MINUTES
of the
WATER RESOURCES COMMITTEE
Holiday Inn at Buffalo Bill Village
Cody, Wyoming
June 23, 2021

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MEMBERS AND ALTERNATES PRESENT

ALASKA	Charley Palmer
ARIZONA	Tom Buschatzke Amanda Long Rodriguez
CALIFORNIA	Jeanine Jones
COLORADO	Becky Mitchell Jeremy Neustifter
IDAHO	Jerry Rigby John Simpson
KANSAS	Connie Owen Cara Hendricks Tom Stiles Kenneth Titus
MONTANA	Laura Rennick
NEBRASKA	Jim Macy Tom Riley
NEVADA	Jennifer Carr Micheline Fairbank Adam Sullivan
NEW MEXICO	John D'Antonio Greg Ridgley
NORTH DAKOTA	Jen Verleger
OKLAHOMA	Sara Gibson
OREGON	Tom Byler

SOUTH DAKOTA	Nakaila Steen
TEXAS	Jon Niermann
UTAH	Erica Gaddis Norman Johnson Todd Stonely
WASHINGTON	Mary Verner Buck Smith
WYOMING	Chris Brown Jennifer Zygmunt

GUESTS

Greg Johnson, Colorado Water Conservation Board
Christopher Estes, Chalk Board Enterprises, LLC
Vern Tharp, Western State Water Partnership
Kathy Alexander, Texas Commission on Environmental Quality
Brandon Gebhart, Wyoming Water Development Office
Julie Gondzar, Wyoming Water Development Office
Sue Lowry, Interstate Council on Water Policy
Brian Dunnigan, Olsson Associates
Teresa Wilhelmsen, Utah State Engineer's Office
Norman Semanko, Parsons Behle & Latimer
Aislinn McLaughlin, American Rivers
Elizabeth Ossowski, NOAA/National Integrated Drought Information System
Kelsey Satalino, NOAA/National Integrated Drought Information System
John-Cody Stalsby, Texas Commission on Environmental Quality
Tracy Streeter, Burns & McDonnell
Michael Elliott, Citizens Infrastructure Advisory Board, City of Huntington Beach

WESTFAST

Roger Gorke, Environmental Protection Agency
Robert Boyd, Bureau of Land Management
Paula Cutillo, Bureau of Land Management
Mike Eberle, USDA Forest Service
Mike Strobel, USDA, NRCS
Heather Hofman, USDA, NRCS
Cara McCarthy, USDA, NRCS, NWCC
Travis Yonts, Bureau of Reclamation

Christopher Carlson, USDA Forest Service
P Brent Duncan, USDA, NRCS, SSRA

STAFF

Tony Willardson
Michelle Bushman
Adel Abdallah
Ryan James
Cheryl Redding
Jessica Reimer

WELCOME AND INTRODUCTIONS

Jon Niermann chaired the meeting on behalf of Water Resources Committee Chair Mary Verner since she was attending remotely. Jon called the meeting to order. Introductions were dispensed with as they were made earlier during the Host State presentation, with the exception of those who joined for this meeting.

APPROVAL OF MINUTES

The minutes of the meeting held virtually and hosted by the State of Texas on March 24, 2021 were moved for approval by Jen Verleger. Seconded by John D'Antonio. Approved unanimously.

SUNSETTING POSITION

Position #423 – Rural Water Supply Project/Infrastructure Needs (August 3, 2018)

oThis resolution, considered for readoption, was a position taken in August 3, 2018. Greg Ridgley asked about the dollar amount in the fifth whereas clause to ensure it was accurate. Tony mentioned the position was vetted through the Bureau of Reclamation.

Greg continued with a couple of other suggested changes. In the last whereas on the first page, third line after the word "money," insert a comma to make clear that the sentence has two halves and that the phrase "while inadequate funding levels" is really a separate thought. Lastly, on page two, in the sixth whereas, I think the word principle should be spelled "pal". It's the primary means.

The Committee Acting Chair sought a motion to recommend this position with Greg Ridgley's corrections and edits. Jen Verleger moved and Mary Verner seconded the motion. The motion carried.

DROUGHT UPDATE

Reference materials are found under Tab K.

