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Management of the Colorado River: Water Allocations, Drought, and the Federal Role

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SUMMARY

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Management of the Colorado River: Water Allocations, Drought, and the Federal Role

The Colorado River Basin covers more than 246,000 square miles in seven U.S. states (Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, and California) and Mexico. Pursuant to federal law, the Bureau of Reclamation (part of the Department of the Interior) manages much of the basin's water supplies. Colorado River water is used primarily for agricultural irrigation and municipal and industrial (M&I) uses; it is also important for hydropower production, fish and wildlife, and recreational uses.

River Management

A collection of compacts, treaties, statutes, and other authorities govern Colorado River allocations and apportionments. The foundational management document, the Colorado River Compact of 1922, established a framework to apportion water supplies between the river's Upper and Lower Basins, divided at Lee Ferry, AZ. The compact allocated 7.5 million acre-feet (MAF) annually to each basin, and a 1994 treaty made an additional 1.5 MAF in annual flows available to Mexico. A Supreme Court case and related decrees inform the Secretary of the Interior's management of the delivery of all water below Hoover Dam.

Apportioned Colorado River water is in excess of the river's natural flows, and actual consumptive use plus other water losses (e.g., evaporation) typically exceeds natural flows. This imbalance has stressed basin water supplies, exacerbated by a long-term drought dating to 2000. Reclamation and basin stakeholders closely track the status of two large reservoirs—Lake Powell in the Upper Basin and Lake Mead in the Lower Basin—as indicators of basin storage conditions. Under criteria agreed upon by basin states, water releases from both lakes are tied to specific water storage levels. Since the onset of drought in the early 2000s, storage levels at these reservoirs have been falling; in 2021 and 2022, Reclamation declared the first-ever *Tier One* and *Tier Two* Shortages in the Lower Basin. These designations reduced water deliveries to contractors in Arizona and Nevada, as well as to Mexico. In the Upper Basin, Lake Powell's storage has also continued to drop. This trend could soon jeopardize hydropower generation at Glen Canyon Dam and has led to operational changes in the Upper Basin.

Efforts to Address Drought

The federal government has led multiple efforts to improve the basin's water supply outlook, resulting in collaborative agreements in 2003 and 2007 and the 2019 drought contingency plans (DCPs) for the Upper and Lower Colorado River Basins. The hydrologic outlook for the Colorado River Basin has deteriorated further since approval of the DCPs. Due to widespread concern about the basin's long-term water supplies, Reclamation initiated a process to revise its near-term operational guidelines for river management. In April 2023, the bureau published a draft environmental impact statement with two action alternatives that would both, among other things, impose additional water delivery cutbacks on Lower Basin contractors in 2024-2026. The alternatives differ primarily in how they allocate water cuts—sharing the cuts among all Lower Basin users in one case or based on the priority of water rights in the other. Any decision on this question could also affect longer-term (i.e., post-2026) operational guidelines.

Congressional Role

Congress funds and oversees management of basin water and power facilities. Congress has enacted legislation affecting Colorado River waters (e.g., Indian water rights settlements; new water storage facilities) and authorizing water shortage mitigation (e.g., the DCPs and other related efforts). Section 50233 of P.L. 117-169 (popularly known as the Inflation Reduction Act) provided $4.0 billion for drought mitigation in the West, with priority given to Colorado River Basin activities. Congress may consider further amending existing authorities or funding mitigation activities for basin's water shortages.

Contents

Introduction 1
The Law of the River: Foundational Documents and Programs 3
Colorado River Compact 4
Boulder Canyon Project Act 4
1944 U.S.-Mexico Water Treaty 5
Arizona v. California 5
Upper Basin Compact and Colorado River Storage Project Authorizations 7
Colorado River Basin Project Act of 1968 10
Water Storage and Operations 11
Annual Operations 11
Recent Conditions 12
Mitigating the Environmental Effects of Colorado River Basin Development 13
Salinity Control 13
Endangered Species Efforts and Habitat Improvements 13
Upper Colorado Endangered Fish Recovery Program 14
San Juan River Basin Recovery Implementation Program 14
Glen Canyon Dam Adaptive Management Program 14
Lower Colorado Multi-Species Conservation Program 15
Tribal Water Rights 16
Drought and the Supply/Demand Imbalance 17
Recent Developments and Agreements 19
2003 Quantitative Settlement Agreement 20
2004 Arizona Water Settlements Act 20
2007 Interim Guidelines/Coordinated Operations for Lake Powell and Lake Mead 21
System Conservation Program 22
Minute 319 and Minute 323 Agreements with Mexico 22
2019 Drought Contingency Plans 22
Upper Basin Drought Contingency Plan 23
Lower Basin Drought Contingency Plan 24
2023 Draft Supplemental Environmental Impact Statement 26
Issues for Congress 33
Funding and Oversight of Existing Facilities and Programs 33
Tribal Water Rights Settlements and Leasing 35
New Facilities and Other Alterations 35
Post-2026 Operations/Agreements 36
Concluding Observations 37

Figures

Figure 1. Colorado River Basin and U.S. Areas That Import Colorado River Water 2
Figure 2. Colorado River Basin Allocations 9
Figure 3. Colorado River Natural Flow at Lees Ferry, Arizona, with 10-Year Moving Average, 1906-2022 18
Figure 4. Combined Storage at Lakes Mead and Powell, 1960-2022 19

Figure 5. Lake Powell End-of-Month Elevation Projections 24
Figure 6. Lake Mead End of Month Elevation Projections 26
Figure 7. Modeled Lower Basin Shortages and Existing Contributions, 2023 Draft SEIS..... 30
Figure 8. Lake Powell Projected Pool Elevations for 2023 SEIS Alternatives 32
Figure 9. Lake Mead Projected Pool Elevations for 2023 SEIS Alternatives 33

Tables

Table 1. Lower Basin Water Delivery Curtailment Volumes Under Existing Agreements 25
Table 2. Proposed New 2024 Lower Colorado River Basin State Water Curtailments in SEIS Action Alternatives..... 29
Table 3. 2025-2026 Lower Colorado River Basin State Water Cuts in SEIS Action Alternatives 30

Contacts

Author Information..... 37

Introduction

From its headwaters in Colorado and Wyoming to its terminus in the Gulf of California, the Colorado River Basin covers more than 246,000 square miles. The basin spans seven U.S. states (Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, and California) and two countries (the United States and Mexico). Pursuant to federal law, the Bureau of Reclamation (Reclamation), a component of the Department of the Interior (DOI), plays a prominent role in the management of the basin's waters. In the Lower Basin (i.e., Arizona, Nevada, and California), Reclamation also serves as *water master* on behalf of the Secretary of the Interior, a role that elevates the status of the federal government in basin water management.[1] The federal role in managing Colorado River water is magnified by the multiple federally owned and operated water storage and conveyance facilities in the basin, which provide low-cost water and hydropower supplies.

Colorado River water is used primarily for agricultural irrigation and municipal and industrial (M&I) purposes. The river's flow and stored water also are important for power production, fish and wildlife, and recreation, among other uses. A majority of basin water supplies (70%) are used to irrigate 5.5 million acres of land; basin waters also provide M&I water supplies to nearly 40 million people.[2] Much of the area that depends on the river for its water supplies is outside of the drainage area for the Colorado River Basin. Storage and conveyance facilities on the Colorado River provide trans-basin diversions that serve areas such as Cheyenne, WY; multiple cities in Colorado's Front Range (e.g., Fort Collins, Denver, Boulder, and Colorado Springs, CO); Provo, UT; Albuquerque and Santa Fe, NM; and Los Angeles, San Diego, and the Imperial Valley in Southern California (**Figure 1**). Colorado River hydropower facilities can provide up to 4,200 megawatts of electrical power per year.[3] The river also provides habitat for a wide range of species, including several species listed under the federal Endangered Species Act (ESA; 87 Stat. 884, 16 U.S.C. §§1531-1544). It flows through seven national wildlife refuges and 11 National Park Service (NPS) units; these and other areas of the river support important recreational opportunities.[4]

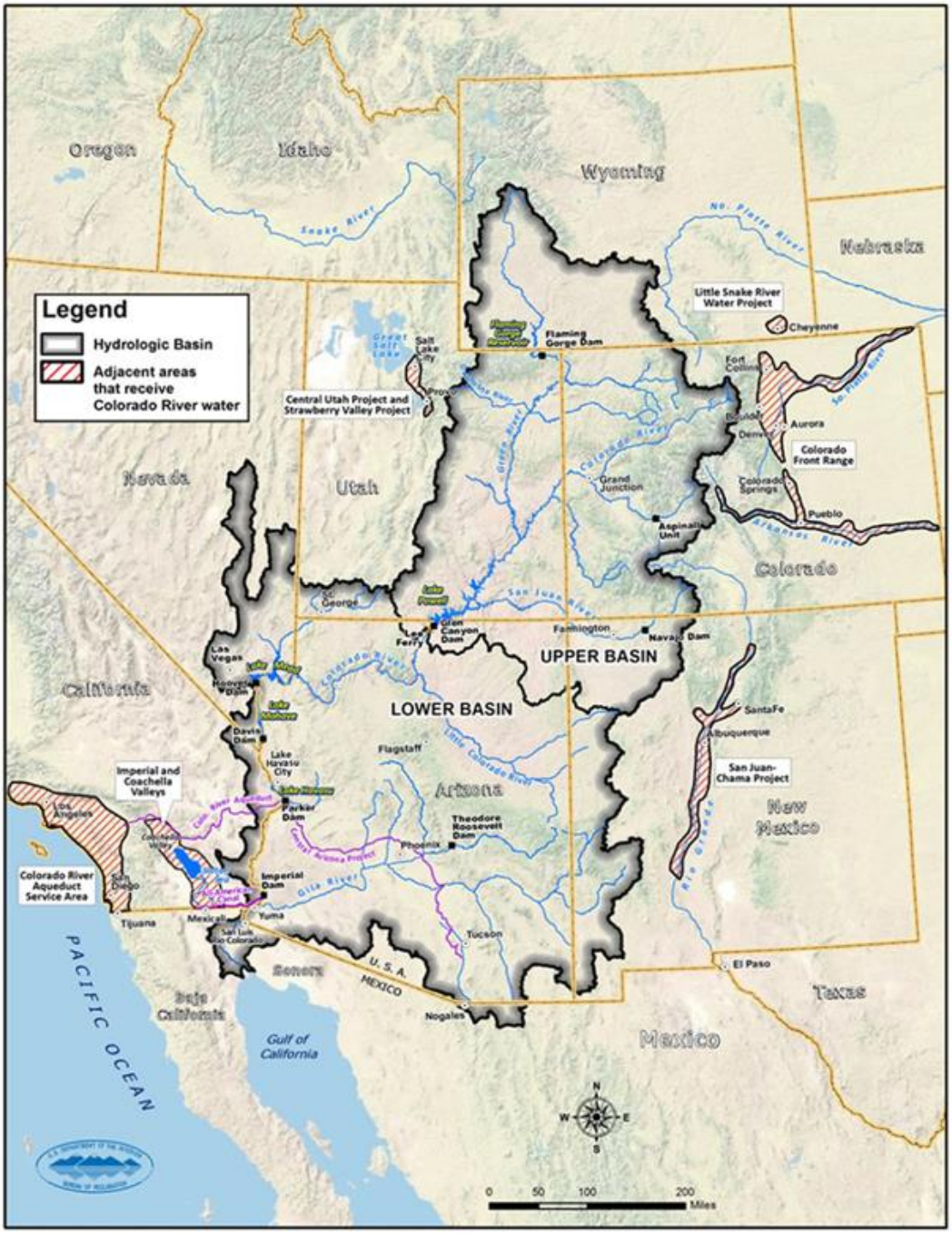
[1] As discussed later in "The Law of the River: Foundational Documents and Programs," the Boulder Canyon Project Act of 1928 made the Secretary of the Interior responsible for the distribution (via contract) of all Colorado River water delivered below Hoover Dam (i.e., the Lower Basin), and authorized such regulations as necessary to enter into these contracts. Subsequent court decisions confirmed the Secretary's power to apportion surpluses and shortages among and within Lower Basin states; this forms the basis for the designation Lower Basin *water master*. No similar authorities or designations have been provided for the Upper Basin.

