billion investment in low-emission mass transit and a $75 billion investment in clean energy (E&E Daily, July 2).

"I think H.R. 2 was a good step forward. I would imagine that if Biden is elected, there will be an attempt to use that as a starting point but incorporate some new concerns from the Biden platforms," said Derek Sylvan, strategy director at the Institute for Policy Integrity at NYU School of Law and the author of a recent report on federal infrastructure policy.

The "Moving Forward Act" passed the House largely along party lines, with only three Republicans voting in favor of the bill. Many GOP lawmakers spent floor time bashing its perceived resemblance to the Green New Deal.

But if Democrats maintain their majority in the House and reclaim control of the Senate, the climate provisions would be an easier sell, Sylvan said.

"I would imagine that it would be a very different starting point if you have one party controlling both houses of Congress and the White House," he said.

House Transportation and Infrastructure Chairman Peter DeFazio (D-Ore.), a leading proponent of the "Moving Forward Act," has spoken to the Biden campaign about advancing an infrastructure package in February if the former vice president is elected (E&E News PM, Oct. 7).

Environmental groups have poured money into the tough race to help DeFazio beat back Republican challenger Alek Skarlatos (E&E Daily, Oct. 27).

The pay-for problem

Lawmakers have previously struggled to reach a consensus on pay-fors, threatening the long-term solvency of the Highway Trust Fund.

Democrats have suggested raising the federal gasoline tax, which hasn't been increased or indexed to inflation since 1993.

But that idea faces resistance from Republicans, who remain wary of piling on to the $27 trillion national debt.

They include Senate Majority Leader Mitch McConnell of Kentucky, who would retain his leadership role if the GOP keeps control of the Senate and he beats Democratic challenger Amy McGrath.

"Right now there doesn't seem to be appetite ... to increase the gas tax," said David Ditch, a budget and transportation associate at the conservative Heritage Foundation and the author of a recent report on transportation policy for 2021 and beyond.

The pay-for problem contributed to the collapse of efforts to pass a broad infrastructure package this year, Ditch noted.

While the Senate EPW Committee unanimously approved a $287 billion, five-year highway bill last year, the Senate Finance Committee never identified a way of paying for the measure, dubbed "America's Transportation Infrastructure Act."

As a result, Congress ended up including a one-year, short-term extension of expiring surface transportation provisions in stopgap spending legislation in September (E&E Daily, Sept. 30).

"The Senate process broke down fairly quickly after the Barrasso bill came out because no one knew how to pay for it," Ditch said, referring to EPW Chairman John Barrasso (R-Wyo.).

"That's one of the biggest issues with Congress in general," he added. "There is lots of agreement on wanting lots of spending. There is no agreement on how to pay for it."

Asked for comment, Barrasso spokeswoman Sarah Durdaller provided the Wyoming Republican's remarks from when the stopgap spending bill passed in September.

"In the Senate Environment and Public Works Committee, we unanimously passed legislation that will fix our roads, grow our economy, protect the environment and cut Washington red tape," Barrasso said at the time.

"That bill is ready to go," he added. "Congress should use America's Transportation Infrastructure Act as a model as we work towards passing a long-term highway infrastructure bill."

# # #

Delta tunnel project would secure California's water future
Cal Matters | November 2, 2020 | Jennifer Pierre

The California Aqueduct, west of Tracy. Photo via iStock

The Delta Conveyance Project is a necessary investment to secure California's water future. Let's face it, our climate is changing rapidly and becoming more unpredictable – wildfires are larger and more frequent, the seas are rising, droughts are lasting longer and storms are fiercer. The need for this project has never been clearer.

Delta conveyance is the movement of water through the network of waterways in the Sacramento-San Joaquin Delta, the hub of the State Water Project – California's most critical water delivery infrastructure. Two-thirds of California's water begins its journey as snowmelt from high in the Sierra Nevada, eventually flowing into the Delta where the State Water Project infrastructure conveys the water to 27 million Californians and 750,000 acres of farmland from Silicon Valley down to San Diego.

