Quenching Thirst in the Colorado River Basin

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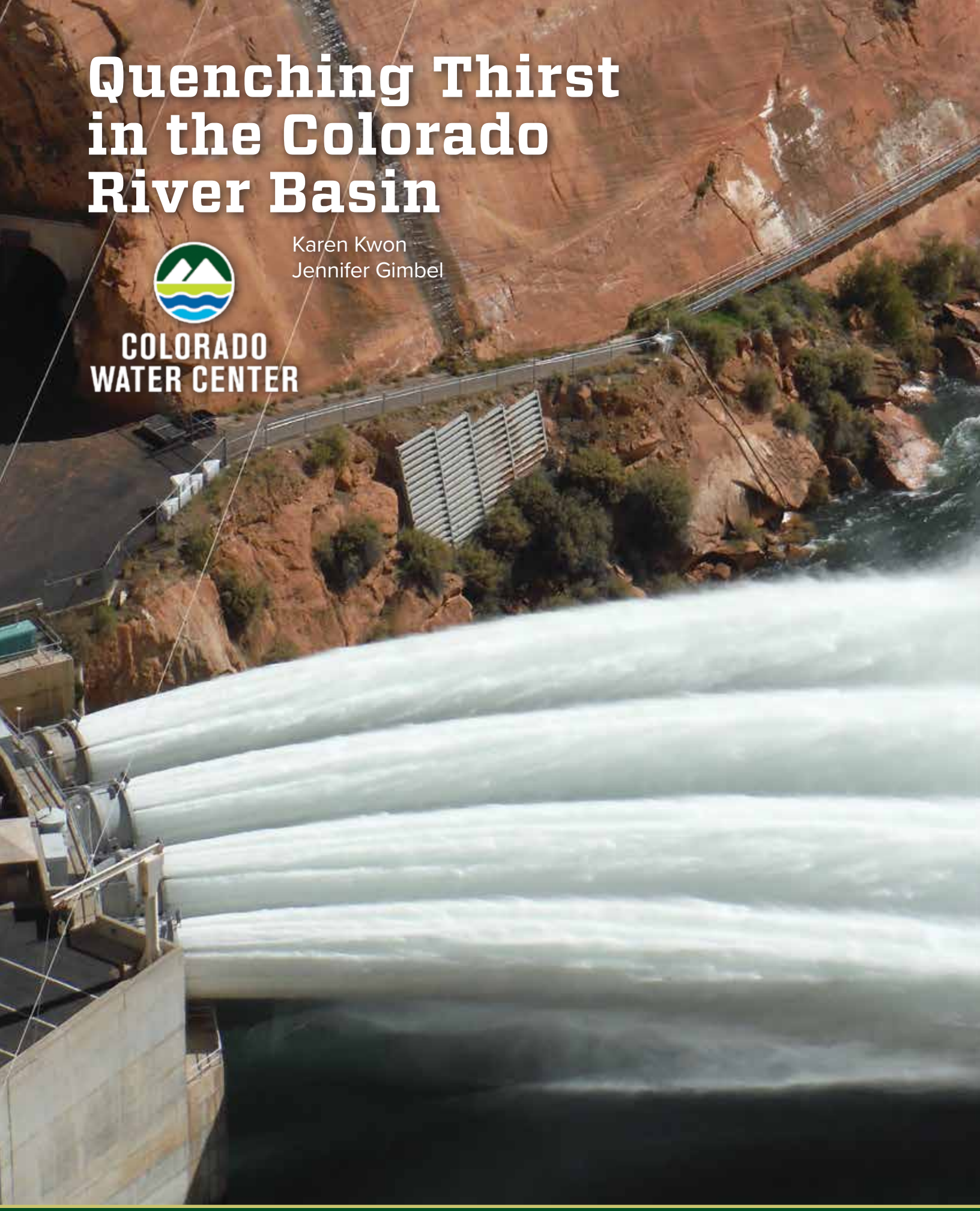
COLORADO WATER CENTER



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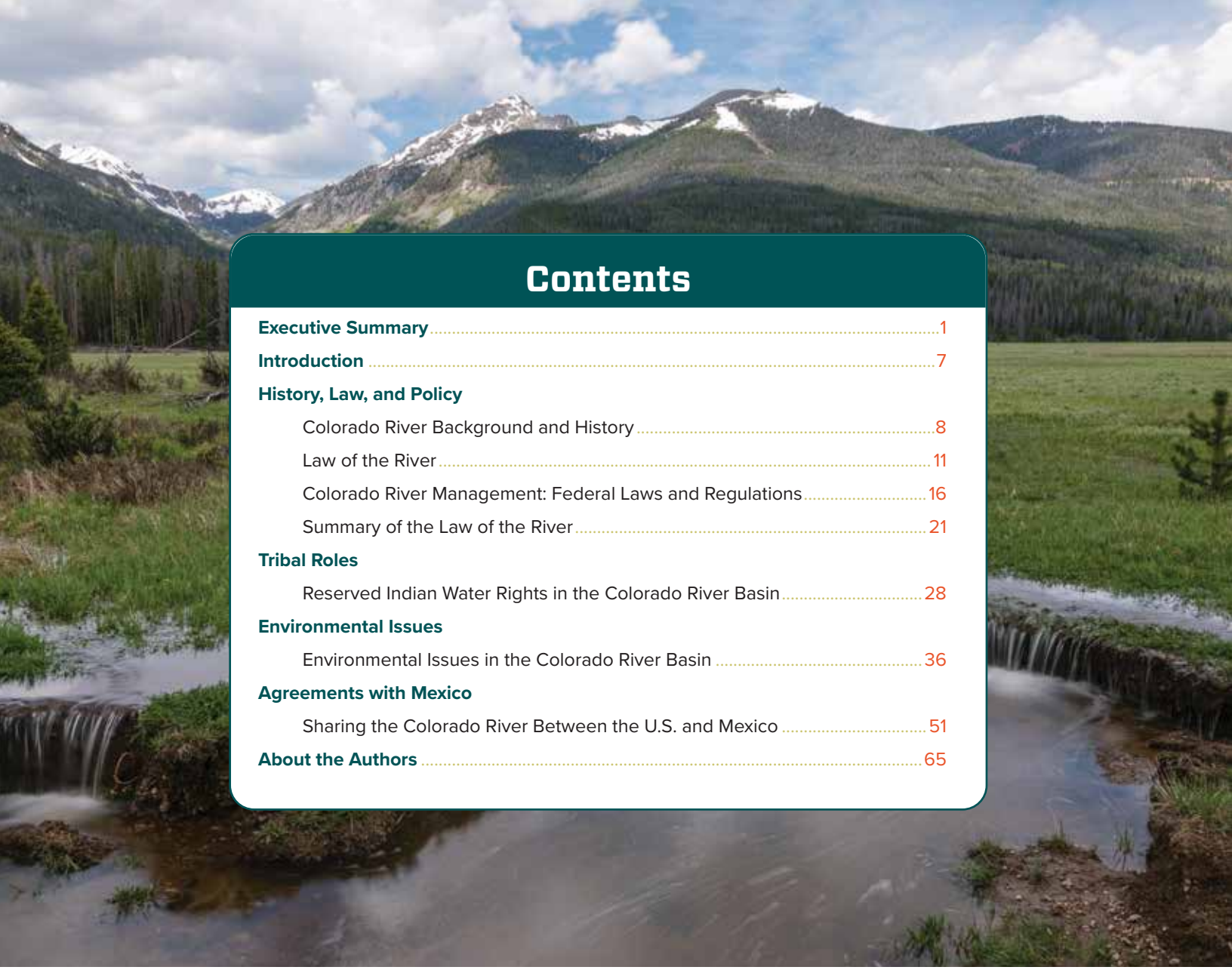

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The Colorado River photographed in its headwaters region near Grand Lake. Photo © Brian Wolski/Shutterstock.com.

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Published by
Colorado Water Center

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This publication was prepared by the Colorado Water Center and funded through a grant from the Walton Family Foundation.

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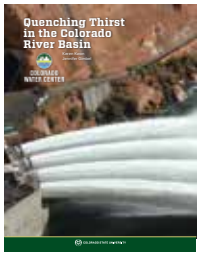


On the cover: Glen Canyon Dam jet tubes releasing water into the Colorado River for a high flow experiment. Photo courtesy of the U.S. Geological Survey.

The authors thank those who reviewed the content: Anne Castle, Carly Jerla, Ted Kowalski, Jennifer Pitt, and Sam Tucker.

Lake Mead, photo ©iStock.com

Quenching Thirst in the Colorado River Basin

"Water, is taught by thirst."

—Emily Dickinson

There is little dispute that the Colorado River Basin (CR Basin) is thirsty. In an attempt to learn from that condition, this series on the Colorado River (CR) is intended to provide an understanding of issues and relationships that have shaped the CR Basin so that the historical doctrines can bend to the needs of the present and future without eroding a foundation upon which we all stand.

Made up of a combination of tributaries and mainstem flows, the CR runs from its Rocky Mountain headwaters in Wyoming and Colorado to the Gulf of California in Mexico. Along its journey, the CR supplies water to millions of people and millions of acres of irrigated agriculture. It also serves to generate affordable power supplies for various municipal and rural customers and is a driving life source for Tribes, national parks, and countless wildlife species throughout the CR Basin.

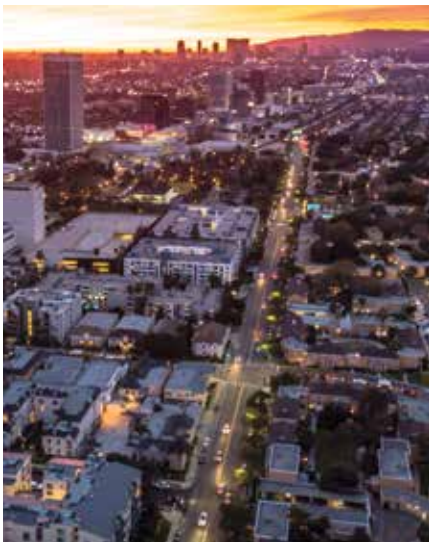
The CR Basin has been enduring a prolonged drought since 2000 with no apparent relief in sight. The 2021 water year was one of the driest in the CR Basin's recorded history. Moreover, the current 20-year period ranks as the second driest in the last 1,200 years. The science presents a cautionary tale that the abundance of 20th Century water supplies may be a thing of the past. On the ground experience and various models demonstrate a regularly hotter, drier future for the CR system going forward. In other words, it may not be just a persistent drought but a more pronounced drying of the system that the CR Basin is experiencing.

At the same time, there remains a strong need to support and maintain the agricultural spirit that has defined much of the West's heritage for well over 100 years. There is also a significant pull to sustain urban cities in places like Los Angeles, San Diego, Denver, Phoenix, Tucson, Las Vegas, Santa Fe/ Albuquerque, Salt Lake City, and Cheyenne that rely on CR water to help supply their growing populations. Not to be overlooked, there is an ever-growing recognition that various Native American Tribes hold legitimate claims to the CR to support their cultures, reservations, and homelands throughout the desert southwest. Finally, there is the added pressure to provide for all of these and other demands without deteriorating the aesthetic and ecological values of the CR Basin.

The science presents a cautionary tale that the abundance of 20th Century water supplies may be a thing of the past.

The present challenge is to determine how to best manage the highly erratic and possibly declining CR water

CR Basin map courtesy of the U.S. Geological Survey.



Los Angeles (above), San Diego, Denver, Phoenix, Tucson, Las Vegas, Santa Fe/ Albuquerque, Salt Lake City, and Cheyenne all depend on CR water. Photo ©iStock.com.

supplies to fit within expanding values and growing demands for CR water while respecting the storage and distribution systems upon which societies have been built over the past century. Past experience teaches us that neither protracted litigation in courts nor political maneuvering through Congress will guarantee successful outcomes in response to the CR Basin's complex challenges. Instead, collaboration and cooperation are also necessary ingredients for thriving in the 21st Century. For the CR Basin, this requires a commitment to and focus on cooperation and beneficial arrangements among varying interests to help mitigate and adapt to changing conditions throughout the region.

This CR series encourages such commitments by providing background and context regarding the forces that have compelled the development and operation of the CR from the 1920s to today. It provides a more in-depth examination than may otherwise be identified in news stories and articles of four primary forces that influence decision making on the CR: (i) History, Law, and Policy on the CR; (ii) Indian Reserved Water Rights in the Colorado River Basing; (iii) Environmental Perspectives in the Colorado River Basin; and (iv) Sharing the CR Between the U.S. and Mexico Insight into how the CR Basin has arrived to where it is today will hopefully help inform how best to direct where it needs to be tomorrow.

History, Law, and Policy

The framework for present-day CR operations can be traced to the history, law, and policies dating back to the early 1900s. Water users in California were seeking federal assistance to construct and operate federal facilities that would even out and reliably distribute the erratic flows of the CR. Elsewhere, other CR Basin States were concerned that the "Prior Appropriation Doctrine" would be applied across state lines to allow California's water users to lay claim to the CR before others had a chance to develop any water. In response, the seven CR Basin States (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming) collectively persuaded Congress to authorize negotiation of the CR Compact. As the first interstate water compact in the country, the CR Compact is the keystone to a series of laws, regulations, and agreements, commonly referred to as the "Law of the River," that have been used to guide the operations and management of the CR System up through today.

This CR series encourages such commitments by providing background and context regarding the forces that have compelled the development and operation of the Colorado River from the 1920s to today.

The Law of the River governs the distribution and uses of the CR System among the seven CR Basin States and the Republic of Mexico. Most would agree that it includes two multi-state compacts, an international treaty, a U.S. Supreme Court decision and decree, an extensive body of federal legislation, and numerous agreements, permits, and regulations. The pieces of the Law of the River serve as a foundation upon which the CR Basin has stood when determining questions of authority, rights, and obligations about CR use and management within the Basin. They are the result of countless negotiations, litigations, congressional hearings, and trade-offs beginning in the 1920s that have influenced the development of not only water but also societies, economies, and cultures from the peaks of the Rocky Mountains to the deltas in the Gulf of California.

The Law of the River's primary focus is on water supply. It revolves around apportionment of the CR water supply, construction of federally authorized projects to aid in accessing and developing the CR water supply, and regulation and operation of the federal infrastructure to distribute the CR water supply.

Through the years, the application and expansion of the Law of the River have worked to moderate conflict and provide some sense of order amidst great uncertainty. That does not mean that the Law of the River is the panacea for all things related to the CR. It is not a Magic 8 Ball that one can shake to reveal the answer. There are differences of opinions concerning its application and interpretation that require regular attention to avoid the threat of conflict and controversy. There are also complex matters that the Law of the River has either kicked down the road or simply overlooked.

Nonetheless, it remains the foundation around which societies and individuals have built identities and a way of life. Moreover, it has demonstrated through the years that it can evolve and grow with the times. With that understanding, it appears time yet again to examine and elaborate on the Law of the River to help meet the needs required of the CR Basin today.

Indian Reserved Water Rights in the Colorado River Basin

The 30 federally recognized Tribes[1] in the CR Basin collectively hold rights to almost 20 percent of the CR water supply. Twelve of those Tribes still await a process for recognizing and quantifying additional rights to the water. While each Tribe maintains its own views and unique perspectives on the CR Basin, it is safe to say that many consider the CR to be sacred, and all rely on the CR resource in some manner for cultural, social, economic, and spiritual survival.

Tribes obtain rights to a significant portion of their water supplies based on the doctrine of federal Indian reserved water rights. This doctrine stems from the U.S. Supreme Court's decision in *Winters v. United States* in 1908. In *Winters,* the Court held that the U.S. had impliedly reserved the amount of water necessary to help accomplish that purpose for establishing the reservation of the Tribes in question. This case serves

Signing of the 1944 Treaty on Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande between the U.S. and Mexico. Photo courtesy of the International Boundary and Water Commission, U.S. Section.

as the foundational element to the doctrine of reserved water rights, and federal Indian reserved water rights are often referred to as "Winters rights."

Winters rights have some unique characteristics. First, they are held in trust by the U.S. for the benefit of the relevant Tribe(s). The trust responsibility is a legal obligation for the federal government to protect Native American resources and assets and manage them in the Tribes' best interests. Second, federal Indian reserved water rights exist independent of use, cannot be lost due to nonuse, and can displace other water rights who commenced water uses after the land reservations for Tribes were created. Third, the volume of a federal Indian reserved water right is limited by the amount of water determined to be necessary to fulfill the purposes of the reservations.

The CR and Upper CR Basin Compacts leave the door open for Tribal water rights to be recognized within the CR Basin. They do not, however, clarify how such rights should be integrated with the compact apportionments of water among the States. This "omission" has been a source of debate regarding, among other things, the magnitude of valid reserved rights claims to CR water, the volume of water reserved under each federal Indian reserved right, and the accessibility/use of federal Indian reserved rights within the CR Basin.

The magnitude of valid CR reserved right claims has yet to be fully defined. In *Arizona v. California,* the U.S. Supreme Court pronounced that uses of mainstream CR water by the U.S. (which is assumed to apply to Tribal reserved rights) is limited to the uses apportioned to the CR Basin States by compact or decree. However, questions remain. Among them are whether the Court's decision applies to rights that existed before the CR Compact or to sources other than the CR mainstream? Moreover, how will recognition of any federal Indian reserved water right implicate or affect existing rights held by non-Indian water users within a state?

The process for quantifying federal Indian reserved water rights is not guaranteed to produce successful results. Congressional quantification requires political jockeying to finalize legislation, which can be problematic if politically powerful interests are pitted against each other inside the U.S. capitol. Judicial quantification often involves decades long proceedings at great cost to Tribes, governments, and water users alike. Negotiated settlements have become a preferred approach to quantifying federal Indian reserved water rights. They have the potential to clarify Tribal water rights while garnering support for resolving long-standing uncertainties and avoiding litigation. However, they are not always successful either. Unless and until a majority of people from each negotiating party feel they have received fair consideration of their rights and interests, the likelihood of agreement and congressional consent remain fleeting.

Access to water entitled to Tribes under a federal Indian reserved water rights remains another critical element to addressing uncertainties related to water uses in the CR Basin. Many Tribes with water rights on paper (statute, court decree, and settlement agreement) still struggle to secure access to sufficient water to meet the basic needs of their communities because they lack the necessary infrastructure to provide the water where it is needed. Unlike courts, negotiated settlements approved by Congress can include terms for funding and construction of water infrastructure that allows Tribal communities to gain actual access to their quantified rights.

As water supplies tighten and policy makers contemplate innovative water management strategies for the CR Basin, there is a growing realization that Tribal considerations and water rights to CR sources are key elements to the continued operation of the system. Recent examples of important Tribal contributions include the 2018 CR Basin Ten Tribes Partnership Tribal Water Study and the 2019 CR Drought Contingency Plans.

Environmental Perspectives in the Colorado River Basin

Conservation efforts to protect watersheds, lands, and resource qualities began to take hold in the U.S. in the 1960s and 1970s. Laws such as the Clean Water Act, Wilderness Act, and Wild and Scenic Rivers Act, are some of the environmental statutes that still serve as an environmental overlay to existing management frameworks throughout the country.

The CR Basin is comprised of watersheds and resources that are unmatched in nature. It is home to an abundance of national parks and monuments, provides irreplaceable habitat for multiple rare and endemic fish and wildlife, serves as a source of refuge for migratory birds traversing the Pacific Flyway and accommodates a Delta Region that once served as one of the most biologically diverse places on the continent. A recreational magnet for fishing, boating, rafting, swimming, skiing, rock climbing, hiking, camping, and kayaking enthusiasts around the world, the CR also makes up an essential part of the cultural fabric for Tribal and other

communities spanning both the lands of snow and sun in the mountain and desert southwest.

Despite the undeniable richness of the CR Basin's environmental and cultural assets, natural resource policy and management decisions are frequently dominated by consumptive use and water allocation considerations within the CR Basin. This structure, however, has proven somewhat malleable through the years. Policies to consider natural resources, minimize environmental harms, and protect, improve, or enhance river assets in key areas have become part of the societal norm as awareness of environmental values has grown. Such policies have also led to procedural requirements and substantive programs that supplement the basic management principles for the CR system.

Species Protection within the Upper and Lower Colorado River Basins

The CR is home to a large number of native species that are found nowhere else in the world. Demands for water and power and the introduction of non-native species through the decades have transformed CR Basin ecosystems. Governments, Tribes, and stakeholders have collectively worked in key areas to develop mechanisms and programs intended to encourage imperiled and native species to succeed. Programs such as high flow release events from Glen Canyon Dam, mechanical removal of non-native species, and recovery implementation programs have become (and will continue to be) integral to the CR Basin's overall health.

Protection of Grand Canyon National Park Resources

The CR is essential to the Grand Canyon National Park. Flowing through 277 miles of the park, from Marble Canyon (just downstream of Lee Ferry and Lake Powell) to the Lake Mead National Recreation Area, the CR has shaped the complex natural and cultural histories of the park and surrounding region. The National Park Service (NPS) manages the Grand Canyon to conserve resources within park boundaries and provide for the enjoyment of those resources for current and future generations. However, the CR resource is also managed by seven CR Basin States and the Bureau of Reclamation (Reclamation) to provide water and power to millions of people and irrigated acres in the U.S. and the Republic of Mexico. These two missions do not always align neatly and require continuous efforts to balance and integrate the values and responsibilities associated with managing the Grand Canyon National Park with the obligations to manage the CR system pursuant to and consistent with the Law of the CR.

Despite the undeniable richness of the Colorado River Basin's environmental and cultural assets, natural resource policy and management decisions are frequently dominated by consumptive use and water allocation considerations within the Colorado River Basin.

Colorado River Delta and Cienega de Santa Clara

At one point, the CR Delta spanned over 1.9 million acres of wetlands and marshes in the U.S. and Mexico that were fed by the CR and the Sea of Cortez. It was home to "green lagoons" that provided habitat for fish, dolphins, mollusks, birds, beavers, deer, bobcats, and even jaguars. However, efforts to divert, dam, and channel the CR to farms and cities throughout the 1900s have caused the CR Delta to be only a trace of its former self. Collaborative agreements consistent with the 1944 Water treaty have taken hold more recently to promote binational measures for reviving parts of the Delta. Future management decisions with binational implications will likely have to take into account ways to further mitigate and restore portions of the Delta and its riverine areas going forward.

Salton Sea Management and Mitigation

The Salton Sea is an important food source as well as a nesting, wintering, and stopover site for thousands of bird species in Southern California. Irrigation runoff from farms in the region have been the primary water source for the Salton Sea since its most recent formation in 1905. Changes to CR supplies in the early 2000s as a result of a regional agreement among water users have drastically reduced the Salton Sea's inflow. The resulting adverse impacts to both public health and wildlife in the region have been cause for significant environmental and financial concerns. Some California water users are demanding attention to address the Salton Sea in future CR management efforts.

Incorporating environmental resource policy into water supply management decisions is an ongoing process. As the CR Basin continues to work through its complex water challenges, it will be important to consider how to further integrate the environmental values that support the CR Basin going forward. Past lessons suggest that the extent to which a balance can be struck will be informed not only by the changing conditions of the CR Basin but also by the interest and willingness of governments, Tribes, water users, and scientists to work together to fully address the real-world challenges of our times.

Photographed at sunset, the Salton Sea is an important food source as well as a nesting, wintering, and stopover site for thousands of bird species in Southern California. Photo ©iStock.com

Sharing the Colorado River Between the U.S. and Mexico

The CR is a source of both tension and triumph in the overall U.S.-Mexican relationship. The binational challenges and problem-solving efforts employed to address U.S./Mexico water management issues provide useful lessons when looking to the next steps in CR System operations.

The last 100-mile reach of the CR flows through Mexico. There, it forms a boundary and serves as the primary source of water for agriculture and domestic water in the states of Baja California Norte, and Sonora. The CR also serves as the freshwater source for the CR Delta on the Gulf of California (Sea of Cortez). Today, however, the CR only reaches the Gulf under rare conditions that usually require heavily negotiated arrangements to remain consistent with the terms and expectations of the Law of the River.

The 1944 *Treaty on Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande* (hereinafter 1944 Water Treaty) apportions the CR (and other rivers) between the U.S. and Mexico. Under the Treaty, the U.S. guarantees Mexico 1.5 million acre-feet (maf) of CR water each year. In the event of an "extraordinary drought or serious accident" reductions can be made to Mexico's allocation in proportion to shortages taken in the U.S. The Treaty also established the International Boundary and Water Commission (IBWC) as an international body to administer the U.S. - Mexico water treaties. The IBWC consists of both a U.S. and Mexico Section that exist to implement the Treaty provisions, exercise the rights and obligations of both governments under the Treaty, and settle all disputes that arise under the Treaty, subject to authorities of each country's federal government. To accomplish these duties, the Treaty authorizes the IBWC to develop rules and issue proposed decisions called "Minutes."

Minutes adopted pursuant to the 1944 Treaty have addressed a range of issues, including the operation and maintenance of cross-border sanitation plants, water conveyance during droughts, dam construction, and water salinity problems (among others). Recently, Minutes have addressed international cooperation on projects and the sharing of CR water during shortage and surplus conditions.

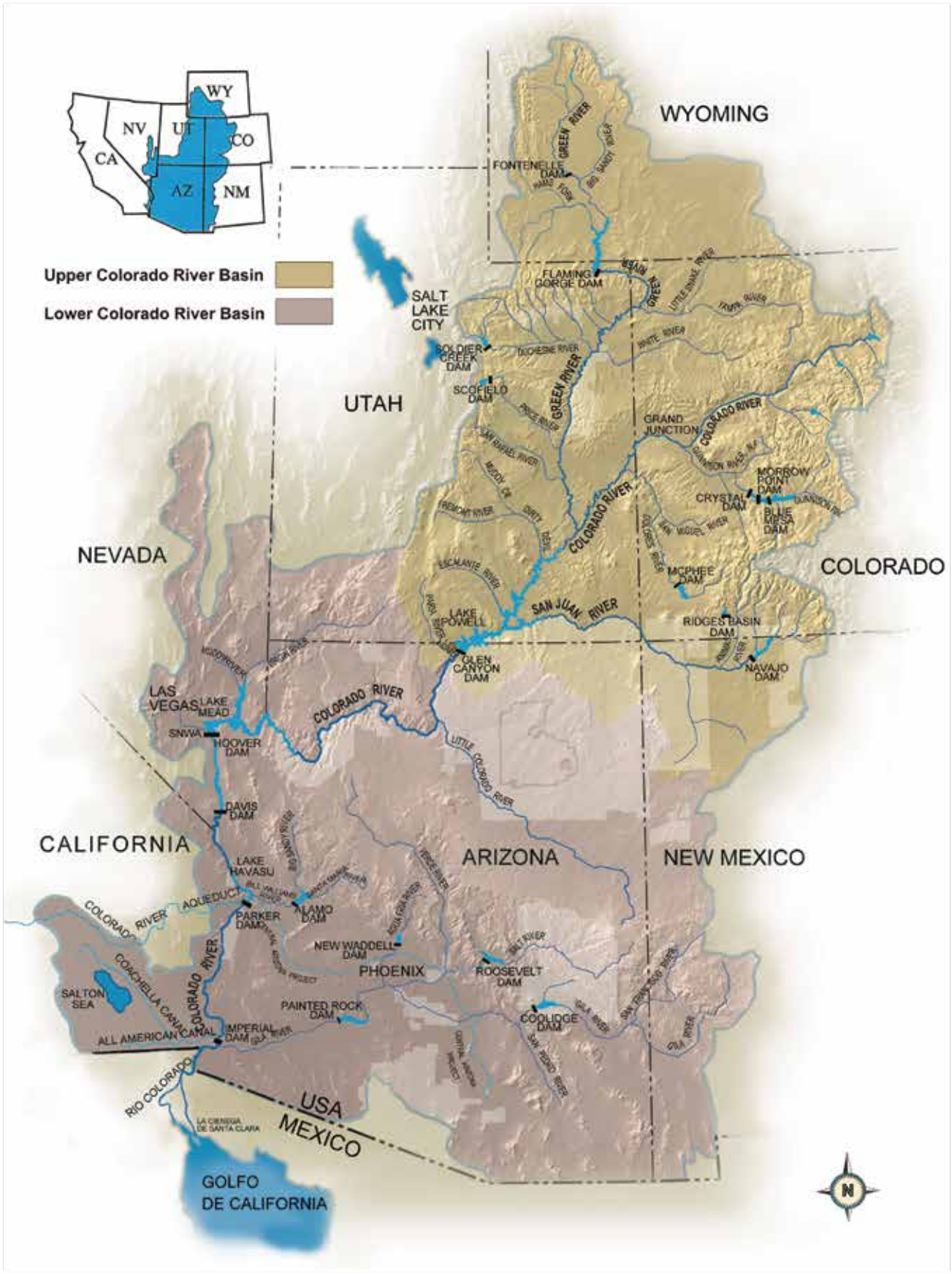
Review of the events and binational relationship status leading up to each of these Minutes reveals that international negotiations on multiple basin-wide issues are particularly difficult. Differences in language, culture, laws, economic structure, and geography bring to light that the U.S. and Mexico manage water and prioritize and perceive issues in the CR Basin differently. Bridging such diverse views takes time, commitment, and high stakes to motivate all parties to reach an agreement. It also takes the shared recognition that both countries are better off reaching an agreement than operating in conflict and uncertainty.

