New Mexico Water Data Initiative 2024 Workshop Speaker Abstracts and Bios

Forging a Path: Migration from Database Applications to JSON APIs

Ian Alexander, Application Developer, Office of the State Engineer

Murudeshwar Barole, Application Developer, Office of the State Engineer

Michael Visser, Application Developer, Office of the State Engineer

Ian Alexander is the Application Development Supervisor at the New Mexico Office of the State Engineer. Over the past 25 years, he has worked to develop software solutions at multiple companies and agencies, including NMHSD, BOEM, BSEE, MMS, and NMDOT. His team is currently engaged in the processes of securing, modernizing, automating, and sharing applications and data associated with New Mexico's water supply.

Abstract

The rapid evolution of technology over the past three decades has often left organizations with core applications that, while functional and widely used, have become disconnected from modern IT standards and best practices. Upgrading these critical applications is a costly and risky process. However, by implementing data-sharing infrastructure through services and APIs, organizations can bridge the technological gap between legacy and modern applications, realizing benefits while minimizing risks and disruptions. This presentation explores the development of one such solution, which pairs PHP Laravel and the Eloquent ORM with IBM Informix to create JSON APIs.

A Graphical Interface to Quantify and Visualize Streamflow Depletion

Gilbert Barth, Principal, S.S. Papadopulos and Associates

Jessica Rogers, Ph.D., S.S. Papadopulos and Associates

Doug Hayes, S.S. Papadopulos and Associates

Dr. Barth specializes in quantitative surface water and groundwater assessments and development of interfaces improving access to predictions from complex models. The interfaces encourage rapid exploration of alternatives, expanding conversations regarding alternative management of limited resources.

Dr. Rogers specializes in groundwater model development and calibration with a focus on quantifying exchanges between groundwater and surface-water systems, with applications to address water resource management.

Abstract

Quantifying streamflow depletion is a critical component of water resource management; however, accurate and cost-effective estimates are often not available to inform decision makers. SSP&A developed a readily adaptable, map-based Graphical User Interface (GUI) allowing users with a basic understanding of the underlying hydrogeology to rapidly evaluate impacts associated with management alternatives including generating estimates of quantity, location, and timing of stream depletion and groundwater level changes. The GUI software platform is model-independent and highly customizable. The GUI platform may be configured to perform analytical calculations using a variety of underlying methodologies or programs, run a numerical model, or both. This talk will demonstrate the Analytical Interface (Ani), which combines a novel analytical depletion function (ADF; Zipper et al., 2019) approach to calculate streamflow depletion and the Theis equation to calculate drawdown. The ADF approach applies the Glover-Balmer equation and apportions depletion based on proximity of the river network to the pumping location. Examples will be shown for draft Ani implementation in the Carlsbad, Gila-San Francisco, and Upper Pecos basins. This talk will also demonstrate existing GUIs developed on behalf of the NMOSE which use a MODFLOW groundwater model (e.g., the Lea County Interface, the Mimbres Basin Interface) or combine numerical and analytical methods (e.g., the Carlsbad Basin Interface).

Data-Powered Source Water Protection

Kelsey Bicknell, Environmental Manager, Albuquerque Bernalillo County Water Utility Authority

Kelsey Bicknell is the Environmental Manager for the Albuquerque Bernalillo County Water Utility Authority. Kelsey holds a graduate degree from the University of New Mexico in Civil Engineering and an undergraduate degree in Environmental Science. She has experience leading investigations of environmental sites ranging from small gas station releases to large historic contamination sites that continue to threaten source water. She uses her diverse experience as an environmental scientist and engineer to develop data-driven strategies to ensure the Water Authority's source water is protected.

Abstract

As the largest water utility in New Mexico, the Albuquerque Bernalillo County Water Utility Authority (Water Authority) employs multiple strategies to ensure it can sustainably provide clean and affordable drinking water to its over half a million customers. One strategy employed is maintaining a robust source water protection program to safeguard water supply for future use. Foundational to the program are the routinely updated source water assessments which ensure new threats to source water incorporated into the source water protection program. Source water assessments consist of defining the protection areas, determining where potential sources of contamination exist within the protection areas based on an inventory compiled from many data sources, and translating those occurrences to a useful metric. The most recent update focused on optimizing the methodology using a Python script (Python Software Foundation, http://www.python.org), which was beneficial to reducing analysis time and increasing repeatability. While the Python script resolved one area of inefficiency in this process, another still exists with the data being stored in multiple locations and formats. The Water Data Catalogue will increase the availability and quality of data on potential sources of contamination, which will result in even more robust source water assessments for not only the Water Authority, but any entity interesting in completing this analysis.

Data Gathering and Integration from Water Data Services: Lessons and Takeaways from a Variety of Sources

Jacob Brown, Water Data Scientist, New Mexico Bureau of Geology and Mineral Resources

Jake Ross, Data Integration Manager, New Mexico Bureau of Geology and Mineral Resources

Rachel Hobbs, Water Data Program Manager, New Mexico Bureau of Geology and Mineral Resources

Jacob Brown is a hydrologist and data scientist with the New Mexico Bureau of Geology and Mineral Resources, supporting the Water Data Initiative. Prior to joining the Bureau of Geology he worked as a hydrologist and consultant for RESPEC. He has his masters in hydrology from the Colorado School of Mines and bachelors in mathematics and French from Pomona College.

