Sinking Feeling

How ignoring inconvenient science drained the Colorado

Jamey Stillings

Detail from Aerial View, June 30, 2009, from The Bridge Over the Hoover Dam, courtesy Etherton Gallery

By Eric Kuhn and John Fleck

The boat ramp at Las Vegas Bay, once a shimmering recreation mecca on the shores of Lake Mead, now ends in a row of concrete barricades and desert sand. A short hike through the scrub leads to an incongruous flowing river, the effluent from the Las Vegas metro area's wastewater treatment plants, flowing the last few miles to Lake Mead.

The floating marina that once anchored Las Vegas Bay here was moved in 2002, towed to deeper water as Lake Mead declined. The great reservoirs integrate the Colorado River's two stories—nature's water flowing in, and humans taking it out. Too little of the first, or too much of the second, is in the long run unsustainable. At the bottom of the old Las Vegas Bay boat ramp, you can look up and see which version of the story is playing out etched in the hillsides above, old shorelines long since left dry by Lake Mead's decline.

At the 2013 meeting of the Colorado River Water Users Association, Arizona water manager Tom McCann gave the reservoir's problem a name. Hundreds of people had gathered in Caesar's Palace 20 miles west of Las Vegas Bay for the annual meeting of the Colorado River water management community. It was a tense affair. Lake Mead is the nation's largest reservoir, the anchor of a hydraulic empire built over the 20th century that spans nine states in two nations. In the previous year, it had dropped more than 13 feet—enough water to meet Las Vegas's needs for nearly six years. Bureau of Reclamation program manager Carly Jerla warned the audience that within the next few years there was a chance Mead would not have enough water to meet the downstream users' needs.

There is a tendency for water managers to blame drought and climate change when reservoirs drop and water becomes scarce, but McCann asked the audience in the big Caesar's Palace ballroom to confront a more uncomfortable reality. Even without drought and climate change, which by 2013 were clearly taking their toll on the Colorado River, there had never been enough water to meet the long-term promises the river's governing bodies had made to the people who had come to depend on the Colorado's water. There was, to use a phrase that would come to dominate Colorado River discussions in the years that followed, a "structural deficit" on the river. By that McCann meant that

even under normal water supply conditions, the rules created by the region's political leaders over the previous century had allocated more water on paper than the river could supply in reality. This was not an aberration based on unusual climate. This was inevitable.

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The open and public discussion launched in 2013, that farms and cities in the United States and Mexico were overusing the available water supply, was startling to some and refreshing to others. To those in charge of the river's water, it felt unique. For much of the previous hundred years, the river's managers had inhabited a fantasy world in which abundant supplies would make all things possible. The disconnect between fantasy and the river's real-world hydrology, which had been increasingly clear in private conversations and obscure technical reports, was now being laid out in full public view. But a closer reading of the river's history reminds us that what McCann was saying was not as new as it felt like that December morning in Las Vegas. McCann's message of a river in deficit had been delivered nearly a century ago by some of the leading scientists studying the river. It had been repeated many times since then. Again and again, science suggested less water in the river. It was ignored as promoters and politicians jockeyed to grab their slice of the water. They built dam after dam, with canals to sluice off ever more

water from the shrinking river and its dwindling reservoirs. Today, the projects that resulted from all of that jockeying are in place, along with cities and farms depending on the water's flow. But there is not enough water to fill them. Some of the problem can be attributed to climate change, which is drying the river. But even absent climate change, we would be in trouble. The 21st century's problems on the river are the inevitable result of critical decisions made by water managers and politicians who ignored the science available at the time they were being made.

