

# [***CONFERENCE REPORT: COLORADO LAW INSTITUTE CLE INTERNATIONAL 11TH ANNUAL CONFERENCE: COLORADO WATER LAW, WATER ADMINISTRATION IN THE 21ST CENTURY, Denver, Colorado February 1, 2013***](https://advance.lexis.com/api/document?collection=analytical-materials&id=urn:contentItem:597S-PR20-00SW-507V-00000-00&context=1516831)

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**Reporter**

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This conference, hosted at the Four Seasons Hotel, was ***co***-chaired by Brian M. Nazarenus of Ryley, Carlock & Applewhite and John J. Cyran of the ***Colorado*** Attorney General's Office, Water Resources Unit. The morning and early afternoon sessions of the conference focused on ***Colorado*** State Engineer's administrative policies, guidelines, and rules. The later afternoon session then focused on the issues surrounding these policies, guidelines, and rules. These discussions required the expertise of several water engineers, particularly for the morning session. The afternoon session included several practitioners, including assistant state attorneys general, a federal natural resource attorney, and a small number of private attorneys.

The morning session of the conference closed with a presentation by Dick Wolfe, the ***Colorado*** State Engineer and Director of the ***Colorado*** Division of Water Resources (the "Division"), who gave an in-depth discussion of the Division's general principles and guidelines regarding the administration of reservoirs, commonly referred to as the Division's Reservoir Administration Guidelines ("Guidelines"). Mr. Wolfe began by discussing the Division's rationale for implementing the Guidelines. The Division created the Guidelines to provide a framework to (i) manage the operations of the more than 3,000 reservoirs in ***Colorado***; and (ii) decrease the complexities associated with managing such a large number of reservoirs. The Guidelines act as a practical guide for Division staff and are not intended to serve as legal authority, even though courts have occasionally cited to them.

Mr. Wolfe acknowledged the Guidelines themselves are largely definitions, but are nonetheless important for water attorneys to know and recognize. For instance, the one-fill rule, which states that a reservoir owner may only fill once per year, and the definition of "fill year," the time a reservoir owner may fill, are two crucial details of which water right holders should be aware, or risk losing a portion of their water right.

An important detail concerning the one-fill rule is that a reservoir owner may be able to receive a refill right from the Division, allowing for an additional fill. However, a refill right is only meant to replace water lost through evaporation and seepage. Additionally, the Division requires on-channel out-of-priority reservoir owners to maintain natural flow through the reservoir by releasing extra water for downstream in-priority reservoirs. This accounts for evaporation loss from the larger surface area of the on-channel reservoir. Without this method, downstream in-priority reservoirs would lose water through evaporation from the out-of-priority reservoir. **[\*458]** Attorneys should also be familiar with the fact that the Guidelines consider water lost to seepage from any reservoir, either into the ground or a stream, to be state water and a loss to the water right owner. Some reservoir owners may try to reduce seepage by lining their reservoirs, but they must be careful to not keep more water than their decreed right allows.

Mr. Wolfe also discussed how unused water could count against a water right owner. Carryover water is the unused water from one fill year that carries over to the next fill year. For example, if a reservoir has fifty acre-feet of water remaining at the end of the fill year, the reservoir owner will begin the next fill year with fifty acre-feet. This unused water counts against what a reservoir owner may store during the next year, though it does not decrease an owner's actual water decree.

Turning next to decreed capacity and physical capacity, Mr. Wolfe emphasized the two methods may conflict at times, so attorneys should take care when applying for water rights. Both methods begin the same way: a conditional water right establishing a certain decreed acre-foot-amount of water. Once the reservoir is filled, if the physical capacity is less than what was decreed in the conditional water right, the physical capacity becomes the established water right. Additionally, if the decreed capacity is less than the physical size of the reservoir, then the decreed capacity becomes the established water right. In essence, whichever capacity is smaller, whether it was decreed or is the physical size of the reservoir, will become the established water right.

Then, Mr. Wolfe explained another area of potential confusion: determining measurement by either volumetric decree or gage height decree. A volumetric decree is, as one might imagine, a measurement of the actual volume of the reservoir, whereas a gauge height decree is a measurement of the water level in the reservoir. Depending on how a reservoir is built, an owner may find it more beneficial to measure the decreed amount via one of these methods and not the other. The owner's attorney should be aware of these differences.

In his concluding remarks, Mr. Wolfe explained that storable inflow, paper fill, out-of-priority storage, temporary detention, and surcharge all pertain to the physical holding of water in a reservoir. Storable inflow is the amount of water that is both physically and legally available for storage under a reservoir owner's existing water right. Water that bypasses through a reservoir counts against the storage water right.

To calculate how much bypass counts against a water right, the Division uses an accounting mechanism called paper fill. This method charges the bypassed water against the actual storage water right, thereby decreasing the remaining water right. The Division does this to ensure senior water rights downstream, as well as other downstream resources, are protected by preventing upstream junior water rights to store water late in the season causing a shortage for the downstream senior water rights.

Out-of-priority storage permits the storage of water by an upstream, out-of-priority reservoir, as long as the water can be made readily available to downstream senior storage rights when needed. Additionally, the upstream, out-of-priority reservoir may have to release more water than needed by the downstream senior right to account for transit loss. **[\*459]** Temporary detention allows for an on-channel water right to detain a surcharge, or the amount of water that may be impounded, for up to seventy-two hours in order to achieve more efficient or effective beneficial use. After seventy-two hours, the water right owner must cease detention and allow the water to flow freely once again.

The attorneys who attended the conference expressed concerns mainly related to paper fill. Specifically, the attorneys were concerned that water not stored by reservoir owners still counts against the storable water right. Mr. Wolfe explained that this ensures that in times of a drought or an otherwise low-water season, upstream junior rights do not take advantage of the downstream senior rights. Additionally, Mr. Wolfe shared that the Division wants to maintain the natural flow of water throughout the entire season.

Koley Borchard

***COLORADO*** WATER CONGRESS 2013 ANNUAL CONVENTION

Denver, ***Colorado*** February 1, 2013

Real Weather

Nolan Doesken, a ***Colorado*** State University climatologist, first provided a look back at the weather patterns of 2012. Doesken's presentation walked the audience through the weather patterns of each month of 2012 and explored the details of ***Colorado***'s current drought. Temperature averages in 2012 were well above the long-term average in ***Colorado***. Warm temperatures, coupled with less than average precipitation, highlighted the importance of spring precipitation to maintain snowpack levels.

In ***Colorado***, the highest snowpack accumulation typically occurs in April. Doesken, however, shared a picture depicting the top of Copper Mountain in late March 2012, showing much of the peak barren and with only man-made and groomed snow visible. In response to the diminished snowpack, flows of the ***Colorado*** and Yampa ***Rivers*** dropped dramatically between 2011 and 2012. ***Colorado*** reservoirs similarly dropped to below average levels, despite attaining above-average levels in 2011. While Doeskin observed higher precipitation in early 2013, at the time of the conference, snowpack levels remained well below average. Thus, Doeskin ended his presentation by noting that a healthy spring precipitation in 2013 is essential for ending the current drought in ***Colorado***.

What's up with the Weather?

Brian Bledsoe, Chief Meteorologist at KKTV, presented his long-term weather projections for ***Colorado***. Bledsoe specifically forecasted that ***Colorado*** can expect further drought based on: (i) El Nino and La Nina cycles; (ii) Madden Julian Oscillation ("MJO"); and (iii) temperature oscillations in the Atlantic and Pacific Oceans. **[\*460]** The El Nino and La Nina cycles create opposing weather patterns in ***Colorado***. El Nino brings in the Pacific jetstream, which rolls across the southern states, bringing wet and cool weather. La Nina, on the other hand, develops a ridge of high pressure, pushing storms north of ***Colorado***, leaving the eastern part of the state windy and dry. Bledsoe explained that, while ***Colorado*** is technically in between these two cycles, current projections suggest that weather will remain in a La Nina cycle.

The MJO tracks storm activity originating over the Indian Ocean. Currently, the MJO is not particularly active, which concerns Bledsoe because an inactive MJO typically results in fewer storms in ***Colorado***.

Bledsoe also discussed the multi-decadal temperature cycles of the Pacific and Atlantic Oceans. The Pacific Ocean shifted to a cold phase in 2005, which typically results in more frequent La Nina cycles. Currently, the Atlantic Ocean remains in a warm phase, leading to more frequent storms (particularly hurricanes). According the Bledsoe, the current cold Pacific Ocean and warm Atlantic Ocean configuration is similar to ocean temperatures in the 1950s. Incidentally, one of the largest droughts in recent Western history occurred during the 1950s. Bledsoe further argued that the Atlantic Ocean is likely to shift to a cold phase in the next three to eight years. He suggested that this temperature shift means a generally wetter United States, except for the High Plains Region. Therefore, Bledsoe advised that ***Colorado***, and particularly its eastern plains, is entering a long-term drought phase for which the state must plan accordingly.