A. NIDIS Drought.gov

Elizabeth Ossowski thanked everyone for the opportunity to join for the meeting. She provided a brief update on the National Oceanic and Atmospheric Administration's (NOAA) National Integrated Drought Information System (NIDIS) program. The bulk of the update was a demonstration of the new redesigned Drought.gov website, which was launched a few months ago.

The first slide showed the June 15, 2021 U.S. Drought Monitor, with a dire picture of much of the West, and the Southwest in particular. As of June 15, almost 80% of the western United States (U.S.) was in some form of drought, with nearly 50% of the Western U.S. in extreme or exceptional drought.

NIDIS recently released the U.S. Seasonal Drought Outlook predicting that drought development is expected in the Northwest with some improvements noticed in southern New Mexico and in southern Arizona. Largely, the story is that drought will persist over the next few months.

The Wildland Fire Potential Outlook for June 2021 rightly predicted many of the wildfires that are occurring in the West.

There are eight regional drought early warning systems (DEWS). You've likely seen the current drought response in the West in two primary ways: (1) through drought status updates with regional partners; and (2) regular drought briefings and webinars. The drought status updates largely deliver not only conditions and forecasted outlooks and wildfire outlooks, but also impacts that we are noticing on the ground and feature either research resources or tools that are of benefit and are relevant to the current drought response situation across the West. We supplement the drought status updates with briefings and webinars. We are constantly coordinating on consistent drought messaging and media outreach.

Most recently in the Southwest, we hosted a post drought Impact Assessment where the States of Arizona, New Mexico, Utah and Colorado looked at the Four Corners drought of 2018. We are in the process of releasing the assessment of the impacts for a variety of different indicators that were noted in communities in the Four Corners region in 2018.

There are a number of drought webinars and events set in the coming months. Elizabeth highlighted the Western Drought Conditions and Impacts Webinar being held July 20, 2021. She also noted the Southwest Drought Virtual Forum planed to take place Sep 13-15, 2021.

Elizabeth turned the remainder of the presentation to Kelsey Satalino to demonstrate Drought.gov and the re-launch of the website.

Kelsey Satalino gave a brief demonstration and overview of the newly updated website.

Questions

Tom Riley: I love the new portal and especially being able to compare the droughts of record amongst each other. I'm wondering if you've done something similar on precipitation, and being able to compare precipitation calculators even yearly.

Kelsey Satalino: Right now, our historical section just contains the three data sets that I showed. However, we are showing precipitation information in terms of a 30-day percent of normal and a 60-day percent of normal, with more current conditions for forecasts, as well as precipitation forecasts. However, that's a great piece of feedback. As part of phase two of our redesign, we are looking to add additional information and to expand on our historical conditions tool to help people better answer the questions when comparing drought years.

Tom Riley: That would be great to have that kind of tool available. I'll be looking forward to that.

Adel Abdallah: I'm curious about the dollar amount. What did it cost to develop this portal?

Elizabeth Ossowski: I don't have the final number at my fingertips. This website has undergone many interations. The project was not one contract. It occurred over a number of years. We could find a ballpark figure. I can follow up with you on that.

Adel Abdallah: Any idea how many visitors you get each month on your site?

Elizabeth Ossowski: I can follow up with more specifics, but about 170,000 users over the past 30 days. We have seen an increase since the launch of the new website in January 2021.

Roger Gorke: This morning we held a meeting about the SECURE Water Act 2021 Water Report, *Water Reliability in the West*. It probably pulls from a lot of the information that NOAA uses, but shows the historic drought perspective and paleo drought perspective. I'll provide a link to the report. You may also wish to view the webinar because I think it helps frame the picture in terms of drought and water in the West.

B. **NWCC Water Supply Outlook**

Cara McCarthy, Team Leader/Hydologist, Water and Climate Services, National Water and Climate Center, Natural Resources Conservation Service addressed the committee.

Since most of you know what is happening in the West, I wanted to share some different ways of looking at what is occurring. See the powerpoint presentation.

The U.S. Drought Monitor from June 15, was shown. Reservoir storage as of June 1, (shown on slide) indicates that only the States of Montana and Wyoming have above average reservoir storage. On the next slides, the red dots in California, Nevada, Utah, the west side of Colorado, Arizona and New Mexico, mean the forecast is indicating below 50% of average streamflow for April to July. Things have changed pretty quickly over the past couple of months.