Abstract

Several federal water data services exist to provide automated water quality and water level data. At the New Mexico Bureau of Geology and Mineral Resources (NMBGMR), retrieving and processing data from these services is essential to developing comprehensive hydrologic studies. Use of these services by personnel at the NMBGMR has led to insights into best water data-sharing practices.

This presentation will focus on two areas of data-sharing: documentation and workflow. In the documentation portion, cases will be presented from services where robust documentation improved the experience of data retrieval. The availability of detailed and thorough documentation enabled our work to be more efficient and precise; on the other hand, a dearth of documentation required exhaustive searches and extensive communication with the reporting agencies, thereby causing delays and excessive effort. In the workflow portion, cases will be presented where gathering desired data was straightforward and efficient and where such a task was cumbersome and time-intensive. Much like documentation, having clear and efficient workflows dramatically decreases the time it takes to gather data. Interacting with the water data services of other organizations has shown many ways in which our own data services may be improved. Planned improvements to NMBGMR's data services, inspired by practices gleaned from other organizations, will be discussed and presented

Building the Texas Water Data Hub, One Partnership at a Time

Taylor Christian, Water Data Scientist and Coordinator, Texas Water Data Hub

Taylor Christian is a Water Data Scientist and Coordinator working at the Texas Water Development Board. Taylor has been working in water data for 13 years worked at the TWDB for the last 10 focused on a variety of data and mapping applications. For the last several years she has been the data lead on the Texas Water Data Hub project. Taylor is passionate about improving data standards in Texas and her favorite part of her job is spreading the good word of FAIR data!

Abstract

The underlying motivation for the Texas Water Data Hub is the belief that good decision making is based on good data. Unfortunately, water data can sometimes be fragmented and locked away, making it difficult to value or use. The groundwork for the Hub started in 2020 with a year-long design and research phase focused on putting real people at the center of the Hub's development. The Beta version of the Hub was released in February 2023 and catalogs datasets with standardized documentation that follows the principles of FAIR (Findable, Accessible, Interoperable, and Reusable) data. The Hub relies on organizations that host, maintain, and provide public access to water data in Texas to partner with the project by contributing and maintaining metadata in the Texas Water Data Hub's catalog. This presentation will go over the background and history of the project, and then focus on the lessons learned from outreach and developing partnerships since the Beta launch of the Texas Water Data Hub.

The PVACD Meter Manager App: Evolution of a Web-Based Water Resource Management System and Associated Challenges

Chris Cox, Water Data Specialist, New Mexico Bureau of Geology and Mineral Resources

Aron Balok, Superintendent, Pecos Valley Artesian Conservancy District

Joe Niece, Operations Manager, Pecos Valley Artesian Conservancy District

Chris has a Masters in Geology and has worked for New Mexico Water Data Initiative program at the New Mexico Bureau of Geology and Mineral Resources for over a year, primarily focused on web application development. He also runs an environmental data analysis consulting business: CRC Earth Analytics. He is originally from Albuquerque and attended UNM for his bachelor's degree. He has also lived in Wyoming and Utah for several years before returning to Albuquerque.

Abstract

The New Mexico Water Data Initiative (NMWDI) is collaborating with Pecos Valley Artesian Conservancy District (PVACD) to create a web application for tracking and managing district water meters. PVACD manages over 1200 meters in the areas around Roswell and Artesian, and they are tasked with all aspects of meter maintenance including repairs and annual maintenance. They work closely with the Office of the State Engineer Water Masters who use the meters to ensure water usage conforms to water rights.

An initial version of the web application (Meter Manager App) is just starting to be deployed by the PVACD and has a number of features designed to streamline the data entry process while ensuring the data itself is robust and consistent. The end goal is a dataset that can be leveraged for sophisticated management workflows and unique insights into the Pecos Valley hydrologic system.

Development of the Meter Manager App has taken more than a year and was far from a linear, straightforward process. The entire project has evolved from a need to migrate data from an old database to a new system. Several aspects of the project were more challenging than expected, including the need to balance a data centric design with existing operational constraints. The project has successfully moved forward via iterative development in close coordination with PVACD managers and technicians.

ZiaMet Weather Data Network

Dave DuBois, State Climatologist, New Mexico State University

Dave DuBois is the New Mexico State Climatologist and Director of the ZiaMet mesonet.

Abstract

The New Mexico mesonet or ZiaMet recently expanded to more than 200 stations with the help of many individuals, agencies, organizations, and communities. Our stations measure air temperature, wind speed and direction, relative humidity, solar radiation, barometric pressure, precipitation, and soil moisture and temperature every 5-minutes. Data from these stations are used by farmers for crop irrigation, crop planting, and determining optimal conditions for pesticide applications. Our data is used for monitoring drought and helps in the creation of the weekly US Drought Monitor maps. Our data is also used for improving weather forecasts and during natural disasters such as floods, winter storms, high wind events, and dust storms. This data is also key for tracking climate change across the state. Currently our data goes to the NOAA National Mesonet Program through a contract with Synoptic Data Corporation. The data is then pushed to the Mesowest website and the National Weather Service for their use. Through the NM Climate Center's website, we offer ways to summarize data at one site or across the network. Output formats include CSV, KML and webpage tables. Our connection with Synoptic leverages their expertise in data delivery and visualization with their Synoptic Data Viewer and API services. This talk will give an overview of the network, current methods to access the data, and future directions.