Dust in Western Snow Cover: What's in It and Where Did It Come From?

Rich Reynolds, from the United States Geological Survey ("USGS"), next discussed the increasing problem of dust in Western snowpack. Dust particles absorb solar radiation, which warms and melts the snowpack. The decreased albedo (reflectivity) of snowpack can trigger earlier and faster snow melt, resulting in more limited late-season water supplies.

USGS analyzes the mineral content of dust on the snowpack, and has more recently focused its research on the Wasatch Range in Utah. Milford Flats, south of the Wasatch Range, experienced a large wildfire in 2007 and is now one of the best-documented dust sources in North America. After the fire, Utah land managers began rehabilitating the land to prevent erosion and improve forage for cattle grazing by seeding and applying herbicide. He also noted that dust from Milford Flats settling in the Wasatch Range actually comes from the treated part of the soil, not the remaining burned areas.

USGS's study of the mineral composition of the dust on the Wasatch Range revealed that particles contained both iron oxide minerals and carbonaceous material. The study found high levels of iron oxide in the Milford Flats area, and USGS believes that the carbonaceous material comes from industrial and transportation sources in the heavily populated area near the Wasatch Range. Reynolds explained the presence of both materials led to lower reflectance of solar energy by the snowpack. Hence, the dust is absorbing heat from **[\*461]** solar radiation and promoting snowmelt. As a result, USGS is currently working with the Bureau of Land Management to create dust risk maps.

Reynolds then discussed dust issues in ***Colorado***, where large dust events have occurred more frequently over the past decade. In ***Colorado***, dust moves from southern plateaus, northeast into the mountains. Reynolds identified numerous sources from which this dust may be coming. For instance, regional groundwater withdrawal, overgrazing, and increasing regional aridity may all contribute to the increased dust levels. Reynolds also pointed to Tolani Lake, a dried-up lake in Arizona, as a large contributor of dust. USGS is testing sediment from ***Colorado*** snowpack in an attempt to trace the largest contributors of dust in the state.

Reynolds ended his presentation by providing possible solutions to the increasing accumulation of dust on snowpack, such as stabilizing soil and sand dunes with perennial vegetation and maintaining high groundwater levels. Reynolds made clear that any solution is going take a lot of "will power, knowledge, resources, and collaboration."

Jenna Anderson

Rio Grande!

Steve Vandiver of the Rio Grande Water Conservation District moderated the Sixth General Session of the 2013 ***Colorado*** Water Congress Annual Convention, titled "Rio Grande!" The four panelists were Bill Paddock of Carlson, Hammond & Paddock, L.L.C.; Craig Cotton, ***Colorado*** Division Engineer from the Rio Grande Division; David Robbins of Hill & Robbins, P.C.; and a special appearance by the Rio Grande Reservoir Chief Engineer from the early 1900s, J.C. Ulrich (performed with a mustache and turn-of-the-century attire by ***Colorado*** Supreme Court Justice Gregory J. Hobbs, Jr.).

"Ulrich" took to the stage first, despite exceeding one hundred years of age many years ago, and recited a letter he wrote on October 27, 1905 to the Farmers Union Irrigation Company, which enlisted Ulrich to construct the Rio Grande Reservoir Dam. In the letter, Ulrich dismissed his prior reservations over dam construction and laid out his proposal for a composite structure comprised of dry rubble, clay, and earth. His subsequent letters illuminated his strict attention to detail over every activity related to the dam's construction. These letters dictated the proper number of tents required for labor crews, the number of axes and axe handles, and the appropriate dimensions and wood type for an engineer's drafting table. No detail was too minor to garner his attention. Ulrich concluded by expressing his concern over the lackluster quality of the contract laborers in a 1910 letter, but he eventually turned the troublesome contractors into a productive crew, as shown by the successful completion of the Rio Grande Reservoir.

Bill Paddock spoke next, and thoroughly discussed the history of the development of the Rio Grande Reservoir. Starting in the 1880s and 90s, and due to an international conflict between the US and Mexico over use of the Rio Grande, the US placed embargos on reservoir development on federal lands. In 1906, Mexico and the US signed a treaty that resolved many of the issues and lifted the embargos. Subsequent water use conflicts between ***Colorado***, **[\*462]** New Mexico, and Texas eventually emerged. The federal government revived the earlier embargos, pressuring the three states to enter into agreement to ensure adequate water allocation along the Rio Grande. Paddock noted that the consequences of these past embargos still affect the region today, as evidenced by the current limited storage capacity along the Rio Grande.

By 1939, Congress approved the Rio Grande Compact, which created a water credit and debt system for the three states, effectively placing a cap on their respective water use. Nevertheless, throughout the 1950s and 60s ***Colorado*** failed to meet its statutory obligations by running up a large debt under Compact provisions. In 1966, Texas and New Mexico sued ***Colorado*** to enforce the Compact. Under pressure to comply, ***Colorado*** began severely curtailing surface water rights in 1968, and with the 1985 spilling of Elephant Butte Reservoir, ***Colorado*** eventually absolved its water debt.

Craig Cotton spoke next and explained various parts of the administration of the Compact. The Compact requires delivery of water from two streams in ***Colorado***: the Rio Grande itself, and the Conejos ***River***, which is the Rio Grande's main tributary. Generally, ***Colorado*** must deliver twenty-seven to twenty-eight percent of the Rio Grande's 650,000 acre-foot average flow and thirty-eight percent of Canejos's 300,000 acre-foot average flow.

One important and challenging Compact condition requires projecting ***Colorado*** water needs each year before those needs actually arise. During periods of low flow, the Compact prioritizes ***Colorado***'s projections and reduces ***Colorado***'s delivery obligations. During periods of high flow, the Compact caps ***Colorado***'s water use near the projected use, and the state's delivery obligation increases. Cotton stated that, at periods of extremely high flow, the Compact requires ***Colorado*** to send one hundred percent of the excess water down to New Mexico and Texas. This often aggravates ***Colorado*** farmers because the State prohibits them from diverting substantial flows that pass right by their lands. Cotton mentioned that another challenge to Compact administration includes meeting endangered species guidelines. Congress designated certain stretches of the Rio Grande as "critical habitats," which presents the challenging task of retaining specific flows in difficult-to-reach regions.

David Robbins was the last panelist to speak and discussed two current legal issues surrounding groundwater. First, Robbins detailed the new governmental subdistricts of the Rio Grande Water Conservation District. The subdistricts are statutorily created entities tasked with analyzing and replacing flows to regions of low flow along the Rio Grande due to groundwater pumping.

[*Second*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T352-D6RV-H379-00000-00&context=1516831), Robbins discussed Texas's pending lawsuit, for which it is seeking a petition for certiorari by the US Supreme Court. Although the legal issue in that case directly involves Texas and New Mexico's well pumping adjacent to the Rio Grande, the lawsuit indirectly implicates ***Colorado*** because of its participation in the Rio Grande Compact. Robbins explained that the fundamental conflict arises from differing legal characterizations of groundwater use. Although ***Colorado*** law administers surface water and tributary groundwater as part of the same hydrological and legal regime, the Compact and other states treat these two water sources as separate. Texas, in particular, allows for unfettered groundwater pumping, and Robbins suggested that such unrestricted **[\*463]** water use is what instigated the present litigation. Robbins concluded by stressing that, if the Court grants certiorari, ***Colorado*** will be ready to defend its water interests.

Andy McFadden

What's On Our Plate for 2013?

Moderator Chris Treese of the ***Colorado*** ***River*** Water Conservation District introduced this session by describing the importance of planning for the future and considering changes happening throughout ***Colorado*** over the next year. This session included discussion of four separate topics: (i) the ***Colorado*** ***River*** Basin Water Supply and Demand Study; (ii) drought; (iii) Good Samaritan legislation; and (iv) the CWC's Public Trust Special Project.

***Colorado*** ***River*** Basin Study

Erin Wilson of the Wilson Water Group first discussed the key findings of the ***Colorado*** ***River*** Basin Water Supply and Demand Study ("Study"). The Study employed several different demand scenarios to obtain the best possible projection of future water use within the ***Colorado*** ***River*** Basin. The Study based its various demand scenarios on models such as Paleo-direct natural flow (tree-ring information) and projected climate models accounting for climate change.

Wilson further explained the Study does not institute any decisions itself, but provides the foundation for future decision-making on water infrastructure and supply projects. Wilson described the key indicators for identifying changes in ***Colorado***'s water supply in the ***Colorado*** ***River*** as flows at Lees Ferry and other critical locations, as well as demand signposts. Based on the results and data of the Study, Wilson recommended a number of steps for ***Colorado*** to take.