Overall, the lessons of sharing the CR between the U.S. and Mexico demonstrate that binational collaboration is a critical piece to addressing complex CR management challenges going forward. To be successful, such collaboration will require dedicated commitment from leaders and representatives in both countries to perpetually invest in relationships that can inform and produce beneficial outcomes for both sides of the border. ❑

Endnote

1 Since there is no official consensus on how to respectfully refer to Indigenous peoples or when to capitalize certain terms, this paper series uses Native American as well as general capitalization of the words Tribe and Tribal as a sign of respect.

The Colorado River Basin



CR Basin, Southwestern U.S., and Northern Mexico. Map courtesy of the U.S. Bureau of Reclamation.

Lake Granby stores CR water and is the largest storage reservoir in the Colorado-Big Thompson Project and the second largest water body in Colorado. Photo ©iStock.com

The Colorado River Basin

The Colorado River (CR) Basin has a diverse geography, history, and climate that is also rich in regional complexities, law, partnerships, and policy. The CR system comprises both tributaries and the mainstem river that drains approximately 250,000 square miles from the headwaters in the Rocky Mountains of Wyoming and Colorado to the Gulf of California in Mexico. Along its approximate 1,400-mile journey, the CR system manages to provide water for over 40 million people, 5.5 million acres of irrigated agriculture, up to 4,200 megawatts of hydropower and has an estimated economic value of over $1.5 trillion annually. In these and many other ways, the CR system is the driving life force for two countries, seven states, 30 federally recognized Tribes, eleven national park units, and countless species of animals.

Since 2000, the CR system has experienced the most severe drought in recorded history. And there does not appear to be meaningful relief in sight. Rather, the science warns that the abundance of 20th-century water supplies may be a thing of the past as on the ground experience and various models demonstrate the possibility of a regularly hotter, drier future for the CR system going forward. In other words, it may not be just a persistent drought but a more pronounced drying of the system that we see in the CR Basin. At the same time, demands for CR water continue to increase. There remains a strong need to support and maintain the rural/agricultural spirit that has defined much of the West's heritage for well over 100 years. There is also a significant expansion of urban cities in places like Los Angeles, San Diego, Denver, Phoenix, Tucson, Las Vegas, Santa Fe/Albuquerque, Salt Lake City, and Cheyenne that rely on CR water to help supply their growing populations. Not to be overlooked, there is an ever-growing recognition that various Native American Tribes hold legitimate claims to a significant portion of the CR to support their culture, reservations, and homelands throughout the desert southwest. Finally, there is the added pressure to provide for all of these and other demands without deteriorating the aesthetic and ecological values of the CR Basin. The very real and present challenge for those whose decisions will shape the future of the CR Basin is to identify how to sustainably manage the highly erratic and possibly declining CR water supplies to comport with expanding values and growing demands for CR water while respecting the storage and distribution systems upon which societies have been built over the past century.

The CR's story has been characterized in the past as one of competing users vying for the CR's water. Each water user group has pronounced theirs is the most important right by virtue of whatever fits the prevailing perspectives — i.e., health and safety, aboriginal, law, location, or economics. Experience with the complex challenges facing the CR Basin in the 21st century, however, has highlighted the importance of working together. Today's challenges are no different. Pursuing protracted litigation or political jockeying to assert one interest over another no longer guarantees security and reliability for anyone within the CR Basin. Rather, commitment to and focus on cooperation and beneficial arrangements among interests in the CR will be required to help fortify the health of the resources and stability of the region going forward.

Along its approximate 1,400-mile journey, the CR system manages to provide water for over 40 million people, 5.5 million acres of irrigated agriculture, up to almost 4,200 megawatts of hydropower and has an estimated economic value of over $1.5 trillion annually.

This CR Series is intended to help support such commitments by providing a foundational understanding of the forces that have influenced the development and operation of the CR, including: (i) History, Law, and Policy on the CR — providing a summary of and context to some of the basic history, law, and policies that have driven CR management since the 1920s; (ii) Indian Reserved Water Rights in the Colorado River Basins — outlining the structure of water rights and role that Native American Tribes have had in the CR Basin; (iii) Environmental Perspectives in the Colorado River Basin — explaining some relevant environmental considerations that are implicated in managing the CR Basin.; and (iv) Sharing the CR between the U.S. and Mexico — highlighting some of the tension and cooperation built between the U.S. and Mexico as they relate to the CR ❑

John Wesley Powell's second expedition ready to start from just below Union Pacific Railway Bridge at Green River Station, Wyoming, 1871 (Left to right: E.O. Beaman, Andy Hattan, Walter Clement 'Clem' Powell; Stephen Vandiver Jones, John K. 'Jack' Hillers, Major John Wesley Powell, Frederick S. Dellenbaugh, Almon Harris Thompson, John F. Steward, Francis Marion Bishop, and Frank Richardson). Photo courtesy Grand Canyon National Park.

Colorado River Background and History

When trying to capture the history of the Colorado River (CR) Basin, the primary question always begins with — Where to start? After all, the history of the CR can be traced back to events that formed the Rocky Mountains and sculpted the Grand Canyon. Geographically, the CR's history includes stories of Native American existence and survival, Hispanic and European exploration and settlement, and American independence and entrepreneurism. This CR series cannot give the deserved attention and respect that each of these various historical influences have on the CR Basin. Suffice it to say that the Basin's history is a rich tapestry of people, landscapes, events, and perspectives that still inform and influence the prominent cultures and attitudes within the CR Basin today. For the scope of this series, however, the focus is on the background and history leading to the laws and policies that have structured management of the CR Basin today. This history begins with the expansion to and settlement of the western U.S., which began in earnest in the 1800s with the notion of "Manifest Destiny."

"Manifest Destiny" motivated thousands of people to migrate westward in search of minerals, land, and freedom. To survive, let alone be successful, all of these and other endeavors required a reliable water supply. But unlike the East, where people were accustomed to large and abundant rivers, the Rocky Mountains and the southwestern U.S. had fewer and smaller rivers traversing vast, semi-arid to arid landscapes. Recognizing that a system to access and use the limited water supplies was crucial to developing enterprises, the mining and agricultural efforts on public lands implemented a custom that was monikered "prior appropriation." This local custom developed into a federally recognized legal doctrine under the 1870 Mining Act and 1877 Desert Lands Act as a means to fairly distribute limited supplies from public lands in the West. The Western Territories took the federal government's lead for water distribution on public lands and began adopting some form of the Prior Appropriation Doctrine as part of their respective constitutions and laws upon becoming states within the Union. Yet, how

At the end of the 19th century and early part of the 20th century, farmers began irrigating California's Imperial Valley with water from the CR. Major crops include alfalfa, lettuce, sugar beets, and carrots. Photo ©iStock.com.

Prior Appropriation Doctrine – The Prior Appropriation Doctrine was developed in the Western U.S. as a means of allocating scarce water supplies based on the productivity of its use. The Doctrine instructs that the first one to divert water for a beneficial use has the superior right to continue such use over any other. Water allocation under this doctrine rests upon the fundamental principle of "first in time, first in right." The first person to beneficially use water (senior appropriator) acquires the first priority right to its future use as against later users (junior appropriators). Junior appropriators are allowed to divert the water remaining in the system for their own beneficial uses so long as they do not take away from or impinge on the rights of the senior(s).

...the [Supreme] Court adopted the principle of "equitable apportionment" to decide reasonable sharing of interstate streams among states.

the limited water supplies of the West should be shared among and between the states remained unclear. When interstate disputes about whether and how streams should be shared arose, the U.S. Supreme Court proclaimed for the first time that no state had an automatic or overarching right to an entire river supply. Instead, the Court adopted the principle of "equitable apportionment" to decide reasonable sharing of interstate streams among states.[1] What constituted an equitable apportionment, however, was left to be determined on a case-by-case basis.

At the end of the 19th century and early part of the twentieth century is also when farmers began irrigating California's Imperial Valley. A portion of the canal supplying irrigation water from the CR ran through Mexico, and maintenance, use, and taxation were continuing issues. Further, in 1905 the river broke through at the canal headgate, ran into an old channel, and flooded into the modern-day Salton Sea. For two years, the CR flowed through the old channel before innumerable loads of rocks from the Southern Pacific Railroad contained the flood.

Then, in 1922, the Supreme Court decided *Wyoming v. Colorado*, which signaled how it would evaluate equitable allocations among most western states. Specifically, the Court pointed to and relied upon the Prior Appropriation Doctrine to determine how to allocate the use of the Laramie River between Wyoming and Colorado. The Court reasoned that it was both foreseeable and equitable for the Laramie River to be allocated based on the concept of first in time, first in right even across state lines when both states already relied on prior appropriation to govern water allocation within their respective boundaries. In the same case, lawyers for the federal government asserted federal, rather than state, ownership of all unappropriated and surplus waters in the western states.[2]

In light of this decision, six of the CR Basin States became anxious. They feared that California's rapid growth in agriculture and population would allow it to claim a larger and better right to CR water because it would

Taken from the International Space Station, this image shows the All-American Canal in Imperial County, California, just west of Yuma, Arizona, in the southernmost section of the Algodones Dunes. Photo courtesy of NASA.

be the first in time to use the system before other states had the opportunity to develop into future demands. California, on the other hand, was looking to the federal government for money and expertise to build an "All-American" canal to solve its problems with Mexico. The director of the Reclamation Service also advocated a dam to solve flooding problems. Worried state water officials wanted to find a way to fend off California's dominance over the river and federal water control.

The solution lay in the interstate water compact. In general terms, such a compact is an agreement between two or more states approved by their state legislatures and Congress under the authority of the Compact Clause of the Constitution. The purpose of the compact is to establish under state and federal law how the water of an interstate stream will be shared between users in different states. It accomplishes this in a manner that respects the states' sovereignty in a federalist system by allowing states to enter into agreements, with the sole limitation being the approval of Congress.

Interstate water compacts derive their authority from the Compact Clause of the U.S. Constitution, which provides, "No State shall, without the Consent of Congress, ... enter into any Agreement or Compact with another State, or with a foreign Power, ..." In the early 1900s, Delph Carpenter, legal advisor to Colorado's governor, proposed the compact as an alternative to piecemeal equitable apportionments determined by the Supreme Court. By his reasoning, states should exercise the compacting powers allowed under the constitution to equitably apportion among themselves the right to use the waters of the CR Basin. Carpenter's arguments in support of the constitutionality of interstate compacts focused on the preservation of state sovereignty. He reasoned that equitable apportionment should not have to be determined by the federal agencies or the U.S. Supreme Court. Rather, it could be an agreement based on cooperation and compromise, designed to avoid costly litigation, respect the federalist system of the U.S. and help establish harmony between multiple states.

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The other CR Basin States found value in this approach as it could provide security of future development opportunities while enabling California's current development to proceed. By 1921 they convinced Congress to authorize the states and the federal government to meet and negotiate what turned out to be the first of many interstate water compacts in the country and the cornerstone of the Law of the CR — The CR Compact of 1922. ❑

Delph Carpenter

A Colorado rancher and attorney with considerable experience in irrigation litigation, Delph Carpenter understood the complexities of water use and delivery, the business end of water development and the intricacies of the Prior Appropriation Doctrine. He was elected Colorado's first native-born state senator in 1908 and became a major force on the committee on agriculture and irrigation. After the Supreme Court decision in *Kansas v Colorado,* in which the Court rejected the assumption that a headwater state had right to unlimited use of the water emanating from within the state's territory, Colorado became acutely concerned about the future of its interstate waters. The Democratic leadership approached Carpenter, a well-known Republican with political force, to chair a special committee on irrigation investigations in relation to interstate streams. It was based on his endeavors in this position and later as legal representative on interstate water matters for Colorado that Carpenter developed the legal basis for the interstate water compact. Carpenter's reasoning in support of an interstate water compacts was based on international and constitutional law as well as necessity to protect the future for his headwater state.

Legal/Logical Basis for Interstate Water Compacts

According to Carpenter, principles of international law should also apply to relationships between the states. Instead, of rushing into the equivalent of war to settle their differences over water allocation, as represented by suit in the Supreme Court, states should first seek to exercise their inherent right and duty of friendly settlements through diplomatic channels and interstate agreements.

This right should be considered inherent because it was built into the concepts of equal footing and state sovereignty that serve as foundational

Delph Carpenter pictured in the Colorado Senate chamber, 1911. Photo courtesy of CSU Water Resources Archive.

principles within the U.S. Constitution. For example, Carpenter reasoned that because the states entered the Union on equal footing and because their powers of sovereignty were limited only by what had been delegated to the federal government (10th Amendment), the states have the right to exercise power they have retained to help settle interstate disputes. In the realm of interstate water allocation, the power they retained lay with the Compact Clause of the Constitution.

Carpenter maintained the Compact Clause considered and allowed for states to enter into agreements or compacts with each other provided that they obtain the consent of Congress. He noted that the governors of interested states could appoint Commissioners for a joint commission to negotiate the terms, that could subsequently be approved by each state and Congress. In Carpenter's scheme of things, an interstate compact commission would be in a "better position to arrive at an 'equitable apportionment of the benefits between ... states from the flow of the river' than would 'any court however constituted.'"

Driving Principles to Interstate Water Compacts

Several basic principles have guided the utility and importance of interstate water compacts through the years. They include:

i. Assurance that each state will be allowed to develop the water allocated to it into perpetuity, as needs and economic conditions dictate.

ii. The Prior Appropriation Doctrine does not automatically and necessarily apply on an interstate basis. Rather, the equity in the water allocation comes from the mutual agreement of the sovereign states on how the water should be apportioned.

iii. State sovereignty and autonomy over intrastate water administration is not erased. The Compact does not impinge on a state's right to determine how to allocate water within its territory.

iv. Avoidance of interstate litigation is a valid and worthy purpose.

Overall

Carpenter's proposal for interstate water compacts caught on. Since finalizing the CR Compact, states have negotiated with Congress' consent water compacts that govern allocation and distribution of water among and between states throughout the country.

Once finalized, the compact must be authorized by each negotiating state's legislature and approved by Congress. Upon these events, the compact has the weight of both federal and state law and also serves as a contractual agreement as between states.

For further reading, see Daniel Tyler's 2003 book, *Silver Fox of the Rockies: Delphus E. Carpenter and Western Water Compacts.* ❑

Delph Carpenter (back row, fourth from left) stands with the other members of the CR Commission at the signing of the CR Compact, November 24, 1922. Herbert Hoover (seated) presiding. Photo courtesy of USBR.

Law of the River

Beginning with the 1922 CR Compact, an interlocking body of laws referred to as the Law of the River has been developed to direct distribution and uses of the CR system among Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming (see CR Basin States) and the Republic of Mexico. The term "Law of the River" has no formal definition, but most would agree that it includes two multi-state compacts, an international treaty, a U.S. Supreme Court decision and decree, an extensive body of federal legislation, and numerous agreements, permits, and regulations that inform water apportionment and distribution among states and between the U.S. and Mexico. Other federal laws may also apply (see Environmental Issues and Indian Reserved Water Rights sections of this CR Series). A summary of the primary elements of the Law of the River is set forth in the table starting on page 21 and described below.

Water Apportionment in the Colorado River Basin — Compacts, Treaty, and Decree

The foundational ingredients of the Law of the River consist of two compacts, an international treaty, and a Supreme Court decision and related decree. Together, these pieces serve as the building blocks to the apportionment of CR water between the Upper and Lower Basins, between the U.S. and Mexico, and among the states within the Upper Basin (UB) and Lower Basin, (LB) respectively.

1922 Colorado River Compact

The CR Compact was signed in Santa Fe on November 24, 1922, and approved by Congress in the Boulder Canyon Project Act in 1928. It was created by a commission composed of representatives from the seven CR Basin States under the chairmanship of Secretary of Commerce Herbert Hoover, representing the U.S.[3] The 1922 Compact, once approved by all states' legislative processes and by Congress, established a unique symbiotic relationship of state and federal law. Key apportionment provisions of the Compact are as follows.

To begin with, the Compact divided the flows of the CR between the UB and LB with the dividing point designated at Lee Ferry, Arizona. The Compact defines the UB to include the portions of Arizona, Colorado, New Mexico, Utah, and Wyoming that naturally drain into the CR System above Lee Ferry. It also includes all parts of those states that are not located within the CR drainage area but are served by CR waters diverted above Lee Ferry — i.e., Colorado's Front Range, among others. The Compact defines the LB to include the portions of Arizona, California, Nevada, New Mexico, and Utah that naturally drain into the CR System below Lee Ferry. It also includes all parts of those same states that are not located within the CR drainage area but are served by CR waters diverted below Lee Ferry, i.e., certain areas in southern California.

Lee Ferry – *Lee Ferry is located near the Arizona-Utah border one mile below the mouth of the Paria River. It is the dividing point between the CR's UB and LB under the CR Compact. Pursuant to the Compact, the UB must not deplete the flow at Lee Ferry below 75 maf over a 10 year rolling period. Whether and how actions should be taken to comply with this commitment are topics of current debate.*

Lee Ferry is not to be confused with Lees Ferry, the historic river crossing that today is the launch point for commercial and private boaters through the Grand Canyon. Photo ©iStock.com.

Under the Compact, each basin is allocated the exclusive beneficial use of 7.5 million acre-feet (maf) from the CR system per year, with an additional 1.0 maf of use from the system allocated to the LB. The Compact defines the CR system to be flows from the CR mainstem and its tributaries.

The 1922 Compact also anticipated a future agreement with Mexico by providing that if a treaty is signed, CR water would first be supplied to Mexico from a surplus above and beyond supplies allocated to the UB and LB. If no surplus existed, then each basin would be responsible for supplying half the deficiency to Mexico (see Sharing the Colorado River Between the U.S. and Mexico section of this CR Paper Series).

As between the basins, the 1922 Compact clarifies how the LB can expect to receive some of its apportionment of the system. The Compact includes an UB requirement to not-cause the flow at Lee Ferry to be depleted below an aggregate of 75 maf over a rolling ten-year period. Implied in this provision is the understanding that the CR flows are highly variable, and the UB should be allowed some flexibility in assuring the LB receives its compact apportionments in light of that variability. As such, the Compact requires UB water users to not employ actions that would cause the flow at Lee Ferry to be less than 75 maf in any consecutive ten-year period. If the UB curtails all post-compact uses and the flow is still below 75 maf over ten years, it is not responsible for finding additional water to deliver to Lee Ferry.

In addition, the 1922 Compact prioritized allocating uses between the UB and LB. Specifically, it provides that the UB shall not withhold and the LB shall not call for the delivery of water "which cannot be reasonably applied to domestic or agricultural uses." How to implement this provision became the subject of negotiations in the 1960s and the CR Basin Project Act (see below).

Two additional 1922 Compact provisions that are currently relevant today include the provisions on present perfected rights and Native American Tribes. The Compact expressly protects rights that existed at the time of the Compact by providing that "present perfected rights" are unimpaired by the Compact. The Compact does not define what constitutes a present perfected right or "at the time of the Compact." Subsequent elements of the Law of the River provide a little more clarity on the matter in the LB in (see *Arizona v. California* Decree, *infra),* but it has yet to be definitively decided in the UB. The 1922 Compact addresses Native American Tribes by stating that nothing in the Compact shall affect the U.S.'s obligations to Indian Tribes. There are 30 Tribes federally recognized within the CR Basin today. Accordingly, it has been and continues to be an important but complicated endeavor to figure out whether and how to fold Tribal claims to CR water into the existing structure for water distribution established under the Compact. (see Role of Indian Reserved Water Rights section of this CR Paper Series).

1944 Water Treaty with Mexico

In 1944, when the U.S. had an interest in securing future water supplies and protecting its southern border during World War II, it entered into a treaty with

Mexico regarding the distribution of CR water. [4] The Treaty guarantees Mexico the right to 1.5 maf of CR water every year. If there is a surplus of supply as determined by the U.S. in any given year, then Mexico is entitled up to an additional 200,000-acre-feet of water for delivery. The Treaty also provides that if there is an "extraordinary drought or serious accident to the irrigation infrastructure in the U.S., deliveries to Mexico can be reduced in proportion to the reduction of uses taken in the U.S." However, the Treaty does not define what constitutes an extraordinary drought. Significantly, the same term is used in another part of the same Treaty to describe shortage allocations between Mexico and the U.S. on the Lower Rio Grande. So, if the term extraordinary drought is defined a certain way on the CR, it is likely to be applied similarly against the U.S. on the Rio Grande. Additionally, the Treaty designated the International Boundary and Water and Commission (U.S.-IBWC; México-Comisión Internacional de Límites y Aguas (CILA)) to oversee the implementation of the Treaty. As part of this process, the IBWC is authorized to adopt "Minutes," or formal operational agreements between the two nations, to clarify operational details regarding the implementation of the Treaty's provisions. In recent years, the countries have relied on the IBWC to enter into Minutes to better clarify the allocation of water supplies under the highly variable reservoir conditions of the 21st century (see Sharing the Colorado River Between the U.S. and Mexico section of this CR Paper Series).

1948 Upper Colorado River Basin Compact

The 1922 Compact is not the only interstate compact that governs CR apportionments. Because it allocated the use of CR supplies between basins as opposed to states, additional agreements were necessary to clarify how CR supplies would be allocated among individual states. The UB States were interested in federal assistance to construct storage facilities that would aid and assist in the development of their compact apportionment. Before the government would consent to such activity, however, it required the UB to clarify how its CR apportionment would be allocated among the States. The UB States accomplished this through the Upper CR Basin Compact (UB Compact). [5]

Table 1. Upper Division State Compact Distributions .

State	Percentage of Available Supply	Percentage of 7.5 maf *(If full supply available)*
Colorado	51.75	3,855,375
New Mexico	11.25	838,125
Utah	23	1,713,500
Wyoming	14	1,043,000

Completed in 1948 and Congressionally approved in 1949, the UB Compact apportions the use of the CR supply in perpetuity for the UB States. Arizona is apportioned a lump sum of 50,000 acre-feet annually to satisfy the demand in the small part of the state located upstream of Lee Ferry in the UB. The remaining apportionments are made on a percentage basis, as summarized in the Table 1.

In addition to apportioning water among the UB States, the UB Compact creates the Upper CR Commission (Commission) as an interstate administrative agency to help administer the UB Compact. The Commission consists of a governor-appointed representative from each Upper Division State, which includes the UB States with the exception of Arizona, and a federal representative as the chair. It is managed by staff led by an executive director and frequently includes both technical and legal personnel and advisors.

The UB Compact also includes specific provisions regarding measurement of depletions, overuse of apportionments, and curtailment to meet the requirements of the 1922 Compact. If curtailment of uses is necessary, the UB Compact provides that the Commission is to make the determination, applying several principles. First, any state that has overused in the preceding ten years must supply a quantity at Lee Ferry equal to its aggregate overdraft. Second, except for the makeup of overdraft, the extent of curtailment is to be proportional to the consumptive use by each state in the preceding water year, excluding the use of water "under rights perfected prior to November 24, 1922." Other provisions within the Compact address storage and consideration of specific interstate tributaries within the UB.[6]

Colorado River Apportionments Among the LB States

The LB States (Arizona, California, Nevada, and parts of Utah and New Mexico) could not agree on CR apportionments via any compact. So, unlike the UB, the LB apportionments were set by Congress as determined by the U.S. Supreme Court.

Congressional Apportionment of Colorado River Water in the Lower Basin — *Arizona v. California*

In conjunction with the 1922 Compact, California was looking for federal support to construct storage and delivery facilities within the U.S. to support its growing agricultural economy. In return for California approving the 1922 Compact and agreeing to be limited to a maximum use of 4.4 maf of CR water per year, Congress approved the 1928 Boulder Canyon Project Act. This Act provided federal approval of the 1922 Compact when six of the seven states approved the Compact (Arizona was the only outlier). In providing this approval, Congress suggested an apportionment of water from the CR mainstem among California, Arizona, and Nevada. The apportionments were based on volumes contemplated by the states as they tried to negotiate a compact. When they couldn't agree, Congress decided to identify possible apportionments via the Act, providing that the use of water from the CR mainstem in the LB could be 4.4 maf for California, 2.8 maf for Arizona, and 300,000 acre-feet for Nevada. No mention was made of any apportionment to New Mexico or Utah as LB

states or of tributary supplies in the LB, and they remain an area of disagreement today (see below).

Arizona did not agree with the provisions and suggestions made under the Act. It disputed the apportionments identified and challenged them in the U.S. Supreme Court. After more than a decade-long proceeding in *Arizona v. California,* the Court decided in 1963 that Congress had provided for a statutory apportionment of the CR mainstream in the LB. In its decision, the Court assumed the apportionments made in the Act were more than mere Congressional suggestions. It also supported the Act's pronouncements that distribution of such apportionments from Lake Mead are to only be accomplished via contract with the Secretary of the Interior (Secretary) and that charges against a state's apportionment be made when the mainstream water is put to use within that state. In other words, the use of mainstream CR water is not assessed to the LB at Lake Mead but rather at where the water is received into a delivery structure within each state. Finally, the Court also clarified to some degree what constitutes a present perfected right in the LB and identified how to identify and quantify federal reserved water rights for five (5) Native American Tribes asserting rights to the River. During the proceeding, the Court denied Colorado and Wyoming's efforts to intervene as UB States and expressly noted that the Court was not interpreting the 1922 Compact. The Court codified its holding in the 1964 *Arizona v. California* Decree, which has been updated as needed to address additional LB uses by Tribes and other entities through the years.[7] ❑

Hoover Dam impounds the CR to form Lake Mead, the largest reservoir by volume in the U.S. Photo ©iStock.com

Colorado River Management: **Federal Laws and Regulations**

The Secretary, through the Bureau of Reclamation (Reclamation), is responsible for managing a significant part of the CR supply as it is stored and moved through federally funded and owned facilities in the CR Basin. The Secretary's responsibilities and authorities to accomplish this management are informed by the building blocks of the Law of the River identified above, as well as additional provisions of federal law that have helped make the Basin what it is today. Some of the key federal operating provisions that govern CR management today include:

Boulder Canyon Project Act

The Boulder Canyon Project Act of 1928 (BCPA) did more than provide Congressional consent for the CR Compact and decide the apportionment of mainstream CR water among the LB states as mentioned above.[8] It also authorized the Secretary through Reclamation to build the All-American Canal and Hoover Dam. The Canal provides a means for fulfilling the largest claim to CR water in Southern California without having to rely on an outdated ditch that historically ran through both the U.S. and Mexico. The dam, which created Lake Mead, serves to control floods, generate power, and regulate the CR water supply in the LB. The BCPA also specifies the process for water users to access water from Lake Mead, requiring, among other things, that each water user enter into a water delivery contract with the Secretary to receive water from Lake Mead or a state agency that has a contract for Lake Mead water. In this role, the Secretary is commonly referred to as the water master in the LB because access to the bulk of CR water is controlled by the Secretary under the BCPA.

In passing the BCPA, Congress also affirmed the concept of state autonomy in the allocation and administration of CR water within a state (intrastate administration). It contains no general federal reservation of rights to CR water. Instead, it subjects the rights of the U.S. in or to waters of the CR to the provisions of the 1922 Compact. As such, the BCPA gives the states an official advisory role, with full access to records, in the Secretary's activities under the Act. Finally, the BCPA specifically disclaimed any interference with the rights of the states to adopt laws and policies concerning the appropriation, control, and use of waters within their borders, subject only to the 1922 Compact or other compacts should they come to exist.

CR Basin Water Supply and Demand Study (2012). Map courtesy of the U.S. Bureau of Reclamation.

Colorado River Storage Project Act of 1956

By completing and approving the UB Compact, the UB States were better positioned to develop their CR apportionment. However, each state was aware of the highly fluctuating nature of the CR flow and the need for comprehensive reservoir systems to achieve security in any water distribution among the states. Once the compact negotiations were concluded, the UB States focused on having the federal government pay to construct a series of reservoirs that would store sufficient water to assure

Compact Call – Compact Call is an informal term referring to the UB's obligation to not deplete the flow at Lee Ferry below 75 maf over a 10-year period. Notably, however, the CR Compact does not provide the LB or any entity a right to place a formal call on the River for a certain amount of water. Rather, it is simply recognized that the UB shall not cause the flow at Lee Ferry to be depleted below 75 maf over a rolling 10-year period. The UB Compact further sets forth measures for the Upper Division States to consider to meet this 75 maf/10-year obligation. How all of these provisions are implemented and enforced remains to be seen as the UB has consistently met this obligation to date.

