

MINUTES
of the
WATER RESOURCES COMMITTEE
Holiday Inn Express and Suites
Deadwood, South Dakota
September 14, 2021

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MEMBERS AND ALTERNATES PRESENT

(Those listed in italics attended virtually via Zoom.)

ALASKA	<i>Tom Barrett</i>
ARIZONA	<i>Amanda Long-Rodriguez Trevor Baggione</i>
CALIFORNIA	--
COLORADO	--
IDAHO	<i>Jerry Rigby John Simpson</i>
KANSAS	<i>Earl Lewis Tom Stiles</i>
MONTANA	<i>Anna Pakenham Stevenson</i>
NEBRASKA	–
NEVADA	<i>Micheline Fairbank Jennifer Carr</i>
NEW MEXICO	<i>John D’Antonio</i>
NORTH DAKOTA	<i>Andrea Travnicek John Paczkowski Jennifer Verleger</i>
OKLAHOMA	<i>Sara Gibson</i>
OREGON	<i>Doug Woodcock</i>

SOUTH DAKOTA

Hunter Roberts
Eric Gronlund
Jeanne Goodman
Nakaila Steen

TEXAS

Jon Niermann
Brooke Paup

UTAH

Erica Gaddis
Norm Johnson
Todd Stonely

WASHINGTON

Mary Verner
Buck Smith

WYOMING

Chris Brown
Jeff Cowley
Jennifer Zygmunt

GUESTS

Roy Smith, Bureau of Land Management – Colorado/Utah
Jim Rizk, Texas Commission on Environmental Quality
Kathy Alexander, Texas Commission on Environmental Quality
John-Cody Stalsby, Texas Commission on Environmental Quality
Jim Schneider, Olsson
Tracy Streeter, Burns and McDonnell
Sue Lowry, Interstate Council on Water Policy
Mitch Kannenberg, LRE Water
Lorraine Flint, Earth Knowledge, Inc.
Patrick Lopez, Texas Water Development Board
John Burns, Sitka Technology Group
Nicole Bringolf, U.S. Department of Agriculture
Lauren Dempsey, Air Force Civil Engineer Center
Kellie Whitton, U.S. Forest Service
Zach Million, U.S. Bureau of Land Management
Rachel Esralew, U.S. Fish and Wildlife Service
Meghan O'Brien, Alaska Department of Natural Resources
Brian Dunnigan, Olsson
Kathleen Ligon, Texas Water Development Board
Charley Palmer, Alaska Department of Environmental Conservation

WESTFAST

Heather Hofman, Federal Liaison
Stephen Bartell, U.S. Department of Justice, ENRD
Brad Doorn, National Aeronautics and Space Administration
Stephanie Santell, Environmental Protection Agency
Veva Deheza, National Oceanic and Atmospheric Administration - NIDIS
Roger Gorke, Environmental Protection Agency
Chris Carlson, U.S. Forest Service
Mike Eberle, U.S. Forest Service
David Merritt, U.S. Forest Service
Mindi Dalton, U.S. Geological Survey
Bob Boyd, U.S. Bureau of Land Management
Paula Cutillo, U.S. Bureau of Land Management
Mike Strobel, Natural Resources Conservation Service
Travis Yonts, U.S. Bureau of Reclamation
Bob Wolf, U.S. Bureau of Reclamation
David Raff, U.S. Bureau of Reclamation
Derek Schook, National Park Service
Joseph Gurrieri, U.S. Department of Agriculture

STAFF

Tony Willardson
Michelle Bushman
Adel Abdallah
Cheryl Redding
Ryan James

WELCOME AND INTRODUCTIONS

Mary Verner, Chair of the Water Resources Committee, called the meeting to order, and requested introductions be made around the room.

Introductions were made of those attending in person, as well as those who joined via Zoom, prior to the Host State presentation.

APPROVAL OF MINUTES

Mary Verner thanked South Dakota for hosting the meetings. She acknowledged several federal agencies representatives had joined the meeting today to provide a status update.

The minutes of the meeting held in Cody, Wyoming on June 23, 2021 were moved for approval by Jon Niermann and seconded by John D'Antonio. As there was no discussion or questions, the minutes were approved by acclamation.

SUNSETTING POLICIES

Position #428 – Federal Water and Climate Data Collection and Analysis Programs

Tony Willardson explained that the WSWC has long supported a number of these different federal programs. The resolution for consideration includes some minor language changes, which would update the resolution, including under the fifth whereas clause. There are several different federal programs that we specifically call out from multiple agencies and there is an addition.

Over the years, we have worked to support the Bureau of Reclamation's Agrimet system. For those of you who may not be familiar with Agrimet, it is a weather monitoring system of stations throughout the Northwest and other states that provides weather information. Measured temperature, humidity, solar irradiance, wind speed, etc. form the basis for calculating base-line evapotranspiration that is important to Landsat and other remote sensing programs, including the OpenET program. An additional note is that the list is not to be interpreted as an exclusive list.

There is another minor change in the seventh whereas clause. There will be some additional wording to include water use, evapotranspiration and other parameters. Further, there is an additional whereas clause that addresses wildfires and floods and other natural disasters and the significant losses and monetary impacts, as well as call out the need to be able to replace monitoring equipment when it's been destroyed.

Lastly, an additional resolved clause has been added which states that the WSWC supports efforts to enhance and expand the availability of and access to consistent and comprehensive water supply, demand and water use data and information, such as, but not limited to, the Open Access of Evapotranspiration (Open ET) data program and related federal authorizing legislation and appropriations. There actually is federal legislation that would provide \$10 million to the Department of the Interior to support an OpenET program.

Jerry Rigby moved for acceptance of the modified Position #428 and recommended it for adoption. Chris Brown seconded the motion. The motion passed.

Position #429 – Drought Preparedness, Prediction and Early Warning Programs

Position #429 relates to drought preparedness prediction and early warning programs. A primary change to this position is the addition of the whereas clause that updates some of the information from the National Center for Environmental Information on drought extremes and

losses. This includes a listing of losses that are over a billion dollars per event. There are just a couple of other minor corrections and additions for this resolution.

Micheline Fairbank offered a motion, and Jerry Rigby seconded. The Committee approved adoption of the resolution with the additions and corrections as set forth in Tab C of the briefing materials.

Position #430 – Bureau of Reclamation Drought Response Program

Except for a change to the information from the National Center for Environmental Information, updating the same whereas clause as we did in Resolution #428, there are no other changes proposed for recommendation.

A motion to approve the resolution as modified was offered by Chris Brown. Erica Gaddis seconded the motion. The motion passed.

WESTFAST FEDERAL WATER & CLIMATE PROGRAMS UPDATE FY2022

Heather Hofman, WestFAST liaison introduced the various federal representatives.

EPA – Stephanie Santell

Thank you all for having me on this morning. My name is Stephanie Santell. I work in the Office of Water as our Climate Change Coordinator.

Achieving water management goals has definitely become more challenging as climate change shifts and hydrological patterns and variability are outside of historic norms. The climate impacts a lot from the development of water quality standards, to drinking water that comes out of the tap. We're finding that the quantity and diversity of these impacts really is underscoring the importance of climate resilience to water management programs nationwide, so that the drinking water remains safe, and that aquatic ecosystems sustain the many benefits that they confer to communities.

Since 2008, EPA's water programs have been working to advance climate activities that not only build the adaptive capacity of the national programs, but also those of our state, tribal, and local partners. Providing resiliency via water management projects across the country is our goal, through SRF, WIFIA, and other grant vehicles. Programs such as the National Estuary Program offer grants and seek stakeholders to support outreach and education to increase awareness of the risks and the potential impacts that they pose.

EPA has also been coordinating with other federal programs so that we can create new prospects for our program partners in terms of resource availability, and also co-benefits for specific actions States and localities are implementing. There are a lot of opportunities to

address climate at home and abroad through this collaborative government-wide approach. Several other administration efforts complement the goals of the Executive Order EO 14008: Tackling the Climate Crisis at Home and Abroad (2021) quite nicely, including the American Jobs Plan, America the Beautiful Initiative and others that focus on the Environmental Justice Initiative.

We're working to implement climate resilience in our missions, programs and operations and developing plans to make sure that does happen. The Office of Water has a fair amount going on in the climate change arena.