[*First*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T2X2-D6RV-H374-00000-00&context=1516831), ***Colorado*** should adopt a signpost approach outside of the modeling industry to respond to indicators in weather and streamflow conditions. For example, water planers can respond to certain set streamflow conditions with carefully planned drought response measures. Next, ***Colorado*** must develop methods to accurately represent supply and demand models. Wilson explained the Surface Water Supply Index ("SWSI") is a good model for basin-wide analysis; however, additional models should include cross-basin impacts. Finally, Wilson advocated for ***Colorado*** to support continued efforts to conduct water bank programs and desalination projects in the lower ***Colorado*** ***River*** Basin.

Wilson's discussion set forth the fundamental concepts contained in the Study and presented several key ideas for water managers to consider as steps to address the projected issues facing the future of water supply and demand in ***Colorado***.

Drought

The next panel on drought featured Stacey Chesney of Denver Water, Diane Johnson of the Eagle ***River*** Water and Sanitation District ("ERWSD"), **[\*464]** and Russ Sands of the City of Boulder. Each panelist discussed the impacts of drought on their respective municipal water providers, specifically focusing on the drought's impact on public relations and rate setting for water in 2013.

Chesney discussed three main takeaways from the drought of 2012. First, Chesney explained drought is a result of many different factors, and water planners should not become too focused on reservoir levels. In order to fully prepare for drought conditions, municipalities must always be on guard for signals of impending drought. Second, Chesney suggested that good customer relationships are key to responding to drought in a timely and meaningful way. Third, Chesney noted the most effective way to involve the public in combating drought is to offer tangible actions with achievable goals.

Next, Johnson spoke about her reactions to a very dry 2012 in the Vail Valley. Johnson explained that, because Vail Mountain is celebrating its fiftieth anniversary this year, it is a relatively young community with little experience with severe drought conditions. This inexperience presents difficulties for community members who are more likely to have reactionary behavior to drought conditions. However, Johnson and the ERWSD learned valuable lessons from the 2002 and 2012 droughts that will impact its planning for the future.

Finally, Russ Sands stated 2012 was the City of Boulder's first actual run-through of its new drought plan. After implementing the plan for the first time, the main question for those in his office was how to work successfully with customers.

The panel then responded to a number of questions. First, do voluntary restrictions work? Chesney responded that Denver Water's aggressive conservation plan after 2002 made it more reluctant to impose mandatory restrictions because of the success of the voluntary plan. She explained that, because so many customers were complying with voluntary restrictions, Denver Water did not want to impose additional mandatory restrictions. Sands disagreed, arguing voluntary restrictions do not work, especially when there is no robust notification and public knowledge plan in place. Johnson agreed with Sands, explaining that in the Vail Valley, ERWSD implemented mandatory restrictions, but also offered explanations to its customers as to why the restrictions were necessary. Johnson also shared that ERWSD labeled the mandatory restrictions "regulations" and reached out to the tourism industry to highlight that the regulations would not impact tourism in the Vail Valley.

Next, the panel responded to the question "what is in store for 2013?" Sands said indoor use continues to decline in Boulder and the City plans to continue and expand its partnership with the Center for Resource Conservation ("CRC"). The CRC provides indoor and outdoor water audits for Boulder residents and businesses. Boulder plans to empower the CRC to implement actual improvements and repairs in people's homes rather than simply providing recommendations. Chesney explained that Denver Water plans to continue using "normal" or "annual" summer water use regulations for its customers. Finally, Johnson stated that ERWSD will (i) continue to focus on outdoor and irrigation water uses; (ii) utilize a five-tiered rate system; and (iii) identify "excessive water users" within the district as targeted for water conservation measures.

**[\*465]** The panel concluded with the following question: "how do you keep peoples' attention if drought is the new normal?" Chesney assured the crowd that if water use affects people directly in their daily lives, they will pay attention. The key is for water managers to effectively communicate to the public the behavior changes needed to face a drought. Sands ended the discussion with the idea that drought mitigation is a long-term prospect: changing peoples' perception of normal water use and then internalizing the changes takes time.

Good Samaritan Legislation

Jimmy Hague, Legislative Assistant to Senator Mark Udall, next presented a legislative update from Washington, D.C. on recent administrative rulemakings that will impact ***Colorado*** in 2013. Senator Udall recently announced the US Environmental Protection Agency's ("EPA") "Good Samaritan" policy for cleanup of abandoned mine sites. Hague explained there is a great mining history in ***Colorado***, and thus cleanup of abandoned sites is very important to the state. In the past, liability issues surrounding the cleanup of these sites were a problem for parties involved with the sites due to the liability schemes of the Clean Water Act ("CWA") and Comprehensive Environmental Response, Compensation and Liability Act ("CERLA"). Hague explained that in 2007, the EPA put out a set of administrative "tools" for addressing liability for no-fault parties wishing to reclaim abandoned mine sites. However, parties still had lingering fears of unlimited liability under CERCLA and the CWA when they wished to reclaim contaminated sites. For example, many questioned whether building and leaving behind a water treatment facility would subject the party to long-term liability for the site.

Because of opposition in Congress, Senator Udall began seeking administrative solutions to these fears. Eventually, in December of 2012, the EPA and Senator Udall unveiled new regulations that amplify existing tools. The EPA's memo requires the "Good Samaritan" to enter into an agreement with the EPA to clean up the contaminated site. Unlike the previous tools, the EPA memo allows these agreements to exist for an unlimited duration. Additionally, if the Good Samaritan meets a five-part test, the EPA will exempt it from obtaining a CWA permit for any changes to water quality. Without legislation from Congress, Hague noted, the EPA memo can only ease, but not erase, the potential for civil liability. Hague urged the Convention attendees to investigate the Good Samaritan rules in more detail and hoped the regulations would make a difference for water quality in ***Colorado***.

Public Trust Special Project

In the final panel of the session, "What's On Our Plate for 2013," Doug Kemper of the ***Colorado*** Water Congress and Steve Leonhardt of Burns, Figa & Will, P.C. discussed the CWC's new Public Trust Special Project ("Special Project"). Kemper set the tone by explaining that drought and water demand issues are very important to the water industry, but not as serious a threat as the Public Trust Doctrine. The CWC has worked for nearly two decades opposing ballot proposals that would impose the Public Trust Doctrine on Colo **[\*466]** rado water rights and riparian landowners. Kemper noted that non-profit environmental organizations are not leading the Public Trust Doctrine movement in ***Colorado***, as they have in other states. Instead, Kemper identified Richard Hamilton and Phil Doe as the two individuals who have been the proponents and sponsors of the ballot initiatives throughout the last two decades. Kemper highlighted Doe's statement that "we will stay with this until we win."

In 2012, Hamilton and Doe submitted another Public Trust Doctrine ballot initiative that eventually fell short of the minimum signature requirement. Although every attempt by these individuals has failed to get an initiative on the ballot, Kemper stressed that there needs to be a more sustained opposition to these initiatives. Hamilton and Doe's determination and persistence suggest there will be future initiative submissions. Therefore, the CWC Board created the Special Project to provide permanent opposition to the initiatives. The Special Project strives to create more public outreach and to provide information about the potential negative effects of these initiatives on water rights holders within the state. The Special Project also serves as a forum for parties across the state to discuss important water issues.

Steve Leonhardt spoke next, explaining in further detail the potential effect of the Public Trust Doctrine ballot initiatives. The Public Trust Doctrine essentially imposes a duty on the state to administer water rights without encroaching on the public's right to water. The extent of this public right varies based on each state's interpretation of the Doctrine. California's Public Trust Doctrine (currently the most expansive state doctrine) includes fishing, navigation, and even environmental needs as public uses of water. Leonhardt explained the proposed initiative from 2012 would be stronger than the California version, because it would apply to all waters in ***Colorado***, not just "navigable" waters. The Special Project is still in its early stages, but more information is available at the newly revamped CWC webpage: [*www.cowatercongress.org*](HTTP://www.cowatercongress.org).

Joseph Norris

22()ND'] ANNUAL ROCKY MOUNTAIN LAND USE INSTITUTE CONFERENCE: LAND USE FOR A LIFETIME, CHANGING DEMOGRAPHICS AND SHIFTING PRIORITIES

Denver, ***Colorado*** March 8, 2013

Energy Production & Water Use: Preparing for a Drier Future

Alice Madden of the University of ***Colorado***, Denver moderated a discussion on water consumption planning in a drought environment at the Annual Rocky Mountain Land Use Institute Conference. She described an increase in populations across the West and charged the panelists with explaining how states could engage in water resource planning.

John Stulp, Director of the Interbasin Compact Committee and ***Colorado*** Special Policy Advisor to the Governor for Water, opened the discussion by describing water availability in ***Colorado*** and the state's planning process. Stulp explained ***Colorado*** is experiencing a significant drought, with the state in an arid D4 drought condition, which is the most severe level of drought as identi **[\*467]** fied by the US Department of Agriculture and their partners, who produce the Drought Monitor.