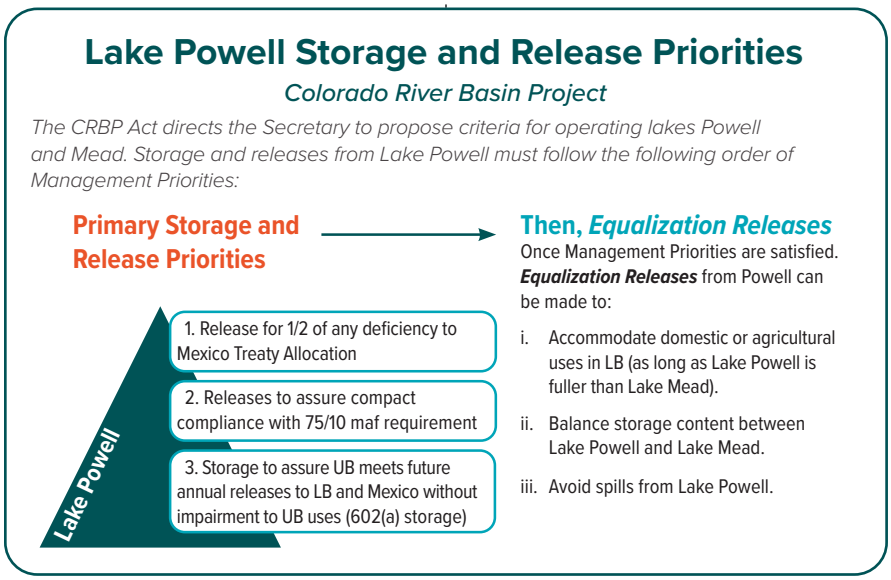


Figure 1. Summary of the CRBP Act, Section 602(a).

that the UB could meet its non-depletion obligation under the 1922 Compact while allowing each state to develop its rights to water in the CR system. These efforts culminated in the 1956 CR Storage Project Act (CRSP Act).[9]

The CRSP Act authorized construction of Glen Canyon Dam, creating Lake Powell, as well as several larger reservoirs in the UB: Aspinall Unit (Colorado), Flaming Gorge (Utah, Wyoming), and Navajo (New Mexico). These reservoirs hold CR water to help the Upper Division States develop their compact apportionments without being subjected to a "Compact Call." The CRSP Act also authorized, subject to subsequent funding appropriations, several "participating projects," intended to help satisfy more regional consumptive use demands, mostly irrigation. However, the federal government did not build a number of these authorized participating projects because of subsequent environmental and financial feasibility challenges. The CRSP Act also recognized the importance and need for hydropower generation to provide a reliable source of energy and help fund the endeavors on the CR. It expressly established the Upper CR Basin Fund, which is credited with power revenues generated from the CRSP facilities.

Colorado River Basin Project Act of 1968

The CR Basin States further clarified coordinated management of federal CR facilities through the adoption of the CR Basin Project Act of 1968 (CRBP Act).[10] Key elements of the CRBP Act include: i) assumption that it was a "national obligation" to provide Mexico's CR entitlement under the 1944 Mexican Water Treaty; ii) authorization for construction of the Central Arizona Project, a 336 mile canal that diverts CR water from Lake Havasu and transports it for municipal, agriculture, industrial, and other uses throughout Arizona; and iii) several Secretarial responsibilities for operating the federal reservoirs on the CR in coordination. For Congress to approve the Central Arizona Project, Arizona had to pay a price. It had to concede the first priority of CR water in the LB to California and agree that the Secretary would limit CR diversions for the Central Arizona Project to assure California would be able to receive its total 4.4 maf of mainstream water in the event of a shortage. For the Upper Division States to approve the legislation, the CR Basin States also had to agree on parameters for coordinated operation of Lakes Powell and Mead to implement the 1922 Compact. Specifically, Section 602(a) of the CRBP Act clarifies an order of priority for storing and releasing water from Lake Powell to comply with the 1922 Compact. The order set forth in the Act is: 1) releases from Lake Powell to supply half of the deficiency in the system, if there is one, to meet Treaty obligations to Mexico; 2) releases from Lake Powell to assure the UB fulfills its non-depletion obligation under the Compact — to not go below 75 maf over any ten consecutive years; and 3) storage of sufficient water in Lake Powell to allow the UB to meet obligations 1 and 2 above without harming its ability to develop and use its compact apportionment (known as "602(a) storage"). Once those priorities are satisfied, additional "Equalization" releases from Lake Powell may be made to the extent it can be put to beneficial use in the LB, to help maintain equal storage levels in Lakes Powell and Mead, and/or to avoid spills from Lake Powell.

In addition to these specific operational provisions, the CRBP Act also requires the Secretary to propose criteria for the coordinated long-range operation of specific reservoirs in both the UB and LB (principally Lakes Mead and Powell), and to report annually on the actual operations under the criteria for the preceding year and the projected operation for the upcoming year. The criteria are referred to as the Long-Range Operating Criteria (LROC), and the report is known as the "Annual Operating Plan."

Flaming Gorge, located in Wyoming and Utah on the Green River, was named by John Wesley Powell during his 1869 expedition down the Green River, due to the spectacular, gorgeous red sandstone cliffs that surround this part of the river. Photo ©iStock.com

1970 Long-Range Operating Criteria

In 1970, the Secretary adopted the Criteria for Coordinated Long-Range Operation of CR Reservoirs (LROC) to outline the steps for Reclamation to jointly operate the UB units authorized under the CRSP Act (Aspinall, Flaming Gorge, Navajo, and Glen Canyon Dams) and Lake Mead.[11] Generally speaking, the LROC requires the Secretary, through Reclamation, to make several determinations to guide operations of system reservoirs for the upcoming year. In the UB, the important determinations relate to the amount of water that the Secretary will store in and release from Lake Powell in that year, under the requirements established in Section 602(a) of the CRBP Act. The LROC also explain that if the forecasted amount of storage in the UB is less than 602(a) storage, or if the storage forecast for Lake Powell is less than Lake Mead, the Secretary will maintain a "minimum objective release" of 8.23 maf in the upcoming year. The government arrived at this amount by taking the average UB Compact requirement of 7.5 maf, subtracting tributary inflows below Glen Canyon Dam and above Lee Ferry (about 20,000 acre-feet), and adding one-half of the U.S.'s delivery obligations under the 1944 Mexican Treaty (750,000 acre-feet).

In operating Lake Mead, the LROC requires the Secretary to make determinations based on elements set forth in the *Arizona v. California* Decree. When the Secretary determines a "Normal Year," releases from Lake Mead shall be sufficient to satisfy each LB state's apportionment (4.4 maf to California, 2.8 maf to Arizona, and 300,000 acre-feet to Nevada) in accordance with the Decree. When the Secretary determines a "Surplus Year" (when water volumes available are greater than "normal" supplies), the Secretary is to apportion 50% of the surplus water to California, 46% to Arizona, and 4% to Nevada, as outlined in the Decree. If the Secretary determines a "Shortage Year" (water in quantities less than "normal" is available), uses are restricted in accordance with the Decree and the CRBP Act.

2007 Interim Operating Guidelines

Since implementing the LROC, the UB has never had to take action to aggregate 75 maf CR water over a rolling ten-year period at Lee Ferry, and the LB has, as of this paper, yet to experience a Shortage Year declaration at Lake Mead.[12] However, as the LB grew into and beyond its CR Compact apportionment in the late 1990s and the drought years of the 2000s began to develop, concern increased over how the reservoirs should be managed under low reservoir conditions.

After five years of consecutive drought, including 2002, when hydrology was 25% of normal, tensions on how to operate the system consistent with the purpose and intent of the Law of the River grew. The Upper Division States asked the Secretary to authorize less than the minimum objective release (8.23 maf) from Lake Powell and began questioning the LB uses that exceeded apportionments set forth in the 1922 Compact. The LB rejected suggested adjustments to Lake Powell releases and challenged the assertions that the LB was over using its apportionment , asserting compliance with the *Arizona v. California* Decree. The LROC lacked any clarification as to how a Secretary may determine a Shortage Year in the LB or whether there was a rational basis for reducing minimum releases from Lake Powell. Instead, the only mechanism that existed was a discretionary Secretarial decision that was likely to be refuted and challenged by one or both parts of the Basin. To avert this crisis, the states and the federal government agreed that supplemental actions were needed to provide greater certainty and security in how the reservoirs would be operated under lower storage conditions and to avoid conflict and litigation. After two years of negotiation and a full envi-

The white band at Lake Mead, as seen from Hoover Dam, marks the high-water storage level. Lake Meade, located in Nevada and Arizona on the CR, is the largest reservoir in the U.S. in terms of water capacity. Photo ©iStock.com.

ronmental impact assessment, the Secretary issued the 2007 Interim Guidelines for LB Shortages and Coordinated Operation of Lake Powell and Lake Mead.[13] These Guidelines serve as a temporary implementation of the LROC through 2026 to learn from and gain experience in operating the system through drought and under variable water supplies. Key elements of the Guidelines include:

i. criteria for the Secretary to determine a surplus, normal or shortage condition at Lake Mead, and greater certainty in how deliveries will be accomplished depending on the year type;

ii. criteria for operating Lake Powell and Lake Mead in closer coordination, to avoid a see-saw effect in storage and better distribute the benefits and burdens of reservoir storage supplies; and

iii. provide for new opportunities and mechanisms for storing and delivering conserved water at Lake Mead to enhance the flexibility of meeting water demands in the LB under drought or low reservoir conditions without relying solely on larger releases from Lake Powell (a/k/a Intentionally Created Surplus (ICS)).

The shortage criteria identify when and to what degree the Secretary will declare a shortage condition in the LB. The determinations are based on reservoir elevations at Lake Mead, and the volume of shortages to be applied are based on amounts agreed to by Nevada and Arizona. The coordinated reservoir criteria identify adjustments to annual releases from Lake Powell based on storage conditions at both Lake Powell and Lake Mead. Depending on storage conditions, Lake Powell releases could be less or greater than the minimum objective release of 8.23 maf to better manage the storage volumes between Lake Powell and Lake Mead. The new operating mechanism, ICS was introduced with the Guidelines and involves a program to incentivize temporary conservation of storage at Lake Mead in return for access to the conserved water when storage levels at Lake Mead improve.

Finally, the Guidelines also recognized and included a requirement for the Basin States and federal government to consult and problem solve before exacerbating conflicts and initiating litigation on the CR. Through these and other measures, the Guidelines were intended to minimize the risk of shortages in the LB, clarify how the reservoirs would be managed under drought conditions until hydrology would improve, and reduce the risk in the UB of adversely affecting its available compact yield and requiring curtailment of uses to comply with the 1922 Compact's non-depletion obligation. To be successful, the Guidelines depended on Mexico participating in shortages with the LB and actual hydrologic conditions to track with the modeling that underscored the agreements for reaching consensus on the Guidelines. Mexico agreed to participate in shortage sharing consistent with the Guidelines so long as, among other things, it was allowed to also share in surplus, if the Secretary ever determined such a condition at Lake Mead. Mexico also required the ability to temporarily defer and store a portion of its guaranteed entitlement in U.S. reservoirs and the agreement from Reclamation to operate the system to help achieve an environmental pulse flow to the Gulf of California. These conditions and the detailed provisions to accomplish them consistent with the 1944 Treaty were documented in Minute 319, which was a 5-year operational agreement between the U.S. and Mexico contingents of the International Boundary and Water Commission.[14]

2019 Drought Contingency Plans

The Interim Guidelines have helped to stabilize the system and avoid litigation during the driest hydrology recorded in the Basin. Unfortunately, the "drought" that started in 2000 has persisted through today, and the hydrology is drier than anticipated when putting together the Guidelines. Additional mechanisms, therefore, were required to protect storage at Lake Powell and Lake Mead to sidestep the possibility of a failure of the system. In 2013, the Basin States and Reclamation began to work on Drought Contingency Plans to serve as an overlay of the Guidelines until 2026. By 2019, the UB and LB had each developed measures to help mitigate the risk of the reservoirs reaching critically low elevations due to the frequency and magnitude of drought conditions in the system. The UB DCP was designed to help assure continued compliance with the compacts by: i) protecting elevations at Lake Powell and ii) preserving opportunities to investigate the interest and feasibility of creating a voluntary temporary conservation program in the UB. The LB DCP calls for Arizona, California, and Nevada to contribute additional water to Lake Mead at specified storage elevations. It also provides for greater flexibility and enhancements to voluntarily conserving water under the ICS program. Congress approved the DCPs in April 2019[15], and each Basin State signed onto the agreements on May 20, 2019.[16] Mexico again participated in these efforts by entering into Minute 323 upon expiration of Minute 319. Minute 323 extends the provisions of Minute 319 and incorporates Mexico's participation in making additional storage contributions under a binational water scarcity plan based on specified reservoir elevations at Lake Mead.[17] With the exception of a few specific provisions, both the DCPs and Minute 323 expire with the Guidelines in 2026.

Today

The Secretary, through Reclamation, recently finalized an analysis of the Guidelines' effectiveness between 2008 and 2019.[18] This study is anticipated to be a key source, along with other information, to help inform whether and how the existing operation and administration of the CR system may be considered going forward. Interested stakeholders throughout the CR Basin are gearing up to participate in determining how the system should be considered to function post-2026 and the expiration of the current Guidelines.

Overall

Taken together, the elements of the Law of the River have worked to moderate conflict and provide some sense of order amidst otherwise potential chaos since the 1920s. Admittedly, no element of the Law of the River is a silver bullet, and interpretive issues over the meaning and application of certain provisions inevitably persist. Nonetheless, to many, neither the Supreme Court nor Congress is best situated to adjust existing operations to meet today's needs. At this critical stage, the affected states, Tribes, and interested stakeholders have significant incentive to find ways to collaborate with the Secretary and her designees to determine better than Congress or the Court how to get the most use and benefits from the CR. Past experience has taught — "It [has] not [been] in their interest[s] to leave matters of such great importance to the vicissitudes of the national political process or the uncertainties of adjudication among adversaries."[19] ❑

Endnotes

1 *Kansas v. Colorado,* 206 U.S. 46 (1907).

2 *Wyoming v. Colorado,* 259 U.S. 419 (1922).

3 Colorado River Compact (1922), authorized pursuant to Act of August 19, 1921, ch. 72, 42 Stat. 171, acknowledged by the Boulder Canyon Project Act, 43 U.S.C. 617, ch. 42, 45 Stat. 1057, (1928), and made effective by Public Proclamation of the President of the U.S. on June 25, 1929 under 46 Stat. 3000 (1929).

4 Treaty between the U.S. of America and Mexico Respecting the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Feb. 3, 1944, U.S.-Mex., 59 Stat. 1219, T.S. 994 (1944 Water Treaty).

5 Upper Colorado River Basin Compact, ch. 48, 63 Stat. 31 (1949).

6 Other key elements of the UB Compact address storage and accounting of CR water in UB reservoirs and allocation among UB states of waters from tributaries to the CR, among others.

7 Consolidated Decree, *Arizona v. California,* 547 U.S. 150 (2006).

8 Boulder Canyon Project Act, 43 U.S.C. 617, et. seq. (1928) (45 Stat. 1057).

9 Colorado River Storage Project Act, 43 U.S.C. § 620, et. seq. (1956) (70 Stat. 105).

10 Colorado River Basin Project Act, 43 U.S.C. § 1501 et. seq. (1968) (82 Stat. 886).

11 Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs, 35 Fed. Reg. 8951 (June 10, 1970).

12 Notably, August 24-month study projections for 2022 indicate that the Secretary will determine a shortage condition in the LB for the first time under the 2021-2022 Annual Operating Plan with storage estimates at Lake Mead to be below 1075 ft. in elevation.

13 Record of Decision for Colorado River Interim Guidelines for LB Shortages and the Coordinated Operations for Lake Powell and Lake Mead, Bureau of Reclamation (December 2007), 73 Fed. Reg. 19873-19892 (April 11, 2008).

14 Minute 319 - Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California, International Boundary and Water Commission (November 2012).

15 Colorado River Drought Contingency Plan Authorization Act, Pub. L. No. 116-14, 133 Stat. 850 (2019).

16 Colorado River Basin Drought Contingency Plans, Bureau of Reclamation (May, 2019), available at https://www.usbr.gov/uc/envdocs/eis/animas/fseis/pdf/rod.pdf (Last Visited, April 20, 2021).

17 Minute 323 - Extension of Cooperative Measures and Adoption of a Binational Water Scarcity Contingency Plan in the Colorado River Basin, International Boundary and Water Commission (September 2017).

18 Review of the Colorado River Interim Guidelines for LB Shortages and Coordinated Operations for Lake Powell and Lake Mead, Bureau of Reclamation (Dec. 2020), available at https://www.usbr.gov/ColoradoRiverBasin/documents/7.D.Review_FinalReport_12-18-2020.pdf (Last Visited April 20, 2021).

19 David H. Getches, Competing Demands for the Colorado River, 56 U. Colo. L. Rev. 413 (1985), available at https://scholar.law.colorado.edu/articles/1027 (Last Visited April 20, 2021).

Summary of the Law of the Colorado River		
Basin Apportionment Provisions		
Law	Relevant Provisions	Current Status/Relevant Considerations
Colorado River Compact	Article III (a) — Apportions in perpetuity the exclusive beneficial consumptive use of 7.5 maf of CR System water to the UB and LB respectively.	The LB has developed its full CR apportionment. The UB has not fully developed its 7.5 maf apportionment under a full supply. There is debate as to whether the UB can develop its full apportionment and fulfill other obligations under the Compact.
	Article III (b) — The LB can increase its beneficial consumptive use of CR System waters by 1 maf.	It has not been expressly determined how this provision should be applied. The Bureau of Reclamation has calculated that use of tributary water in the LB exceeds 1 maf. However, Arizona disputes inclusion of the Gila River in any calculation. Moreover, the LB relies on the decision in *Arizona v. California* to assert each LB state is entitled to use the tributaries within its own borders though that opinion also noted that it was not interpreting the Compact.
	Article III (c) — If the U.S. enters into a CR water treaty with Mexico, supplies to Mexico should come first from amounts over and above the allocations made to the UB and LB (surplus). If the surplus is insufficient to meet a treaty's delivery requirements to Mexico, then the UB and the LB each shall equally shoulder the burden of the deficiency of delivery. The UB shall deliver its one-half the deficiency at Lee Ferry.	There is ongoing debate as to whether there is a deficiency in the system that justifies the UB having to provide half of Mexico's delivery obligation. Some assert that until it can be shown the LB is not overusing its compact apportionment under Article III, there is no deficiency in the system. The excess uses would be considered part of the surplus that should be delivered to fulfill the 1944 Treaty requirements. Others maintain that there is less than 15 maf in the CR system on a consistent basis. As a result, there is no surplus over and above the apportionments made to the basins under the compact. Each basin, therefore, shall provide half the Mexico delivery obligation, including the volumes necessary to deliver the water to Mexico. The Bureau of Reclamation has regularly operated Lake Powell to provide the LB's annual apportionment of 7.5 maf as well as half the Mexico delivery obligation, as evidenced by declaring 8.23 maf to be the "Minimum Objective Release" from Lake Powell each year (see LROC).
	Article III (d) — The Upper Division States will not cause the flow at Lee Ferry to be depleted below 75 maf for any consecutive ten year period.	The UB has always satisfied this provision, and has never had to curtail uses to fulfill this responsibility. In light of the persistent drought experienced since 2000, the future inflow in the UB is likely to be closer to the minimum flow target at Lee Ferry and has heightened concerns for considering whether and how to proceed — challenge Compact provisions, prepare for curtailment measures, etc.
	Article III (e) — The Upper Division States shall not withhold water, and the Lower Division States shall not require the delivery of water that cannot be reasonably applied to domestic and agricultural uses.	LB States have argued that, under the CR Compact, water not required to meet the UB States requirements must be released to the LB. As the hydrology gets drier, the appropriateness for sending more water from the UB to the LB is challenged.
		In the face of climate change, questions arise about how to interpret Articles III (a) - (e) together.
	Article VII — The compact shall not be interpreted as affecting the U.S.' obligations to Native Americans.	The Compact does not address whether and how to reach Tribal reserved water rights settlements with claims to the CR. In deciding *Arizona v. California,* the Supreme Court concluded that any reserved rights for CR water must be satisfied from the compact volume allocated to the state where the reservation is located.
	Article VIII — The Compact does not impair present perfected rights to use of Colorado River System waters.	Present perfected rights is not a defined term in the Compact. What constitutes a present perfected right in the UB and what it means to leave them unimpaired are two concepts that have yet to be expressly determined.

Summary of the Law of the Colorado River *Continued*		
Basin Apportionment Provisions		
Law	Relevant Provisions	Current Status/Relevant Considerations
U.S.-Mexico 1944 Water Treaty	Article 10a — guarantees an annual amount of 1.5 maf of the CR's annual flow to Mexico.	As a guaranteed right to a volume of water, the Mexico treaty requirement is considered the first priority to meet on the River.
	Article 10b — If there is surplus supply, as determined by the U.S. Section of the IBWC, Mexico can request up to 1.7 maf for that surplus year. If there is an extraordinary drought or serious accident to U.S. infrastructure making it difficult to make Mexico deliveries, Mexico's annual allocation will be reduced in proportion to reductions of consumptive uses in the U.S.	The term "extraordinary drought" is undefined. The same term is also used in a separate part of the Treaty regarding the Lower Rio Grande. If the IBWC were to clarify the meaning of the term for the CR, there would be political pressure to apply the same requirements against Texas in the Lower Rio Grande.
	Article 24 — The IBWC shall record its decisions in Minutes and shall execute the decisions as approved by the two Governments.	
	Article 25 (d) — The IBWC shall have the power to settle differences regarding the interpretation or application of the Treaty subject to the approval of the two Governments.	Minutes are not considered an amendment to the Treaty without the advice and consent of a 2/3 majority of the Senate. Therefore, Minutes cannot alter, ignore or renegotiate the express terms of the 1944 Treaty. Rather they clarify details for implementing and administering the terms as agreed to by the countries. Some relevant operational Minutes that the U.S. and include: Minute 242 (salinity control); Minute 306 (enviornmental considerations); Minute 319 (cooperative measures to address variable CR water supplies); and Minute 323 (extending Minute 319 and clarifying how to share the water supply through 2026).
Upper Colorado River Basin Compact	Article III (a) — sets forth the UB apportionment of CR water.	
	— Arizona receives a flat 50,000 acre feet/year The rest is by percentages of available water supply as follows: — Colorado 51.75% — New Mexico 11.25% — Wyoming 14% — Utah 23%	Significant portion was utilized for the Navajo Generating Station and is pivoting to other uses. The actual water supply available pursuant to these percentages depends on water made available from annual hydrology and storage in a given year.
	Article IV — In the event that curtailment of beneficial water use is necessary to comply with the CR Compact, the amount of curtailment required by each state will be determined by the Upper CR Commission based on specific principles set forth in Art. IV (a) - (c).	Some examples of the many relevant questions include: • When, if ever, does curtailment have to be triggered in the UB? • Should it be triggered regardless of uses in the LB? • How will consumptive use be credibly accounted for in a timely fashion to identify curtailment needs in the UB? • Should these and other questions be sidelined to allow for creative problem solving and innovation at this critical time?
	Article VIII — Establishes the Upper CR Commission as an interstate administrative agency and sets forth its duties and responsibilities.	The UCRC is not an arm of any state or the federal government. It is comprised on commissioners from the Upper Division States and the federal government. It also includes committee members designated by the commissioners. The UCRC's focus is on work to inform relevant compact administration and coordinate the Upper Division States to have a united positions when possible.

Summary of the Law of the Colorado River *Continued*		
Basin Apportionment Provisions		
Law	Relevant Provisions	Current Status/Relevant Considerations
***Arizona v. California* Decision**	The Supreme Court's 1963 decision: —Focused and relied on the Boulder Canyon Project Act, and did not interpret the CR Compact; —Concluded that the Act: (i) approved the CR Compact; (ii) made a "complete statutory apportionment" of 7.5 maf in uses of CR mainstem water among the LB States; (iii) does not include an allocation of tributary uses; (iv) provided a comprehensive scheme for the Secretary of the Interior to provide water under surplus, normal and shortage conditions via permanent/direct delivery contracts with water users; —Noted that contracting parties and the Secretary of the Interior "can do nothing to upset or encroach upon the Compact's allocation of CR water between the UB and LB."—Determined the allocation of federally reserved waters for five Tribes in the LB, explaining that such allocations shall be derived from the amounts allocated to the state in which the Tribal lands are located.	Although the decision did not interpret the CR Compact and recognized that no actions can upset or encroach on allocations between the UB and LB, it created an expectation that the LB states do not have to account for evaporation or transit losses as part of its Compact allocation, and an argument as to whether and to what extent the LB tributaries could be used regardless of Compact allocations. These two issues (evaporation/transit losses and tributary uses) comprise part of the LB's structural deficit. The LB states require more than what is apportioned to them under the CR Compact to sustain uses as contemplated by the *Arizona v. California* decision. Additionally, there are more Tribal claims to resreved water rights that have yet to be determined, and could potentially drastically alter the distribution and use of CR water under the Compact.
***Arizona v. California* Decree 1964**	Served to enforce Secretary of the Interior's operational authority. Characterized all water below Lee Ferry and in the U.S., as "Water Controlled by the U.S.," and required the Secretary to distribute such water in strict accordance to its terms. Acknowledged that the Secretary could only release water from Lake Mead pursuant to valid contracts with water users, and only under three different water conditions: normal, surplus, and shortage. The Decree also required the Secretary to charge any consumptive use of mainstem water(including Tribal water) to the LB State in which it is used, and allowed the Secretary the authority to make unused mainstem water in one state temporarily available for use in another state.	
	Declared that the consumptive use of any surplus water available shall be distributed 50% to California, 46% to Arizona, and 4% to Nevada.	
	Declared that if the supply is insufficient to the LB's annual compact allocation, then shortages may be distributed to the LB States, providing that 4,400,000 acre feet will still be apportioned for use in California including all present perfected rights.	
	Allowed unused water from one LB State's apportionment to be used in another LB State.	

The CR near Parshall, Colorado, is designated a Gold Medal fishery by Colorado Parks and Wildlife. Photo ©iStock.com.

Summary of the Law of the Colorado River *Continued*		
Federal CR Statutes		
Law	Relevant Provisions	Current Status/Relevant Considerations
Boulder Canyon Project Act	Provided Congressional ratification of the CR Compact upon California agreeing to limit its allocation to 4.4 maf, and California and at least five other state legislatures ratifying the Compact.	This Act serves as the foundation for LB management and distribution of CR water supplies. Documents related to fulfill conditions for implementing the Act include: California Limitation Act: CA agreeing to limit its LB apportionment to 4.4 maf; California Seven Party Agreement: Intrastate agreement on how the 4.4 maf will be prioritized to water users in CA.
	Authorized construction of Hoover Dam and the All-American Canal.	
	Suggested an apportionment of the LB's CR Compact allocation to be Arizona (2.8 maf), California (4.4 maf) and Nevada (0.3 maf).	
	Identified a mechanism for the Secretary of the Interior to serve as the Water Master in the LB by functioning as the sole contracting authority for CR water use from Lake Mead in the LB.	
	Contains no general federal reservation of rights to CR water. Instead, it subjects U.S. rights in or to waters of the CR water to the CR Compact.	Note: This Act expressly does not amend or modify the CR Compact.
Colorado River Storage Project Act	Commits to aid in comprehensive development of CR water in the UB by providing water storage facilities, including Glen Canyon Dam, to help the UB assure it can utilize its compact entitlements while meeting its CR compact obligations	Just as the Boulder Canyon Project Act is Congress's directive on the development of water in the LB, the CRSP Act is the directive for federal assistance to develop water in the UB. It serves to authorize storage facilities that will help protect against the need to curtail to satisfy the CR Compact's non-depletion obligation and promote the development of irrigation and other uses.
	Also authorized several "participating projects" to help satisfy more regional consumptive use demands.	
	Recognized hydropower revenues from storage facilities should help maintain the current use and development of UB water, therefore, establishing the Upper CR Basin Fund to credit power revenues for CRSP facilities .	Hydropower revenues generated from the storage facilities are to help with repayment of construction costs and ongoing operation and maintenance for the Units. The Basin Fund also is intended to provide an opportunity for the States to assist irrigation projects by making future hydropower revenues available to each state based on a specific formula.

The hydroelectric power facility at Glen Canyon dam has a total capacity of 1,320 megawatts and produces about five billion kilowatt-hours of hydroelectric power annually which is used in Wyoming, Utah, Colorado, New Mexico, Arizona, Nevada, and Nebraska. Photo ©iStock.com.

