

ANNUAL FORUM



Presentation Descriptions & Speaker Bios

2021 Annual Forum | Virtual Event

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Source Water Protection

“Welcome to Utah and the West: Source Water Protection & the Farm Bill”

Emily Fife | State Conservationist | NRCS - Utah

Emily Fife was born in Wilkes-Barre, Pennsylvania but grew up in Northeast Ohio. While growing up she worked on horse farms and developed an appreciation for agriculture and the outdoors. She found her calling in college when she learned that she could take her passion for the environment and combine it with her love of agriculture by helping farmers and ranchers with voluntary conservation.

Emily started her career with two Soil and Water Conservation Districts and as an NRCS Earth Team Volunteer in Kentucky while studying agricultural science at Austin Peay State University where she graduated with honors in December 2004. In her 17 years with NRCS, she has served as a soil conservationist in Oregon, a District Conservationist in New York, a Team Leader in Oregon, and Assistant State Conservationist for Programs in Arizona. Throughout her career, Emily has also done temporary assignments as Easement Remediation Coordinator in Wyoming, Acting State Conservationist in Arizona, and a National Headquarters detail in Washington DC. These experiences have provided her with exposure and knowledge in the variety of services that NRCS offers.

Emily's role as State Conservationist is to provide leadership and management direction of all NRCS functions involved in planning, organizing, and implementing complex soil, water, and natural resource conservation for Utah. Emily brings with her a breadth of experiences which has taught her the value of different perspectives and approaches.

Believing that the best work starts at a grass roots level, Emily plans to focus on one of the agency's greatest strengths and founding principles, locally-led conservation. She also believes that NRCS employees, partners, and customers are our greatest asset and will support them to ensure Utah has a solid foundation for great conservation.

In her free time, Emily enjoys spending time with her husband Kenny, two boys, Keegan and Quinlan, and her cats and dogs. She loves running long distances and has completed several marathons and ultra-marathons. Writing is another passion of hers and she uses her writing to share the lessons she has learned throughout life.

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Astor Boozer | Regional Conservationist | NRCS – West

Astor Boozer has served as the NRCS regional conservationist for the West Region since December 2011. He provides agency and natural resources leadership and support to state conservationists and partners and ensures states effectively manage an extensive portfolio of comprehensive conservation

strategies—which includes implementing NRCS’s conservation technical assistance and financial assistance programs on private lands.

Through his leadership, NRCS has addressed water quantity and quality issues and strengthened partnership collaboration and customer service throughout the region. Boozer works to improve private and public lands conservation and help landowners efficiently gain access to USDA technical and financial assistance programs and services. He also helps leverage funding for boots-on-the-ground to deliver voluntary, science-based conservation.

He’s passionate about employee development and works closely with NRCS national and state leadership to provide training, offer temporary career-enhancing assignments, and explore mentoring opportunities to develop future agency leaders.

A native Texan and diehard Cowboys fan, Boozer grew up on a farm and ranch operation where he learned all about agriculture and caring for the land. During his 34-year tenure with NRCS, he has worked in eight states in a variety of state, regional, and national positions. He holds a Bachelor of Science in Agriculture from Prairie View A&M University in Prairie View, Texas. He appreciates the outdoors and loves to hunt, fish, and ride horses.

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“Boots on the Ground: Implementing SWP working with NRCS, State & Local Partners”

SWP competes with other Federal, State and local resource priorities. Prioritizing and targeting SWP is essential working with NRCS and SWCD resource staff to get projects going on the ground. Identifying multiple benefits, involving stakeholders, nonprofits and all levels of government is needed to implement SWP and work towards drinking water protection goals. Minnesota SWP efforts attempt to integrate SWP into a number of local water resource protection programs to tackle nitrate issues and other threats to groundwater sources of drinking water.

Mark Wettlaufer | Planning Supervisor, SWP Unit | Minnesota Department of Health

SWP competes with other Federal, State and local resource priorities. Prioritizing and targeting SWP is essential working with NRCS and SWCD resource staff to get projects going on the ground. Identifying multiple benefits, involving stakeholders, nonprofits and all levels of government is needed to implement SWP and work towards drinking water protection goals. Minnesota SWP efforts attempt to integrate SWP into a number of local water resource protection programs to tackle nitrate issues and other threats to groundwater sources of drinking water.

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“DWMAPS: A Tool for Source Water Protection”

Safe drinking water starts at the source. State, local, or utility-led source water protection programs are an important component of source to tap drinking water protection. These programs conduct source water assessments and develop and implement source water protection plans. EPA’s Drinking Water Mapping Application to Protect Source Waters (DWMAPS) is an online mapping tool that provides state and utility drinking water professionals, watershed protection groups, source water protection partnerships, and others with information to update source water assessments and prioritize source water protection measures in any location or watershed in the country. During this presentation we will emphasize the importance of source water protection and demonstrate the tools available in DWMAPS that, when used together with state and locally available mapping tools and data, can help users:

- Identify potential sources of contamination
- Find data to support source water assessments and plans to manage potential sources of contamination
- Evaluate accidental spills and releases, identifying where emergency response resources for accidental releases must be readily available
- Promote integration of drinking water protection activities with other environmental programs at the EPA, state, and local levels
- Identify source water protection partnerships and watershed projects

Terrell Tiendrebeogo | Environmental Engineer | EPA

Terrell Tiendrebeogo is an Environmental Engineer on the Source Water Protection Team at EPA Headquarters. Since 2019 he has worked with partners within and outside EPA to promote and strengthen source water protection. Prior to joining EPA, Terrell worked as a consultant for Maryland Department of the Environment. He also has a Master of Science Degree in Environmental Science. His primary roles at EPA include data analysis and outreach.