Middle Rio Grande Conservancy District Water Gauge Website Overview

Brittney Erdmann, Hydrology Technician, Middle Rio Grande Conservancy District

Brittney received her B.S. in Earth and Planetary Science from the University of New Mexico in 2014. She is a Hydrology Technician for the Middle Rio Grande Conservancy District

Abstract

The Middle Rio Grande Conservancy District (MRGCD) has recently launched a new water data application, Contrail by OneRain, to collect and provide water data for our staff, constituents and various partners in the Middle Rio Grande Valley. The MRGCD uses Ultra High Frequency (UHF) radio and a series of strategically placed radio repeaters to transmit water data in the MRGCD district. Up until recently, we were relying on a much more rudimentary and unsupported software application to conduct radio polling. The new software platform supports automated real-time data collection, processing, and visualization of water gauge data via a user-friendly website. My presentation will provide an overview on how to navigate the new site to view, access and download MRGCD's water gauge data.

Addressing New Mexico's Water Crisis by Adequately Funding the Prerequisites to Data-Driven Governance

Norm Gaume, President, Water Advocates for New Mexico and the Middle Rio Grande

Dr. Ladona Clayton, Executive Director, Ogallala Land and Water Conservancy

Barbara Gastian, Water Advocates for New Mexico and the Middle Rio Grande

Norm Gaume is a retired licensed New Mexico water resources engineer and water policy leader. His focus, since 1989, is water management, planning, advocacy, and activism for New Mexico's water security and sustainability. A prominent legislator once disparaged his truth-telling testimony before the Water and Natural Resources Committee regarding the Gila Diversion boondoggle because he is an avid river runner.

Abstract

New Mexico faces an urgent water crisis, characterized by unsustainable water use and water governance neglect. This crisis, largely unnoticed by the public and legislators, threatens the state's future sustainability and resilience.

Two landmark laws are key to New Mexico's water future, the 2019 Water Data Act (WDA) and the 2023 Water Security Planning Act (WSPA). These acts mandate the use of the best available science, data, and models for water resource planning, emphasizing transparency, integrity, and professionalism. However, despite their potential, these laws remain largely unfunded by the New Mexico Legislature, a reflection of a longstanding culture of State of New Mexico's neglect that blocks progress towards water governance necessary for New Mexico's survival of the 21st Century and beyond.

Public water data, essential for informed decision-making, remain inaccessible and poorly managed, undermining efforts to address the water crisis effectively. Full implementation funding is required for the 2019 Water Data Act and the 2023 Water Security Planning Act, along with integrating all the 2022 Water Task Force recommendations into the 2019 Water Data Act's Directing Agencies' strategic plans and annual operational improvement goals or rejecting them for publicly stated reasons.

Multi-Scale Drivers of Daily Flow Intermittency in a Regulated Desert River

Eliza Gilbert, Department of Biology, University of New Mexico

Thomas F. Turner, Department of Biology, Museum of Southwestern Biology, University of New Mexico

Melanie E. Moses, Department of Computer Science, University of New Mexico; Santa Fe Institute

Alex J. Webster, Department of Biology, University of New Mexico

Eliza is a current doctoral student at the University of New Mexico and a biologist for the US Fish and Wildlife Service

Abstract

River ecosystems are vital for biodiversity and human welfare but face increasing threats from flow intermittency caused by climate change and other human activities. To better understand drivers of flow intermittency, we analyzed long-term and spatially explicit river drying data from the Rio Grande. We examined the spatial structure and influences of in-channel infrastructure, river discharge, and weather on flow intermittency using multivariate autoregressive state space (MARSS) models and 12 years of daily discharge and drying observations. We define weather as inter and intra-annual variability in precipitation and temperature. River diversion rates at dams and irrigation return flows significantly structure the spatial occurrence of flow intermittency, but fine-scale factors (e.g., transmission losses) at distances ≤ 7 kilometers (km) are more influential predictors of drying. We did not detect influences of temperature and precipitation at the reach scale (~150 km) but they were significant at each of three the subreach scales we investigated. At all subreach scales, the effect size of temperature exceeds that of precipitation by 2.5 times and was the strongest predictor of drying. Overall, our analysis shows that scale-sensitive models can inform environmental flow management strategies aimed at mitigating negative effects of climate change and water extraction.

Data and Data Visualization Needs to Advance the Usefulness of the New Mexico Dynamic Statewide Water Budget Model

Austin M. Hanson, INTERA Incorporated

Alexander G. Fernald, New Mexico Water Resources Research Institute

Ahmed F. Mashaly, Postdoctoral Researcher, New Mexico Water Resources Research Institute

Austin Hanson was born and raised in Taos, New Mexico. He earned Bachelor and Master of Science degrees in geology at New Mexico State University. Austin worked as a program specialist for the New Mexico Water Resources Research Institute where he focused on the New Mexico Dynamic Statewide Water Budget. Currently, Austin is working for INTERA Incorporated where he focuses his efforts in the water resources and environmental lines of business. Austin is the vice president of the New Mexico Water Dialogue and New Mexico's water resources are Austin's professional passion.