[2] U.S. Bureau of Reclamation (Reclamation), *Colorado River Basin Water Supply and Demand Study*, p. 4, December 2012, at https://www.usbr.gov/lc/region/programs/crbstudy/finalreport/index.html.

[3] Ibid., p. 3.

[4] Ibid.

Figure 1. Colorado River Basin and U.S. Areas That Import Colorado River Water



Source: Bureau of Reclamation, *Colorado River Basin Water Supply and Demand Study*, 2012.

Precipitation and runoff in the basin are highly variable. Water conditions on the river depend largely on snowmelt in the basin's northern areas. From 1906 to 2022, natural flows in the Colorado River Basin averaged about 14.6 million acre-feet (MAF) annually.[5] Flows have dipped significantly during the

[5] Reclamation, "PROVISIONAL Natural Flow Data 1906-2023 (Excel file, 0.3 MB) based on the April, 2023 24 MS," at https://www.usbr.gov/lc/region/g4000/NaturalFlow/LFnatFlow1906-2023.2023.4.17.xlsx. Hereinafter, Reclamation,

current drought, which dates to 2000; annual natural flows from 2000 to 2022 averaged approximately 12.1 MAF per year.[6] Reclamation has noted that the 23-year period from 2000 to 2022 was the driest 23-year period in more than 100 years of record keeping, and among the driest periods in the past 1,200 years.[7] Climate change impacts, including warmer temperatures and altered precipitation patterns, may further increase the likelihood of prolonged drought in the basin.[8]

Congress plays a prominent role in the management of the Colorado River. Specifically, Congress funds and oversees Reclamation's management of Colorado River Basin facilities, including facility operations and programs to protect and restore endangered and threatened species. Congress has also approved and continues to consider Indian water rights settlements involving Colorado River waters, and development of new and expanded water storage in the basin. In addition, Congress has approved supplemental funding to mitigate drought and stretch basin water supplies, and new authorities for Reclamation to combat drought and enter into agreements with states and Colorado River contractors. This report provides background on management of the Colorado River, with a focus on recent developments. It also discusses the congressional role in the management of basin waters.

The Law of the River: Foundational Documents and Programs

The *Law of the River* refers to a collection of compacts, treaties, statutes, and other authorities that govern Colorado River allocations and apportionments.[9] In the latter part of the 19th century, interested parties in the Colorado River Basin began to recognize that local interests alone could not solve the challenges associated with development of the Colorado River. Plans conceived by parties in California's Imperial Valley to divert water from the mainstream of the Colorado River were thwarted because these proposals were subject to the sovereignty of both the United States and Mexico.[10] The river also presented engineering challenges, such as deep canyons and erratic water flows, and economic hurdles that prevented local or state groups from building the necessary storage facilities and canals to provide an adequate water supply. In part because local or state groups could not resolve these "national problems," Congress considered options to control the Colorado River and resolve potential conflicts between the states.[11] In an effort to resolve these conflicts and avoid litigation, Congress gave its consent for the states and Reclamation to enter into an agreement to apportion Colorado River water supplies in 1921.[12]

"Reclamation Flow Data."

[6] Ibid.

[7] Reclamation, Department of the Interior, "Request for Input on Development of Post-2026 Colorado River Reservoir Operational Strategies for Lake Powell and Lake Mead Under Historically Low Reservoir Conditions," 87 *Federal Register* 37884, June 24, 2022. Hereinafter 87 FR 37884, 2022. For additional discussion on historic drought in the Colorado River, see Subhrendu Gangopadhyay, Connie A. Woodhouse, and Gregory J. McCabe, "Tree Rings Reveal Unmatched 2nd Century Drought in the Colorado River Basin," *Geophysical Research Letters*, vol. 49, no. 11 (June 2022).

[8] B. Udall and J. Overpeck, "The Twenty-First Century Colorado River Hot Drought and Implications for the Future," *Water Resources Research*, vol. 53 (February 17, 2017), pp. 2404-2418.

[9] For an example of how courts characterize the Law of the River, see, for example, Navajo Nation v. Dep't of the Interior, 26 F.4th 794, 800 (9th Cir. 2022).

[10] Arizona v. California, 373 U.S. 546 (1963). Hereinafter, Arizona v. California.

[11] S. Doc. No. 67-142 (1922). For example, the states in the Upper Basin (Colorado, Wyoming, Utah, and New Mexico), where the majority of the river's runoff originates, feared that a storage facility making water available downstream might form a basis for claims to priority access to basin waters by Lower Basin states before Upper Basin states could develop means to access their share.

[12] Ch. 72, 42 Stat. 171 (1921). In lieu of litigation, interstate compacts have historically been a preferred means of allocating

The below sections discuss the resulting agreement, the Colorado River Compact, as well as key statutory authorities, the Supreme Court's decision in *Arizona v. California*, and other documents and agreements that form the basis of the Law of the River.

Colorado River Compact

The Colorado River Compact of 1922, negotiated by the seven basin states and the federal government, was initially signed by all but one basin state (Arizona).[13] Under the compact, the states established a framework to apportion the water supplies between the Upper Basin and the Lower Basin, with the dividing line between the two basins located at Lee Ferry, AZ,[14] below the confluence of the Colorado and Paria Rivers near the Utah border.[15] Each basin was apportioned 7.5 MAF annually for beneficial consumptive use, and the Lower Basin was given the right to increase its beneficial consumptive use by an additional 1 MAF annually. The agreement also required that Upper Basin states not deplete more than a total of 75 MAF over any 10-year period (i.e., 7.5 MAF per year), thus allowing for averaging over time to make up for low-flow years. The compact did not address inter- or intrastate allocations of water (which it left to future agreements and legislation), nor did it address tribal rights or other rights that existed at the time the compact was finalized.[16] The compact also contemplated how the basins could share the burden of provisioning water to Mexico, the river's natural terminus, the details of which were addressed in subsequent international agreements.[17] The compact was not to become binding until it had been approved by the legislatures of each of the signatory states and by Congress.

Boulder Canyon Project Act

Congress approved and modified the Colorado River Compact in the Boulder Canyon Project Act (BCPA) of 1928.[18] The BCPA ratified the 1922 compact, and authorized the construction of a federal facility to impound water in the Lower Basin (Boulder Dam, later renamed Hoover Dam) and of related facilities to deliver water in Southern California (e.g., the All-American Canal, which delivers Colorado River water to California's Imperial Valley). The BCPA apportioned the Lower Basin's 7.5 MAF per year among the three Lower Basin states: 4.4 MAF per year to California, 2.8 MAF to Arizona, and 300,000 acre-feet (AF) to Nevada, with the states to divide any surplus waters among them. It also directed the Secretary of the Interior to serve as the sole contracting authority for Colorado River water use in the Lower Basin and authorized several storage projects for study in the Upper Basin.

Congress's approval of the compact in the BCPA was conditioned on a number of factors, including ratification of the compact by California and five other states (thereby allowing the compact to become

water among competing uses. Pursuant to the U.S. Constitution, Article I, Section 10, Clause 3, no such compacts can be entered into without the consent of Congress.

[13] Because the Colorado River Compact of 1922 did not specify the apportionments for individual states, Arizona initially refused to sign and ratify the agreement out of concern that rapidly growing California would lay claim to most of the Lower Basin's share of water. Arizona signed and ratified the compact in 1944.

[14] *Lee Ferry* is the dividing line between basins designated in the compact. *Lees Ferry* (or *Lee's Ferry*), approximately 1 mile upstream from that point, is the location of the USGS streamgage that has measured flows dating to 1921. After the compact was signed, the Lees Ferry streamgage, along with a gage on the Paria River, became the measurements used to determine compliance with the compact.

[15] Arizona receives water under both the Upper and the Lower Basin apportionments, because parts of the state are in both basins.

[16] Boulder Canyon Project Act (BCPA), 45 Stat. 64–65, as codified in 43 U.S.C. §§617l–q; *c.f.* Boulder Canyon Project Adjustment Act, 54 Stat. 799, as codified in 43 U.S.C. §618m (containing similar savings clause language).

[17] Colorado River Compact Art. III(c). See below section, "1944 U.S.-Mexico Water Treaty."

