

THE 2018 UTAH WATER USERS WORKSHOP

MARCH 19-21, 2018

The Dixie Center, St. George, Utah

<http://conference.usu.edu/uwuw/>

GENERAL SESSIONS

A. WATER OUTLOOK

Troy Brosten - NRCS, Brian McInerney - NWS

Snowpack, precipitation, streamflow forecasts, reservoir storage and all aspects of Utah's water supply will be discussed. They will discuss the weather patterns that are shaping the 2018 water year to date. They will also discuss current weather patterns and why we are stuck in this high pressure ridge since November, and what the spring looks like regarding flows and how the spring runoff may play out.

B. GOVERNOR'S WATER STRATEGY UPDATE

Tage Flint - Weber Basin, Warren Peterson - Farmland Reserve & Tim Hawkes - Legislator

In 2017, the Governor's Water Strategy Advisory Team released the Recommended State Water Strategy, which provided overarching water policy guidelines for M&I and agricultural water, the environment, and the economy. The co-chairs of the Team will present on the next steps forward and the future of water in Utah.

WORKSHOP SESSIONS

1. Special Master Duties

Rick Knuth - Jones Waldo

"In 2016, the Utah Legislature, as part of a legislative package designed to modernize and streamline Utah's process, allowed for the first time the appointment of a master in general adjudications of water rights. Funds were also appropriated to employ a master to assist the court in Utah's largest pending general adjudication, and Rick L. Knuth was appointed as Special Master in the Utah Lake and Jordan River General Adjudication. In this session, Mr. Knuth will explain the role of the Special Master, his relationship with the court and the litigants, the extent and limits of his authority, and how using a master has affected the progress of the case."

2. Adjudication Update

Blake Bingham - Utah Division of Water Rights

As competing demands for water resources within the State of Utah continue to grow, the urgency for clarity and certainty in the realm of water rights likewise becomes more critical. Having evolved over time--commensurate with the history of Utah--present-day water rights take many shapes and forms. Consequently, questions of supplemental relationships, pre-statutory rights, forfeiture, and Federal Reserve rights often cloud the overall water rights picture. The General Adjudication process addresses these issues utilizing a unique combination of historical research, "boots-on-the-ground" investigations, and legal proceedings--ultimately providing the public with a clear delineation of the water rights within their respective watershed. New statutory provisions coupled with the appointment of a Special Master have quickened the pace of adjudication efforts and highlighted the need for an informed public. Join Blake Bingham (Assistant State Engineer - Adjudication) for a quick review of water rights history and an

update covering ongoing efforts.

3. Water Rights Website Update

James Greer - Utah Division of Water Rights

The Utah Division of Water Rights provides vast amounts of information and data on their website (www.waterrights.utah.gov). Water right records, diversion data, publications, and much more is all available if you know where to find it. This presentation will give a brief overview of what data is available and how to access the information. I will also be demonstrating a overhauled new water right interface display that will be available soon to the public.

4. Update on Water Lawsuits/AG's Office

Norm Johnson - Attorney General's Office

Congress historically recognized state authority to create and administer water rights. Congress and the President also established federal reservations in the West without creating water rights for them. The U.S. Supreme Court ruled that such reservations have impliedly reserved water rights. To minimize harm to State-created water rights, Utah negotiates the rights for federal reservations. This presentation provides a status report on negotiation efforts in the State.

5. Irrigation Company Bylaws & State Law

Brent Rose & Emily Lewis - Clyde, Snow & Sessions

This presentation will review applicable non-profit corporation statutes with respect to bylaws generally, including what they are, as distinguished from article of incorporation, why they are necessary, what they should include and how they are amended. The presentation will also address common issues related to irrigation company bylaws, including the law with respect to share transfers generally, the transfer of shares owned by shareholders who are deceased, replacement of lost certificates, etc. and other common issues.

6. Legislative Update

Mike Styler - Utah Department of Natural Resources

Who knows what the legislature is going to do each year? We know what we have studied and recommended through the Executive Water Task Force. Legislators usually pay some attention to our Recommendations --but not always. Our track record is pretty good, so let's talk about the expected, and the unexpected from this past Legislative Session.

7. Water Right Issues of the State Engineer

Kent Jones - Utah Division of Water Rights

This presentation will include a discussion of recent legislative changes, how they are being implemented by the Division of Water Rights, and other current important water right issues affecting Utah.

8. Technology - Relationships with Utilities & Consumers

Theron Miller - South Davis Sewer District

9. Climate Variation Projections

Yoshimitsu Chikamoto - Utah State University

Unusual climate conditions sometime trigger the long-lasting water shortage in the Southwestern United States. Successful predictions of multi-year drought condition for several years ahead would be beneficial for wide range of sections, such as agriculture, water resource managers, food production, and forestry. Whereas rainfall predictability is limited to less than several weeks, some land hydrological processes are synchronized with more slowly changing climate originated from a long-term ocean memory. In order to predict the future water availability, we have developed the new seasonal-to-decadal climate prediction system using a current state-of-the-art earth system model along with historical observational datasets. This prediction system demonstrates that annual drought condition and wildfire probability in the Southwestern United States are predictable for several years ahead. Impacts of climate variability as well as climate change on multi-year drought conditions would be discussed.