Abstract

The Dynamic Statewide Water Budget Model (DSWB) is a multiyear and collaborative effort to account for the origin and fate of New Mexico's water supply. The DSWB uses a mass balance approach to aggregate monthly water storages and flows for counties, water planning regions, river basins, and statewide. The DSWB includes a historical (1975–2018) and future scenario period (2019–2100). To complement the model, an interactive visualization tool is currently available online, which provides users access to modeled results. Current limitations of the DSWB include the large spatial and monthly temporal resolution of the model; estimates for runoff, recharge, land surface evapotranspiration, and surface water-groundwater interactions are calculated as closure terms; surface water and groundwater quality is not considered; and total groundwater in storage is currently assumed to be infinitely available. Current limitations of the visualization tool are that data of modeled results can only be downloaded with proprietary software, and the results are not comprehensive of all modeled parameters or future scenarios. However, the DSWB contains abundant historical data, identifies regional variation of the state's water availability and use, identifies data gaps, and has proven to be useful in advancing community conversations about water. The goal for the DSWB is to model technically valid data and provide access to these data that informs viable solutions to the water resource challenges that New Mexicans are facing.

U.S. Geological Survey Monitoring and Data Access in New Mexico.

Lauren Henson, Hydrologist, U.S. Geological Survey New Mexico Water Science Center

Lauren Henson is a hydrologist and data management specialist for the New Mexico Water Science Center, located in Albuquerque, New Mexico. She manages the Statewide Groundwater Program and provides quality assurance and database support to the data and studies programs in the center.

Abstract

The mission of the U.S. Geological Survey (USGS) New Mexico Water Science Center is to lead in public service by providing relevant, accessible, and innovative water science to New Mexico and the Nation. Our long-term monitoring data program includes approximately 200 continuous surface-water gaging stations and approximately 1000 groundwater wells from which water-level data are obtained at least annually. Discrete and continuous water-quality data are also collected throughout the state of New Mexico. The National Water Information System (NWIS) Modernization program is focused on providing necessary improvements to NWIS, the world's largest authoritative enterprise water information system. These improvements have impacted and will continue to impact the way that USGS water data are served to the public. Tools and data access portals, such as the National Water Dashboard, have been developed to improve public access to real-time water data and information. In addition, recent changes to the way that water-quality sample data are stored in NWIS will affect user interfaces for accessing data . USGS data delivery updates make hydrologic data more findable, accessible, interoperable, and reusable (FAIR) to enable combining USGS data with other data sources.

Use of Water Star for Tracking Produced Water Quantity, Quality, and Stewardship Information

Mike Hightower, Director, New Mexico Produced Water Research Consortium

Mike is Director of the NM Produced Water Research Consortium, a joint effort of New Mexico Environment Department and New Mexico State University.

Abstract

In November 2019, the US Environmental Protection Agency (USEPA) asked the New Mexico Produced Water Research Consortium (Consortium) to collaborate with the Ground Water Protection Council (GWPC) to lead efforts in produced water treatment and reuse for the National Water Reuse Action Plan (WRAP). In support of this effort, the Consortium and GWPC implemented a produced water data base for New Mexico in 2021 using the GWPC's Water Star water data management tool. Water Star is being considered by several western states as the basis for produced water data management. For 2024, the Consortium has expanded efforts with GWPC and the NM Oil and Gas Association (NMOGA) to improve the NM Produced Water Data Portal with additional produced water quality data, with improved and independent QA/QC of produced water quality data. This presentation will discuss the current expansion of produced water data collection, and how we are trying to integrate with the NM Water Data Initiative. The effort will hopefully help establish common produced water data formats that will make data more easily accessible to promote the recycling, reuse, and mineral recovery of produced water, while also promoting better overall water and environmental stewardship.

Water Protection Data: Bringing NMED into the 21st Century

Pam Homer, Team Lead of the Surface Water Quality State Permitting Program, New Mexico Environment Department

Jason Herman, Pollution Prevention Section Program Manager, Surface Water Quality State Permitting Program, New Mexico Environment Department

Meta Hirschl, IT Project Manager New Mexico Environment Department Surface Water Quality State Permitting Program, New Mexico Environment Department

Pam has 19 years of experience in various ground and surface water protection programs at NMED. She has also held water resources management positions at the NM Interstate Stream Commission and in Oregon. She has degrees in earth science and geography and originally hails from the panhandle of Texas.

Abstract

The NMED is developing an urgently needed water quality permitting database to support a new surface water permitting program mandated by the Legislature and the existing groundwater permitting program. The initiative supports the Governor's 50-Year Water Action Plan. A 21st century permit management system is essential to protect the state's scarce water resources from pollution.

