



# The 2022 National Water Use Data Workshop Summary Report

Salt Lake City, UT  
August 16-18, 2022

Compiled by: Adel Abdallah, Ryan James, and Tony Willardson  
Western States Water Council



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## Summary Report

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## **Introduction**

On August 16-18, 2022, the Western States Water Council (WSWC), in cooperation with the U.S. Geological Survey (USGS), Interstate Council on Water Policy (ICWP), and Internet of Water Coalition (IoW) held a National Water Use Data Workshop, in Salt Lake City, Utah. Water use measurements, estimates and reporting are important to both water supply planning, drought response planning and mitigation, water project construction and operations, water policy and water rights administration. Yet, States and USGS face challenges in estimating and reporting water use to make inform decisions.

The goal of the workshop was to: (1) provide a platform for state agencies' staff to learn from each other about the latest efforts related to water data management and sharing; (2) engage state information technology (IT) and water resources management staff with the staff of the USGS National Water Use Data and Research (WUDR) and the WSWC Water Data Exchange (WaDE) Programs; (3) exchange the latest developments on water use data sharing methods and how States can benefit from them; and (4) identify challenges related to states' data sharing efforts and consider potential solutions.

Overall, the workshop drew some 100 participants, roughly half in-person and half virtually, from 32 states representing 67 different state, federal, private sector, non-profit, academic agencies and organizations.

Thirty speakers covered topics of: (1) data collection and reporting; (2) models to estimate water use; and (3) software tools to share, visualize, query, and download water use data. They shared states' methods for sharing surface and groundwater use for all categories of water use such as agriculture, public supply, thermoelectric. Workshop speakers also presented on: (1) programs and initiatives related to improving data collection, sharing, and access to water use data; (2) historic monthly/annual site-specific water withdrawals and use; and (3) data gaps and developing ways to fill the gaps; and (4) metadata for water use information.

## **Welcoming Remarks – U.S. Rep. Melanie Stansbury**

U.S. Rep. Melanie Stansbury (NM) kicked off the workshop with a pre-recorded video welcoming everyone and highlighting the Water Data Act that she introduced in the House of Representatives. She pointed to the important role of the participants in helping our communities better understand and manage our water resources, especially through the power of data through stakeholder partnerships. She has dedicated her career to working on water resources issues as a researcher, an educator, working in the White House Office of Management and Budget, as staff to the U.S. Senate Committee on Natural Resources, in the New Mexico State Legislature, and now in the

Congress. She emphasized that managing water resources sustainably into the future will require bringing stakeholders together, ensuring that everyone has a seat at the table, and ensuring people can access data and science.

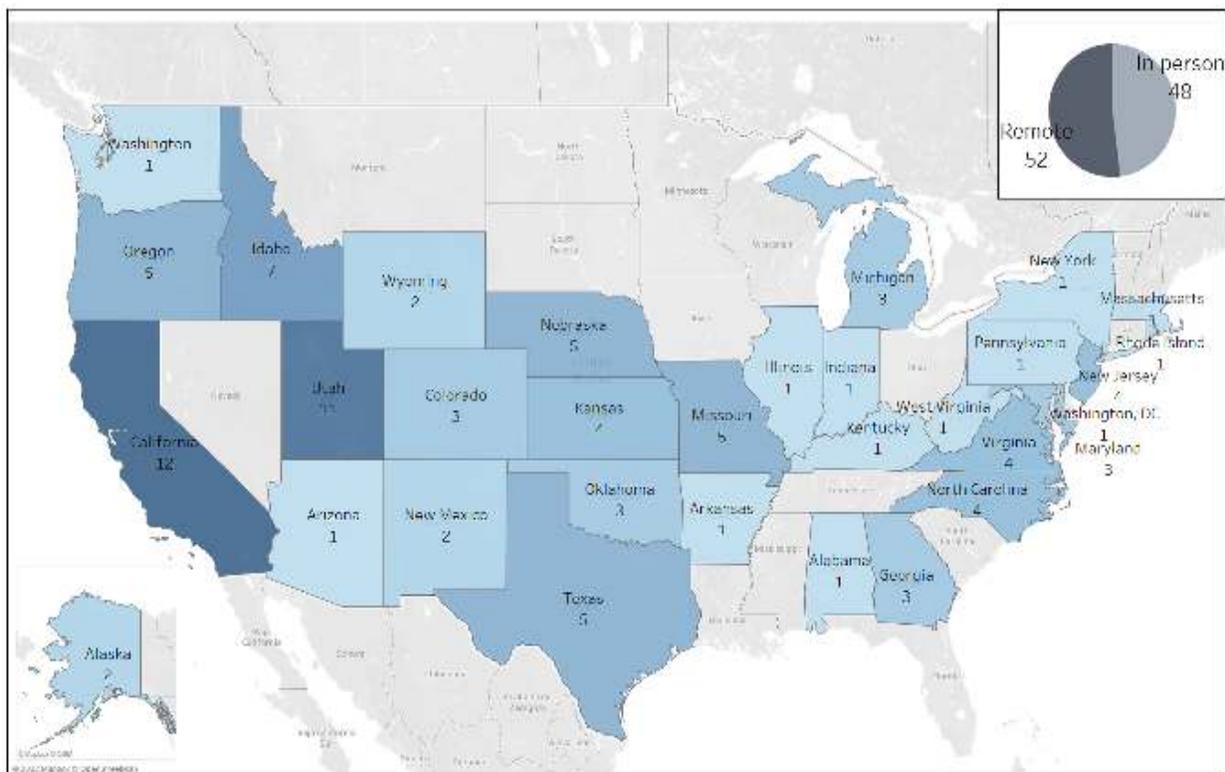


Figure 1: The distribution of workshop participants across the U.S.

Rep. Stansbury was proud to recently introduce the bipartisan Water Data Act, with the Western States Water Council’s review and support playing an integral role. She thanked the attendees for all their feedback and support. The bill was not only introduced but also passed in the house just two weeks ago. This bill is designed to unlock the power of big data to empower our communities to control their own water future and ensure that our water managers, ranchers, farmers and communities have the tools and resources that they need to use data in real time and manage water sustainably, especially as we’re facing drought and unprecedented change. The bill passed as part of a comprehensive wildfire and drought package that also included our Rio Grande Water Security Act.

Rep. Stansbury shared her excitement that this bill aligns directly with so much of the critical work that the States are doing all across the West. The bill creates a comprehensive national framework to help address water data challenges at the national level in partnership with the state, tribal, federal and local entities, as well as the nonprofit and private sectors. She summarized that reliable and comprehensive data is crucial to tackling our biggest water challenges and that different stakeholders coming together, leveraging the power of data, will contribute to innovation that will help to bring transformational change on the ground in the way we managing water going forward. She asked for help to get this bill across the finish line in the Senate. Finally, Rep. Stansbury

thanked the participants as the policy, technical experts, scientists, and researchers who make it possible every day for her to do this work in Congress.