But the State Water Project's 1960-era infrastructure is aging and needs to be upgraded to meet the challenges ahead. As we've seen in recent years, the state's precipitation is increasingly coming in the form of big storms in-between extended dry periods. The State Water Project infrastructure must be improved to be more resilient to climate change and more flexible in its ability to take advantage of big storms by moving water when it's wet for use when it's not.

The Delta Conveyance Project would add new conveyance facilities in the Delta, including two new intakes located farther north, away from sensitive fish habitat and 20 feet above sea level.

The project also includes a state-of-the-art single tunnel underneath the Delta to safely convey water from the new intakes to the existing State Water Project facilities in the south Delta.

Not only would this help ensure the continued delivery of affordable, clean water to millions of residents throughout the state, it would minimize impacts to threatened and endangered fish species and is compatible with ecosystem restoration projects already underway.

In addition to the increased water security and environmental benefits the Delta Conveyance Project would provide, it would also help maintain California's $5 trillion economy – the fifth largest in the world – and is particularly important for the approximately 1,500 disadvantaged communities throughout the state that rely on the State Water Project for affordable, clean water.

The proposed project is a crucial part of the governor's portfolio approach to water management and will help California water agencies develop their local water supply projects and reduce future reliance on imported supplies. That's because the consistent delivery of State Water Project water allows public water agencies to blend high-quality water with local sources to meet or exceed drinking water standards, making the most of our state's limited water resources. State Water Project water is also used to replenish groundwater basins, fill Southern California reservoirs and support recycled water projects.

California depends on the State Water Project. Without it, California would need to replace about 3 million acre-feet of high-quality water annually to meet state demand. That is enough water to serve approximately 6 million households per year.

California water agencies, policymakers and think-tanks have been studying the need for this project for more than a decade. All that work points to the same conclusion: we need a Delta conveyance solution that will reinforce State Water Project infrastructure with modern, flexible operations.

We must address what we have all known for decades: the risk of a devastating statewide water shortage is unacceptable, and time is of the essence. The Delta Conveyance Project is a game-changing modernization of California's aging water delivery infrastructure that will be paid for by the participating public water agencies that receive water from the State Water Project – not taxpayers. It will ensure we can continue to efficiently move water statewide to keep taps flowing for generations to come.

We fully support the Newsom administration as it moves forward with the Delta Conveyance Project planning process and the public water agencies who are currently considering their ongoing participation in the project. The cost of doing nothing is far too high.

# # #

Priorities for California's Water
PPIC | November 2020 | Ellen Hanak

Summary

"Volatile" doesn't begin to describe the past year. The monumental impacts of the coronavirus health emergency and resulting economic fallout have affected virtually every aspect of modern life, including how water is managed. And the nation's much-needed and difficult conversation about racism has illuminated water equity issues—such as how we address climate change, safe drinking water, flood management, and more.

Layered on top of these upheavals is California's regular companion, drought. As in other western states, the pandemic's effects are compounded by long-term drought—which is being made worse by climate change. California is also experiencing increasing conflict over water solutions, especially in the Sacramento–San Joaquin Delta.

In the midst of the pandemic, the Newsom administration finalized its water resilience portfolio—an ambitious, wide-ranging charter for tackling chronic problems and adapting California's water systems to the changing climate. Dwindling state and local revenues require hard choices on near-term funding priorities for this plan.