Today, I want to highlight a few initiatives that are specifically related to drought. Recently, we're hearing from program partners about the need to secure resources in order to take action in times of drought. We have been working on encouraging climate resilience, investment in water, and committing to approaches that provide multiple benefits for a single project. Some of the biggest challenges deal with identifying and then navigating the landscape of federal funding opportunities that are available. This is especially true for more innovative, non-traditional water management projects. Currently, EPA is working on a guided decision support tool that allows users to quickly navigate a very robust range of federal funding and financing programs, and identify opportunities that they're eligible for based on their water project needs. This spans projects that go well beyond EPA's mission and mandate to other federal agencies and interests. It is intended to help remove any guesswork and research that a project applicant has to perform, to assist a diverse array of communities and other project proponents more equitably, and improve access to federal resources.

Two such programs are the Water Infrastructure Finance and Innovation Act (WIFIA) and also the State Revolving Fund (SRF) programs. WIFIA accelerates investments in national water infrastructure by providing long term, low cost supplemental loans for regionally and nationally significant projects. WIFIA loans can be combined with private partnerships and joint ventures to help local, state, tribal and federal government entities, as well as state SRF programs finance a wide array of loans including alternative drinking water supply projects, like desalination, aquifer recharge, and even water recycling. Others include drought prevention and mitigation projects, stormwater energy efficiency projects for drinking water and wastewater facilities, and upgrades to treatment plants so that they can increase their resiliency to extreme weather events. We just announced a new \$120 million WIFIA loan to support the Pure Water San Diego project which will create a reliable sustainable and drought proof water supply and reduce the city's reliance on imported water. Understanding the project's benefit from leveraging the resources of many entities, often WIFIA loans can be combined with private equity revenue bonds, corporate debt, grants and even SRF loans as appropriate. I will not move into the SRFs, although they are also available to provide low-cost financing for a range of eligible activities that help communities become more resilient to natural disasters and extreme weather.

Various resiliency features related to energy and water efficiency upgrades, stormwater management, conservation practices, and even green infrastructure are often incorporated into a larger project that can strengthen traditional water infrastructure projects. Projects generally

include planning activities that assess vulnerability to climate impacts that are reasonably expected to result in a capital project. We are looking at performing risk or vulnerability assessments, emergency preparedness and recovery plans, drought management plans and even climate adaptation plans.

The SRF can also fund projects that help reduce impairment of water quality caused by wildfire, water conservation, collection and efficiency projects, stormwater management using both green and gray infrastructure, and equipment to reuse reclaimed water and direct potable reuse through the Drinking Water SRF. Technical assistance for training public water system operators, adopting new technologies and upgrading infrastructure help to increase the system's resilience. State SRFs have some leeway where they can encourage climate resilience for both infrastructure and surrounding communities through programmatic goals that support resilience incentives and encourage resilient projects through priority points, reduced interest rates and principal forgiveness. Requirements encourage resilience projects and other activities such as joint funding programs, emergency funding, and event technical assistance, which can often be a barrier to implementing a project.

If and when our partners are ready with resources, they are then looking for ways to turn the information into action. The Office of Water provides technical assistance for assessing, planning for, and implementing projects that improve water management, climate resilience, and spanning hard infrastructure to natural resource solutions.

I wanted to be sure to mention EPA's Creating Resilient Water Utilities Initiative (CRWUI). So "crew" as it's called, helps drinking water, wastewater and stormwater utilities through tools that are used for assessing climate impacts and risks for utilities building on frameworks that they have in place for developing adaptation plans based on that assessment. Mapping and data services help to visually display potential climate impacts and risks. EPA can even personalize workshops and training for utilities on climate risk and resilience.

On Tuesday, September 21, CRWUI is going to provide a series of five free, two-hour webinars for drinking water, wastewater and stormwater utility owners and operators, as well as other water sector stakeholders in the northern Great Plains region of the United States. These webinars will focus on building resilience to the impacts of climate and also identify adaptation options. As part of these training webinars, CRWUI will work with a pilot utility. They will provide technical assistance in conducting a risk assessment for that utility, using their Climate Resilience, Evaluation and Awareness Tool (CREAT). It's a great opportunity for a utility to get a really comprehensive assessment of their climate risks. See <https://www.epa.gov/crwu>.

The water reuse program is also providing a lot of technical assistance. I won't hit too hard on this area because I know that you all are plugged in pretty well with these efforts. Of course, water reuse is a great way to earn an addition to a community's water portfolio and provide resilience against climate-induced impacts like drought, flooding, saltwater intrusion, and other risks. We facilitate the Water Reuse Action Plan (WRAP) collaborative, which

involves a variety of different stakeholders and implementing and considering reuse as part of a resilient water management strategy.

EPA has a lot of WRAP actions that are helping to promote interagency coordination, provide educational opportunities, explore private and market opportunities, and even help communities fund reuse projects that offer climate resilience benefits. They also regularly coordinate to support reuse as a long-term drought resilience approach. Check out the WRAP dashboard online to view more directly related to addressing the impacts of climate.

This brings me to addressing the Committee's WaDE program, which provides data and information to support local actions. We've been exploring a lot of ways to make the best available science and information transparent, accessible, and discoverable to decision makers by developing decision support tools, and data integration products to help bring together the existing climate and water information in a way that makes it useful for decision makers at various scales. We already have a lot of frameworks for assessing climate signals and water resources through the Healthy Watersheds Team. We also have a divisional mapping tool that was recently updated to add climate change indicators for flood and sea level rise for the first time ever.

These products are really important to help form collaborative solutions that work on larger scales across jurisdictional boundaries and throughout an entire watershed system. One thing I wanted to briefly mention as an item of interest for this group is that our Healthy Watersheds Team just announced the completion of a new version of the watershed index online, which is actually a National Library of watershed attributes used for comparing watershed characteristics anywhere in the coterminous United States. (See <https://www.epa.gov/wsio/wsio-indicator-data-library>.)

The new and updated HUC 12 indicators featured in this release specifically focus on climate change and environmental justice parameters. Many of these indicators can be readily applied using the recovery potential screening tool that we have, which is a systematic method for comparing watersheds based on characteristics relevant to successful restoration and protection. Healthy Watershed programs also work with States and other partners to help them apply the indicators in useful ways, such as prioritizing watersheds through a 3-D program, nutrient management plans, and even nonpoint source program planning.

Finally, just a note that we have a lot of partnership programs, like Urban Waters, and geographic in-place based programs such as National Estuary programs that bring together diverse stakeholders within a regional community around water resources. These programs use collaborative frameworks and data integration tools to better align program efforts not just across what we do at EPA, but with other federal agencies, while working with communities to make lasting solutions on the ground.

With that, I want to thank everybody again for the opportunity to join today and talk about some of the climate focus efforts we have underway at EPA. We're kind of dipping our

toe into the water so to speak. I'm happy to connect offline and provide more information on areas of particular interest. Thank you.

USDA – Mike Strobel

I'll give you an update, first of all, with my position. I have stepped down from the position as Director of the National Water and Climate Center. I am currently working as the National Hydrologist for the Natural Resources Conservation Service (NRCS). Cara McCarthy is in my former role.

The agency is trying to coordinate between the three focus areas as mandated through the Administration. Climate is one of those. Second is racial justice and equality. And third is urban agriculture. In the way of climate, if we can bring in urban agriculture, or waste, and bring in equality with that, and diversity, serving different communities, then that's what we're going to try to focus on.

Obviously COVID is affecting all of us. NRCS has staff in nearly every county across the United States. Given COVID, we have a lot of restrictions in our office staffing. In most of the locally staffed offices, they are at about 25%, with no more people at any one time in the office. For employee safety, they are minimizing the number of staff on site. Travel is also affected. Out of state travel is not allowed, and most of the travel is kept to mission critical. The snow survey work and the maintenance is ongoing, and we're doing really well with that. There are certain areas that are limited, but we're making do as best we can.

I'll focus on the budget and the proposed budget in H.B. 4356, which is looking at the budget for NRCS. For the snow survey on water supply forecasting program, they have identified \$14.488 million for that program, which is a \$5 million increase from the current year. The snow survey program budget has been pretty steady for the last 10 years at about \$4 million. Receiving a boost to \$14.5 million would allow for several efforts that have been on the table that we have been unable to pursue.

There's a lot of good stuff in the budget as it stands right now. We want to see not less than \$15 million go to climate related initiatives, which includes climate science, as well as the 22 climate hubs that serve the country. There are some strong funding increases for the focus areas. They are looking at \$65 million for projects and activities that address regional priorities related to water, such as flood prevention, agricultural water management, efficient irrigation systems, fish and wildlife habitat, and watershed protection. About \$10 million of that would go to watershed rehabilitation programs. Also included is an increase in the NRCS Conservation Technical Assistance Program of \$42.6 million.