In 1925, U.S. Geological Survey scientist Eugene Clyde LaRue tallied what was known at the time about the river's flow, potentially irrigable farmland, and growing cities, and concluded that if we built the dams and canals to use all the water being allocated on paper in the 1920s to meet all the anticipated demand, the Colorado River would be in deficit. Two contemporary scientific analyses also done in the 1920s, one by LaRue's U.S. Geological Survey colleague Herman Stabler and one by a board of experts commissioned by Congress and led by retired Gen. William Sibert, backed him up. Despite the warnings from LaRue, Stabler, and Sibert, Congress approved the Colorado River Compact, the foundation of the legal edifice that has come to be called the "Law of the River" and launched a century of dam building that allowed the sparsely populated deserts of the Colorado River Basin and surrounding areas to bloom.

By ignoring the best available science of their day, they set in motion decades of decisions that would end in the overuse seen today.

The plane flight from Las Vegas to Denver, across the canyon country of the Colorado Plateau and the high Rockies that generate the river's water, is stunningly beautiful. The flight starts in the Colorado River's Lower Basin, the arid country of Nevada, Arizona, and Southern California that has come to depend on the water of the Colorado River. The typical flight path leaving Las Vegas' McCarran Airport toward the east climbs out of the Las Vegas Valley over the Black and Boulder Canyons, carved over millions of years by the Colorado River. Out the plane window the most notable feature today is Hoover Dam, tiny from this vantage point, and the vast expanse of Lake Mead piled up behind it. It shimmers blue in the late afternoon sun, but a passenger in a window seat can't help but notice its white "bathtub ring," the layer of minerals left behind around its rocky desert rim as the reservoir drops.

In December 2013, as McCann spoke in nearby Las Vegas, Lake Mead was less than half full and dropping fast. The bathtub ring had been growing since the early years of the twenty-first century. The years 2000–2004 were exceptional, the driest five years in a century of detailed records of the Colorado River's flow. But they were simply a

prelude to what was to come. After a seesaw from moderately dry to a single wet year in 2011, 2012–13 followed as one of the driest two-year periods in the river's modern history. But water users kept using as much as ever, and storage in the river's two big reservoirs, Lake Mead and Lake Powell, continued their decline.

By the time it reaches the ocean, the Colorado River has drained approximately 242,000 square miles of the southwestern United States and another 2,000 square miles in Mexico. As it makes its 1,450-mile course to the ocean it flows through four different major landscapes: the Rocky Mountains; the Colorado Plateau; the Basin and Range Province; and its own delta. Over its course to the ocean, it drops from over 14,000 feet on its highest peaks to sea level. The growing season varies from three months in high mountain valleys to seven months at 5,000 feet in the lower valleys of Colorado to year-round by the time it leaves the Grand Canyon.

Although one of the great rivers of North America, the Colorado's flow as measured by the natural discharge at its mouth is modest. Both the Colorado River and the Columbia River Basin drain an area of approximately 250,000 square miles, but the average annual natural discharge of the Columbia is thirteen times that of the Colorado. When compared with other U.S. rivers based on natural discharge,

the Colorado is slightly larger than the Hudson, and about the same as the Illinois River. If anything, though, the Colorado's small size relative to its basin makes its role *more* important. The Hudson River Valley is awash in water. If you need water in this part of the world, the Colorado is your only source.

The river's geography poses a second great challenge. The majority of its flow originates in the high country in its upper reaches, while the greatest chances to use its water—its largest cities and most productive farmland—are in its lower reaches.

A flight from Denver to Las Vegas crosses the boundary between those two very different geographies, following the course of the Colorado River over the Grand Canyon, past a historic northern Arizona river crossing called Lees Ferry.

A passenger flying east over the canyon country that defines this part of the Colorado Plateau—a flight both authors have made many times, peering out the windows to make sense of the landscape—could see beyond Lees Ferry the waters of Lake Powell, the river's second great reservoir. Completed in the mid 1960s, Powell sits astride the Arizona-Utah border, a gleaming pool of blue in the late afternoon sun but another casualty of lower flows in the river. In 2013, holding 10.8 million acre-feet, Lake Powell was just 44 percent full. The Colorado River's flow that year was less

than 60 percent of the long-term average.