The bright, bold picture on slide 7 shows the snow water equivalent (SWE) as a percent of median on May 1. This shows that much of the West was below average. Montana and portions of Wyoming are in better condition. Their forecasts seem to be holding, but conditions are drying.

The slides presented many other graphs and pictures showing the status of the water supply outlook.

Jon Niermann thanked, Cara and stated that it is sobering to see these pictures.

ARIZONA COLORADO RIVER SHORTAGE MITIGATION MEASURES

Tom Buschatzke, Director of the Arizona Department of Water Resources (ADWR) used a powerpoint presentation and addressed Arizona's actions in relation to the Colorado River water supply shortage, which they expect to come next calendar year.

ADWR is responsible for management of Arizona's water resources. Their sister agency, the Department of Environmental Quality, is responsible for water quality management. There's a little bit of overlap, but not much.

Tom began by sharing a slide depicting the water surface elevation of Lake Mead. This is the core measure for the call with the Bureau of Reclamation which is done every month, about mid-month, and a continuous study of reservoir levels. Through this study, one can equate what's going to happen in the next calendar year, in 2022. A formal decision is made in August. The projection is for the lake to be 10 feet or so below the trigger elevation for what we call a tier one shortage.

We have been in what's called a tier zero shortage for the last couple of years because of the drought contingency plan, which is an overlay to the 2007 shortage guidelines. The overlay was created because the 2007 guidelines' intention to slow the draining of Lake Mead was not working.

In about 2013, we started working on the next phase of protections for Lake Mead. The presentation slide shows three lines, in addition to the most probable projection, and was included to show the range of uncertainty. We fully expect in 2022 to be in tier one status in the State of Arizona, which basically equates to a loss of 512,000 acre-feet of Arizona's 2.8 million acre-feet allocation in complying with the law of the Colorado River. The projections get worse beyond 2023.

The yellow line on the right in the picture projects an elevation of about 1,048 feet, which is a little less than two feet below the next year's elevation. A tier two shortage for Arizona means the state is going to lose another 80,000 acre-feet of its water supply. Nevada and Mexico would also lose water at this elevation.

If we get to the 1,045 foot elevation, California is going to start taking reductions, which was a huge thing for California to do under the contingency plan. Legally, under the Compact, California really doesn't have to take reductions. The Central Arizona Project (CAP) within Arizona goes completely dry. So this provides the context for what's happening in Arizona with the reduction in water supplies.

First, we need to talk about where we are with our full supplies. The reduction that we're going to see is almost exclusively going to fall on the Central Arizona Project (CAP). They move 1.5-1.6 million acre-feet from the Colorado River to the southern part of the State of Arizona.

There are priorities, though they are not exactly prior appropriation priorities. The block chart in the presentation shows the priorities. The lowest priority (depicted by the top gray bar) is "other excess." That other excess has historically gone under the ground to recharge aquifers in Arizona within the CAP service area for various purposes. The green block is agricultural water users within the Central Arizona Project that gave up their contractual rights as part of the 2004 Arizona Water Settlement Act. In return, they got first dibs, so to speak, on any excess water that was created through the CAP. And again, that excess water is water that contractors and subcontractors do not take within the Central Arizona Project, these contractors being tribes and subcontractors being municipal and industrial users.

The next pool depicted in the orange color says NIA. It's called Non-Indian Agricultural primary water and it is either Indian, non-Indian or agricultural. This is water that the ag users gave up when they developed contracts. That water was set aside to settle tribal water claims in the State of Arizona, and a piece of it was set aside for non-tribal water users. Some of the water is already in the hands of some tribal and non-tribal water users. Some of it is yet to be allocated. The dark blue and light blue are the next slug of water that would be Arizona's

highest priority water for Indian and municipal and industrial users. The little red bar shown at the bottom of the chart says P3. It has a higher priority than all of the priorities above it. This water came as part of the 1988 water settlement with the Fort McDowell Yavapai Tribal Nation.

We're going to see a 512,00 acre-foot reduction, which is 320,000 acre-feet pursuant to the 2007 guidelines, and 192,000 acre-feet pursuant to the Lower Basin drought contingency plan. Without mitigation, our agricultural growers within the Central Arizona Project are going to lose 100% of their renewable water supplies, and then it would be a 60% reduction to the non-Indian agricultural pool. Almost the entire non-Indian agriculture pool was held by one tribe, the Gila River Indian Community, and by my former employer, the city of Phoenix. A few other cities have a small piece of the non-Indian pool.