10. SCADA & Metering/Automation for Reservoirs

Jay Mark Humphrey - Emery Water Conservancy District

Where's my water? This session will focus on Leveraging technology to efficiently and accurately your water resources. The discussion will address how to bridge the gap between idea and implementation and why should water providers use technology.

11. Recent Spillway Failure/Oroville Flood Control Outlet/USU Modeling

Mike Johnson - Utah Water Research Laboratory

The Flood Control Outlet (FCO) at the Oroville Dam failed in February of 2017. After being in service for 50 years, during a period of heavy rainfall, employees of the California DWR observed strange flow patterns in the spillway flow in the vicinity of the vertical curve. The FCO gates were closed and damage to the chute was identified. Due to the heavy rains and the rising reservoir elevation, it was determined to open the FCO gates to reduce the rate of the rising reservoir elevation and minimize the amount of water that would have gone over the emergency spillway. Consequently, because of the significant release that needed to be made, the FCO spillway was severely damaged. The rising water level in the reservoir eventually spilled over the emergency spillway resulting in erosion downstream of the emergency spillway and was a cause of concern regarding the stability of the concrete weir associated with the emergency spillway. Subsequently nearly 200,000 people downstream were evacuated. The concrete weir of the emergency spillway did not fail and incoming water levels reduced and the reservoir levels lowered. The California DWR contacted the Utah Water Research Laboratory early in February to assist with the recovery efforts by building a scale model of the FCO spillway. Modeling efforts were used to provide information to the design team to determine options for reconstructing the chute as well as to provide more detail on the hydraulic operation of the chute up to flows of 277,000 cfs. The model also provided information for proposed aerators. Construction from May 20, 2017 to November 1, 2017 by Kiewit restored the chute to a condition that would enable flow to be released if necessary. This presentation summarizes the cause, failure and recovery of the FCO spillway at Oroville Dam.

12. Water Loss Control & the AWWA Water Audit: Providing Accountability in Your Operations

Alane Boyd - Desert Rose Environmental

Scott Paxman - Weber Basin

Dave Norman - Lehi City

Water loss control represents the efforts of water providers to ensure accountability in their operation by reliably auditing their water supplies and implementing controls to minimize system losses. Water providers incur real losses from pipeline leakage and apparent losses when customer water consumption is not properly measured or billed. The AWWA Water Audit Method provides the best management practice tools and guidance water providers need to

efficiently manage their supplies.

This presentation will go over the basics of the water audit methodology and what it can do for water providers. You will hear from Weber Basin Water Conservancy District and Lehi City on their experiences using the AWWA Water Audit Method to account for both drinking water and irrigation water.

**13. Pah Tempe Hot Springs/Where does the Water Come From?
Tom Marston & Bert Stoip - US Geological Survey**

Pah Tempe Springs, also known as Dixie Hot Springs or La Verkin Springs, are located along the Virgin River where the river cuts through Timpoweap Canyon in Washington County, Utah. The average concentration of dissolved solids in discharge from these springs is 9,100 mg/L and the springs contribute about 95,000 tons of dissolved solids (salt) annually to the Virgin River. The Bureau of Reclamation (BOR) Colorado River Basin Salinity Control Program (CRBSCP) continues to evaluate the feasibility of desalinizing the discharge of Pah Tempe Springs to improve water quality in the Virgin River. The most viable plan identified by the BOR in early studies for mitigating the salt discharge to the Virgin River from Pah Tempe Springs is to capture and treat the spring flow by withdrawing (pumping) thermal groundwater from within the Hurricane Fault damage zone to lower the groundwater pressure head and thereby reducing or eliminating discharge from the springs into the river. To understand the interaction between the hydrothermal groundwater system and the Virgin River locally around Pah Tempe Hot Springs, the U.S. Geological Survey (USGS) and Washington County Water Conservancy District (WCWCD) conducted three stress tests where thermal groundwater was pumped at rates up to 7 cubic feet per second from a shallow subsurface cistern under different flow conditions in the adjacent Virgin River during 2013-2014. During each test, changes in spring and pumping discharge, chemistry, and temperature were continuously monitored. The USGS and WCWCD are currently drilling two exploration wells that will: 1) investigate groundwater stratification associated with Pah Tempe Springs and the Virgin River using general water chemistry and age-dating tracers, 2) assess hydrologic conditions associated with the Hurricane Fault in relation to the location of Pah Tempe Springs, 3) examine hydraulic characteristics of the shallow stream channel deposits, Toroweap Limestone, and Queantoweap Sandstone, and 4) refine a preliminary numerical model of the groundwater flow system.

**14. Modeling of Distribution Systems
Jared Manning - Utah Division of Water Rights**

The Division of Water Rights is developing online distribution models that provide accurate, transparent, and understandable water accounting for water users and river commissioners. This session will demonstrate the online modeling tool currently in use on several river systems in Utah with a strong emphasis on the Provo River Model. General concepts to be discussed include calculating natural flow, accounting for import water, and distribution by priority.