[18] BCPA, Ch. 42, 45 Stat. 1057 (1928), codified as amended at 43 U.S.C. §617.

effective without Arizona's concurrence), and California agreeing by act of its legislature to limit its water use to 4.4 MAF per year and not more than half of any surplus waters. California met this requirement by passing the California Limitation Act of March 4, 1929, and the compact became effective on that date.[19]

1944 U.S.-Mexico Water Treaty[20]

In 1944, the United States signed a water treaty with Mexico (1944 U.S.-Mexico Water Treaty) to guide how the two countries share the waters of the Colorado River.[21] The treaty established water allocations for the two countries and created a governance framework (i.e., the International Boundary and Water Commission) to resolve disputes arising from the treaty's execution. The treaty requires the United States to provide Mexico with 1.5 MAF of Colorado River water annually, plus an additional 200,000 AF when a surplus is declared. During drought, the United States may reduce deliveries to Mexico in similar proportion to reductions of U.S. consumptive uses. The treaty has been supplemented by additional agreements between the United States and Mexico, known as *minutes*, regarding matters related to the treaty's execution and interpretation.[22]

Arizona v. California

Arizona ratified the Colorado River Compact in 1944, at which time the state began to pursue a federal project (later named the Central Arizona Project, or CAP) to bring Colorado River water to its primary population centers in Phoenix and Tucson. California opposed the project, claiming it had senior water rights based on its "first in time" use under the doctrine of prior appropriation and that any diversions from Colorado River *tributaries* should be included in Arizona's allotted 2.8 MAF under the Colorado River Compact.[23] In 1952, Arizona filed suit against California in the U.S. Supreme Court to settle these and other issues.[24]

Eleven years later, in the 1963 *Arizona v. California* decision, the Supreme Court ruled in favor of Arizona.[25] The ruling was notable in forgoing typical Reclamation deference to state law under the

[19] The Department of the Interior also requested that California prioritize its Colorado River rights among users before the Colorado River Compact became effective; the state established priority among these users for water in both "normal" and "surplus" years in the California Seven-Party Agreement, signed in August 1931.

[20] For more information on the 1994 U.S.-Mexico Water Treaty and Colorado River water sharing issues with Mexico, see CRS Report R42917, *Mexico: Background and U.S. Relations*, by Clare Ribando Seelke and Joshua Klein.

[21] The treaty also included water-sharing provisions relating to the Lower Rio Grande and Tijuana Rivers. See Treaty Between the United States of America and Mexico Respecting Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, U.S.-Mex., February 3, 1944, 59 State. 1219, at https://www.ibwc.gov/Treaties_Minutes/treaties.html. Mexico ratified it on October 16, 1945 and the United States ratified the treaty on November 1, 1945. It became effective on November 8, 1945.

[22] International Boundary & Water Commission, Minutes between the United States and Mexican Sections of the IBWC, https://www.ibwc.gov/Treaties_Minutes/Minutes.html. For more information on recent minutes, see section, "Minute 319 and Minute 323 Agreements with Mexico."

[23] Historically, water in the western United States (versus riparian rights in the eastern portion) has been governed by some form of the *rule of prior appropriation*. Under this rule, the party that first appropriates water and puts it to *beneficial use* thereby acquires a vested right to continue to divert and use that quantity of water against claimants junior in time.

[24] Article III of the Constitution states that in all cases in which a state shall be a party, the Supreme Court has original jurisdiction. U.S. Constitution, Article III, §2, cl. 2. In original jurisdiction cases, the Supreme Court issues detailed decrees that are more akin to trial court judgments than the Supreme Court's usual appellate decisions.

[25] The 1963 Supreme Court decision in Arizona v. California is the first in a line of Supreme Court decisions and orders in the same litigation that address water allocation disputes within the Lower Basin. 373 U.S. 546, 601 (1963), 376 U.S. 340 (1964) (order issued), 383 U.S. 268 (1966) (amending judgment), 466 U.S. 144 (1984) (amending order), 530 U.S. 392 (2000) (subsequent determination), 531 U.S. 1 (2000) (supplemented), 547 U.S. 150 (2006) (consolidated decree); *cf. California v. United States*, 438 U.S. 645 (1978).

Reclamation Act of 1902 and formed the basis for the Secretary of the Interior's role as *water master* for the Lower Basin.[26] The Court determined that the BCPA serves as the framework for apportioning the Lower Basin's share of the mainstream waters of the Colorado River, neither the BCPA nor water contracts require any specific formula for apportioning shortages, and the Secretary of the Interior exercises considerable control in managing the delivery of water from Lake Mead to the Lower Basin. The Court determined that the Colorado River Compact guides resolution of disputes regarding allocations between basins, that statutory authority—in this case the BCPA—guides Lower Basin water allocations originating from the main stream of the River, and that tributary allocations are reserved to the states.[27] Although California argued its historical use of the river trumped Arizona's rights to the Arizona allotment, the Court rejected this argument because Congress had spoken definitively to the contrary.[28]

A key element of the suit concerned the extent to which Arizona's Gila River diversions should count toward its allocation in the Colorado River Compact and BCPA. The Supreme Court concluded that the BCPA and compact's 7.5 MAF allocations within and between basins apply only to the mainstream of the Colorado River. [29] Tributary allocations, such as from Arizona's diversion of water from the Gila River, are governed under separate authorities.[30]

As detailed in the Supreme Court's opinion, Congress granted DOI the exclusive authority to enter into contracts with Lower Basin users to apportion stored water pursuant to BCPA Section 5.[31] The resulting contracts determine how mainstream water is delivered to Lower Basin users. In the event of shortages, the Secretary of the Interior has discretion to determine how to divide the burden of shortages in the Lower Basin among the three states, within the parameters of the BCPA and water contracts.[32] The Court clarified that DOI is not bound by a single approach to addressing shortages and acknowledged that one valid option could be to reduce lower basin deliveries proportionally to statutory allocations of the first 7.5 MAF (California 4.4/7.5, Arizona 2.8/7.5, and Nevada 0.3/7.5). DOI also has the authority and discretion to elect an alternate basis for apportioning shortages, subject to statutory constraints.[33] These constraints include the congressionally directed priorities for uses of the dam and reservoir, as well as limitations reflected in statute or the Colorado River Compact.[34]

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[26] Pursuant to Section 8 of the Reclamation Act of 1902 (32 Stat. 388), Reclamation is not to interfere with state laws "relating to the control, appropriation, use, or distribution of water used in irrigation," and "the Secretary of the Interior, in carrying out provisions of the Act, shall proceed in conformance with such laws." However, the Court in Arizona v. California noted that the Secretary must be able to manage the projects of the Colorado River Basin without being subject to "the varying, possibly inconsistent, commands of the different state legislatures." The Court therefore construed the Secretary's authority "to permit him, within the boundaries set down in the Act, to allocate and distribute the waters of the mainstream of the Colorado River." Arizona, 373 U.S. at 587, 589–90.

[27] Ibid. at 564–65.

[28] Ibid. at 593.

[29] Arizona v. California, 547 U.S. at 161–66.

[30] Ibid. In addition to the Central Arizona Project legislation discussed in the next section, Arizona v. California also addressed Gila River disputes between Arizona and New Mexico prior to reaching the mainstream, which is beyond the scope of this report.

[31] Arizona v. California, 373 U.S. at 593-594. As the court explained, BCPA §5 serves as the basis for DOI's authority to apportion Lower Basin water deliveries.

[32] Ibid. at 594 (allowing the Secretary, "in case of shortage," to "adopt a method of proration" and to consider "priority of use, local laws and customs, or any other factors that might be helpful in reaching an informed judgment in harmony with the Act, the best interests of the Basin States, and the welfare of the Nation").

[33] Ibid. at 592–93.

[34] Ibid. at 584 (referencing BCPA contract authority limitations including that irrigation and domestic uses are for "permanent service," that nothing should disrupt compact-designated allocations between basins, and that reclamation law provisions generally apply unless Congress explicitly provides otherwise); *c.f.* BCPA, *supra* note 19.

In 1964, the Supreme Court issued a decree implementing its opinion in *Arizona v. California*.[35] The decree has been updated multiple times since, most recently in 2006.[36] The decree requires the United States to follow specific priorities for managing water flows from federal structures based on the BCPA.[37] In the event flows are insufficient to provide 7.5 MAF per year to the Lower Basin, the decree instructs DOI to account for *present perfected rights* (i.e., water rights already in place at the time the Colorado River Compact became effective) in order of their priority dates.[38] Additionally, the decree quantified water rights for five tribes, although it did not address any rights or priorities of any additional Indian Reservation.[39] After consulting with states and "major" contracting parties, DOI has the authority to apportion flows pursuant to the BCPA and other statutes based on the following priority use order: (1) river regulation, navigation improvements, and flood control; (2) irrigation and domestic uses, including the satisfaction of present perfected rights; and (3) electric power.[40] The decree also identifies specific quantities of present perfected rights and their date of recognition.[41]

Arizona v. California continues to play a significant role in Colorado River allocations. Multiple federal statutes pertaining to Colorado River basin management refer to the *Arizona v. California* decree and codify its requirements.[42] Following the decree, Arizona sought congressional authorization of a new project to access and convey its Colorado River supplies as provided for in the Supreme Court's decree. Congress authorized that project in 1968, on the condition that California's and Nevada's water deliveries receive priority over Arizona's during times of drought (see below, "Colorado River Basin Project Act of 1968").

Upper Basin Compact and Colorado River Storage Project Authorizations

Congress did not allow projects originally authorized for study in the Upper Basin under BCPA to move forward with federally funded construction until the Upper Basin states determined their individual water

[35] Arizona v. California, 376 U.S. 340 (1964). The 1964 decree determined, among other things, that all water in the mainstream of the Colorado River below Lee Ferry and within the United States would be "water controlled by the United States" and that the Secretary would release water under only three types of designations for a year: "normal, surplus, and shortage."

[36] The Supreme Court supplemented the 1964 decree in 1966, 1979, 1984, and 2000; in 2006 it issued a consolidated decree incorporating the 1964 decree and supplements. *See supra* note 26. Among other things, the decrees set forth tribal water rights and present perfected rights of various parties in the Lower Basin.

[37] Arizona v. California, 376 U.S. 340 (1964); 547 U.S. 150 (allowing for Colorado River water releases to satisfy Mexico treaty obligations "without regard" to the priorities specified in the BCPA as referenced in subdivision II(A) of the decree).

[38] Arizona v. California, 547 U.S. 150 (2006), 154–55, 166. Present perfected rights are those existing as of June 25, 1929, in accordance with state law and exercised by actually diverting a specific quantity of water and/or reservation of water rights for federal use. Ibid. at 154.

[39] Arizona v. California. 373 U.S. at 598–602. Indian reserved water rights were first recognized by the Supreme Court in Winters v. United States, 207 U.S. 564, 575-77 (1908). Under the Winters doctrine, when Congress reserves land (i.e., for an Indian reservation), it implicitly reserves water sufficient to fulfill the purpose of the reservation. Because the establishment of Indian reservations (and, therefore, of Indian water rights) generally predated large-scale development of water resources for non-Indian users, the water rights of tribes often are senior to those of non-Indian water rights. For more information on the resulting settlements, see below section, "Tribal Water Rights" and CRS Report R44148, *Indian Water Rights Settlements*.

[40] Arizona v. California, 547 U.S. 150 at 154–56 (2006). The Court did not clarify what a constituted "major delivery contract." Ibid. at 155.