Shown on the slide are tier one shortage impacts prior to mitigation (on the right side of slide #5). Shown on the left side of the slide, is the mitigation I'm talking about today. We went through the mitigation process with our stakeholders We did it largely because, while we had the priority system in place, I had the distinct pleasure of being the one of the seven basin states representatives that needed legislative authority to enter into things like the drought contingency plan. Thus, I needed the stakeholders to support the legislation.

The Central Arizona Project General Manager, Tim Cook, and I embarked on about a 10-month long process with 40 people (the steering committee) composed of stakeholders and more importantly, legislators from both parties, the minority and majority of both houses, and key legislators. We put together a very complicated deal. I'll give you a very high level overview.

One of the basic principles was not to bust the priority system, it was to honor it. Because agricultural water users are going to suffer a reduction, we had to fill their pool to be able to get surface water or water for the agricultural priority users who are in a lower priority. We did that through a variety of processes. You can see the label with the mitigation water – that is water that would go to the agricultural water users after filling the NIA water users allocation first, by taking water out of Lake Mead.

The Central Arizona Project created a conservation program some time ago, to provide Intentionally Created Surplus (ICS) water, which was water left in Lake Mead with your name on it, that is water you are allowed to take out at a later point in time. The Arizona Water Banking Authority, which handles certain water supplies, assured their water was part of the mitigation plan. There's compensated mitigation too, which is a nice way of saying we're paying people to accept money instead of water.

There's also a solar component with the Central Arizona Project with an exchange with both a solar project and an old Reclamation project that serves the Metropolitan Phoenix area with some of its water. Uniquely, some of the cities who had high priority water have agreed to send their water to the agricultural entities. In return, the agricultural entity does not pump its wells. That doesn't remove groundwater from the aquifer, because it's taking water from the

city allocation, and the city gets credit to pump the water out at a later point in time. This underground storage program has been in existence for quite a while.

This has been a very complicated process with different elements of mitigation to be able to build these pools. Yet, in the counties serviced by the Central Arizona Project, they're still going to have to fallow fields on 30 to 40% of the farmland even with the mitigation. It's going to be very interesting. Most of that farmland creates feed for either cattle or dairy cows.

Determinations are made annually for a fixed volume of Colorado River water for the safety of agricultural water users. There was no mitigation in 2020 and 2021. In other words, there was no water coming out of Lake Mead going to agriculture. Some of the cities are finding it more difficult than others to send their water to agricultural users. Formerly, cities with "top" water from surface storage, the underground storage facility water, or power savings facilities, had an indirect way of shutting the ag wells down for less groundwater pumping, and getting groundwater credit.

Another facet of the mitigation program is we're paying the agriculture community to restore 70,000 acre-feet of well capacity that they've lost over the years. Agricultural entities, under state law, have the absolute right up to pump groundwaer up to certain limits, given certain conservation requirements. And again, we have to fill the useful industrial priority or higher priority water first. It's all based on the actual uses annually, and how much water goes to CAP.

Starting in 2023, we will cut the mitigation to 75% because there is no mitigation for agriculture, and no wet water allocation. We didn't have to fill the pool, and thus we're less worried about not busting the priority system. In subsequent years, it goes down to 50%, for the non-Indian Agricultural pool, and then zero mitigation in 2026. This has been a very consistent part of the process since about September of 2018 as we've negotiated this deal. There was full mitigation for every sector through 2026. That was not really doable from a resource standpoint and Governor Ducey told the stakeholders they had to have a plan that is doable.

Referring to the chart on slide 7 of the presentation, Tom said he put this chart here for a couple of really important reasons. Look at the red circles for 2020 and 2021. At Tier Zero, pursuant to the DCP contingency plan, Arizona was supposed to cut its use by 192,000 acre-feet, and you see we only cut it by 180,608 acre-feet. This relates to the Bureau of Reclamation's accounting grip. They weren't able to track the water closely enough for us to reach the 190,000 acre-feet. But we anticipated that might happen. Part of the planning allows you to add a range, and we're paying back in 2021 some water that we didn't leave behind in the lake in 2020. Another part of this chart shows, in the third row down, Arizona's job is to plan mitigation costs. I mentioned that to help mitigate agriculture, water was going to come from Lake Mead. This is at cross purposes to what we're trying to accomplish by propping up Lake Mead. That was not lost on any of us.