**15. Water Use Reporting/Requirements & Tools
James Greer & Rachel Shilton - Utah Division of Water Rights**

This joint session held by the Utah divisions of Water Rights and Water Resources focuses on the Water Data collection program. It will expound on new protocols, how data is used and why it is so vital in our water communities and communications that water supply and use data is reported accurately. The divisions will also touch on the ways that they are collaborating to ensure that this program is strategic and successful and will

answer.

**16. Water Right Conversion from AG to M&I/A Case Study of Nibley City
Lance Anderson - Cache Landmark Engineering**

In 1999, the Division of Water Rights adopted the Cache Valley Ground Water Management Plan which gives the conditions and limits under which further ground-water development may take place. This presentation will discuss considerations in transferring agricultural to M&I use and the latest application approved by the State Engineer under the Ground Water Management Plan. The case study will provide insights on how to protect prior water rights (agricultural) while putting to beneficial use the greatest amount of available water (agricultural and M&I).

**17. Water/Energy Nexus: Energy Management and Tools for Water Utilities
Rob Sowby - Hansen, Allen & Luce**

Energy is usually a water utility's largest operating expense and is expected to increase with scarcer water supplies, stricter water quality standards, and population growth. Fortunately, almost all water systems can save energy through no-cost operational changes or fast-payback capital projects—without threatening water quality or level of service. This session will establish the need for energy management, introduce the necessary practices and tools, and highlight success stories from Utah water systems.

18. Soil Health & Water Use

Meredith Albers & Mason LeFevre - NRCS

"Soil Health is the repackaging of old ideas for sustainable agriculture, such as crop rotations and cover crops, backed by new science. Practitioners report improved soil functions lower input costs by managing for the soil as a system. Implications on water use will be presented."

19. Protection of Utah's Allotment of the Colorado River

Eric Millis - Utah Division of Water Resources

The Colorado River is a very important part of Utah's water supply, making up about 22% of the total. Its waters are used by agriculture, industry, cities and towns and will be increasingly used in the future. Utah still has a sizeable quantity of water in the river, allocated by compact, that is ours to develop and use. However our ability to do so depends on a number of things: Cooperation and comity among the seven Colorado River Basin states and Mexico; cooperative efforts with the involved federal and state agencies, Native American Tribes, power distributors, recreation and environmental interests up and down the river; and participation in key programs that necessary for the health and well-being of the River. Utah will continue to do those things in order to protect its ability to use and develop its allocation of the Colorado River.

20. Underground Aquifers & Recharge Programs/Central Iron County

Paul Monroe - Central Iron County Water Conservancy District

Cedar Valley, like many other valleys in the State, is over allocated. In addition, water users in Cedar Valley have been over pumping for the past six-seven decades above safe yield. Being faced with the reality that water rights could become revoked by the State Engineer through a Groundwater Management Plan, the Water Conservancy District, municipalities, local farmers and property owners came together and constructed five artificial recharge basins to utilize surface water, which has historically evaporated once discarded into an impermeable lake. Conservation, artificial recharge, waste water reuse and monitoring ground and water levels are a recipe for sustainability today, but what about the future?

21. Bear River Development Project Update

Marisa Egbert - Utah Division of Water Resources

The Bear River Development (BRD) planning has had a moving target. Over the decades, the Division of Water Resources has planned and completed studies regarding further development of the Bear River. In the 1990's, the population and water use projections estimated the need for the Bear River Development Project in 2015. In the early 2000's, the projections were for 2030-2035. Most recently, the projections are for 2040-2050. As population continues to grow, per capita water use has reduced, thus delaying the need for this additional water. Conservation and technology have been keys to the reduction in use.

As people have made changes, the environment has made changes as well. This has also affected the planning involved with the BRD. Drought has become a key driver of how to supply a reliable water source for the growing population. With drought comes change in hydrology. Assumptions and plans from decades ago have to be re-thought and revised. Continued changes in climate could also steer the continued planning and studies in different directions than expected. The Division will continue to learn and revise, as needed, in order to provide water for a growing population.

22. Native American Water Projects in the Uinta Bason

Duane Moss, Misty Bruns & Bart Powauke, Ute Indian Tribe

1. Brief history and update on Tribal Water Rights and Water Resource Management
 2. Update on current water projects and plans
 3. Update on Water Quality issues on Tribal lands
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23. Review of Strategies to Obtain More Crop Per Drop for Utah Agriculture

Dr. Matt Yost, Agroclimate Extension Specialist, USU

Producing more crop per drop of water is critical to the future success of Agriculture in Utah and the Intermountain West. Several strategies exist for improving water use efficiency and conserving water. These include improvements in irrigation (rate,

scheduling, delivery system), crop genetics with drought tolerance, alternative crops, and other cultural practices such as no-tillage and cover crops. This talk will review and summarize the current state of science on these strategies in Utah and the Intermountain West and compare their relative effectiveness for saving water. Results will highlight where future research and education efforts towards agriculture water conservation should focus.