He further explained, because approximately eighty percent of ***Colorado***'s population lives on the eastern side of the state, and twenty percent of the population lives on the western side, the state diverts water from the west to the east. Further, ***Colorado*** must allow a specified amount of water to reach downstream states to comply with interstate water agreements. Stulp noted two out of every three gallons of water in ***Colorado*** go to out-of-state users. Yet these out-of-state users have never forced ***Colorado*** to curtail water rights in the ninety years since the enacting the interstate agreements. However, with climate change and extreme drought negatively affecting its water supplies, ***Colorado*** may have to curtail water rights. Stulp explained agriculture uses eighty-six percent of water in ***Colorado***, municipalities and industry use twelve percent, and self-supplied industrial users consume only two percent. Stulp further noted that between fourteen thousand and fifteen thousand acre-feet of water go toward hydraulic fracturing processes in ***Colorado***.

Stulp went on to give overview of the Interbasin Compact Committee Reports, which were based on the 2010 Statewide Water Supply Initiative. Even with proposed projects that may make additional water available to users, Stulp explained ***Colorado*** will nonetheless experience an annual 390,000 acre-foot shortfall. Stulp noted the ***Colorado*** Water Conservation Board ("CWCB") considered several water availability scenarios in preparing the reports. The CWCB's main recommendation was to minimize the effects of "buy and dry," where (generally municipal) water purchasers obtain water supplies from agricultural users and "dry out" that land. CWCB also recommended increased conservation efforts, while maintaining non-consumptive water allocations for tourism and recreation.

Kristen Averyt, Associate Director for Science at the Cooperative Institute for Research in Environmental Sciences ("CIRES"), spoke next. Her presentation concerned the energy-water nexus and specifically focused on electricity generation and water use. Averyt noted, in the United States, generating electricity accounts for forty one percent of all water withdrawals. Industry withdraws the water primarily to run and cool power plants. Averyt explained the electricity sector is the only energy sector where water needs are actually growing nationally and internationally.

Notably, thirteen percent of energy produced in the US is used to clean, convey, and pump water. In California, water-related energy uses consume about twenty percent of the electricity supply. These water-related uses consume much of the energy by moving, conveying, and storing water. Averyt then explained power plants are the primary contributor to thermal pollution in the country. Additionally, in some areas, electricity withdrawals account for more than ninety percent of all water withdrawals in the municipality. In the Lower ***Colorado*** and Rio Grande regions, power plants primarily use groundwater and recycled water, due to the scarcity of surface water.

Averyt further noted water availability from the ***Colorado*** ***River*** is expected to decline by ten to fifteen percent over the next forty years. Averyt projected a twenty to thirty percent increase in water stress, based on current power plant demand for water, and electricity generation is vulnerable to water **[\*468]** shortage. Last, Averyt presented research on how low-carbon energy production impacts water use. She explained that producing energy under a carbon budget might mean a 1.5-2 million acre-foot increase in the monthly average volume of water available for storage in Lakes Mead and Powell. At the current coal-to-natural-gas-production ratios, Averyt projected a net decline of two million acre-feet in water available for storage in both Lakes over the next forty years. Averyt further noted low-carbon energy productions means states would preserve more water in groundwater aquifers.

Amelia Nuding, Water and Energy Analyst at Western Resource Advocates, next discussed managing energy and water during drought in the West. Specifically, she presented research on how power plants use energy during a drought. Nuding noted several of the challenges facing electricity generators include insufficient water resources, degraded water quality, and high water temperatures not suitable for power plant processes.

Nuding further highlighted case studies demonstrating how several states have reacted to drought. In one case study, Texas risked losing roughly 3,000 megawatts of electricity due to lack of water. Texas responded by bringing power plants back online to supplement the existing energy supply. Texas also had to curtail 1,200 water rights to manage the problem (primarily senior agricultural rights).

Nuding then presented additional research focusing on the impact of drought in the West on power generation mixes. The study postulated that, due to the drought, coal production will decrease; natural gas production will increase; hydroelectric production will decrease; renewable energy production will stay the same; electricity prices will increase; and carbon dioxide emissions will increase, primarily due to the drop in hydroelectric power.

Nuding also outlined a three-fold approach to dealing with a drought environment: (i) utilities need to share more information on water use and water intensity with their respective states; (ii) communities need to realize the value of water and the opportunity costs of using water; and (iii) society must recognize the risk of drought and the impact drought has on energy production. Nuding concluded by noting most energy companies and water commissions run their water conservation programs independently. She argued, because there may be opportunities for synergies in combining water conservation efforts, utilities and water commissions should integrate their conservation programs.

The panelists concluded by acknowledging that, as population increases, the need for energy increases. Therefore, communities need to find more efficient ways to use water in the production of energy.

Alex Bayee Besong

Planning for Extreme Drought: How Communities Are Thinking About and Planning for Extreme Drought

The recent drought conditions throughout much of the West have forced some local and state officials toward the cutting edge of planning and adapting to extreme drought. Water resource management in extreme drought has significant implications to municipal, industrial, and agricultural water and land **[\*469]** uses. Many ***Colorado*** municipalities are proactively developing water resource management programs, like the Water Infrastructure and Supply Efficiency project ("WISE"), to ensure their constituents will have the water they need. Alex Davis, Principal of GBSM, a Denver-based consulting and public affairs firm, and Eric Hecox, Executive Director of South Metro Water Authority, which is based in Greenwood Village, ***Colorado***, jointly focused their presentation on how communities think about and plan for extreme drought.

Alex Davis first presented a brief background on Western water law before talking specifically about the prior appropriation doctrine. Davis argued that, while the doctrine of prior appropriation has worked well in the West for the first century of its existence, it is now a problem. Specifically, Davis contended that the prior appropriation system is the single most overarching problem in the West inhibiting efficient planning for the next century, and meaningful solutions to our generation's complex water problems. Today, Davis argued, planning is ad hoc and splintered, thereby driving the decision-making processes down to the smallest entity. Then, each entity is pitted against every other water user in the basin or state. In other words, prior appropriation sets municipalities against municipalities; energy users against farmers; and other water users against one another.

Davis then noted the West is full of competing uses for a severely limited water supply. Currently, water supplies do not meet water demands in ***Colorado***. The Western Slope provides eighty percent of the state's water, but only twenty percent of the population resides there; conversely, the Front Range has twenty percent of the water, but eighty percent of the population. On ***rivers*** like the South Platte, the general calling date is between 1865 and 1869. Therefore, Davis contended, the South Platte ***River*** has been over-allocated for more than one hundred years. Many other basins are also already over-allocated, so she posed the question of how we are supposed to plan for population increases in the future.

Davis explained that Planners project ***Colorado***'s population will double by 2050, increasing to five million people or more. Further, eighty percent of this population will live on the Front Range, resulting in increased demands on agriculture, energy, food, and the environment. When individuals on average use one hundred gallons of water per day to supply basic needs, five hundred gallons of water per day in food, and five hundred gallons per day in energy, communities and water planners must think holistically when it comes to conservation.

Davis said one major challenge for Planners is climate change, because scientists do not yet know how it will impact water availability. Likely climate change impacts include the potential for temperatures rising 2.5 to four degrees; a five to twenty percent reduction in water availability; and ***Colorado*** could see reduced snowpack, but also more intense rainstorms and earlier spring runoff. In short, water supply planning will become more complex.

Davis concluded by suggesting the best solutions are local in nature. There is no way the federal government can determine the best solution for the St. Vrain ***River***, for example, as the nuances of the local governments, communities, and attitudes differ greatly on the local level. In other words, Davis contended the phrase "think globally and act locally" applies to water planning. **[\*470]** Davis stated that while she did not have all of the answers to the problems, communities must think about how planners create the structures to promote regional collaboration, thinking, and solutions.

Eric Hecox spoke next, describing specific local decisions that attempted to drought-proof ***Colorado*** municipalities along the Front Range. Hecox first described the South Metro Water Supply Authority ("SMWSA"), a membership organization of fifteen water providers in the South Metro area of Denver. These entities are normally pitted against each other, but are bound together by one need - all of these entities rely on the groundwater supply in a declining aquifer. That reality forced them to come together to develop alternatives, as they need the economies of scale to make water projects financially viable. SMWSA developed regional renewable water projects to use the Denver Basin Aquifer. While using the aquifer as a base supply remains a liability, it gives the region a competitive advantage against the state.

Hecox explained that, in 2002, water planning changed for many communities in ***Colorado***. The 2002 drought year was the single worst drought on record in the state until last year (2012). The 2002 drought was a wake-up call for many state water providers. The City of Aurora was one of the hardest hit cities because it has a junior water right. Aurora implemented extreme drought restrictions, and was within months of running out of water before a late spring blizzard occurred. The drought scared Aurora into developing the Prairie Waters Project downstream of the Denver Metro Wastewater Plant. Essentially, the Prairie Waters Project became a very large reuse project with a capacity of 10,000 acre-feet per year, expandable to 50,000 acre-feet with additional infrastructure. The project includes a thirty-four mile pipeline with three pump stations, and a multi-barrier state-of-the-art treatment process. In total, the Prairie Waters Project's infrastructure cost eight hundred million dollars. Despite the cost, Aurora conceived, planned, and built the Prairie Waters Project in less than ten years.