Within Arizona, we have a program to offset the potential withdrawal. Through various processes, we commitred to creating the additional water. Most of that is through paying tribes to

fallow their land to keep more water in Lake Mead. In some cases the water stays in Lake Mead forever. In other cases, the Indian community has to keep that water in Lake Mead (through at least one week into 2026), depending on the drought contingency plan and the mitigation plan.

Lastly, notice the very bottom line in the chart for the years 2020 and 2021 for Arizona's contributions to Lake Mead, pursuant to the drought contingency plan. Arizona is doing more than we're required to do under the 2017 guidelines, and we hope to do even more.

I mentioned that they're going to be below the trigger for tier two, but we can conserve 40,000-50,000 acre-feet above these numbers. In 2022, we might forestall falling below that elevation. I'm happy to say that our State legislature has set aside money to buy some of the water needed.

Referring to his summary slide on page 8, Tom said this teacup diagram shows elevations with tier zero shortages starting at 1,090 surface water elevation in Lake Mead, to the DCP guidelines at 1,075. Again, that's significant with the states of California, Nevada, and Arizona, and Mexico then taking reductions. The goal is to reduce the probability of Lake Mead falling below a surface elevation of 1,050 feet. They accomplished that goal. The overall combined plan, with the Upper and Lower Colorado River Basin States, had a single digit probability, even using the last 30 years of historical hydrology, which is 11 percent less than the long-term data.

Because of the recent drought situation, problems have crept up again. One interesting part of the job is to plan for the whole basin. If the Reclamation 24-month study projects out for a two-year timeframe that the elevation of Lake Mead is going to fall to the 1,030 foot elevation, we have a mandatory consultation provision between California, Nevada, Arizona, and the Department of Interior. Adaptive management is built into the plan.

In our mitigation plan, we set out to protect the most important resources. This was a really robust and good plan that was very difficult to put together. There was a lot of creative thinking by many of the stakeholders in Arizona, who came forth and put their resources on the table. And one of the really important aspects of this process was that for the first time to my knowledge, and I've been doing this for 40 years, we actually had tribal entities in the room during the negotiations. There were three tribes in that room, although there are 22 federally recognized tribes in Arizona. More tribes want to be included in the process moving forward. So with that, I will be happy to take questions.

Questions

Jessica Reimer: Bringing all of these stakeholders together was amazing. Going forward until 2026, how are you seeing behavior changes? And what do you see in terms of the stakeholders responding to the fact that this is going to be changing going forward?

Tom Buschatzke: An audit matters. We've had several meetings and created sort of a pyramid structure. At the bottom is me with all the stakeholders. To provide some level of transparency,

we have a technical workgroup committee that's open to not only the members, but the public. That committee looks at modeling, or how we might use modeling, to help us predict what we do with six different potential actions that impact the system in Arizona. The strategy committee is a very small subset of folks from the steering committee. They have either legal or policy expertise. We have a confidentiality agreement in that group, so that we can avoid telling what we're doing all the time. The no mitigation event is from the governor. That will be a challenge as we move forward. This is our way of having transparency plus some confidentiality. And being able to be confident that when we are in the room with the Seven Basin States, Mexico, tribes and other stakeholders that we have the authority, so to speak, or support, as we make offers and take offers. So we hope the process that has worked so well to get through the mitigation plan will serve as well, moving forward for the post-2026 plans. Our website posts the meetings of the consultation committee and webinars.

Question: With the compensated mitigation program or alternative, what was the process for determining how much you compensate water users for not diverting water?

Tom Buschatzke: That was predetermined. We came up with a dollar amount of $40 per acre-foot with a consumer price index for inflation for the five years of the program itself. And that dollar amount really came out of a budget thing. It was a pilot conservation program in the Colorado system that was funded. I think the average price was about $150. Mexico was getting paid to do some conservation under Minutes to the Treaty, and that was a little higher. At the end of the day, everyone's going to get the same amount. One tribe is not going to get $1 more than another tribe, which is kind of what they wanted. We still prefer that it has to be an equal amount. Part of it was they knew how much money we might have had in back payments. My governor put $30 million on the table in November of 2018. The Arizona Water Banking Authority had certain funds that it receives from a pump tax. So they knew there was a finite amount of money. The non-governmental organization (NGO) community committed a million dollars. That was something new for the State of Arizona to work closely with the NGOs.