The Water Quality Permitting Application will allow electronic application, renewal, and monitoring submissions. It will streamline interactions with the regulated community and make water quality monitoring data and facility information readily accessible to the public. It will also allow NMED to efficiently manage the surface and ground water permitting programs, including staff and resource allocation, revenue and funding oversight, and strategic analysis of the overall process. An internal team of technical and IT staff is guiding the database development process, which targets this fall for showcasing an interim product.

Water for Energy: Complex Data Requirements Across New Mexico Users

Nicole Jackson, Senior Technical Staff, Sandia National Laboratories

Raquel Valdez, Sandia National Laboratories

Will Peplinski, Sandia National Laboratories

Thushara Gunda, Sandia National Laboratories

Nicole D. Jackson is a researcher focused on complex systems and extreme event analysis.

Abstract

There are strong connections between the water and energy sectors. Energy is required to treat and distribute water while water is required to support energy production. Requirements for water data, however, are context- and user-specific and vary depending on specific technological process and geographic location. This talk will start with a summary of the different energy-related water touchpoints that can influence water data requirements. A few case studies will be presented to highlight key dimensions of import within the state including touchpoints between water and thermoelectric production. We will also talk through water needs for energy transitions-related activities, including hydrogen production and solar manufacturing. Finally, we will discuss water requirements for oil and gas production, highlighting both considerations for supply and quality monitoring as well as produced water reuse for this sector. In addition, the increasing frequency and intensity of climate-related events and the growing digital economy (e.g., data centers), underscores the critical role of reliable water and energy data management systems in supporting evolving needs of the energy sector. We will end the talk with the opportunities associated with more open sharing of water data that take into account these complex data requirements – across natural, social, and built systems – associated with collecting, characterizing, and effectively using water-related data for the energy sector.

Data Used for MIKESHE Integrated Hydrologic Model of the Middle Rio Grande Basin

Laurel Lacher, Principal and Owner, Lacher Hydrological Consulting

Robert Prucha, PhD, PE; Integrated Hydro Systems, LLC

Todd Caplan, GeoSystems Analysis, Inc

Shannon Weld, New Mexico Interstate Stream Commission

Dr. Lacher's 30-year career has focused on groundwater-surface water interactions. Following her graduation from the University of Arizona Hydrology and Water Resources Program in 1996, she served as the Water Resources Program Manager for the White Mountain Apache Tribe for 6 years prior to starting her own consulting firm in 2002. Since that time, her work has centered on human impacts to desert river systems. In the past 4 years, she and Dr. Prucha have developed integrated MIKESHE models of several perennial stream basins in Arizona as well as the Middle Rio Grande basin in New Mexico.

Abstract

The New Mexico Interstate Stream Commission must balance its obligation to deliver Rio Grande water to Elephant Butte Reservoir as required by the Rio Grande Compact of 1938 with protection of endangered species habitat as required by the 2016 Middle Rio Grande Biological Opinion. To inform complex management decisions, the NMISC contracted with GeoSystems Analysis, Inc. to develop a fully integrated MIKESHE hydrologic model of the Middle Rio Grande. The multi-scale MIKESHE model simulates the entire water cycle and is driven by weather data. Groundwater-surface water interactions, streamflows, groundwater levels, evapotranspiration, and unsaturated flow conditions in response to human and natural stresses are simulated on an hourly basis. This fully model is data-intensive and its developers have cast a wide net to obtain relevant local data from water managers and data specialists in the Middle Rio Grande. Data sources include numerous state, local, and federal agencies, various theses and reports, and several subject experts. Other spatial-temporal data sets required for this modeling effort include continuous hourly precipitation, air temperature, and reference evapotranspiration; stream, canal, and drain flows; channel bathymetry and topography; groundwater pumping and elevations; land-cover; and vegetation type distribution, greenness, and rooting depths. In this presentation, we will describe both satellite- and ground-based datasets and point to remaining data gaps.

A New Geodatabase and User Interface for Aquifer Test Data

Amy Lewis, Hydrologist, HydroAnalytics LLC

Max Gersh, Hydrologist, Hydrology Bureau, Office of the State Engineer

Amy Lewis, owner of HydroAnalytics LLC, has a Master's in Hydrology from NM Tech and 40 years of experience working in New Mexico as a hydrologist for both private and public sectors. Her work experience includes groundwater modeling; municipal, regional, and state water planning; field work; technical research; and database and GIS-tools development.

Max Gersh is currently a Hydrologist with the New Mexico Office of the State Engineer, Hydrology Bureau. Max obtained an BS in Hydrology and Water Resources from the University of Arizona and an MS in Environmental Science and Management from Portland State University where he focused on forest fire effects on snow albedo and snowmelt timing. His work experience includes the use of gravity surveys for aquifer monitoring, remote sensing and GIS-based hydrology work, water rights allocation, groundwater modeling, and surface water/groundwater interactions.

Abstract

The New Mexico Bureau of Geology through an applied science WaterSMART Grant from the Bureau of Reclamation is working with the Office of the State Engineer Hydrology Bureau to update a database of aquifer test results. The goal of this online platform will protect existing data while enabling new aquifer test entries. The online map interface allows sharing and collaborating with colleagues while minimizing the risk of creating different versions of the geodatabase, and also allows for review and verification of new entries by an administrator. The map interface will also allow the public to view and download aquifer test data as needed.