[41] Ibid. at 167–81 (2006). In sum, California, including tribal uses within the state, is entitled to approximately 3 MAF based on present perfected rights. Present perfected rights total approximately 1.05 MAF in Arizona and .000013 MAF in Nevada. California's rights include Imperial Irrigation District rights to 2.6 MAF (priority date of 1901), Palo Verde Irrigation District rights to 0.2 MAF (priority date of 1877), tribal rights totaling approximately 0.16 MAF with priority dates ranging from 1873-1903, and an additional 0.04 MAF from other uses.

[42] See, for example, 43 U.S.C. §§1521, 1525.

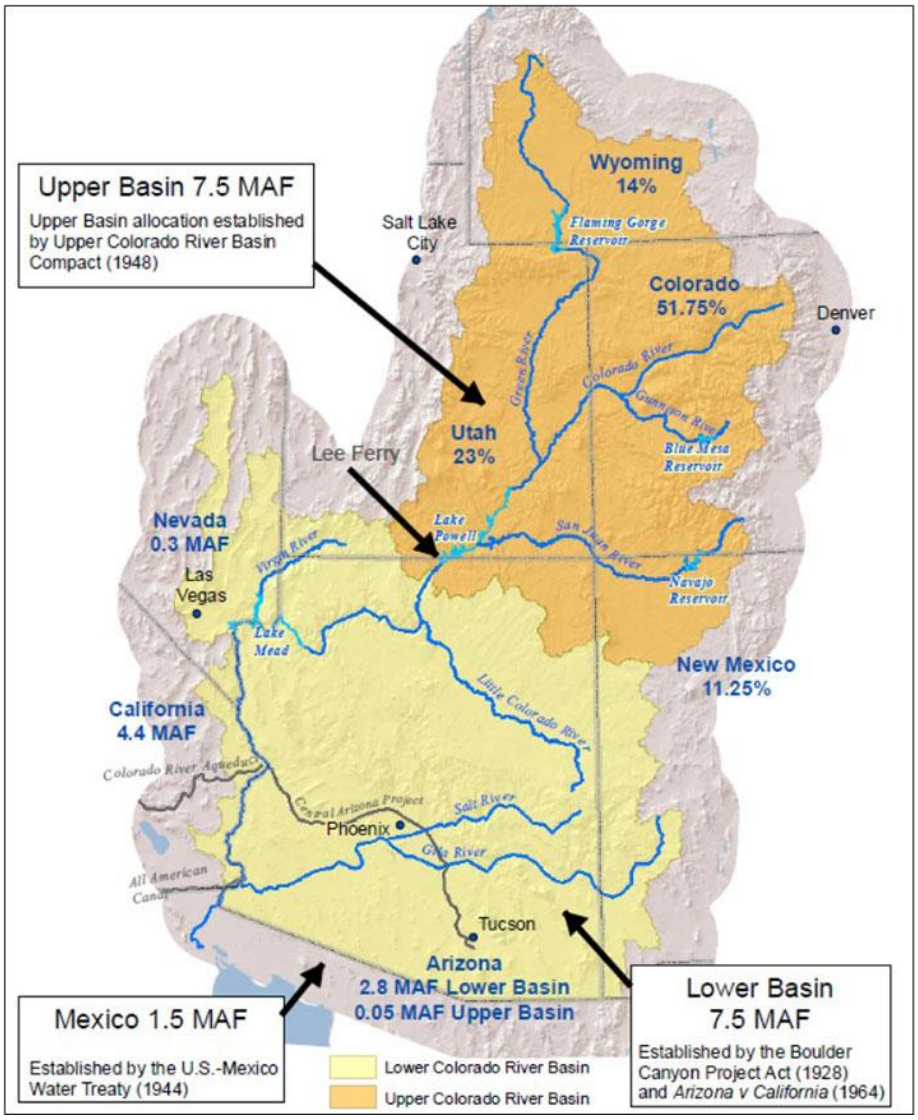
allocations, which occurred under the Upper Colorado River Basin Compact of 1948.[43] Because there was some uncertainty as to the exact amount of water that would remain in the system after Lower Basin obligations were met, the Upper Basin Compact established state allocations in terms of percentage: Colorado (where the largest share of runoff to the river originates) is the largest entitlement holder in the Upper Basin, with rights to 51.75% of any Upper Basin flows after Colorado River Compact obligations to the Lower Basin have been met. Other states also received percentage-based allocations, including Wyoming (14%), New Mexico (11.25%), and Utah (23%). Arizona was allocated 50,000 AF in addition to its Lower Basin apportionment, in recognition of the portion of the state in the Upper Basin. **Figure 2** shows basin allocations by state following approval of the Upper Basin Compact (i.e., the allocations that generally guide current water deliveries). The Upper Basin Compact also established the Upper Colorado River Commission, an interstate administrative water agency charged with administering the provisions of the Upper Basin Compact.[44]

[43] Upper Colorado River Basin Compact, 1948.

[44] For more information, see Upper Colorado River Commission, "About the UCRC," at http://www.ucrcommission.com/about-us/.

Figure 2. Colorado River Basin Allocations

(shown as percentage of allocation or million acre-feet [MAF])



Source: Figure by the Congressional Research Service (CRS), using data from USGS, ESRI Data & Maps, 2017, Central Arizona Project, and ESRI World Shaded Relief Map.

Notes: Although both the Upper and Lower Basins were each allocated 7.5 MAF, there was uncertainty about how much water would remain in the Upper Basin after Colorado River Compact obligations to Lower Basin states were fulfilled. Therefore, outside of 50,000 AF provided annually to Arizona, the Upper Basin Compact includes apportionments in terms of percentage of the overall Upper Basin allocation.

Subsequent federal legislation paved the way for development of Upper Basin waters. The Colorado River Storage Project (CRSP) Act of 1956 authorized CRSP *initial units* of Glen Canyon, Flaming Gorge, Navajo, and Aspinall in the Upper Basin. The act also established the Upper Colorado River Basin Fund, which receives revenues collected in connection with the projects, to be made available for defraying the project's costs of operation, maintenance, and emergency expenditures.

Colorado River Basin Project Act of 1968

The Colorado River Basin Project Act (CRBPA), enacted in 1968, authorized additional projects in both the Upper and Lower Basins and made other changes to basin management. In the CRBPA, Congress authorized a major new water conveyance project in Arizona, the Central Arizona Project (CAP),[45] as well as several other Upper Basin projects (e.g., the Animas La Plata and Central Utah projects). The CRBPA also established funding mechanisms for revenues from power generation from relevant Upper and Lower Basin facilities to be used to fund specific expenses in each respective basin. The act also provided direction on how to address shortages in the Lower Basin when the Colorado River cannot supply annual consumptive use of 7.5 MAF in Arizona, California, and Nevada.[46]

The CRBPA represented a legislative compromise between the interests of California and Arizona. The act authorized the CAP but provides that, in the event of shortage conditions, California's 4.4 MAF allocation would have priority over CAP water supplies.[47] Specifically, when there are shortages, the CRBPA directs that diversions to the CAP are to be limited to ensure sufficient consumptive use for certain California and Nevada users whose water rights predate the CAP, consistent with the 1964 *Arizona v. California* decree.[48]

In addition, the CRBPA directs the Secretary of the Interior to develop a plan for meeting future water needs, develop criteria for operating federally authorized reservoirs in the basin to ensure that the reservoirs satisfy existing needs and legal obligations, and report annually on implementation of the plan.[49] Section 602 of the CRBPA directs the Secretary of the Interior to consultatively develop operational criteria—known as *Long-Range Operating Criteria* (LROC)—for federally authorized Colorado River reservoirs in the following order of priority: (1) treaty obligations to Mexico, (2) the Colorado River Compact requirement for the Upper Basin to not deplete more than 75 MAF to Lower Basin states over any 10-year period, and (3) carryover storage to meet these needs.[50] The Secretary of the Interior may modify the criteria based on "actual operating experience or unforeseen circumstances" after correspondence and consultation with representatives of the basin states.[51] The Secretary of the Interior first adopted LROC in 1970; they were last modified in 2005.[52]

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[45] See 43 U.S.C. §§1501–1556. The Central Arizona Project was authorized in 43 U.S.C. §1521. Some portions of the Colorado River Basin Project Act (CRBPA) were codified as amendments to the CRSPA. Ibid. §§620a, 620a-1.

[46] Ibid.

[47] 43 U.S.C. §1521.

[48] See 43 U.S.C. §1525 (allowing for limitations to Arizona supplies sufficient to enable 4.4 MAF of annual consumption "by holders of present perfected rights, by other users in the State of California served under existing contracts with the United States by diversion works heretofore constructed, and by other existing Federal reservations in that State, and by users of the same character in Arizona and Nevada"). Note that the legislation references Section II(B)(1) of the Arizona v. California 1964 Supreme Court decree, 376 U.S. 340, which is associated with the 1963 opinion Section III, Apportionment and Contracts in Time of Shortage, 373 U.S. 546, 592-94. See also 43 U.S.C. §1521(b) (allowing modifications to Central Arizona Project diversions).

[49] Ibid. §§1501(b), 1552.

[50] Ibid. §1552(a)-(b). The Grand Canyon Protection Act (P.L. 102-575) directs DOI to operate Glen Canyon Dam in a specific manner. In addition to compliance with laws governing Colorado River water apportionment, DOI must adopt criteria and operating plans separate from and in addition to the ones specified in Section 602 of the CRBPA consistent with Grand Canyon National Park values. However, the legislation states that the provisions are not intended to affect state water rights to Colorado River allocations that have been secured by "any compact, law, or decree." P.L. 102-575, §1802, 106 Stat. 4669 (1992). The CRBPA provides that if the federal government fails to comply with applicable law in operating Glen Canyon Dam, any affected state can sue to enforce its provisions in the Supreme Court. 43 U.S.C. §1551(c).

[51] Ibid.

[52] Operating Criteria, 70 *Federal Register* 15,873 (Mar. 29, 2005); Colorado River Reservoirs, Coordinated Long-Range Operations, 35 *Federal Register* 8951 (June 10, 1970). Through later legislation, Congress required that, in preparing the LROC

Water Storage and Operations

The Colorado River Basin's large water storage projects can store as much as 60 MAF, or about four times the Colorado River's annual flows, to insulate water users from annual variability in flows. Thus, storage and operations in the basin receive considerable attention, particularly at the basin's two largest dams and their storage reservoirs: Glen Canyon Dam/Lake Powell in the Upper Basin (26.2 MAF of storage capacity) and Hoover Dam/Lake Mead in the Lower Basin (26.1 MAF of storage capacity). The status of these projects is monitored closely by Reclamation and interested stakeholders as an indicator of basin health.