### **Workshop Co-Sponsor Remarks**

Tony Willardson, WSWC Executive Director, welcomed everyone and thanked Rep. Stansbury for her support as a champion for water data to help provide the resources for workshop participants to achieve some of the things that they are working on. Tony also noted his appreciation of the hospitality of the Utah Department of Environmental Quality, and the opportunity to use their board room and the facilities for the workshop.

The WSWC was created by the Western Governors to advise them on water policy issues. He shared with the participants that earlier in the morning he had heard Deputy Assistant Secretary of the Interior Tanya Trujillo call for the Lower and Upper Colorado River Basin States to reduce their water use, which is generally one of the primary reasons for the workshop. He remarked that a lot of work has been done on the water supply side of the equation in developing our resources. The dams on the Colorado River have supplied users through the last 22 years of drought, but are nearing levels that we have not seen before.

Tony recalled visiting Page, Arizona with his father when he was eight years old and seeing the completion of Glen Canyon Dam. Lake Powell took 17 years to fill, and he hopes that 17 years into the future, it will be full again. He said that we have no control over water supply (rain and snow), which leaves us only with control over water use and demand management. When the supply is not there, we are going to have to reduce our demands.

He suggested that there is a need to identify the ramifications of demand reductions and water use choices, in many areas of the country, as we face challenges related to water for environmental uses, demands for energy, and also the needs of growing populations. Tony also suggested we need to provide policymakers from the level of the governor down to the individual farmer with more information to make water use decisions.

Tony shared a historical overview of the WSWC Water Data Exchange (WaDE) Program over the last 10 years. WaDE initially began with stimulus funding from 2009, through the Department of Energy, to Sandia National Labs and to the Western Governors Association. Back then the interest was in water needs related to electricity transmission. It takes water to generate electricity. The governors were interested and asked WSWC to look at the impacts on water use from energy development.

Earlier, in 2004, the WSWC had asked its members, the 17 Reclamation States and Alaska, to share estimated water demands and whether or not they had the supply to meet demand projections to 2030. If not, how did they anticipate they would close that gap. The survey uncovered the fact that such information was not readily available, not managed in a centralized system, and the long-range regional demand projections were hard to estimate due to a lack of data.

Finally, Tony introduced the co-hosts of the meeting: Mindy Dalton, USGS Coordinator, Water Availability and Use Science Program (WAUSP) and the National Water Quality Program (NWQP); Peter Colohan, IOW Executive Director, Center for Geospatial Solutions at the Lincoln Institute of Land Policy; and Beth Callaway, Executive Director, Interstate Council on Water Policy (ICWP).

Mindy welcomed the participants and noted that USGS has recently kicked off a new strategic way of handling water use since the Water Use Data and Research (WUDR) stakeholder meetings, one

of which was held in 2015 in Salt Lake City, Utah. One of the messages that came through loud and clear was a desire for people across the water use community to get together much more frequently to talk to each other about the work that they are doing regarding water use at the state and regional levels. Mindy said that WUDR has a monthly open forum virtual meeting, but there is nothing like getting together in person to have these kinds of conversations. She noted the last meeting was in 2019 in Fort Collins and USGS is looking forward to continuing to support meeting every couple of years to help strengthen the water use community.

Mindy reiterated that USGS national water use data collection efforts rely on what happens at the state and local level. So it is really critical for USGS to essentially leverage what they get from the states and help support development of new data sources and new data types through avenues like WUDR, which is really beneficial. Mindy shared her excitement to learn more about what's happening at the state level.

Peter Colohan was the Executive Director of the Internet of Water start up at Duke University for three years and is now the Chair of the Internet of Water Coalition. Duke is a research university that creates innovative, but universities are not necessarily setup to sustain technology initiatives over time. He summed up the startup experience as addressing the need to bring technology and people together. The successful IoW startup attracted philanthropic funding that allowed them to expand into a new initiative at the Center for Geospatial Solutions at the Lincoln Institute of Land Policy. Kyle Onda is the IoW Associate Director.

Peter mentioned that they are now partnering with the federal government, starting with the Department of Energy, with a focus on hydropower data through Oak Ridge National Laboratory. The goal of the IoW is to assist both federal agencies and state agencies in the modernization and digital transformation of water data so that we all share and exchange and integrate that data more easily, and arrive at more careful conclusions.

Peter said that the IoW Coalition is working with federal partners that the U.S. Bureau of Reclamation (Reclamation), USGS, and U.S. Environmental Protection Agency (EPA). USGS supports Duke and the IoW Coalition directly in the creation of the Geoconnex software, which allows connecting data at the state level and across jurisdictions with the federal agencies. He also mentioned that the IoW is building a HubKit as another open-source water data management tool that is an alternative to services like KISTERS.

The Lincoln Institute is a venerable "think tank" based in Boston where they recently set up a new center for geospatial solutions, which is about providing geospatial data for conservation, land management and water resources management. The main reason the IoW is at the Lincoln Institute is to better promote water data technology and its adoption, through education and outreach.

In March 2022, the broader IOW Coalition was formed with five organizations: Duke, the Lincoln Institute, the Western States Water Council, the Water Data Collaborative, which is a community science group, and the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI). It has grown to a group of about 20 nonprofits and other entities, represented by individuals, that collectively act across jurisdictions in the public and private sectors. So, the IoW Coalition represents the philanthropic, public, private, and non-profit sectors working to get society to a place where our data is more modernized, and more and more easily shared.

One goal is to broaden the IOW initiative and help foster the core technologies need to modernize water data sharing in partnership with the federal government. Peter reiterated that another goal to foster their relationship with states so they can assist them and provide the tools and information to help improve the work that they are doing.

Peter concluded by sharing that he worked for the National Oceanic and Atmospheric Administration (NOAA) for about 20 years, and he knows how hard it is to change a public agency dataset. The IoW is trying to help states create pathways, so they don't necessarily have to wait for that change, though internal change is still needed.

Beth Callaway ICWP Executive Director welcomed everyone. ICWP is a national nonprofit that represents the interstate government agencies who work on water policy issues, as well as others interested in water law or policy issues, including industry, academia, and anyone who has a vested interest in learning and sharing information about interstate water policy issues. Beth noted that she took the job about three months ago. She worked at the Wyoming State Engineer's Office, and in the Wyoming Governor's office. ICWP is happy to help co-sponsor this workshop. She emphasized that the primary goal of the workshop is to bring states together to share their water use data approaches, information and findings, which is one of ICWP's core values.

## **Future Vision**

Jaime Painter USGS Water Use Program Manager presented on the Next-Gen Water Use Information Program. She stated the USGS Water Mission Area (WMA) science priorities are grounded in the SECURE Water Act and a National Academy of Sciences (NAS) report. She reported their goal is to develop an operational system for estimating and forecasting water use and water transfers nationally, in collaboration with water users. She concluded addressing the near and longer term of delivery of water use information at different specific geospatial and temporal resolutions.