The original database was developed in 2007-2009 in an Access database. The content of the original database evolved as individuals exported the data to Excel or ArcGIS and added data and modified fields. Amy Lewis, with HydroAnalytics LLC, was retained in 2023 to reconcile the various versions of the datasets, bring them together in the ArcGIS Pro and identify new sources of aquifer test data. With the assistance of Wetherbee Dorshow, Earth Analytic Inc., the geodatabase was transferred to an online GIS platform that allows multiple users to enter new data. The NM Aquifer Test Wells App is an ESRI based application that includes an input form with detailed descriptions and a procedure for verifying and approving data entry.

Utah's Water Rights Network

Jared Manning, Assistant State Engineer, Utah Division of Water Rights

Jared Manning is a registered professional engineer in Utah and has worked in several capacities at the Utah Division of Water Rights for the last 26 years. He has a bachelor's and a master's degree in Civil Engineering from Brigham Young University. Jared enjoys playing pickleball and spending time with his grandkids.

Abstract

Utah's hydrodata has recently been the subject of scrutiny from water planners, legislators, and water users as drought has impacted the Great Salt Lake, Colorado River, and other basins within Utah. To address ongoing data needs the Utah Division of Water Rights is currently developing the Water Rights Network which ties together hydrography, water use records, water rights information, and distribution accounting data. In addition, our agency is undergoing a data infrastructure gap analysis to identify shortcomings in the current system and to construct a roadmap for addressing the gaps.

The Arizona and New Mexico Streamgage Catalogs: A Compilation of Streamgage Locations and Supporting Metadata

Marleigh Nicholas, Hydrology and Atmospheric Science, University of Arizona

Martha P. Whitaker, University of Arizona

Holland Sterling, University of Arizona

Robert Jimenez-Wieneke, University of Arizona

Marleigh Nicholas is currently an accelerated master's student in the department of Hydrology and Atmospheric Science at the University of Arizona expecting to graduate with her Master's degree in December of 2025.

Abstract

The United States Geological Survey (USGS) operates a publicly-accessible streamgage network, but there are many streamgages in each state that are operated by other agencies, and the locations are not cataloged as the USGS gages are. A lack of collaboration creates a data gap between the non-USGS agencies that operate streamgages. The New Mexico Streamgage Catalog is a central database that catalogs non-USGS gages. It will inform stakeholders of non-USGS streamgage locations and the availability of streamflow data, and increase resource efficiency. The New Mexico Streamgage Catalog was created by obtaining streamgage locations and associated metadata for each gage from individual organizations in New Mexico. It is an interactive map created with ArcGIS and includes streamgage locations, precipitation gage locations, watershed boundaries, and major river layers. When completed, the catalog will be publicly available as a web application. The New Mexico Streamgage Catalog will be integrated with the Arizona Streamgage Catalog, with plans to begin working on other states that make up the 7 lower Colorado basin states.

Compiling and Analyzing Groundwater Data to Develop Lifetime Projections for the High Plains Aquifer in East-Central New Mexico

Geoff Rawling, Hydrologist, New Mexico Bureau of Geology and Mineral Resources

Dr. Rawling works in the New Mexico Bureau of Geology and Mineral Resources (NMBGMR) Aquifer Mapping and Geologic Mapping Programs. His responsibilities include collection of physical and chemical hydrologic data, geologic mapping, and subsequent data analysis and interpretation. In addition to preparing geologic maps, technical reports, and peer-reviewed scientific papers, Dr. Rawling presents the results of NMBGMR research programs to audiences including scientists, conservation districts, state and local government officials, and groups of concerned citizens.

Abstract

Several thousand water level measurements spanning over 50 years, from over a thousand wells, were used to create aquifer lifetime projections from the year 2016 for the High Plains Aquifer in east-central New Mexico. The dataset of well information and depth-to-water data was provided by the USGS New Mexico Water Science Center. Projections are based on water-level decline rates from decadal median water levels, calculated over ten- and twenty-year intervals, for two scenarios: the time until total dewatering of the aquifer, and the time until a 30 foot saturated thickness threshold is reached. The scenarios may be viewed as the usable aquifer lifetime for domestic and low-intensity municipal and industrial uses, and the usable lifetime for large-scale irrigated agriculture.

Projected lifetimes and developing areas of zero saturation are shown on maps. The results match very well with independent lifetime projections for the Texas Panhandle region. Water-level trends in east-central New Mexico are similar to those observed elsewhere in the High Plains. Much of the region already has insufficient saturated thickness for large-capacity irrigation wells. Even when considering the lifetime of the entire thickness of the aquifer, projected lifetimes across much of the study area are a few tens of years or less. This study is an example of the utility and need for readily-available water-level data collected regularly from spatially and temporally consistent well networks.

Designing a Water Quality Sampling Program for Volunteers and for Data Submittal to the New Mexico Environment Department

Shannon Romeling, Projects and Foundations Coordinator, Amigos Bravos

Steven Fry, Policy and Project Specialist, Amigos Bravos

Projects and Foundations Coordinator, Shannon leads the Amigos Bravos water quality sampling program.