Glen Canyon Dam, completed in 1963 at the southern end of the Upper Basin, serves as the linchpin for Upper Basin storage and regulates flows from the Upper Basin to the Lower Basin, pursuant to the Colorado River Compact. From 2000 to 2020, it generated an average of approximately 3.8 billion kilowatt-hours (KWh) of electricity per year, which the Western Area Power Administration (WAPA) supplies to 5.8 million customers in Upper Basin States.[53] Other significant storage in the Upper Basin includes the initial units of the CRSP: the Aspinall Unit in Colorado (including Blue Mesa, Crystal, and Morrow Point dams on the Gunnison River, with combined storage capacity of more than 1 MAF),[54] the Flaming Gorge Unit in Utah (including Flaming Gorge Dam on the Green River, with a capacity of 3.8 MAF), and the Navajo Unit in New Mexico (including Navajo Dam on the San Juan River, with a capacity of 1 MAF). The Upper Basin is also home to 16 participating projects, which are authorized to use water for irrigation, M&I uses, and other purposes.[55]

Hoover Dam, completed in 1936, provides the majority of the Lower Basin's storage and generates on average about 4 billion KWh of electricity per year for customers in California, Arizona, and Nevada.[56] Also important for Lower Basin Operations are Davis Dam/Lake Mohave, which regulates flows to Mexico under the 1944 Treaty, and Parker Dam/Lake Havasu, which impounds water for diversion into the Colorado River Aqueduct (thereby allowing for deliveries to urban areas in Southern California) and CAP (allowing for diversion to users in Arizona). Further downstream on the Arizona/California border, Imperial Dam (a diversion dam) diverts Colorado River water to the All-American Canal for use in some of the river's largest agricultural areas in California's Imperial and Coachella Valleys.

Annual Operations

Reclamation monitors Colorado River reservoir levels and projects them 24 months into the future in monthly studies (called *24-month studies*).[57] The studies take into account forecasted hydrology, reservoir

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and Annual Operating Plan, the Secretary of the Interior must consult the governors of the basin states and with the public, see Grand Canyon Protection Act of 1992, P.L. 102-575, §1804(c)(3), 106 Stat. 4669.

[53] Statement of Bureau of Reclamation Commissioner Camille Calimlim Touton, in U.S. Congress, Senate Committee on Energy and Natural Resources, Subcommittee on Water and Power, 117th Cong., 2nd sess., May 25, 2022. For a more detailed discussion of the effects of long-term drought on Glen Canyon Dam, see CRS Report R47497, *Long-Term Drought and Glen Canyon Dam: Potential Effects on Water Deliveries and Hydropower*, by Charles V. Stern and Ashley J. Lawson.

[54] The Curecanti Unit was renamed the Aspinall Unit in 1980 in honor of U.S. Representative Wayne N. Aspinall of Colorado.

[55] In total, 16 of the 22 Upper Basin projects authorized as part of CRSP have been developed. (Of the six remaining projects, five were determined by Reclamation to be infeasible, and Congress deauthorized the the Pine River Extension Project.) For a complete list of projects, see Bureau of Reclamation, "Colorado River Storage Project," at https://www.usbr.gov/uc/rm/crsp/index.html.

[56] Reclamation, "Hoover Dam Frequently Asked Questions and Answers," at https://www.usbr.gov/lc/hooverdam/faqs/powerfaq.html, accessed August 3, 2022.

[57] Current 24-month studies, as well as two- and five-year probable projections of Lake Mead and Powell elevations, are available at Reclamation, "Colorado River System Projections Overview," at https://www.usbr.gov/lc/region/g4000/riverops/

operations, and diversion and consumptive use schedules to model a single scenario of reservoir conditions. The studies inform operating decisions by Reclamation looking one to two years into the future. They express water storage conditions at Lake Mead and Lake Powell in terms of elevation, as feet above mean sea level.

In addition to the 24-month studies, the CRBPA requires the Secretary of the Interior to transmit to Congress and the governors of the basin states, by January 1 of each year, an *Annual Operating Plan* (AOP). In the AOP, Reclamation describes the actual operation for the preceding water year and the projected operation for the coming year. The AOP's projected January 1 water conditions for the upcoming calendar year establish a baseline for future annual operations.[58]

Since the adoption of operational guidelines by Reclamation and basin states in 2007 (see below section, "2007 Interim Guidelines"), Reclamation has tied operations of Hoover and Glen Canyon Dams to specific pool elevations at Lake Mead and Lake Powell. For Lake Mead, the first level of shortage (a *Tier One Shortage Condition*) in the 2007 guidelines, under which Arizona's and Nevada's allocations are curtailments (along with releases to Mexico), is triggered if the Lake Mead pool elevation falls below 1,075 feet. For Lake Powell, releases under tiered operations are based on storage levels in both Lake Powell and Lake Mead. Drought contingency plans (DCPs) for the Upper and Lower Basins, enacted in 2019, overlaid additional operational changes tied to elevations in both reservoirs. For Lake Mead, this included additional curtailments beyond those established in 2007.[59] For Lake Powell, the Upper Basin DCP incorporated a Drought Response Operations Agreement (DROA) that established a target lake elevation of 3,525 feet. It also provided for altered releases from Glen Canyon Dam and Upper Basin reservoirs in order to protect Lake Powell from falling below an elevation that would no longer produce hydropower. These efforts are discussed more in the below section "Recent Developments and Agreements."

Recent Conditions

Falling water levels in Lake Mead have resulted in Reclamation announcing Lower Colorado River Basin delivery curtailments for Arizona and Nevada, in accordance with previous plans. In August 2021, Reclamation declared the first-ever Tier One Shortage Condition for the Lower Basin.[60] In August 2022, Reclamation announced the first-ever Tier Two Shortage, which resulted in additional water supply delivery cutbacks.[61] In March 2022, Lake Powell fell below the target elevation of 3,525 feet, which had not occurred since the late 1960s.[62]

coriver-projections.html.

[58] Current and historical AOPs are available at Reclamation, "Annual Operating Plan for Colorado River Reservoirs," at https://www.usbr.gov/uc/water/rsvrs/ops/aop/.

[59] For example, a new set of curtailments for Nevada and Arizona at lake elevations up to 1,090 feet (*Tier Zero*) was added pursuant to the 2019 DCP for the Lower Colorado River Basin. These agreements also added additional curtailment requirements to existing Tiers below Tier 1 (e.g., Tier 2, etc.). For more details, see **Table 1**.

[60] Reclamation, "Reclamation Announces 2022 Operating Conditions for Lake Powell and Lake Mead," press release, August 16, 2021, at https://www.usbr.gov/newsroom/#/news-release/3950.

[61] Reclamation, "Interior Department Announces Actions to Protect Colorado River System, Sets 2023 Operating Conditions for Lake Powell and Lake Mead," press release, August 16, 2022, at https://www.usbr.gov/newsroom/news-release/4294.

[62] Reclamation, "Lake Powell to Temporarily Decline Below 3,525 Feet," press release, March 4, 2022, at https://www.usbr.gov/newsroom/#/news-release/4117. 3,525 feet is established as a target because it is 35 feet above 3,490 feet, or the level at which power production would cease.

Mitigating the Environmental Effects of Colorado River Basin Development

Construction of most of the Colorado River's water supply infrastructure predated major federal environmental protection statutes, such as the National Environmental Policy Act (NEPA; 42 U.S.C. §§4321 et seq.) and the ESA. Thus, many of the environmental impacts associated with the development of basin resources were not originally taken into account. Over time, multiple efforts have been initiated to mitigate these effects. Some of the highest-profile efforts have been associated with water quality (in particular, salinity control) and the effects of facility operations on endangered and threatened species.

Salinity Control

Salinity and water quality are long-standing issues in the Colorado River Basin. Parts of the Upper Basin are covered by salt-bearing shale (which increases salt content of water inflows), and salinity content increases as the river flows downstream due to both natural leaching and return flows from agricultural irrigation. The 1944 U.S.-Mexico Water Treaty did not set water quality or salinity standards in the Colorado River Basin. After years of dispute between the United States and Mexico regarding the salinity of the water reaching Mexico's border, the two countries reached an agreement on August 30, 1973, with the signing of Minute 242 of the International Boundary and Water Commission.[63] The agreement guarantees Mexico that the average salinity of its treaty deliveries will be no more than 115 parts per million higher than the salinity content of the water diverted to the All-American Canal at Imperial Dam in Southern California. To control the salinity of Colorado River water in accordance with this agreement, Congress passed the Colorado River Basin Salinity Control Act of 1974 (), which authorized desalting and salinity control facilities to improve Colorado River water quality. The most prominent of these facilities is the Yuma Desalting Plant, which was largely completed in 1992 but has never operated at capacity due to cost and other factors.[64] In 1974, the seven basin states also established water quality standards for salinity through the Colorado River Basin Salinity Control Forum.[65]

Endangered Species Efforts and Habitat Improvements

Congress enacted the ESA in 1973.[66] As the federal government listed some basin species under ESA in accordance with the act,[67] federal agencies and nonfederal stakeholders consulted with the U.S. Fish and Wildlife Service (FWS) to address the conservation of the listed species. As a result of these

[63] See International Boundary and Water Commission, *Minute 242, Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River*, August 30, 1973, at https://www.ibwc.gov/Treaties_Minutes/Minutes.html.

[64] The Yuma Desalting Plant's limited operations have been due in part to the cost of its operations (desalination can require considerable electricity to operate) and surplus flows in the Colorado River during some years. In lieu of operating the plant, high-salinity irrigation water has been separated from the United States' required deliveries to Mexico and disposed of through a canal that enters Mexico and discharges into wetlands called the Ciénega de Santa Clara, near the Gulf of California. Whether and how the plant should be operated and how the impacts on the Ciénega de Santa Clara from the untreated irrigation runoff should be managed remain topics of some debate in the basin and between Mexico and the United States.

[65] Additional information about the forum and related salinity control efforts is available at Colorado River Basin, "Salinity Control Forum," at https://www.coloradoriversalinity.org/.

[66] For background information on the Endangered Species Act (87 Stat. 884, 16 U.S.C. §§1531-1544), see CRS Report R46677, *The Endangered Species Act: Overview and Implementation*.

[67] Several listed species are found throughout the Colorado River Basin. Some are specifically found in the Colorado River, such as the Razorback sucker (*Xyrauchen texanus*), Bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus Lucius*), and Humpback chub (*Gila cypha*). Consultation about an agency action's effects on these species is required by 16 U.S.C. §1536(a).

consultations, several major programs have been developed to protect and restore listed fish species on the Colorado River and its tributaries. Summaries of some of the key programs are below.