Adel Abdallah, WSWC WaDE Program Manager, observed the unique contributions WaDE provides are standardized access to water rights and water use data for eighteen western states. WaDE's architecture is now in a "cloud" environment. WaDE's Data Analyst Ryan James maps and imports states' public data into WaDE, using a consistent data structure and terminology.

Adel emphasized the user-centered design that led to the upcoming release of the Western States Water Data Access and Analysis Tool (WestDAAT). WestDAAT's first phase will provide a wide range of filters to query and analyze over 1.6 million water rights across WSWC member states. He demonstrated possible applications of WestDAAT which will eventually support accessing historic site-specific and aggregate water use data, as well as streamgage and reservoir data operated by states. He concluded by suggesting how other states can participate in WaDE by making their data publicly available in a tabular format and by following the WaDE data reporting and data dictionary protocols approved by the USGS.

## **Water-Use Data and Research Grants – Lessons-Learned**

Erik Smith, WSWC WUDR Program Coordinator, led a discussion on the obstacles, perceived or real, to getting WUDR grants, and ideas for regional grant strategies. He summarized the WUDR goals to; first, improve the availability, quality, compatibility, and delivery of water use data that are collected and/or estimated by states to support the National Water-Use Assessments; and second, to integrate state water resource agency water-use or water-availability datasets into USGS databases. Erik summarized the history of WUDR, and which states and the types of projects that received funding. Erik used a polling service called menti.com to facilitate answering questions for both remote and in-person participants.

## **Federal Water Use Data Collection and Modeling Efforts**

Cheryl Dieter, USGS, shared a perspective on water use data availability and useability throughout the country. USGS is developing tools to improve this data. She noted that the two largest water uses across the country are thermoelectric cooling use in the East, and irrigation in the West. She stated water use data should include daily site-specific facility and systems data by water source with the timing, location and quantity of water used, with emphasis on the metadata. She also highlighted the need to be able to understand and fill in data gaps, identify outliers (anomalies), and understand reporting differences.

In the last 2 years, USGS identified more than 13,000 water use sites and added 14 million monthly and annual water quantity data values in 20 states. Cheryl outlined issues that affect the usability of water use data, including: (1) spatial variability; (2) relating water withdrawals to places of use; (3) data latency; (4) censored data; (5) limited time-data collection periods; (6) inconsistent or non-unique site names; (7) erroneous data values and outliers; and (7) aggregated values versus site specific and permit specific data. She concluded with how others can collaborate with the USGS on improving their own water use data.

Richard Niswonger presented about the “USGS National Water Use Models.” He focused on the public supply and irrigation modeling activities at USGS. He first talked about a 20-year reanalysis effort for estimating irrigation water use and then irrigation withdrawals. He also talked about the modeling of effective precipitation in the Upper Colorado River Basin. Rich then talked about water application and the total crop consumption for irrigated lands. He also talked about public supply water use; using a machine learning model for water use and predicting patterns in use; and that the national per-capita public supply water use had declined over the past 20 years. He concluded by talking about uncertainty in quantification of per capita water use.

Forrest Melton, National Atmospheric and Space Administration (NASA) Western Water Applications Office (WWAO) provided an update on the Open Evapotranspiration (OpenET) initiative in Utah, California, and an Oregon pilot study. He described the value of OpenET data and how the project was founded on open science and well-established methods with an ensemble modeling approach. Forrest talked about OpenET use cases and partnerships to help rural communities, water managers, policymakers, and farmers. He focused on a recent partnership with the California Department of Water Resources, Colorado River Authority of Utah, and federal patronships with USGS and Reclamation. WWAO is supporting OpenET activities in other areas such as the Columbia River Basin and with the Idaho Department of Water Resources. He discussed the accuracy of the OpenET approach through an intercomparison and accuracy assessment study. OpenET project next steps include releasing their Application Programming Interface (API) in late 2022.

Finally, Forrest reflected on lessons learned and best practices. He suggested looking for win-win solutions that address concerns of stakeholders, as open science and open data are not free. He concluded by giving credit to OpenET partners and their role in the success of the project.

James Prairie, the Bureau of Reclamation, joined virtually and gave an overview on how water use reporting is occurring in the Upper Colorado River Basin. Water use reports come out in 5-year increments. He outlined a long-term collection method at a HUC 8 level and demonstrated the Colorado River Simulation System model used for a longer-term planning. It is used with the Natural Flow Records data set, which is an estimate of what flow would be with no human interaction. He

outlined the eight major categories of use tracked, with irrigated agriculture the largest at 63.4%, followed by out-of-basin exports at 16.5%.

James talked about struggling with irrigated agriculture water use estimates that rely on older techniques (modified Blaney-Criddle crop ET). Acreage estimates come from state statistics and census data, which is not always accurate, and recent work is intended to improve estimates. Working with the Upper Colorado River Commission, Reclamation is starting to use the eeMETRIC remote sensing model for estimates ET instead. Reclamation is also revisiting acreage estimates with a Normalized Difference Vegetation Index (NDVI) approach. Lastly, he outlined efforts to improve other lower priority water use reporting (exports, municipal and industrial use, etc.).

## **Software Tools to Share, Visualize, Query, and Download Water Use Data**

Kyle Onda, Internet of Water Coalition, Center for Geospatial Solutions at the Lincoln Institute of Land Policy, provided an update on the Internet of Water and Geoconnex project using a New Mexico Pilot Study. He talked about the difficulty in searching for water data on the web. The Geoconnex project is a system for connecting water data from different data providers via geographic location. He demonstrated that using the Network Linked Data Index (NLDI) as part of Geoconnex allows users to query water diversion sites as organized by WaDE and monitor locations as provided by USGS gages upstream of a location in the Pecos River Basin in New Mexico. Each water feature has an individual landing page with a persistent identifier providing consistent access across platforms. Kyle concluded by providing instructions on how data providers can participate and contribute to the Geoconnex project.

James Schneider from Olsson, a private firm, and Kathleen Elmquist, from Environmental Science Associates Sitka, talked about “Real-time Groundwater Management with Big Data and the Internet of Things - Examples from the Twin Platte Natural Resources District Water Data Program (TPNRD).” Jim described the TPNRD outreach campaign and how they used Paige Wireless service and bandwidth to affordably communicate measurements of water use, using energy use as a proxy measure. Kathleen explained next steps, learning from the collected data, to: (1) integrate more sophisticated, automated analysis tools such as the Groundwater Evaluation Toolbox; (2) work with subject matter experts to define and build data visualizations such as dashboards, maps, and charts; and (3) continue to perform analysis using new data sources such as remotely sensed water usage and precipitation. She concluded by talking about their effort in building a family of open, shared software technologies.