Abstract

This presentation will walk attendees through how to set up a volunteer water quality sampling program, and how to collect those data at an acceptable level for submittal to the New Mexico Environment Department (NMED) Surface Water Quality Bureau for inclusion in their policy decisions related to the CWA 303(d)/305(b) Integrated List of Assessed Surface Waters. We will go over details of how to formulate a water quality sampling program to work for volunteers but also how to follow NMED guidelines for data submission. Data collected by the Amigos Bravos Water Sentinels volunteer water quality sampling team since 2007 will be summarized and used as an example throughout the presentation.

Building a Water Data API Ecosystem: Lessons Learned and Paths Forward

Jake Ross, Data Integration Manager, New Mexico Bureau of Geology and Mineral Resources

Dr. Jake Ross is the NM Bureau of Geology's Data Integration Manager and the technical lead to the New Mexico Water Data Initiative. Jake moved to Socorro, NM, in 2006 to pursue a PhD in Argon Geochronology and software development and has been writing software to improve the flow of data from producer to consumer ever since.

Abstract

Convened by the New Mexico Bureau of Geology and Mineral Resources (NMBGMR), the New Mexico Water Data Initiative has developed an ecosystem of APIs, data entry mechanisms, and data visualization tools tailored to our state's unique water data landscape. This presentation highlights specific efforts at the NMBGMR aimed at designing and implementing data pipelines for automated data collection, alongside user-friendly web interfaces for data exploration and visualization.

We'll share the lessons learned from our journey, emphasizing the importance of establishing a shared vocabulary and navigating the intricacies of maintaining cloud-based systems amidst New Mexico's diverse water data challenges. From tracing the origins of our effort to its current state, we'll outline our future goals and chart the course ahead for advancing water data accessibility and usability across New Mexico.

Leveraging Human-Centered Design to Understand Users and Solicit Feedback

Laura Sepulveda, Manager, Texas Water Development Board

Laura is the manager of the Design, Innovation, and Marketing department in the Texas Geographic Information Office (TxGIO), and has a background in interaction design, GIS, and government data. She is passionate about information accessibility and making digital products that are useful instead of frustrating for stakeholders.

Abstract

Understanding user needs and preferences is important for the success of any product or service. Human-Centered Design (HCD) offers a systemic approach to empathize with users, define their problems, and generate solutions that resonate with their experiences. This presentation delves into HCD methods used by the Texas Geographic Information Office to foster meaningful user engagement and solicit feedback to drive innovation and product development. This presentation will include real world examples of how HCD methodologies such as contextual inquiry, prototyping, and think aloud user testing are being used to support projects such as the Texas Water Data Hub.

Water, Air Quality, Health, and Finance/Economic Dashboard (WAQHE)

Sriram Thokatura, University of New Mexico,

Andrew Padilla, Principal, Datacequia

Norm Gaume, President, Water Advocates for New Mexico and the Middle Rio Grande

Ramiro Jordan, Electrical and Computer Engineering, University of New Mexico

Peter Coha

Sriram Thotakura is a student who is currently pursuing a MS in Electrical Engineering at the University of New Mexico.

Abstract

Two vital and unique resources for the planet are water and air. Any alterations in their composition can have detrimental effects on humans and living organisms. The public must recognize that action is required. Availability of verifiable, trusted, compiled, accessible data will promote our critical need to work toward equitable adaptation and attain sustainable resiliency in our city, county, state, country and globally. Currently institutional published Open Data have no means to collectively engage citizen groups in a “data” dialogue where citizenry can independently publish derivative works based on institutional or locally collected data at the speed of social networks which is thought to be the ‘viral’ cadence necessary towards achieving equitable adaptation and sustainable resiliency. The goal of the collaboration between JEDAI/Datacequia/MRG is to demonstrate the possibilities when local and institutional knowledge are paired on equal footing through self-sovereign co-publications of derivative works from citizen science groups in concert with institutional Open Data sources such as the NM Water Data Initiative and MRG.

Diné Household Water Survey: Understanding Household Water Needs of Diné Families Living in the Fort Defiance Agency

Taishiana Tsosie, Research Assistant, Johns Hopkins Center for Indigenous Health

Crystal Stewart, Research Assistant, Johns Hopkins Center for Indigenous Health

Taishiana Tsosie is Diné. Her clans are Honaghaanii (One Who Walks Around), born for Tabaaha (Water's Edge). Her maternal clan is Dibe Lizhini (Black Sheep), and her paternal clan is Toheedliiinii (Water Flows Together). Originally, she is from Houck, Arizona but resides in Sanders, Arizona. Taishiana received her Bachelors of Arts in Sociology from Susquehanna University, located in Selinsgrove, Pennsylvania. She is a Research Assistant at Johns Hopkins Center for Indigenous Health. While being part of the Behavioral Health team, her focus is committed to the continuation of the Center's newer project titled, the Diné Household Water Survey.