Hecox then explained the Prairie Waters Project created a WISE Partnership between the cities of Denver, Aurora, and the SMWSA. WISE creates a secondary water supply system to mitigate droughts for the Front Range. Aurora also incorporated a cost-sharing mechanism into the expensive project. SMWSA also benefits from a renewable water supply. This WISE Partnership impacts over two million people.

In addition to the local partnership benefits, Hecox believes the WISE Partnership also has regional benefits. Denver, Aurora, and SMWSA are in a partnership. This project builds regional cooperation and recognizes the complex relationships that exist within the Region. Further, this opens the door to regional cooperation and provides a sustainable supply to SMWSA without compromising Aurora or Denver's water supplies. Through this project, several of the largest cities in ***Colorado*** hope to better cope with future drought.

In sum, as continued drought and lack of water plagues agriculture, municipalities, and the energy industry, local water entities are becoming increasingly aware of their need to plan for the future. By following the example of the WISE Partnership, perhaps other communities can also work together to overcome the biggest challenge - facilitating cooperation among many disparate **[\*471]** water users to solve the complex problems of water resource management.

Amy Wegner Kho

The ***Colorado*** ***River***: Intergovernmental Agreements

As part of its three-day annual conference, the Rocky Mountain Land Use Institute hosted a discussion on recent developments in ***Colorado*** ***River*** use. The discussion focused on the unique and sometimes competing land use interests in ***Colorado*** that can pit interests on one side of the Continental Divide against interests on the other side.

"The ***Colorado*** ***River***: Intergovernmental Agreements" specifically focused on the 2011 ***Colorado*** ***River*** Cooperative Agreement ("CRCA"), which brought together Western Slope and Front Range parties in an effort to settle ongoing conflicts and also consider cooperative conservation efforts. Eric Kuhn, General Manager of the ***Colorado*** ***River*** Water Conservation District ("CRWCD"), outlined the general Western Slope view. Covering fifteen counties, CRWCD is one of ***Colorado***'s four major conservation districts (their respective boundaries defined by a specific water basin). According to Kuhn, as the conservation district of the ***Colorado*** ***River*** Basin, CRWCD strives to conserve water in the basin, protect statewide interests, and promote responsible development on both sides of the Divide. Tom Gougeon, a member of Denver Water's five-person Board of Water Commissioners, joined Kuhn and represented the Front Range (and more specifically Denver) view.

Mr. Kuhn began by describing how land use policy inextricably links to water use and conservation. For the Western Slope, encouraging settlement and agricultural development requires extensive irrigation and access improvements. From at least the 1930s, the Bureau of Reclamation has played a vital role in creating more arable land and encouraging agriculture on the Western Slope.

But as Western Slope irrigation projects took shape and grew under the auspices of the Bureau of Reclamation, Denver continued to grow and strain its own water supply from the South Platte system. Denver and the Front Range had similar goals in agriculture and irrigation as the Western Slope, but Denver's large population growth forced the city to look beyond the South Platte to supply its residents. As a solution, Denver turned to the ***Colorado*** ***River*** Basin and constructed transbasin water infrastructure to supply the burgeoning Denver population.

The decision to turn to the ***Colorado*** ***River*** was predictable: 80% of the state's population lives along the Front Range, but about 80% of the state's water flows west and away from Denver by the ***Colorado*** ***River*** and its tributaries. As Kuhn noted, major projects bringing Western Slope water to the Front Range, including the Moffatt System on the Fraser ***River*** and Dillon Reservoir on the Blue ***River***, pull water from headwater streams. Kuhn also explained that projects on the Fraser ***River*** and the Blue ***River*** are just "one pass" from the Front Range (Berthoud and Loveland Passes, respectively) making them Denver's most accessible options.

**[\*472]** As these projects came on line, Kuhn explained, disputes arose between the two interests, and they pumped untold amounts of money into litigation. For example, determining the priorities of the ***Colorado***-Big Thompson Project, which supplies the Front Range, and Green Mountain Reservoir, which supplies Western Slope communities, proved arduous and expensive. The Blue ***River*** Decree attempted to resolve these and other conflicts, but has itself become the subject of litigation and dispute since its inception in 1955.

After the drought years of 2002-2003, Denver sought to improve the Moffatt System and increase the capacity of Gross Reservoir, and applied for permits to do so. In response, CRWCD and other Western Slope entities wanted to create an agreement to facilitate the resolution of disputes and set out a more cooperative relationship over ***Colorado*** ***River*** use. The CRCA negotiations were completed in 2011. CRWCD, Denver Water, and many Western Slope constituencies have signed the agreement.

As Kuhn explained, the most important goals for CRWCD and the other Western Slope signatories were to protect streamflows, secure water for consumptive use in the Western Slope's agricultural and recreational economies, encourage smarter growth and irrigation practices, and implement better Front Range conservation and reuse. To CRWCD, the CRCA works to achieve each of those goals by, for example, defining the specific service area of Denver Water, supplying more water for more diverse uses in Summit and Grand Counties, implementing Denver's "WISE" reuse project (discussed below), and allowing new Denver Water development only with the consent of impacted Western Slope signatories. Each of these provisions contributes to water conservation and a more cooperative environment, allowing the two sides to work together to tackle future challenges. As Kuhn stated, the CRCA recognizes Denver and the Western Slope have interconnected economies and with that both sides need to recognize the same connection in water policies.

After Kuhn's outline of the CRCA and its effect on Western Slope signatories, Denver Water's Tom Gougeon spoke about the agreement's impact on Denver and the Front Range. Summarizing the century-long development Denver Water's system and its utilization of the South Platte, Blue, and Fraser ***Rivers***, Gougeon asserted Denver Water's system remains reliable and robust, providing high-quality water to over 1.3 million people in Denver and surrounding areas.

Gougeon noted Denver Water has diligently pursued conservation efforts by metering use and instilling a culture of conservation in its customers. In fact, Gougeon offered, despite significant population growth, Denver Water has reduced demand by 20-25% since 2005. But as Gougeon explained, these improvements to the system and to conservation efforts have not tempered the need to ensure reliable supply in an increasingly unpredictable hydrological climate. The old view that ***rivers*** provide a "firm yield" year-to-year no longer accurately describes the situation confronting water providers. Future supply is not as easily calculable as once believed, which means conservation and reuse are more important than ever to prepare for dry years. New challenges like increased fire danger, terrorism, and possible ***Colorado*** ***River*** Compact calls do not simplify the picture either.

**[\*473]** To Denver Water, entering into the CRCA was a way to tackle numerous goals at once and replace historical conflict with cooperation. Above all, the CRCA helped to create more certainty in supply and in the ability to cooperate with the Western Slope on new projects and conservation. As Gougeon observed, fighting over the interpretation of the Blue ***River*** Decree did not help either party. By settling points of contention, both sides can instead focus on more pressing issues of conservation and vulnerability of supply.

Denver Water, for example, abandoned long-held conditional water rights in Eagle County because it was unlikely to ever make those rights absolute. In truth, continued retention of those priorities only aggravated relations with Western Slope communities. CRWCD likewise abandoned similar rights that it perfected in the 1950s and 1960s but never put to development or use. This new cooperative mindset, Gougeon believes, created a "holistic approach" that is better suited than litigation for actually resolving sticking points between the Western Slope and Front Range to the benefit of all ***Colorado*** ***River*** users.

Two specific accomplishments of the CRCA serve Denver's interests. First, Gougeon said, making progress on the Gross Reservoir expansion was essential to Denver Water to strengthen the relatively weak northern end of its system. Second, WISE would also serve to conserve more water and relieve some of the stress upon Denver's system in the present and future. As Gougeon explained, WISE came out of a realization that, eventually, many residents in Douglas County and other areas southeast of Denver will face supply problems and will turn to Denver Water for relief. Because many residents of Douglas County rely upon a decentralized system of groundwater wells, any depletion in supply cannot easily be resolved without outside help. Instead of taking on those customers directly, Denver Water preferred to reuse some of its reusable effluent through the WISE project to supply those areas.

Kuhn and Gougeon agreed the CRCA embodies a "new way of doing business." The CRCA will help to secure reliable water supply for all Coloradoans along the Front Range and throughout the ***Colorado*** ***River*** Basin. It will also work to ensure more environmentally sound water systems and more productive political relationships across the Continental Divide.

Overall, the discussion was effective in helping to describe the competing interests in ***Colorado*** for access to ***Colorado*** ***River*** water. Kuhn and Gougeon's comprehensive account of the various challenges each faces in their respective roles, and in implementing the CRCA, left out no detail. The discussion further provided a good look into the future of cooperation between their respective organizations.