We would like to see some efforts focused in seven different areas, one being to increase the accuracy of the data. We would like to see investments in the information technology (IT) side so that we can improve the data that we provide, as well as the data that we collect from the sensors we use at our sites. Another would be to expand the network. We get many requests for

additional Snotel sites. Areas we'd like to focus on, include higher elevations and areas that we aren't currently monitoring, so we can provide better coverage and better spatial distribution of information across the western United States. As you can imagine, with the climate changing, we're also seeing a lot of the current Snotel sites, where precipitation is changing to rain versus snow. The rain-snow transition is changing. Again, we want to make sure that we can cover these areas well with the distribution of our sites.

Third is to improve the forecasting. We will continue to invest in and improve our forecasting and modeling so that the forecasts we provide are as accurate as possible, using the information that we collect from our sites, as well as information from other agencies that we utilize in our modeling.

Further, we'd like to increase collaboration on remote sensing. As many of you know, there are several efforts going on in the areas of collecting snow data, utilizing both fixed wing and satellite aerial remote sensing techniques, LIDAR, etc. We are looking at how we can incorporate the work that we do with the in situ measurements at our Snotel sites and our manual snow courses to improve accuracy and the spatial distribution of that information. We're working closely with other groups on this.

Another focus is to improve communications. We'd like to make sure that we not only get the information out, as we currently do through web services, but really increase the information that we provide to the public, to other federal agencies, and to water users, through increased communications, as well as increasing the communications that we use within our own system. Currently, we have three different methods of transmitting information from our remote sites. We use the meteor burst, which is kind of an older system that uses free radio frequencies. We also use the cellular technology and GOES satellite technology. We are trying to improve so that we have better continuity in how the information is transmitted to us and how we distribute it out to users.

Another area would be to ensure employee safety. This is not just related to COVID, but safety in general. We send folks into very remote and rugged areas.

Lastly, is looking at workforce efficiency. We have offices across the western U.S. and data collection offices in six locations. There are water supply specialists in six states that are pretty much centralized to those areas. They travel a lot, and we believe that there's a better, more efficient way of collecting the information and serving the public by relocating some of these employees, or when we hire new staff to locate them where they could access sites quicker. They would be more local. Thus, we're looking at how we distribute our workforce to improve the workforce efficiencies.

Those are the areas that we would focus on with an increased budget. This provides us a lot of opportunities. One other thing that I'll mention briefly, is our soil moisture monitoring. There are a number of activities being worked on right now. We've been working with national committees to help put together a national soil moisture network with other federal, state and

local agencies. And as we know, with drought across the West, this is really critical information. It certainly will be necessary for the U.S. Drought Monitor and others to have improved information on soil moisture. We are working with other USDA agencies, the NRCS and the Forest Service to build up the current SCAN network to provide information for the USDA agencies to better serve the communities when it comes to soil moisture information.

So there's a lot going on, We have combined the National Water and Climate Center with the National Soil Survey Center in Lincoln, Nebraska, to improve the Soil Climate Analysis Network (SCAN). We've been putting a lot of effort into this. We're hiring full-time SCAN staff and looking at how we can expand the network, and how we can improve the data distribution and data delivery.

USDA Forest Service – Chris Carlson

Mike's overview of the COVID challenges is pretty much the way things are working in the Forest Service.

On the fire front, there are approximately 25,000 firefighters deployed as of today. The agency along with its federal partners have been at preparedness level five for about two months. Almost all available personnel are either "on fire" or have come home for a brief respite and will be back on fire again. There have been 86 large fires to date (5,000 acres, plus). Total fires have burned about five and a half million acres as of yesterday, and about 3 million of those acres have been National Forest system lands. Many of you have probably heard the news that all the national forests in California have been closed to all non-essential access through this week, but that is likely to be extended given the extreme drought conditions. So with the increasing scope and scale of wildfire across the country, but particularly in the West, the Forest Service is working with partners to develop a 10-year strategy to dramatically increase hazardous fuels treatments. The FY22 President's budget includes an increase for such efforts.

The Senate infrastructure bill includes a substantial plus up, in the early information. The reconciliation process indicates that federal investments in reducing wildfire risk to communities and their water supply will be substantially increased shortly. The estimates I've seen so far range from about a doubling of resources, going to hazardous fuels treatment, to perhaps a quadrupling of those resources over the next five to 10 years for that investment to be successful at reducing risk. It will require collaboration with States, Tribes, NGOs and others using all the available tools that we have, including shared stewardship, good neighbor authority, contracting, collaborative forest restoration, joint chiefs, restoration and others. This will require an all hands on deck effort. Planning inside the agency is ramping up right now with the anticipation that the infrastructure bill and some aspect of reconciliation will pass in the next couple of weeks.

The Forest Service is also working to develop climate vulnerability assessments across the country, including most national forests and grasslands in the West, as well as developing more regional assessments such as those that already exist across New Mexico and Arizona, the

Great Lakes States, and the Northeast. Summaries of that information are available on an ArcGIS online story map.

There are many federal and non-federal partners working to foster the development of the soil moisture monitoring network that Mike talked about, so I'll leave it at that. The agency is working to foster the use of "biochar" as a soil amendment on forested and non-forested lands to improve both moisture retention and carbon sequestration as well as improving productivity. To help facilitate the use of biochar, the Forest Service researchers are working with partners to develop and test mobile biochar production equipment that can get out on the ground in remote settings and produce biochar. The Forest Service worked with its sister agencies and USDA and with NASA to renew a memorandum of understanding (MOU) that helps facilitate the use of remote sensing data to monitor climate and drought. The Forest Service is coordinating the work of the USDA climate hubs to connect land and resource managers and agricultural producers with actionable information on climate and drought. The FY22 President's budget proposes to increase funding to the climate hubs to help them expand their capacity to help communities respond to the changing climate.

Lastly, over the past couple of years, the Forest Service with lots and lots of local, state, federal, and NGO partners has increased its focus on improving stream system resilience through a variety of techniques, including reconnecting floodplains, restoring mountain wet meadows, and installing beaver dam analogues. The FY22 President's budget, the Senate infrastructure bill and the reconciliation process all include renewed investment on watershed and stream improvements, including the establishment of a new collaborative stream improvement program to mirror the collaborative forest restoration program. It includes funding for the 2018 Farm Bill Water Source Protection Program, and reestablishes the Legacy Roads and Trails Program to restore roads and trails to reduce impacts to water quality and aquatic organisms. Those watershed investments could mean, depending on how the reconciliation process works out, an infusion of something like \$250 to \$500 million a year, over the next five to 10 years, just focused on watershed improvements, which is a massive shift in resources. So with that, I will turn it back to Heather. Thank you

NASA – Brad Doorn

I would echo similar themes. The President's budget is very good for NASA. In particular to NASA science issues and one that I think you'd be interested in is a substantial increase in sub-seasonal to seasonal models and observations to include climate sustainability -- even airborne instruments and campaigns and surface networks for wildfire fighting operations.

So that you understand how the NASA budget comes down, it will come down to the Earth Science Division. Part of that budget is set aside for research to operations, which is the Applied Sciences Program. That is where we make the connections with the Forest Service, with USDA, and all of the partners. The other aspect will be to continue work that we're already doing, and a big part of that is soil moisture. We are still building upon the Soil Moisture Active Passive, or SMAP mission. We will be leaning in to next year's surface water work with the

Surface Water and Ocean Topography (SWOT) mission. That is followed by the joint Earth-observing mission between NASA and the Indian Space Research Organization (NISAR). The NISAR mission, which is a radar mission, will produce a high resolution soil moisture product. All of that entails a big press on soil moisture and wildfires, and particularly all aspects of wildfires from prevention to fighting, and then of course, mitigation after the fire.

I also want to call out your support for the Western Water Applications Office. They went through a five-year review. Tony was on the panel and we had a lot of input. We are now scoping out what the next five years will look like for the Western Water Applications Office.

We have a lot of work going on in our needs assessments for Earth observations as well. Things like OpenET, western databases, groundwater, water forecasting, and snow. We will look at the next steps. Thanks.

DOI – USGS – Mindi Dalton

In FY22, USGS put a lot of focus on continued support for a number of our priorities in our Integrated Water Science activities to provide better data tools and information for our partners and stakeholders to use in resource planning and decision making.

With respect to activities in the Water Mission Area, we put in a request for an increase for the Next Generation Water Observing Systems (NGWOS) to fully operate the energy loss that's happening in the Delaware River Basin and to complete implementation in both the Upper Colorado River and the Illinois Basins. We started our third basin in the Illinois in FY21.

We are going through the process to select a fourth Integrated Water Science basin this year. A number of you have probably been engaged in some of the stakeholder discussions. The focus is in the Pacific Northwest. A selection will be made by the end of this fiscal year, and I will make sure that everybody is aware when that happens.