Summary of the Law of the Colorado River *Continued*		
Federal CR Statutes		
Law	Relevant Provisions	Current Status/Relevant Considerations
Colorado River Basin Project Act	Authorizes construction of the Central Arizona Project on condition that water supply available to the CAP is subordinate to California's compact rights to CR water in the event of a shortage.	
	Recognizes that it is a national responsibility to provide water to Mexico's Treaty water and commits to investigate sources to import additional water supplies.	
	Sets forth under Section 602(a) of the Act the coordinated operations of federal storage facilities authorized under the Boulder Canyon Project and CR Storage Project Acts by expressly setting the priority of releases and storage of CR water consistent with the Compacts as follows:	
	(i) Releases to supply half of any deficiency to supply the Mexico Treaty supply. (ii) Releases to provide 7.5 maf to the LB (iii) Storage of water in the UB to assure future accomplishment of (i) and (ii) without impairing consumptive uses in the UB.	Known as Section 602(a) Storage. The calculation for determining this storage is the subject of disagreement between the UBand LB.
	(iv) Releases to extent water can be reasonable applied to uses in the LB so long as Lake Powell storage is not less than storage at Lake Mead; it is necessary to maintain as nearly as practicable storage in Mead equal to Powell; or to avoid spills from Lake Powell.	This additional release under priority (iv) appears to be the mechanism for implementing Article III(e) of the CR Compact. It is for water in excess of the storage necessary to meet priority (iii). These excess releases over and above what would be needed to provide half the Mexico treaty obligation and satisfy the compact obligation not to deplete the flow at Lee Ferry below 75 maf/10 years is referred to as an "equalization release."
	Directs the Secretary of the Interior to create a Consumptive Uses and Losses Report to account for beneficial consumptive uses on a state by state basis.	
	Requires the Secretary to develop "Long Range Operating Criteria" for the CR reservoir system, and to report operations under the criteria for the past year and projected operations for the preceding year under an Annual Operating Plan.	
	Recognizes that operation of CR federal facilities is subject to compliance with the Compacts, treaties, laws and decrees governing the CR. Provides that if operations do not comply, any affected state may file an enforcement action in the U.S. Supreme Court and the U.S. may be joined as a party (a/k/a waives sovereign immunity).	

The Central Arizona Project is a 336 mi diversion canal in Arizona. The aqueduct diverts water from the CR into central and southern Arizona. Photo ©Tim Roberts/Shutterstock.com.

Summary of the Law of the Colorado River *Continued*		
Rules/Regulations/Guidelines		
Law	Relevant Provisions	Current Status/Relevant Considerations
Long Range Operating Criteria	Developed in 1970	
	Established the criteria for the coordinated operation of the units of the Colorado River Storage Project in the UB, and Lake Mead in the LB.	
	In the UB, declares the minimum objective release from Lake Powell to be 8.23 maf annually and identifies considerations for calculating 602(a) storage.	The Secretary arrived at 8.23 maf, by averaging the UB non-depletion requirement to 7.5 maf per year, subtracting tributary inflows below Glen Canyon Dam and above Lee Ferry (about 20,000 acre-feet), and adding one-half of the U.S. delivery obligation under the 1944 Mexican Treaty (750,000 acre-feet).
		The formula for calculating 602(a) storage at Lake Powell, including the minimum objective release, is not an interpretation of the Compact, and includes a number of variables that are the subject of disagreement between the UB and LB.
	In the LB sets Lake Mead release volumes in accordance with *Arizona v. California* Decree — In normal years, annual releases to be sufficient to satisfy 7.5 maf of consumptive use. In surplus years, the Secretary apportions 50% of surplus water to California, 46% to Arizona, and 4% to Nevada. In shortage years, uses are to be restricted in accordance with the 1964 Decree and Basin Project Act.	The LROC did NOT set forth whether and how the Secretary would identify a surplus or shortage condition in the LB. Nor does it specify how shortages would be distributed to satisfy the Law of the River.
Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead	Serves as an interim implementation of the LROC to gain valuable experience on how to better operate federal CR facilities under variable water supply conditions between 2008 and 2026	
	Clarifies the conditions when the Secretary will declare a shortage condition and reduce annual releases below 7.5 maf from Lake Mead consistent with the 1964 Decree	
	Sets storage tiers at Lake Powell under which different volume releases will be made based on conditions at both Lake Powell and Lake Mead (can be less than or greater than 8.23 Minimum Objective Release under certain conditions).	
	Authorizes mechanisms that provide for the storage and delivery of conserved water from Lake Mead to increase the flexibility of meeting water use needs from Lake Mead under low reservoir conditions.	
	Requires consultation and collaboration among the CR Basin States and federal government before filing any action regarding the Guidelines.	

Summary of the Law of the Colorado River *Continued*		
Rules/Regulations/Guidelines		
Law	Relevant Provisions	Current Status/Relevant Considerations
Drought Contingency Plans	Compilation of separate plans for the UB and LB brought together by a jointly signed Companion Agreement and Federal legislation to serve as an overlay to the 2007 Interim Guidelines to provide additional operational measures under drought conditions in the CR Basin.	
	Provides for the development of tools between 2019 and 2026 to provide additional security and certainty in CR water supplies to avoid circumstances that could otherwise form the basis of claims or controversies in the application of the Law of the River.	
	The LB Plan commits the Secretary and water users to implement conservation measures or accept additional delivery reductions to limit the about of releases from Lake Mead.	In a significant step for water conservation, entities within CA agreed to participate in the DCP, even though other LB state's rights are subordinate to its rights on the River. In order to meet new commitments under the DCP, Az and Ca have both developed their own intrastate agreements to define which water users will undertake conservation measures to implement the necessary cuts.
	The UB Plans include three elements: — Promoting Weather Modification activities to augment supplies.	
	— Working to protect minimum power pool elevations at Lake Powell and help maintain Compact compliance.	"This DCP element is referred to as the "Drought Response Operations Agreement"" — This Agreement establishes a process to rely on water stored in federal reservoirs as needed to reduce the risk of Lake Powell dropping below a target elevation of 3,525 feet above mean sea level. It essentially establishes a process to move water from where it is already stored to where it is needed—Lake Powell. This Agreement: — Only applies to the CRSP Act Initial Units: Lake Powell, Flaming Gorge, Aspinall and Navajo reservoirs. It does not affect participating projects under the CRSP Act. — Provides the UB States a role in how the decision to operate UB reservoirs will be made. Assures that all Initial Units are considered and includes emergency provisions if needed. — Precludes the release of any water for DCP purposes if needed to satisfy existing uses. It does not affect any existing or future contracted water uses in the UB. —Provides for recovery of storage as soon as practicable.
	— Investigating tools to help assure continued compliance with the CR Compact's non-depletion obligation.	This DCP Element is referred to as the "Demand Management Storage Agreement" — It makes available unfilled storage capacity at the CRSP Act reservoirs for UB use to store water conserved under an UB Demand Management Storage Program. The Agreement does not establish a Demand Management program but sets forth the minimum framework under which such program might exist prior to 2026, which include: — Any program will only be to reduce consumptive uses in a temporary, voluntary, and compensated manner if needed in times of drought, to help assure continued compact compliance without impairing existing water rights. — A program will only be created if, after study, the UB States determine that a demand management program is feasible, implementable and advisable. — A program will only be established and implemented if approved independently by each of the Upper Division State's Compact Commissioners and the Upper CR Commission, after consultation with the LB and entering into additional agreements with the Secretary of the Interior.

Navajo Reservoir, New Mexico. Photo by Timthefinn/Wikimedia Commons.

Reserved Indian Water Rights in the Colorado River Basin

There are 30 federally recognized Tribes in the Colorado River (CR) Basin.[1] While, collectively, they lay claim to almost 20% of the CR water supply, each Tribe upholds its separate form of sovereign governance and maintains its own views and unique perspectives on the CR Basin. Still, it is safe to say that many of these Tribes consider the CR to be sacred, and all rely on the CR resource in some manner for cultural, social, economic, and spiritual survival.

Successful exercise of Tribal regard for CR resources intersects with how the water supply is managed throughout the Basin. The Law of the River annually apportions the use of over 17.5 million acre feet (maf) of CR water to seven U.S. states and the Republic of Mexico. However, since 2000, average annual inflow was approximately 12.8 maf, which is about 14% below the long-term historical average. The discrepancies between annual allocations of CR water under the Law of the River and the average annual inflow since 2000 has been manageable for two reasons: (1) the considerable system reservoir storage (approximately 60 maf); and (2) the fact that UB states and Native American Tribes have yet to fully develop their rights to the CR. Reliance on these sources to weather drought has caused reservoir storage to decline from approximately 94% full in 2000 to less than 50% of capacity as of end of water year 2020.[2] While Tribes are continuing to look for ways to realize the full benefits of their respective water rights, others are concerned with how Tribal water uses will conflict or integrate with already existing and planned uses by non-Indian water users in the Basin. When confronted with an ongoing drought or persistent drying of the system, these interests present significant challenges for the Basin to address.

The following summarizes certain background principles and uncertainties regarding Native American claims and rights to CR water and highlights the relevance of Native American Tribes when making water basin management decisions going forward.

Doctrine of Federal Indian Reserved Water Rights

The doctrine of federal Indian reserved rights stems from the U.S. Supreme Court's decision in *Winters v. United States* in 1908. In Winters, the U.S. sought to prevent settlers from building and using infrastructure to divert water upstream from the Reservation on the Milk River in Montana.[1] The Court decided in favor of the U.S. on behalf of the Tribes that would be affected by the non-Indian diversions. The Court held that because a primary purpose of the Ft. Belknap Reservation was to transition the Tribes from a pastoral to agrarian lifestyle, the U.S. had also impliedly reserved the amount of water necessary to help accomplish that purpose. This case serves as the foundational element to the doctrine of reserved water rights, and federal Indian reserved water rights are often referred to as "Winters rights."

Unique Elements to Federal Indian Reserved Water Rights

Federal Indian reserved water rights have some unique characteristics. First, they are held in trust by the U.S. for the benefit of the relevant Tribe(s). The trust responsibility is a legal obligation for the federal government to protect Native American resources and assets and manage them in the Tribes' best interests. This relationship has a foundation in the U.S. Constitution and is further fortified by Congressional legislation, treaties, and court rulings. At a basic level, the U.S. retains title to all reserved public lands. Some of these lands were reserved as part of an arrangement to establish permanent homelands for Native American Tribes. Under this arrangement, the U.S. remains responsible for protecting the reserved lands and related resources on the Tribes' behalf.

Second, federal Indian reserved water rights exist independent of use, cannot be lost due to nonuse, and can displace other water rights who began uses after the land reservations for Tribes were created. Unlike water rights governed strictly by the Prior Appropriation Doctrine, federal Indian reserved water rights do not have to be diverted and put to beneficial use to secure a priority date for administration against other water rights. Unless agreed to otherwise, recognized federal Indian reserved water rights have a priority date based on when the reservation was formed or time immemorial. When the reserved rights are needed to help achieve the purposes of the land reservation, the priority date is the date the reservation was established. If water is reserved so a Tribe can continue its native or aboriginal uses, rights to such water may have a time immemorial priority date.

ID	Tribe Name	ID	Tribe Name	ID	Tribe Name	ID	Tribe Name
1	Ute Indian Tribe of the Uintah and Ouray Reservation	9	Havasupai Tribe	15	Chemehuevi Indian Tribe	23	Salt River Pima-Maricopa Indian Community
2	Southern Ute Indian Tribe	10	Hualapai Indian Tribe	16	Colorado River Indian Tribes	24	Gila River Indian Community
3	Ute Mountain Ute Tribe	11	Shivwits Band of Paiute Indian Tribe	17	Yavapai-Apache Nation	25	Ak-Chin Indian Community
4	Jicarilla Apache Nation	12	Moapa Band of Paiute Indians	18	Yavapai-Prescott Indian Tribe	26	Quechan Indian Tribe
5	Navajo Nation	13	Las Vegas Tribe of Paiute Indians	19	Tonto Apache Tribe	27	Cocopah Indian Tribe
6	Zuni Tribe	14	Fort Mojave Indian Tribe	20	White Mountain Apache Tribe	28	Tohono O'odham Nation
7	Hopi Tribe			21	San Carlos Apache Tribe	29	Pascua Yaqui Tribe
8	Kaibab Band of Paiute Indians			22	Fort McDowell Yavapai Nation		

Map of the Federally recognized Tribes in the CR Basin. The additional Tribe recognized in the Basin is the San Juan Southern Paiute Band (map ID# 30) that is located within the lands designated within the Navajo Reservation. Map courtesy of the Colorado River Basin Water and Tribes Initiative.

The San Juan River as seen in New Mexico is a tributary of the CR, providing drainage in Colorado, New Mexico, Utah, and Arizona. Photo © Brenda Landdeck /shutterstock.com.

Third, the volume of a federal Indian reserved water right depends on the amount of water necessary to fulfill the purposes of the land reservations. Various approaches have been used to quantify federal Indian reserved water rights. In *Arizona v. California,* the U.S. Supreme Court established the "practicably irrigable acreage" (PIA) standard, setting the Tribes' CR entitlements to an amount sufficient to irrigate the PIA on a reservation.[3] Arizona courts have also recognized an alternative "homeland standard" for quantifying federal Indian reserved water rights within the CR Basin. Under this standard, the reserved rights are quantified based on more than need tied to agriculture. They are calculated based on the Tribe's past, present, and future water needs to sustain the homeland. This could include hunting, fishing, commercial, and other economic development purposes. Applying these standards to recognize federal Indian reserved water rights has enabled quantification of rights that aid in Tribal planning and development and clarify water availability for other water users.

Uncertainties with Federal Indian Reserved Water Rights to Colorado River Water

Native American Tribes were not directly involved in the CR Compact negotiations. Still, the concept of Tribal interests in CR water were not overlooked completely. Herbert Hoover, the federal representative and chairman of the CR Compact Commission was aware of the Winters doctrine and indicated concern that Congress might raise the issue of "Indian water rights" when considering its consent to the final interstate agreement. In response, the commissioners included Article VII to the CR Compact, providing, "Nothing in this compact shall be construed as affecting the obligations of the U.S. to Indian Tribes."[4] The UB Compact commissioners followed suit, reasoning that having a different pronouncement or approach to Tribal water claims could confuse or conflict with the CR Compact. Article XIX of the Upper CR Basin Compact adopts the same language as Article VII of the CR Compact as it relates to Tribes.[5]

Although these compacts provide a proverbial 'foot in the door' for recognizing Tribal water interests, they do not prescribe how such interests should be integrated with the compact apportionments of water among the States. This "omission" has been a source of debate within the Basin. Some of the debates have to do with the magnitude of valid reserved rights claims to CR water, the volume of water reserved under each federal Indian reserved right, and the accessibility/use of federal Indian reserved rights within the Basin.

a. Magnitude of Valid Claims

The magnitude of valid reserved rights claims to the CR has not been fully defined. Approximately twelve Tribes still await a process to have CR claims recognized. The Navajo Nation's pending CR claims are among the largest. Located in parts of New Mexico, Utah, and Arizona, the Navajo Nation claims "aboriginal, historic, appropriative and reserved rights to the use of all the water necessary for the Navajo Reservation to be the permanent homeland for the Navajo people."[2] These claims extend into both the UB and LB and require the Navajo (and the U.S. as a trustee) to be involved in multiple sets of settlement negotiations and/

or general stream adjudications to have their claims considered and recognized. So far, they have successfully reached settlements with New Mexico and Utah but are still working with Arizona.

The Supreme Court may have clarified the upper limit to the extent the Navajo's and other Tribes' reserved rights claims. In deciding *Arizona v. California,* the Court pronounced that uses of mainstream CR water by the U.S. (which is assumed to apply to Tribal reserved rights) are to be accounted from the allocations made to the Basin State where the federal use is situated. This suggests that the magnitude of Tribal claims to the CR mainstream is limited to the uses apportioned to the Basin States by compact or decree. However, questions still remain. Does the Court's decision apply to rights that existed before the CR Compact – i.e., including federal Indian reserved water rights? Does it apply to sources other than the CR mainstream?

When considering why some Tribal reserved rights claims have yet to be recognized, it is important to understand that incentives have historically been lacking, and the process has always been complicated. As demands from cities and farms risk outstripping current CR water supplies, it is reasonable to conclude that any significant recognition of additional federal Indian reserved water rights will require considerable repositioning of existing water supplies within both Basins. Motivating people and institutions to go through such a process has generally required a pressing need for certainty in the river system or other inducements to be successful.

b. Quantifying Recognized Reserved Rights

Once a Tribal claim to CR water is recognized, it must be quantified. There are generally three different approaches for determining the volume of the valid reserved water right. The first approach is to rely on Congress. While theoretically an option, Congressional quantification is severely limited, if not outright precluded, unless it coincides with a negotiated water settlement (see below). Congressional quantification involves passing legislation that identifies the volume of reserved Tribal water. To arrive at this calculation, the legislation risks having to navigate state authorities to manage water supplies, the Tribal needs and demand for water within their sovereign boundaries, and concern by non-Indian water users with interests in the water supply. The political jockeying required to finalize the legislation is difficult to accomplish under any circumstances. It is especially problematic if politically powerful interests are pitted against each other inside the U.S. capitol.

The second approach is to rely on the courts to define the reasonable quantity of water reserved to the Tribes. Judicial quantification of Tribal water rights, however, is not always an effective option for Tribes and other water users. The court process often lasts for a number of years at great cost to all parties: the federal government, Tribes, states, and local water users. At present, a number of federal Indian reserved right cases are currently before the courts with little prospect of meaningful resolution in a short timeframe. Even when the court proceeding is completed, the process of identifying the means and infrastructure for developing the water resources remains. There is no guarantee that either will be realized through court proceedings.

The third approach is a negotiated settlement. More recently, Tribes have worked with the federal government to reach agreements with states and water users on the amount of water reserved for Tribal use. This approach has the potential to clarify Tribal water rights while garnering support for resolving long-standing uncertainties and avoiding litigation. The Department of the Interior (Interior), one of the agencies charged with executing the trust responsibilities for the Tribes, has expressly noted that negotiated settlements, rather than litigation, are the preferred method of addressing Tribal water rights.[6] Examples of such settlements include:

- Utah-Navajo Water Rights Settlement Act (2020)
- Navajo Nation San Juan River Basin Water Rights Settlement in New Mexico (2009) (and related Navajo Gallup Project authorized under the 2009 Omnibus Public Land Management Act)
- Arizona Water Rights Settlement Act (2004)
- Colorado Ute Settlement Act (1986) and related amendments

Negotiated settlements may be the preferred approach, but they are not always successful. Efforts to reach settlement on Navajo claims to CR water in the LB, for example, have met significant resistance. Following more than a decade of negotiations among Arizona, Navajo, and the federal government, negotiators reached a draft settlement agreement. However, when submitted for approval, the political representatives did not agree, and the negotiating parties have been forced to go back to the drawing table. Such a situation suggests that unless and until a majority of people from each negotiating party feel they have received fair consideration of their rights and interests, the likelihood of agreement and congressional consent remain fleeting.

c. Accessibility

Many Tribes with water rights recognized on paper (statute, court decree, settlement agreement) still struggle to secure access to actual water to meet the basic needs of their communities. The primary obstacle is the lack of necessary infrastructure to provide the water where it is needed. Unless there is a means for Tribes to access and develop their quantified water rights, uncertainties will remain as to whether the water will ever be put to use. Access to water entitled to Tribes under their reserved water rights, therefore, remains a critical element to addressing uncertainties related to water uses in the CR Basin.

Unlike litigated reserved rights, negotiated settlements provide an opportunity to include terms that

The management of Glen Canyon Dam and Lake Powell near Page, Arizona, assists in the distribution of water between the UB and LB states consistent with the Law of the River. © KaryB/shutterstock.com.

can direct how the reserved rights may be developed. Courts cannot authorize projects or provide funding to develop water infrastructure that would allow the Tribes to utilize their newly recognized rights. In contrast, negotiated settlements approved by Congress can and often do include terms for funding and construction of water infrastructure to allow Tribal communities to gain actual access to newly quantified rights.[7]

Still, Tribal access to water implicates more than funding appropriations. It also affects reliance on the Tribe's unused water supply. Tribes have raised concerns in formal consultations and litigations related to non-Indian water users' reliance on unused Tribal water supplies. Most recently, the Navajo Nation filed suit against Interior, asserting, among other things, that the Department's CR management decisions violated various environmental laws as well as the federal government's trust obligations regarding the Navajo's CR interests. In doing so, the Navajo asserted that Interior caused non-Indian water users to improperly rely on the Navajo's yet to be recognized and quantified Tribal water rights.[8] The district court dismissed the direct challenges to Interior's CR management decisions, and the 9th Circuit Court of Appeals affirmed most but not all of the district court's decision on appeal. The 9th Circuit sent the case back to the district court to reconsider whether the Navajo may have a valid breach of trust claim against the U.S. In April 2021, the 9th Circuit rejected the district court's determination that only the Supreme Court had the authority to hear the Navajo's breach of trust claim related to rights in the Lower CR Basin. The 9th Circuit has once again directed the district court to consider the Navajo's claim.[9]

The haphazard framework for recognizing, quantifying, and accessing federal Indian reserved water rights hinders effective water management and long-term planning for the Basin. In the past, who will win and who will be left with little or nothing has depended on the Winters doctrine, priority administration, courts, isolated agreements, and ultimately politics. None of these options, however, assures stability in the Basin. The rights to water — reserved, compacted, or otherwise — cannot work in isolation to keep the system running. The Basin's true functionality requires a coming together to consider and identify opportunities, flexibilities, and assurances that will help all of those who depend on the CR supply to solve today's challenges. In this capacity, it is undeniable that the Tribes play an important role.

Role of Tribes in the Colorado River

Native American communities have articulated their historical absence water planning and management decisions for the CR Basin. As water supplies tighten and policy makers contemplate innovative water management strategies for the Basin, there is a growing realization that Tribal considerations and water rights to CR sources are key elements to the continued operation of the system. Recent examples of important Tribal contributions include:

Colorado River Tribal Water Study

The 2018 CR Basin Ten Tribes Partnership Tribal Water Study (Tribal Water Study) is a collaboration between Interior and the Ten Tribes Partnership to document water uses and potential future water development of the ten

The LB Drought Contingency Plan explains how the LB states to take a reduction in water deliveries when Lake Mead reaches certain target elevations. © Isogood_patrick/shutterstock.com.

Tribes that comprise the Partnership to more fully inform water use planning and decision-making throughout the Basin. Building from the Basin analyses performed in the 2012 CR Basin Study, the Tribal Water Study provides more focused detail on how Tribal waters fit within the CR management scheme. First, the Study summarizes the type and location of current Tribal water uses. It then projects the Tribes' estimated volume of water use by 2060. Finally, it explores some of the general effects that increased Tribal uses could have on the Basin. The Study also allows each of the Tribes to provide its perspectives on the Basin's challenges and opportunities ahead. To this end, the Study serves to facilitate a broader understanding of Tribal waters within the CR Basin and highlights the significant role that Native Americans have in CR water management going forward.[10]

Lower Basin Drought Contingency Plan

The LB Drought Contingency Plan (DCP) is part of a package agreement to help temporarily stabilize the system despite drier than expected hydrology.[11] The LB DCP's goal is to conserve water in Lake Mead above that contemplated under the 2007 Interim Guidelines for LB Shortages and Coordination Operation of Lake Powell and Lake Mead to reduce the growing probability that water levels would "reach critical elevations that could cause draconian reductions in water deliveries." (see History Law and Policy section of the CR Paper Series). The agreement requires the LB states to take a reduction in water deliveries when Lake Mead reaches certain target elevations. The agreement provides opportunities for conserving water in Lake Mead in lieu of taking shortages in deliveries with the understanding that any water proactively conserved may be accessed at a later date under certain conditions.

Arizona's participation in conservation or reduction requirements was essential to the overall success of the LB DCP. Arizona's contributions to Lake Mead, either in conserved water or reduced deliveries (shortages), are of significant volume and triggered sooner than California water users as a concession to secure the Central Arizona Project (CAP) in the CR Basin Project Act.[12] Without Arizona's consent to the agreement, therefore, the entire DCP could have been defeated, and the security of Lake Mead storage would be significantly compromised.

Before Arizona could consent to the LB DCP, it had to garner the support of a diverse group of water users that hold rights and interests in the CAP and CR System, including the Tribes. At present, Tribes in Arizona reportedly have rights to nearly 600,000 acre-feet of CAP water per year and an additional 772,000 acre-feet of CR water directly from the mainstem. These large, high-priority water rights necessitated that Tribes have a voice for Arizona to fully accomplish the DCP. Two Tribes, in particular, became crucial partners in the process — The CR Indian Tribe (CRIT) and the Gila River Indian Community (GRIC). Both hold rights to significant quantities of CR water, and both were reportedly interested in being part of the process instead of letting others decide their fate. They worked to secure representation on Arizona's DCP Steering Committee and successfully advocated with others for a statewide agreement. Part of this agreement included the GRIC offering water to mit-

The San Juan River in Goosenecks State Park, Utah. Photo ©iStock.com

igate the DCP's effects on other water users. Similarly, the CRIT committed to conserving water over a three-year time period to benefit the CR and move the Arizona DCP process forward. Without these substantial commitments to introduce opportunities and innovative solutions on top of major commitments by other water users, Arizona's policy makers and diverse stakeholders might have remained at political loggerheads, and the added security to the CR System could have been compromised.

Moving Forward

The integrity of future decisions for managing the CR will likely depend, in part, on integrating Tribal water rights and concerns into the ongoing updates to CR management under the Law of the River. The lessons of late demonstrate that any meaningful integration requires including the Tribes instead of informing them at the end. To accomplish this, governments, Tribes, and stakeholders must establish a process for including Tribal perspectives into an inherently complex decision-making process. It will take more than mere recognition that Tribes should play a role. It will also require innovating pathways and ideas to meaningfully include Tribal perspectives in a manner that does not overwhelm or undermine the entire process. How this will be accomplished will depend on consensus accommodations and compromises by states, federal agencies, and Tribal leaders alike. Some considerations to inform that effort are highlighted below.

i. Effective Participation and Input

As stated previously, there are presently 30 federally recognized Tribes in the Basin. Each Tribe possesses its own values and unique system of sovereign governance and self determination. There are a multitude of questions revolving around how to effectively fold each Tribe's perspective into the water policy discussions concerning the entire CR Basin? How do each of the Tribes assemble sufficient capacity to inform and shape water policy decisions going forward? How can these perspectives integrate with those from other stakeholders, states and countries in the Basin? Will the process require formal federal consultation beyond collaborative discussions with States and their stakeholders? Could the process work if Tribes collaborated with the stakeholders and governments where their respective reserved rights are located to formulate collective water management strategies and approaches — i.e., Arizona DCP approach? How would Tribes with reserved rights in multiple states fit in such a process? How would the sovereign interests and authorities of each Tribe and the states be preserved? Could the various Tribes be successful at forming a representative group to identify consistent water policy strategies that they could then bring to the discussion? What assurances might be needed to make sure that the Tribal perspectives will be heard? There is no perfect process for integrating meaningful input and participation from the varied sovereign interests in the Basin. Whatever the process, it will require commitments and compromises on behalf of all parties.

ii. Innovation and Flexibility

Agreements with CR Tribes could provide much needed flexibility for Tribes and other water users alike to manage expected shortfalls in available water supplies in various regions of the Basin. Leases and other temporary transfers of unused or underutilized reserved water rights could be made for an appropriate sum or other consideration that could spark innovation in infrastructure, power production, and other business interests on and off Tribal lands. For such arrangements to occur, however, the legal terms and conditions of various water rights will have to be clearly delineated and defined. One foundational question is whether and how to incorporate the leasing or selling of unused or underused federal Indian reserved rights with the laws governing or limiting transferability of non-Indian rights. Another basic question is whether federal Indian reserved water rights can be alienable? If federal reserved water rights were created to fulfill the purposes of the reservations, and the overall purpose of every Native American reservation is to provide a permanent homeland where the Tribes can economically govern themselves, then reservation purposes conceivably could be fulfilled by selling or leasing water to others for use off reservation. But many reserved rights settlements

and decrees specifically prohibit off-reservation water uses. And many reserved water rights settlements have special provisions regarding the limitations and extent to which water leases and marketing may be authorized. As can be seen, it is not merely a matter of entering into Tribal agreements for temporary leases or transfers of water. Foundational principles that underscore and define the limits and extent of the reserved water rights may have to be reconsidered and retooled before such flexibilities and innovations can be pursued.