This brief highlights how events this past year have shifted the state's water landscape and lays out priorities for local, state, and federal action. Key elements include:

- Ensure safe and affordable water. Some California communities did not have safe drinking water before the pandemic, and the recession has made affordability of water and wastewater an urgent crisis. Solutions must ensure access for the most vulnerable, while maintaining the financial health—and safety—of our water systems.
- Collaborate to reduce uncertainties in agricultural water supplies. Broad-based partnerships to bring groundwater basins into balance and address environmental water needs can improve the outlook for farm water supplies. The agricultural sector can also do more—in partnership with others—to support workforce communities hit hard by the pandemic.
- Invest in forest health as a vehicle for economic recovery. Wildfire risk is growing in California, threatening lives, property, and the quality of our air and water. Expanding forest management can help reduce extreme wildfire risk and safeguard the many benefits forests provide, while creating good jobs for rural, forest-based communities.
- Make the most of limited resources for the environment. Increasing the efficiency and effectiveness of ecosystem investments can help, as can efforts to reduce conflict over water dedicated to the environment. California also needs robust funding and reliable water supplies to improve the health of freshwater ecosystems, which are especially vulnerable to drought.

On the next page (***click here***) you'll find a summary of the major disruptions currently affecting the water sector. These disruptions also bring opportunities to reduce the water system's

vulnerability to economic shocks and other “surprises”—because the state’s water systems are at risk not just from drought and disease, but also from floods and earthquakes. In this rocky economic period, we must also try to do more with less: boosting resilience to multiple sources of stress, while supporting economic recovery and workforce development.

It’s been a tough year, and the light at the end of the tunnel remains faint. But there is much work to do to create a more equitable, resilient water system, and delays only make these goals harder to accomplish. We hope this policy brief spurs meaningful conversations that can take us forward and fosters new ways of addressing problems in these uncertain times.

– Ellen Hanak

California's climate agenda likely to get big boost from Biden — look for reversal of Trump policies

San Francisco Chronicle | November 9, 2020 | Kurtis Alexander

California's war with Washington over the environment will soon come to an end.

The legal wrangling that sparked 57 environmental lawsuits against the Trump administration — for loosening policies on everything from automobile pollution to pesticide use and salmon conservation — should turn to consensus and cooperation.

President-elect Joe Biden has pledged to act quickly to restore and strengthen dozens of protections on public lands, water and wildlife. In addition, California's efforts to fight climate change will no longer face hurdles put up by the White House, which has downplayed the global threat.

But just how far a Democratic president can push an environmental agenda, and how quickly, is limited in large part by Republicans, who are likely to control the Senate.

Some of the Trump administration's actions can be undone simply by executive order, like halting the expansion of oil drilling on federal lands. Other changes also can be done without a nod from Congress but require public processes that can take months or even years, like reinstating strict environmental reviews of new projects, such as highways and logging proposals.

Meaningful progress on global warming may be the toughest task. While Biden can put the United States back into the Paris climate agreement, he can't easily shrink the nation's carbon footprint and hit the targets of the accord without sweeping initiatives that need Congressional approval. He has the ideas but not the support.

"A lot of Biden's climate plan is predicated on the ability to spend money," said Michael Wara, director of the Climate and Energy Policy Program at Stanford University's Woods Institute for the Environment. "Working without the full cooperation of Congress limits the ability to get where we need to go on the problem. There's just no way to pretend otherwise.

"That being said," Wara added, "Biden can still do a lot during his first term without support from the Senate, if that's where we end up."

As it stands, Republicans control the Senate. For Democrats to take over they must win two runoffs for seats in Georgia — those races will occur in January.

California's environmental offensives have partly blunted the impacts of Trump's deregulatory moves.

Unlike some other states, California has its own environmental protections, which have provided a backstop to Trump's biggest rollbacks. The weakening of the Clean Power Plan, which regulates power plant emissions, and the Endangered Species Act, for example, had little direct effect on the state.

Where gaps have existed in California law, state officials have moved aggressively to pass new legislation to offset Trump. California put in place new protections for wetlands when the federal government relaxed water standards, and it phased out chlorpyrifos, a pesticide linked to brain damage, when Washington announced it was rejecting a proposed ban.

State Attorney General Xavier Becerra, meanwhile, has challenged policy changes that have broken through California's defenses as well as those that may be more pertinent to other states but could degrade the nation's environment as a whole.