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“Funding Integration Planning Tool: Set the Stage for Source Water Protection Success ”

Successful source water protection (SWP) programs require integration across environmental programs. Without a single source of funding, state and local SWP programs need to identify, plan, and access funding from a variety of sources, even leveraging multiple funds together, in order to develop and implement source water protection programs. To help navigate this process, EPA has developed an online, interactive tool which brings together information on common federal funding opportunities for that can be used to protect sources of drinking water (e.g. EPA’s Clean Water State Revolving Fund, FEMA’s Hazard Mitigation Program, USDA’s Natural Resources Conservation Service programs, and more). This tool is divided up into three sections: funding sources for SWP, planning and funding throughout a SWP program, and examples of funding success. By understanding the details of SWP funding sources, how they may support each step in a SWP program, and how to plan for accessing these funds, users can begin finding ways to leverage federal support for their SWP goals.

Kara Goodwin | Physical Scientist | US EPA

Kara is a physical scientist with EPA's Drinking Water Protection Division in the Office of Ground Water and Drinking Water in Washington, DC, and is a member of the Source Water Protection Team. In this role she builds and strengthen connections among environmental programs to protect drinking water sources. Prior to joining EPA, she worked for the Oregon Department of Environmental Quality monitoring and assessing surface water and groundwater quality, and spent several years in watershed biogeochemistry research at EPA and the Cary Institute for Ecosystem Studies. Kara has a M.S. in Environmental Science from Washington State University and a B.A. in Biology with a concentration in environmental studies from Bryn Mawr College.

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“Benefits and Challenges of a Regulatory Source Water Protection Program”

Utah administers a regulatory source water protection program, one of only a few in the nation. The Drinking Water Source Protection Rules (R309-600 and R309-605), administered by the Utah Department of Environmental Quality’s Division of Drinking Water (DDW), places the responsibility for protection of drinking water sources on Public Water Systems (PWS) while providing the framework for fulfillment of this responsibility. The regulatory nature of the program has resulted in a high level of compliance, but water systems still struggle with the myriad of requirements, including plan implementation. Many local governments have worked on behalf of PWS to protect drinking water sources from contamination by passing ordinances to control land uses within source water assessment zones. These land use ordinances have provided many benefits to Utah’s water systems but increasing development pressures have unintentionally placed source water protection and local development interests at odds with one another. Utah’s source water protection program coordinators will discuss the many benefits and some of the unique challenges associated with administering a regulatory program.

Deidre Beck and Melissa Noble | Environmental Scientist | Utah DEQ/Division of Drinking Water

Deidre Beck and Melissa Noble are licensed Professional Geologists who have been responsible for the administration of Utah’s source water assessment program for the last five years. With nearly thirty years of combined experience in the water industry, they understand the importance of protecting Utah’s most valuable resource. Longtime residents of Utah, and as geologists, Deidre and Melissa enjoy spending time outdoors, and both happen to have two rambunctious boys and husbands who are educators.

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“Planning for Source Water Protection: Calculating Load Reductions to Address Impairments to Groundwater to Leverage CWA Funding ”

In 2018, the community of Springfield, Nebraska, received a Source Water Protection grant from the Nebraska Department of Environment and Energy. Part of Springfield's grant funded the development of a Drinking Water Protection Management Plan, which was approved as an alternative to a 9-element watershed based plan by EPA in December of 2020. This plan addresses nitrogen-nitrate as an impairment to the city's drinking water, which is sourced entirely from groundwater, and provides an in-depth path forward to protecting source water by calculating the projected load reductions from urban and rural best management practices using several models in tandem. Along with load reductions, the plan lays out the milestones necessary to achieve the city's goals, and the monitoring plan required to assess progress.

Tatiana Davila | Hydrogeologist, Wellhead Protection Coordinator, Source Water Protection Coordinator | Nebraska Department of Environment and Energy

Tatiana is a hydrogeologist in the Drinking Water and Groundwater Quality Division at NDEE. She administers the Wellhead Protection and Source Water Protection Programs, two statewide programs that assist communities in protecting drinking water. Before coming to NDEE in 2019, she worked in oil and gas exploration and petroleum remediation in the Colorado front range. She received her BS in Geology from the University of Nebraska-Lincoln and is currently pursuing her MS in Natural Resource Science with an emphasis in Hydrological Sciences and Groundwater Modeling from UNL.

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Opening General Session – Welcomes & Federal Perspective

Jon Kenning | GWPC President | Bureau Chief | Montana Department of Environmental Quality

Jon is currently the President of the Ground Water Protection Council and Water Protection Bureau Chief at the Montana Department of Environmental Quality, where he oversees a number of surface and groundwater quality programs. Prior to working in Montana, he worked in a similar capacity at the Nebraska Department of Environmental Quality. Before working in government, he was a professor at Creighton University. He has a PhD from the University of Minnesota and BA from Carleton College.

Jennifer McLain, Ph.D., Director, Office of Ground Water & Drinking Water, U.S. Environmental Protection Agency

Jennifer McLain is the Director of the Office of Ground Water and Drinking Water and has over 20 years of experience at the Environmental Protection Agency both in the Office of Water and in the Office of Pesticide Programs. Jennifer joined EPA after earning a Bachelor of Science degree from the University of Notre Dame and a Ph.D. in Chemistry from Princeton University.

