A Document for Focus Groups to Help the WaDE Team Refine, Revise, and Improve the Designs of the Upcoming Western States Water Data Access and Analysis Tool (WestDAAT)

A Description of Six End-User Personas to Inform the Development of WestDAAT

By

The Western States Water Council (WSWC)

Water Data Exchange (WaDE) Program

WESTERN STATES WATER COUNCIL

Contributors

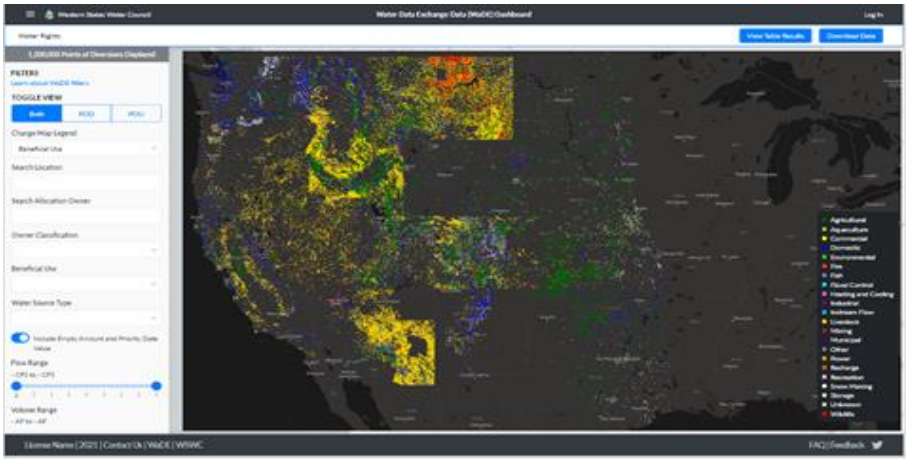
Adel Abdallah - WaDE Program Manager (adelabdallah@wswc.utah.gov)

Ryan James - WaDE Data Analyst

Tony Willardson - WSWC Executive Director

Michelle Bushman - WSWC Assistant Director and General Counsel

Jessica Reimer - WSWC Policy Analyst



September 2021

Water Resource Personas for WestDAAT Use Cases

The WaDE Program is committed to assisting WSWC member states in sharing water allocation, supply, and use data through a common streamlined and standardized service that enables regional analyses to inform water resource planning and policies.

This document provides background about WaDE and describes six distinct categories of WestDAAT users as illustrative personas with different roles in managing or understanding water resources, and with different water data needs. The WestDAAT user personas will provide the WaDE Team with meaningful use cases for the further design and development of computer software that meets the goals and expectations of end-users. The six personas include (1) Gary the Governor (2) Stan the State Engineer, (3) Maggie the River Basin/Environmental Conservation Manager, (4) Laila the Land Use Manager, (5) Frank the Farmer/Irrigation Canal Company Manager, and (6) Ratibah the Researcher. A potential seventh use case may be Fred the Federal Agency Specialist.

We request that you go through the personas below and share your feedback, comments, and suggestions with the WaDE Team.

WaDE Background

The Water Data Exchange (WaDE) Program began in 2011 under a subcontract with the Western Governors Association (WGA), as a cooperative effort between WSWC and the Sandia National Labs, with funding from the Department of Energy made available under the American Recovery and Reinvestment Act (ARRA) of 2008. It was subsequently sustained with WSWC funds and in-kind support through participation from our member States that committed staff and resources, as well as sharing data, without which WaDE would not be possible. Other early funding came from the Environmental Protection Agency's Exchange Network (EN), as well as funding from the Cynthia and George Mitchell Foundation, the Water Funders coalition, and the Gordon and Betty Moore Foundation, through the Internet of Water and Duke University.

The focus of the WaDE program is to provide a framework for states to share important water data with each other, with federal agencies, and with the public with an emphasis on enabling regional analysis. States make their water data available to the WaDE platform, which streamlines the data into standardized and machine-readable formats. Making the water data accessible enables users to answer regional and national questions about water availability, scarcity, and resilience in a cost-effective, sustainable, and consistent way. With the continuous support of the Western States' Governors, natural resource agency directors, state engineers, and their staff, the WaDE Program is approaching its 10th anniversary and entering an exciting third phase.