## **State Water Use Data Collection, Reporting and Sharing**

### **Alaska**

Kevin Petrone, Alaska Department of Natural Resources, addressed (virtually), for possibly the first time at a national level, how water use is reported in Alaska. Kevin gave a brief comparison of Alaska and the Lower-48 states, with Alaska accounting for about one-fourth of the nation’s land and precipitation, 7% of the evapotranspiration, about 80% of the surface water runoff, and 2% of total fresh water. He noted that there is an abundance of water flowing into the ocean with precipitation greatest in the southeast and southcentral coast.

Kevin provided an overview of a WUDR grant program and a 2011-2015 water use report for Alaska. Hydroelectric water use is 90% of total use, followed by public supply & mining. Kevin went over

how data flows into the Alaska Water Use Data System (AKWUDS), which was updated to include water user metadata, permitted rate, reporting interval/submittal frequency, and water source type. Data is user reported with an online form. Kevin finished describing a case study on water use availability during a recent drought.

### **California**

Tara Moran's presentation, was entitled, "Advancing Urban Water Use Data Sharing and Reporting." She is with the California Water Data Consortium (Consortium), a 501(c)(3) non-profit corporation, formed in 2019 to help state agencies implement California's Open and Transparent Water Data Act (Act). First Tara quoted an excerpt from the 2016 Act, which mandated that California Agencies work together and publicly share water data in machine readable formats. The agencies supported the creation of the Consortium. It has a board of directors and steering committee comprised of state agency representatives and non-state agency partners. California is facing ongoing and unprecedented water supply challenges related to climate change, population growth, and other stressors.

The Consortium is focused on urban water reporting in partnership with the California Department of Water Resources (CDWR) and State Water Resources Control Board (Board). The Consortium is aligning urban water supply and use data to reduce reporting burdens, expand access to more timely data, and improve data use. Tara listed critical urban water policy questions and the project's approach to improve the understanding of several factors, such as state legal and regulatory requirements. She mentioned an urban water reporting workshop that was held recently in Sacramento and its recommendations. She concluded with the Consortium's next steps to meet their goals, including pursuing grants and other funding opportunities.

### **Colorado**

Brian Macpherson, Colorado Water Conservation Board (CWCB), presented on "How Colorado's Decision Support System (CDSS) Hosts and Shares Water Data." He acknowledged that water use data for decision-making in Colorado is a joint effort between CWCB and the Colorado Division of Water Resources (DWR). Approximately 120 DWR water commissioners gather data and administer rights to the use of Colorado's rivers, streams and groundwater. Brian talked about the CDSS history and then shared how the online tools work to query and visualize the State's water use data. He also described the input and output to and from their state-wide water allocation model. Brian also explained how their HydroBase REST Web Services works to query the state's water data.

### **Indiana**

Mark Basch, Indiana Department of Natural Resources (IN-DNR), Division of Water, explained "Indiana's Water Use Registration and Reporting Program." He provided a brief overview of Indiana's Significant Water Withdrawal Facility (SWWF) registration and water use reporting program. The Indiana Water Resources Management Act (Indiana Code 14-25-7), enacted in 1983, required registration of all SWWFs (both groundwater and surface water) defined as facilities with the capacity to use greater than 100,000 gallons per day (gpd). Approximately 4,270 SWWFs are currently registered. The 2021 state totals across SWWFs show that total annual withdrawals have declined significantly since 1985. Mark presented a new online tool to submit annual water use data. With fundings from the Indiana Geological and Water Survey (IGWS) they have identified potential unregistered SWWF sites. He concluded talking about IN-DNR's approach and next steps in estimating water use from these sites.

## **Kansas**

David Engelhaupt and Andy Terhune from the Kansas Department of Agriculture both gave a high-level overview of water use reporting. The Kansas Water Appropriation Act of 1945 states all water may be appropriated for the use of the people. Each year Kansas sends out 16,000 water use report forms to 32,500 active water-right users, with the largest use being irrigation. There are penalties in the form of fines for failure to report. Kansas has recently switched to online form submission, which has resulted in a significant increase in compliance. They briefly discussed how the data is accessed through their Water Information and Analysis System (WIMAS), and online database, that can be queried by the public. David and Andy finished by speaking about possible future WUDR grant projects to improve the database and streaming data.

## **Missouri**

Trevor Ellis, Missouri Department of Natural Resources, addressed “Missouri Water Use: A People-Centered Science.” First, he described Missouri’s groundwater resources across the Ozark plateau, Mississippi alluvial plain, and the central lowlands. Missouri has abundant groundwater in the South, but limited groundwater in the North. He provided a water use breakdown across Missouri’s counties and categories of water use, then talked about Missouri’s water rights system, which is riparian.

Trevor talked about their Water Use Reporting System (WatURS) updates and concluded by summarizing their outreach efforts to help in improving water use reporting. Water use is not regulated or permitted, but it must be reported the following year. A lack of enforcement leads to varying compliance. He suggested a need to renew their purpose and goals, and change their mindset, developing relationships and working with partners to promote water use reporting.

## **Nebraska**

Jennifer Schellpeper, Nebraska Department of Natural Resources, described their history and future plans for water use acquisition and sharing. Water use data gathering is built upon seven different models across the state, unique to each area. Data is shared via their Integrated Network of Scientific Information and Geohydrologic Tool (INSIGHT). Water supply and water demands data is shared. She described what they have done with WUDR. A 2016 effort made improvements to their database with a focus on their non-irrigated supplies of water. She listed a few products, including a template database structure for each water-use type, a process document for compilation of the data, and a Lower Platte coalition reporting database.

## **New Jersey**

Kent Barr, a research scientist at the New Jersey Department of Environmental Protection, shared that New Jersey does not deal with water rights, but does have water regulations. He described the State’s water use database, the New Jersey Water Transfer Database (NJWaTr). The conveyance-based model represents water exchange activity between two sites, records transactions between sites, and creates a conveyance for a water network. The two primary conveyance network structures used are: (1) a basic one-way structure for withdrawal-to- discharge point for commercial, industrial, agricultural, or power water uses; and (2) a more complex interconnected structure, used for potable water supply and wastewater.

Kent outlined some key points related to their data covering 53,000 withdrawal points and use areas, and 32,00 one-way conveyances. Currently there are 5.5 million monthly transfer records in their database from 1990-2020. The majority of their water use is metered, but there are some

exceptions in more rural areas (including agricultural and domestic uses), that are accounted for by using an average daily estimate. He explained the New Jersey Water Supply Plan to improve water use data and anticipated future demands. The Plan involves comparing metered data to the reported use for agricultural and domestic use. Kent concluded with how this data is being shared online and is available to download for aggregated municipality or Hydrologic Unit Code (HUC 14) levels, with story maps and directions for how users can see these results.