Jennifer Wilcox, Ph.D. Principal Deputy Assistant Secretary (Acting Assistant Secretary) for Fossil Energy and Carbon Management

Jennifer Wilcox, the Principal Deputy Assistant Secretary (Acting Assistant Secretary) in the Office of Fossil Energy and Carbon Management at DOE, was the Presidential Distinguished Professor of Chemical Engineering and Energy Policy at the University of Pennsylvania. As a senior fellow at the World Resources Institute, she led WRI's Carbon Removal Program.

Having grown up in rural Maine, Wilcox has a profound respect and appreciation of nature. That appreciation permeates her work; she focuses on minimizing the negative impacts of humankind on our natural environment. Wilcox holds a Ph.D. in Chemical Engineering and an M.A. in Chemistry from the University of Arizona and B.A. in Mathematics from Wellesley College.

Wilcox's research takes aim at the nexus of energy and the environment, developing both mitigation and adaptation strategies to minimize negative climate impacts associated with society's dependence on fossil fuels. She has served on committees of the National Academy of Sciences and the American Physical Society to assess carbon capture methods and impacts on climate. She is the author of the first textbook on carbon capture, *Carbon Capture*, published in March 2012. She co-edited the CDR Primer on carbon dioxide removal in 2021.

General Session – Utah’s Pioneering Efforts

“Utah’s Geoheritage – From the Iconic to the Unsung”

Utah is an amazing geologic canvas with a wide range of geologic landforms. Individually and collectively they tell unique stories. Home to five national parks, eight national monuments, and 45 state parks, most of which have geology as their centerpiece attraction. Millions of visitors from around the world come each year to behold their beauty. This talk will focus on some of the many features, sights and efforts to educate the public about them.

R. William (Bill) Keach II, State Geologist, Director Utah Geological Survey

Bill is a scientist and educator with a 30+ year background in industry, academia and state

government. He is currently the State Geologist for Utah and Director of the Utah Geological Survey.

Following degrees in geology (BYU) and geophysics (Cornell) he explored for

hydrocarbons with SOHIO/BP in California and offshore Gulf of Mexico. He spent 17 years with Landmark Graphics/Halliburton, traveling the world leading the effort to develop and encourage adoption of 3D visualization technology. In 2006 he came back to Utah, joining the Energy and Geoscience Institute (Univ of Utah) and BYU doing research and teaching courses on seismic interpretation and reservoir modeling, and leading field courses for students and professionals throughout Utah to see its many wonders. In addition to his role as State Geologist, Bill continues to hold adjunct appointments with University of Utah (Chem Eng) and BYU to satisfy his passion for teaching. In his off-time Bill enjoys spending time with his grandchildren, ATV riding and exploring the outdoors near his home in central Utah. Bill and his wife have four children and five grandchildren.

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Advancing Clean Water in Utah: Current Water Quality Issues and Initiatives

Erica Gaddis – Director, Division of Water Quality, Utah Department of Environmental Quality

Erica Brown Gaddis, became the Director of the Utah Division of Water Quality in July 2017 after serving as Assistant Director for 2 years. Prior to joining UDEQ, Erica worked as a consultant with expertise in water resources and water quality. Erica holds a B.S. in Biology and Environmental Science from Willamette University in Oregon; a MS from Central European University in Budapest, Hungary, and a Ph.D. in Natural Resources from the University of Vermont, Gund Institute for Ecological Economics. Erica was born and raised in Utah and enjoys living and working in Salt Lake City with her husband and three sons.

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“Data Innovations and Accomplishments in Utah”

John Baza, Director, Utah Division of Oil, Gas, and Mining

John Baza was appointed Director of the Utah Division of Oil, Gas and Mining in May 2005 by then Governor Jon M. Huntsman. He leads the division’s efforts in petroleum development, coal and mineral mining, and abandoned mine reclamation.

Baza is a registered professional engineer in Utah and holds Bachelor of Science and Master of Science in petroleum engineering from Stanford University. Baza’s career spans 35 years of working with the energy and mineral extractive industries, including engineering positions with Phillips Petroleum Co., Amoco Production Co., and Flying J. He is a 38-year member of the Society of Petroleum Engineers, having held various officers positions including section chairman, program chairman and scholarship committee chairman.

Baza and his wife Darlene were both raised in Utah. They have four children and are the extremely proud grandparents of four grandchildren. He appreciates the heritage and diversity of historical, cultural, and recreational experiences that he and his family enjoy living Utah.

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General Session: The Science of Functional Equivalence

Analyzing the factors by Congress and US EPA to evaluate where and when indirect discharges may require NPDES permits or other action.

National Ground Water Association Activities in Response to the Maui Supreme Court Decision

William Alley, Ph.D., National Ground Water Association

Dr. William M. Alley is Director of Science and Technology for the National Ground Water Association. Previously, he served as Chief, Office of Groundwater for the U.S. Geological Survey for almost two decades. Dr. Alley has published over 100 scientific publications, including several general interest environmental books with his wife, Rosemarie. Among other awards, Dr. Alley received the Meritorious Presidential Rank Award. He holds a B.S. in Geological Engineering from the Colorado School of Mines, an M.S. in Hydrogeology from Stanford University, and a Ph.D. from the Johns Hopkins University.

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Emerging Issues & Trends

“Toward Net-Zero: Securing the Nation’s Energy Supply through Underground Energy Storage and Utilization”

The increasing reliance of renewable energy sources such as wind and solar is a key component in the drive towards a net-zero, carbon-free economy. Supplanting traditionally reliable energy sources such as coal, oil-and-gas, and nuclear with distributed renewable systems creates uncertainty the security of energy supply and deliverability on which the Nation depends. Underground energy storage can help to mitigate this issue through the use of existing gas storage in geologic traps and engineered salt caverns. Economically and socially critical gases already in underground storage include natural gas, CO₂, compressed air, natural-gas liquids such as propane and ethane, and, increasingly hydrogen, along with crude oil in the US Strategic Petroleum Reserve. Maintaining storage containment and mitigating migration of energy-related products out of the storage zone into groundwater systems, the ground surface, or the atmosphere requires both increased technical understanding and increased public awareness of the benefits and safety of underground storage systems.