We also put in requests for increases for Integrated Water Availability Assessments. Regionally, these take place in partnership with the NGWOS, with a focus on understanding basin-specific water availability issues and trying to work with our partners and stakeholders to develop the tools and resources they need for planning. Those regional assessments also help to feed and support our National Water Census, and understanding water availability nationally. This activity is really focused around helping to address the requirements given to us by Congress as part of the SECURE Water Act.

In addition, in order to carry out these integrated water availability assessments, we need to improve water prediction. So we asked for an increase associated with our water prediction activities. This will allow us to continue to test and evaluate multiple codes that represent different processes and basins across the country, with the focus to incorporate climate change, land use and land cover change, and socio-economics into our water prediction capacities. This will also include our ability to improve predictions on things like drought. We are very focused

on developing drought prediction capabilities that will allow us to predict the onset, the duration, and the severity of a drought. We are looking at predicting wildfire impacts to water quality, and have dipped into focusing on drought prediction capabilities.

We have also sought increases for the priority stream gauges, which I know many of you are very interested in. This funding would essentially help us to ensure continued operation of the approximately 3,500 federal priority stream gauges nationally. In the House mark-up of the funding bill, the House is very supportive of a number of these things and actually gave the full request for the Next Generation Water Observing System and the full request for federal property streamgages. They did give us the majority of what we requested for Integrated Water Availability Assessments and Integrated Water Prediction.

However, the House redirected some of the increases to priorities that they wanted to see us account for as part of these activities. The first being a continuation of some work that was started last year on the impacts of water bottling. In FY21, we are in the process of developing a strategic plan for how we will prioritize these assessments nationally in five basins. That report is due to Congress at the end of the fiscal year. They have given us continued funding and increased that funding in FY22 in the House. Additionally, they've given us more funds to evaluate per- and polyfluoroalkyl substances (PFAS), as well as harmful algal blooms (HABs), and the impacts of both of those water quality issues nationally in terms of water availability.

Finally, you heard Brad Doorn mention OpenET. We've been working with both the House and the Senate on authorization language for OpenET and the transition of that to the USGS. The House provided some funds for OpenET in the House mark. In addition, in FY22 we've been working on supporting some authorizing language that you may have seen on saline lakes and hydraulic hydrology of saline lakes and the impacts in the Great Basin on water availability for migratory bird species, as well as other species that use saline lakes. This did not come up in the House mark, and we have not seen the Senate mark.

The reconciliation bill does give the Water Resources Research Institutes a \$75M increase to be expended by FY23.

In FY23 and beyond, we will focus on continued advancement and development of our Integrated Water Science priorities, including the research and tool development that is needed to fully understand demand for both human needs and ecological needs. So not only can we report water use, but we can start to predict what water use may be in the short term, and then in a multi-year, phase, as well as fully developed the National Water Census, which is our ultimate response to the SECURE Water Act.

Bureau of Reclamation – Bob Wolf

I am Bob Wolf, the Director of Program and Budget with the Bureau of Reclamation. I appreciate the opportunity to talk about the Reclamation program with this group. I'll just mention at the onset that Reclamation is very much affected by drought and climates. As an

agency, Reclamation has historically been looking at variability of hydrology within a year, and also across years. That is what our program has been about since its inception.

As far as the President's budget for FY2022, priorities include racial justice and equity. Indian water rights settlements, which are a key part of our program, are budgeted at roughly \$150 million. Infrastructure is another key component, and that includes our dam safety program, for which we had roughly a doubling of our requests this year to make sure we address safety concerns with respect to our dam portfolio and major construction. Another major priority is conservation, drought and resiliency. Of course, there are very significant issues on the Colorado River in the 22-year drought that has been underway there. California is experiencing extreme drought conditions, as well as the Klamath Basin and other parts of the West. If you look at the drought map, you'll see that much of the West is in severe drought this year.

The 2022 President's budget for Reclamation was about \$1.5 billion dollars. That's an increase from prior year budgets. Our budget has been passed by the House. It is through the full committee in the Senate and the marks for those two bodies are in the House. It's about \$75 million above the President's budget. It is an increase over last year's enacted budget and over \$400 million above the President's budget last year.

With respect to where the increases are and how they're important in the context of today's discussion, we have been getting additional funding for ongoing work, which has been the congressional way of providing funds to be spent at the discretion of the agency. These are not earmarks, though we do have some earmark funds based on the new process. We still have considerable flexibility on the House side. They've added in five categories including rural water, water conservation, water delivery, fish passage/fish screens for variable compliance requests, facility operations and rehabilitation. It is a very small number. They've increased our research and development program. So that's key in this evolving climate world to make sure that we're getting the information and addressing challenges appropriately for the future.

Further, our WaterSMART program is a key program for addressing resiliency now and in the future. The President's budget was around \$54 million dollars for a combination of WaterSMART grants and our water recycling program, which is Title 16. Drought response and the ability to maximize the use of our reservoirs that currently exist with the WaterSMART grants is key as well. The House incentivized marks for that program. We had \$54 million for that group of programs in the President's budget. The House mark is over \$191 million and in the Senate is \$123 million. So there are significant increases for the WaterSMART program.

The Water Infrastructure Improvements in the Nation Act of 2016, which is primarily Army Corps of Engineers authorizations, did provide some authorization for Reclamation to make recommendations to Congress on how to allocate those funds for three program areas. One area is storage, primarily to increase storage in reservoirs, and then a couple of cases for upstream new reservoir opportunities. Congress has been appropriating about \$143 million a year in recent years for storage. They've been appropriating about \$20 million for the Title 16

water recycling program and about \$12 million for desalination projects. They are continuing to do that in the 2022 appropriation process.

The Continuing Resolution proposal was sent up this last week, which includes language to name projects in the Act. This would allow us to begin making use of those funds on October 1. They are previously appropriated funds from FY2021, or prior years in the case of storage. We're proposing about \$200 million for storage, that we could start using October 1, if they are included in the Continuing Resolution. There would be \$12 million for desalination and \$30 million for Title 16 projects, based on some other funds that are available. We're very hopeful that Congress will follow the Administration's lead on making those funds available October 1.

The other thing of significance is that the Administration sent up \$100 million dollars in a Continuing Resolution for drought disaster funds. Again, we have very severe drought circumstances that we're dealing with in the Central Valley Project in California, Klamath Project on the Oregon-California border, the Colorado River, and in other places around the West. We have not identified exactly how those funds would be used yet, but will have access to those funds on October 1.

The Senate included \$450 million in a CERCLA title of the appropriation bill to address disaster relief, primarily for drought.

On the infrastructure front the Bipartisan Infrastructure Stimulus Bill, includes \$8.3 billion for Reclamation. It would be provided in equal installments of \$1.6 billion in each of five years 2022 through 2026. Western Water Infrastructure, Title IX of the Senate passed infrastructure bill, includes over \$1 billion for water storage, groundwater storage and conveyance improvements, \$3.2 billion for aging infrastructure, \$1 billion for authorized water projects (that I mentioned previously), and \$1 billion dollars for water recycling projects. Historically, those have been limited to \$20 million each, with rare exceptions, with specific congressional authorizations. Within that billion, there's actually \$415 million that would be for large-scale water recycling projects, \$250 million for water desalination projects, and \$500 million for dam safety. We had a huge increase in need based on the portfolio for a couple of very large dam safety projects that are expected to start by the end of this calendar year. Another is a couple years out.

There is \$400 million for WaterSMART grants, \$300 million for Colorado River drought contingency plans, and \$100 million dollars for cooperative watershed management. On the latter, we're working on reservoir operational systems to try to maximize what we get from each reservoir. There is \$250 million for a new program that was authorized last December, for ecosystem restoration, and another \$100 million for watershed health projects and \$50 million for endangered species. In the Colorado River, we have a couple of programs to address Endangered Species Act issues. We're very much looking forward to final enactment of the 2022 Energy and Water Appropriations Act. Reclamation will be watching very carefully the Continuing Resolution and also the infrastructure bill to see what funds may be provided to try to

address infrastructure needs and the drought situation occurring this year. This is the most severe drought I've seen in my career. Thanks very much.

Questions

Jerry Rigby: I wanted to confirm that Landsat 9 has the infrared imagery.

Brad Doorn: Absolutely. We're depending on it. So yeah, all systems are go. Just so you know, the launch delays are not due to any mechanical issues, or whether it will be on the satellite or the rocket. It's an interesting story, though probably too long for this discussion. Rest assured that the thermal band is on this satellite.