In this third phase, we will develop a user-friendly dashboard called the Western States Water Data Access and Analysis Tool (WestDAAT), an operational decision support and planning tool that will streamline the sharing of water data for western states. The WaDE Program has progressed from its initial concept and creation phase (2011-2018), which established working relationships with states agencies and created data sharing protocols while building and populating a collaborative data management system in response to interest and funding from the WSWC States, federal agencies (DOE, EPA), and philanthropic groups. In its second phase (2019-2021), WaDE created a template for transforming disparate state water-related data systems into a functional regional and cloud-based data system with standards and metadata. These data services help streamline access to water rights and water use data.

WaDE is one of the major data hubs within the Internet of Water project https://internetofwater.org/resources/hubs/. In addition, a WaDE metadata dictionary that includes controlled vocabularies is considered as the standard method for sharing state agency water use data between WaDE and the U.S. Geological Survey (USGS) Water Use Data Research (WUDR) Program (https://water.usgs.gov/wausp/wudr/files/WUDR-USGS-data-transfer-guidance.pdf).

Earlier this year we developed a WestDAAT prototype to be used as a proof-of-concept and basic features application that connects the WaDE database to an online visualization environment (Mapbox) https://wade-mapbox-prototype.azureedge.net/ During the spring we followed up by specifying the features and desired full functionality of the desired application by building a mockup of WestDAAT, which is not connected to any data but simulates the user experience for each of our persona use cases. This mockup will be used to facilitate feedback from participants in our focus groups, which will later be used as a blueprint for the final WestDAAT product that our contractor DPL will build later this year or next depending on the availability of funding. The mockup is available here https://xd.adobe.com/view/b5bc36d8-d490-473b-905a-deefba319a15-e0ef/?fullscreen. This document will help the WaDE Team refine the mockup and build WestDAAT to satisfy the defined needs and deliverables.

WestDAAT will innovate water data sharing and improve water management in the West through its simple user interface and ability to provide access to disparate water data across state boundaries. Our goal at the WSWC is to make water rights and water use information more findable, accessible, interoperable, and reusable (FAIR), which will lead to more innovative and climate-resilient applications. We anticipate WestDAAT will enable states and federal agencies to more efficiently accomplish a variety of water management and policy objectives, including the use of the tool to:

1. Prolong the use of scarce water supplies to ensure future water source reliability.
2. Improve drought and environmental risk management, building climate resiliency.
3. Highlight conjunctive groundwater and surface water use opportunities.
4. Facilitate state water rights administration and better define federal agency water rights.
5. Promote water conservation and efficiency.
6. Promote water marketing, transfers, leasing, and banking.

7. Focus initiatives for fish and wildlife habitat management and species protection.

WaDE data services will complement and help integrate with other national water data services such as U.S. Geological Survey (USGS) stream gages/streamflow information, Bureau of Reclamation Information Sharing Environment (RISE) data on reservoirs and canals, and the Environmental Protection Agency's (EPA) water quality data services. As part of this integration effort, the WaDE team is currently working with the Internet of Water and USGS groups on connecting WaDE to the Geoconnex project. This includes indexing the state data in WaDE with the Network-Linked-Data-Index (NLDI) tool. Geoconnex will provide permanent identifiers to all sites that have data in WaDE and generalized landing pages with common metadata to facilitate the searchability of the data. NLDI will provide data query capabilities for locations upstream or downstream of water sites referenced in WaDE, USGS, Reclamation, and EPA data services based on the National Hydrography Dataset (NHDPlus). Users can further query WaDE sites and view their landing pages while federal data will point to their external landing pages as maintained by each federal data provider.

The WaDE team is also coordinating with another regional project, OpenET, to integrate aggregate consumptive water use summaries and allow comparisons between permitted water rights and estimated consumptive use in a watershed. The OpenET project (https://openetdata.org/) has developed an operational system for mapping evapotranspiration (ET) and consumptive use for the 17 states in the Western U.S. OpenET provides daily, monthly, and annual ET data at a spatial resolution of 30 m x 30 m (0.22 acres). It uses an ensemble of well-established satellite-driven ET models implemented on the Google Earth Engine cloud computing platform. This allows interoperability across different datasets, massive parallel processing, storage, and scalability in time and space, and automated operational updates with new observations that would otherwise be very costly and burdensome for State and federal agencies to develop, operate and maintain.