In this presentation we provide an overview of the American Rock Mechanics Association’s new Technical Committee on Underground Storage and Utilization. It is an international scientific body comprised of technical experts and researchers from industry, academia, and government. The goal of USUTC is to explore current trends, engage the research and applications communities, and educate the public concerning critical challenges and opportunities related to the importance of storage of energy-related solids, liquids, and gases in the subsurface. We examine the current state of storage of natural gas, petroleum products, carbon dioxide, hydrogen, thermal energy, compressed energy, and nuclear waste in the subsurface by synergistic analyses of saline aquifers, depleted hydrocarbon reservoirs, salt caverns, and emerging technologies. We explore opportunities for improved characterization, lab testing, monitoring, risk analysis, and identification of key learnings and future opportunities.

Richard Schultz | Dr. | Orion Geomechanics LLC

Dr. Richard A. Schultz applies geomechanics to underground energy storage. He is owner of Orion Geomechanics LLC of Cypress, Texas. Previously he was Senior Research Scientist at The University of Texas at Austin, Principal Geomechanicist with ConocoPhillips, and Foundation Professor of Geological Engineering and Geomechanics with the University of Nevada, Reno. Dr. Schultz is a member of the Interstate Oil and Gas Compact Commission, the board of directors of the American Rock Mechanics Association, a Fellow of the Geological Society of America, and a licensed Professional Geologist in the State of Texas.

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Lugging Away: The Regrow Act and its Implementation

This is an overview of the provisions of the REGROW Act which is expected to be enacted into law by early October. This law will provide over \$4B to plug and remediate orphaned oil wells. A majority of that money will be granted directly to states to fund their existing orphan well programs. We will also discuss the practical implementation of this program, which we hope to have more details on by the Conference date.

Stratton Edwards | Legislative Counsel | Capitol Hill Consulting Group

Stratton Edwards serves as Legislative Counsel at Capitol Hill Consulting Group. Prior to joining CHCG, Mr. Edwards worked for Congressman Tom Cole (R-OK) where he specialized in appropriations. He also has done extensive work on energy, natural resources and tribal policy. Working in this capacity, Mr. Edwards was successful in securing increased funding and placing policy provisions in a number of different appropriations bills. Mr. Edwards' work on tribal issues was substantial, managing the operations of the House Native American Caucus and working directly with the BIA and the Secretary of Interior on a number of issues facing tribes. Prior to joining Cole's staff, Mr. Edwards spent time with the Department of Interior, Marathon Oil, and Congressman John Sullivan (R-OK). Mr. Edwards' appropriation work spans the firm's full policy practice areas. In addition to appropriations, Edwards focuses on energy, defense, and water policy. Mr. Edwards holds an A.B. and a J.D. from Washington University in St. Louis as well as a M.A. in Political Management from George Washington University's Graduate School of Political Science. An Oklahoma native, Mr. Edwards now lives in Fort Hunt, Virginia.

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Carbon Capture & Underground Storage

“Hydrogen and Energy 101: Role of CCUS”

The hydrogen economy and the role of CCUS (carbon capture, utilization and storage) is big news today. Many governments, corporations (including non-profits), academia and the general public support efforts to address global warming and climate concerns and this has led to a significant projected increase in hydrogen use and a bigger role for CCUS globally in the future energy mix as we transition to a low carbon economy by 2050. A predicted 2.40 C increase in the average global surface temperature by 2100 (greatly exceeding the Paris Climate Accord targets) is also a cause of great concern, in order to mitigate global weather - related catastrophic events.

Fossil fuels (mostly natural gas) will remain the primary source of hydrogen by 2050 and the oil and gas industry with its unique skills, resources and experience can play a major role in this energy mix transition. Renewable energy sources from wind, solar etc. are also expected to play a bigger role in efforts to decarbonize other industry sectors.

This presentation will cover the production and uses of hydrogen in various industry sectors, its health and safety risks, a brief look at the future H2 economy, a listing of the CCUS projects that are currently active or planned globally, and the challenges in massively scaling up the H2 economy.

Talib Syed | Consulting Petroleum Engineer/CCUS Consultant | TSA, Inc.

Talib Syed, P.E. holds a B-Tech (Chemical Engineering – Univ. of Madras, India) and an M.S. in Petroleum Engineering (Univ. of Oklahoma) and is a Registered Petroleum Engineer in CO and WY. Talib started his oilfield career with ARAMCO – Saudi Arabia and has U.S. and international experience – both onshore and offshore. Talib is a Society of Petroleum Engineers (SPE) Distinguished Lecturer on Life Cycle Well Integrity (2020 – 2021) and has served as SPE Denver Section Chair – HSES/Facilities (2020 – 2021) and as SPE Member-at-Large CCUS Technical Section. Talib is a member of SPE, American Association of Drilling Engineers (AADE), Interstate Oil and Gas Compact Commission (IOGCC) and Ground Water Protection Council (GWPC).