Todd Stonely: I understand that Arizona's groundwater storage program is pretty extensive, with maybe upwards of a million acre-feet stored. I read recently and was surprised not to see that as part of any of the mitigation you've talked about. What is happening in the broader picture with Arizona's groundwater storage?

Tom Buschatzke: Some of that underground stored water by the water bank is being sent to cities who are going to be impacted. When the cities are sending their water to ag and getting a credit, that credit can't move across active management boundaries. Think of those as county boundaries, The water bank is perpetuating exchanges. Through the water bank's underground storage credits, they're doing an exchange. My fees will end up with credits in Maricopa County where Phoenix lies and they can recover those recorded credits and use them. We do get into situations where two cities or tribes are hit, and the water bank has an obligation to tribal entities to some degree and to the cities to some degree. It is an important part of our process. You can look at those underground storage credits as a finite number. Folks are allowed to sell their credits. There is a growing market for the sale of those credits between different entities.

DROUGHT PLANNING AND RESPONSE ROUNDTABLE

This agenda item was skipped due to a lack of time, and will likely be included on the agenda for the meetings in the Fall.

SUBSEASONAL TO SEASONAL (S2S) FORECASTING PILOT PROJECTS

Jeanine Jones remarked that as some may know, NOAA released a report to Congress at the end of last year. The Weather Forecasting Improvement Act required that a report be prepared. The legislation was subsequently reauthorized along with the NIDIS reauthorization, which called for NOAA to submit a report to Congress on what it would take to improve S2S forecasting.

The report recommended four pilot projects. Each of them was estimated in the $10 - $15 million range over multiple years. One of the pilot projects is to provide S2S precipitation forecasting for water management in the West. One of the projects regards forecasting for agriculture, summer precipitation, and is located in the Midwest. A third project is on Arctic ice; and the fourth project regards hurricane related work. The concept for the pilot project that we're particularly interested in involve studies of western water management.

Jeanine called out the good work of Tony and Jessica on legislative efforts attempting to get funding for the first year of $15M for the western pilot project. NOAA informed us the funding would be in the US Weather Research Program line item within the Office of Atmospheric Research. Historically, that line item has been funded. In the current fiscal year, it was funded at about $26 million.

On the House side, WSWC worked with Representative Grace Napolitano's office (D-CA) and that generated a "Dear Colleague" letter with 13 co-signers. Virtual meetings were held with a number of Senate offices, although we were not able to find someone on the Senate side to sponsor a letter.

Recently, NOAA's and the President's budget requests were released. Not surprisingly, there was no money for the pilots projects in the NOAA budget nor the President's request. The only thing in the President's budget request related to S2S was $3.5 million for subseasonal to seasonal decision support for the National Weather Service, essentially using their existing information, and developing additional products from it. The problem with that is that the accuracy or skill, as meteorologists would say, of those existing projects is almost nonexistent, which is why we were pushing for an appropriation.

The other somewhat related item in the President's budget request was for the Office of Atmospheric Research for $7 million for the Precipitation Grand Challenge, which was about research in general to improve precipitation forecasting. A a big chunk of that $7 million is

related to ocean observations – so not so much on the modeling side, but rather for fundamental observation work.

That is a big discrepancy between what NOAA asked for and what we were trying to get with this request for an appropriation specifically for improving forecasting for the West. I'm not too optimistic, given the big plus-up this would be to the existing weather research line item.

Thanks to those who attended the virtual meetings with the congressional offices with us.

Tony added that the Appropriations Committee required written testimony by last Friday. The WSWC provided written testimony.

WYOMING WEATHER MODIFICATION PROGRAM

Julie Gondzar, Project Manager of the Wyoming Water Development Office, helps run the weather modification program. She addressed the committee and used a powerpoint presentation to illustrate Wyoming's cloud seeding program.