Disclaimer

The following use cases are key examples of possible end-users for WestDAAT but are not the only stakeholders that could benefit from these services. The descriptions provided for each persona should not limit other applications. Use cases focus the development of the software and orient the design around usability from the end-user's perspective. Many applications of WestDAAT might use the same underlying features described herein but in different contexts. We will take note of the diversity of use to prioritize the development of features and their importance to operability.

WestDAAT is intended to be a starting point to demonstrate how WaDE data can be used, given the unique ways that our member states define water rights and estimate or report water use. WestDAAT is not intended to provide a comprehensive demonstration of all the ways these data may ultimately be used for policy implementation and water management decision-making.

WestDAAT is not intended to limit further software applications by third parties capable of taking data analysis and integration to the next level, but rather to inspire them. We look forward to discussing the personas with our focus groups to better refine them over time, and potentially add new personas to highlight the needs of distinct end-users and stakeholders.

WestDAAT User Personas

Each use case below provides a context of the persona and their needs and then specifies the WestDAAT key deliverables that meet these needs.

1. Gary the Governor

Gary is concerned about the impacts a prolonged drought might have on the economy and environment of his state. He is also concerned about the possible future impact on rural economies that might result if too many water rights are transferred away from rural agricultural communities that rely on water deliveries. Lastly, he is interested in how water banking and marketing policies might affect future water use trends. Gary and his Administration are looking for tools that can couple water rights with state and federal water supply data, which might include the following:

1. Identifying water rights that will become increasingly valuable during shortages, as well as the communities that depend on those rights, and consider policies and programs to limit, facilitate, or manage short-term changes in use.
2. Coupling water rights data from WaDE with other data across state agencies, with a federal water supply and reservoir storage information, and with past aggregate water use estimates.
3. Developing insight on historic water use trends in his state, at the watershed and county levels, compared to other states for similar categories of users and water supply sources.

WestDAAT Key Deliverables (Option to export data and metadata results to Excel file or shapefile)

A. Display and list all water right points of diversion in the state with a specific beneficial use, owner type, priority date range, and assigned volume or flow.
B. Easily identify and visualize the locations of the largest water rights holders in the state (e.g., the size of the point corresponds to the volume of water owned).
C. Display and list all water right points of diversion, state and federal reservoirs, streamgages, and water quality measurement sites in the state.
D. Display a color-coded heat map that aggregates water use for selected beneficial uses and supply sources (e.g., surface water, groundwater, etc.) in the state and compare it to other states (e.g., heatmap of water use).

E. Plot and compare historic time-series water use trends for beneficial use categories in selected counties in the state.


---

2. Stan the State Engineer / Director of Natural Resources Department of Division

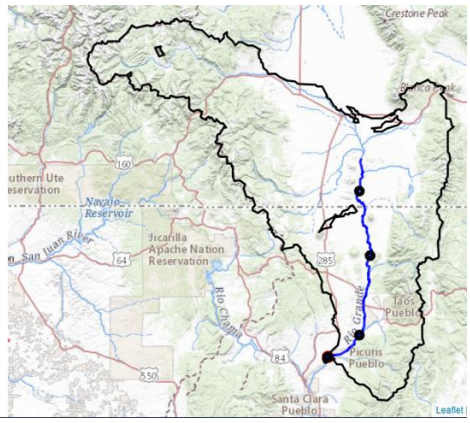
Stan is responsible for water rights administration and water budgets, and he needs to identify and protect existing senior water rights that might be impacted by a new water rights application, or a change/transfer application. Stan is interested in administering water rights by priority date and gaining other high-level insights about water right ownership, changes, and trends. Stan is also interested in identifying surplus or deficit trends in water budgets within his jurisdiction. Stan's goals include the following:

1. Identify existing downstream surface water rights older than a specific priority date that might be impacted by a new water rights application, or change /transfer application.
2. Identify existing water rights tied to groundwater in a major aquifer.
3. Identify locations of upstream reservoirs, gage stations, and water rights (including regional water rights, supplies, and uses for interstate basins) to evaluate the availability of water for the new water right under consideration.
4. View reported historic water uses by selected upstream surface water users or within a groundwater aquifer.
5. Identify whether an application falls within a special or active management area for his or other state agencies with regulations that may affect the use of water for the water right under consideration.
6. Gain insights on the number of water rights that other states have for unique beneficial uses that might not exist in his state such as recharge, reuse, wildlife, fish, or snowmaking. Stan may use such insights to evaluate how to designate such beneficial uses in his state.
7. Gain insights on how other states have progressed in adjudicating their water rights based on the legal status of rights. **This data is mostly available but pending WSWC Legal Committee's reconciliation of the similar, unique, and different legal status of terms across member states, translating them into WaDE common terms.*