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“Carbon Capture, Utilization, and Storage (CCUS): Insights, Opportunities, and Challenges”

Carbon sequestration of carbon dioxide is the long-term plan for the removal, capture, and geologic sequestration of CO₂. This initiative was launched in July of 2000. Now called Carbon Capture, Utilization, and Storage (CCUS), the U.S. Department of Energy through the National Energy Technology Laboratory started to increase funding to the initiative in 2003 with the FutureGen Project and Seven Regional Carbon Sequestration Partnerships. This initiative moved into the validation phase and then into the development phase by 2008.

According to the International Energy Agency’s 2020 report, reaching net-zero emissions will be virtually impossible without CCUS. CCUS is the only technology that contributes both to reducing emissions directly in key sectors and removing CO₂ to balance emissions.

From a regulatory standpoint, CCUS is regulated as Class IIER injection for enhanced oil recovery or as Class VI injection for storage in saline reservoirs. Class IIER wells are regulated by primacy states or by US EPA regional offices. Class VI injection is predominantly regulated by US EPA, although North Dakota and Wyoming have received primacy.

Technical requirements for Class VI are fairly extensive. These include site characterization, geologic assessment and integrity, geochemical, seismic history, and risk assessment, surface and soil gas monitoring, conceptual and computational modeling, groundwater monitoring, and CO₂ plume and pressure front tracking.

With an estimated two trillion-dollar CCUS market by 2040, the opportunities for CCUS are many. However, the challenges facing CCUS must be considered before success can be achieved. The volumes of CO₂ to be injected for CCUS in the U.S. are huge, with the latest number of 5,130 million metric tons in 2019. This along with competition for pore space, current high cost of direct air capture, risk of induced seismicity, faster issuance of Class VI permits, increases in 45Q tax credits, and additional federal funding must be addressed to make CCUS a reality.

Tom Tomastik | Chief Geologist and Regulatory Specialist | ALL Consulting LLC

Mr. Tomastik is Chief Geologist and a certified petroleum geologist with over 39 years of diverse expertise and experience in the energy sector, environmental, government, and consulting. Tom obtained his BS and MS in geology from Ohio University. He has been involved in the planning, drilling, permitting and development of oil and gas and Class II saltwater disposal wells, Class I feasibility studies and permitting, injection well audits, stray gas investigations, natural gas and natural gas liquids storage, groundwater contamination investigation cases, induced seismicity, carbon sequestration, seismic monitoring and installation, and expert witness testimony.

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Additional Authors: J. Daniel Arthur, President and Chief Engineer, ALL Consulting

“Spatial-temporal risk mapping at a geologic carbon sequestration site”

Risk at a geologic carbon sequestration (GCS) site drives project selection during the prescreening and permit application phases. Typical project variables that are considered include injection rate, reservoir brine viscosity, reservoir thickness, porosity, permeability, and rock compressibility. We combine these properties into two grouped variables H and S which represent hydraulic resistivity and storage capacity, respectively. We conduct a global sensitivity analysis to compare the influence of the individual variables to the two grouped variables at every spatial location and time. We find that the grouped variables dramatically outperform all individual variables in terms of first-order sensitivity and correlation with reservoir pressure. We show that risk scales directly with H but inversely with S. We present a novel approach to risk mapping by using spatial-temporal coordinates that allow for straightforward assessment of potential hazards and magnitude of impact over the project’s entire spatial and time domains. Our methodology is tested against several models adopted from GCS pilot projects. Modeling efforts show that risk is greatest near injector wellbores where pressure buildup is largest and falls off rapidly after injection ceases. Our results contribute to improved risk assessment visualization and hazard identification for operators and regulators alike.

Brandon Schwartz | Assistant Research Professor | Penn State University

Brandon Schwartz is an Assistant Research Professor at Penn State University with expertise in the areas of experimental geomechanics and dynamic rock physics modeling. His research focuses on how internal pore structure and rock fabric influences transport and mechanical property evolution during thermal, mechanical, hydrologic, and chemical processes in porous and fractured geologic media. His interests are in characterizing the deformation-driven impacts of fluid injection, flow, and storage on rock and fluid properties with application to carbon sequestration, induced seismicity, and geologic waste disposal. His work contributes to multiscale characterization of fundamental processes that govern emerging energy and environmental applications.

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“Acid Gas Injection & Carbon Capture and Storage Well Design Similarities”

As implementation of carbon capture and storage (CCS) wells grows across the US, companies will require maintenance, from pre-determined testing and monitoring plans to ongoing well maintenance operations, to ensure their injection wells satisfy the Class VI Rule requirements. This presentation will highlight the design and operation of existing acid gas injection (AGI) wells, and review how it could apply to CCS wells with relation to the Class VI Rule.

AGI well design and operation methods will be reviewed as they compare to requirements outlined by the Class VI Rule in the pre-operational phase (site screening, wellbore design), operational phase (well testing, maintenance), and post-operational phase (well closure, site monitoring).

AGI wells face similar well design requirements as CCS, due to the high concentration of carbon dioxide present in the injectate. Likewise, the presence of carbon dioxide in AGI well injectates necessitates similar operating parameters to CCUS wells. The presentation will highlight designs of existing AGI wells and how similar well construction could be deployed to satisfy the Class VI Rule.

Troy Gillen | Senior Consultant, Petroleum Engineer | WSP USA

Troy Gillen has a degree in petroleum engineering, with 5 years of experience in the fields of wastewater disposal well testing, cavern storage well interventions, and acid gas injection (AGI) well operations.

He currently works for WSP USA as an engineer in the geology & permitting group, including assisting in the development of feasibility studies for Class VI wells.