Of the more than 50 environmental lawsuits filed against the federal government, the tally suggests the attorney general has been successful in nearly half his cases. Most of the remaining litigation is pending.

Still, many of the federal government's rollbacks continue to impact the state. The Biden administration, consistent with the president-elect's commitments, could pursue a number of strategies that would strengthen California's environmental protections and hasten the state's progress on climate change.

They include:

Allowing California to regulate auto emissions: The Trump administration blocked stronger fuel-economy standards for cars and trucks nationally, reversing one of President Obama's key policies for curbing planet-warming emissions.

The administration also told California it couldn't go its own way on automobile emissions and revoked the state's long-standing authority to establish stricter tailpipe standards, which were followed by the rest of the country.

California could reapply for a waiver to set its own emissions rules once Biden is in charge of the U.S. Environmental Protection Agency. The president-elect has said he wants to strengthen the nation's gas-mileage standards, which could mean granting California's request.

"The vehicle question is central to climate progress in the United States," Wara said. "It won't be overnight but there will be progress and milestones."

Halting oil and gas drilling: Under Trump, the federal government sought to increase fossil fuel development on both federal lands and waters in California, backtracking on the nation's efforts to create a climate-friendly economy.

Last year, the U.S. Bureau of Land Management opened nearly 2 million additional acres in California to potential drilling, mostly in Kern and Monterey counties. The first lease sale on federal lands in seven years, near Bakersfield, is scheduled to go forward next month.

The Biden administration, following up on a promise to downsize the oil industry and rein in planet-warming fossil fuels, would likely halt new permits for extraction on federal lands. It could even try to get out of newly agreed-upon leases.

Offshore, President Trump has sought to open up more of the nation's waters to oil rigs, including the California coast, which hasn't seen a new drilling lease since 1984. The plan, though still on the books, has faced legal challenges, and no new projects have commenced.

"Come inauguration day, there will never be a new lease on federal lands or waters off of California again," said Brendan Cummings, conservation director for the Center for Biological Diversity.

Reducing pumping from the delta: Federal water managers, under Trump, were given greater leeway to pump water from the Sacramento-San Joaquin River Delta, fulfilling the president's pledge to deliver more water to California farms. This compromised the amount of water for struggling fish populations, including delta smelt and chinook salmon.

The Biden administration could choose to return to the more protective pumping policies under President Obama. To make long-term changes, the federal government would have to go through the lengthy process of rewriting biological opinions, or rules, that dictate pumping operations, like the Trump administration did. Short term, it could use the discretion allowed under the biological opinions to steer a course more sustainable for wildlife.

"The changes came at tremendous cost to the salmon fishery," said John McManus, executive director of the trade group Golden Gate Salmon Association. "We hope and are beginning to take steps to see that this is addressed."

Tightening environmental reviews: The Trump administration rolled back the National Environmental Policy Act, the landmark law that prevents ecological destruction, in an effort to accelerate approval of projects like highways, power plants and oil pipelines.

While California puts checks on new development, state law doesn't cover federal lands. As a result, projects including logging and mining in the state's Forest Service lands and national parks face less environmental review.

The Biden administration could undo the change, but not without initiating what's likely to be a laborious rule-making process, followed by lots of litigation.

Cracking down on climate change: Biden has committed to rejoining the Paris climate agreement, which the United States left at Trump's directive. And he has laid out an ambitious

$2 trillion plan to reduce the nation's greenhouse gas emissions, which would help win compliance with the accord.

The plan calls for generating electricity without fossil fuels by 2035 and having a completely carbon-free economy by 2050.

While divisions in Congress are likely to stand in the way of Biden's goals, many believe that progress can be made. Agreements on less partisan issues like infrastructure, stimulus spending and tax breaks could include climate benefits.

"It would be easier, of course, if Biden had the Senate," said Daniel Kammen, a professor of energy at UC Berkeley. "But the Senate does have a way of sensing the mood of the nation. There's going to be some serious reckoning. ... There's going to be increasing amounts of senators on the Republican side that ultimately switch over."