8. Compare aggregate permitted vs. actual water use (“paper water” vs. “wet water”) as estimated by OpenET in a watershed or aquifer (Pending Funding).

WestDAAT Key Deliverables (Option to export data and metadata results to Excel file or shapefile)

A. Display and list all points of diversion or places of use for water rights, and locations of federal reservoirs and gage stations downstream or upstream from any location in a river basin, groundwater aquifer, or regulatory area. These displayed water rights can be filtered using many WestDAAT features (e.g., priority date, beneficial use, legal status owner type, flow or volume amount, water source type) to produce a more condensed list if needed. WestDAAT can color-code water rights based on classified owner type, priority date, water source type, and beneficial use. WestDAAT also can size-code points of diversions for water rights based on permitted volume or flow rate.
B. Display a time series plot of historic water use for a selected water user.
C. Plot a pie chart of the total volume of appropriated water rights versus consumed water use charts as estimated by OpenET for agriculture in a selected area such as hydrologic units (HUCs).
D. Display summary plots of permitted water use for beneficial use categories, owner type, etc.
E. Plot a pie chart showing the portions of water rights in the state that are adjudicated among other legal statuses.



---

3. Maggie the River Basin / Environmental Conservation Manager

Maggie is responsible for developing a basin-wide water management plan, addressing water use, water storage and conservation (perhaps from fallowing irrigated acreage), ecological flows, salinity control plans and managing related projects. Maggie is interested in identifying ownership of water rights, seeing short- and long-term basin water yields, and actual water use, including how water is being withdrawn or used in areas that are of critical

importance (such as those areas that are threatened or endangered species habitat). In addition, Maggie's River Basin spans multiple states, which means she has many stakeholders with varying goals and purposes, all of whom rely on Maggie to produce various summary reports and maps. Maggie is interested in finding regional insights on water rights and water use in her river basin, and in developing narrowly tailored solutions to complex problems. Her goals might include the following:

1. Identify all the surface water rights in a river basin with a specific beneficial use (e.g., agriculture) and with priority dates older than an interstate compact year (e.g., rights that are older than 1922), particularly year-round water rights that extend beyond the growing season.
2. Identify water rights and their beneficial uses for environmental purposes (e.g., wildlife, fish, recreation, etc.) across river basins in the West.
3. Focus on improving instream flows and identify potential water rights available for purchase near environmentally sensitive areas.
4. Identify water right points of diversion that are upstream or downstream of a specific location and older than a specific priority date in a river basin so that she may model a water demand management and shepherding simulation for planning purposes, implement possible curtailment plans to meet senior water rights, or ensure instate allocations downstream are met. Water shepherding involves tracking foregone use or conserved water from an upstream site to a downstream site for a designated beneficial use without being withdrawn by other water users along the way.
5. Highlight opportunities for conjunctive management of ground and surface water use in the basin.
6. Identify both federal and state reservoirs, gage stations, major water user locations, and water quality measurement sites across state lines in the river basin.
7. Identify water right ownership categories in the basin, and points of division within areas that are of critical importance, such as threatened and endangered species habitat.
8. Identify historic consumptive water use reported by OpenET for the whole basin or in a state's portion of an interstate basin (Pending Funding)

WestDAAT Key Deliverables (Option to export data and metadata results to Excel file or shapefile)

A. Display and list all the surface water rights in the river basin with a specific beneficial use (e.g., agriculture), a specific priority date (e.g., rights that are older than 1922), and a specific owner type (e.g., private).
B. Display a bar chart that shows the cumulative growth of water rights over time in the river basin along with a line showing the average annual flow of the river.
C. Display a bar chart of total monthly water use across all the river basin's users, per beneficial use, year, and water source type.
D. Display summary statistics about the total amount of water use authorized by those water rights or aggregate estimated water use data in the form of charts, plots, etc.