William Davis Wert **[\*474]**

UNIVERSITY OF DENVER WATER LAW REVIEW SIXTH ANNUAL SYMPOSIUM 2013: ADDRESSING SUPPLY <AMP> DEMAND IMBALANCES IN THE ***COLORADO*** ***RIVER*** BASIN

Denver, ***Colorado*** April 12, 2013

Challenges of the Future in the ***Colorado*** ***River*** Basin

Anne Castle, Assistant Secretary for Water and Science at the US Department of the Interior, opened the Water Law Review's Annual Spring Symposium with a keynote address. Castle's comments focused on future challenges in the severely endangered ***Colorado*** ***River*** Basin ("Basin") and the importance of operational flexibility in managing the Basin. She emphasized that strategic collaboration between governments, people, and nations can achieve the flexibility required to ensure the future viability of the Basin. In her keynote address, Castle discussed four projects involving the management and conservation of the Basin: (i) the ***Colorado*** ***River*** Supply and Demand Study ("Study"); (ii) Minute 319 interpreting the 1944 US-Mexico Treaty for the Utilization of Waters of the ***Colorado*** and Tijuana ***Rivers*** and of the Rio Grande ("Water Treaty"); (iii) Navajo Generating Station; and (iv) Glen Canyon Dam.

The Study evaluated existing infrastructure and supply and demand imbalances in the Basin as part of a broader Basin-wide study program. Additionally, the Study attempted to develop strategies for projecting future imbalances. The cooperation and partnership of the federal government, seven Basin States, ten Basin Native American tribes, and multiple governmental and non-governmental organizations was essential for the completion of this three-year-long comprehensive Study (completed in January 2013). The Study confirmed that, with rapidly increasing water demands, environmental needs, and continuous droughts, the Basin's water supply remains at least static, and is possibly declining.

Having established a common technical foundation model, the Study offered an opportunity for thoughtful discussion through an open comment process, resulting in approximately 150 suggestions from the general public on ways to address the supply and demand imbalance in the Basin. Wrapping up her discussion of the Study, Castle suggested that, although the Study still needs to refine some areas and reduce uncertainties, the Study is "smart," very detailed, should serve as a model for the future, and should serve as a tool for educating the public about the Basin. She added that only broad support and collaborative efforts support concrete methods advancing the common goal: providing a healthy ***river*** to future generations.

The second Basin management development Castle discussed was Minute 319, which interprets the Water Treaty. The Water Treaty regulates the US and Mexico's utilization of waters of the ***Colorado*** ***River*** across international boundaries. Pursuant to Minute 319, Mexico and the US must share water shortages as well as water surpluses. Prior to Minute 319, the two countries **[\*475]** shared water shortages only. Sharing surpluses allows for more reliability and predictability of the ***Colorado*** ***River***'s water supply in both the US and Mexico.

Minute 319 also extended Minute 318 by allowing Mexico to defer its water rights and store its ***Colorado*** ***River*** allotment in Lake Mead without losing its rights to the allotment. Such deferred delivery benefits both countries. On the one hand, it enhances Mexico's water security and storage capacity. On the other hand, it increases the water levels of Lake Mead, ensuring predictable water storage levels for Lower Basin States. Another important provision of Minute 319 authorized establishment of an Intentionally Created Mexican Allocation, which enabled Mexico to adjust its water delivery schedule to allow for later use.

Minute 319 further created a pilot program to provide water for planned environmental flows and a one-time high-volume pulse flow for the ***Colorado*** ***River*** Delta. The goal of this pilot program is to create new wetland habitat in the Delta and establish a foundation for future restoration projects. Castle emphasized that such productive collaboration between Mexico and the US is especially remarkable in light of the fact that US states often fail to cooperate with each other, not to mention another country, when it comes to water allocation. Castle called Minute 319 a "breakthrough" and a historical example of cooperation between the governments of the US and Mexico, seven US states, the International Boundary and Water Commission, and many non-governmental organizations.

Moving on to her third topic, Castle discussed the Navajo Generating Station ("NGS"). The need for additional energy generation in the Southwest became apparent in the 1960s. However, the initial suggestion to build two hydroelectric dams did not survive vigorous opposition from the National Park Service and environmental groups. Taking the dams' place is NGS, a 2250-megawatt coal-fired power plant on land on the Navajo Indian Reservation in Arizona. NGS has become an important energy, income, and employment source for the region and the Navajo Tribe.

NGS-generated energy serves many purposes, including pumping ***Colorado*** ***River*** water for Arizona, Nevada, and California. Revenues from selling energy surplus and mining coal on Reservation lands belong to the member Native American Tribes with NGS also serving as a significant source of employment. However, the power plant also contributes to the notorious haze in the area. NOx emissions have become increasingly concerning in light of NGS's proximity to three wilderness parks, a national park, and several Native American Tribes. There is concern that high levels of NOx emissions will negatively affect the tourism industry, which has historically generated substantial revenue for the area as well.

Castle discussed the Glen Canyon Dam ("Dam") as her final keynote address topic. The Dam is a physical dividing point between Upper and Lower Basin water supplies on the ***Colorado*** ***River***. Basin restoration efforts involving the Dam include releasing water from the Dam and stimulating historically natural seasonal floods. In the past, for each such release, the Bureau of Reclamation was required to complete an individual environmental impact statement ("EIS"). The process often resulted in irreversible delays, where water releases would not occur during optimal natural conditions. Recently, the Bureau **[\*476]** of Reclamation received approval of a programmatic EIS, which lists conditions when water releases are permissible. This change allows for flexibility and an ability to operate the Basin restoration program seamlessly.

Following the programmatic EIS, the Department of the Interior initiated the first high-volume release in November 2012, with more similar releases on the way. The goal of these releases is to study whether repeated high-volume water releases can stimulate natural conditions, retain sediment, and stop extensive erosion in the Basin. In addition, the Department of the Interior and approximately twenty cooperating agencies are currently working on the Long-Term Experimental and Management Plan for operation of the Dam. Castle noted that she expects the release of the initial draft in early 2014.

In closing, Castle reiterated the scale of the problems the Basin is facing as a result of climate change, population growth, unquantified water rights for Native American Reservations, interests of competing industries, and environmental dilemmas. She praised the recognition that submitting Basin problems to the judiciary alone does not help to solve these problems - only mutual efforts and cooperation can lead the way to water sustainability and preserve the Basin for generations to come.

Natasha Schissler

Basin Study Overview with Reaction Panel and Q&A

The 2013 University of Denver Water Law Review Annual Symposium welcomed a panel that provided an overview of the comprehensive new ***Colorado*** ***River*** Basin Supply and Demand Study ("Study"). The Study, which was jointly funded by the US Bureau of Reclamation and seven ***Colorado*** ***River*** Basin states, projected supply and demand imbalances throughout the Upper and Lower ***Colorado*** ***River*** Basins over the next fifty years. The discussion panel was comprised of several of the water law and policy experts who helped prepare the Study and gave a broad spectrum of perspectives on the Study's findings and implications.

Carly Jerla of the US Bureau of Reclamation, representing the Federal perspective, began by giving a general synopsis of the Study and assessed changes in water supply and demand within the basin over the next fifty-years. The Study's authors compiled these projections to see how the entire ***Colorado*** ***River*** Basin is likely to perform under a wide range of projected future conditions, with scenarios ranging from the current status quo to one based on a worst-case projection of the effects of climate change. The final phase of the Study identified several portfolios of strategies for dealing with projected supply and demand imbalances. While many of the potential solutions are likely to be partially effective, Jerla stressed that no one single option will completely eliminate the risks associated with increased demand and dwindling supply in the Basin.

The next speaker, Kay Brothers of the Southern Nevada Water Authority, gave a Lower Basin perspective on the Study. From Brothers' perspective, the Study highlighted the fact that Lower Basin municipalities will be unable to cope with projected supply and demand imbalances by relying solely on strategies designed to reduce demand. Brothers instead stressed the need to devel **[\*477]** op new sources of supply in the Lower Basin as soon as possible, including developing new desalination capabilities and supplies of imported water.

The third speaker, Ted Kowalski of the ***Colorado*** Water Conservation Board, represented the State of ***Colorado***'s perspective. According to Kowalski, because most of the big trans-mountain diversions to the Front Range are post-***Colorado*** ***River*** Compact water rights, the Front Range must begin looking for ways to avoid curtailment of these rights in the case of a Lee Ferry Deficit. From this perspective, water banking in the Upper Basin is vital to avoiding or surviving a Compact curtailment. Dave Kanzer, providing a Western Slope perspective of the ***Colorado*** ***River*** Water Conservation District, likewise emphasized water banking as a key tool for avoiding a deficit at Lee's Ferry in the next fifty years.