24. Drought Mitigation Programs for Irrigators

Pedro Ramos - NRCS

25. Conserving Fisheries in Priority Streams Through Flow Transactions

Paul Burnett - Trout Unlimited

Working within the parameters of Western Water Law to develop mechanisms for keeping water in streams is a slow process. In 2008, the Utah Legislature approved legislation allowing our organization to lease traditional consumptive water rights, such as irrigation, and keep them in-stream to benefit native trout, after several years of groundwork from Trout Unlimited and our partners. The Prior Appropriation Doctrine has provided order and clarity for the traditional water users throughout the West, however these conventional rules are rigid, limiting opportunities for collaborative conservation groups like TU, despite that fact that providing additional flexibility – via non-regulatory and incentive-based water management tools – can work for both fisheries and agricultural producers. Many of our societal values continue to change over time, as the West continues to grow and develop. Undoubtedly, agriculture continues to be a significant and important economic driver in the West, but within that context, traditional water management strategies within the western states are increasingly being adjusted to better-accommodate diverse emerging values, such as fishing and whitewater recreation, both industries with huge untapped economic potential, but few if any water rights. Many of these changes are accomplished within the existing prior appropriation system, and reinforce the right to use water for traditional uses, while at the same time, encouraging some producers to market water either permanently or temporarily to better protect fish and wildlife habitat. In this paper we discuss the strategies that we have applied across Utah to develop collaborative water transactions, which provide broad benefits to both water users and the aquatic ecosystems.

26. Coordinated Operation of Lake Powell & Lake Mead

Jack Schmidt - Utah State University

Increasing attention has been given to issues associated with the allocation of water storage between Lake Powell and Lake Mead. Together, these reservoirs store ~ 50 million acre feet (af) of water and are the two largest reservoirs in the United States. The Upper Basin states and some environmental groups are focused on developing policies that maintain water storage in Lake Powell above minimum power pool so as to ensure hydropower production and maintain flexibility in meeting requirements of the Colorado River Compact. Alternatively, the Glen Canyon Institute has proposed the Fill Mead First (FMF) plan that would establish Lake Mead as the primary water storage facility of the main-stem Colorado River and would relegate Lake Powell to a secondary water storage

facility. The FMF plan would be implemented in three phases. Phase I would involve lowering Lake Powell to the minimum elevation at which hydroelectricity can still be produced (called minimum power pool elevation): 3490 feet above sea level (ft asl). At this elevation, the water surface area of Lake Powell would be approximately 77 mi², which is 31% of the surface area when the reservoir is full. Phase II of the FMF plan would involve lowering Lake Powell to dead pool elevation (3370 ft asl), abandoning hydroelectricity generation, and releasing water only through the river outlets. The water surface area of Lake Powell at dead pool is approximately 32 mi² and is 13% of the reservoir surface area when it is full. Implementation of Phase III would necessitate drilling new diversion tunnels around Glen Canyon Dam in order to eliminate all water storage at Lake Powell. Implementation of Phase I of FMF would allow the flow regime of the Colorado River in Grand Canyon to be more natural, but only if hydropower generation does not follow daily and weekly demands. Implementation of Phase II of FMF would unavoidably create a less natural flow regime in Grand Canyon. The primary limitation to re-establishing a natural flow regime is the capacity of the facilities that release reservoir water downstream to the Grand Canyon ecosystem. The capacity of the penstocks that route water to the power plant have a capacity of ~31,500 ft³/s (cubic feet per second), and an additional ~15,000 ft³/s can be released through the river outlets when the reservoir is at minimum power pool. However, the penstocks cannot be used when the reservoir is below minimum power pool, and the capacity of the river outlets decreases as reservoir elevation drops; the capacity of the river outlets is less than 5000 ft³/s when the reservoir is near dead pool elevation. Thus, the largest releases from Lake Powell could only be ~45,000 ft³/s during Phase I, even though typical incoming floods to Lake Powell exceed 50,000 ft³/s in most years. If Phase II was implemented and an attempt was made to maintain the reservoir at dead pool, releases downstream could be only 5000 ft³/s.

A renewable supply of fine sediment is necessary to maintain Grand Canyon's eddy sandbars that are used by river runners, create the architecture of aquatic habitat, and serve as a source of fine sediment to be redistributed by winds upslope to help protect archaeological sites. However, Phase I or Phase II would not change the existing condition of fine-sediment deficit that exists in Grand Canyon today, because water released from a partially drained Lake Powell in Phase I or Phase II would be devoid of fine sediment.

We estimate that there would be a small net decrease in total reservoir evaporation if Phase I or Phase II were implemented in comparison to present conditions. Implementation of FMF would decrease the combined surface area of the water stored in both reservoirs, and the evaporation rate from Lake Mead is not much more than from Lake Powell. However, the magnitude of the savings is less than the natural range in variability in evaporation.