E. For any given location in the river basin, display all downstream surface water points of diversion with water rights older than a specific date and indicate the water right amount through the size of the point. In addition, display owner names and seasonal start and end times for their water rights for these points of diversion in a tabular format.
F. Display points of diversion for groundwater rights within a given boundary that defines potential surface and groundwater interactions within the river basin.
G. Display the locations of federal reservoirs, gage stations, and water quality monitoring sites in the river basin, state portion of the river basin, or upstream or downstream of any given location.
H. Display water right points of diversion with a color-coded legend based on classified owner type. Display a pie chart that showcases the portion of water rights each owner type has in the river basin.
I. Using an existing file, upload a shapefile or boundary layer (e.g., GeoJSON) and display the locations of water rights that fall within it. The uploaded layer may represent a sensitive habitat area that requires more instream flows (Pending Funding)


---

4. Laila the Land Use Manager

Laila is responsible for identifying opportunities for integrated land and water use in the region that may span many watersheds and states. She is interested in tracking sustainable land and water use projects. Those projects might include managing cattle grazing allotments and related water rights, identifying the potential impact that water rights transfers and leases might have on multipurpose land, and how areas of critical environmental concern are being treated. Laila is interested in finding regional insights into how water rights impact land use. Her goals might include the following:

1. Identify the connections between land and water rights (e.g., grazing on federal land) and the potential impact of water right transfers and leases on that land.
2. Identity water rights that divert water for use outside river basins.

3. Summarize statistics about places of use for water rights with a specific beneficial use (e.g., livestock, agriculture, etc.) that are owned by a specific individual/organization (e.g., U.S. Bureau of Land Management, etc.).
4. Compare historic reported water use for a city and relate it with populations in comparable cities across the west.
5. Identify intensive consumptive-use areas in a river basin, especially with agricultural irrigation in close proximity to sprawling urban areas.

WestDAAT Key Deliverables (Option to export data and metadata results to Excel file or shapefile)

A. Display and list all the points of diversion and/or places of use for water rights in a river basin (toggle between them or display both) using a series of selected filters (e.g., priority date, beneficial use, owner type, flow, or volume amount, water source type).
B. Produce a series of landing pages that are either (a) water-right centric, that will graphically show the relationship between its points of diversion and its known places of use; or (b) location-centric, that will list all water rights associated with that site and how they are being used.
C. Using an existing file, upload a shapefile or boundary layer (e.g., GeoJSON) and display the locations of water rights that fall within it. Display pie charts that summarize permitted water rights amounts by owner types (e.g., Forest Service) and beneficial uses (e.g., stock water for grazing, irrigation) within the area. (Pending Funding).
D. Display a bar chart with per capita water use for a selected list of public water suppliers in the West.
E. Display Hydrologic Units (HUCs) that have the highest estimated consumptive agricultural water use in a river basin.

5. Frank the Farmer or Irrigation Canal Company Manager

Frank is an irrigated-land owner with an individual water right or water service contract. Frank would like to learn more about his specific water right(s), priority administration in his local area, on- and off-farm water budgeting, and broader planning efforts. In addition, he would like to know if his water right may be affected by a drought, a local water conservation proposal, or a water transfer proposal. Frank is also considering purchasing or selling a water right and would like to gain insight into nearby similar water rights in his area with similar use. Frank's potential uses of WestDAAT could include:

1. Query all available information about his own water rights(s) and priority date(s) compared to similar surrounding rights, maximum allowable use, and any regulatory agency limitation.
2. Gain insights on how shortages and other upstream or downstream nearby water rights, storage and diversion structures, and/or environmental reservations or minimum streamflow requirements might affect his own water right and water use.

WestDAAT Key Deliverables (Option to export data and metadata results to Excel file or shapefile)

A. Search and display water right(s) with only limited information (e.g., owner name, generic location on the map, or city etc.).
B. Show a water-right-centric landing page that will graphically show the relationship between its points of diversion and its known places of use.
C. Display and list all points of diversion for water rights, state and federal reservoirs, gage stations, and water quality monitoring sites upstream of his own point of diversion.
D. Show the numeric seniority order of priority date for his right along with others in a watershed (e.g., 1 is the highest priority, 99 is the lowest).
E. Quantify aggregate consumptive use for the hydrologic unit that his land falls within (Pending Funding).