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Russell Bentley, VP Reservoir Storage, WSP USA

“Overview of 3D-4D Seismic and its Application to CO2 Sequestration”

"4D Time-Lapse Geophysical Imaging" can be an excellent tool in monitoring CO2 injection. Using the reflection amplitude attributes analysis and mapping capabilities, comparisons between the initial 3D seismic-geologic model and subsequent 3D models after CO2 injection into a target zone, depth-slice imaging is used to assess the time-lapse horizontal and vertical expansion or contraction boundaries of a CO2 plume.

Collier Consulting

Presenter TBA

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Doug Laymon, Senior Geophysicist, Collier Geophysics

ASR / MAR

“Rapid Mapping of Aquifers, Confining Units, and Potential MAR Sites Using a Towed Cart Time-Domain Electromagnetic Induction System ”

Screening large areas for groundwater studies can be time consuming and expensive. Geophysical methods can be used to speed up the process but most ground based methods are still relatively slow for screening large areas. A new towed time domain electromagnetic induction system has been developed to quickly provide dense subsurface coverage on sites of hundreds to thousands of acres to fill this gap. The system uses a compact design with the ability to pass over rough terrain and can be towed by a small ATV. The system provides real time data output to monitor data quality during acquisition. The system can be used to map sand and gravel aquifers and clay confining units, identify favorable recharge areas, map the depth to bedrock, map saline zones in aquifers, find productive fracture zones, and identify zones of connection between surface water bodies and groundwater. This presentation will show the key technical elements of the system and present several case histories that illustrate the data density and resolution the system can provide.

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Presenter TBA

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Kristen Marberry, Collier Geophysics

Enhanced Aquifer Recharge of Stormwater in the United States: State of the Science Review

This presentation will summarize the goals, content and conclusions of EPA's recently released report titled Enhanced Aquifer Recharge of Stormwater in the United States: State of the Science Review . Topics addressed include factors affecting recharge volumes, risks (particularly of water quality degradation), what current science suggests about best practices, and knowledge gaps that, if filled, will help inform recommendations for safe, effective EAR using stormwater. The presentation is technical and does not address policy or regulatory issues.

Thomas Johnson, Ph.D. | Hydrologist | US Environmental Protection Agency

Dr. Thomas Johnson is a hydrologist at the U.S. EPA Office of Research and Development, Center for Public Health and Environmental Assessment. His interests include assessing and managing the impacts of climate and land use change on water and watershed systems, resilient designs of urban and agricultural BMPs, and decision support and modeling tools for water management. He has degrees from Penn State University (Ph.D.), Colorado State University (MS), and University of Colorado (BA).

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Provo City Aquifer Storage & Recovery Project

For the past two years, Provo City (Utah) has been actively testing five selected pilot locations for the development of a successful managed aquifer recharge (MAR) program. These five sites include three surface infiltration sites and two direct deep injection sites. Through multiple pilot tests, monitoring, modeling, water quality testing, and soil batch testing, an understanding was gained to the efficacy of a MAR program. Plans are now being made to design and permit a final program. The goal of this MAR program is to replenish groundwater storage and secure long term sustainable water supply for a city that is expected to double in population by 2060.

Jeff Davis | Barr Engineering

Jeff has more than 25 years of experience with hydrogeology and civil and environmental engineering. As an NGWA Certified Groundwater Professional and Professional Engineer, he has worked on numerous groundwater-related projects in Utah, as well as across the country and internationally. Jeff serves on the board of directors of the National Ground Water Association's Scientists and Engineers Section, as well as on the board of the Utah chapter. Jeff is passionate about water and loves to spend his free time running and climbing in the Wasatch Mountains.

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Water Right Permits for Aquifer Recharge and Recovery in Utah

In Utah, the State Engineer maintains water right records and distributes water according to state law. Before water can be artificially recharged into an aquifer, a recharge permit is required. Before artificially recharged water can be withdrawn, a recovery permit is required. This presentation will briefly discuss the filing requirements for these two permits and will describe the storage accounting that determines the quantity of recoverable water.

David Jones, PE | Utah Division of Water Rights

David Jones has been with the Utah Division of Water Rights since 2012. He is a professional engineer and works in the Division's Technical Services section.

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Aquifer Storage & Recovery Regulation Under the Utah Underground Injection Control Program: Current Permits In Utah & Application Process

The Safe Drinking Water Act of 1974 included the creation of the Underground Injection Control (UIC) program and is administered by the US Environmental Protection Agency and Utah has State Primacy for Class I through V UIC injection wells. Aquifer Storage and Recovery (ASR) Wells are regulated under UIC Class V regulations, enforced by the Utah Division of Water Quality, written into Utah Administrative Code R317-7 and Code of Federal Regulations (CFR) incorporated by reference. This presentation will provide a brief description of the regulatory framework for UIC regulation of ASR injection wells with examples of current ASR permits in Utah and the Class V application process for Class V ASR permits.

Drummond Earley, III, Ph.D., PG | Utah Division of Water Quality

Dr. Earley has 30 years of research, consulting and regulatory experience in the water, environmental, and energy industries involving groundwater quantity, quality and contamination, waste leachate seepage studies and other water quality issues. His technical skills include integration of geographic information systems with geochemical and hydrologic modeling, stochastic water balance analysis, groundwater flow and multicomponent reactive contaminant transport modeling, solid and liquid waste characterization, and aquifer characterization. He is currently the Underground Injection Control (UIC) program coordinator for the Utah Department of Environmental Quality, Division of Water Quality and oversees the UIC Class V permits for aquifer storage and recovery projects in Utah.