Movement of reservoir water into the ground-water system that surrounds Lake Powell is inevitable. Most of the ground water that has already moved into storage would return to the Colorado River during a period of decades to centuries after FMF was implemented. A small proportion of the reservoir water that has moved into the surrounding bedrock has been a true loss from Lake Powell, but this water has seeped around Glen Canyon Dam and returned to the Colorado River immediately downstream from the dam. Only a small proportion of ground-water storage immediately moves out of the surrounding bedrock when the reservoir is drawn down. Extrapolation of the results of Thomas' (1986) study concerning ground-water movement and storage north and west from Glen Canyon Dam and Wahweap Marina yields an estimate that between 2.1 and 9.0 million acre-feet of water moved into the bedrock surrounding Lake Powell between 1963 and 1983. There is very large uncertainty in estimating how long into the future reservoir water will continue to move into the surrounding bedrock. Thomas (1986) estimated that some movement of reservoir water into the surrounding bedrock would occur for a period of between 80 and

700 years, assuming that the reservoir stays full most of the time. Based on the best estimates of Thomas (1986), the long-term future rate of movement of ground water into the surrounding bedrock is likely to be less than ~50,000 acre feet/year and would decline to less ~30,000 acre feet/year after mid-21st century.

Assuming that movement of reservoir water into ground-water storage surrounding Lake Mead is small – an estimate suggested by water balance calculations but not yet verified by independent measurements of ground-water flow at wells – the projected water savings by implementing FMF would be less than ~50,000 acre feet/year). It is a matter of public policy debate whether or not this magnitude of savings is sufficiently large to justify immediate reconsideration of many administrative and legal agreements concerning storage of water in Lake Powell and Lake Mead. At some time in the future, however, this magnitude of water savings might be viewed as sufficiently large to be worth serious engineering and scientific analysis and policy discussion. Now is the time to initiate new measurement programs of losses at Lake Powell and Lake Mead so that future policy discussions have access to less uncertain data regarding evaporation and ground-water storage.

27. Reservoir Sedimentation & Water Supply

Dr. Rollin H. Hotchkiss - Brigham Young University

Trends in water storage for Utah dams reflect national data: storage for water supply has been decreasing from about the year 2000 due to sedimentation in reservoirs. With Utah population estimates skyrocketing, producing more demand for water, it will be increasingly important to preserve the remaining reservoir storage by minimizing future reservoir sedimentation. Utah and the rest of the U.S. find themselves in this situation due to a rather short-sighted and incomplete method of performing benefit-cost analyses that has been codified into required procedures. The result is that most of our dams are incapable of passing sediment downstream in order to maintain storage capacity and maintain downstream channels and ecosystems only minimally affected by dam construction. And after almost of all of our dams were built, important and essential environmental legislation makes it difficult to manage reservoir sedimentation. A case study at Ferron Utah will be used to illustrate the challenges faced by those managing our water supply reservoirs. The prognosis is brightening a bit as state and federal regulators better understand the dilemma we face.

28. Utah Division of Forestry, Fire & State Lands Updates

Laura Ault - Utah Division of Forestry, Fire & State Lands

Bear River CMP: In October 2017, the Utah Department of Natural Resources Division of Forestry, Fire and State Lands (FFSL) finalized the first-ever comprehensive management plan for the Bear River. FFSL is required to ensure that all uses on, beneath or above the bed of the Bear River are regulated to ensure the protection of navigation, fish and wildlife habitat, aquatic beauty, public recreation and water quality.

Green and Colorado Rivers CMP and Mineral Leasing Plan: The Division of Forestry Fire and State Lands (Division) is empowered to prepare and adopt comprehensive management plans for sovereign land resources. Given this direction and the Division's

management authority over the Green and Colorado River's sovereign lands, the Division will initiate the development of the Green and Colorado River Comprehensive Management Plans (CMPs) and Mineral Leasing Plan (MLP) in January 2018 and is anticipated to conclude by December 2019. Population growth, recreation use and mineral development have increased steadily within the east and southeastern counties where the sovereign land portions of the Green and Colorado Rivers are situated. Development in and around the rivers has placed an increasing amount of pressure on the rivers. The Division is obligated to protect and sustain the public trust resources of the Green and Colorado Rivers while allowing for the multiple uses and sustained yields.

Fee Schedule Update: During the 2018 Legislative session FFSL requested a change to its fee schedule. These changes to the fee schedule were in response to feedback received from water users during the Bear River and Jordan River CMP public involvement processes. These fee changes went into effect on July 1st, 2017.

29. Update on Salinity Projects in the Colorado River Basin

Don Barnett - Barnett Intermountain Water Consulting

Slowly, yet persistently over the past 40-plus years, federal agencies and state partners along with hundreds of private canal companies and several thousand individual producers have worked tirelessly to reduce the salt load in the Colorado River. This billion-dollar effort, in conformance with Clean Water Act requirements, has now reduced the annual salt load in the Colorado River by 1.33 million tons, improved the downstream water quality by a little more than 100 mg/L and reduced the commiserate damages to downstream water users by about \$300 million annually. However, salinity levels and associated quantified damages are projected to increase above the current \$450 million annual level unless the program continues to be aggressively implemented.

30. Forest Health & Water Quality

Mike Melton - Utah Division of Forestry, Fire & State Lands Gary Bezzant - Utah Division of Wildlife Resources

The Brian Head Fire began June 17, 2017, downslope from Brian Head Town and lasted 42 days. At nearly 72,000 acres and \$39 million in suppression costs, it is the 4th largest and most expensive fire in Utah's history. Communities and businesses, wildlife and habitat, watersheds and water infrastructure, and many other natural and built resources were damaged or otherwise negatively affected by the fire. Come hear first-hand from wildfire and restoration experts about the efforts to fight and contain the fire, on-the-ground impacts of the fire, and on-going post-fire rehabilitation work.