### **New Mexico**

Stacy Timmons, New Mexico Bureau of Geology and Mineral Resources, addressed the “New Mexico Water Data Initiative.” New Mexico is facing numerous water challenges with a decreasing water supply due to less snowpack, less snowmelt runoff, less groundwater recharge, and more variable and extreme precipitation. Stacy talked about the 2019 Water Data Act and how it directed state agencies to collaborate with regional and national efforts to share, integrate, and manage water data. She pointed out that current access to data requires expertise. She summarized a stakeholder engagement study that identified their water data needs. Stacy noted two paths for data sharing and access through a data catalog and a federated data model. She acknowledged the reality that water use data can be challenging to collect and then talked about successful outcomes using modern data. Stacy concluded by reiterating the State’s current focus on integration and data connection and credited their collaborators and supporters.

Julie Valdez, New Mexico Office of the State Engineer, spoke virtually and gave a high-level overview of how water use data is gathered for the New Mexico Water Use By Categories 2015 Report. Irrigated agriculture is the largest use at 76.3%, followed by public water supply at 9.1%. Withdrawal data is gathered in multiple ways (e.g., metered, surveyed, and estimated). Due to data gaps, they use population data to help estimate water use in certain areas.

Julie summarized the challenges related to gathering data, with low compliance and only 20% of their metered data being uploaded into a database, as some metered data is only gathered for paper files from individual reports. There are issues with water use estimates due to population estimate difference between the U.S. Census and local county reports. Also, not all groundwater use is metered, but instead computed. Further, irrigation use estimates may lack cropping patterns data. New Mexico has worked to improve their water use data collection. All new meters must include a meter reading tag, which helps track information with online reporting forms. Public Water Supply Service area boundaries were created to improve census population data estimates. Lastly, an aerial imagery program was started to help identify irrigated and potentially irrigated crop lands and to fill in missing cropping patterns data. Water use data reports are publicly available online.

### **Oklahoma**

Jason Tutkowski, Oklahoma Water Resources Board outlined water use reporting. He explained groundwater permitted and defined beneficial use. Domestic use is exempt, including water used from an individual or family household well. Farm and domestic animals may use up to normal grazing capacities. Water use reporting is only required for long term permits. Reporting is a best estimation with paper submissions only. There is no metered data. There are late fees penalties. Reports are delivered by mail and uploaded by hand into a database. Data is used to generate water use maps and reports.

Oklahoma received a 2018 WUDR grant to update its Water Use Information System, including adding monthly data, and improving QA/QC warnings. USGS principal aquifer and HUC8 aggregated data are included. Dam identifications were added to track water storage. The challenges they face include issues with Oklahoma staff accessing the data, the small staff, the age

and complexity of database, and domestic use assumptions. Jason ended describing future plants for increasing the penalty for late submissions, a better water use questionnaire and intent-to-drill database, as well as moving to an online water use reporting system.

### **Oregon**

Jordan Beamer, Oregon Water Resources Department (ODWR), presented on satellite-based evapotranspiration (ET) and updating Oregon's consumptive use data. Oregon has limited records of irrigation water use though irrigated agriculture is the largest user of water in the State. Updated and accurate comprehensive water use datasets are needed for all users, with estimates of actual ET and potential ET from irrigated fields. This data is used for: (1) groundwater basin studies; (2) water availability analyses; (3) place-based planning and water development projects; and (4) water rights administration. He said that current estimates and approaches lack data and data quality. Oregon needs time series data for actual ET for every irrigated field in the State. He pointed out that recent federal and state funding has allowed ODWR to establish a statewide ET estimate program. Jordan talked about a five-step approach to: (1) develop mapped agricultural fields; (2) identify irrigation source type; (3) assign whether a field was irrigated; (4) calculate ET and Net ET by field using OpenET; and (5) estimate field and HUC-12 ET summaries for 2016-2021. Jordan concluded by talking about the Columbia River ET Mapping Tool and its timeline and next steps.

### **Texas**

Taylor Christian, Texas Water Development Board (TWDB), described the "Building of the Texas Water Data Hub." The project started in 2017 with the Aspen Institute Dialogue Series on Water Data. In 2018, TWDB hosted a workshop for the Texas water data community, followed in 2019 with further communication, outreach, and preparations. In 2020, the project began with a focus on Human Centered Design (HCD). She also talked about the process used to create an intuitive system to index, document, search and access Texas water data.

Taylor summarized the findings of their initial HCD interactions, observing, "Data access is dependent on who you know." Successful data sharing depends on trust between producers and users. She suggested that Texas water data is fragmented and locked away making it difficult to understand, value, and use. She concluded by listing the goals of the Texas Data Hub which are: (1) provide a central location for data that reflects the entire landscape; (2) establish automatic and easy ways to share data and updates; (3) provide intuitive methods to efficiently search and download data; (4) emphasize clear communication and documentation to build trust and understanding; and (5) assist data interoperability efforts through standards and curated datasets.

### **Utah**

Aaron Austin, Utah Division of Water Resources, demonstrated, "Utah's Open Water Data Website." Utah's interest in improving water use estimates and data sharing was motivated by a Utah State Legislature Performance Audit in 2015. Aaron explained the role of different state agencies in reporting and sharing water use data, and introduced the website, data offerings, and tools that support data query, visualizations, and download capabilities. Water use information is reported online to the Utah Division of Water Rights, within the Department of Natural Resources, which solicits feedback from the Utah Division of Water Resources, which flags potential errors, before water use data is validated.

The Department of Environmental Quality is also working with Natural Resources in a cooperative effort to obtain annual water use data from public water supply systems, as well as collect water use data from industrial and large private water users. This data is used to for several state financial

assistance programs, the preparation of basin water plans, and an assessment of water supply and water use in the state. Population and estimated gallons per capita per day (gcpd) are used to consolidate residential indoor and outdoor use, as well as use by parks, government buildings, schools, businesses, offices, and churches. For more detail and interactive web mapping applications Aaron pointed to [water.utah.gov/opendata](http://water.utah.gov/opendata).

### **Virginia**

Ryan Green, Virginia Department of Environmental Quality, presented on “Virginia’s Approach to Addressing Water Use Data Gaps.” Since 1982, Virginia has required annual withdrawal water use reporting. Water use data is used for permit evaluations, water budgets, modeling, water supply availability planning, etc. Ryan talked about their work in addressing gaps in water use data in order to improve data driven decision making and regularly review.

He noted that previous analysis indicates a potential for substantial unreported water use for agriculture in some localities, and within limited staff resources, DCRB is working to register farms and improve the consistency of water use data. With an increasing trend towards smaller farms, more and more fall under the reporting threshold. Agricultural water use is a significant proportion of total water use in some basins, which increases during drought and is largely consumptive. He

Ryan talked about a 2020-2021 WUDR grant project, “Quantifying Unreported Water Use for Crop Irrigation in Virginia.” Using U.S. Department of Agriculture data from an agricultural census that provides irrigated acres per farm with crop type and inches irrigated from USDA’s Irrigation and Water Management Survey, They then developed unreported withdrawal estimates. Farms irrigating less than 10 acres were presumed to be below the reporting threshold. For larger farms, they took the estimated acreage, crop need and PRISM precipitation data (deficit method) to estimated withdrawals. The results were highly variable with estimates in some counties ten times the reported data. Lastly, he also talked about their approach in refining Virginia’s water supply estimates with discharge and withdrawal data and their next steps to improve the program.