FEDERAL/STATE DROUGHT PLANNING & RESPONSE ROUNDTABLE

Heather Hofman facilitated this panel as well.

Bureau of Reclamation - Dave Raff

Thanks for having us. Obviously, drought is of critical importance to Reclamation, currently and always. All of the western states are certainly aware of or more aware that drought is unprecedented this year, and affecting all of our water supplies and power generation. Reclamation testified in front of Congress recently. One of the materials we use when we talk to Congress are the drought maps produced by the National Integrated Drought Information System (NIDIS) overlaid with the current status of our reservoirs across the western United States, and it is bleak. It's not great. I'm sure you're aware that for the first time in history, just two weeks ago, Reclamation or the Department of Interior declared a shortage on the Lower Colorado River Basin. That is obviously a significant step.

Things are tough. However drought is not just on the Colorado River Basin. It's throughout the western United States in terms of water supply. We're looking at situations, as you're aware, in which the power pools at a number of our reservoirs could be threatened, not only now, but also looking into next summer, if conditions persist.

That is the backdrop by which Reclamation is operating. Reclamation is taking active measures in terms of drought preparedness, drought resilience and drought planning. Three or four weeks ago, we completed a reprogramming effort. I forget the exact number, but making approximately \$100 million available now for drought activities, for immediate needs in places such as the Central Valley Project or the Klamath Basin. Also, we are expanding funding opportunities through our drought program, which is part of WaterSMART, making available additional funding, approximately \$10 million for immediate drought actions, as well as funding additional drought resilience projects. We're also looking at how we incorporate climate change and expectations of increased aridity in the western United States into our planning efforts. We're looking to the future through things like our basin study program.

We have increased requirements or increased scrutiny of our expectations for inclusion of climate change analyses and job analyses in each and every one of our planning projects, our construction projects, as well as our operation and maintenance activities. These are significant efforts on our part. We're taking active roles, both internally and externally, to make those as successful as possible, including standing up a more formal Community of Practice within Reclamation focused on climate change and climate change analyses. We're also setting up a more formal Community of Practice focused on hydrology and hydraulics, which incorporates improved forecasting into our annual water operations plans and water operations activities. We faced a number of challenges this past year relative to forecasts that missed the mark, in terms of what water actually showed up in a couple of our basins and made our operations much more difficult. We are going to be working both internally and with our partners at the National Oceanic and Atmospheric Administration (NOAA) and at the NRCS and others to try to do better forecasts and also for how we use the forecasts.

These are significant efforts at Reclamation. There are significant amounts of money going into drought resiliency and drought planning, as well as climate change incorporation.

National Integrated Drought Information System - Veva Deheza

The NIDIS program functions as an interagency program, but is housed within NOAA. Unfortunately, I don't have a better picture to paint than what Dave just talked about. The picture is very bleak. Things are tough, and things will continue to be tough.

NIDIS is joining forces with all of our federal agency partners, including the Bureau of Reclamation and the U.S. Geological Survey (USGS), to not only advanced research and accelerate research that is needed to deal with the conditions that David talked about in terms of the future, but also to work with USGS and others at NRCS with the System for Convection Analysis and Nowcasting (SCAN) program to develop upcoming innovative new technologies or decision support tools that will help water managers and water leaders such as yourselves to respond to the drought and to plan for the future.

I want to bring to everyone's attention a couple of items that NIDIS is currently working on with partners. We will be convening in cooperation with a lot of our federal agency partners, state partners, and other organizations, including the business sector, a Southwest Drought Virtual Forum. It will begin next week, and goes for four and a half days. The first two days of the forum are next Tuesday and Wednesday, the 21st and 22nd. Then the third and fourth days will be happening the following week on September 28th and 29th. You may access the information and register on the website found at [Southwestdroughtforum.com](https://southwestdroughtforum.com). Take a look at the agenda for what we're going to be talking about next week and the following week. You'll also be able to find necessary links to everything about the forum, including the registration site.

This forum is a little bit different than other forums that we've convened in that we set out to have a dialogue. This forum is not as much about the current drought conditions that we're all facing, but more about what does the future portend? I could sum this up by saying I was

reading an article in The Economist and it quoted Kristen Averyt, the Nevada Climate Policy Coordinator. She was quoted as saying drought almost seems too puny of a word to describe the water scarcity that the Southwest is experiencing. In some ways, drought implies that it's ephemeral. And that could not be more targeted towards what we're going to talk about. We're hearing from constituents who are asking questions: "Is this a drought? Is it something bigger? Is it possible to get back to a state of normal?"

This forum will focus more on the last 20+ years in the Southwest basins and the Southwest region, that have been in a drought. We'll have a plethora of science related presentations, everything from current drought conditions to wildfire conditions. We'll be introducing some very new, hot-off-the-press research that NOAA did integrating a number of other research scientists from other agencies and academic institutions. Specifically, this document is called the [Assessment Report on the 2020-2021 Southwestern U.S. Drought](#). In the report, researchers did an excellent job of answering the questions of how bad is it right now? And what caused it? And when is it going to end?

I will echo Dave Raff's comments about the impending release of the next 24-month study for the Colorado River Basin, as well as the five-year outlook that the Bureau of Reclamation will be putting out. It doesn't portend good times anytime in the near future. This forum will really take a close look at what the science is telling us, but the emphasis and the thrust of the forum is really about whether or not we are prepared. The idea that we have plenty of States and local communities that have drought contingency plans is fantastic. However, if what we are experiencing in the Southwest is something other than "a traditional drought," with a clear end in sight to this extreme event, then do we have plans, activities, mitigation, and adaptation strategies in place? Are they going to be helpful and valuable as we go into the next several years in the southwest?

We're also going to be having a panel discussion on infrastructure. We'll be talking about all kinds of infrastructure, not just building, but green water markets, policy infrastructure, and legal infrastructure, if you will. Additionally, we'll be talking about how the financial services sector is responding to what's happening in the Southwest. How are they doing business differently? I encourage everybody to attend the panel at the end of the fourth day. We've got a lot of what I would consider some really strong minds, really thoughtful leaders and water manager leaders and we'll have an open dialogue with many of these individuals. If you've got the time, we'd love to have you join us.

Let me just make one comment in terms of the House mark for FY22 for NIDIS. Earlier in the year, NIDIS released a tribal drought resilience strategy that we had developed in concert with multitude of tribes. We started implementing that strategy from the get go, as soon as it was off the printing press. The House mark calls for NOAA to receive a \$3 million increase in its annual appropriation and that money is targeted for interacting and partnering with the tribes throughout the country on improving their drought resilience. We hired a new staff member at NIDIS that will be solely focused on implementing the tribal drought resilience strategy. We are

starting to prioritize where we're going to be working first. Most notably, it will happen within the Southwestern part of the United States.

One last thing I wanted to inform you of. Mindi Dalton talked a little bit earlier this morning about drought prediction. Dave Raff talked about the need to improve prediction and what the Bureau of Reclamation is doing. To that end, NIDIS, with its appropriation has entered into a three-year (which could possibly extended to five-year) partnership with the Climate Prediction Center at NOAA, which is housed under the National Weather Service, for about \$1 million dollars per year to start looking at how we execute and implement those drought outlooks. People are familiar with the outlook that is generated by the Climate Prediction Center every month, and then every three months. They're called the monthly drought outlook, as well as the seasonal drought outlook. Those products are in need of some updating with the new science data sources that can be included. NIDIS is committed to working with the National Weather Services' Climate Prediction Center which has obligated the funds to start looking at significantly improving not only the outlooks, but the confidence in the outlooks.

So I will stop there and just make a plug about the drought.gov portal which was relaunched this year. It is the federal government site for all things drought. We are in the midst of adding a ton of new capabilities that will allow the general public and water managers to access information easily, and also to manipulate the data and the resources to develop products and images and maps that would be helpful in your decision making. I encourage everybody to take a look at drought.gov and keep checking in with drought data because we literally are bringing on board new capabilities on almost a weekly basis. Thank you for your time, everyone.

Environmental Protection Agency – Roger Gorke

The National Drought Resilience Partnership (NDRP) fits into what Veva just talked about. The NDRP does look at long term drought resilience. My colleague Stephanie Santell talked earlier about funding and financing. Also, we need to know if there are barriers to building that resilience? Are there regulatory barriers? Are there other barriers that we could try to address from a federal perspective, in order for States, locals, tribes, and regional entities to build that long term drought resilience? The NDRP is alive and well.