Policy considerations must also be weighed in authorizing transfer of federal Indian reserved water rights, even temporarily. Some Tribes may believe they will be better off receiving payments instead of water, and others may be quite willing to pay for the assurance of a supply not subject to interruption by exercise of the reserved right. But even if CR water users have formally acknowledged Tribal rights, the tribal perspectives regarding tradeoffs in terms of communities and life on and off the reservations need to be considered? Should any agreement to lease or transfer water have to include provisions for maintaining the fabric of local communities? If so, how? If not, what externalities of a water lease or transfer may be inflicted on the Tribal and non-Tribal communities?

Marketing of Tribal waters may hold great promise for the Basin, but only to the extent it can be assured that the water will be available when needed, the water management structure for the CR System will remain intact, and the viability of Tribal reservations is preserved. Because Congress must consider and approve any alienation of federal Indian reserved water rights, these and other issues will surely arise.[13]

Overall

Decision-makers are being tasked with determining how best to manage and sustain the CR system going forward. In doing so, they will have to honor and respect the vested rights and interests that have been established through the years while adapting to the realities of a more uncertain, and possibly much drier future. Some of the most senior and vested rights to the CR are held by a multitude of Tribes located throughout the CR Basin. Collectively, their share of water is greater than entire allocations made to some states under the Law of the River. Yet, many Tribal rights to CR water still go unidentified or underutilized. Neglecting to consider and include the Tribal perspective risks creating incomplete policies that miss the mark in supporting the Basin. At the same time, Tribes risk losing opportunities to have rights recognized, protected, and/or better utilized if they do not meaningfully engage to problem solve the water supply challenges in the region. In the end, decisions on how to sustainably manage the River in the 21st Century will not be fully deliberated or well-informed without recognizing the important role that Tribes have in the CR Basin and finding ways to meaningfully involve them in decisions and policies designed to overcome the challenges that we are all confronted with today. ❑

Endnotes

1 Since there is no official consensus on how to respectfully refer to Indigenous peoples or when to capitalize certain terms, this paper series uses Native American as well as general capitalization of the words Tribe and Tribal as a sign of respect.

2 *Review of the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, Bureau of Reclamation* (Dec. 2020) ("7.D. Review Report"), https://www.usbr.gov/ColoradoRiverBasin/documents/7.D.Review_FinalReport_12-18-2020.pdf (Last Visited April 20, 2021).

3 It is also important to note that uses for federal Indian reserved water rights can extend beyond agricultural endeavors. While the quantity of water allocated to the Tribes may be calculated by a specific standard (i.e., PIA within the reservation), the Tribes are not confined to use the reserved water to meet that standard. In more recent decades, Tribes have developed their supplies for additional beyond agriculture and homeland endeavors, including leases for nonagricultural enterprises.

4 Colo. River Compact (1922), authorized pursuant to Act of August 19, 1921, ch. 72, 42 Stat. 171, acknowledged by the Boulder Canyon Project Act, 43 U.S.C. 617, ch. 42, 45 Stat. 1057, (1928), and made effective by Public Proclamation of the President of the United States on June 25, 1929 under 46 Stat. 3000 (1929).

5 Upper Colo. River Basin Compact, ch. 48, 63 Stat. 31 (1949).

6 See *Congressional Research Service,* April 2016 — https://fas.org/sgp/crs/misc/R44148.pdf (Last Visited, April 20 2021).

7 Securing funding to build the infrastructure to access water to which Tribes are entitled is an entirely different protracted process. As former Interior Solicitor Hillary Tompkins points out in her article The Future of Tribal Water: Ensuring the Promise of a Permanent Homeland, "The federal funding of Indian water rights settlements has also become incredibly complex, bureaucratic, and at times, contentious. After weathering the multi-year process of reaching a deal with the U.S., then the federal appropriations process must be navigated. Obstacles to resolution include having to find offsets in the federal budget to avoid increases in the federal deficit (referred to as "scoring"), persuading the Office of Management and Budget that the settlement is more cost effective for the U.S. than litigation, and ensuring that funding will be available in future years through annual appropriations (i.e., discretionary funding). The Interior Department has also required that it oversee settlement fund accounts, resulting in bureaucratic oversight of the expenditure of funds by Tribes for the construction, operation, and maintenance of water projects." November, 2020 (internal citations omitted).

8 *Navajo Nation v. Dep't. of the Interior,* 876 F.3d 1144 (9th Cir. 2017).

9 *Navajo Nation v. Dep't. of the Interior,* No. 19-17088 D.C., www.courthousenews.com/wp-content/uploads/2021/04/waterrights.pdf (9th Cir., April 28, 2021). Note, it is yet to be seen whether Interior or the Intervenors will try to appeal the Circuit Court's decision.

10 *Colorado River Basin Ten Tribes Partnership Tribal Water Study,* Bureau of Reclamation (December 2018), available at https://www.usbr.gov/lc/region/programs/crbstudy/tws/finalreport.html (Last Visited, April 20, 2021).

11 Colorado River Basin Drought Contingency Plans, Bureau of Reclamation (May, 2019), available at https://www.usbr.gov/dcp/finaldocs.html (Last Visited, April 20, 2021).

12 Specifically, Arizona agreed that Central Arizona Project (CAP) water users would be "junior" to other LB water users to secure California's support for federal legislation to finance the CAP. As a result, CAP supplies are to be reduced first when there is not enough water to meet the contractual demands of LB water users.

13 As an example of this issue, refer to the 2021 efforts by the Colorado River Indian Tribe to ask Congress to pass legislation that would allow CRIT to lease some of its CR Water Entitlement.

Colorado River, photo ©iStock.com.

Environmental Issues in the Colorado River Basin

The Colorado River (CR) Basin is comprised of watersheds and resources that are unmatched in nature. Known for its breathtaking landscapes and wide-open spaces, the CR Basin is home to an abundance of national parks and monuments. CR water provides irreplaceable habitat for multiple rare and endemic fish and wildlife. It serves as a source of refuge for migratory birds traversing the Pacific Flyway and accommodates a Delta Region that once served as one of the most biologically diverse places on the continent. A recreational magnet for fishing, boating, rafting, swimming, skiing, rock climbing, hiking, camping, and kayaking enthusiasts around the world, the CR also makes up an essential part of the cultural fabric for Tribal and other communities spanning both the lands of snow and sun in the mountain and desert south-west.

Despite the undeniable richness of the CR Basin's environmental and cultural assets, natural resource policy and management decisions are frequently influenced by consumptive use and water allocation considerations within the CR Basin. This is partly due to a regional management structure that was formalized well before the CR Basin's environmental assets were considered an important resource in and of themselves. As the CR Series on History, Law, and Policy describes, the Prior Appropriation Doctrine and interstate water compacts began to shape the CR Basin by focusing on mechanisms to maximize beneficial consumptive use for the benefit of people and economies with little attention paid to environmental stewardship at the time. This structure, however, has proven somewhat malleable through the years. Policies to consider natural resources, minimize environmental harms, and protect, improve, or enhance river assets in key areas have become part of the societal norm as awareness of environmental values has grown. Such policies have also led to procedural requirements and substantive programs that supplement the basic management principles for the CR system.

The humpback chub (Gila cypha) is an endangered, native fish of the CR that evolved around 3-5 million years ago. Restoration efforts include translocation of populations, river management strategies, and developing populations in captivity. Photo courtesy USFWS.

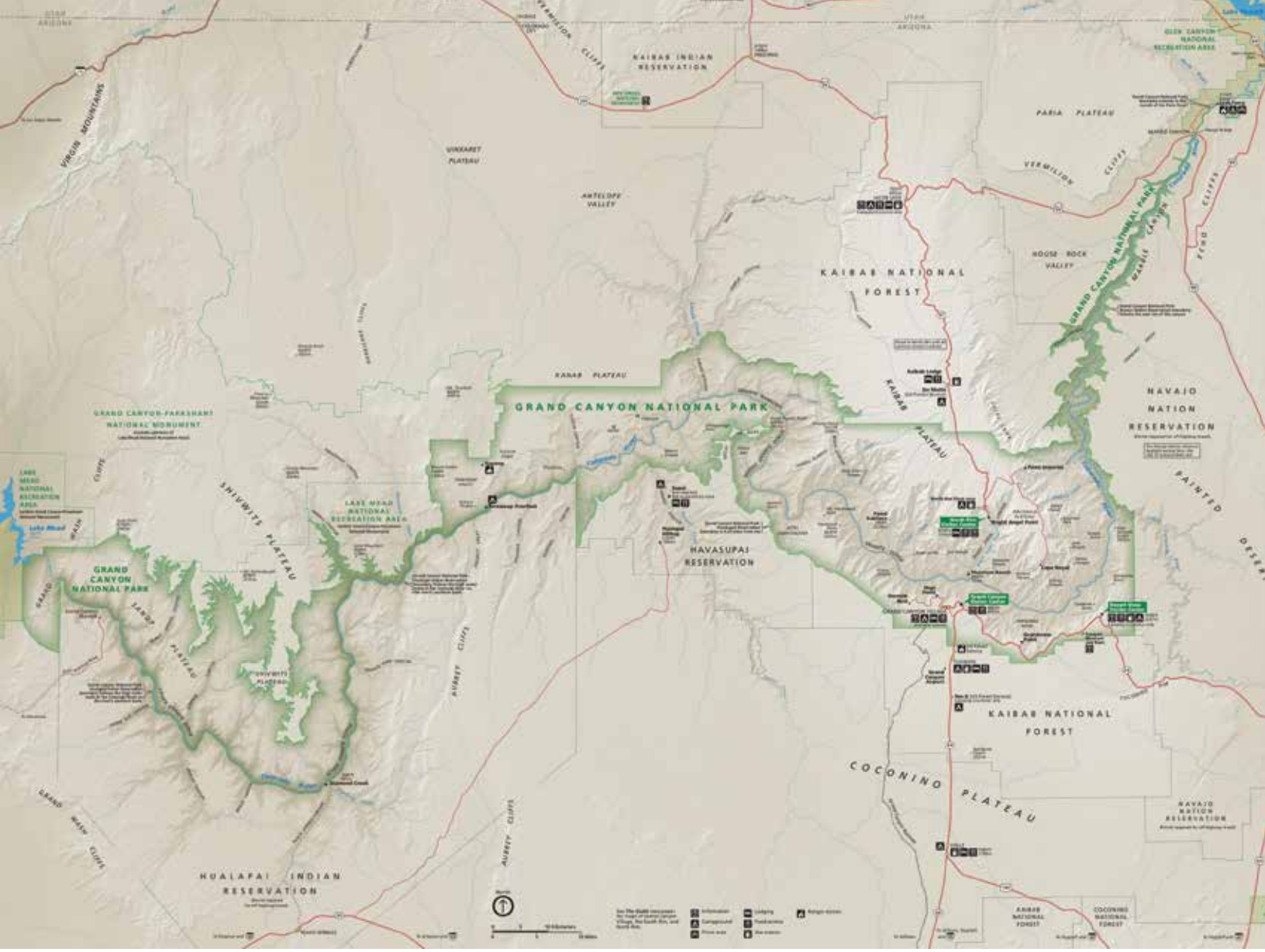
This Colorado River Series outlines some of the foundational environmental issues that are the subject of policy debates and management decisions in the CR Basin. It summarizes legislative tools and collaborative programs that have been developed to help address these issues and outlines likely considerations and challenges the CR Basin is to confront going forward.

Environmental Issues in the Colorado River Basin

Protection of Native and Imperiled Species within the Upper and Lower Basins

A unique characteristic of the CR is the large number of native species that are found nowhere else in the world. Before the construction of any dams and alteration of the River's flow, two researchers from the U.S. Fish Commission claimed that over three-quarters of the CR Basin's fish species were "endemic" to the region (i.e., found nowhere else).[1] Over the past 100+ years, however, demands for water and power have altered the natural system through dams, irrigation diversions, channelization, pollutants, and dewatering or alterations of wetlands and riverbanks, among others. In addition to these physical alterations, the introduction of numerous non-native and invasive species has transformed ecosystems throughout the CR Basin.

Restoring the CR back to its unaltered state of species and habitats is not likely possible, nor is it necessarily the overall goal. At this time, the need is to include and consider all of the complex sets of interests that rely on the CR resource in the pursuit of a precarious balance in the CR Basin. To further this objective, mechanisms and programs have been put into place in key areas within the CR Basin to encourage imperiled and native species to succeed. For example, high flow experimental releases from Glen Canyon Dam have been designed to slow erosion and channel narrowing by better distributing limited sediment available in the system and to help restore natural habitats for native fish populations in the Grand Canyon National Park. Mechanical removal of non-native fish has also been implemented in various parts of the CR Basin (following consultation with Tribes to consider and address



National Parks Service map of the Grand Canyon National Park. Courtesy of the National Park Service.

cultural values) to reduce predation on native fish and temporarily mitigate competition for resources and space. Moreover, recovery programs have been developed to protect and recover fish and wildlife species while allowing for the continued operation of federal water and power projects in the CR Basin (see details below).

Looking forward, these and other programs remain integral to the CR Basin's overall health. It will be important for policy makers to determine whether and how continued species protection and enhancement efforts should be accomplished in conjunction with the plans and operations for addressing growing demands with limited supplies throughout the CR Basin.

Preserving Grand Canyon National Park Resources

The Grand Canyon was designated a National Park in 1918 and a World Heritage Site in 1979 for its world-renowned resources and scenic vistas. Several ecosystems in the park, ranging from the lower canyon's Sonoran Desert to the North Rim's coniferous forest, support biologically diverse communities, including many rare, endangered, and endemic species. The park also contains several cultural resources, and more than ten American Indian Tribes attach substantial cultural significance to the Grand Canyon, the CR, and various sites and resources through the park's boundaries. Not to be overlooked, the Grand Canyon also provides opportunities for a range of recreational experiences that attract millions of visitors annually.

The CR flows through 277 miles of the Grand Canyon National Park from Marble Canyon (just downstream of Lee Ferry and Lake Powell) to the Lake Mead National Recreation Area. Along with its tributaries, the CR has shaped the complex natural and cultural histories of the park and surrounding region. As a result of Grand Canyon's National Park designation, the National Park Service (NPS) is charged with managing the resources within Grand Canyon to conserve the scenery, the natural and historic objects, and wildlife within park boundaries and to provide for the enjoyment of the Grand Canyon's resources in a manner that will leave them unimpaired for the enjoyment of future generations.[2] However, the CR

Glen Canyon Dam jet tubes releasing water into the CR for a high flow experiment. The increase in flow of the CR downstream of the dam mobilizes sand at the bottom of the river and that sand rebuilds sandbars in Grand Canyon. Photo courtesy of USGS.

resource is also managed by seven Basin States and the Bureau of Reclamation (Reclamation) to provide water and energy resources to millions in both urban and rural communities within the U.S. and Mexico. These two missions do not always align neatly and require continuous efforts to balance and integrate the values and responsibilities associated with managing the Grand Canyon National Park with the obligations to manage the CR system pursuant to and consistent with the Law of the CR.

One such example that highlights the intricacies of the ongoing efforts involves sandbars. Sandbars along the CR provide campsites for hikers and river runners, important habitats for aquatic and riparian species, and protection for historic and archaeological sites in the Grand Canyon. Construction and operation of Glen Canyon Dam has altered the sedimentation and sandbar building processes downstream in the Grand Canyon. The fluctuating water releases to accommodate the production of peaking hydroelectric power and the elimination of natural floods within the Grand Canyon have reduced the build-up and movement of fine sediments from the River. Alluvial sandbars have eroded as a result, and activities and life structures along the River have been negatively impacted.

A sandbar on the CR in the Grand Canyon was deposited by the 2008 controlled flood. This view is looking downstream and the location is approximately 65 miles downstream from Lees Ferry, Arizona. Photo courtesy of Matt Kaplinski, Northern Arizona University.

The Department of the Interior (Interior) has recognized the erosion and reduction of sediments and sandbars

The Salton Sea and surrounding area in California as seen from the space shuttle on June 12, 2002. Photo courtesy of NASA.

as a significant impact to Grand Canyon resources. In response, Interior has implemented a management regime that is intended to help mitigate the effects of Glen Canyon Dam. Following consultation with states, water users, power interests, stakeholders, and Tribes, Interior modified the flow regime to reduce erosion of existing sandbars to the extent possible and instituted a sediment trigger for when various high flow experimental releases from Glen Canyon Dam will be made to mimic floods that can help build or expand on existing sandbars in the Grand Canyon. Notably, these efforts do not operate in a vacuum. They have to be implemented in balance with consideration of other resources, including, but not limited to, the status of endangered fish populations, recreational fishing and rafting opportunities, and cultural resource preservation. Moreover, none of the flow modifications can impact the total volume of water to be released from Lake Powell to Lake Mead in satisfaction of the requirements under the Law of the River in any given year.

Interior's dual responsibilities of protecting park resources and releasing stored water pursuant to the Law of the River require continuous monitoring and adaptations. As the CR Basin considers appropriate operations for the CR system going forward, their impacts on the Grand Canyon and its resources will inevitably come up for discussion. How they will be addressed and integrated will depend on the balance that Interior strikes between the sometimes-competing responsibilities of its subagencies and the consensus or understanding of the states, water users, power interests, Tribes, and other stakeholders involved.

Salton Sea Management and Mitigation

The Salton Sea is located in southern California and is the state's largest inland lake. The current version of the Salton Sea was formed beginning in 1905 when spring flooding of CR supplies that had been diverted to the Imperial Valley breached and overflowed an irrigation canal and flowed into the Salton Sink – a basin that is 227 feet below sea level. Over the next two years, the lake grew to hundreds of square miles until the breach was contained.[3]

In the years following, irrigation runoff from farms in the surrounding districts consistently fed the newly formed Salton Sea. Providing a consistent wetland habitat in Southern California, where most wetlands have been dried and eliminated through development, the Salton Sea is an important food source as well as nesting, wintering, and stopover site along the Pacific Flyway for thousands of bird species.

A key characteristic of the Salton Sea is its high salinity content. Considerably saltier than the Pacific Ocean, the highly saline environment is attributed to two conditions — agricultural runoff water that serves as the sea's primary source of water and the terminal nature of the lake. Since it has no outlet, water that replenishes the Salton Sea only depletes through evaporation. Evaporation leaves the salts from the water mixture and sea bed behind. For these reasons, the sea has continually increased in salinity over time.

Since the early 2000s, changes to CR supplies in the region have significantly reduced the Salton Sea's inflow. In 2003, Interior, the state of California, the Imperial Irrigation District (IID), the Coachella Valley Water District, San Diego County Water Authority (SDCWA), and the Metropolitan Water District of Southern California, among others, finalized a series of agreements, collectively known as the Quantification Settlement Agreement (QSA), to address outstanding issues and reduce California's overuse of CR water.[3] Part of the QSA involves lining irrigation canals in the IID and Coachella Valley Water District and transferring the use of the saved irrigation water to municipal uses in southern California. By reducing the amount of water available for agricultural uses in these districts, the QSA's implementation has decreased the volume of runoff that drains into the Sea. The Salton Sea has been steadily shrinking and growing increasingly more saline as a result.

Reductions of inflow to the Salton Sea was an anticipated outcome of the QSA. The agreements included express provisions that split responsibilities among the water districts and the state for addressing the effects of QSA water transfers on Salton Sea resources. The QSA required the IID to continue providing conserved water to the Salton Sea until 2017 as a temporary mitigation of the water transfer effects on salinity. The water districts were also required to spend over $125 million in 2003 dollars to begin to mitigate the environmental effects of the water transfers, and the state committed to implementing and funding the additional activities necessary to address public health and wildlife impacts. Since 2018, when the IID contributions of mitigation water ended, salinity levels have begun to increase, taxing tolerance levels for fish and other wildlife that rely on the Salton Sea. Lacking a sense of urgency at times, progress has been slow.

Significant adverse impacts to both public health and wildlife in the region have been the result. The increased salinization of a shrinking Salton Sea has created inhospitable conditions for migratory birds, fish, and other species in the area. As increased salinity concentrations and exposed lakebeds have reduced fish populations, fish-eating bird populations have declined. Lakebed dusts containing toxic elements from agricultural runoff have become increasingly susceptible to exposure and airborne transport in

the high winds and arid climate around the Salton Sea. Particulates in the Imperial and Coachella Valleys have posed a health danger to surrounding communities as the toxins can become trapped in the lungs and cause asthma attacks, bronchitis, and lung diseases. In the recent past, Imperial County declared a local state of emergency to address the dust suppression concerns, and the county's Air Pollution Control District served notices of violation on the U.S. Fish and Wildlife Service and the IID for failing to address ongoing dust problems at the Salton Sea's southeastern edge.

In light of these conditions and the lack of action by others to protect the Salton Sea since the signing of the QSA, the IID felt it necessary and prudent to oppose the CR LB Drought Contingency Plan for not considering and including sea mitigation in the programs. Part of the IID's reasoning is attributable to a concern that it would have to take further conservation actions to address conditions in the Salton Basin while others continued to ignore the situation. Accordingly, the IID worked to encourage the federal government to commit financial resources that could kickstart real action for mitigating the effects of decreased inflow to the sea. It leveraged the seven Basin States' efforts, including representatives from the relevant water districts in California, the federal government, and Mexico to address the persistent hydrologic drought conditions within the Basin. While the IID's efforts did not entirely derail the drought contingency planning efforts, they have signaled that the largest CR water user considers conditions at the Salton Sea critical to promoting real progress on future management of the CR system.

The state of California, through Governor Newsome's administration, has recently pledged to make progress on mitigating the Sea's dust and habitat issues. Focusing on both dust suppression and habitat restoration projects, the state, and its partners have set a goal of creating 30,000 acres of habitat and dust suppression by 2028. To do this, it has to scope, design, and build

This NASA Earth Observatory image by Lauren Dauphin, using Landsat data from the U.S. Geological Survey, shows the CR Delta on April 25, 2020. The dark green area at the top is the Ciénega de Santa Clara wetland.

projects that require funding, permitting, and easements for land and water that will be essential to the overall success of the projects. Each of these takes considerable time and dedication, and the inertia of the past has made local districts and communities skeptical. Nonetheless, there are initial signs of progress. In January 2021, the California Salton Sea Management Program broke ground on construction of a 4,000-acre species conservation habitat project to restore bird and fish habitat and improve conditions for nearby communities at the southern end of the Salton Sea.[5] The Salton Sea's issues have been viewed as infeasible or insurmountable at times. Now there is a greater focus on taking some actions. Depending on how committed and successful these actions reveal themselves to be, it is likely that the Salton Sea could continue to be a key environmental issue that will influence or have implications for the success of collaborative participation in CR management for the future.

Colorado River Delta and Cienega de Santa Clara

At one point, the CR Delta spanned over 1.9 million acres of wetlands and marshes in the U.S. and Mexico that were fed by the CR and the Sea of Cortez. It was home to "green lagoons" that provided habitat for fish, dolphins, mollusks, birds, beavers, deer, bobcats, and even jaguars. (see Aldo Leopold's description of the Delta in the Sharing the CR Between the U.S. and Mexico section of this CR Paper Series.).

For over a century, however, the CR has been diverted, dammed, and channeled to farms and cities, causing the Delta to be only a trace of its former self. Receiving only a fingerling of flow from

Receiving only a fingerling of flow from Arizona's Wellton-Mohawk Irrigation and Drainage District to the Cienega de Santa Clara Wetland in Mexico (above), the delta region thirsts for rare floods to temporarily quench the dried wetlands and river reaches between the U.S.- Mexico border and the Gulf of California. Photo courtesy of the Redford Center.

Arizona's Wellton-Mohawk Irrigation and Drainage District to the Cienega de Santa Clara Wetland in Mexico, the Delta region thirsts for rare floods to temporarily quench the dried wetlands and river reaches between the U.S.-Mexico border and the Gulf of California. But successful efforts to consider and implement measures that can more consistently revive parts of the Delta Region have recently taken hold.

Beginning in 2000, the U.S. and Mexico entered into Minute 306 — the first purely environmental agreement regarding the CR under the 1944 Treaty[6]. This Minute outlines a framework for the countries to cooperate and make future recommendations concerning the CR Delta while working within the confines of the Treaty. In this manner, Minute 306 establishes a structure for and expectation of executing joint studies and exchanging information to evaluate and propose measures for collaboratively restoring and sustaining parts of the Delta ecosystem.

The relationships and efforts built in conjunction with Minute 306 allowed the countries to work next with states and non-governmental organizations in 2010 to consider and avoid impacts to the Cienega de Santa Clara during a test run of the Yuma Desalting Plant (YDP) in Arizona. Testing YDP operations directly risked impacting the quantity and quality of CR bypass flows from the Wellton-Mohawk Irrigation and Drainage District to the Cienega de Santa Clara. For the first time, the countries jointly considered impacts to this Delta resource when initiating actions and worked with the non-governmental organizations to mitigate the YDP test operations. The agreement reached by all the parties is codified in Minute 316, which provided for the conveyance of up to 30,000 acre-feet of water through the Cienega de Santa Clara during a yearlong pilot test run of the YDP at 1/3 capacity. The countries further agreed to work together to rehabilitate canal infrastructure to assist in the conveyance. This was the first time that the countries included outside entities in the commitments to achieve the goals of a binational Minute.

Also, in 2010, the countries established a conceptual and practical framework for working through bilateral consideration of CR Basin matters. Utilizing this structure, the countries have created binational workgroups to investigate and make joint recommendations to the U.S. and Mexico Commissioners of the International Boundary and Water Commission (IBWC) on issues of binational importance. One such matter is the environment involving the CR Delta. The environmental workgroup is comprised of two co-chairs, as well as government officials and experts from both countries, and it is currently tasked with working together on plans to help restore the wetlands in parts of the delta regions.

Since 2010, the U.S. and Mexico have worked with environmental conservation groups and state representatives through the environmental workgroup and IBWC management processes to revive small parts of the river delta. Through a one-time pulse flow in 2014 and habitat restoration projects along pockets of the river banks, cottonwoods, and willows are starting to grow, birds have been repatriating the area, and people are starting to remember or experience for the first time what it was like to have greenery in the desert.

The efforts and momentum of these projects demonstrate new values to consider for the CR Basin. No longer is it possible to simply ignore or reject the values of the CR Delta in the name of water allocation and distribution. Future management and development projects will likely have to consider and address further environmental impacts to the region. And the countries may need to more readily recognize the long-term importance of rehabilitating and restoring portions of the Delta and riverine areas going forward (see *Sharing the CR Between the U.S. and Mexico* section of this CR Paper Series).

The 2021 Cameron Peak wildfire in Colorado burned 208,663 acres (326 square miles) through the Arapaho and Roosevelt National Forests in Larimer and Jackson counties and Rocky Mountain National Park. Photo© Steven A Herrera/ShutterStock.com

Forest Health in Colorado River Headwaters

Forests perform a number of processes that benefit watershed systems throughout the West. They reduce flooding and sedimentation by stabilizing riverbanks and preventing the erosion of soils into streams and reservoirs. They form and maintain soils, filter contaminants, and enhance groundwater recharge. And they provide important habitat for a variety of plants, fish, and wildlife communities.

It has been estimated that national forest lands in the CR Basin are responsible for over 50% of the total runoff above Lee Ferry (Upper CR Basin). The surface water supplied from these forests provide for the majority of drinking water, agriculture/irrigation enterprises, industrial uses (i.e., for mining or manufacturing), recreation opportunities, and ecological needs in the seven CR Basin States and Mexico. The health of these forested areas, therefore, is inextricably tied to the quantity and quality of water supplies that support a large part of the CR system.

In recent decades, forested lands in the CR headwaters have experienced several phenomena that are detrimental to forest health and that have caused large-scale impacts. Prolonged periods of drought and warmer temperatures have stressed trees and made them more susceptible to insect and disease outbreaks and wildfire destruction. The most recent mountain pine beetle outbreak began in the 1990s. Initially, it was primarily located in scattered groups of lodgepole pines at low elevations in areas of lower annual precipitation. However, the multi-decadal drought has fueled the outbreak, allowing it to wreak havoc on vast swaths of lodgepole and ponderosa pine forests at various elevations, destabilizing soils, altering habitats and recreation areas, helping create a tinderbox for wildfires.

Destructive wildfires have also become a year-round concern. Descriptors such as “harrowing,” “unprecedented,” “nightmarish,” and “unending” were frequently used adjectives to characterize wildfire threats in 2020 within certain CR Basin States. This is because human-caused wildfires, warmer temperatures, continual suppression efforts, variable precipitation, and accumulation of fuels have subsequently contributed to growing severity, duration, and size of wildfires. Both Colorado and California set records in 2020 for the largest wildfires (by area) in each state’s history. In Colorado, two separate wildfires connected to the CR Basin burned late in the wildfire season to surpass the previous benchmark for largest wildfire within the state.