### **Washington**

Andrea Lauden, Washington State Department of Ecology, gave an overview of metering programs and water use. The largest use is agriculture at 59%, followed by public supply at 20%. Washington uses a prior appropriation water right system that is managed through a decentralized regional system. Water use data comes from metering programs. Under the Water Resources Act, a metered database was rolled out in 2009 Data is user submitted, and there are some quality assurance/quality control (QA/QC) tools to help validate the data. Water use is linked to the water rights database. However, metered data is collected for less than 1% of users (only where it is required). She outlined challenges they face with self-reported data, as there is limited quality assurance, it is costly to scale up, and there is a lack of public access. They plan in the future to expand the program.

### **Wyoming**

Melinda Fegler, Wyoming State Engineer’s Office, talked about the history and the growing need for water use data online available, as well as the progress they have made thus far. She outlined the major challenges they are facing with building this water database, including sharing personal user permit information, program funding and limited staff, the time needed to develop projects, the clarity of data sharing (i.e. getting information out to the people that need it), expectations of how that data will be used, and finally the urgency of developing this data for future planning and use. She then explained their online data sharing methods. Wyoming’s Phase 1 Aquarius Search Engine

Optimization (SEO) Flow holds only site information for 2012 to the present. A Phase 2 update includes flow values but no permit information. She then talked about how Wyoming has had more success with the development and use of the MetriDyne Application Programming Interface (API) for Bear River Basin flow data, which is a more user-friendly automated data acquisition project.

## **Regional Water Use Data Collection, Reporting and Sharing**

### **Delaware River Basin**

Michael Thompson, Delaware River Basin Commission (DCRB), addressed “Water Withdrawal and Consumptive Use Estimates for the Delaware River Basin (1990-2017) With Projections Through 2060.” The Delaware River Basin drainage spans parts of Delaware, New Jersey, New York and Pennsylvania. There are no mainstem dams, but major exports to New York City and New Jersey under a 1954 Supreme Court Decrees. The river provides drinking water for some 13.3 million people. The DCRB was formed in 1961, with five commissioners represent each of the States and a federal representative.

DCRB regulates withdrawals of greater than 100,000 gpd. DCRB gathers and “normalizes” state data into an integrated database from 1.6 million withdrawal points with metadata that includes latitude and longitude, system categories, groundwater or surface water sources, interconnections and transfers, as well as regulatory approvals. A DCRB project review section continually updates the list of active approved withdrawals. Data is categorized by sectors that cover public water supply, power generation, industrial, mining, irrigation, and out-of-basin diversions. The latter include diversions from three New York City reservoirs, and one diversion in New Jersey.

### **Great Lakes Basin**

James Polidori, Great Lakes Commission (GLC), talked about the history and formation of their database. This is a binational effort to coordinate reported water use in the Great Lakes Basin between the United States and Canada. He gave a brief description of the water policy questions that led to the formation of the database, which started in 1987, and covered reporting protocols, that were revised in 2009 and fully implemented in 2012. These called for accurate and comparable data acquisition for all compacts and agreements. He went over the collection procedure for data, which are self-reported water users reports on monthly withdrawals, consumptive uses, and diversions submitted via paper or online forms. Users drawing over 100,000 gallons per day on average over 30 days are required to report. Data includes the jurisdiction, the watershed, the use sector, the water source type, and the measurement method used. This data is publicly available online. The GLC also releases annual water use reports.

### **Potomac River Basin**

Stephanie Nummer-Fantozz, Interstate Commission on the Potomac River Basin (ICPRB), participated virtually reported on their water use and withdrawals database. She gave a quick history and covered key points related to the Potomac River Basin. The Commission was created in 1940 to manage water resources in the Basin that is a mix of tidal lands and water from the Atlantic Ocean (roughly 8,045 km<sup>2</sup>) and non-tidal lands (29,950 km<sup>2</sup>). The predominate land use is forests, followed by irrigation. Stephanie outlined the challenges of managing five different jurisdictions and datasets.

Stephanie noted two 2015 studies were used for early versions of the data base: (1) Ducnuigeen et al. 2015 Geospatial Analytics Tool for Estimating Watershed-Scale Consumptive Use -- Potomac

River Basin study; and (2) Ahmed et al. 2015 Washington Metropolitan Area (WMA) Supply Study – Demand and Resource Availability Forecast for the Year 2040.

In 2018, ICPRB released the Potomac River Basin Comprehensive Water Resources Plan, which identified four challenge areas with 14 recommended actions. The goal was to ensure sustainable water use and supplies basin-wide addressing water uses, projected demands, and consumptive demands. This led to the more modern database which includes 2015-2019, 2020, and quality control measures to ensure all available data.

### **Susquehanna River Basin Commission**

John Balay, Susquehanna River Basin Commission, gave an overview of a cumulative water use and availability study. The commission is comprised of representatives from Maryland, New York, and Pennsylvania, with a federal representative [currently the U.S. Army Corps of Engineers North Atlantic Division Commander]. The study looked at cumulative water use to determine water capacity, sustainability and availability basin wide for future planning and regulatory decision-making. Data includes permitted and daily quantities reported at the HUC10 basin level, as well as consumptive use, surface water withdrawals, and groundwater withdrawals. Integrating all the data together is challenging as each member state reports data in different increments (annual, monthly, weekly), and they check for double-counting records between agencies that share boundaries, etc. He finished describing a hydrologic analyses report to define new water capacity estimates and create new water availability estimates. These results are available online with a GIS-based assessment tool and web map.

### **Break-out Sessions Summary**

The workshop included two break-out sessions with six series of questions for the participants to address. The questions are listed below with a bullet-point summary of the key takeaways. The first session was on Wednesday, August 17, 2022, and was composed of four groups that discussed the first two series of questions. The second session was on Thursday, August 18, 2022, which had three groups of four-to-six that discussed the remaining three series of questions.

### **Questions**

1. What are ways your state has improved their capability to share water data such as tools/databases/APIs or others?
2. What can we do to improve data sharing or make it easier? What hinders states from sharing data? How can we encourage data sharing?
3. What data-related assessments (QA/QC) do you use, such as identification of gaps, ways/tools for evaluating data, analysis to identify outliers or overcome data latency issues? What are the challenges in getting the data you need to meet your water rights regulatory needs, water planning and other obligations? Do you have adequate information/data on surface/groundwater uses to make more informed decisions? If not, do you have plans for a solution to those challenges? What data are missing now?
4. What are your state's water use reporting systems and are there gaps in technical support, and methods? What future updates/plans for data collaboration, models, data services do you have? If water use data are reported voluntarily by water users, does your agency provide guidelines for reporting?