The principals are at the assistant secretary level, from our agencies. There will be a federal panel at the Southwest Drought Forum that will include folks from the Department of the Interior, U.S. Department of Agriculture, Environmental Protection Agency, Federal Emergency Management Agency (FEMA), and the National Oceanic and Atmospheric Administration on that panel. It's on the second day, which would be September 22nd.

The NDRP action plan is not an accounting of everything that the feds are doing related to drought, but what really warrants collaboration, and can be built on leveraging each other's efforts.

Earlier you heard Stephanie mention that EPA's Office of Water is working with other agencies to move forward on a funding and financing tool. Another effort is one that our water security division is working on with FEMA and with EPA Region 9 in California. The Water Security Division in our Drinking Water Office is looking at a demonstration of how we can help the State of California use the hazard mitigation grant programs. These are funds that go to a State after a disaster and 15% of that money can be used for climate resilience anywhere in the State. So for example, the fires in Northern California a few years ago, 15% of that money that comes to a State can be used in Southern California for say aquifer storage and recovery, or some other kind of resilience effort. Thus, we're trying to help with shovel-ready projects for drought through that funding program. I think that's a really good way to show how we're really working together, and then show how to leverage each other's funding, because that funding is a 75% grant, and it can be leveraged with, say, SRFs.

With that, I'll conclude and advise you to be careful what you ask for when you invite the feds to a meeting to talk because what we are doing because we have a lot of work going on both the climate front and also on drought. We want to partner with you all and help get these efforts implemented within the States with a direct partnership with you.

Questions:

Chris Brown: Is the report Veva referenced available?

Veva Deheza: Yes, it will be available. It's in the final stages of being laid out and designed. It will be available in time for the forum, which starts next Tuesday. We can definitely make sure that we get a copy of the report to Tony, and then ask him to send it out to the membership.

USGS BASIN CHARACTERIZATION MODEL – HOW DRY IS IT REALLY?

Lorraine Flint, Senior Scientist, with Earth Knowledge, Inc. and formerly with the U.S. Geological Survey (retired) addressed the group using a [powerpoint presentation](#).

Having listened to the last panel, I'm very excited to hear how much work is going on in this area. I'll be describing some tools we've developed to characterize the changes in landscape condition and water supply in response to climate.

Water supply drought, lack of recharge, and runoff is a shorter term impact that can be ameliorated with shorter wet periods. We have different kinds of drought -- water supply drought and landscape drought. Even if reservoirs are full longer, droughts can reduce recharge to the aquifer. Landscape droughts differ from water supply droughts, which are unique because they are exacerbated by the dry conditions and hot temperatures. These droughts dry out the vegetation and the soil and saturated zone. And they take much more to reverse.

How do we characterize these things? How do we help with being able to do forecasting and things like that? We need to understanding antecedent conditions. There are a lot of data and monitoring efforts in the West, including sensor data and remotely sensed data. There are also a number of models that are used to forecast water supply and climate extremes and the assessment of drought conditions. Measurements are great, and they are used to constrain models, but models are very useful to describe processes at different scales and time periods. This allows for forecasting models to all differ.

A regional water balance model that we've developed has some unique capabilities to assess conditions for resource managers. It is called the basin characterization model. It has been under development since 2007 with the U.S. Geological Survey (USGS), and since 2010 with the California Department of Water Resources (CDWR). We've been working closely with CDWR recently on drought forecasting and runoff forecasting. The model was published as a USGS code in 2021. If you want to access that information, there is a link on the Committee meeting agenda.

The basin characterization model can be used to explore a variety of processes from species conservation and distribution of vegetation to plot studies, water supply/baseflows, including timing of ecological processes, and extreme events to wildfire risks. The model has been used in nearly 130 different publications with different kinds of studies.

The model is based on a very simple water balance calculation that includes rigorously developed soils data, and incorporates detailed soil properties and spatially distributed estimates of bedrock permeability for distributing recharge. It's pretty fundamental in identifying all the processes that relate to the hydrologic response to climate. Any good modeler is going to use a grid-based monthly water balance model that uses climate data downscaled to fine spatial scales. West of the Rockies, it's 270 meters, which is about 18 acres for historical and future climates. For the continental United States, the scale is at one kilometer. We're doing North America and Europe, for example, at a kilometer and we've got models locally for different applications at down to ten meters. The basin characterization model develops a rigorous energy balance with vegetation specific evapotranspiration. We can identify different vegetation types and management scenarios, incorporate detailed soil properties and spatially distributed estimates of bedrock permeability. The model can calculate spatially distributed water supply as recharge and runoff and calculate climatic water deficit as an estimate of demand and stress.

An example of the Colorado River Basin annual water supply was shown in the presentation for water year 2011. They calibrated the model regionally in this basin to measure data and the slide shows an example of recharge and runoff output. There's a monthly map for all of these different variables. The photo depicts that the lower basin is dominated by recharge with its deeper soils, and the upper basin has more runoff from snowmelt and shallower soils.

How much of the precipitation falls as either rain or snow becomes part of the water supply in any given year. (See graphs in presentation.) Looking at precipitation versus recharge plus runoff (the amount of precipitation that doesn't just soak into the ground) in the lower basin,

it has become less over the last 20 years. The two curves depicted for 2020 and 2021 are highlighted and 2021 is certainly the most extreme. In the upper basin, the difference has been insignificant mostly due to the shallower soils. The recharging runoff is divided by the precipitation to calculate runoff efficiency. It is clear in the lower basin that the drought started in 2000. The lines are all much lower. It is not very obvious in the upper basin, however 2021 certainly stands out in the end.

We can look at different kinds of sensitivity analyses using the vegetation. We can change vegetation density to simulate the effects of fire, die-off, or forest management on hydrology. We can calibrate the model to observe vegetation recovery rates and these can be used to establish places where on-the-ground reforestation or restoration after wildfire would be useful, and simulate vegetation response to climate and effects on hydrology.

The graphic shows an example in California in a basin dominated by Douglas fir (the pink color in the graphic). The basin boundary is shown for the Mad River in Northwest California. The streamgage location is the yellow dot and you can see this drains into a reservoir. With the removal of different levels of vegetation, our baseline is an index of one. At 20% increments of removal, you see increases in late season flows. So, for example, if you removed only 20% of the transpiring vegetation, and you remove most of the understory plants or you did a controlled burn, you could get an increase in August baseflows of over 40%. Leaving that moisture in the soil and in the vegetation also reduces the stress on the landscape.

The powerpoint includes an example of removing vegetation as a result of wildfire. Once calibrated, this can be used to assess the likelihood of increases in peak flow following wildfire. In this example, it assumes a loss of 70% of vegetation in Colorado 2020 from a wildfire on the East Fork, which burned 89,800 acres.

We start with a calibrated model (shown on the upper graphic), and then we remove 70% of the vegetation within to justify the boundary, and then rerun the model. Thus, the (bottom) graphic is showing the reduction in actual evapotranspiration from the removal of the vegetation levels of water in the soil, which results in increased streamflow as the snow melts in May and June. We see the last two points in the graphic where with the wildfire runs it made far more streamflow.

Climatic water deficit is a calculation of landscape condition. Note that in this example, these are oak woodlands that seek out deeper soils in the valleys. On the north facing slopes, where climatic water deficit is the lowest, this variable has been used to characterize species distributions, wildfire risk and fire danger, changes in irrigation demand, forest die off, and the evolution of drought. So climatic water deficit is the annual evaporative demand that exceeds available water. It is calculated as potential minus actual evapotranspiration.

In the West, where we have mostly winter rains, and declines in the spring, the actual evapotranspiration is keeping up with the increase in potential evapotranspiration through the season and then the soils dry out. As the soils dry out you start accumulating a deficit for that

season. In this calculation, it integrates climate energy loading and drainage available soil moisture storage. It addresses irrigation demand, because that deficit is what you need to water to accommodate the plants. It defines the level of stress on the landscape. The earlier the snowmelt, the higher the annual deficit. The hotter it is, the higher the potential evapotranspiration.

In this example, we're using water deficit to characterize the evolution of drought in the Upper and Lower Colorado river basins. We subtract the long term 1951 through 1980 mean water deficit from each year, and then we accumulate those differences over time. When we're above the line, conditions are drier than average. Below the line, conditions are wetter than average. There were some drought years in the 1960s, which were reversed starting in about 1983 (which was a really wet year), followed by some more wet years that reset the system. This is more obvious in the Upper Basin than in the Lower Basin. In the Lower Basin, drought conditions started to accumulate in the year 2000. The Upper Basin did not exceed the long term average until 2004. Then the water deficit and drought conditions continued to rise, which we're all very aware of.