The implications of unhealthy forests for many downstream users are cause for increasing concern. Aside from the property losses that often accompany wildfires, silt, and debris-flows that follow a significant wildfire contribute to stream and river pollution. The risk that wildfire poses to long-term protection of ecosystems and safe drinking water supplies may require dedicated attention, additional treatment, and infrastructure in communities within, nearby or downstream of the impacted landscapes.

Governments and stakeholders have begun to evaluate resilience strategies to address forest health in the CR Basin. Additionally, a combination of federal, university, and other wildfire researchers have committed resources to support the immediate needs of managers during a wildfire and help inform mechanisms for managing forest lands and lessen health risks. These and other efforts are not assured to be front and center in the ongoing basin-wide discussions over management of CR infrastructure post-2026. Nonetheless, water policy decision-makers will likely be expected to keep forest health within headwater

areas in mind when when considering appropriate resilience and mitigation mechanisms for the CR Basin in the decades to come.

Environmental Management Mechanisms in the Colorado River Basin

When the commissioners signed the CR Compact in 1922, issues such as access to clean water, protection of species and habitat conditions, or free-flowing rivers for the enjoyment of future generations were not on the radar. Water for the environment was not contemplated as a beneficial use and, therefore, did not serve as a basis for water policy decisions. The heart of the water issues, instead, centered on how to share, capture, and divert water in dry western lands for economic prosperity and agricultural settlement by pioneers within the U.S. Encouraged by those who had migrated West in search of their Manifest Destiny, the federal government helped states pursue such efforts with success until at least the mid-1960s.

The legacy of political and social change in the 1960s included movements to consider and better protect environmental resources in the U.S. Conservation efforts to protect watersheds, lands, and resource qualities began to take hold through federal legislation, rules, and regulations that specifically required environmental values to be incorporated into daily considerations. The predecessor to the formidable Clean Water Act as well as the Wilderness Act and Wild and Scenic Rivers Act are examples of the many legislative efforts that heightened water resource awareness beginning in the 1960s. These and other environmental laws currently serve as an overlay to existing management structures throughout the country. Generally, the laws that have been most frequently applied to water management and distribution systems in the CR Basin include (but are not limited to) the: (1) National Environmental Policy Act; (2) Endangered Species Act; and (3) Grand Canyon Protection Act.

National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA) establishes a general framework for considering and assessing human-caused impacts to natural resources and the environment as a result of federal activities in the U.S. Passed by Congress in 1970, NEPA's basic policy goal is to assure that all branches of government consider and make informed decisions about the environmental effects of agency actions.[7]

The policy under NEPA is "to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans."[8] NEPA's provisions implement this policy by outlining procedural requirements for government agencies to identify and assess the environmental impacts of any proposed major federal action *before* deciding to proceed with such action. If, after a limited Environmental Assessment (EA), the process reveals that the action is not likely to significantly affect the environment, the governmental agency can issue a Finding of No Significant Impact and proceed accordingly. If, however, the process reveals that the proposed action may have a significant environmental impact, then the federal agency must prepare a detailed Environmental Impact Statement (EIS) that considers:

i. the proposed action;
ii. alternatives for achieving the proposed action as well as the no-action alternative;
iii. the immediate and cumulative environmental impacts of the various action alternatives considered;
iv. the adverse effects that cannot be avoided as a result of the proposed action; and
v. any irreversible and irretrievable commitments of resources that would be involved in the proposed action.[9]

Under NEPA, the federal agency must also provide a reasonable opportunity for public outreach and input and incorporate the best available information to develop the environmental analysis. Based on the EIS process findings, the decision-maker must then issue a Record of Decision (ROD) that explains the basis and reasons for either authorizing an action or taking no action as a result of the analysis. If an agency ignores NEPA or fails to adequately implement the steps for completing the NEPA process, it can be subject to a court challenge and potentially blocked from proceeding with any action until it has performed the requisite steps appropriately. Notably, however, NEPA does not require or dictate a specific outcome to any agency's decision based on the information it gathers and assesses. The Act simply serves as a framework for demonstrating reasonable and informed decision-making in a transparent manner with the assurance of public input and participation.

NEPA Application in the Colorado River Basin

The considerable federal presence in managing public lands and operating federal facilities makes the CR Basin frequently subject to NEPA investigations and decision-making processes. Although the legislation did not require federal agencies to conduct environmental investigations regarding actions taken in the past, it has triggered environmental considerations and public outreach for any major federal action going forward. Construction of any new federal installations or adjustments to existing operations involving federal lands or facilities, therefore, activates the NEPA process.

Some examples of NEPA investigations to inform CR activities within the Basin are listed in Table 1.

Endangered Species Act

The Endangered Species Act (ESA) provides federal protection to plant and wildlife species in danger of be-

coming extinct.[10] It was passed in 1973 with bipartisan support, and is considered one of the most powerful pieces of environmental legislation. The U.S. Supreme Court interpreted the ESA as an expression of Congress' intent to save federally endangered species "whatever the cost."[11] It is also one of the few environmental laws with significant enforcement capability through citizen suits and civil and criminal penalties. The ESA is sometimes referred to as the "Pit Bull" of U.S. environmental laws for these reasons.

The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. The ESA is administered by Interior's U.S. Fish and Wildlife Service (USFWS) for terrestrial and freshwater organisms. Key responsibilities for USFWS include:

- Listing species as endangered or threatened, designating their critical habitat, and developing plans for species recovery (Section 4);
- Assuring that actions taken by the federal government do not jeopardize the continued existence of a listed species or result in the destruction or modification of designated critical habitat for a listed species (Section 7) and
- Prohibiting the "take" of any species listed as endangered or threatened (Section 9);

Table 2 provides a summary of the key elements associated with each of these responsibilities.

ESA Application in the Colorado River Basin

The ESA has influenced water policy and management throughout the CR Basin. At a basic level, operations or activities that jeopardize or "take" a listed species or adversely modify or destroy its critical habitat can be stopped in its tracks under the ESA. Admittedly, whether and how the ESA should be prioritized and integrated with prior legislation aimed at implementing the goals of the interstate water compacts, Tribal water settlements, or binational treaties is still a work in process. Instead of proceeding down a collision course between the

Table 1. NEPA investigations to inform CR activities within the Basin

- 2012 Aspinall Unit Final Environmental Impact Statement and Record of Decision (Found at https://www.usbr.gov/uc/envdocs/eis/20120100-AspinallUnitOperationsVol1-FinalEIS-508-WCAO.pdf and https://www.usbr.gov/uc/envdocs/rod/20120400-AspinallUnitOperation-ROD-508-UCRO.pdf, respectively).
- 2009 Navajo-Gallup Water Supply Project Planning Report and Final Environmental Impact Statement, including Record of Decision (Found at https://www.usbr.gov/uc/envdocs/eis/navgallup/FEIS/index.html)
- 2007 Final Environmental Impact Statement and Record of Decision for Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead (Found at https://www.usbr.gov/lc/region/programs/strategies/FEIS/index.html and https://www.usbr.gov/uc/envdocs/rod/Dec2007_GCDShortages_ROD.pdf)
- 2006 Record of Decision of Operation for Navajo Reservoir Operations, Navajo Unit (Found at https://www.usbr.gov/uc/envdocs/eis/navajo/pdfs/NavWaterOpsROD2006.pdf)
- 2006 Final Environmental Impact Statement and Record of Decision for Operation of Flaming Gorge (Found at https://www.usbr.gov/uc/envdocs/rod/OperationofFlamingGorgeDam-FinalEISandROD-2006-02.pdf)
- Glen Canyon Dam
  - 2016 Final Environmental Impact Statement and Record of Decision for the Glen Canyon Dam Long-Term Experimental and Management Plan (Found at https://ltempeis.anl.gov/news/index.cfm#LTEMP-FEIS-Available, and https://ltempeis.anl.gov/documents/docs/LTEMP_ROD.pdf respectively)
  - 2008 Final Environmental Assessment and Finding of No Significant Impact for Experimental Releases from Glen Canyon Dam (Found at https://www.usbr.gov/uc/envdocs/ea/gc/2008hfe/GCD-finalEA2-29-08.pdf and https://www.usbr.gov/uc/envdocs/ea/gc/2008hfe/FONSI.pdf, respectively)
  - 1995 Final Environmental Impact Statement and 1996 Record of Decision for Operation of Glen Canyon Dam (Found at
- 2002 Environmental Assessment and Finding of No Significant Impact for the Colorado River Storage and Interstate Release Agreement (Found at https://www.usbr.gov/lc/region/g4000/SIRA/FONSI-EA.pdf)
- 2002 Final Environmental Impact Statement for Colorado River Water Delivery Agreement — Implementation Agreement, Inadvertent Overrun and Payback Policy, and Related Federal Actions (Found at https://www.usbr.gov/lc/region/g4000/FEIS/Volume%20I.pdf and https://www.usbr.gov/lc/region/g4000/FEIS/Volume%20II.pdf)
- 2000 Final Environmental Impact Statement and Record of Decision for Interim Surplus Criteria (Found at https://www.usbr.gov/lc/region/g4000/surplus/SURPLUS_FEIS.html and https://www.usbr.gov/lc/region/g4000/surplus/surplus_rod_final.pdf, respectively)
- 2000 Final Environmental Impact Statement for Animas-La Plata Project/Colorado Ute Indians Water Settlement (Found at https://www.usbr.gov/uc/envdocs/rod/Oct1996_OperationGCD_ROD.pdf)

Humpback Chub

Bonytail

Colorado Pikeminnow

Razorback Sucker

Partners of the Upper CR Endangered Fish Recovery Program are recovering four species of endangered fish in the CR and its tributaries in Colorado, Utah, and Wyoming while water use and development continues to meet human needs in compliance with interstate compacts and applicable federal and state laws. Illustrations © Joseph Tomelleri.

ESA and the Law of the CR, the federal government, states, Tribes, and individuals have often worked to assure ongoing ESA compliance by accommodating species protection and recovery while still pursuing resource development in the CR Basin as needed.

Examples include:

» *Upper CR Endangered Fish Recovery Program (UCRIP)*– Initially established in 1988, the UCRIP operates to protect and recover four endangered fish species while allowing for the continued operation of federal water and power projects in the Upper CR Basin. In partnership with local, state, and federal agencies as well as water and power interests and environmental groups, the UCRIP conducts research and monitoring and implements management actions such as habitat restoration, non-native fish controls, and instream flow protections to recover the endangered fish within state and federal laws and Tribal rights. The states of Wyoming, Colorado, and Utah, along with the USFWS, water users and customers for hydropower from the CR Storage Project, contribute annual funds to base funding provided by the Reclamation to support the UCRIP's activities. A current uncertainty for the program is suitable funding from all funding sources to effectively continue the recovery process post-2023 when the current authorization expires.

» *San Juan River Fish Recovery Implementation Program (SJRIP)*– Initially established in 1992, the SJRIP functions similar to the UCRIP to recover the endangered pikeminnow and the razorback sucker while allowing water development and management activities to continue in the San Juan River Basin. Funding for this program is cost-shared between Colorado, New Mexico, the Navajo Nation, Jicarilla Apache Nation, Southern Ute Indian Tribe, and Ute Mountain Ute Indian Tribe along with USFWS, Reclamation, and Bureau of Land Management at Interior. Primary program elements have focused on habitat restoration, water quality, genetic integrity, non-native fish control, and research and monitoring. Along with the UCRRIP, the status of future funding is currently uncertain and the subject of ongoing policy discussions.

» *Lower CR Multi-Species Conservation Program (MSCP)*– Established in 2005, the MSCP works to help recover species listed under the ESA and reduce the likelihood of additional species listings. The program is scheduled to be implemented over 50 years to provide focused conservation of native and imperiled species and their habitats. It also proactively works to prevent the listing of species that might become imperiled in the future. The program is implemented through the Reclamation by an MSCP steering committee that has representation for over 50 entities and organizations from state and federal agencies, water and power users, municipalities, Native American Tribes, conservation organizations, and other interested parties. The program is currently funded equally by the program partners to implement a specific habitat conservation program that can accommodate

Table 2. Summary of Key Endangered Species Act Responsibilities for USFWS

» **Section 4 – Listing, Designating, and Recovery Planning**
The ESA establishes requirements for determining whether a species should be entitled to specific protections as a threatened or endangered species. A species may be listed as "endangered" if it is deemed in danger of extinction throughout all or a significant portion of its range. A species may be listed as "threatened" if it is likely to become endangered within the foreseeable future. When evaluating a species for listing, the USFWS must rely on the best scientific information available to assess at least five factors: 1) damage to, or destruction of, a species' habitat; 2) overutilization of the species for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) inadequacy of existing protection; and 5) other natural or manmade factors that affect the continued existence of the species.

In addition, the USFWS is responsible for designating "critical habitat" for listed species when "prudent and determinable." An area can be excluded from critical habitat designation if an economic analysis determines that the benefits of excluding it outweigh the benefits of including it, unless failure to designate the area as critical habitat may lead to extinction of the listed species. Nevertheless, lands eligible for critical habitat designation include geographic areas that may or may not be presently occupied by the listed species. Instead, the criteria are whether the lands contain the physical or biological features that are essential to the conservation of the species and that may need special management or protection.

Upon listing a species or designating habitat, the USFWS can consider recovery planning to restore a species to ecological health. Typically, when the USFWS develops recovery plans, they address at a minimum: (1) objective measurable criteria for delisting the species; (2) site-specific actions; and (3) estimates of the time and cost for implementing the recovery plan. Such plans also usually involve the assistance of species experts; other Federal, State, and local agencies; Tribes; nongovernmental organizations; academia; and other stakeholders to develop and implement as appropriate.

» **Section 9 – Prohibiting Take**
Section 9 of the ESA makes it unlawful to import, export, take, possess, sell, or transport any endangered or threatened species. The ESA defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term harm is further defined by regulation as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." When a species is listed under the ESA, any "take" of that species is expressly prohibited without a take permit that authorizes a taking of a listed species provided that the take is incidental to some other lawful activity. An "Incidental Take Permit" usually details which species is authorized for incidental take and how many individual members of that species will be covered by the permit.

» **Section 7 – Avoiding Jeopardizing Listed Species or Adversely Modifying Critical Habitat**
Section 7 of the ESA prohibits any federal agency from authorizing, funding or conducting any activity that is likely to jeopardize the continued existence of a listed species. Nor can a federal activity result in the destruction or adverse modification of critical habitat. For purposes of the ESA, "jeopardize the continued existence of'" means to engage in an action that would reasonably be expected to appreciably reduce, directly or indirectly, the likelihood of both the survival and recovery of a listed species. And "destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

To comply with Section 7, federal agencies are to consult with the USFWS and NMFS to assess the effects of any federal action on a listed species or its critical habitat. During consultation, the USFW or NMFS and the "action" agency typically share information about the proposed project and the species or critical habitat likely to be affected. The appropriate administering agency then prepares a Biological Opinion concluding whether the Federal agency has avoided a jeopardy determination by ensuring that the proposed action will not implicate the continued existence of a listed species and/or result in the destruction or adverse modification of critical habitat. If, on the other hand, the administering agency makes a jeopardy determination, it may offer "reasonable and prudent alternatives" for modifying the proposed action to avoid jeopardy.

current and projected water diversions and power production while maintaining ESA compliance going forward.

In addition, the federal government has been obligated to assure its agencies do not jeopardize the continued existence of a listed species or adversely modify critical habitat in the CR Basin. Many activities on the CR, therefore, have required USFWS reviews and related Biological Opinions to authorize operations in compliance with the ESA. Recent examples of such efforts are listed in Table 3.

The above examples of ESA compliance efforts have not made the CR Basin entirely immune from enforcement efforts or ESA challenges. Citizen suit litigations against Interior have cropped up on occasion to question and alter federal agency decisions and actions.[12] Each of these cases has faced an uphill battle in achieving complete success. However, they have succeeded to sometimes force the agencies and other CR stakeholders to adjust and rethink how to proceed in the future. As such, these cases (and others like them) serve as certain indicators of the ongoing attention to the environment that will have to be paid in making and implementing water policy decisions going forward.

Moreover, the non-jeopardy requirement for threatened and endangered species may also become more challenging through the years. If drier hydrology persists, the reasonable and prudent alternatives for dam and other infrastructure operations that the USFWS have established to avoid jeopardizing imperiled species or modifying critical habitat may require further considerations.

Grand Canyon Protection Act of 1992

The Grand Canyon Protection Act (GCPA) is the culmination of scientific investigations, legal interpretations, and policy considerations to effectively integrate the operation and use of Glen Canyon Dam for water allocation and hydropower production with the growing recognition for the need to protect our most valuable resources.[14] Passed in 1992, after a drawn-out process to consider and address the numerous competing interests in the CR, Senator John McCain (the legislative sponsor) summarized the GCPA's purpose as follows:

> "The Grand Canyon Protection Act is not draconian legislation. Glen Canyon Dam will continue to supply abundant and economical electrical power. It will continue to provide water critical to the

Table 3. Recent Biological Opinions

- 2016 Biological Opinion for the Glen Canyon Dam Long-Term Experimental and Management Program (Found at https://www.fws.gov/southwest/es/arizona/Documents/BioI_Opin/120059_LTEMP%20BiOp_11-25-16.pdf).
- 2008 Programmatic Biological Opinion for the Gunnison River Basin and operation of the Wayne N. Aspinall Unit, and re-consultation for the Dallas Creek and Dolores Projects Consultation for the Gunnison River basin includes operation and depletions associated with existing Bureau of Reclamation (Reclamation) projects, other Federal projects and existing nonfederal water depletions. (Found at https://www.usbr.gov/uc/envdocs/ba/AspinallUnitOps/cvr.pdf)
- 2008 Biological Opinion for the 5-Year Experimental Plan Operation of Glen Canyon Dam (Found at https://www.usbr.gov/uc/envdocs/bo/FinalGCDBO2-26-08.pdf)
- 2007 Biological Opinion for the Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead. (Found at https://www.usbr.gov/lc/region/programs/strategies/BOFinal.PDF).
- 2006 Navajo Reservoir Operations Final Biological Opinion (Found at https://www.fws.gov/southwest/sjrip/pdf/DOC_NavajoReservoirOperations_BO_FINAL_2006-1-5.pdf).
- 2005 Biological and Conference Opinion on the Lower CR Basin Multi-Species Conservation Program (Found at https://www.fws.gov/southwest/es/arizona/Documents/BioI_Opin/040161_LCRMSCP.pdf)
- 2005 Flaming Gorge Final Biological Opinion —- Identifies the status of listed species and designated habitat and provides flow recommendations to assure continued ESA compliance while operating the facility. (Found at https://www.usbr.gov/uc/envdocs/eis/fgFEIS/appdx/10_bioOpin.pdf)
- 2005 Yampa River Basin Biological Opinion on Management Plan for Endangered Fishes (Found at https://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/yampaPBO/FinalYPBO.pdf)
- 2005 Final Programmatic Biological Opinion on the Management Plan for Endangered Fishes in the Yampa River Basin. (Found at: https://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/yampaPBO/FinalYPBO.pdf)
- 1999 15 Mile Reach Programmatic Biological Opinion — addressing impacts related to water depletions on the CR that occur above the confluence with the Gunnison River and impact critical habitat from Rifle, Colorado to Lake Powell. (Found at https://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/15mile/FinalPBO.pdf)

View of the Grand Canyon from Powell Point on the South Rim. Photo by Tuxyso/Wikimedia Commons.

> region. The bill will merely ensure that our constructive use of one resource will not become an abuse of another — particularly the Grand Canyon."[13]

Key provisions of the GCPA define the processes and priorities for operating Glen Canyon Dam. First, they direct the Secretary of the Interior (Secretary) to operate the dam "in such a manner as to protect, mitigate adverse impacts to, and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established." It clarifies, however, that all operations shall remain consistent with and subject to:

> "the CR Compact, the Upper CR Basin Compact, the Water Treaty of 1944 with Mexico, the decree of the Supreme Court in *Arizona v. California,* and the provisions of the CR Storage Project Act of 1956 and the CR Basin Project Act of 1968 that govern allocation, appropriation, development, and exportation of the waters of the CR Basin."

Next, specific provisions of the GCPA require the Secretary to undergo a NEPA analysis to identify long-term operations for Glen Canyon Dam to comply with the legislation's goals. The plan that results from this investigation must be prepared in consultation with (i) all appropriate Interior agencies; (ii) the Secretary of Energy; (iii) the seven CR Basin States; (iv) Indian Tribes; and (v) the general public, including representatives from academic and scientific communities, environmental organizations, the recreation industry, and contractors for the purchase of federal power.

Subsequently, the GCPA provisions require the Secretary to establish a monitoring program to be conducted in consultation with the same groups participating in the EIS process. The program will be designed to assess the effects of any new operating criteria and include all necessary research and studies.

GCPA Implementation in the Colorado River Basin

Unlike NEPA and the ESA, the GCPA applies expressly and directly to CR operations. It requires the Secretary to adjust operations at Glen Canyon Dam to protect and enhance natural resources downstream without undermining the requirements and responsibilities enumerated under the Law of the River.

Interior completed the first NEPA process for reoperating Glen Canyon Dam in 1995. The resulting ROD in 1996 identified the balance to protect or enhance downstream resources while still permitting hydropower generation to fluctuate as needed. The ROD required Glen Canyon Dam to reduce fluctuations in daily reservoir releases well below historic patterns and to provide high steady releases of short duration when possible. This modified low fluctuating flow (MLFF) and occasional

The Adaptive Management Work Group provides input from stakeholders regarding modifications to Glen Canyon Dam operations. AMWG membership includes each CR Basin State, Tribal representatives, cooperating state and federal agencies, environmental groups, recreation interests, and contractors for federal power from Glen Canyon Dam. Photo © iStock.com.

spike flow regime still provided for annual release volumes consistent with the Law of the River while adjusting the timing of those releases to reduce natural resource degradation and rebuild high elevation sandbars, deposit nutrients, restore backwater channels, and provide some of the dynamics of a natural river system.

Because of scientific uncertainties associated with dam operations, the Secretary also concluded in the 1996 ROD that Interior should adjust dam operations pursuant to a process known as "adaptive management."[15] The Secretary created the Glen Canyon Dam Adaptive Management Program ("AMP") and established an advisory committee known as the Adaptive Management Work Group (AMWG) to provide input from stakeholders regarding modifications to Glen Canyon Dam operations. AMWG membership includes each CR Basin state, Tribal representatives, cooperating state and federal agencies, environmental groups, recreation interests, and contractors for federal power from Glen Canyon Dam. The Secretary brings these varied interests together through the AMP to formulate consensus approaches for protecting downstream resources and striking a wise balance for river operations consistent with the rights and obligations under the law. The process includes on-going study and experimentation between Glen Canyon Dam and Lake Mead to better understand any number of issues based on the best information available in order to make sound choices about actions necessary and feasible to benefit the listed fish, recreation, aesthetics, culture, and other values in the region.

To fulfill the GCPA's monitoring directives and serve as the science provider for the Glen Canyon AMP, the Secretary established the Grand Canyon Monitoring and Research Center (GCMRC). As part of the U.S. Geological Survey (USGS), the GCMRC assesses the effects of Glen Canyon operations on natural, cultural, and recreational resources within the Glen Canyon National Recreation Area and Grand Canyon National Park. It designs and implements scientific investigations based on directives made under the AMP to inform management policies and decisions related to dam operations and downstream resources.

2016 Glen Canyon Dam Long-Term Experimental and Management Plan (LTEMP)

After almost 20 years of operating under the MLFF regime and accumulating scientific information from GCMRC studies, Interior performed a comprehensive review of Glen Canyon Dam operations beginning in 2011. Specifically, Interior underwent a second, full-blown EIS investigation to evaluate whether and how operations should be updated to continue compliance with the GCPA and other provisions of applicable federal law for the next 20 years.

The resulting 2016 LTEMP provides a framework for adaptively managing

Glen Canyon Dam operations through specific baseline operations and periodic experimental activities intended to promote natural resources and recreation and/or study conditions in the Glen Canyon National Recreation Area and Grand Canyon National Park.[16] In this way, the LTEMP serves as a programmatic authorization for operating Glen Canyon Dam through 2036 based on both consistent and experimental operations that without having to undergo timely and costly NEPA investigations for each experiment.

Key elements of the LTEMP include:

- Monthly release patterns with limits to daily fluctuations;
- High flow experiments with sediment triggers for spring and fall,
- High flow experiments with extended durations,
- Potential low summer flows,
- Trout management flows,
- Aquatic invertebrate (weekend) flows,
- Hydropower improvement flows, and
- Mechanical fish removal activities in consultation with Tribal representatives

Overall

Overall, the integration of environmental resource policy into water supply management decisions is an ongoing process. Large water projects and population growth have had significant impacts on landscapes, natural flows, fish and wildlife species and habitats, as well as cultural values and recreational opportunities. The population growth and expansion of perspectives have allowed expanding water management considerations to evolve. As the CR Basin continues to work through the competing challenges of increasing water demands and decreasing water supplies, it will be important to consider how to further integrate the environmental values that support the CR Basin. Whether a balance can be struck will depend on the collaboration implemented to advance collective goals and confront the challenges faced today. ❑

Endnotes

1 B.W. Evermann and C. Rutter, *The Fishes of the Colorado Basin* (1895), Bulletin of the U.S. Fish Commission for 1894, Vol. 14:473-486, available at, https://www.biodiversitylibrary.org/item/215790#page/9/mode/1up (Last Visited, April 20, 2021).

2 National Park Service Organic Act, 16 U.S.C. 1, *et. seq.* (1916) (39 Stat. 535).

3 Some historians and research scientists report that the Salton Sea was once part of the vast and expansive Colorado River Delta that "filled and dried for thousands of years" before it was established in its current form beginning in 1905. See e.g., *Salton Sea,* Audubon California Chapter, available at https://ca.audubon.org/conservation/conservation/important-bird-areas/salton-sea (Last Visited, April 20, 2021).

4 2003 Quantification Settlement Agreement documents, available at https://www.iid.com/water/library/qsa-water-transfer, (Last Visited, April 20, 2021).

5 See G. Pitzer, Long Criticized for Inaction at Salton Sea, California Says It's All-In On Effort To Preserve State's Largest Lake, Water Education Foundation (July 17, 2020), available at https://www.watereducation.org/western-water/long-criticized-inaction-salton-sea-california-says-its-all-effort-preserve-states (Last Visited, April 20, 2021).

6 *Minute 306 — Conceptual Framework for U.S. - Mx Studies for Future Recommendations Concerning the Riparian and Estuarine Ecology of the Limitrophe Section of the Colorado River and its Associated Delta,* International Boundary and Water Commission (December, 2000).

7 National Environmental Policy Act of 1969, 42 U.S.C. 4321, *et. seq.* (1970).

8 National Environmental Policy Act of 1969, 42 U.S.C. §4331 (1970).

9 The U.S., Canada, and Mexico are negotiating a Transboundary Environmental Impact Assessments (TEIA) agreement that could require each country to assess any significant transboundary environmental impacts of proposed projects. Furthermore, the Council on Environmental Quality (CEQ) and the Executive Branch itself have issued guidance and orders respectively instructing further analysis of transboundary effects of proposed actions. The CEQ guidance concludes that, "NEPA requires agencies to include analysis of reasonably foreseeable transboundary effects of proposed actions in their [Environmental Assessment or Environmental Impact Statement] analysis of proposed actions in the U.S." Executive Order 12114 (Environmental Effects Abroad) requires Federal agencies to analyze in NEPA documents the significant impacts of proposed projects on the environment outside the U.S.

10 Endangered Species Act of 1973, 6. U.S.C. 1531, et. seq. (1973).

11 See *Tennessee Valley Authority v. Hill,* 437 U.S. 153, 184 (1978).

12 See *Consejo de Desorollo Economico de Mexicali v. United States,* 438 F. Supp. 2d 1207 (D. Nev.2006) and No. 06-16345 (9th Cir. 2007); *Center for Biological Diversity v. Department of the Interior,* CV06-494-PCT-DGC (D. Ariz. 2006); and *Grand Canyon Trust v. Department of the Interior,* 623 F. Supp. 2d 1015 (D. Ariz. 2009).

13 Grand Canyon Protection Act of 1992, 106 Stat. 4669, *et. seq.* (1992).

14 137 Cong. Rec. S36256 (daily ed. Nov. 27, 1991) (statement by Sen. John McCain).

15 1996 Record of Decision - Operation of Glen Canyon Dam, Bureau of Reclamation, available at, https://www.usbr.gov/uc/envdocs/rod/Oct1996_OperationGCD_ROD.pdf (Last Visited, April 20, 2021).

16 *2016 Record of Decision for the Glen Canyon Dam Long-Term Experimental and Management Plan Final Environmental Impact Statement,* Bureau of Reclamation, available at https://ltempeis.anl.gov/documents/docs/LTEMP_ROD.pdf

Cotton is one of the crops grown in the Mexicali Valley, one of Mexico's richest agricultural regions. Photo ©VG Foto/Shutterstock.com.

