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Real Weather; What's Up With the Weather?; Dust in Western Snow Cover: What's in it and Where did it Come From?

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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

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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.

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

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 Colo-