5. What can WaDE (WSWC), WUDR (USGS), ICWP, and IoW do to help your state meet its challenges?

### **Key Takeaways**

- States have improved their data collection, management, visualization, and sharing process over time, and the Water-Use Data and Research (WUDR) grants were a great help.
- Staffing and budget limitations, or the lack of legal requirements to report water use are all major challenges to improving the quality of water use data.
- Structural limitations such as legislation or laws that mandate specific water use data collection or sharing remain the key factors restricting the collection and processing of water use data in each state. Reporting and contrasting such differences and capabilities across each state could help benchmark and compare states' progress over time.
- Staffing limitations, training, and turnover remain significant challenges that affect water use reporting. It is not easy to find water resource professionals who also understand IT and vice versa. Hiring contractors on a year-by-year basis is often limited to specific short-term projects and grants. Water data sharing priorities are being affected when a state moves towards a central IT system.
- There was a consensus that states need more flexibility than the WUDR program currently allows. Making any state water agency eligible to apply for grants and removing the \$250,000 total limit per state would make a difference. Such changes would require congressional approval, and the states would appreciate WSWC and ICWP advocacy in that regard.
- The Water Data Act that was introduced by Representative Melanie Stanbury (D-NM) and passed by the House was praised with the hope it would become law and states would receive more funding to improve water data management.
- Each state has a different method of validating water use data, through Quality Assurance (QA) checks before the data is entered into the database and Quality Control (QC) checks after the data has been entered. Automated QA/QC procedures exist in a few states, while others plan or hope to incorporate them in the future.
- Some states, such as Colorado, are introducing mobile phone applications or digital online forms that allow water users to report their water use while they are out in the field. Others, such as Oklahoma, still have difficulty processing reported water use data because it is submitted on paper forms that need to be digitized, which is time-consuming and may introduce errors.
- Providing easy-to-follow instructions to water users was identified as a necessary and useful tool for improving water use reporting.
- Voluntary reporting can be challenging to verify.
- There was a concern that the U.S. Census is not publishing some population data due to privacy reasons, which affects the accuracy of per capita water use estimates.

- States use different reporting systems and technologies (e.g., ArcGIS, R, Python, SQL) to query, QA/QC, and visualize the data. One suggestion was to summarize the different software tools that are being used by the states as an online repository and guide for other states.
- Coordination between multiple state agencies within a single state that each have a different role in administering water use, managing data, and conducting planning studies remains a challenge in many states.
- There was a suggestion that the WSWC WaDE program may play a greater role in standardizing water use data management across the states.
- Required real-time diversion measurements or reporting is often limited to basins with compact obligations, not state-wide.
- Data privacy issues with water use data were raised. It was suggested that water rights and use under the West's Prior Appropriation Doctrine are about permitting the use of the public's water, and while users have the right to divert it, this information should be public as it is in the public interest.
- Some still have questions about the value of tracking and sharing water use data. Handling data requests is time-consuming. How can the states know if people care about data sharing? Some states have metrics to track data downloads, but don't know how the data is being used and what types of decisions may be informed by the data? What difference does it make?
- Facilitating long-term and transparent planning was cited as one good reason for sharing.

Note: Most of the challenges reported were also identified during a 2019 Workshop held in Fort Collins, Colorado. See <https://westernstateswater.org/events/2019-wims/> page 4. Further, see: "Factors that inhibit the collection and dissemination of accurate and timely water-use data. Successful data collection and sharing initiatives must overcome these barriers," TABLE 2 in this journal article <https://onlinelibrary.wiley.com/doi/10.1111/1752-688.13004>.

# Agenda

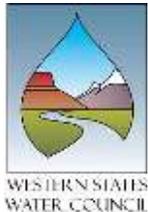
## 2022 National Water Use Data Workshop

August 16-18, 2022

Salt Lake City, Utah

Utah Department of Environmental Quality Building

195 North 1950 West, Salt Lake City



### What are water use data?

Water use data represent reported or estimated site-specific water withdrawals or consumptive use at daily, monthly, or annual scales for the USGS use categories of public supply, domestic, irrigation, thermoelectric power, industrial, mining, livestock, and aquaculture from surface or groundwater sources.

### Workshop Goals

- ❖ Provide a platform for state agencies' staff to learn from each other about the latest state and federal efforts related to water use data management and sharing.
- ❖ Engage state IT and water resources management staff regarding the USGS National Water Use/Water Use Data and Research (WUDR) Program and the WSWC Water Data Exchange (WaDE) Programs.
- ❖ Present the latest technological developments on water use data collection, storage and data Findable, Accessible, Interoperable, Reusable (FAIR) sharing methods and how States can benefit from them.
- ❖ Identify challenges related to States' data collection, storage and sharing efforts and potential solutions to consider
- ❖ Share strategies for enhanced data quality assurance and quality control.

### Focus Areas

- Programs or initiatives related to improving FAIR data collection, sharing, and access
- Historic annual/monthly/weekly/daily site-specific water withdrawals and use data reporting and sharing efforts.
- Data gaps and ways that have been developed to fill them. Present on metadata for water use information.

## Day 1: Tuesday, August 16, 2022

### 12:30 pm: Workshop Registration and Refreshments

### 1:00 pm – 1:30 pm: Welcoming Remarks

- **WELCOME AND THE WATER DATA ACT: U.S. REP. MELANIE STANSBURY (NM)** (video)

#### *Workshop Co-Sponsor Remarks:*

- Tony Willardson, Western States Water Council (WSWC)
- Beth Callaway, Interstate Council on Water Policy (ICWP)
- Melinda Dalton- U.S. Geological Survey (USGS)
- Peter Colohan - Internet of Water Coalition (IoW), Center for Geospatial Solutions at the Lincoln Institute of Land Policy

### 1:30 pm – 2:00 pm: Future Vision

- USGS Water Use Vision: Jaime Painter, USGS Water Mission Area (virtual)
- WSWC Water Data Exchange (WaDE) Program Water Use Data Sharing: Adel Abdallah, WSWC

### 2:00 pm – 2:30 pm: Water-Use Data and Research (WUDR) Grants – Feedback, Discussion, and Lessons-Learned

- Erik Smith, USGS: Discussion on the obstacles, perceived or real, to getting WUDR grants, and regional grant ideas and strategies

### 2:30 pm – 2:45 pm: Break

### 2:45 pm – 3:45 pm: National, Regional, and State Water Use Data Collection and Modeling Efforts *Moderator: Tony Willardson*