Upper Colorado Endangered Fish Recovery Program

The Upper Colorado Endangered Fish Recovery Program was established in 1988 to assist in the recovery of four species of endangered fish in the Upper Colorado River Basin.[68] Congress formally authorized this program in 2000.[69] The program is implemented through several stakeholders under a cooperative agreement signed by the governors of Colorado, Utah, and Wyoming; the Secretary of the Interior; and the Administrator of WAPA. The recovery goals of the program are to reduce threats to species and improve their status so they are eventually delisted from the ESA. Some of the actions taken in the past include providing adequate instream flows for fish and their habitat, restoring habitat, reducing nonnative fish, augmenting fish populations with stocked fish, and conducting research and monitoring. Reclamation is the lead federal agency for the program and provides the majority of federal funds for implementation. Other funding includes a portion of Upper Basin hydropower revenues from WAPA and funding from FWS; the states of Colorado, Wyoming, and Utah; and water users, among others.

San Juan River Basin Recovery Implementation Program

The San Juan River Basin Recovery Implementation Program was established in 1992 to assist in the recovery of ESA-listed fish species on the San Juan River, the Colorado's largest tributary.[70] The program is a partnership implemented under a cooperative agreement between DOI and the states of Colorado and New Mexico, the Jicarilla Apache Nation, the Navajo Nation, the Southern Ute Indian Tribe, and the Ute Mountain Ute Indian Tribe.[71] It is concerned with the recovery of the Razorback sucker (*Xyrauchen texanus*) and Colorado pikeminnow (*Ptychocheilus Lucius*). Congress authorized this program in with the aim to protect the genetic integrity and population of listed species, conserve and restore habitat (including water quality), reduce nonnative species, and monitor species. The program is coordinated by FWS, and Reclamation is responsible for operating the Animas-La Plata Project and Navajo Dam on the San Juan River in a way that reduces effects on the fish populations. The program is funded by a portion of revenues from hydropower revenues from WAPA in the Upper Basin, Reclamation, the Bureau of Indian Affairs, and participating states. Recovery efforts for listed fish are coordinated with the Upper Colorado Endangered Fish Recovery Program.

Glen Canyon Dam Adaptive Management Program

The Glen Canyon Dam Adaptive Management Program was established in 1997 in response to a directive from Congress under the Grand Canyon Protection Act of 1992 () to operate Glen Canyon 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."[72] This program uses experiments to determine how water flows affect natural resources south of the dam. Reclamation is in charge of modifying flows for experiments, and the U.S. Geological Survey conducts monitoring and

[68] The fish species are the humpback chub, bonytail, Colorado pikeminnow and razorback sucker. For more information, see Upper Colorado River Endangered Fish Recovery Program at http://www.coloradoriverrecovery.org/uc.

[69] P.L. 106-392.

[70] For more information, see U.S. Fish and Wildlife Service, "San Juan River Basin Recovery Implementation Program," at https://www.fws.gov/southwest/sjrip/.

[71] It also includes participation by water development interests in Colorado and New Mexico.

[72] For more information, see Reclamation, Glen Canyon Dam Adaptive Management Program, "Glen Canyon Dam High Flow Experimental Release," at https://www.usbr.gov/uc/progact/amp/ltemp.html.

other studies to evaluate the effects of the flows.[73] The results are expected to better inform managers how to provide water deliveries and conserve species.

Lower Colorado Multi-Species Conservation Program

The Multi-Species Conservation Program (MSCP) is a multistakeholder initiative to conserve 27 species (8 listed under ESA) along the Lower Colorado River while maintaining water and power supplies for farmers, tribes, industries, and urban residents.[74] The MSCP began in 2005 and is planned to last for at least 50 years.[75] The MSCP was created through consultation under ESA. To achieve compliance under ESA, federal entities involved in managing water supplies in the Lower Colorado River Basin met with resource agencies from Arizona, California, and Nevada; Native American Tribes; environmental groups; and recreation interests to develop a program to conserve species along a portion of the Colorado River. A biological opinion (BiOp) issued by the FWS in 1997 covers operations and maintenance activities conducted by Reclamation along the Colorado River from Lake Mead to the Southerly International Boundary; consultation was reinitiated in 2002, and a new BiOp was issued later that year.[76] Nonfederal stakeholders also applied and received an incidental take permit under Section 10(a) of the ESA for their activities.[77] This resulted in a habitat conservation plan for the MSCP that formed the basis for the program.[78] A Lower Colorado River Multi-Species Conservation Program Implementing Agreement integrated the federal and nonfederal activities in the MSCP and was signed by stakeholders in 2005.[79]

The objective of the MSCP is to create habitat for listed species, augment the populations of species listed under ESA, maintain current and future water diversions and power production, and abide by the incidental take authorizations for listed species under the ESA. The estimated total cost of the program over its lifetime is approximately $626 million in 2003 dollars ($903 million in 2019 dollars) and is to be split evenly between Reclamation (50%) and the states of California, Nevada, and Arizona (who collectively fund the remaining 50%). The management and implementation of the MSCP is the responsibility of Reclamation, in consultation with a steering committee of stakeholders.

[73] Regardless of the status and results of flow experiments, the total annual volume of water released from Glen Canyon Dam remains dictated by the Law of the River, as described above.

[74] The stakeholders include 6 federal and state agencies, 6 tribes, and 36 cities and water and power authorities. Stakeholders serve more than 20 million residents in the region, and irrigate 2 million acres of farmland. For more information, see Lower Colorado River Multi-Species Conservation Program at https://www.lcrmscp.gov/.

[75] The program was authorized under Subtitle E of Title IX of P.L. 111-11.

[76] U.S. Fish and Wildlife Service, Reinitiation of Formal Section 7 Consultation on Lower Colorado River Operations and Maintenance - Lake Mead to Southerly International Boundary, Arizona, California and Nevada, April 30, 2002, https://www.usbr.gov/lc/region/g2000/BO2002operations.pdf.

[77] The incidental take permit is valid for 50 years from its date of issuance and covers the implementation of the Lower Colorado River Multi-Species Conservation Program, diversions of water from the river, demand for and receipt of hydropower, and flow and non-flow actions along the Colorado River with the geographic scope of the permit.

[78] Lower Colorado River Multi-Species Conservation Program, *Final Lower Colorado River Multi-Species Conservation Program Volume II: Habitat Conservation Plan*, December 17, 2004, at https://lcrmscp.gov/lcrm-prod/lcrm-prod/pdfs/hcp_volii_2004.pdf.

[79] Lower Colorado River Multi-Species Conservation Program Implementing Agreement at https://lcrmscp.gov/lcrm-prod/lcrm-prod/pdfs/imp_agr_2005.pdf.

Hydropower Revenues Funding Colorado River Basin Activities

Hydropower revenues finance a number of activities throughout the Colorado River Basin. In the Lower Basin, the Colorado River Dam Fund uses power revenues generated by the Boulder Canyon Project (i.e., Hoover Dam) to fund operational and construction costs for related Reclamation facilities. A separate fund, the Lower Colorado River Basin Development Fund, collects revenues from the Central Arizona Project (CAP), as well as from a surcharge on revenues from the Boulder Canyon and Parker-Davis Projects that was enacted under the Hoover Power Plant Act of 1984 (). These revenues are available without further appropriation toward defraying CAP operation and maintenance costs, salinity control efforts, and funding for Indian water rights settlements identified under the Arizona Water Settlements Act of 2004 (i.e., funding for water systems of the Gila River Indian Community and the Tohono O'odham Nation, among others). In the Upper Basin, the Upper Colorado River Basin Fund collects revenues from the initial units of the Colorado River Storage Project and funds operation and maintenance expenses, salinity control, the Glen Canyon Dam Adaptive Management Program, and endangered fish studies on the Colorado and San Juan rivers, among other things.

Source: Department of the Interior, *Department of the Interior Budget Appendix, Fiscal Year 2023 Budget Request*

Tribal Water Rights

Tribal water rights are often senior to other uses on the Colorado River.[80] Tribal water diversions based on these rights typically come out of individual state allocations. There are 30 federally recognized tribes in the Colorado River Basin, many of whom have settled or unresolved (i.e., currently claimed for use but unsettled) tribal water rights.[81] As of early 2023, 11 basin tribes had reserved (i.e., held for future use) water rights claims that have not been quantified and settled; the total potential amount of these claims is unknown.[82] According to Reclamation, as of December 2020, tribes held diversion rights to approximately 3.4 MAF per year of Colorado River water.[83] Previous studies noted that these tribes were using just over half of their quantified rights.[84]

Because of the magnitude and seniority of tribal water rights, future decisions about the settlement and development of tribal water rights in the Colorado River Basin are likely to influence the availability of basin water resources for various uses. Increased consumptive water use by tribes with existing quantified and settled water rights, and/or future settlement of claims and additional consumptive use of basin waters by tribes with reserved rights, would exacerbate competition for basin water resources. At the same time, some tribes have entered into arrangements to lease or conserve their waters to other users; new

[80] Tribal water rights claims typically arise out of the right of many tribes to water resources dating to treaties establishing their reservations. These water rights are often senior to those of non-Indian water rights holders because they date to the creation of the reservation (i.e., prior to the awarding of most state water rights). For more information on Indian water rights settlements, see CRS Report R44148, *Indian Water Rights Settlements*.

[81] For a list of the tribes, see Bureau of Reclamation, "Colorado River Basin," at https://www.usbr.gov/ColoradoRiverBasin/.

[82] CRS analysis of enacted Indian water rights settlements and Bureau of Reclamation, *Colorado River Basin Water Supply and Demand Study*, Technical Report C- Water Demand Assessment, Appendix C9, Tribal Water Demand Scenario Quantification, pp C9-33-C9-34. Tribes with claims yet to be fully adjudicated or quantified as of early 2023 include the Navajo Nation; the Ute Indian Tribe of the Uintah and Ouray Reservation; the Havasupai Tribe; the Hopi Tribe; the Kaibab Band of Paiute Indians; the Pascua Yaqui Tribe; San Carlos Apache Tribe; the San Juan Southern Paiute Tribe; the Tohono O'odham Nation; Tonto Apache Tribe; and the Yavapai Apache Nation.

[83] Reclamation, *Review of the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead*, December 2020, p. 14, at https://www.usbr.gov/ColoradoRiverBasin/documents/7.D.Review_FinalReport_12-18-2020.pdf.