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Utah Drinking Water Review of Aquifer Storage & Recovery (ASR) Projects

Utah Division of Drinking Water (UDDW) requires reviewing the existing new source chemistry data for both the source water and receiving well for completeness and MCL compliance for the Aquifer Storage and Recovery (ASR) Project involving Public Drinking Water Sources. The water system must evaluate whether the ASR project will significantly alter the flow and velocity in the distribution system. DDW review process also includes the source water and its water quality (including the dissolved oxygen level), how the source water will be delivered to the injection site during the ASR project, configuration of the injection well, method of injection, the proposed injection period, estimated quantity of injected water, the minimum disinfectant residual that will be maintained prior to injection, agency review status (e.g., Division of Water Quality, Division of Water Rights) etc. Obtain Plan Approval from DDW prior to starting the construction or modification of the drinking water facilities related to the ASR project. Obtain an Operating Permit from DDW before placing the constructed or modified drinking water facilities related to the ASR project in service.

Nagendra Dev, Ph.D., PE | Utah Division of Drinking Water

Nagendra Dev currently serves as Environmental Engineer in Utah Division of Drinking Water. In this capacity, he oversees technical aspects of Drinking Water Infrastructure, Capacity Development, and coordinates with Utah Capacity Development Program with EPA Region 8. He actively participates in the Permitting Section for Plan Review and Operating Permits of drinking water projects and provides technical assistance in facilitation of water systems in fostering full fledged success of drinking water systems. He obtained his PhD in Civil and Environmental Engineering from University of Utah. Before joining Drinking Water about 13 years ago, Nagendra was involved in consulting business in the Civil Engineering sector for almost 12 years.

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Groundwater Data Collection & Management

Assessment of Per- and Polyfluoroalkyl Substances in Groundwater across New Mexico

Per- and polyfluoroalkyl substances (PFAS) have previously been detected in public and private drinking-water wells, springs, and surface waters in New Mexico. Certain areas of New Mexico are known to have sources of PFAS; however, the presence and distribution of PFAS in water resources across the state are not well characterized. Starting in August 2020, the U.S. Geological Survey (USGS), in collaboration with the New Mexico Environment Department, began collecting water-quality samples from groundwater sites throughout New Mexico. Sample locations were selected to cover a large spatial area of the state, including the most populated urban areas in addition to remote less populated areas. 53 groundwater samples were collected across New Mexico, two of which were re-sampled. Additional sampling of every public drinking-water supply source in Curry and Otero Counties added 83 samples to the dataset, ten of which were first sampled for the statewide assessment then were resampled later during the study period. Groundwater samples are being collected from unconfined water-table aquifers. In addition to PFAS, analytes for groundwater include a geochemical suite (field parameters, major ions, trace elements, nutrients, dissolved organic carbon, boron isotopes, stable isotopes of oxygen and hydrogen, tritium, and carbon-14) that can provide context for groundwater age and evolution. Blanks and replicates are being collected to assess bias and variability of the results for PFAS and geochemical compounds, with the exception of blank samples for isotope analytes. Results of the study will establish baseline PFAS values, provide geochemical context for groundwater evolution, and guide future sampling efforts focused in areas where environmental PFAS detections are found.

Kimberly Beisner | Hydrologist | US Geological Survey

Kimberly Beisner conducts geochemical research on the evolution of groundwater from recharge through water rock interactions. She focuses on mining hydrology, dissolved gas, and isotope tracer projects throughout Arizona. Additionally, she is the USGS New Mexico Water Science Center Water-Quality Specialist which includes research related to understanding anthropogenic influences on the hydrologic system including emerging contaminants ranging from per- and polyfluorinated compounds to wastewater tracers. She conducted undergraduate research at the University of Kansas and graduate research at the University of Utah.

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Assessment of Water Resources in Alabama Using Data Storage and Geospatial Tools For Management and Policy Decisions

The Geological Survey of Alabama (GSA) is a non-regulatory institution tasked with assessing the natural resources of the state through monitoring and research. Groundwater levels are monitored through a real-time network of wells supplying daily water-level information directly to the GSA via cellular transmission, and a more extensive periodic network that incorporates manual bi-annual recording of water levels. The GSA also serves as a repository of water well information dating back to the 1940's that was historically been maintained in hard copy format but has since been converted to digital format and made available through the GSA website. The GSA is migrating this information and data from the two monitoring networks to an RDBMS-Environmental database. An ArcGIS dashboard has been developed to facilitate viewing and working with the data, and real-time data is also supplied to the National Groundwater Monitoring Network. The GSA also maintains a separate database developed during the 1990's for storage of water quality information collected either through specific projects or annual sampling events. The information extends back several decades prior to the development of the database, and much of it is in hard copy format and unavailable for public viewing. An ArcGIS dashboard is under development that will allow for geospatial viewing and data evaluation by interested individuals. Use of a single integrated platform, however, would provide a more powerful tool for assessing the states water resources by combining the ability to evaluate potential changes in aquifer storage, groundwater availability, and water quality through a single interface. This platform would not only serve as a powerful tool for water research but would also provide a vital resource for local, regional, and statewide agencies as they address growth, development, and water policy issues in the coming years.

Greg Guthrie | Director, Groundwater Assessment Program | Geological Survey of Alabama

Greg is the Director of the Groundwater Assessment Program and a member of the Graduate Faculty at the University of Alabama. He is a Registered Professional Geologist with almost 40-years' experience as a geologist and hydrologist with the state of Alabama and as a consultant. He has authored more than 50 reviewed publications and professional conference presentations on research topics ranging from the genesis of gold and marble deposits, to groundwater availability and groundwater flow in fractured rocks. His current research interests include groundwater-surface water interactions and statistical evaluations of hydrographs.

