2018 WSWC Water Information Management Systems (WIMS) Workshop

January 16-18th, 2018 | NASA JPL | Pasadena, CA

The WSWC and the NASA Western Water Applications Office (WWAO) hosted a Water Information Management Systems (WIMS) workshop at the Jet Propulsion Laboratory/Caltech (JPL) in Pasadena, CA on January 16-18th.

Stephanie Granger and other WWAO representatives welcomed over 70 public, private and academic representatives who attended. Over 27 state water agency staff participated from Arizona, California, Idaho, Kansas, Nebraska, Nevada, New Mexico, North Dakota, Oregon, Texas, Utah, and Wyoming.
There were over 37 presentations on a series of panels addressing: (1) water rights and water rights adjudications and data management strategies; (2) water use, permitting and reporting systems; (3) States' use of the "cloud;" (4) advances in remote sensing for water resources management; (5) federal data sources and applications; and (6) data access, visualization, and archiving. The goal of the workshop was to discover the needs of WSWC members regarding water data acquisition, quality control, and publication, and to generate a dialogue between states and the other attendees. The WIMS provided a forum for attendees to make new connections with other states agency staff and hear about many new resources and tools available to water planners and decision-makers, in addition to an optional tour of JPL facilities, dinner, and social hour.

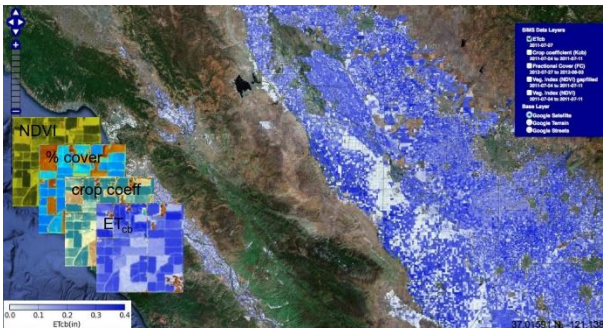
During the first day of the workshop, representatives from western states presented on data management strategies that their offices were employing to improve adjudication processes, survey data collection in the field, online platforms for water permitting, and gathering reports from users. Specialty topics included use of the National Hydrography Dataset (NHD) for water rights routing – an innovation that allows for upstream/downstream investigation of water

rights and diversions. The use of Unmanned Aerial Systems (UAS) for adjudication verification garnered many questions, as well as a presentation on updated methods for projecting future water demand in Texas. The day was concluded with a summary of California's implementation of the state's new Sustainable Groundwater Management Act (SGMA).

The following day provided a forum for "big data" topics, states' use of cloud computing platforms, and advances in remote sensing. Several state agency members presented on their state's use of cloud computing platforms in their day-to-day operations and for data publication. Attendees were able to discuss the return on investment for the agencies, costs, performance, and challenges related to cloud vendors and platforms.

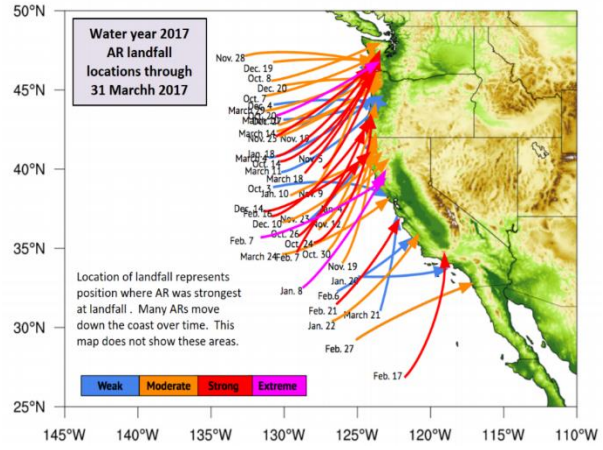
WSWC conducted an extensive survey of its member states concerning their use of the cloud, and staff presented their findings to the group. The survey results indicated that states were beginning to use the cloud but were not yet comfortable with the variability of its costs and performance. The relevance of these findings to the WWAO and NASA Applied Science Program (ASP), and the potential for the transition of cloud-based software, tools, and data systems, were discussed.

Attendees from the NASA-WWAO office had the opportunity to present on their ongoing collaboration and partnerships with state water resource management agencies. They gave a high-level overview of new research and tools useful for decision support. Remote-sensing for more precise Irrigation management was presented and shown to be a critical tool in managers' ability to adapt to drought and climate change in California. Other states are working to implement similar programs.



New methods and new state partnerships for estimation of evapotranspiration and crop water use requirements were presented. Improvements in snowpack assessment and runoff forecasting were discussed. New tools that use radar-based measurements of surface land subsidence and recovery were shown to be an effective monitor or indicator of aquifer recharge and withdrawals. Methods for quantifying a variety of water quality parameters in larger water bodies via satellite imagery were presented, as well as assessments of soil moisture conditions on regional scales.

WSWC Vice Chair Jeanine Jones spoke over lunch on the merits of forecast informed reservoir operations (FIRO) with improved subseasonal to



seasonal (S2S) precipitation forecasting. These improvements have the potential to allow water managers to optimize their decisions and allocations, especially during periods of drought. Effective FIRO management has implications for other states in the West as well. In addition, examples of weather pattern anomalies that have the potential to increase the accuracy of seasonal forecasts were presented.