- USGS Water Use Modeling: Richard Niswonger, USGS
- OpenET Update (Utah, California, and Oregon pilot study): Forrest Melton, NASA Western Water Applications Office
- Oregon's Statewide ET project to Update Irrigation Consumptive Use Data: Jordan Beamer, Oregon Water Resources Department

### 3:45 pm – 4:00 pm: Break

### 4:00 pm – 5:00 pm State Water Data Initiatives *Moderator: Tony Willardson*

- California Water Data Consortium: Advancing Urban Water Use Data Sharing and Access: Tara Moran, California Water Data Consortium
- New Mexico Water Data Initiative: Stacy Timmons, New Mexico Bureau of Geology and Mineral Resources
- Developing the Texas Water Data Hub: Taylor Christian, Texas Water Development Board

### 5:00 pm: Wrap Up and Adjourn

## Day 2: Wednesday, August 17, 2022

### 8:00 am: Refreshments

### 8:30 am – 9:50 am: Software Tools to Share, Visualize, Query, and Download Water Use Data Moderator: Nancy Barber

- Internet of Water Geoconnex Update – New Mexico Pilot Study: Kyle Onda, Internet of Water Initiative, Center for Geospatial Solutions at the Lincoln Institute of Land Policy
- Utah’s Open Water Data Website: Aaron Austin, Utah Division of Water Resources and James Reese, Utah Division of Water Rights
- Real-time Groundwater Management with Big Data and the Internet of Things - Examples from the Twin Platte Natural Resources District Water Data Program: James Schneider, Olsson, and Kathleen Elmquist, Environmental Science Associates Sitka
- How Colorado’s Decision Support Systems (CDSS) Hosts and Shares Water Data: Brian Macpherson, Colorado Water Conservation Board

### 9:50 am – 10:20 am: Break

### 10:20 am – 12:00 pm: States Data Collection and Sharing Efforts Moderator: Erik Smith

- USGS Data Insights: Cheryl Dieter, USGS Water Mission Area
- New Jersey’s Methods in Estimating Water Use and Sharing Data: Kent Barr, New Jersey Department of Environmental Protection
- Wyoming Data Sharing Efforts: Melinda Fegler, Wyoming State Engineer’s Office
- The Great Lakes Regional Water Use Database - Data Collection, Analysis and Reporting Protocols: James Polidori, Great Lakes Commission
- Reported Water Uses in the Potomac River Basin: Stephanie Nummer-Fantozz, Interstate Commission on the Potomac River Basin. (virtual)

### 12:00 pm – 1:30 pm Lunch (Boxed Lunch)

### 1:30 pm – 3:00 pm: Data Collection and Sharing Efforts Moderator: Beth Callaway

- Kansas Water Use Data Collection and Database Migration: David Engelhaupt and Andy Terhune, Kansas Department of Agriculture (virtual)
- Alaska Water Use Data System: Kevin Petrone, Alaska Department of Natural Resources (virtual)
- New Mexico Water Use Data: Collection, Reporting, and Sharing: Julie Valdez, New Mexico Office of the State Engineer (virtual)
- Susquehanna River Basin Cumulative Water Use and Availability Study: John Balay, Susquehanna River Basin Commission
- Upper Colorado River Basin Consumptive Use and Loss Reporting: James Prairie, Upper Colorado Region Office, Bureau of Reclamation (virtual)

### 3:00 pm – 3:15 pm Break

### 3:15 pm – 4:00 pm Short break out session

Prompting questions

- What are ways your state has improved their capability to share water data such as tools/databases/APIs or others?
- What can we do to improve data sharing or make it easier? What hinders states from sharing data? How can we encourage data sharing?
- What are the two biggest take-away?

**4:00 pm – 5:00 pm States Water Use Data Collection and Reporting** Moderator: Tony Willardson

- Washington Data Sharing Efforts: Andrea Lauden, Washington State Department of Ecology
- Water Use Data Improvements for Nebraska: Jennifer Schellpeper, Nebraska Department of Natural Resources
- Water Use Reporting in Oklahoma and Future Goals: Jason Tutkowski, Oklahoma Water Resources Board

**5:00 pm: Wrap Up and Adjourn**

**Day 3: Thursday, August 18, 2022**

**8:00 am: Refreshments**

**8:30 am – 9:30 am: States Water Use Data Reporting and Sharing Efforts** Moderator: Beth Callaway

- Major Water Users in Missouri: Trevor Ellis, Missouri Department of Natural Resources
- Indiana’s Water Use Registration and Reporting Program: Mark Basch, Indiana Department of Natural Resources, Division of Water (virtual)
- Water Withdrawal and Consumptive Use Estimates for the Delaware River Basin (1990-2017) With Projections Through 2060: Michael Thompson, Delaware River Basin Commission (virtual)
- Virginia’s Approach to Addressing Water Use Data Gaps: Ryan Green, Virginia Department of Environmental Quality (virtual)

**9:30 – 9:45 am Refreshment Break**

**9:45 am – 11:15 am: Breakout sessions 3 or 5 groups (see prompting questions below)**

**11:15 am – 11:30 am Break**

**11:30 am – 12:15 pm: Breakout Session Reporting**

**12:15 pm: Wrap Up and Adjourn**

**Questions to consider answering during the talks and breakout sessions:**

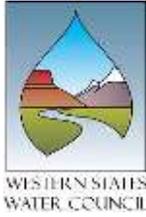
1. What data related assessments (QA/QC) do you use such as identification of gaps, ways/tools for evaluating data, analysis to identify outliers or overcome data latency issues?

2. What are the challenges in getting the data you need to meet your water rights regulatory needs, water planning and other obligations? Do you have adequate information/data on surface/groundwater uses to make more informed decisions that are not here now? If not, do you have plans for a solution to those challenges? What data are missing now?
3. What is your state's water use reporting systems and are there gaps in technical support, and methods? What future updates/plans for data collaboration, models, data services do you have? If water use data are reported voluntarily by water users, does your agency provide guidelines for reporting?
4. What can WaDE (WSWC), WUDR (USGS), ICWP, and IoW do to help your state meet its challenges?

**2022 National Water Use Data Workshop Planning Committee\***

- Adel Abdallah, Western States Water Council
- Tony Willardson, Western States Water Council
- Beth Callaway, Interstate Council on Water Policy
- Amy Shallcross, Interstate Council on Water Policy
- Peter Colohan, Internet of Water Coalition, Lincoln Institute of Land Policy
- Lucas Stephens, Internet of Water Coalition, Nicholas Institute for Environmental Policy Solutions at Duke University
- Kristin Linsey, U.S. Geological Survey
- Erik Smith, U.S. Geological Survey
- Nancy Barber, U.S. Geological Survey
- Dieter Cheryl, U.S. Geological Survey
- Jaime Painter, U.S. Geological Survey

\* In no particular order



## 2022 National Water Use Data Workshop

Salt Lake City, Utah  
August 16-18, 2022

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