Sharing the Colorado River Between the U.S. and Mexico

The Colorado River (CR) has a complex, binational history and has been a source of both tension and triumph in the development of the U.S.-Mexican relationship. While there are a number of binational waterways that inform the subject of U.S. - Mexico relations, the CR has frequently played a starring role. This following highlights key considerations regarding the relevant history/geography of the binational region, treaty elements and binational governance of the River, and the challenges and problem-solving efforts that have been employed to address more recent CR management issues between the two countries.

History/Geography

The last 100 miles of the CR's journey flows through Mexico before it historically empties into the Gulf of California. In Mexico, the CR forms a boundary and serves as the primary water source for agriculture and domestic uses in the states of Baja California Norte and Sonora. The CR also serves as the freshwater source for the CR Delta (at the Sea of Cortez), in the early 1900s, the Delta was a picture of expansive wetlands best captured by Aldo Leopold's writings in the Sand County Almanac:

> "On the map, the Delta was bisected by the [Colorado] River, but in fact, the river was nowhere and everywhere, for he could not decide which of a hundred green lagoons offered the most pleasant and least speedy path to the Gulf. So he traveled them all. He divided and rejoined, he twisted and turned, he meandered in awesome jungles, he all but ran in circles, he dallied in lovely groves, he got lost and was glad of it. For the last word in procrastination, go travel with a river reluctant to lose its freedom to the sea."[1]

With the completion of the All-American Canal and Hoover Dam in the late 1930s and early 1940s, storage and diversion infrastructure in the U.S. worked to impede the CR's flow for most of the 20th Century from reaching its historical terminus. Today, the CR only reaches the Gulf under rare conditions, involving either a collection of extremely wet precipitation years or heavily negotiated arrangements to either re-create natural pulses to the Sea of Cortez or direct available flows through irrigation canals to the sustainable river reaches.

In Mexico, the Morelos Dam supplies domestic and agriculture water in the Mexicali Valley and municipalities in Mexicali and Tijuana. The Mexicali Valley has almost 500,000 acres of land in production and is considered one of the most productive agricultural regions in Mexico. To survive its harsh desert conditions, the Mexicali Valley relies on CR water to produce mostly wheat, cotton, and vegetables. Today, the Mexicali Valley is one of Mexico's most important exporters of asparagus, broccoli, carrots, green onions, lettuce, peas, peppers, radishes, and tomatoes to the world.

Below Morelos Dam, the small portion of the CR that remains in the limitrophe (river) flows beyond Yuma, Arizona and the confluence with the Gila River before becoming the Mexico–U.S. border for about 24 miles. Below San Luis Río Colorado, the Colorado passes entirely into Mexico, defining the border between Baja California Norte and Sonora, Mexico. With the exception of a few outlying high flow years in the 1980s and 1990s, the stretch of the CR between San Luis Rio Colorado and the Gulf of California has been dry, or only a trickle formed by irrigation return flows since about 1960 (see Salinity and Cienega de Santa Clara below).

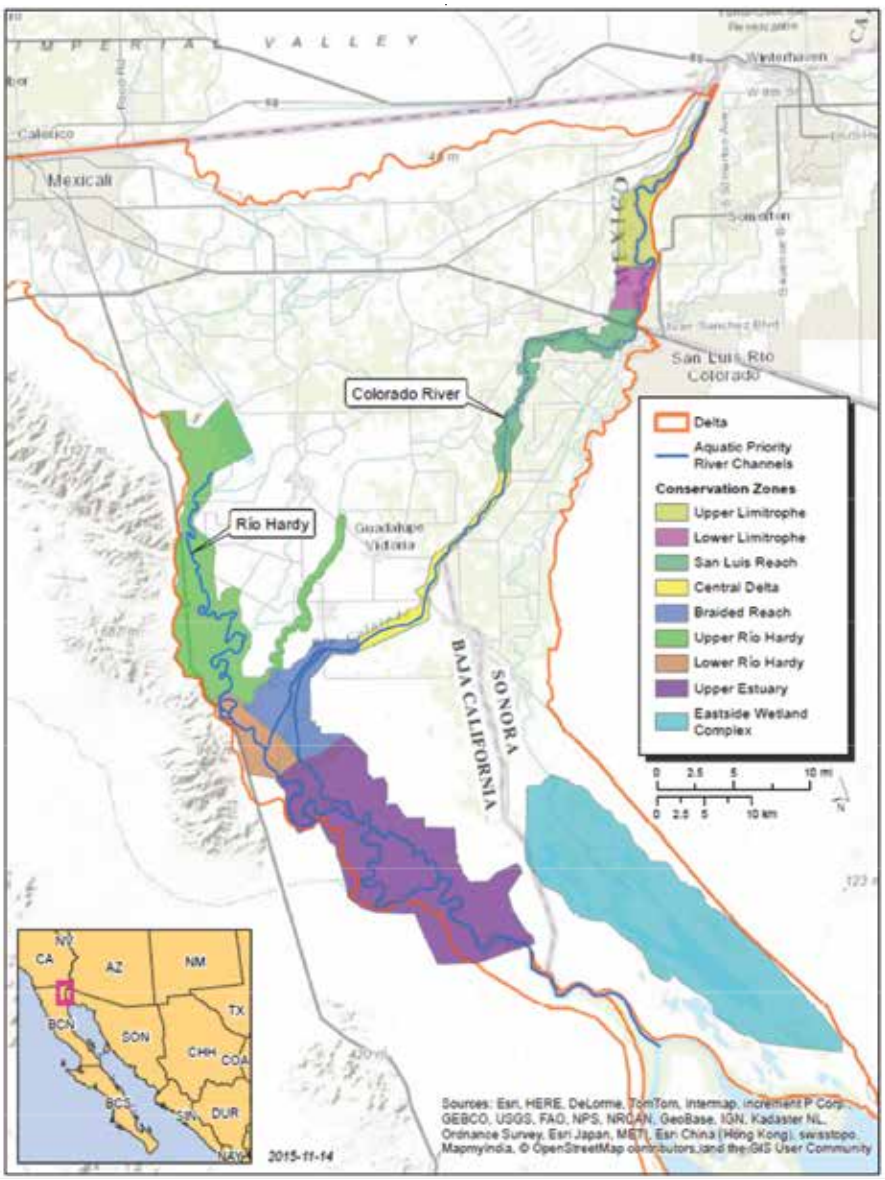
1944 Water Treaty

In 1944, negotiators from both the U.S. and Mexico agreed on final provisions for the equitable distribution of waters from both the CR and Rio Grande (as well as the Tijuana River). The *Treaty on Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande* (1944 Water Treaty) was subsequently introduced to the Senate Foreign Relations Committee in the U.S. and its equivalent in Mexico for approval. Following weeks of hearings in which California objected to and questioned a number of provisions and sought clarifications through testimony from technical advisers and commissioners charged with negotiating the agreement, the U.S. Senate provided its advice and consent to the Treaty in April 1945 subject to certain "understandings." Mexico followed suit by ratifying the Treaty in October 1945 following a month of hearings within its own congress. In November 1945, President Truman ratified the Treaty, subject to the Senate's understandings. The Treaty has been in effect ever since.[2]

CR treaty negotiations can be traced back to the early 1900s. The Imperial Valley in the U.S. and Mexicali Valley in

Mexico have relied on CR water since the 1800s to foster growing farming enterprises. As demands for infrastructure and CR supplies grew, leaders in both countries early advocated for a treaty to provide for greater certainty in distribution of the CR water supply.

During the early CR discussions, Mexico proposed a division of water that would allow it to increase its right to the flows as agricultural demands in Mexico grew. The U.S. balked, recognizing that terms that fluctuations in future right would undermine a quintessential goal of securing greater certainty in the future CR development within the U.S. The CR Basin States encouraged the U.S. to invoke the Harmon Doctrine of territorial sovereignty and assert the right to use every drop of the CR within the U.S. without any obligation to deliver water to Mexico.[3] The U.S., however, let go of the Harmon Doctrine position in the 1940s upon additional pressure stemming from developments of World War II,[4] Mexico's insistence that conflicts over the Rio Grande (some of whose waters originate in Mexico) be addressed in concert with the CR and increased Basin State interests to dissipate disagreements so that anticipated water infrastructure projects could be secured in the UB. Mexico was also motivated to secure a guaranteed water supply at a time when drought was compromising farming endeavors in northern Mexico. These overriding circumstances caused the countries to ultimately overcome previous disputes and disagreements to reach a definitive and lasting agreement.



The CR Delta and Conservation Zones. Map courtesy of the Walton Family Foundation.

Treaty Elements

The 1944 Water Treaty can be thought of as three treaties rolled into one — one for the Rio Grande River, one for the CR, and one for the Tijuana River. The primary water allocation elements of the 1944 Treaty relevant to the CR are summarized as follows:

Treaty Elements — Water Allocation

The Treaty's key provisions regarding the allocation of CR water include Articles 10, 11, 12, and 15. Through these provisions, the Treaty commits the U.S. to deliver to Mexico 1.5 million acre-feet (maf) of CR water annually. It further provides that Mexico is entitled up to an additional 200,000-acre-feet when the U.S. determines there is a full surplus supply available for distribution in the system.

In the event an "extraordinary drought or serious accident" prevents the U.S. from delivering Mexico's guaranteed delivery, the Treaty provides that Mexico's allotment can be reduced in proportion to reductions taken in the U.S. However, the Treaty does not define extraordinary drought or define how it should be determined. Additionally, a similar provision regarding extraordinary drought applies to the Rio Grande in the same Treaty. To the extent that extraordinary drought is ever used to define reductions of CR deliveries to Mexico, it should be expected that a similar application will be applied to deliveries from Mexico to the U.S. on the Lower Rio Grande.

The Treaty next sets forth two delivery points for Mexico to receive its allotment. The U.S. shall deliver Mexico's CR water, "whatever its origin," first to limitrophe above Morelos Dam (located 1.1 miles downstream from the California-Baja California land boundary between the town of Los Algodones in northwestern Mexico and Yuma County, Arizona). This delivery point is referred

In Mexico, the CR is diverted at Morelos Dam (above) to supply water for agriculture in the Mexicali Valley and municipalities in Mexicali and Tijuana. Photo couresy of the Redford Group.

to as the Northerly International Boundary (NIB). The second delivery point is at the Southerly International Boundary (SIB) (located across the land border near San Luis, Arizona, and includes the water flows through the limitrophe of the river below Morelos Dam).

To satisfy Mexico's schedule for deliveries, the Treaty commits that the U.S. will, within five years after the Treaty is in force, build and operate Davis dam and reservoir so that a portion of the capacity can "be used to make possible the regulation at the boundary of the waters to be delivered to Mexico" in accordance with the Treaty's distribution provisions.

Treaty Elements – Governance Through the International Boundary and Water Commission

In addition to allocating CR water, the 1944 Treaty re-configured the existing International Boundary Commission into the International Boundary and Water Commission (IBWC) to administer the U.S. - Mexico border and water treaties. Specifically, it establishes the IBWC as an international body that consists of a U.S. Section and a Mexico Section to administer the terms of the 1944 Treaty subject to the authority of each country's federal government. Each section of the IBWC is headed by a Commissioner, and staffed by two principal engineers, a legal advisor, and a secretary, all of whom enjoy diplomatic privileges and immunities in the territory of the other country.

The Treaty requires the IBWC to implement Treaty provisions, exercise the rights and obligations of both governments under the Treaty, and settle all disputes that arise under the Treaty. To accomplish these duties, the Treaty authorizes the IBWC to develop rules and issue proposed decisions, called Minutes. Minutes adopted pursuant to the 1944 Treaty have addressed a range of issues, including the operation and maintenance of cross-border sanitation plants, water conveyance during droughts, dam construction, and water salinity problems, among others (see Minute Process below).

Article 24 of the Treaty also provides certain mechanisms for dispute resolution, establishing that the IBWC has authority "to settle all differences that may arise between the two Governments with respect to ... application of the Treaty, subject to the approval of the two Governments." If the Commissioners cannot resolve a dispute, then U.S. and Mexico may address it through diplomatic channels. Each country may also seek recourse through any "general or special agreements which the two Governments have concluded for the settlement of controversies."

The U.S. Section of the IBWC is headquartered in El Paso, Texas, and the Mexican Section is located in Ciudad Juárez, Chihuahua. The U.S. Section is a federal agency operating under the Department of State's foreign policy guidance. It is typically funded through annual appropriations for the Department of State's Foreign Operations and Related Programs. The President appoints the U.S. IBWC Commissioner, which typically does not require Senate confirmation. In Mexico, the Ministry of Foreign Affairs oversees the Mexican IBWC Section and its funding. Pursuant to the Treaty, each government is responsible for maintaining its own

Minute 319 provides for base flows at the Laguna Grande Restoration Area in the CR Delta. Photo courtesy of the Redford Center.

IBWC section, while joint expenses incurred by the IBWC are borne equally by the two governments. Any works constructed, acquired, or used in fulfillment of the Treaty and located wholly within the territory of either country are placed under the exclusive jurisdiction and control of the section in the country they are located.

Treaty Elements — Minute Process

A "Minute" under the 1944 Water Treaty is the equivalent of a binding executive rule or agreement between the U.S. and Mexico IBWC Sections on how to interpret or accomplish the concepts set forth in the Treaty. In this way, Minutes guide operations by directing how to implement or administer the rights and obligations under the Treaty. They are not intended or allowed to modify the Treaty's express provisions without undergoing the treaty negotiation process, including additional Senate ratification.

Minutes are initially drafted through both IBWC Sections. Once drafted, a Minute must be signed by each Commissioner and forwarded to each government within three days of being signed. If neither country announces its disapproval within 30 days, the Minute is accepted and is adopted. If either government disapproves, the matter is further negotiated with the assistance of the diplomatic agencies of each country. If the two governments reach an agreement during these negotiations, the IBWC must take any further acts that may be needed to carry out the agreement. In consenting to the Treaty, however, the Senate provided that the IBWC and the Secretary of State cannot commit the U.S. to build works at U.S. expense without Congress' prior approval. Accordingly, for Minutes involving the construction of works or infrastructure to be functional, Congress has to also pass legislation authorizing the construction of the projects pursuant to the Treaty[5] (see, e.g., Salinity Control Act below).

The Minute process has proven useful in certain situations – especially when provisions within the Treaty are ambiguous or silent as to how to address present-day conditions confronting the countries (see, e.g., Summary of Recent Minutes, infra).

Post-Treaty Challenges and Collaborations

Salinity "Crisis"

The CR is naturally salty. As the CR and its tributaries flow downstream, salts naturally leach subsurface salts into the stream channel as well as from irrigation return flows, storage evaporation, and municipal and industrial uses. Knowing this, it would be reasonable to assume that the distribution of waters would also include discussion about the quality of water between the two countries. The Treaty, however, did not squarely address the issue. Rather, it took another round of diplomatic negotiations in the 1960s and 1970s after salinity concentrations began to severely degrade the Mexicali Valley's agricultural industry and drinking water supplies in Baja California Norte and Sonora. The "incident" tested the Treaty's dispute resolution provisions and methods for problem-solving issues as they arise.

Water Quality and the 1944 Treaty

The 1944 Treaty said nothing directly about the CR's quality. Research reveals that this may have been intentional so as to help assure Treaty ratification in both countries.

During the Senate hearings, U.S. Senators inquired whether water quality was part of the 1944 Treaty. Wanting to confirm that Mexico would only be entitled to a set volume of water, senators inquired about the role of water quality in meeting Mexico deliveries. Hearing witnesses pointed to general Treaty provisions to clarify the issue. They insisted that the Treaty bound Mexico to accept a set volume of water regardless of quality because Article 10 notes the water delivered to Mexico

can be "from any and all sources," and Article 11 provides that the water can be "from whatever origin." In contrast, Mexico justified the omission of any express reference to water quality based on the rules of treaty interpretation that would require all provisions to help fulfill the Treaty's intended purposes. The Mexican Section IBWC Commissioner noted that "in this treaty, as in any other of its kind, it is understood that the water must be of good quality."[6]

In other words, water quality was a sensitive subject, and ambiguity on the question of water quality in the Treaty had certain advantages. Both countries understood that water quality would likely decline somewhat through the years, but no one could know how much. In the end, the U.S. could point to language to minimize or push back on the need to provide water of a certain quality, and Mexico had some protection in the Treaty purposes and in ordinary principles of interpretation that require a treaty to be construed to accomplish its purposes. Mexico also could rely on water users in the Imperial Valley to protest any poor water quality with the backing of California as needed to apply political weight if needed. As such, both parties could demonstrate that they were protected while still maintaining uncertainty as to the exact water quality of Mexico's entitlement. Removing such uncertainty could be to the disadvantage of one country or the other and thus would jeopardize the chances of ratification.[7]

Salinity Degradation – Post-Treaty

While both the U.S. and Mexico may have anticipated some water quality deterioration, the level of degradation starting in the 1960s came much sooner and was more severe than had been expected when the Treaty was negotiated in the 1940s. The primary reason for the dramatic increase in salinity was two-fold. First, in the mid-1960s, the U.S. finished building the Glen Canyon Dam and started filling Lake Powell in the Upper CR Basin. This came after damming the CR to create Lake Mead and building the All-American Canal in the 1930s, all of which decreased flows and increased salinity concentrations in downstream flows than had been experienced in years prior. Second, in the 1950s and 1960s, the Wellton-Mohawk Irrigation and Drainage District in Arizona began releasing saline wastewater into the Bureau of Reclamation's Main Outlet Drain, which discharged to the CR between Imperial Dam (diversion point for U.S. water users) and Morelos Dam (diversion point for Mexico water users). This raised salinity levels in the CR water delivered to Mexico above limits set by the World Health Organization (WHO) and had dire consequences for the agricultural industry in Mexicali Valley. Charles Meyer describes the drainage project and its impact as follows:

> "Th[e] Bureau of Reclamation … constructed the Wellton-Mohawk District along the Gila River, near its confluence with the Colorado, on lands overlying beds of extremely saline groundwater. Once irrigation commenced[,] this water had to be drained away to prevent the salts from rising to the root zone of the plants. Initially, the drain water was dumped into the dry channel of the Gila River, where it was absorbed without harm to anyone. But the District was limited in size to "such number of acres as can be adequately irrigated by the beneficial consumptive use of no more than 300,000 acre-feet of water per annum diverted from the CR …." Apparently operating on the extremely dubious theory that the discharge of saline groundwater into the CR would count as return flow under the formula for measuring beneficial consumptive use by "diversions less return flows," Wellton-Mohawk constructed a drain that flowed directly into the Colorado. The effluent in the Wellton-Mohawk drain carries as much as 6,000 to 6,500 parts per million of dissolved solids (totally unfit for irrigation), and its discharge significantly contributed to the increase in salinity at the international boundary from 1,100 parts per million in March of 1961 to 2,700 parts per million in November and December of 1961."[8]

In light of these conditions, Mexico made formal complaints to the U.S. At first, the U.S. State Department countered Mexico, claiming the Treaty did not address water quality. However, when Mexico's then President Echeverria threatened to sue on the matter, the State Department not only risked compromising relationships between the two governments but also litigation in the International Court of Justice, U.S. courts, or before arbitrators. How the State Department evaluated the risks of litigation on the merits is not fully known, but it is apparent that it ultimately decided to sidestep its original position that CR deliveries to Mexico should not have any water quality considerations when it decided to work with Mexico on a mutually agreeable resolution.

Salinity "Solution" – Minute 242

To address the salinity "crisis" at the border, the U.S. agreed to consider a more comprehensive salinity control agreement with Mexico. The first step to this undertaking was Minute 241, in which the U.S. committed to finding a solution to the problem. Next came a number of years of negotiation that resulted in Minute 242 — *The Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River (1973)*.

Per Minute 242, the U.S. agreed to construct additional channels to control salinity, fund cleanup of the Mexicali Valley lands damaged by the accumulation of salts, and limit the annual average salinity levels of CR waters delivered to Mexico to a maximum of 145 parts per million over the average annual salinity of CR waters arriving at the Imperial Dam, in Yuma, Arizona.

While successful, the negotiated Minute 242 could not achieve intended results without specific steps taken in the U.S. to decrease salinity concentrations in the river. Such steps could not be mandated solely through an IBWC Minute but also required Congressional authorization. In 1974, Congress passed

the CR Basin Salinity Control Act to accomplish the obligations required under Minute 242 in a manner that would comport with the authorities of various agencies in the U.S. and be agreeable and supported by the seven U.S. CR Basin States. Among other things, the Salinity Control Act authorized the construction of the Yuma Desalting Plant (YDP) near Yuma, Arizona, to treat the return flows from the Wellton-Mohawk District and bring CR deliveries to Mexico within the agreed-upon salinity levels. The YDP was completed in 1991 and operated at one-third capacity by Reclamation for a 9-month period in 1992 and 1993 to determine whether it would perform as designed. Then a Gila River flood damaged the intake canal, and the YDP remained dormant until a 3-month test operation in 2007 and a one-year test operation in 2010. In the YDPs dormancy, the U.S. instead relied upon a bypass drain also authorized by the Salinity Control Act to meet salinity control obligations to Mexico.

The Bypass Drain transports untreated return flows from the Wellton-Mohawk District (or concentrated wastewater from the YDP process if operational) to the Santa Clara Slough (aka Cienega de Santa Clara) on the Gulf of California in Mexico. Bypassing Wellton-Mohawk return flows (i.e., not returning the water to the CR, but discharging it to the Cienega) in combination with wellfield pumping near the Arizona – Sonora border helps the U.S. meet Minute No. 242 salinity requirements at the NIB without operating the YDP. However, in accordance with the Minute, the water discharged to the Cienega is not counted as part of the annual treaty deliveries to Mexico. So, when water is bypassed through the drain, additional water from upstream on the CR has to be released to meet the Mexico delivery requirement.

Recent Binational Collaborations –Environmental Considerations Leading to Minute 306

The 1944 Treaty is devoid of any express environmental provisions. However, as can be seen through Minutes passed since 2000, binational collaboration on environmental and ecosystem management considerations have been allowed to enter into the Treaty governance process.

This 1905 photograph provides a view of the CR Delta prior to the impounding of water by Hoover and Glen Canyon dams. Photo courtesy of the Redford Center.

Originating at a time when the countries were narrowly concentrated on allocating and developing water uses, the 1944 Treaty focuses on the distribution of flows between Mexico and the U.S. and the construction of necessary infrastructure to accomplish what was termed to be "the equitable distribution" of CR water. In the decades following the 1944 Treaty ratification and implementation, laws were passed, and projects undertaken to the dam and divert the CR from its headwater states in Colorado and Wyoming to Morelos Dam in Mexico. The CR Delta suffered as a result of these developments. As mentioned above, the gates closing at Hoover Dam in the 1930s, Morelos Dam in 1950, and Glen Canyon Dam in 1964 resulted in virtually no water flowing to the Delta except in flood years. The Delta has resultingly shrunk to a shadow of its original 9,650 square miles, devastating habitat, wildlife, and communities along the way.

Despite the significant dewatering in the latter half of the 1900s, the limitrophe downstream of Morelos Dam and Delta showed signs of some resiliency with the assistance of flood waters and limited leftover flows from excess dam releases (made as a result of inefficient operations). Upon studying the Delta conditions post-1980s, it began to be hypothesized that periodic pulse flows, coupled with small base flows, could maintain or revive a portion of the Delta going forward.

Non-governmental organizations (NGOs) took note and began campaigns for pulse flows to save part of the Delta. Their first efforts crystallized in the late 1990s as the Secretary of the Interior (Secretary) began working with the seven U.S. Basin States to bring California within its CR allocation as recognized under the Boulder Canyon Project Act. The Secretary worked to develop interim rules for declaring surplus conditions in the Lower CR Basin that would enable states to access water from Lake Mead over and above their respective CR allocations.[9] Building on the notion that surplus water could be released to benefit water users, the NGOs pressed the Secretary to make accommodations for allowing surplus flows specifically for the CR Delta. Although the Secretary concluded that such actions would exceed the purpose of the rulemaking (to get Lower CR Basin water uses within their allocations), he committed to working together to develop a Delta solution. *Minute 306 — Conceptual Framework for U.S. — Mx Studies for Future Recommendations Concerning the Riparian and Estuarine Ecology of the Limitrophe Section of the Colorado River and its Associated Delta* was the result.

Signed in December 2000, right before the end of the Clinton administration, Minute 306 is the first purely environmental/ecological agreement between the U.S. and Mexico regarding the CR.

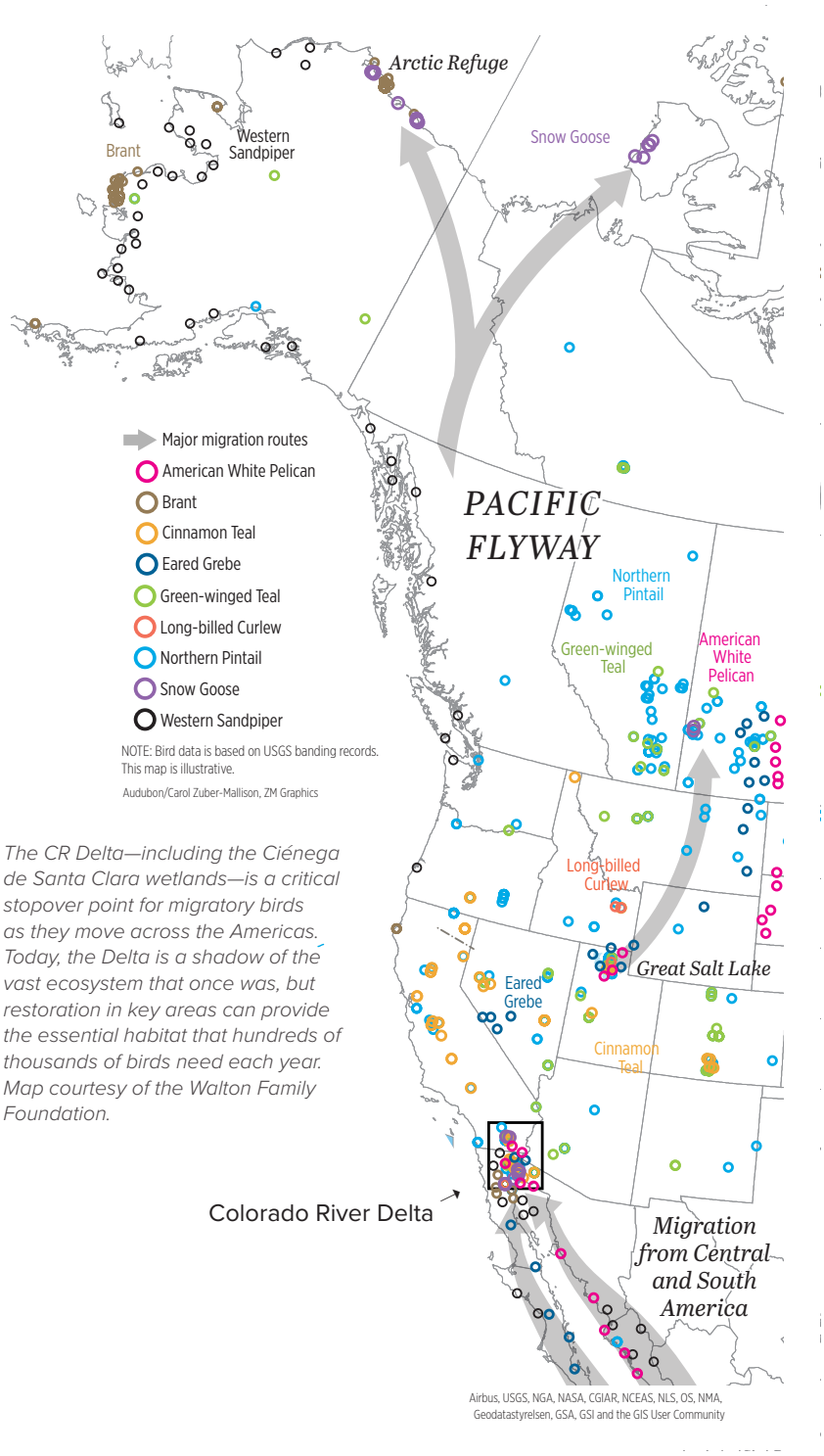
Cienega de Santa Clara and Minute 316

Minute 242 called for a reduction in the salinity of CR deliveries to Mexico. As a result, the U.S. diverted the poor-quality water from agricultural runoff to a Colorado Delta floodplain in Sonora, Mexico via a manufactured drainage referred to as the Main Outlet Drain Extension (MODE) to the Santa Clara "slough" in Mexico. By the 1970s, this bypass diversion had inadvertently fed the Cienega de Santa Clara wetlands, which serves as a remnant of the numerous wetlands that once made up a flourishing the CR Delta. Consistently fed by irrigation runoff drainage, the Cienega supports rare and endangered bird and fish species and is a nesting and feeding site for shorebirds and marshbirds on the Pacific Flyway

As of June 1993, the wetland became part of Mexico's Upper Gulf of California and CR Delta Biosphere Reserve.