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The divide between Lower and Upper Basin is crucial to understanding the history of the development of the Colorado River. Much of its basin is dry, and the river's water is central to the lives of the 40 million people who live in and around its basin and use its water. But while most of the water use happens in the Lower Basin, most of the water itself comes from the Upper Basin, falling as winter snows in the high mountains and filling the river with the melt of spring and summer. The tension over this fact—water coming from one place and being used in another—is central to the river's story.

It was here, as the river flowed through the canyon country, that LaRue in 1923 gathered some of the data on the Colorado River's flow that proved so prescient, and that was so thoroughly ignored nearly a century ago. A photo of the hydrologist shows him shirtless in the summer sun measuring the flow of Nankoweap Creek in the Grand Canyon, part of an expedition to fill in our understanding of how much water the Colorado River had and how we might use it. LaRue had been studying the river's hydrology for a decade, but the report that resulted from the 1923 expedition became the definitive account, in its day, of how much water the Colorado had to offer.

When LaRue and his colleagues emerged from the canyon country at Needles, California, at the conclusion of their 1923 expedition, his initial explanation of what he and his colleagues had found was brief. "We were sent to secure certain information for the government," he told the *Los Angeles Times*, "and we got it." At that point in the early history of the Colorado River's development, the river shortfall we see before us now was nothing more than shadows of the future cast in the pages of the analyses LaRue and his colleagues began producing.

But what he began reporting in the following two years bears a striking resemblance to the "structural deficit" McCann laid out before the Colorado River Water Users Association nearly a century later. The numbers were of necessity imprecise when LaRue published them in the 1920s, but the bottom line was the same as McCann's in 2013. What LaRue identified as inevitable growth of water use in the river's upper reaches, especially in the state of Colorado, would reduce its flow before it reached the desert canyon country. Downstream, vast areas of desert landscape awaited the water that would turn them into bountiful farms. Cities to the west, in Southern California, were outstripping their local supplies and looking for more. "If the population of this region continues to increase," LaRue wrote, "a new source of domestic water must be found." That "new source" was a canal through the desert

to the Colorado River, one of many such schemes of the region's boosters to use Colorado River water to overcome the arid land's shortcomings.

Basing their plans on the flow during an unusually wet few decades, the boosters thought they could pull it off. But LaRue's math, taking into account past droughts the boosters were unwilling to consider, suggested there was not enough water to meet their aspirations.

The list of people who followed click to enlarge
LaRue with a similar message
is long: Herman Stabler, who had accompanied LaRue and colleagues on their 1923 expedition and published his independent analysis in 1924; William Sibert, drafted by Congress in 1928 to provide an independent assessment; Reclamation commissioner Harry Bashore in 1945, as Congress was considering a treaty allocation a share of the river to Mexico; Northcutt Ely in 1946, who took the stage at a meeting of the same Colorado River Water Users Association that McCann addressed sixty-seven years later, warning of an inevitable shortfall; Royce Tipton, who in 1965 warned of future shortages because of the river's inability to meet the paper apportionments in the Colorado River Compact; Arizona's G. E. P. Smith, who in the 1920s and again in the 1940s cautioned his state that the river's yield was far less than what the decision-makers were claiming.

The difference in 2013 was that McCann was no longer describing a future possibility. LaRue, Stabler, Sibert, and those who followed were dismissed in their day as hypothetical pessimists. But as McCann spoke, the white bathtub ring circling Lake Mead could no longer be ignored.

From today's perspective, the obvious question is why projects kept being built, and increasing amounts of water diverted, in the face of the evidence being presented. Our answer is that like the approval in 1928 of the Boulder Canyon Project Act which ignored the findings of LaRue's 1925 report and the Sibert board report, the fate of projects at each step of the way were decided by the politics of the day, not science. The concept of "entitlement" ruled the actions of the states. The original founding documents of the river's management were seen to create a promise of water, and few were willing to question whether the Colorado River could deliver.