31. Update on Algal Blooms in Utah

Ben Holcomb - Utah Division of Environmental Quality

Following an unprecedented year of harmful algal blooms (HABs), 2017, it was hoped, would provide a relief from these events. For some waterbodies, conditions had improved compared to 2016, but for others, conditions may have deteriorated. This discussion will

compare 2017 HABs to last year-- exploring differences in diversity and concentration of cyanobacteria and their cyanotoxins. Additionally, it will cover the latest techniques adopted by UDWQ for tracking these events and the latest coordination processes implemented this year.

32. Utah's Water Quality Priorities

Erica Gaddis - Utah Division of Environmental Quality

33. Division of Drinking Water Update

Marie Owens - Utah Division of Drinking Water

34. Quantifying Trends in Groundwater Quality in Basin-fill Aquifers in Utah

Olivia Miller, U.S. Geological Survey

Groundwater is an important part of the water supply in many parts of Utah, with annual withdrawals estimated over 1,000,000 acre-feet. Basin-fill aquifers, consisting of sand and gravel deposits within structural depressions, are the primary source of groundwater supply for many urban and rural areas. Since the 1960s, groundwater-quality data have been collected and recorded across Utah by the State of Utah, the U.S. Geological Survey (USGS) and by public-water suppliers, providing a long-term record of water quality conditions in the State. The water-quality data collected by the USGS resides in the National Water Information System (NWIS) database and the Utah Division of Drinking Water (UDDW) Safe Drinking Water Information System (SDWIS) database, which contains millions of sample results from public-supply sources in Utah. Given the long period of record (50+ years) at many of these sites, an opportunity exists to quantify changes in groundwater quality and investigate regional and long-term trends. This study uses water quality data these databases taken between 1960-2017 from wells within selected basin-fill aquifers experiencing substantial groundwater development to identify spatial and temporal trends in selected water quality parameters such as arsenic, nitrate, and dissolved solids. Information on water-quality trends will help water managers assess and plan for potential changes in groundwater quality and will also provide a better understanding of how changes in water quality may relate to natural processes or land uses, such as urban development and agricultural activities.

35. A Legislator's Perspective of Water in Utah

Senator Margaret Dayton - Utah State Senate

36. Olmsted Flowline Rehabilitation

Cort Lambson - Central Utah Water Conservancy District

The Olmsted Flowline is a critical link in the Central Utah Project (CUP) – Bonneville Unit (BU) – Municipal & Industrial (M&I) System conveying raw water from the Provo River to the Alpine and Jordan Aqueducts as well as the Olmsted Hydropower Plant at the mouth of Provo Canyon. The flowline was originally constructed as a wooden flume in 1917 by the predecessors of Rocky Mountain Power (RMP). The wooden flume was replaced by a 3/8-inch thick, 102-inch welded steel pipeline installed mostly on supports above ground between 1948 & 1952. The US Bureau of Reclamation (USBR) recognized the criticality of acquiring rights to utilize the Olmsted facilities in their planning for the M&I System of the Bonneville Unit of the CUP. A condemnation settlement agreement between USBR and the power company was reached in 1986, which transferred ownership of the facilities and water rights to USBR, recognizing that significant upgrades were needed to achieve the reliability required for M&I water delivery. The operation and maintenance responsibility was assigned at that time to the Central Utah Water Conservancy District (CUWCD). Planning was begun to address the most glaring deficiencies and since that time, CUWCD has planned and completed a series of projects to address or avoid hazards and replace the aging facilities. The last of these projects will be completed this year, namely the replacement of the Olmsted Hydropower Plant at the mouth of Provo Canyon and the Olmsted Flowline Replacement and Seismic Retrofit Project (OFRSRP). The OFRSRP replaced the last 1,200 feet of the remaining 1949-52 vintage 102-inch welded steel pipe and also included replacement of nine large rubber expansion joints and a failed polyurethane lining in the above-ground pipe sections of the flowline. The shutdown window in which to complete the construction was limited to 12-1/2 weeks beginning October 16, 2017 and ending January 10, 2018. Due to the complexities of the work and the tightly constrained construction window, CUWCD chose to utilize the CMGC method of Project Delivery for this project that allows the selection of a contractor early in the design process to provide constructability and risk mitigation input to the design team. Timing of the project award on April 27, 2017 was critical to providing sufficient time to procure the long-lead items prior to the start of the shutdown window in mid-October. The contractor was allowed to mobilize onto the site in August for early preparation work in advance of the shut-down. The Olmsted Flowline was shut down and drained on October 16th and the contractor began excavation of and demolition of the existing facilities in earnest. The construction crews faced many challenges, but were aided by favorable weather conditions through mid-December. The work was substantially completed by December 22, 2017 and CUWCD staff was able to water up the flowline beginning on December 27, 2017 a full two weeks before the deadline.