We've talked about the importance of water in the western part of the country, and the significant drought that we're seeing and still expecting to see for the next few years. Wyoming is looking for opportunities to bring in some additional water supply whenever we have the opportunity to do so. If we change our perspective a little bit, we can think about all of the water that's in the air. There is a lot of water in the air in the form of water vapor. The numbers I'm presenting are based on the really great weather models that we have used in Wyoming. One cubic mile of air equals 18,000 tons of water. That equates to just over 23 acre-feet of water, or approximately 0.244 inches of water over the entire state of Wyoming. The point is, there's a lot of water in the atmosphere. Can we tap into it and bring it to the ground where it can be usable? The projects we undertake are called orthographic cloud seeding. Put simply, that means we seed clouds over mountain ranges to argument snowpack.

Meteorologically speaking, winter clouds contain a lot of water. However, they are naturally inefficient at producing precipitation or snowfall. Why? One reason is due to the fact that water droplets in a cloud do not always freeze at 32F. We learn at a young age that water freezes at 32 degrees or lower, but in the atmosphere, that doesn't always happen. This phenomena is known as supercooled water.

Supercooled water droplets also need a special type of "dust" particle as a nucleus in order to freeze into an ice crystal. There must be a specific geometric shape in order for the supercooled water to freeze and collect, collide and turn into ice crystals and then turn into snow. Clouds are not really efficient at producing snowfall when there is a lack of those dust particles. If we help boost that process, then we can help boost the start of the snowfall process.

Cloud seeding is in fact how we get the clouds to produce more water. We use a natural compound known as silver iodide, AgI. This natural compound is a salt that is dispersed into the atmosphere in very specific types of clouds. It initiates the ice crystal formation, which eventually creates snow. This process only works in certain types of clouds with certain temperature ranges, and the cloud has to have a lot of supercooled water. The silver iodide seeding agent acts essentially as a dust particle allowing the supercooled water to freeze into ice crystals. Once a lot of ice crystals form, they'll collide and turn into snowflakes – which is how it would naturally happen anyway. Better efficiency means that a greater fraction of the cloud water will be converted into snow, where it can hopefully make it to the ground for use.

Wyoming has done a lot of research using this technology. There are a couple different ways that clouds can be seeded: (1) by an aircraft; or (2) with a ground-based generator. Via aircraft, silver iodide particles are released into the clouds with supercooled water. It takes about 15 to 20 minutes for the compound to initiate the snowfall process, then the natural process takes over.

The scientific community is steering away from the verbiage weather modification and using the terminology cloud seeding since they've noticed "weather modification" can sometimes be associated with misleading concepts. Cloud seeding is not a short-term solution for drought. It is a tool in our toolbox for drought mitigation. It cannot create clouds or move clouds, change temperature, wind or atmospheric moisture. Cloud seeding is a safe and effective way to increase snowpack incrementally over time, over mountain ranges, beyond what nature provides. Cloud seeding is part of Wyoming's drought contingency plan and one of the three legs of the stool. It is an inexpensive tool for water resource management.

Research has been done for a number of years. Over the past five to seven years, the industry has come a long way. The question is no longer does it work? Rather, the question is how well is it working? How much additional water are we getting during a season of seeding? There are currently projects taking place in several states. Some areas are focusing on augmenting snowpack over mountain ranges, while others, such as in Texas and North Dakota, are seeding clouds during the summertime to help increase rainfall and mitigate hail storms.

Gondzar provided an overview of the timeline of the history of Wymoing's cloud seeding program. Wyoming has been actively seeding in the Wind River Mountain Range since 2014. Since 2015, they have done feasibility studies to look at what it would take to develop cloud seeding programs in different parts of the state.

In 2018, the States of Wyoming, Colorado, and Utah (the Upper Basin states) signed an agreement with the Lower Colorado River Basin states, called the Colorado River Basin Weather Modification Programmatic Funding Agreement. The Lower Basin States provide funding for many cloud seeding programs that benefit the Colorado River Basin (CRB). This is an eight year programmatic funding agreement. This agreement allows the states to continue the use of weather modification efforts as a way to contribute additional water into the system for CRB users. Proposals are submitted every summer, to be approved prior to operations. Collectively

the states can contribute $1.5 million in a single year. This funding provides opportunities to expand the program.