Marc Waage from Denver Water then presented Denver Water's perspective. Placing heavy emphasis on the uncertainty of the science behind the Basin Study, Waage pointed to Lower Basin shortage problems as the most pressing problem facing the ***Colorado*** Basin as a whole, as well as the need for all of the Basin stakeholders to work together to solve common problems. Waage made it clear, however, that Lower Basin shortages should not keep the Upper Basin from developing its own allocation of ***Colorado*** ***River*** water.

The final speaker on the panel, Taylor Hawes of the Nature Conservancy, provided an environmental perspective on the Study. Though she generally had praise for the Study, Hawes criticized it for not considering the current health of the ***river*** ecosystem and its associated species. This failure, she contended, will inevitably lead to further degradation and, importantly, further endangered species listings within the Basin. This will in turn generate greater conflict among ***Colorado*** Basin stakeholders while decreasing flexibility to cope with future imbalances. These criticisms aside, Hawes echoed the general sentiment among the panelists that the Study represents an important first step in confronting the challenges facing the ***Colorado*** ***River*** Basin over the next fifty years.

Nathanial Brown

International Water Law: The United States and Mexico

The Symposium's second panel discussion focused on the international legal regime governing the allocation of ***Colorado*** ***River*** water between the United States and Mexico. Specifically, the panelists focused on the 1944 Mexican-American Treaty ("1944 Treaty") and the recent amendment to the 1944 Treaty, Minute 319.

The first panelist was Edward Drusina, the US Commissioner of the International Boundary and Water Commission (IBWC). The IBWC is the intergovernmental agency charged with implementing all the boundary and water treaties between the United States and Mexico. The IBWC also settles differences in the application of those treaties. Most importantly, the 1944 Treaty charged the IBWC with administering the rights and obligations of the United States and Mexico regarding the waters of the ***Colorado*** ***River*** and the Rio Grande ***River***.

**[\*478]** The Commissioner began by giving a brief overview of the 1944 Treaty, the IBWC, its mission, and its history. He then gave a narrative overview of the joint cooperative process that culminated in the historic Minute 319, beginning with the 2007 joint statement by the US Secretary of the Interior and the Mexican Ambassador. This joint statement required the IBWC to begin working toward solutions to the growing tensions between Mexico and the United States regarding the boundary waters of the ***Colorado*** ***River*** Basin.

Minute 317 to the 1944 Treaty, signed in 2010, was the first major cooperative agreement following the 2007 joint statement. Minute 317 set the framework for the subsequent bilateral talks on the ***Colorado*** ***River*** Basin by formalizing international workgroups and noting topics for further study. Unfortunately, the 2010 earthquake in the Mexicali Valley in Mexico destroyed large sections of the water diversion infrastructure in the Valley and the surrounding area. Without emergency action on both sides, large amounts of Mexico's ***Colorado*** ***River*** allotment would have been lost. The parties reached an innovative and unprecedented solution allowing Mexico to store almost 230,000 acre-feet of its total 1.5 million acre-foot annual allotment in the United States' reservoir system. This allowed Mexico to postpone its ***Colorado*** ***River*** water deliveries until the completion of repairs to its delivery system was completed.

In order to give Mexico sufficient time to complete repairs, the United States and Mexico entered two years of negotiations to solidify the arrangement set out in Minute 318 and to begin dealing with other general issues facing the ***Colorado*** ***River*** Basin. Because of the nature of the water storage arrangement, however, Commissioner Drusina and his Mexican counterpart opted for only a five-year extension to Minute 318 as a way to ensure the arrangement would work in the parties' best interests.

Minute 319, signed in 2012, codified this extension to the Minute 318 storage arrangement and included several other provisions dealing with shortage sharing, surplus sharing, salinity concerns, water allocations for environmental programs, and a call for a $ 21 million investment in Mexico over the five-year cycle of Minute 319.

Following Commissioner Drusina was Karen Kwon, an Assistant Attorney General for the State of ***Colorado***. Kwon gave an overview of the states' roles in the international management of the ***Colorado*** ***River*** Basin and ways individual states have an impact on the diplomatic process. Most importantly, the ***Colorado*** ***River*** Basin States ("Basin States") have responsibilities under the 1944 Treaty to help keep the United States in compliance with its obligations to Mexico. The Basin States have also played a major role in furthering coordinated management of the Basin. For example, during the negotiations over Minute 319, the Basin State representatives made sure that the Lower Basin States did not benefit at the expense of the Upper Basin States, and vice versa.

The final panelist, Peter Culp of international firm Squire Sanders, first gave a brief description of how holders of Mexican water rights utilize ***Colorado*** ***River*** water. The vast majority of Mexico's allotment of ***Colorado*** ***River*** water goes to agricultural uses, with the rest diverted mainly for use by municipalities. According to Culp, nearly three million people rely on this water supply. Because the Mexicali region lies downstream from every American farm **[\*479]** and municipality in the Basin, salinity and other chemical imbalances are a major problem for water users in northern Mexico. Minute 319 begins to address this problem.

Culp then laid out the environmental implications of Minute 319 for the ***Colorado*** ***River*** Delta ecosystem. Since the turn of the last century, the Delta shrank dramatically to the point where the Delta ecosystem had been declared effectively dead by the 1970s. A large flood in the early 1980s actually reversed some of the degradation, which in turn spurred efforts to restore the Delta. Culp, however, was quick to point out that the proponents of these efforts are not attempting to restore the Delta to its historic maximum. Instead, these efforts, which Minute 319 funds in part, will restore only a relatively small, perennial riparian ecosystem within the limits of the historic Delta. In addition to funding restoration efforts, Minute 319 storage arrangements between the United States and Mexico will allow Mexico to store and release water in a manner that will best facilitate restoration of the Delta.

Nathanial Brown

Climate Change's Effect on Supply and Demand in the Upper Basin

The afternoon keynote speaker, Brad Udall, Director of the newly named Getches-Wilkinson Center for Natural Resources, Energy, and the Environment at the University of ***Colorado***, spoke on the role of climate change in water policy and its effects on supply and demand in the ***Colorado*** ***River*** Basin. Udall was also the lead author of the Water Sector chapter on Global Climate Change Impacts in the United States Report and the Western Water Assessment of Climate Change in the ***Colorado*** Report.

Udall began his keynote address by outlining the basics of the water cycle and the role climate change plays in the water cycle. Udall explained the water cycle is the mechanism the earth uses to move heat from hot areas to cooler areas. A warmer climate leads to more water vapor in the atmosphere and therefore a warmer climate generally translates to more evaporation and precipitation on a global basis (but he also noted regional imbalances will also occur). Udall explained that, as the climate warms, wet places will become wetter, and dry places will become drier.

Next, Udall spoke on the impact of Hadley cells. Hadley cells develop when evaporation at the equator rises into the atmosphere and moves toward the poles. In the subtropics, evaporated water cools and sinks, creating a return flow back towards the equator. Hadley cells fuel the growth of the world's major deserts around the subtropical latitudes at thirty degrees north and south of the equator. Udall believes Hadley cells will proliferate because of climate change, and, as a result, the world's major deserts will continue to grow in size.

Udall then explored climate change's impact on the water supply of the ***Colorado*** ***River***. Udall focused on the recently completed ***Colorado*** ***River*** Basin Supply and Demand Study, which projected various potential scenarios for future flows at Lee's Ferry. The models in the Basin Study took several aspects of climate change into consideration. In seventy-five percent of the **[\*480]** various fifty-year models in the Basin Study, the projected flows at Lee's Ferry declined. The median result of the models projected Lee's Ferry flows would drop nine percent by 2060, with climate change as one of the contributing factors.

Udall then addressed allocation, overuse, and reservoir problems. According to the models he presented, on average, by 2060, there would be a four percent annual increase in demand on reservoirs in the ***Colorado*** ***River*** Basin due to climate change. Notably, these models did not include the increase in energy demand resulting from population growth in the Basin. Lake Mead, which stores water to be provided to the Lower Basin, currently has a net deficit of 1.4 million acre-feet per year. Currently, the Lower Basin covers this deficit with unused Upper Basin flows. The Lower Basin will be forced to address this deficit as water demands in the Upper Basin increase and those unused flows are used. Udall noted as demand in the Upper Basin increases, there will likely be Compact calls and additional shortages.

Finally, Udall addressed the level of uncertainty involved in science and climate change policy. Udall contended a lack of certainty does not provide grounds for taking no action. Scientists can only calibrate global climate models somewhat imprecisely because the time horizon on these models is usually one hundred years into the future. Udall emphasized possible futures exist outside the models and there is no rational way to rank the myriad of models in use. Udall, however, still argued for taking action to combat climate change. He also stressed the high level of uncertainty involved when scientists reduce a global climate model to a specific region. Ultimately, Udall stated he hopes to better integrate the efforts of the scientists producing the models with the decision-makers using them, because the models, though imprecise, provide a good starting point for discourse in the climate change forum.