Drought conditions accumulate over time. When precipitation in the West is low each winter, it will accumulate ongoing drought. Water balance modeling can be used to characterize the spatially variable hydrologic processes that lead to drought effects and highlight where on the landscape priority or strategic management actions should take place. Because we do it at a fine scale, we can zoom in and help identify where monitoring gaps are. I believe that monitoring and modeling should be combined to inform resource management and to constrain models. Well implemented scenario testing can provide bounds for management decisions and highlight locations where the most benefit would be attained. Using things like climate forecasts and assessments to be able to forecast what kind of runoff you may have in the springtime or any of those kinds of hydrologic processes is my job. Thank you.

Questions

Roger Gorke: Did you do any water quality monitoring, such as for sediments?

Lorraine Flint: We have not done that. The model doesn't do chemical constituents. But it has been correlated very well with sediment transport modeling, and peak flows are carrying more sediment. The USGS is doing a lot of water quality modeling and a lot of the air monitoring. Many of the locations are coincident with peak increases in peak flows following large wildfires.

Roger Gorke: EPA's Office of Research and Development has been doing some research comparing prescribed burns to low intensity burns to the high intensity burns and looking at the water quality impacts. That might be a good webinar for the WestFAST series.

OPEN SOURCE, INTER-CONNECTED, CLOUD-BASED WATER MANAGEMENT

Jim Schneider with Olsson remarked he is happy to join us to talk about water management efforts from a technological standpoint.

As you notice from the presentation title, water management technologies are open source, interconnected, and cloud-based. I never thought I would be giving a presentation about software technology. I'm a scientist. I do groundwater modeling. My background is in groundwater. I worked for the State of Nebraska for about 10 years. In preparing for this presentation, I thought back to where we've been. When I started at the Department of Natural Resources, there was some data that I needed to get. It turned out that if I wanted that data, I had to go to an individual who would pull the data out from wherever it was, and put it in a spreadsheet for me. Obviously, times have changed, and technologies have changed. Certainly there has been a fantastic effort and amazing advancements in data availability.

However, simply having data available, as you all know, doesn't necessarily answer the water management questions that we have. We have taken that data and built a lot of models. In fact, we just heard about one, the basin characterization model. If those models are not available to water managers to respond to the questions they have, there's a disconnect.

I'm going to turn this presentation over to a colleague of mine. His name is John Burns, and he's with a company called Sitka Technology Group. For the past two or three years, we (Olsson) have been working with them, and learning about cloud applications, with software that can really bring data alive. Data and models can talk to each other in the cloud without you even doing anything – just automatically once it is set up. It's exciting for me, as somebody who spent a lot of time in the public sector, and then moved into the private sector, to find ways to make water management easier for water managers and discovering how technology can assist in those efforts.

John Burns with Sitka Technology Group used a powerpoint presentation. Today, I'm going to discuss a process for creating applications for managing water data, not about a specific application in detail. I will highlight the platform called the Water Accounting and Trading Platform. I've worked on this platform with a group of partners, including the Environmental Defense Fund (EDF), and some water management agencies in California and Nebraska. Before I get into the details, I wanted to present a graphic showing what we're trying to do with modern data management systems. It's no longer about databases and emailing spreadsheets that Jim mentioned. We are really trying to identify and build connections in our systems so that the data can be used, obviously, to inform decision making -- better decision making than could be made without these systems and data connections in place.

We do not typically start with the data, but rather with the people. When we're looking into building a data management system, we first identify the personas or the types of users who might engage with the system, so we understand their motivations and goals.

For the case study of the water accounting and trading platform we've built with EDF and other partners, we identified a group of personas or user types. Then we determined which of those personas to focus on initially and which others we would keep in mind for future iterations of the platform. We identified eight key personas in the case study and chose to focus primarily on the growers, groundwater managers, and data managers. And we'll keep in mind the other personas. Once the personas have been identified, we talk about their motivations and form a series of "I want" statements, around things that a person might hope to accomplish, using the data and the interfaces we build.

In this case, a groundwater manager in the context of water accounting at the local scale would be interested in meeting their regulatory compliance obligations, understanding benefits and balances, benefits and impacts of water usage, etc. We've created an inventory of these types of statements as comprehensively as we can. We engage with as many stakeholders as we can in the preliminary process before we begin to write computer code. Before the motivations are all inventoried, we can start developing.

In the case of this water accounting platform case study, we had the fortune of being able to engage directly with a number of landowners in the California Central Valley. Specifically in the Rosedale Rio Bravo Water Storage District, in which, under the leadership of Eric Everett, we were able to start a pilot of what would it would mean to put field by field water use data in the hands of landowners using remote sensing technology from the OpenET program. By working directly with the end users, even going so far as to find volunteer farmers who are interested in having access to the greater insight that this type of data can provide, we were able to iterate and watch them use the platform. We have gathered their feedback, changed what we built, and then tested it again. Through a number of pilot phase developments working directly with users, our process allows us to really hone the interface to help build those connections in the data that we're seeking to build.

We started with the pilot in Rosedale Rio Bravo. There's a site in use today that brings the early access OpenET data to these pilot landowners and the water managers in Rosedale Rio Bravo. The idea with this platform was to start in a local, small-scale case and then expand to other use cases, throughout California's Central Valley and elsewhere in the State.

Given the partnership that Jim and I have built between Olsson and Sitka, Jim has introduced us to some folks in irrigation districts in Nebraska. We worked with the staff at the Upper Big Blue Natural Resource District, following the process of identifying the users and understanding their motivations. As we were doing that, we started to notice a lot of alignment between how the needs for water accounting at the field and parcel scale present in Nebraska were very similar, just with differing terminology, to the work we were doing in California. So bit by bit, we started moving pieces of the platform from the California tool to the Nebraska tool. We have been able to do this because the platforms we are building are governed by an open source license, which means that the underlying technology that we're building is not proprietary. It's not owned by Olsson or by Sitka, or by the agencies who are funding the work. It's a model

of technology sharing that puts the ownership of the underlying source code into community availability through a specific license agreement.

So as we were going through the project in Nebraska, and started moving pieces we noticed underlying motivations for the same underlying personas. And lo and behold, we recognized that we were building a family of systems – sharing investment from California to Nebraska. These have become a water accounting platform family.

I started by describing our process and our analysis of the motivations. Now I'm going to loop back to talk about the water accounting platform and what we're doing. We are bringing in a number of different data sources, from different cloud providers, including remote sensing. We are bringing in OpenET data through an automated API to provide monthly water use data at the field scale to landowners. We're bringing in water supply information that is entered by district water managers, including different types of water that might be available for managed aquifer recharge, precipitation, other water available through native yield. Once we've brought in water usage, from OpenET water supply from district policies, we can create a water budget. Just like you have a budget for your checkbook so that you don't go bankrupt after a month or a year, similarly, we're trying to provide landowners with a water budget showing their supply and their demand so they can manage within that budget at the field scale. Once we have water budget information, we can enable landowners to consider whether they might trade water.

There is a trading module in this platform. We have not actually used it for water trades, but we have a pilot trading module under evaluation. Once we have budgets, we can think about what the impacts of trading programs might be. This has been tested with the landowners. We may go live with the water trading platform once the policy catches up to the technology.

The last step in the interconnected diagram is to take these data sources (knowledge) and turn them into wisdom. We're doing this through integrating with Modflow models, and a cloud-based platform that Olsson has built called the Groundwater Evaluation Toolbox. I want to take a moment to acknowledge the project partners: Rosedale Rio Bravo Water Storage District, the Upper Big Blue Natural Resource District, and the Environmental Defense Fund. Sitka, my company, and the OpenET folks have been great partners as we've been early adopters of their API, and have been able to have great back-and-forth as our use cases have informed their processes.

Once we've got the field-scale water accounting information that's available to us, and have an understanding of what landowners and water managers would like to do with that data, we can bring in models to help with decision making options and the impacts of those decisions. We've created a conceptual integration with the water accounting platform, and with Olsson's Groundwater Evaluation Toolbox, where we can actually send data to a model to ask a specific question. This conceptual integration is available for you to log into and check out right now through an EDF demonstration version of the accounting platform. Through this specific conceptual integration, we're allowing the groundwater manager, through a web interface, to determine the impacts of aquifer recharge on two different basins. Then they can determine how

the water levels would change as a result of those different scenarios. The yellow polygons represent the location of disadvantaged communities, then the red dots represent shallow domestic water wells, drinking water wells. So what we're showing through this potential integration is how recharge using the eastern basin – I'm sorry, the red dots in this case are actually arsenic concentrations, but the wells are there too – and the notion is to avoid impacting the shallow domestic wells adjacent to the disadvantaged communities, where there's potentially higher arsenic concentrations in this conceptual integration example.