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Status and Accomplishments of USGS National Ground-Water Monitoring Network (2015-2021)

Daryll A Pope | National Groundwater Monitoring Network | US Geological Survey

I am currently managing the USGS work on the National Ground Water Monitoring Network (NGWMN). The NGWMN is a compilation of selected wells from existing Federal and State monitoring efforts to create a network to allow assessment of long-term water-level and water-quality trends at a National scale. The Network was created by the Subcommittee on Ground Water (SOGW) of the Federal Advisory Committee on Water Information (ACWI). My work involves coordinating with the SOGW and managing the USGS work on the NGWMN. Information on the NGWMN is available at: <http://cida.usgs.gov/ngwmn/>

Previously I served as the New Jersey Water Center Groundwater Specialist and worked on groundwater projects of my own. As Groundwater specialist, I worked with groundwater projects to provide technical guidance, worked on the New Jersey Water-level monitoring network, and oversaw work on the Center groundwater databases. My project work involved groundwater modeling in support of water supply issues. Most of my work has been in the Coastal Plain aquifer system of New Jersey.

Specific areas of interest are; groundwater modeling, groundwater databases, GIS, Water use data, water availability assessment, and groundwater monitoring networks.

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NRAP Tools for Geologic Carbon Storage Risk-Based Decision Making

Overview of the National Risk Assessment Partnership and NRAP Phase II Products

Robert Dilmore | NETL

Robert Dilmore is a research engineer in the Geologic & Environmental Systems Directorate of the U.S. Department of Energy's National Energy Technology Laboratory, and Technical Director of the U.S. DOE's National Risk Assessment Partnership - a multi-national laboratory research collaboration to assess and manage environmental risks associated with geologic carbon storage. Robert holds a Ph.D. in environmental engineering from the University of Pittsburgh, is a licensed professional engineer in the Commonwealth of Pennsylvania, and is board certified by the American Academy of Environmental Engineers and Scientists.

NRAP Open-source Integrated Assessment Model And Relevant Application

Veronika Vasytkivska | NETL

Veronika Vasytkivska is a data scientist with Battelle as an on-site contractor for the National Energy Technology Laboratory (NETL) in Albany, OR. Dr. Vasytkivska holds a PhD in Mathematics from Oregon State University. Her general research interests include uncertainty quantification, computational fluid dynamics, data analysis, and software development. Dr. Vasytkivska is a principal developer of the NRAP-Open-IAM tool.

Interface and Workflow Design for Geological Carbon Storage Modeling, Simulation – GCSRiskman Prototype

Mark Brandyberry | Illinois RocStar

Dr. Mark Brandyberry is Chief Technical Officer and a co-founder of Illinois Rocstar LLC, a small computational science business in Champaign, IL. His primary areas of research include scientific computation, large-scale computer code system design, probabilistic risk assessment, and uncertainty quantification. Dr. Brandyberry holds a Ph.D. in Nuclear Engineering from UCLA and a second Masters degree in Computer Science from the University of Illinois at Urbana-Champaign. Dr. Brandyberry has published over 75 journal articles, conference papers, technical reports, and multivolume risk assessments. He currently organizes and manages the technical program at Illinois Rocstar as well as acts as principal investigator on multiple projects in cloud computing, mesoscale material modeling, and geoscience.

Assessing Geomechanical Risks at GCS Sites Using the State of Stress Assessment Tool

Jeff Burghardt | PNNL

Jeff Burghardt is an Earth Scientist in the Energy and Environment Directorate at the Pacific Northwest National Laboratory (PNNL). Jeff has over ten years of experience in experimental and computational geomechanics, with more than 50 publications on topics of geologic carbon storage, geothermal energy, hydraulic fracturing, and subsurface stress measurement. Dr. Burghardt holds a PhD in Mechanical Engineering from the University of Utah and a B.S. in Mechanical Engineering from Utah State University. He is the principal developer of NRAP's State of Stress Assessment Tool (SOSAT).

Short Term Seismic Forecasting – A Tool to Assess Seismicity During Injection Operations And RiskCat

Corinne Layland-Bachmann | LBNL

Corinne Layland-Bachmann is a Sr. SEA in the EESA area at Lawrence Berkeley National Laboratory. Her primary areas of research foci include the study of induced seismicity, seismic risk and microseismic analysis. Dr. Layland-Bachmann holds a PhD in Geophysics from ETH Zurich, Switzerland. Dr. Layland-Bachmann is the principle developer of NRAP's STSF tool.

Designs for Risk Evaluation and Monitoring and Example Coupling with Integration with NRAP-Open-IAM

Alex Hannah | PNNL

Dr Alex Hanna is a Data Scientist in the Subsurface Fate and Transport Modelling group of the Earth Systems Science division at Pacific Northwest National Lab, and the lead for the DREAM software development project under NRAP Task 4. His primary areas of research foci include optimization algorithms, groundwater flow and geomechanics simulations, database design and web development. Dr Hanna holds a PhD in Environmental Engineering and MSc in Hydrogeology from Clemson University.

Optimal Design of Microseismic Monitoring Network

Lianjie Huang | LANL

Dr. Lianjie Huang is a Senior Scientist with the Geophysics Group at Los Alamos National Laboratory (LANL). He obtained his PhD degree in Geophysics in 1994 from the University of Paris 7 / Institut de Physique du Globe de Paris, after receiving his BSc in Physics in 1985 and MSc in Mathematics in 1989 from Peking University. His research areas encompass acoustic- and elastic-wave modeling, imaging, inversion/tomography, and active and passive seismic monitoring, with applications to geothermal energy, geologic carbon storage, oil/gas, and cancer detection and characterization.