Gerard Deffenbaugh

Age of Limits in ***Colorado***, and How Do We Recognize Them in Developing a State Water Plan?

John Stulp, Special Policy Advisor to the Governor on Water and Chairman of ***Colorado***'s Inter-basin Compact Committee, moderated a panel on the limits of ***Colorado***'s water supply and how future water supply projects and legislation may manage those limits. Panelists shared Western Slope and Front Range perspectives on ***Colorado***'s water supplies and the need to balance the development of new supply projects with flows for environmental and recreational purposes. The panel also examined the viability of agricultural water transfers to meet growing municipal water demands. The panel consisted of Eric Kuhn of the ***Colorado*** ***River*** Water Conservation District; Marc Waage of Denver Water; David Taussig of White & Jankowski, LLP; and Peter Nichols of Berg, Hill, Greenleaf, & Ruscitti, LLP.

Eric Kuhn was the first to deliver his presentation on "Augmenting Supply in ***Colorado***: How Much Water Is Left to Develop in ***Colorado***?" Mr. Kuhn discussed the uncertainty in new water projects regarding the future supply and demand of water in the ***Colorado*** ***River*** Basin. Kuhn identified three primary sources of uncertainty: (i) future hydrology; (ii) future demands; and (iii) existing **[\*481]** compacts, such as the ***Colorado*** ***River*** Compact of 1922 and Upper ***Colorado*** ***River*** Basin Compact of 1948, which impose uncertain legal constraints. Mr. Kuhn also identified three strategies to reduce risks and uncertainties for future water projects, which he recognized are both politically and practically difficult to implement: (i) limit new consumptive use to times when the system storage is full; (ii) use water banks; and (iii) implement improvements to current and future storage.

Next, Marc Waage responded to Kuhn's presentation. Waage started with the principle that there is no unused water in the state that the people of ***Colorado*** can use without consequences. Mr. Waage then outlined the conservation measures Denver Water currently employs to make the most of its water resources. Waage noted Denver is reaching the limits of what behavior-oriented conservation mechanisms can achieve in terms of producing additional water supply for the Front Range. Waage completed his presentation with the argument that small projects are very important for the future viability of the state's water delivery systems. He then listed four key thing that will promote the effectiveness of these small projects: (i) giving water utilities support for conservation measures; (ii) flexibility in water laws to allow for increased sharing of water resources; (iii) streamlining water project approvals; and (iv) enabling future development of ***Colorado*** water.

David Taussig then presented on "Challenges and Opportunities in Protecting Non-Consumptive Uses in an Ecologically Limited ***River*** System Like the ***Colorado*** ***River*** and its Tributaries in Grand County." Mr. Taussig listed numerous challenges to protecting the water resource of Grand County. Specifically, he mentioned the need to improve the water clarity of Grand Lake; reduce sedimentation in Grand Lake and the ***Colorado*** ***River***; and ensure water flows are adequate to keep water temperatures at or below standard levels. Mr. Taussig also identified the following opportunities to protect the water resources of Grand County: (i) increase limits on future diversions from the ***Colorado*** and Fraser ***Rivers***; (ii) require Grand County's and the ***Colorado*** ***River*** District's approval for all future projects; (iii) adhere to the 2008 ***Colorado*** Water Quality Control Commission's narrative standard on water quality; and (iv) require flushing flows of up to 1,200 cfs below Windy Gap. Mr. Taussig was confident that implementing the initiatives he listed would help alleviate current challenges and protect the ***Colorado*** ***River*** and its tributaries in Grand County.

Last, Peter Nichols presented "The Future of Transfer From Agricultural to Municipal Use: Changing ***Colorado*** Legislation to Allow for More Flexible Water Leases." Mr. Nichols outlined six pieces of existing and future ***Colorado*** legislation allowing for temporary transfers of water rights from agricultural uses to municipal uses. The various pieces of legislation Mr. Nichols discussed would limit the majority of transfers to periods of three to ten years, contingent on the requirement that no injury would result to existing water rights holders, and also subject to the State Engineer's approval. Mr. Nichols completed his presentation by asserting water leases are an essential element of state water policy, and we need to devote more attention to whether they will be effective tools for alleviating future water shortages.

**[\*482]** Mr. Kuhn, Mr. Waage, Mr. Taussig, and Mr. Nichols therefore presented on a variety of issues, challenges, and opportunities to be drawn from the inherent limits on ***Colorado***'s water supply, and which should be addressed in the development of a state water plan. All panelists were optimistic that a well-conceived state water plan could ensure a water supply for ***Colorado***'s future generations.

Christopher H. Butler

Securing the Moffat Supply System: Weighing the Costs and Benefits of the Gross Reservoir Expansion, and Project Alternatives

Rebecca Mitchell of the ***Colorado*** Water Conservation Board moderated a panel discussion titled "Securing the Moffat Supply System: Weighing the Costs and Benefits of the Gross Reservoir Expansion, and Project Alternatives." Panelists shared Western Slope and Front Range perspectives on Denver Water's Moffat Collection System project and the accompanying expansion of the Gross Reservoir. The panel consisted of Charles Howe, Professor Emeritus in Economics at the University of ***Colorado***; Barbara Green of Sullivan, Green, and Seavy, LLC; Amelia Whiting of Trout Unlimited; and Travis Bray of Denver Water.

The panel discussion began with an overview of Denver Water's Moffat Collection System. The existing Moffat supply system diverts water from the Fraser ***River*** through the Moffat Tunnel to South Boulder Creek. South Boulder Creek then flows into Gross Reservoir and the Gross Reservoir Dam releases water into the South Boulder Creek. The South Boulder Diversion Canal then diverts water from the South Boulder Creek to the Ralston Reservoir. The Ralston Reservoir ultimately provides water to Denver Water's Moffat Treatment Plant. Denver Water estimates an 18,000 acre-foot shortage of water in the coming decades. To meet this demand, Denver Water proposed expanding Gross Reservoir to hold an additional 76,000 acre-feet of water. This project would increase the dam's height from 340 feet to 465 feet. Notably, the Moffat system would not divert the additional water in dry years.

Charles Howe was the first to present on "The Economics of High Volume Interbasin Water Transfers." Professor Howe detailed the history of large interbasin transfers in ***Colorado***. He explained the secondary economic and social impacts of interbasin transfers are important considerations and large water transfers out of depressed regions can result in severe regional economic and social disadvantages. He emphasized large transfers out of depressed regions require compensation for those regions but, even in light of these facts, legislation should not outright prohibit interbasin transfers.

Barbara Green next presented "***Colorado*** ***River*** Cooperative Agreement and the Gross Reservoir Expansion - Western Slope Non-Opposition to Gross Reservoir Expansion." Ms. Green began by providing background information on the historical tensions between water interests on the Western Slope and the Front Range of ***Colorado***. She then outlined the evolution of Article IV, Paragraph J of the newly minted ***Colorado*** ***River*** Cooperative Agreement. Article IV, Paragraph J prevents West Slope signatories, other than Grand **[\*483]** County, from objecting to any permits for the Moffat Collection System Project. Grand County is a National Environmental Policy Act consultant on the Project and is thus exempt from Article IV, Paragraph J. Last, Green described how this new agreement is a historic and positive step for relations between water rights interests on the Western Slope and the Front Range.

Amelia Whiting of Trout Unlimited then presented "Environmental Concerns: Why Trout Unlimited Supports the Windy Gap Firming Project and Not the Gross Reservoir Expansion." Trout Unlimited is a not-for-profit organization dedicated to the conservation, protection, and restoration of North America's cold-water fisheries and their watersheds. Whiting began by describing the Windy Gap Firming and Moffat Collection System Projects. She then described Trout Unlimited's objections to the Moffat Collection System expansion project. Specifically, Trout Unlimited objects to the Gross Reservoir Expansion because Denver Water will not agree to (i) reduce diversions if water temperatures are too high; (ii) guarantee flows that cleanse the ***river*** of sediment; or (iii) develop a program to monitor the ***rivers*** and adapt to developing situations.

Last, Travis Bray presented on "Securing the Northern Moffat System: Why Denver Water Needs to Increase its Moffat Supply System." Bray began by discussing Denver Water's three-prong approach to municipal water supply: Conservation, Recycling, and Supply. Next, Bray outlined the supply problems of the next twenty years, including the reliabilities and vulnerabilities of the north and south Denver supply systems. Bray then gave the history of the Moffat project from 1954 (the original Gross Reservoir completion date) to the present. Finally, he listed the following issues associated with the Moffat Collection System Project that still outstanding: new studies, conflict resolutions, and Boulder County voting issues. In an audience member question after the presentation, Bray commented on Denver Water's reluctance to agree to Trout Unlimited's conditions. Mr. Bray stated all of the objections are already-existing problems and the Gross Reservoir Expansion would not be responsible for these problems.

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