The next slide gets into turning the data into information and knowledge into wisdom. We have a roadmap to go further down the path of daylighting additional water management scenarios. We have developed a wireframe that we're looking to build, thanks to some Reclamation WaterSMART grant funding that has been awarded to the California Water Data Consortium, that will further build out these modeling/accounting platform integrations. In this example, we're allowing water managers to create hypothetical allocation scenarios for different zones and then determine how that would impact the field-by-field water budgets that landowners would need to manage.

Broadly speaking, we're taking a bet on this open source model, which is really common in the Silicon Valley for private sector development. It has been really common for the federal partners for a lot of the modeling and engines that are being built like Modflow. It has been less commonly applied by consultants in partnership with NGOs, like EDF and government agencies, and smaller scale government agencies. We're taking this tried and true approach of making the technology available to anybody with the hopes of having a greater impact for lower cost to smaller scale agencies to adopt these tools. Through technology sharing, model features built by one group can be shared and available to others. There's no subscription fee, and anyone can use and add to the software and deploy it on their own. We certainly would like to be a part of that. But you may choose to work with another technology partner, and you can use this established functionality and customize it to your heart's content. You do have an option to self-manage and host a web application on your own or to work with a vendor to do that. Through this model, we think we can deploy these types of systems more rapidly to more groups of people. We hope to see other consultants start to contribute and build on to this model

See the slide for URLs for places where you can go to learn more.

WADE UPDATE

Adel Abdallah used a powerpoint presentation and provided an update on the Water Data Exchange (WaDE) work over the last quarter. We're coming up on the 10th anniversary of WaDE. The first and second phases have been completed, and we are moving to the third phase, which is WaDE use cases and personas. We have written a report explaining the questions we believe the personas would like to have answered. The report has helped us identify the connections between land and water and the potential impact of water rights transfers and leases on land management

We are developing the dashboard. Tony coined the term WestDAAT, the Western States Water Data Access and Analysis Tool, which will operationalize data services, demonstrate interoperable use cases, and support regional water planning. WaDE provides centralized access to the data to complement national datasets. One of the goals is to enable regional analysis to inform policy and planning. We're focusing on water rights data, site specific use and withdrawals, aggregated water budget estimates, and regulatory overlays.

As many of you are aware, the U.S. Geological Survey (USGS) puts together a national compilation of water use estimates for the United States, and that has been at the county level and updated every five years. We're working with the USGS to streamline and add water use to their Water Census program. Their goal now is to provide annual updates.

A graphic provided a summary of the datasets WaDE is sharing. Adel expressed appreciation to WSWC members for the assistance from their staff in making the data available. California, Utah and Nebraska are sharing five data sets, while other western states have fewer.

We hope to starting work on the dashboard soon to support use cases. We are in the process of finalizing some grants that will allow us to further the work. One big challenge is coming up with a common vocabulary. We appreciate the WSWC Legal Committee's efforts with the terms and vocabulary list.

WaDE is working toward integrating the water rights data with Open ET. As you know, OpenET provides monthly estimated consumptive evapotranspiration from agriculture across the 17 western states.

Tony Willardson described a funding opportunity with the National Aeronautics and Space Administration's Research Opportunities in Space and Earth Science (NASA ROSES). The WSWC will be contacting many of you to see if we can get a joint letter of support from our WSWC member states collectively to NASA discussing how this will help better manage water use in the West. This would be a very useful tool.

STATE WATER CONSERVATION PLANNING AND INCENTIVES

Tony Willardson reported that the Council has done a lot in the area of water conservation over the years, though a lot of it is pretty dated. In fact, you'll find a 1995 report in the briefing materials. Given the drought and other challenges, there is a renewed interest in what states are doing.

Earl Lewis remarked that in general, Kansas has a number of efforts trying to reduce demand. We don't want to reinvent the wheel. It could be there's something that can be helpful or we can share information. I wanted to share with you that we have started a new agricultural water optimization scheme. It's kind of a spin on conservation that really looks at both sides of

the equation, the water depletion, and also the agricultural benefit. We're trying to figure out metrics for how to do that. Kansas is looking at putting a sizable concern into that program. We want to get it right. I'd love to hear about not just water conservation, but how to maximize benefits in the agricultural sector and minimize depletions. Thank you.

SUBSEASONAL TO SEASONAL (S2S) FORECASTING

Tony reported that Jeanine Jones has been leading the WSWC's efforts to push out the S2S forecasting efforts from 15 days to months. The WSWC sent letters last spring to try to impact the budget process. Last December, NOAA's Weather Research Program recommended four different pilot projects, two of which impact us in the West. One is related to snowpack and runoff, and precipitation forecasting. The other deals with summer precipitation, primarily in the Plains. The WSWC has sent letters reaching out to cabinet level folks. David Hayes, in the White House, and Interior Secretary Haaland received letters. We will be sending similar letters to the Secretary of Agriculture and to NOAA. These letters should also go to the Office of Management and Budget (OMB), and we hope to get it in the President's Budget for FY23.

We intend to hold another S2S workshop in California in the spring of 2022 to talk about the science of improving forecasting. From a layman's perspective, one of the big challenges is actually the modeling. Given the computing requirements, it can take months to run the models on a climate scale. A large part of this effort is to secure investments into capabilities to actually run the models to help improve shorter term outlooks for months, and from months to years.

WESTFAST STATE WATER PLAN SURVEY & LISTENING SESSIONS

Heather Hofman reported on a topic Pat Lambert initiated. We will be reaching out to Wyoming and Nevada and ask you to identify some state teams to schedule some listening sessions perhaps in October or November. These people will send out the survey to folks on their staffs. You will hear from us more in the next couple of months.

STATE WATER RESOURCES AGENCY STRUCTURES & KEY FUNCTIONS

Tony Willardson noted that the group heard this morning from Hunter Roberts as he discussed some of the organizational efforts South Dakota has recently undergone. Kansas is also looking at reorganization. In Texas, they have a sunset provision, and the legislature requires a periodic look at the agencies, their organization and their effectiveness. Tony remarked that the WSWC has received questions related to agency organizational structures. Staff pulled together some information, mainly from each individual state's websites, and that is included in the briefing materials under Tab M.

More and more, states will be looking at what are the essential functions of your state water management agencies. If it would be useful, the WSWC could put together more of that information.

Jon Niermann remarked that the Texas Commission on Environmental Quality (TCEQ) is going through a sunset process right now. It normally occurs about every 12 years unless an agency falls out of the good graces of the legislature, in which case the schedule may be accelerated. TCEQ has just submitted an overview sketch of the agency's programs. It covers our water resources, groundwater, water rights, etc. It is a public resource and it's on our website and the sunset commission's website. The document is available should anyone want to look at it for their own purposes.

FEDERAL INFRASTRUCTURE LEGISLATION UPDATE

Michelle Bushman gave a brief overview on federal infrastructure legislation. The Senate has passed an extremely large infrastructure bill, and the House is waiting to do their part because they want to do a reconciliation vote. It provides an incredible amount of funding over the next five years for all different kinds of water infrastructure with dam safety, water reuse, wastewater, and drinking water SRF funding that is unprecedented. It was impressive that it was the Senate that ended up passing the legislation first, from a House bill modified by the Senate. There are so many variables, it will be difficult to determine what the outcomes will be for the States.

The legislation includes two tribal water rights settlements. Some are trying to include mandatory funding and to provide sufficient funding for all settlements that have already been approved by Congress.

Roger Gorke commented regarding the funding in the Senate version of the bipartisan infrastructure framework bill that was passed by the Senate. The SRF funding levels are unprecedented. They are almost \$12 billion for each. There's also nearly \$2 billion for some of the other accounts that go to what we call geographic programs, such as for Chesapeake Bay and Long Island Sound, the Pacific Northwest Puget Sound, the San Francisco Bay, and those kinds of efforts as well as the National Estuary Programs. There's also \$15 billion for lead service lines, and then another \$1 billion in the Clean Water/Drinking Water SRFs for PFAS. That's on top of the the more normal amounts for the traditional SRFs. It is a lot of money, and we don't know how it's going to get doled out, nor whether there will be matches required. So that's just a little bit more context.

SUNSETTING POSITIONS FOR 2022 SPRING MEETINGS

Position #432 – supporting Rural Water Infrastructure Needs and Projects
Position #433 – supporting Renewable Hydropower Development

OTHER MATTERS

There being no other matters, the meeting was adjourned at 11:46 a.m. Mary thanked all of the federal partners for joining and for their participation.