Any climate funding that Biden can secure could go a long way to helping California, whether it's providing financing for research of green technologies, the state's high-speed rail line or electric vehicle charging stations.

Additionally, even without Congress, the Biden administration could make sure federal agencies operate in environmentally responsible ways and procure climate-friendly products, like electric vehicle fleets.

"I would expect to see a lot of action there, and that's not something to shake a stick at," Wara said. "The U.S. government is so big."

# # #

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AMWA: Closely divided Congress complicates policy landscape for 2021
Water Finance and Management | November 9, 2020 | WFM Staff

The Association of Metropolitan Water Agencies released an update in it's Monday Morning Briefing today noting that a thinly divided Congress could result in a complex policy landscape on many issues including water and infrastructure.

Voters across the country delivered somewhat mixed messages on Election Day, sending Joe Biden to the White House but also withholding the decisive victory that some had expected for congressional Democrats. Much remains to be settled in the coming weeks and months, but it is apparent that when lawmakers convene for the 117th Congress in January neither party will have any margin for error when attempting to advance policy priorities.

As of late last week Democrats were positioned to maintain their hold on the House of Representatives, but with a weakened majority will fall short of earlier expectations of building on their current 17-vote advantage. When all the votes are counted, it is anticipated that Republicans could end up with a net gain of as many as ten House seats.

The picture is more complicated in the Senate, where Republicans currently hold a three-seat advantage. Democrats fell well short of predictions that they could win upwards of a half-dozen new seats, netting a gain of just one seat so far. But by week's end the party still appeared to have a narrow path to gaining control of the chamber for the first time since 2014. This is because no candidate in either of Georgia's two Senate races broke the 50 percent threshold the state requires for an outright victory. Now both races are headed to runoffs on January 5, and two Democratic wins could leave the party with precisely 50 Senate seats. Combined (following a Joe Biden victory) with the tie-breaking vote of Vice President Kamala Harris, this would give Democrats a bare majority in the Senate.

The closer-than-expected outcome in the presidential and congressional races muddles what otherwise might have been an aggressive Democratic governing agenda in 2021. Democratic leaders had eyed a suite of legislative priorities including a multi-trillion-dollar COVID-19 package, economic stimulus with an infrastructure component, global climate change, and reform of the Safe Drinking Water Act's contaminant regulatory process. The Democratic House should still be able to advance these initiatives through the lower chamber, but most would face

long odds in a Republican Senate. And even if Democrats attain a narrow Senate majority, some of the party's more ambitious proposals might have to be scaled back to gain passage. As a result, some degree of compromise between both parties will probably be necessary in order to advance any significant legislation next year.

With Democrats holding the House, the chamber's Democratic leadership structure is expected to remain intact. Rep. Nancy Pelosi (Calif.) will likely seek to return as speaker, Rep. Frank Pallone (N.J.) will continue to chair the Energy and Commerce Committee, Rep. Peter DeFazio (Ore.) will keep hold of the Transportation and Infrastructure Committee, and Rep. Paul Tonko (N.Y.) will again chair the Environment and Climate Change Subcommittee. Conversely, there will be turnover on the Republican side of the Energy and Commerce panel, as current ranking member Greg Walden (Ore.) and top Environment and Climate Change Subcommittee Republican John Shimkus (Ill.) are each retiring.

Though control of the Senate remains up in the air, Sen. Mitch McConnell (R-Ky.) and Sen. Chuck Schumer (D-N.Y.) are each expected to continue to lead their respective caucuses. Delaware's Tom Carper will return as the top Democrat on the Environment and Public Works Committee, while West Virginia's Shelley Moore Capito is in line to take over as the top Republican. But who will chair the panel – or serve as Senate Majority Leader – will not be decided until the results of Georgia's January runoff elections are in.