Breakout sessions for small group interactions with NASA-WWAO staff were held to determine states' needs and how research projects could be successfully and more easily transitioned to operations. The questions each group addressed included: what may be done at the beginning of projects to ease later transitions, key data standards or metadata that should be considered, and other best practices when partnering with state agencies. The breakout sessions also brought to light approaches that should be avoided and gaps in data that presented difficulties for the state agency. Participants provided feedback during sessions, with some key takeaway practices and challenges for the WWAO office to consider:

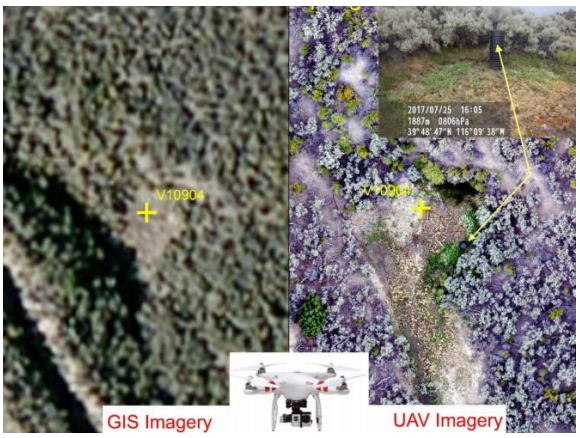
1) Management practices evolve over time, and the best results will be achieved with frequent communication and by staying engaged and looking for pilot opportunities collaboratively. Outreach and education will be key to engaging with new states and expanding partnerships. On-going training and support are necessary to a successful transition of research and tools.

2) Websites and tools for data accessibility and processing that are easy to use are very important. Working with the states to build processing tools they can support is very important. Having a strategy in place with respect to where software and tools will eventually reside is also a critical issue that should be addressed as projects commence. Some attendees expressed concern about fluctuating costs with cloud vendors and proprietary data formats.

3) There are myriad datasets that need further research, a majority concerning the agricultural sector in the West. Soil moisture, channel geometries, reservoir levels, water quality, vegetation mapping, groundwater modeling, especially at usable field-scale resolution would be very useful. Ensuring that, where applicable, datasets are delivered using widely adopted standards (e.g. the Open Geospatial Consortium (OGC) WaterML 2.0 or Federal Geographic Data Committee (FGDC) Geospatial Information System (GIS) standards) is paramount.

4) Reducing the difficulty related to working with a federal partner would be ideal. The ability to quantify benefits gained from the research for a state agency is highly desirable. It was suggested that co-mentoring between state agencies and NASA offices might be a good way to transfer knowledge and facilitate tool integration into agency operations.

The busy day ended with presentations on water data-related programs within federal agencies that would be useful to state agency IT staff. The U.S. Geological Survey, the Bureau of Reclamation, and the National Oceanic and Atmospheric Administration staff presented on water availability and use programs, the federally-led Open Water Data Initiative, the status of Agrimet, a significant weather station and irrigation management system network in the West, new data visualization tools for reservoir levels and diversions, and the National Integrated Drought Information System (NIDIS).



The final day's focus was on "open water data" concepts and discovering the value of shared data. Representing a year-long Dialogue Series conducted by the Aspen Institute, Lauren Patterson presented on the high-level intrinsic value of shared data and posited an "Internet of Water" framework for regional data sharing. Technologies and strategies available for data acquisition, publication, and storage were also presented by state agency staff, ranging from use of UAS for operations and project maintenance, to new statutory requirements for data in California (AB1755), to the challenges of migrating a state agency IT shop to strictly "open source" software.

New data accessibility and visualization tools, data services and HydroShare, were presented by Jerad Bales, the Executive Director of the Consortium of Universities for the Advancement of Hydrologic Sciences, Inc. (CUAHSI). Successes and challenges of other data visualization platforms and decision support tools were presented and discussed by the attendees. The notion of a western water data archive was floated before the audience to gage interest and determine what next steps may be. The meeting was concluded with a final discussion of future WIMS topics that attendees would like to see, and feedback on the format and timing of the meetings. The participants provided written feedback and suggestions for a more focused WIMS to be held in the future.

Overall, the WIMS tour, workshop, dinner, and social were successful largely due to interactions between state water resource agency program managers and specialists and the NASA-WWAO research team. There were many insightful presentations, questions, and conversations held over the course of the three-day meeting. Feedback received from participants indicated an average score of 6.4 out of 7-point scale for quality of the presentations, interactions, formatting, location, and logistics for the workshop. Participants requested specific topics for the next WIMS meeting, primarily centered on new methods/techniques related to remote-sensing, and water supply, water use, (water budgets generally), surface and groundwater interactions, and other monitoring programs and applications. Soil moisture and runoff forecasting also ranked high in the requested topics.

All WIMS presentations, photos, and other meeting materials are archived, and can be accessed on the WSWC's WIMS workshop webpage: http://www.westernstateswater.org/upcoming-meetings/2018-water-information-management-systems-wims-workshop/. Please watch for the next WIMS workshop announcement in early 2019.