Abstract

Access to safe, reliable, and affordable water is fundamental to health, wellbeing, culture, and dignity. Indigenous communities across the US, including the Navajo Nation (NN), lack this fundamental human right. The number of households that lack running water or experience water access challenges are inconsistently reported, estimates varying significantly. This lack of data means that water-related resources and investments will continue to underserve those experiencing water-related burdens. This pilot research study was developed in direct response to the significant water access data gap on the NN, and the call for comprehensive, current data that can inform future policies and investments that are culturally relevant and sustainable. Diné Household Water Survey is a cross-sectional study using a multi-stage population-based household sampling methodology with a representative sample of households within the NN Fort Defiance Agency. The comprehensive survey measures multiple household water use behaviors, self-reported water quality/quantity, and reliability experiences, water insecurity, and preferences for water access solutions. Drinking water quality is also tested with a subset of households for biological, metal, and chemical contaminants to assess water safety at the point of consumption. Findings from this first-ever comprehensive water needs assessment with Diné households and progress toward scaling this research to the entire NN will be presented.

AI/ML for Characterization, Mapping, and Prediction of Groundwater Contamination Plumes

Velimir Vesselinov, Chief Technology Officer, EnviTrace LLC

Trais Kliphuis, Chief Executive Officer, Envitrace LLC

Hope Jasperson, Envitrace LLC

Dr. Vesselinov, PhD, authored a machine-learning patent, numerous research papers and software

Abstract

Groundwater contamination is one of the most pervasive and challenging environmental problems of the 21st century. Addressing these groundwater contamination problems requires understanding hydrogeochemical processes occurring in the subsurface. There are two significant problems associated with the characterization, mapping, and prediction of contaminant fate and transport at groundwater remediation sites: data and models. To solve this problem, we apply unsupervised (self-supervised) and science-informed machine learning (SIML) methods to develop reactive geochemical transport models that accurately represent (i.e., correctly upscale) small-scale reaction dynamics by assimilating all the site data. The significant advancement in SIML is the incorporation of existing scientific knowledge (physics, chemistry, geochemistry, geology, etc.) in the ML process. The SIML models include preconceived knowledge provided by subject-matter experts. In this way, the ML models do not need to learn everything just from the data. To address challenges associated with developing and applying SIML models for real-world problems, we have developed ChemML (https://emvitrace.com/chemml). ChemML allows for the processing of complex groundwater contamination datasets. This work was funded by a US Department of Energy small business innovation and research grant, and we have demonstrated ChemML application for groundwater contamination sites in the U.S.

Introduction to the USGS Colorado River Basin Science Collaboration Portal

Jon Wilson, Hydrologist, USGS Nevada Water Science Center

Anne Tillery, Program Officer, USGS New Mexico Water Science Center

Jeanne Godaire, USGS, Rocky Mountain Region

Jon has been a hydrologist with the USGS since 1996, working on varied hydrologic activities focusing on southern and eastern Nevada. He has participated in regional groundwater flow studies, localized surface-water assessments, and USGS national water-use initiatives. His most recent work includes an analysis of surface-water gains and losses in urban Las Vegas, evaluating sediment deposition in rural dry wash environments, and bank storage at Lake Mead.

Abstract

The Colorado River Basin (CRB) provides water for over 40 million people, millions of agricultural acres, recreation, mining, ecosystems and more. Since 2000 the CRB has been experiencing drought conditions resulting in basin changes such as increased wildfire activity, vegetation shifts, and depletion of streamflows and reservoir levels. These cascading effects of drought have led to increased need for timely, findable, and accessible science delivery for predicting the effects of the drought across the basin. The USGS has initiated a new approach to science in the CRB to help resource managers plan and mitigate the effects of the drought. The recently launched USGS CRB Science Collaboration Portal brings together access to science, data, and tools from across the basin in a central location and enables portal users to join online communities to explore and share scientific resources relevant to specific topics and groups. By connecting USGS scientists with multiple groups and individuals across the landscape, we are creating new partnerships, lowering barriers between scientists and resource managers, and making our science, data, and tools more effective and impactful for society. This portal was developed based on requests from local partners to help improve access to the wide range of USGS science produced across the basin. The portal will continue to evolve through ongoing collaboration, and in response to advances in science, updated data, and partner science needs.

A New Tool to Quantify Patterns and Trends of Agricultural Water Use in New Mexico

Cameron Wobus, Principal, CK Blueshift LLC

Caroline Nash, CK Blueshift LLC

Mary Kelly, Culp and Kelly LLP

Patrick McCarthy, Thornburg Foundation

Cam is an earth scientist and principal at CK Blueshift, LLC. He lives in Boulder, CO.

Abstract

To support a more resilient agricultural sector in New Mexico, programs, there is a need to better understand current agricultural water use throughout the state, using consistent data sources and replicable methods. We built a geospatial analysis tool that leverages newly available, satellite-derived data quantifying field-scale consumptive water use at a resolution of approximately ¼ acre. When combined with publicly available precipitation and cropland data, this tool can support quantification of annual trends in total agricultural water use state-wide; estimation of total consumptive water use by crop, region, or irrigation district; and evaluation of water savings potential from existing or proposed conservation programs. We will summarize the development of the tool, our preliminary findings regarding trends in agricultural water use in New Mexico, as well as how outputs from the tool could be used to help secure resilience funding from federal and state grant sources.