Although the quality of water bypassed to the Cienega de Santa Clara has been deemed unusable for Mexico's agriculture industry, it has become a valuable resource for establishing a consistent supply of water to the otherwise dwindling CR Delta. However, over the past two decades of drought in the CR Basin the agricultural runoff is also deemed a potentially valuable resource to meet growing water demands through operation of the YDP, which will reduce the amount of upstream water required to meet the salinity differential at Morelos Dam under the Minute 242 requirements.

For such reasons, the LB states and Reclamation entered into a cooperative agreement to examine the operability and utility of the YDP in 2010. The agreement was expanded to be a binational collaboration of government agencies in the U.S. and Mexico as well as environmental groups and university scientists to protect and study the risks to the Cienega wetlands during the trial run of the YDP. Replacement flows and environmental monitoring helped to encourage active management of this ecosystem. The agreement reached in the 2010 Minute 316 to the Treaty was an initial stepping stone to additional efforts to protect shared ecosystems along the U.S.-Mexico border.



The CR Delta—including the Ciénega de Santa Clara wetlands—is a critical stopover point for migratory birds as they move across the Americas. Today, the Delta is a shadow of the vast ecosystem that once was, but restoration in key areas can provide the essential habitat that hundreds of thousands of birds need each year. Map courtesy of the Walton Family Foundation.

Pelicans and other species make use of artificial wetlands in the limitrophe downstream of Morelos Dam in the CR Delta near Mexicali in the state of Baja California, Mexico. Photo courtesy of the Redford Center.

The terms of the agreement do not alter the 1944 Treaty but, instead, outline a framework in which the countries may cooperate and make future recommendations concerning the CR Delta while working within the confines of the Treaty. There are no specific obligations or requirements to take action under Minute 306. Rather it sets forth the structure for and expectation of executing joint studies and exchanging information to evaluate and propose measures for the Delta's restoration based on the principle of equitable distribution of resources and the need to examine flows and requirements of water in order to keep the Delta ecosystem viable and robust.

The initial implementation of Minute 306 was at a binational delta summit in Mexicali, Mexico. The summit took place on September 11, 2001. The terrorist attack that ensued that same day became the first obstacle to progress under Minute 306 for a number of years. Foreign relations between Mexico and the U.S. were also taxed by geopolitical disagreements such as the Iraq War and border issues. Specific to the CR, Mexico had expressed great discontent in being excluded from the U.S.'s development of the Interim Surplus Guidelines for operating CR reservoirs. In addition, Mexico harbored concerns over the efficiency/improvement projects in the U.S. that minimized Mexico's access to seepage water from the All-American Canal. concurrently, the onset of a decades-long drought began to grip the Basin. Still, the framework established under Minute 306 remained in place and served as an example that binational collaboration could be possible in the decades to come.

Recent Binational Collaborations – Management Considerations Leading up to Minute 319

Beginning in 2000, spills from Lake Mead that provided occasional flows to the Delta and connected the river channel to the floodplain ceased entirely. Flows in excess of Mexico's treaty allocation also declined considerably as Reclamation sought to improve efficiencies in the U.S. water delivery system. During this time, federal and state governments and water managers in the U.S. directed their attention to developing guidelines for declaring and implementing shortages in the Lower CR Basin and coordinating reservoir operations under highly variable water supply conditions. The final guidelines were completed in 2007 after extensive in-country consultations and negotiations to assure the operations would work within the Law of the River and avoid conflicts and litigation going (see CR History, Law and Policy paper series above). Although the guidelines are limited to domestic operations and do not include Mexico, it was clear that their success would depend on Mexico sharing in any shortage conditions declared in the U.S. Mexico, however, did not agree. It was skeptical of guidelines that could otherwise affect its Treaty allocations without sufficient binational input from its perspective. Relationships following the Interim Surplus Guidelines and the All-American Canal dispute also required significant repair. Diplomatic discussions among Interior Secretary Dirk Kempthorne and Mexico's Ambassador to the U.S., Arturo Sarukhan, were critical to reigniting meaningful discussions regarding the sustainability of the Basin's water supplies. Coupled with the encouragement of the seven Basin States and conservation entities in both countries, official lines of communication between Mexico and the U.S. on managing the CR system began to open at the end of 2007.

Then tragedy struck. IBWC Commissioners Carlos Marin (U.S.) and Arturo Herrera (Mexico) were killed in a plane crash near the Rio Grande. The loss of dedicated leaders in both countries took time to grieve and then rebuild. Thus, more than a decade after signing Minute 306 and initiating collaborative binational discussions concerning the CR, no progress had been made. 2010 broke this logjam.

All-American Canal and the Weakening of International Relations Between U.S. and Mexico 2003-2008

The All-American Canal is an 80-mile aqueduct, that conveys CR water from the Imperial Dam (approximately 30 miles northeast of Yuma, Arizona) to Calexico, California and the Imperial Valley. The canal, which was authorized along with Hoover Dam under the Boulder Canyon Project Act, runs parallel to the Mexico – California border. It was designed as an earthen canal to replace the Alamo Canal, whose alignment was partially in the U.S. and partially in Mexico. Completed in 1940, the total canal system irrigates approximately 630,000 acres of fertile crop land in a region that has sometimes been characterized as one of the driest places on earth.

As the CR flows through the All-American Canal, it passes through sandy soils, allowing for considerable seepage from the earthen designed canal. (It was determined that approximately 68,000 acre-feet was lost annually by seepage from the Canal). In light of the alignment and gradient of the canal, the majority of this seepage entered Mexico. Initially, this seepage water caused flooding and damage in Northern Mexico, but Mexicali Valley residents and agricultural operations had constructed drains and pumps to manage the supply and started to rely on the seepage supply, in addition to Mexico's surface water allocation under the 1944 Water Treaty, to recharge aquifers and provide for additional irrigation water.

Whether Mexico had a right to the seepage water became an issue beginning in the mid-1990s when the Lower U.S. Basin States began to develop uses for more than their CR entitlements. California, in particular, had been relying on Arizona's unused apportionment to sustain uses in Southern California when the Central Arizona Project came on line in 1993. Efforts to get California within its 4.4 maf entitlement commenced soon thereafter. The 4.4 Plan that ultimately resulted required extensive efforts within California to make diversion and uses of water in Southern California more efficient, thereby allowing the water savings from the more efficient operations to be transferred to municipal districts. Such efficiencies included, but were not limited to, lining the All-American Canal.

The All-American Canal Lining Project involved constructing a 23-mile concrete canal to run parallel and eventually supplant a section of the original earthen AAC. While characterized as a useful efficiency project in the U.S., the AAC Lining Project was viewed as highly problematic to Mexico and environmental groups on both sides of the border.

The U.S. recovery of seepage water from the All-American Canal would negatively affect water supplies for prime agricultural land in Mexico, where the main source of irrigation water was the local aquifer that benefited from canal seepage for recharge and to dilute the otherwise salty water in the aquifer.

It was also reported from Mexico and environmental interests that the lining project would negatively affect wetlands and habitat in both Mexico and the U.S. Seepage from the canal supplied the Andrade wetlands in Mexico and the Salton Sea in the U.S., both of which provided critical habitat for numerous bird species, some of which were deemed endangered in the U.S. and Mexico.

Binational consultation consistent with the Treaty and Minute 242 were conducted as part of the Canal Lining Project. But Mexico asserted that the consultations were perfunctory at best. Similarly, efforts by environmental groups to have the U.S. further consider environmental impacts associated with the Canal lining were not heeded. As a result, a coalition of groups representing community and environmental interests in Mexico and the U.S. felt it necessary to file a lawsuit in federal district court of the Ninth Circuit in the U.S. to halt the lining project.

Spearheaded by the Consejo de Desarrollo Económico de Mexicali (CDEM), a civic and economic development corporation from Mexico, the plaintiffs also included non-profit entities in the U.S. seeking to enjoin the project as a violation of property rights and environmental interests. (The town of Calexico also joined the plaintiffs on the air quality claims raised.)

The federal district court initially dismissed the lawsuit for a variety of technical deficiencies, but the Ninth Circuit Court of Appeals breathed new life into the cross border challenges when it stopped the project from proceeding pending an appeal in 2006. Soon thereafter, however, the U.S. Congress included a rider in the Tax Relief and Health Care Act of 2006 that expressly mandated completion of the All-American Canal lining project. The lawsuit was rendered moot as a result, and the Canal Lining Project was completed in 2009.

While the U.S. and its Basin States may have ultimately won the battle to manage CR supplies despite explicit binational concerns, the resulting impact to U.S./Mexico relations were significant. It took years to overcome the failure to find a diplomatic solution and subsequent action by the U.S. to line the canal.

The Yuma Desalination Plant in Arizona on the Cienega de Santa Clara in Mexico photographed in 2018. Photo courtesy of USBR.

Whether it be the seven U.S. Basin States' imperative need to have Mexico share in shortages if declared in the U.S. under the 2007 Interim Guidelines, the conservationists' strong desire to secure water for the CR limitrophe and Delta, or Mexico's interests in leveraging storage capacity and environmental protections for its northern states, the stars aligned to bring everyone to the table and reach significant agreements beginning in 2010.

Minute 316

The first evidence of renewed collaborative efforts on CR matters since 2000 was Minute 316. This Minute, entitled *Utilization of the Wellton-Mohawk Bypass Drain and Necessary Infrastructure in the United States for the Conveyance of Water by Mexico and non-governmental organizations for Both Countries to the Santa Clara Wetland During the Yuma Desalting Plant Pilot Run,* was approved in April 2010 and sought to identify and implement ways to mitigate likely impacts from a test run of the Yuma Desalination Plant in Arizona on the Cienega de Santa Clara in Mexico. At a time when the Basin was experiencing an unprecedented drought, governments and water users in the U.S. wanted to test YDP operations after decades of non-use to see if it could be used as another tool for managing CR supplies under variable conditions. However, YDP operations ran the risk of impacting the quantity and quality of flows to the Cienega de Santa Clara. Instead of determining the next steps in isolation, the countries invoked the spirit of Minute 306 and worked with a collection of environmental conservation groups to devise a mutually agreeable solution. The final agreement documented the joint commitment from the U.S., Mexico, U.S. water users, and a binational group of environmental NGOs to provide for the temporary conveyance of up to 30,000 acre-feet of water to the Cienega de Santa Clara during a year-long pilot test run of the YDP at 1/3 capacity. The countries further agreed to work together to rehabilitate canal infrastructure to assist in the conveyance. This was the first time that the countries included outside entities in the commitments to achieve the goals of a binational Minute. It became the example of a win-win negotiation for all parties involved.

Minute 317

A couple of months later, IBWC also formalized and implemented Minute 317 *—Conceptual Framework for U.S.-Mexico Discussions on CR Cooperative Actions.* Through this Minute, the IBWC established a "conceptual and practical framework" for cooperation that sought input from IBWC officials and representatives of the U.S., Mexico, the Basin States, and environmental NGOs. Among other things, the multi-tiered process provided a mechanism for both countries to "explore opportunities for binational cooperative projects" that minimize the impacts of shortages, generate new water sources, and conserve water within the Basin. To this end, the Commissioners agreed to establish a binational Consultative Council, which includes representatives from the Commission and both federal governments that can seek assistance from the binational Core Group and any of the binational Work Groups created to tackle topics such as Water Conservation, New Water Sources, System Operations, and Environment.

Completion of Minute 317 reflected efforts ongoing since late 2007 to rehabilitate relationships between the countries as they tried to explore ways of managing the water supplies during a historic drought. As negotiations commenced, it quickly became clear that no progress on any issues of interest would occur until the countries could agree on a process. Minute 317 documents the process the IBWC intended to invoke to work through bilateral consideration of these and other basin-wide matters regarding the CR.

Minute 318

Unlike Minutes 316 and 317, which required a methodical commitment of energy and resources to learn and understand the issues that needed to be redressed over time, Minute 318 demonstrated an ability for the U.S. and Mexico to act in concert in an emergency. Minute 318 was signed in December 2010 in direct response to the devastating 7.2 magnitude earthquake

"Extraordinary Drought" Provision

Without Mexico's agreement to Minute 319, the U.S. and Basin States feared that the "extraordinary drought" provision of the 1944 Treaty would have to be invoked. Jennifer Gimbel, Colorado's CR Commissioner and Director of the Colorado Water Conservation Board at the time of Minute 319 negotiations summarized the complexity as follows: "The [extraordinary drought] provision provides that in the case of an "extraordinary drought," the U.S. can decrease deliveries to Mexico in proportion to shortages taken within the U.S. The term "extraordinary drought" is not defined beyond the terms of this provision in the treaty. There had been and continues to be a long-running conflict on the Rio Grande between the U.S. and Mexico about the use of this provision as it applies to that portion of the Treaty. The Bureau of Reclamation and the Basin States wanted to avoid such conflict when considering CR supplies. The use of that provision would also trigger conflict between the Upper Basin and the Lower Basin, since the CR Compact also provides for specific instructions in the event there is a deficiency in the CR system that makes it difficult to make treaty deliveries. What constitute a deficiency under the Compact has not been defined, and the provision has never been invoked. To do so could cause considerable controversy and possible litigation among the Basin States."

in April 2010 that damaged canals and other water infrastructure, making it impossible to supply almost a quarter of the Mexicali Valley with water. Entitled *Adjustment of Delivery Schedules for Water Allotted to Mexico for the Years 2010 Through 2013 as a Result of Infrastructure Damage in Irrigation District 014, Rio Colorado, Caused by the April 2010 Earthquake in the Mexicali Valley, Baja California,* Minute 318 permitted Mexico to reduce its annual allotment of CR water to "only those volumes of water that Mexico can utilize," due to its damaged infrastructure. The unused allotment could be stored in U.S. reservoirs for a period of up to three years, and Mexico could request delivery of the stored allotment above its annual treaty entitlement based on specified conditions. In this way, Minute 318 allowed the countries to build trust and goodwill following a natural disaster and test for a limited time some of the management concepts being considered over the long-term (i.e., temporary storage of Mexico's CR water). As part of the Minute, Mexico also committed to making a good faith effort to reach an agreement on the outstanding issues regarding a more comprehensive approach to basin-wide management under variable water supply conditions.

Together, Minutes 316-318, all approved in 2010, helped the countries and interested parties develop relationships and cultivate the trust needed to finalize the agreement on larger basin-wide issues of concern. In this way, they provided the momentum for reaching an agreement on Minutes 319 and 323, both of which address a broad package of binational issues in the Basin.

Binational Collaboration — Minutes 319 and 323

Negotiations are never easy, but international negotiations regarding multiple basin-wide issues prove particularly difficult. Differences in language, culture, laws, economic structure, and geography revealed that the U.S. and Mexico prioritized and perceived issues in the CR Basin differently. Bridging such diverse views would take time, commitment, and high stakes to motivate all parties to reach a consensus. Such was the case with Minute 319. "The specter of climate change and future extended droughts" inspired negotiators to reach a comprehensive five-year agreement by November 2012, entitled Minute 319 — *Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California.*

Following Minute 306 in 2000, Mexican and American environmental NGOs had pursued their agenda with both nations for possible environmental projects within the CR in Mexico. They specifically sought more water in the river for ecological health and proposed an experimental pulse flow within existing laws to maximize the extent to which the CR could inundate historic floodplain terraces and promote the establishment of new and growth of existing vegetation. Subsequent to 2007 and the finalization of guidelines for operating U.S. reservoirs in the CR Basin under variable water conditions, Reclamation and the seven U.S. Basin States proposed talks with Mexico regarding ways to sustain CR storage during the continuing drought. Mexico was initially hesitant to engage in negotiations that may reduce its Treaty deliveries. Yet, it was highly interested in exploring environmental projects to revive the CR in Mexico and in the possibility of binational programs that could help sustain water supplies going forward.

Official negotiations on comprehensive matters began under the standard protocol between diplomatic representatives from the two federal governments through the IBWC. Interpreters translated each statement, regardless of whether the parties were fluent in the other language. Reclamation shuttled between the negotiation room, the basin state group, and environmental conservation groups in an effort to assure consensus on key topics and terms for the Minute. Such formality, however, made the negotiations difficult, and progress was stalled.[10]

Despite the challenges, there was one aspect that both nations could agree on — baseline technical information and analysis were needed. As such, both countries agreed to form a technical work group that included Ba-

sin State advisers and representatives from the environmental community to develop a common platform to inform useful discussions going forward. Both sides took time to articulate and understand the technical, legal, and policy structures regarding the CR in each nation. Coupled with personal outreach by Interior Secretary Ken Salazar and Reclamation Commissioner Michael Connor to Mexico's Ambassador to the U.S., Arturo Sarukhán, Secretariat of the Environment and Natural Resources (SEMARNAT), Juan Rafael Elvira Quezada, and Director General of the National Water Commission (CONAGUA), José Luis Luege Tamargo, enough trust and good faith was established to have representatives in both countries consider deviating from the formal processes of international negotiation to allow those with ownership interests to the CR to participate in the binational discussions on CR management.

The countries ultimately agreed on a small group of 12–15 people from both state and federal governments to pursue the negotiations and periodically report to the larger groups on progress and address policy questions. The small group negotiated in English since most of the Mexican representatives were fluent in English. A translator was on hand as needed, but the formal translation processes were not imposed, which helped the discussions progress.

By 2012, time was of the essence. The summer of 2012 saw national campaigns in the U.S. that would lead to the presidential election in November. In Mexico, national elections were held in July with the understanding that a new president and administration would come into power in December of that same year. Unless agreement on CR matters was reached before December, the countries faced the prospect of having to start the process all over with new leadership in one or both countries. This motivation to finalize the agreement was successful. After vetting final provisions in both nations, the IBWC Commissioners signed the Minute 319 on November 20, 2012.

Minute 319

Minute 319 is a comprehensive agreement on CR management for a five-year period. Through the Minute, both nations made compromises and received gains.

Key elements of the Minute included:

- extending provisions of Minute 318 (Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California) to allow Mexico to defer delivery of its CR water allocation while the country repairs earthquake-damaged infrastructure;
- delivering additional water (i.e., above the 1.5 million acres-feet annual delivery required by the 1944 Water Treaty) to Mexico when surplus conditions are declared in the Lower CR Basin of the U.S.;
- reducing deliveries to Mexico when shortage conditions are declared in the Lower CR Basin of the U.S. (i.e., Mexico's annual water deliveries would be reduced if Lake Mead elevations indicated shortage conditions, similar to reduction by the U.S. LB States);
- creating a mechanism for incentivizing storage of Mexico's unused Treaty allocation in U.S. reservoirs (and thereby raising storage levels in the U.S.) for subsequent delivery under specified conditions when needed;
- continuing to address salinity concerns per Minute 242;
- implementing a pilot program of jointly funded water efficiency and conservation projects in Mexico that would provide benefits to participants on both sides of the border; and
- committing to environmental restoration projects that would help sustain the CR limitrophe in Mexico and to provide for an experimental pulse flow release from Lake Mead to the Delta in 2014.

Minute 323

Lifelong partnerships and an atmosphere of trust developed from the negotiations and success of Minute 319. However, five years went by quickly, and the drought continued. Interim measures set forth in the 2007 Interim Guidelines and Minute 319 were not enough to adequately assure the system would be sustainable. Encouraged by the Secretary, the U.S. Basin States pursued drought contingency plans that would overlay existing operations to provide additional protections. To be successful, Mexico's participation was once again essential. The result was Minute 323 — *Extension of Cooperative Measures and Adoption of a Binational Water Scarcity Contingency Plan in the Colorado River Basin (2017)*.

Building on the experience and relationships formed in developing Minute 319, the U.S. and Mexico negotiated Minute 323 through the IBWC with binational input from water users, scientists, academics, and NGOs. In addition to evaluating and determining whether and to what extent projects and concepts from Minute 319 should be extended, Minute 323 also focused on additional measures to be instituted in both countries to incentivize conservation and reduce diversions of CR water during ongoing drought conditions.

The negotiation process included a Steering Committee comprised of members from both nations and the Basin States. This committee worked with technical experts that formed workgroups regarding the environment, salinity, reservoir operations, and infrastructure projects. Over the course of 2+ years, the nations settled on a new agreement that was signed on September 21, 2017, which is to be enforced through December 31, 2026. In addition to extending many of the provisions developed in Minute 319, Minute 323 also includes a Binational Water Scarcity Contingency Plan intended to coincide with contingency measures in the U.S. once the Basin States and U.S. Congress approved the Drought Contingency Plans for the Upper and Lower CR Basins. Thus, when the Basin States and the U.S. implemented the CR Drought Contingency Plans in the U.S. in May of 2019, the

Pulse Flow

While all of the elements of Minute 319 have been implemented to some degree of success, none has been more visible and noteworthy than the 2014 pulse flow. Beginning in March and ending in May 2014, 106,000 acre feet of CR water was released in the U.S. and allowed to flow past the diversions and dams in the U.S. and Mexico to the CR Delta and Gulf of California.

Even though it was a one-time event, the response to the pulse flow was amazing. Entire communities came to the edge of the riverbed to witness water flowing once again. Children who had only experienced the remnants of a river long ago were able to splash and play in real water for the first time. And environments, long parched by the River's dry up, began to green up along within the flow reach for months to come

The opportunity for a pulse flow was made possible in part because of the storage arrangement Mexico and the U.S. had agreed to under Minute 318 and Minute 319. After the earthquake in 2010, irrigation canals and diversion structures in Mexico were damaged sufficiently to prevent full diversion of its CR entitlements. As part of the CR negotiation package, the U.S. and Mexico had agreed to allow Mexico to store the unused water in U.S. facilities until the water could be called for at a later time. The storage that Mexico accumulated, along with funding from non-profits and U.S. entities allowed Mexico to call for release of 106,000 acre feet of water to accomplish the pulse flow that occurred in 2014.

Pre and post environmental monitoring followed the pulse flow event to consider valuable next steps. After the flow event, there was nearly a 25% increase in plant growth, reversing a decade of decline. With new plants have come more and different kinds of river-dependent birds, good news for both the Delta's environment and the ecotourism industry. Studies since then informed the elements for the environmental components of Minute 323 to best sustain parts of the Delta while the countries consider other CR management objectives going forward.

The 2014 pulse flow passed diversions and dams in the U.S. and Mexico to reach the CR Delta and Gulf of California. Photo courtesy of the Redford Center.

countries also took appropriate measures to initiate the Water Scarcity Plan components under Minute 323.

The specific topics covered under Minute 323 include:

- extending Minute 319 provisions to provide Mexico with additional water under high reservoir storage conditions;
- extending Minute 319 provisions to reduce deliveries to Mexico under low reservoir storage and shortage conditions in the CR Basin, including additional planning, reporting, and coordination measures to reduce future risk to both countries of low elevation in Lake Mead reservoir;
- confirming Mexico's Water Reserve, where delivery of Mexico's unused Treaty allocation can be deferred and stored in U.S. reservoirs in the event of potential emergencies or as a result of water conservation projects in Mexico, to be available for subsequent delivery;
- continuing to address salinity concerns per Minute 242;
- providing water and funding for habitat restoration and related monitoring;
- investing in water conservation and new water sources projects; and
- noting ongoing consultations for design, construction, operation, and maintenance of the All-American Canal, which eventually would need to be addressed in a separate minute.

Each of these topics incorporates detailed provisions based on criteria and lessons learned through implementing Minute 319 and considering what needs to be considered looking forward. Many are focused on providing flexibilities to adjust to variable water supplies in a manner that helps sustain people, agriculture, and the environment. Some believe U.S. investment in water conservation in Mexico in exchange for additional water usage will decrease the already-reduced amount of water available for irrigation in Mexico. Others see the Minute 323 efforts to increase water levels in Lake Mead as critical to preventing future water shortages and sustaining cooperation between the two countries. Time will be needed to tell. Going forward, lessons from past endeavors reveal that binational collaboration is necessary and important to comprehensively address CR management challenges in the 21st Century. Such collaboration will require commitment and dedication from leaders and representatives in both countries to perpetually invest in relationships that can inform and produce beneficial outcomes for both sides of the border. ❑

Endnotes

1 Leopold, Aldo. *A Sand County Almanac.* Oxford University Press, 2020.

2 See Treaty Between the United States of America and Mexico Respecting the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Feb. 3, 1944, U.S.-Mex., 59 Stat. 1219, T.S. 994 (1944 Water Treaty) and Protocol (November 1944) can be found at https://www.usbr.gov/lc/region/pao/pdfiles/mextrety.pdf (Lase Visited, April 20, 2021); See also — Mumme, S. (2019). *The 1944 U.S.-MEXICO Water Treaty as a Constitutional Document.,* Mexico Center. March 2019. "Similar to treaty reservations and declarations, understandings are interpretative statements made by the Senate that clarify or elaborate on provisions in a treaty but do not alter them." *U.S.-Mexico Water Sharing: Background and Recent Developments — Congressional Research Service — March 2, 2017.* For background on reservations, understandings, and declarations to treaties, see CRS Report RL32528, International Law and Agreements: Their Effect Upon U.S. Law, by (name redacted) (Last updated Sept. 2018).

3 An application of the Harmon Doctrine (21 Op. Att'y Gen. 274 (1895)) would preclude any liability on behalf of the U.S. for draining a shared river entirely before it could reach Mexico.

4 Some assert that the U.S. was amendable to guaranteeing Mexico 1.5 maf under the 1944 Treaty due in part to a series of conciliatory programs supported by the U.S. government to help strengthen ties between the U.S. and Mexico during World War II. This included efforts to secure use of Latin American military bases as well as raw materials and petroleum reserves in Mexico. It also stemmed from a desire to promote national security by protecting the U.S. and Mexico borders from infiltration of Axis saboteurs or sympathizers. See *The Surprising Role Mexico Played in World War II,* https://www.history.com/news/mexico-world-war-ii-surprising-involvement. (Last visited Jan. 19, 2021). See also, *Bringing Water to the Sea,* Environmental Defense Fund, https://www.edf.org/sites/default/files /pulseflow/index.html (Last visited March 12, 2021). Whether guaranteeing an annual delivery of 1.5 maf of Colorado River water to Mexico was part of these specific World War II considerations is not completely confirmed, but it is obvious that both countries were in a position to bolster relations through the lens of both local instability and global conflict.

5 *See* Treaty Protocol (November 1944) can be found at https://www.usbr.gov/lc/region/pao/pdfiles/mextrety.pdf (Last Visited, April 20, 2021).

6 See Colorado River Basin Salinity Control Act: Hearings, Ninety-third Congress, Second Session, on H.R. 12165 and Related Bills. March 4, 5, and 8, 1974 United States. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Water and Power Resources.

7 For more insight into the Mexico Treaty discussions, see Meyers, C., & Noble, R., *The Colorado River: The Treaty with Mexico,* Vol. 19, No. 2, *Stanford Law Review,* 367-419 (Jan. 1967).

8 Meyers, C., & Noble, R., *The Colorado River: The Treaty with Mexico,* Vol. 19, No. 2, *Stanford Law Review,* p. 409 (Jan. 1967).

9 The reasoning behind the surplus guidelines was to provide California a "soft landing" in cutting back its uses to within its 4.4 maf allocation of CR water. See *Salton Sea Section of Environmental Issues in the Colorado River Basin of the Colorado River Paper Series.*

10 An example of the important difference in views and perspectives that needed to be overcome can be found in how each country approached the negotiation. In Mexico, the federal government (CONAGUA) controls water and grants rights. Permits for water rights are renewed every few years. In the U.S., each state owns and controls water within its boundaries. Water rights are obtained through either a state court or administrative agency and held in perpetuity, unless forfeited or abandoned. In order to share water in interstate rivers within the U.S., States have entered into compacts (approved by Congress) to apportion the water among them. State water users are subject to curtailment of their water rights in order to meet their State's compact obligations. Therefore, the U.S. is unable to commit the Basin States' water or its use without their consent, and the Basin States were not in a position to rely on the federal government to protect state interests in international negotiations. Neither the Mexican federal government nor the U.S. State Department, however, readily supported the idea of changing negotiation protocols to involve the Basin States in the Minute 319 negotiations.

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Lower Antelope Canyon in the Navajo Reservation near Page, Arizona. Photo ©Maria Sbytova/Shutterstock.com.

Quenching Thirst in the Colorado River Basin

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This publication was prepared by the Colorado Water Center and funded through a grant from the Walton Family Foundation.

The CR as seen from Nankoweap Granaries in Grand Canyon Mational Park. Photo Beth Ruggiero-York/Shutterstock.com.