The Association of Metrolitan Agencies AMWA will continue to engage with lawmakers on both sides of the aisle. The association is planning outreach to the president-elect and will also develop a suite of water policy recommendations to distribute on Capitol Hill in 2021.

In the near-term, the Senate returns to Washington this week to begin a post-election lame duck session that is expected to focus on approving a stopgap government funding bill and additional COVID-19 response legislation. The House is expected to return next week.

# # #

This update originally appeared in the Nov. 9 Monday Morning Briefing from the Association of Metropolitan Water Agencies.

California's Complex Water Market Faces New Challenges
Institutional Investor | October 26, 2020 | Alison Coughlin

AT A GLANCE

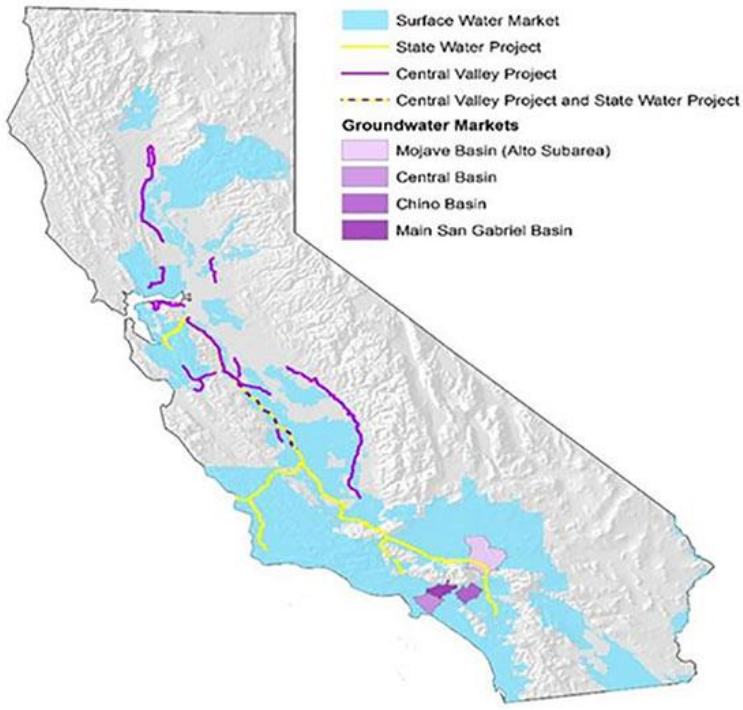
- *The supply and demand of California water are geographically and seasonally disconnected, a trend that could be exacerbated by climate change*
- *Agriculture, urban and environmental use compete for limited supply in California's $1.1 billion water* market

California has an intricate and multifaceted system of water management. The state's $1.1 billion water market allocates a concentrated supply to the areas that need it most. From farming to landscaping and personal consumption, there is a constant tension in the state's supply and demand of this life-sustaining resource.

Rivers, Lakes and Aquifers

In addition to stored supply, water in California is obtained through several avenues. Precipitation supplies approximately 75 million acre feet of usable water to California each year, mostly from December to March. Additionally, snowpack in the Sierra Nevada mountains can account for up to 30% of California's water supply– as temperatures warm in the spring, snow from the mountain range thaws and trickles down, collecting in reservoirs and basins. Lastly, the Colorado River is a large supply source for California water, especially for southern California. All three of these sources are potentially compromised by a changing climate.

There are two immediate sources of water in California – surface water, which is water found in things like rivers, lakes, and reservoirs, and groundwater like that found in aquifers. Water that comes from snow melt and precipitation can become surface water or groundwater, and groundwater can be naturally distributed to surface water when groundwater levels are high. Drawing water out of groundwater basins also changes the relationship between surface water and groundwater, as low supply in groundwater can alter how surface water flows or is "imported" in the state, and vice versa.