It's important to look at the numbers. Using the results from the Wyoming Weather Modification Pilot Study (2014) and the Medicine Bow and Sierra Madre Mountains (MBSM) Design Study (2017), positive impacts have been estimated. Cloud seeding in the Wind River Mountains can generate ~16,000+ acre-feet of additional run-off (at $24-$28 per acre-foot). Cloud seeding in MBSM can generate ~30,000 (+/-) acre-feet of additional water (at $24 per acre-foot).

WESTERN STATES WATER PARTNERSHIP

Vern Tharp, Manager of the Western States Water Partnership said he hopes to bring a glimmer of hope today, particularly since many of the topics discussed have been rather sobering.

The Western States Water Partnership is owned 100% by a nonprofit and structured to build and fund a need for legacy water gap filling radars. Vern finds capital company deals and consults for the University Corporation for Atmospheric Research (UCAR), which manages the National Center for Atmospheric Research (NCAR), with support from the National Science Foundation.

My role primarily is to translate from the scientists, the staffers and policymakers, the significance of the science NCAR is doing. The Colorado Water Conservation Board funded a study called the Upper Rio Grande Basin Snowfall Measurement and Streamflow Forecasting Improvement Project. Simply put, the study showed that if you have better data, and you have a better tool, you can better forecast your water assets. Copies of the report were made available to those in attendance.

The graphic displayed on page 7 of the powerpoint presentation is a clear indication that the vast majority of western Colorado has poor to no radar coverage.

The team who wrote the report found that accurate information on snowfall and liquid water, the snowpack and associated runoff, remains a significant challenge for local, state and federal water communities. Only through collaborations and sponsorships, as fulfilled in the project, would fundamental progress be realized. Additionally, gap-filling, watershed-based radars would provide great benefit to Colorado for land, water, and weather management. Local, state and federal coalitions should be built to purchase and maintain permanent and mobile radars to provide a more complete data on precipitation for use in hydrologic models such as WRF-Hydro and for flash flood prediction.

The Western States Water Partnership is designed to fill that mission find gaps that exist within local, county, state and federal agencies radar observations that impede their ability to

effectively address legacy water issues critical to Colorado and other western states. Public private partnerships are the structure to help reach the next level of funding, and philanthropy should play a role.

WADE DASHBOARD & STAN THE STATE ENGINEER

Adel Abdallah, Program Manager commented that the Water Data Exchange (WaDE) has been working for the last ten years to provide better data. The first phase was establishing the system and building relationships. In Phase 2, we have improved the schema, adapted to centralized cloud hosting, and provided streamlined data access. Over the next few years, we hope to operationalize the system and put it to use.

We've just completed importing the places of use and connected them to points of divversions for water rights for seven states.

Currently, we're working on securing funding to help in development of the Western Water Data Access and Analysis Tool (WestDAAT) dashboard. Additional funding sources are being investigated.

We are partnering on a proposal with the OpenET team to the NASA Research Opportunities in Space and Earth Science (ROSES) program to integrate WestDAAT and OpenET.

Lastly, we are generating WaDE use cases and personas. For example, an individual may wish to know how much water was permitted in a watershed versus how much water is being depleted. One of the next steps will be working with different groups to develop how the personas can use the information. A State Engineer (Stan) may be able to use WaDE data and artificial intelligence to screen applications, for example. We want to involve interested WSWC members in participating in redesigning the parameters for the database. The takeaway is the personas. Please let us know if you would be interested in participating.

FY 2021-2022 WATER RESOURCES COMMITTEE WORK PLAN

A clean copy and edited copies of the work plan are provided in your briefing materials. Some suggested edits were made to the work plan at the last meeting. We will still take input if you'd like to see more changes and we appreciate any feedback on priorities. There's always more to do than we have resources.

John D'Antonio moved approval of the Committee's work plan. The motion was seconded, and was carried.

SUNSETTING POSITIONS FOR FALL 2021 MEETINGS

The Water Resources Committee has responsibility for three policy resolutions which are due to sunset at the Fall 2021 meetings. The three policies are listed below. Please review them and provide any proposed changed to your state's Executive Committee member.

Position #428 – regarding Federal Water and Climate Data Collection and Analysis Programs
Position #429 – regarding Drought Preparedness, Prediction and Early Warning Programs
Position #430 – regarding Bureau of Reclamation Drought Response program

OTHER MATTERS

There being no other matters, the meeting was adjourned.