37. A New Utah Soil Moisture Map and Forecast Network

Scott B. Jones - Utah State University

Soil water is the lifeblood of Planet Earth and it affects virtually every process occurring in soil, including plant growth and crop production, microbial and root respiration, infiltration and groundwater recharge, carbon sequestration and loss, as well as security issues including drought, runoff and flooding, fog and fire. Utah's landscape is populated with hundreds of environmental monitoring stations, more than half of which include soil water content sensors for recording soil moisture at one or more depths. These records can provide valuable information for understanding the network's current or historical soil moisture status. However, for planning purposes, access to a soil moisture forecast would provide additional benefits, similar to weather forecasts. The United States Drought Monitor provides a monthly soil moisture outlook, but these maps are extremely coarse and have

little utility or correlation to local conditions. Because soil moisture affects so many other processes, a soil moisture monitoring network, mapped product and forecast can provide a high resolution fire, flood and drought risk assessment capability in addition to efficient irrigation management and other undeveloped opportunities connected to soil moisture. The Department of Plants, Soils and Climate at USU is partnering with the Utah Climate Center to develop this product and expand its capabilities with interested state and federal partners.

38. How Cities & Irrigation Companies Can Work Together

Gary Cannon - South Jordan Canal

We will be covering the challenges that are brought about when new development is proposed using existing facilities. We will spend time on statewide statistics and on knowing and educating the audience.

39. Title Transfer/The Nebraska Perspective

Tom Knutson - HDR Engineering

40. Millsite Dam Rehabilitation Update

Eric Dixon - Utah Division of Water Resources
Norm Evenstad - NRCS

Millsite Dam is a high-hazard dam located near Ferron, Utah, in Emery County. A dam safety study identified several deficiencies with Millsite Dam based on current dam safety regulations. These deficiencies included an undersized spillway, internal filtering concerns, inadequate seepage collection, and seismic stability concerns related to liquefaction. The Ferron Canal and Reservoir Company (FCRC) applied for USDA-NRCS's Dam Rehabilitation Program and was funded along with receiving funds through the Utah Board of Water Resources' dam safety grant program. An Environmental Assessment (EA) was completed by the NRCS in February 2017, which evaluated several options to rehabilitate the dam. This talk will present a history of the rehabilitation planning and design process, and give an update of the rehabilitation construction underway. The rehabilitation work began in June 2017 and is expected to be completed by the end of 2018. The construction portion of the work will cost approximately \$23 million.

41. Water Efficiency in Agriculture

Representative Tim Hawkes - Utah House of Representatives

42. USU Extension/Landscape Water Conservation

**Jerry Goodspeed, Larry Rupp, Kelly Kopp &
Joanna Endter-Wada - Utah State University**

This session will feature Utah State University (USU) Extension programs that specifically serve urban communities where landscaping is a major water use. The focus will be on the science behind the urban landscape water conservation research being conducted by USU's Center for Water Efficient Landscaping and the USU Botanical Center. As examples of applied research conducted through these university programs, the speakers will report on several projects currently funded through the USU Extension Water Initiative. The collaborative nature of these projects with other entities in the state also will be described. The session will highlight ways these projects and the larger programs they are part of are working to help advance Utah's overall water conservation efforts, and how they can be adopted throughout the state.

43. Partnerships with Agriculture & Other Water Users to be More Efficient

Sterling Brown - Utah Farm Bureau

Production agriculture is looking for partners – partners that share the passion, vision and work ethic of today's modern, sustainable farmer and rancher. In recent years, added partners have come in the form of non-government organizations (NGOs) and local, state and national governments. The result of these partnerships have leveraged funds and resources to accomplish the once unattainable. Improving water efficiency is not just an exercise of proven science, trusted experiments and reliable funds. Rather, enhancing water efficiency, through partnerships, is also an exercise of shifting the mind from the historic practice to the undisclosed potential.

44. Federal & State Funding for Water Projects

Rob Hougaard - Utah Dept. of Agriculture

Marie Owens, Jim Bowcutt - Utah Dept. of Environ. Quality

Candace Powers - Utah Department of Workforce Services

Todd Stonley - Utah Division of Water Resources

Scott Blake - Bureau of Reclamation

Bronson Smart - NRCS

Water is our most precious natural resource and is increasingly stressed by the demands our society places on it. Reclamation plays a key role in the WaterSMART program as the Department's main water management agency. Focused on improving water conservation and helping water and resource managers make wise decisions about water use, Reclamation's portion of the WaterSMART program is achieved through administration of grants, scientific studies, technical assistance, and scientific expertise. Let us answer any question's you may have regarding Reclamation funding.

45. Utah's Long Term Demographic & Economic Projections

Dr. Pam Perlich - University of Utah

The Kem C. Gardner Policy Institute produces long term economic and demographic projections at the county level to support informed decision making in Utah. The inaugural projections were released 7/1/2017. This work is funded by the legislature and done in collaboration with the Governor's Office of Management and Budget, the Office of the Legislative Fiscal Analyst, Associations of Government, and many other research and planning entities. This presentation will 1) overview the newly built model and data system, 2) identify the process used to develop data, methods, model, and assumptions, 3) highlights from the projections, and 4) a review of products available for use.