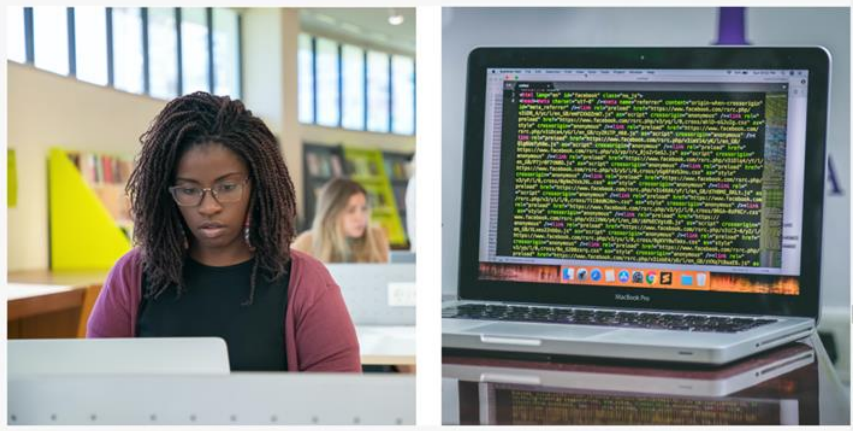
6. Ratibah the Researcher

Ratibah is a scientist and researcher and is interested in obtaining a large and preferably unfiltered water rights and water use dataset for analysis and modeling purposes. She is interested in asking questions about how water use relates to other regional activities or environmental characteristics, such as energy, ecology, land use, hydrology, forest management data (etc). Ratibah's goals could include:

1. Query and download all water rights, including points of diversion and places of use, or water use data for one or many state(s), river basin(s), or the entire Western United States.
2. Download a shapefile for the locations of the water rights and water use data in WestDAAT with identifiers that relate to the downloaded datasets.
3. Use WestDAAT to query specific data and metadata from WaDE.
4. Learn about the underlying assumptions or cross-boundary differences in the data collected, and give proper credit to WaDE within her publications.

WestDAAT Key Deliverables (Option to export data and metadata results to Excel file or shapefile)

A. Download an entire dataset of water right(s) or water use data into a workable machine-readable format.
B. In the event the size of the requested data is too large to be downloaded in a workable machine-readable format, the user has the option to submit a request for data to the WaDE staff. When the request is ready, the user will receive an email that contains a web link to download the requested data in a SQLite format).
C. Shareable web links for the selected filters in WestDAAT that others can replicate to produce the same result on a different browser or machine.
D. Documentations of the WaDE Application Programming Interface (API) and support data access to different programming languages.
E. Jupyter Notebook examples of using WaDE API and analyzing its data



- END -

Fred the Federal Agency Specialist (potentially a 7th use case)

Fred is a hydrologist, scientist, or manager who works for one of the many U.S. federal natural resource agencies. Fred is concerned with how water is being used and diverted or withdrawn in an area that is considered of critical importance, particularly those areas related either to endangered species habitat or natural disaster emergency relief. Fred has access to many points of data, but needs a better way of understanding and analyzing the relationships between and significance of all the available data. Fred's goals might include the following:

1. Identify water rights within or adjacent to a national forest that are either privately owned or have a state-recognized federal use.
2. Identify instream water rights in areas of special environmental concern, such as endangered and threatened species critical habitat, wild and scenic rivers, state trust waters, etc.
3. Arrange the joint coordination of multiple agencies' and organization's data contributions to water (e.g. Geoconnex Index project, Network-Linked Data Index project, etc).
4. Quantify water use per category in each state to produce a national report on water use and trends.

WestDAAT Deliverables

A. Query and transfer water use data to the USGS Water Use Data Program to identify nation-wide water use trends.
B. Display and list all the points of diversions of water rights in a given area. These displayed water rights can be filtered using existing WestDAAT categories (e.g., priority date, beneficial use, owner type, flow or volume amount, water source type) to produce a more condensed list if needed.
C. Display and list all water rights, federal reservoirs and supply sites, gage stations, and water quality monitoring sites in a given river basin in a state. Fred will be able to input any given location in a river basin, and will get all sites either upstream or downstream of his selection.
D. Display locations where states report instream flows for environmental purposes.