[84] Colorado River Research Group, *Tribes and Water in the Colorado River Basin*, June 2016. According to this study, tribal consumptive use in 2015 (including leasing of tribal water to non-tribal entities) totaled 1.7 MAF of the 2.9 MAF in recognized diversion rights at that time.

agreements along these lines have the potential to secure water supplies for some non-tribal users without other viable alternative sources of water.[85]

Drought and the Supply/Demand Imbalance

The Colorado River Compact was based on the assumption (formed by the available record at the time) that average annual flows on the river were 16.4 MAF per year.[86] As noted, from 1906 to 2022, observed historical natural flows on the river at Lee Ferry, AZ—the common point of measurement for observed basin flows—averaged 14.6 MAF annually (**Figure 3**).[87] Natural flows from 2000 to 2022 (i.e., during the ongoing drought) averaged less than 12.1 MAF annually,[88] with this period noted to be the driest 23-year period on record.[89] At the same time, consumptive use and losses (e.g., evaporation) in the basin have regularly exceeded natural flows (in particular during the current drought).[90] Consumptive use in the basin generally increased from 1971 to 2002 but declined after the 2003 approval of the Quantitative Settlement Agreement (QSA), which in part led to a decrease of consumptive use in the Lower Basin (see below section, "Recent Developments and Agreements").[91] Despite this development, overall basin consumptive use and other losses continue to exceed natural flows in most years; the resulting "structural deficit" has caused a drawdown of basin storage (**Figure 4**).

The lack of a formal mechanism accounting for evaporative losses in the Lower Basin exacerbates the supply/demand disparity. A key difference between Upper and Lower Basin reporting involves how each basin accounts for consumptive use. In accordance with Articles I and V of the *Arizona v. California* decree,[92] a Lower Basin Water Accounting Report (published annually) reports only on *diversions from the system for consumptive use*. Conversely, the comparable Upper Basin accounting—the Upper Basin Consumptive Use and Losses Report (published every five years)—is prepared in response to congressional direction in the CRBPA, which directed "a detailed breakdown of the beneficial consumptive use of water on a State-by-State basis.[93] Reclamation defines *beneficial consumptive use* to include *any removal from the system for beneficial consumptive use*, which Reclamation defines to include both diversions and losses from mainstem reservoir evaporation that occur prior to diversions [94] Thus, even though Lower Basin consumptive use is typically below the compact threshold of 7.5 MAF, after accounting for evaporative losses, the total amount of water regularly exceeds this thresholds.

[85] See footnote 143.

[86] National Research Council, Committee on the Scientific Bases of Colorado River Basin Water Management, Water Science and Technology Board, *Colorado River Basin Water Management: Evaluating and Adjusting to Hydroclimatic Variability*, 2007, at https://www.nap.edu/read/11857/chapter/1.

[87] Reclamation, "Reclamation Flow Data."

[88] Ibid.

[89] 87 FR 37884, 2022.

[90] *Consumptive uses and losses* include reservoir evaporation and other consumptive use losses, which average an estimated 2 MAF per year. For more information on consumptive use, see Reclamation Consumptive Uses and Losses Reports at https://www.usbr.gov/uc/DocLibrary/reports.html and Reclamation Colorado River Water Accounting and Use Reports at https://www.usbr.gov/lc/region/g4000/wtracct.html.

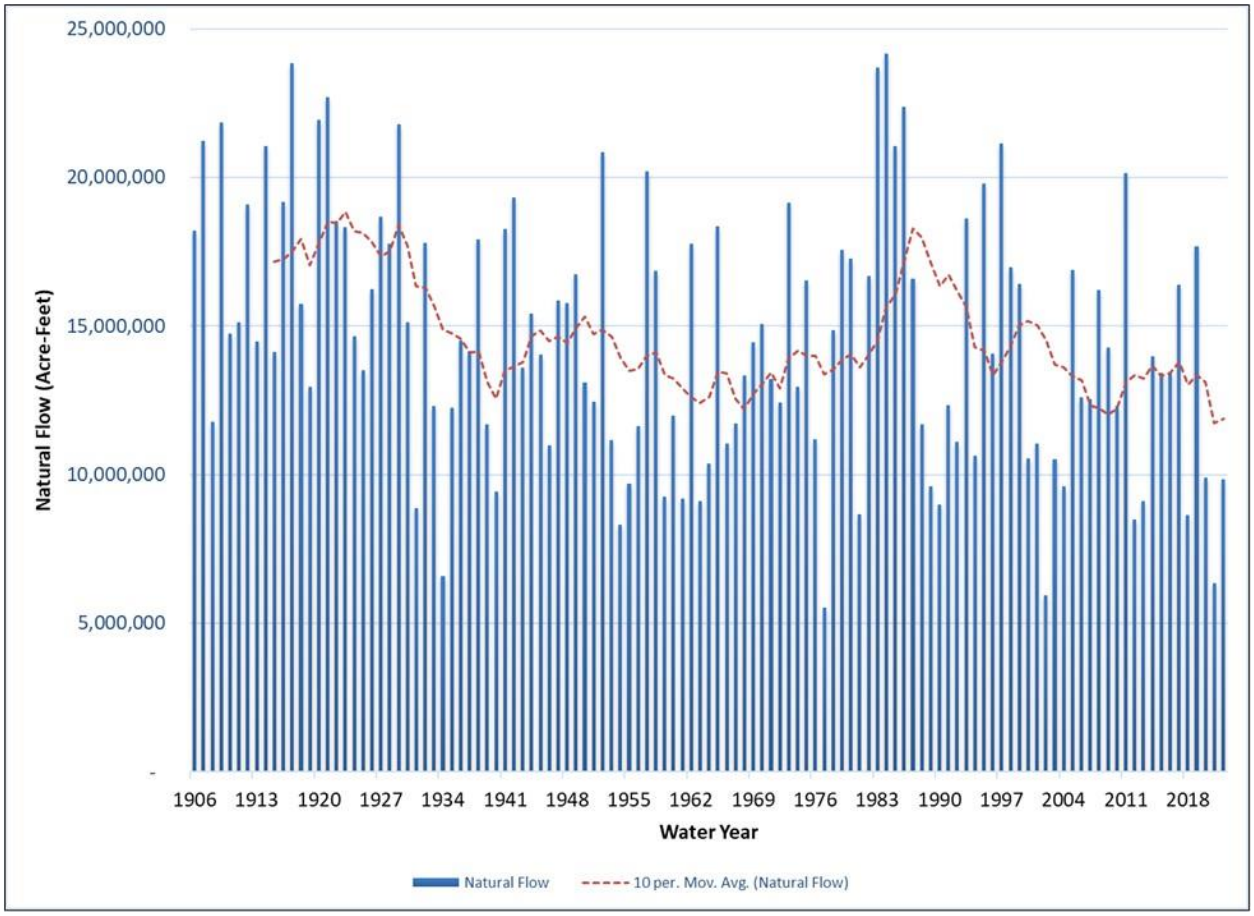
[91] Consumptive use in the Lower Basin (excluding tributaries and evaporative losses) was in excess of 8.4 MAF in 2002 but had decreased to 6.8 MAF as of 2020.

[92] See footnote 25.

[93] 43 U.S.C. §1551.

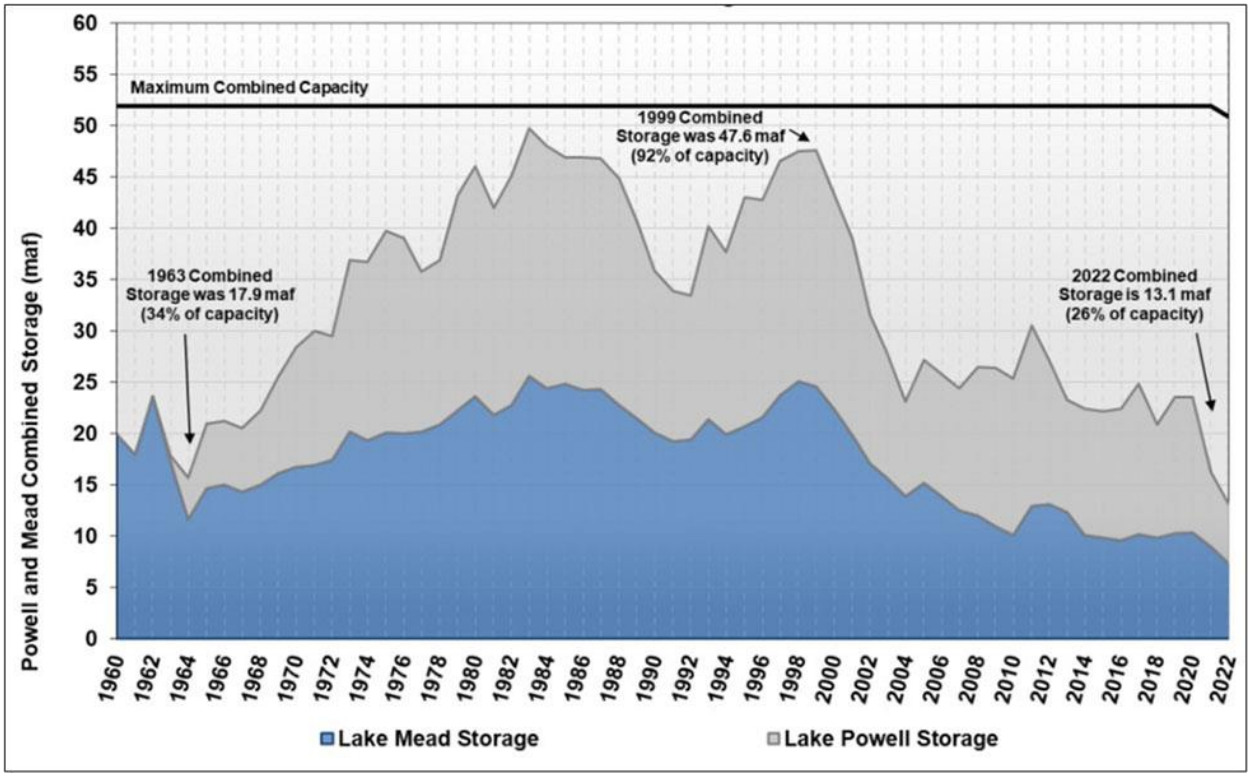
[94] See Bureau of Reclamation, Upper Colorado River Basin Consumptive Uses and Losses Report, 2016-2020, February 2022, p. 6.

Figure 3. Colorado River Natural Flow at Lees Ferry, Arizona, with 10-Year Moving Average, 1906-2022



Source: Bureau of Reclamation data, *General Modeling Information*, at https://www.usbr.gov/lc/region/g4000/riverops/model-info.html.

Figure 4. Combined Storage at Lakes Mead and Powell, 1960-2022



Source: Bureau of Reclamation, "Notice of Intent to Prepare a Supplemental Environmental Impact Statement," Public Webinar, November 9, 2022.