46. Great Salt Lake Update

Ryan Rowland & Cory Angeroth - U.S. Geological Survey

Great Salt Lake (GSL) is estimated to contribute about \$1.3 billion to Utah's economy via mineral extraction, brine shrimp cyst extraction, recreation, and passive services such as providing bird habitat of hemispheric importance. While GSL has always been a dynamic system, increased demand for its fresh water inflows, modification of the rock-filled railroad causeway that bisects the lake, increased inflows of urban run-off and treated effluent, and recent periods of drought are drivers of additional change that require careful monitoring and management to ensure GSL's economic and ecologic health. USGS, in cooperation with several State of Utah agencies, maintains an extensive network of inflow and lake monitoring sites that provide data needed for management of GSL. These data, which will be summarized in our presentation, provide a detailed record of north and south arm lake elevations; major fresh water inflows; south arm nutrient, trace metal, and mercury concentrations; bidirectional flow at a new causeway breach; south arm nutrient mass balance; and response of south arm lake chemistry to closure of two causeway culverts and opening of a new causeway breach. This monitoring builds on USGS' long history of scientific study at GSL that dates back to the late 19th century.

47. Lake Powell/The Bottom Revealed

Rob Baskin - U.S. Geological Survey

The USGS Utah Water Science Center (UTWSC), in cooperation with the USGS Woods Hole Coastal and Marine Science Center, Bureau of Reclamation, and the National Park

Service, just completed a bathymetric survey of Lake Powell using a high-resolution multibeam sonar system that includes corrections for sound velocity variations and boat movement. The new bathymetric data provide an unprecedented view of the underwater portion of Lake Powell that will be used to generate an improved elevation/area/volume relation, identify areas of sediment deposition, identify structural features, and generate detailed contour data for management and recreational use. This effort represents Phase I of a longer-term UTWSC project to support USBR efforts to improve the accuracy of area-capacity tables for Lake Powell. Phase II of the project will utilize EROS Data Center expertise to assist in integrating the high-resolution bathymetric data with airborne LiDAR to create a continuous 3-D topobathy model of the Lake Powell area. The 3-D model will be used to develop a new area-capacity table that extends from the bottom of Lake Powell to the top of Glen Canyon Dam.

48. Reclamation Quagga Planning Study

Rick Baxter - Bureau of Reclamation

Quagga mussels are a non-native invasive species that, when introduced to a reservoir, may result in significant and costly impacts to project facilities, infrastructure and the ecosystem. Boats are the most likely vector for spread of this species. Therefore the most common method used to ameliorate that risk is the interdiction and decontamination of boats moving between infested and non-infested reservoirs. Despite their best efforts the probability of interdicting one of these boats may be low. Additionally, coordination and communication between State and Federal agencies, as well as between States, can cause a lack of continuity in processes, creating situations where risk of infestation increases. In order to look at this problem in a new way, the Bureau of Reclamation (Reclamation) initiated a value planning study that brought together multiple professionals from various disciplines with different insights or perspectives to attempt to find solutions to the problem. The team developed 21 alternatives. Results showed a clear need to better understand the economic cost of infestation as well as the need to develop an assessment process for determining the susceptibility of clean waterbodies. Multiple alternatives also highlighted the need for better communication, coordination and collaboration between States and between States and Federal agencies.

49. USU Extension/Technologies for Water Conservation in Utah Orchards

Niel Allen & Brent Black - USU Extension

Researchers at Utah State University are exploring multiple strategies for conserving irrigation water in Utah's fruit orchards. As part of an ongoing effort to find tree fruit rootstocks adapted to Utah's arid alkaline soils, we are comparing the hydraulic conductivity of some of these rootstocks as well as their response to cyclical drought. We are also exploring how commercially available environmental sensors could be adapted to directly measure tree water status, and provide orchard managers precise tools to better manage irrigation. This session will provide an overview of this research.

50. USU Extension/Water Conservation Education & Policy**Joanna Endter-Wada & Ellen Bailey - USU**

This session will report on two projects funded under the Utah State University Extension Water Initiative. Ellen Bailey will present on behalf of Andree' Walker Bravo on the Make A Splash teacher education program. The Make A Splash program provided intensive, long-term education for teachers to help them incorporate water conservation and water quality education into all grade levels and topics. Water Initiative funding supported evaluation of the 2014-2015 workshop as well as facilitating a new cohort in 2016-2017. The presentation will include information on both the success of the structure and the format of these workshops and also the impact of the trainings on teachers' and students' knowledge and behaviors. Joanna Endter-Wada will present on the recently funded "Water Banking in Cache County" research project. This project involves collaboration between USU researchers and Cache Water District, Utah Division of Water Resources, and Utah Division of Water Rights. This presentation will include information on the project's purposes and activities, along with implications for current policy discussions occurring in Utah over water banking.

51. Health, happiness and Weight loss: 10 Tips to Living a Vibrant Life**Charity Lighten**

We live in an "information era" where knowledge is just a click away....which means we should have more clarity on health and wellness than ever before....right?!! Unfortunately, there seems to be more confusion and a lot LESS clarity these days. High-carb, low-carb? High-protein, low-protein? Keto, Paleo?... Who's to know?! Luckily, we can look to science and learn from history to find proven ways that improve our health and vitality. This class will offer 10 tips (that ANYONE can use) to improve overall health and to live a happy, vibrant life!