Water Map
Source: West Water

Surface water, which accounts for 60-70% of the state's supply, is not geographically dispersed – the majority of it is found in the northern part of the state, whereas groundwater is more evenly distributed throughout California. Hundreds of miles of water storage and delivery systems of reservoirs, aqueducts, and pumping plants stretching almost the entire length of the state convey water from its origin in the north to demand in the south.

Pumped from underground aquifers, groundwater has a contentious history of use, especially in the state's thriving agricultural production industry. This led California to pass the Sustainable Groundwater Management Act (SMGA) in 2014, a first-of-its-kind law aimed making groundwater resources sustainable by 2040.

Where Water is Used

The available water in California is used by three avenues – environmental, agricultural, and urban. Though use by sector can vary dramatically within the state and can change each year, approximately half the water goes to environmental uses, 40% goes to the agricultural segment, and 10% is urban use. There is constant interplay between these three, as they have competing interests over a commodity with limited supply. Let's look at all three.

Environmental
Environmental use includes natural water sources like rivers being protected by federal and state laws, water that supports existing habitats both within streams and creeks as well as within wetlands and wildlife preserves, and water that is needed to maintain water quality for other uses like agricultural and human consumption.

Agricultural
Agricultural use supports the largest agricultural producing U.S. state in terms of cash receipts. There are approximately 9 million acres of irrigated farmland in California, and that acreage required 24.5 million acre feet of water in 2018. Most agricultural water use occurs from June through September. Though agricultural production has increased with less intensive water inputs over the last few decades, California has seen growth in tree and vine crops which need to be watered each year. The reliance on these types of agricultural products makes California farms more vulnerable to any water shortages. Additionally, as populations increase both locally and globally, there is more demand for crops grown in California.

Urban
Approximately half of urban water use is dedicated to landscape watering and half is used for human consumption. California's water resources need to support about 40 million inhabitants – a number expected to grow over the coming years. The strongest urban water demand is seen, like with the agricultural sector, in summer months. A recent focus on water shortages and development of water-saving technologies has resulted in a decline in per capita urban water usage. In 1990, per capita water use was 231 gallons per day, which decreased to 146 gallons per day by 2015. However, an expected increase in population clearly means more demand for water.

The Climate Change Threat

The supply and demand of California water are geographically and seasonally disconnected. However, climate change threatens to upset supply, change demand, and alter the connection between the two even further.

The precipitation patterns in California have become more variable over time. Scientists with the California Natural Resources Agency have suggested that there will be more dry days in the coming years, with short instances of significant downpours. This will exacerbate the geographic supply disparity within the state, with northern California getting even more water and the more arid southern areas receiving less rain through the year.

Rising temperatures also mean less snowpack will be available once spring arrives. Estimates suggest that the Sierra Nevada snowpack can experience as much as a 48-65% loss over the remainder of this century. The change in temperature also means that the timing of the snowpack melt will be impacted, and more water will run off earlier in the year. This alters the balance of storage and use currently employed in California, and months with the highest water demand could be even drier.

Severe weather events like droughts, heavy rains and wildfires have already become more common. . Estimates from NOAA, using the Palmer Drought Severity Index, suggest that droughts will be more severe in the coming years, leading to both periods of extremely limited supply and periods of intense flooding.

These intense storms can add pressure to existing reservoirs and aging infrastructure, leading to potential flooding in certain geographies while making it more difficult to move water to areas of high demand. As sea levels rise, more salt water is introduced into the surface water systems, leading to higher costs for water purification and threatening supply numbers.

In addition to climate change impacting the supply of water in California, warmer, drier days will increase demand. Crops will need more water input over a longer season, and human consumption for landscaping and personal use will rise. Ultimately, climate change makes it more difficult to manage the priorities of the California water system – storing water for droughts without being oversupplied in certain areas, managing the risks of flooding, satisfying total demand, and protecting the surrounding environment.

At the heart of these challenges lies a unique market for water with disparate participants. The ability to manage the pricing risks ahead may ultimately determine where and how this precious resource is used.

# # #