Note: Total storage = 52.3 million acre-feet.

Recent studies have concluded that Colorado River flows are unlikely to return to 20th century averages and that future water supply risk is high.[95] Overall, natural flows have declined by approximately 20% over the last century, and one study attributed more than half of this decline to increasing temperatures resulting from climate change.[96] Although there is potential for some precipitation increases in the region due to climate change, such potential increases are not expected to counteract projected drying resulting from rising temperatures.[97] As a result, most research has projected continuing reduction in runoff through the mid-21st century.[98]

Recent Developments and Agreements

Drought conditions throughout the basin have raised concerns about potential negative impacts on water supplies. Concerns center on what sort of changes to the current water management regime might result if

[95] B. Udall and J. Overpeck, "The Twenty-First Century Colorado River Hot Drought and Implications for the Future," *Water Resources Research*, vol. 53 (February 17, 2017), pp. 2404-2418.

[96] Paul C. D. Milly and Krista A. Dunne, "Colorado River Flow Dwindles as Warming-Driven Loss of Reflective Snow Energizes Evaporation," *Science*, vol. 367, no. 6483 (March 13, 2020), pp. 1252-1255. Hereinafter, Milly and Dunne, "Colorado River Flow Dwindles." Also see Mu Xiao, Bradley Udall, and Dennis P. Lettenmaier, "On the Causes of Declining Colorado River Streamflows," *Water Resources Research* 54 (2018), pp. 6739–6756.

[97] Milly and Dunne, "Colorado River Flow Dwindles."

[98] Jeff Lukas and Elizabeth Payton, eds., *Colorado River Basin Climate and Hydrology: State of the Science*, Western Water Assessment, University of Colorado Boulder, 2020.

the Secretary of the Interior were to determine that a shortage condition exists in the Lower Basin. Some in Upper Basin States are also concerned about the potential for a *compact call* of Lower Basin states on Upper Basin states. This is the commonly used term for the Lower Basin states' hypothetical attempt to force deliveries of Colorado River water under the compact.[99]

Drought and other uncertainties related to water rights priorities (e.g., potential tribal water rights claims) spurred the development of several efforts that generally attempted to relieve pressure on basin water supplies, stabilize storage levels, and provide assurances of available water supplies. Some of the most prominent developments since the year 2000 (i.e., the beginning of the current drought) are discussed below.

2003 Quantitative Settlement Agreement

Prior to the 2003 finalization of the QSA, California had been using approximately 5.2 MAF of Colorado River on average each year (with most of its excess water use attributed to urban areas). Under the QSA, which is an agreement between several California water districts and DOI, California agreed to reduce its use to the required 4.4 MAF under the Law of the River.[100] It sought to accomplish this aim by quantifying Colorado River entitlement levels of several water contractors; authorizing efforts to conserve additional water supplies (e.g., the lining of the All-American Canal); and providing for several large-scale, long-term agriculture-to-urban water transfers. The QSA also committed the state to a path toward restoration and mitigation related to the Salton Sea in Southern California.[101]

A related agreement between Reclamation and the Lower Basin states, the Inadvertent Overrun and Payback Policy (IOPP), went into effect concurrently with the QSA in 2004.[102] IOPP is an administrative mechanism that provides an accounting of inadvertent overruns in consumptive use compared to the annual entitlements of water users in the Lower Basin. These overruns must be "paid back" in the calendar year following the overruns, and the paybacks must be made only from "extraordinary conservation measures" above and beyond normal consumptive use.[103]

2004 Arizona Water Settlements Act

The 2004 Arizona Water Settlements Act (AWSA,) altered the allocation of CAP water in Arizona. It ratified three water rights settlements (one in each title) between the federal government and the State of Arizona, the Gila River Indian Community (GRIC), and the Tohono O'odham Nation, respectively.[104] For the state and its CAP water users, the settlement resolved a final repayment cost for CAP by reducing the water users' reimbursable repayment obligation from about $2.3 billion to $1.7 billion. Additionally,

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[99] For more background, see Anne Castle and John Fleck, "The Risk of Curtailment under the Colorado River Compact," November 20, 2019, at https://ssrn.com/abstract=3483654.

[100] California Quantification Settlement Agreement by and Among Imperial Irrigation District, the Metropolitan Water District of Southern California, and Coachella Valley Water District, October 10, 2003.

[101] The Salton Sea is an inland water body in Southern California that was historically sustained by Colorado River irrigation runoff from the Imperial and Coachella Valleys, but is shrinking. Toxic dust from exposed seabed is a major concern for surrounding areas. For more information on the Salton Sea, see CRS Report R46625, *Salton Sea Restoration*.

[102] Reclamation, *Record of Decision for the Colorado River Water Delivery Agreement*, October 10, 2003, pp 16-19.

[103] Ibid.

[104] Congress passed the Colorado River Basin Project Act of 1968 and authorized construction of CAP despite significant uncertainty related to tribal water rights related to the Colorado River. The Gila River, Arizona's largest tributary of the Colorado River, runs directly through the Gila River Indian Community, which encompasses approximately 372,000 acres south of and adjacent to Phoenix. Additionally, the Tohono O'odham Nation possessed reserved water rights near Tucson with the potential to disrupt that city's water supplies.

Arizona agreed to new tribal and non-tribal allocations of CAP water so that approximately half of CAP's annual allotment would be available to Native American tribes in Arizona, at a higher priority than most other uses. The tribal communities were authorized to lease the water, so long as the water remains within the state via the state's water banking authority. The act authorized funds to cover the cost of infrastructure required to deliver the water to the Indian communities, much of it derived from power receipts accruing to the Lower Colorado River Basin Development Fund. It also authorized funding for the study of a potential New Mexico Unit of CAP.

2007 Interim Guidelines/Coordinated Operations for Lake Powell and Lake Mead

Another development in the basin was the 2007 adoption of the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (2007 Interim Guidelines). DOI developed the guidelines to implement the LROC, through issuance of the *Annual Operating Plan for Colorado River Reservoirs* (AOP), as directed by the 1968 CRBPA.[105] Development of the agreement began in 2005, when, in response to drought in the Southwest and the decline in basin water storage, the Secretary of the Interior instructed Reclamation to develop coordinated strategies for Colorado River reservoir operations during drought or shortages.[106] The resulting guidelines included criteria for releases from Lakes Mead and Powell determined by "trigger levels" in both reservoirs, as well as a schedule of Lower Basin curtailments at different operational tiers (**Table 1**). Under the guidelines, Arizona and Nevada, which have junior rights to California, would face reduced allocations if Lake Mead elevations dropped below 1,075 feet. At the time, it was thought that the 2007 Guidelines would significantly reduce the risk of Lake Mead falling to 1,025 feet.

The 2007 agreement also included for the first time a mechanism by which parties in the Lower Basin were able to store conserved water in Lake Mead, known as Intentionally Created Surplus (ICS). Reclamation accounts for this water annually, and the users storing the water may access the surplus in future years, in accordance with the Law of the River. As of 2020, the portion of Lake Mead water in storage that was classified as ICS was 2.99 MAF.[107] That is, as of the end of the 2021 water year, approximately one-third of the water stored in Lake Mead was previously conserved ICS volume.

The 2007 guidelines are considered "interim" because they are scheduled to expire in 20 years (i.e., at the end of 2026). Thus, Reclamation began coordinating a review on the effectiveness of the 2007 guidelines in 2020, and in 2022 formally initiated the review process for post-2026 operations.[108] The review is expected to encompass negotiations related to renewal of the Upper and Lower Basin DCPs, which are an overlay on the 2007 guidelines (see below section, "2019 Drought Contingency Plans").

[105] Secretary of the Interior, Record of Decision: Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead (December 2007), p. 4, at https://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf.

[106] Prior to this time, the Secretary of the Interior had the authority to declare a shortage, but no shortage criteria had been publicly announced or published. (Criteria for surplus operations were put in place in 2001.)

[107] Bureau of Reclamation, *Colorado River Accounting and Water Use Report, Calendar Year 2021*, at https://www.usbr.gov/lc/region/g4000/wtracct.html.

[108] Department of the Interior, Reclamation, "Request for Input on Development of Post-2026 Colorado River Reservoir Operational Strategies for Lake Powell and Lake Mead Under Historically Low Reservoir Conditions," 87 *Federal Register* 37884-37888, June 24, 2022.

System Conservation Program

In 2014, Reclamation and several major basin water supply agencies (Central Arizona Water Conservation District, Southern Nevada Water Authority, Metropolitan Water District of Southern California, and Denver Water) executed a memorandum of understanding to provide funding for voluntary conservation projects and reductions of water use. The activities outlined in the memorandum had the goal of developing new *system water*,[109] to be applied toward storage in Lake Mead, by the end of 2019.[110] Congress formally authorized federal participation in these efforts, known as the Pilot System Conservation Program, in the Energy and Water Development and Related Agencies Appropriations Act, 2015 (, Division D). The Energy and Water Development and Related Agencies Appropriations Act, 2019 (, Division A) extended the authority through the end of FY2022, with the stipulation that Upper Basin agreements could not proceed without the participation of the Upper Basin states through the Upper Colorado River Commission. The authority was most recently extended through FY2024 in Division CC of the Consolidated Appropriations Act, FY2023 (). Reclamation estimated that as of the end of 2019, the Lower Basin program had conserved more than 175,000 AF of water in Lake Mead, at an average cost of $170 per AF.[111] Additional projects also were carried out in the Upper Basin by the Upper Colorado River Basin Commission; these efforts ended in 2018.[112]

Minute 319 and Minute 323 Agreements with Mexico[113]

In 2017, the United States and Mexico signed Minute 323, which extended and replaced elements of a previous agreement related to implementation of the 1944 U.S.-Mexico Water Treaty, Minute 319, signed in 2012.[114] Minute 323 includes, among other things, options for Mexico to hold water in reserve in U.S. reservoirs for emergencies and water conservation efforts, as well as U.S. commitments for flows to support the ecological health of the Colorado River Delta. It also extended the initial Mexican cutback commitments made under Minute 319 (which were similar in structure to the 2007 cutbacks negotiated for Lower Basin states) and established a Binational Water Scarcity Contingency Plan that included additional cutbacks that would be triggered if DCPs are approved by U.S. basin states (see the following section, "2019 Drought Contingency Plans").

2019 Drought Contingency Plans

Ongoing drought conditions and the potential for water supply shortages prompted discussions and negotiations focused on how to conserve additional basin water supplies. After several years of

[109] *System water* refers to water that is provided to increase water supplies as a whole, without being directed toward additional consumptive use for specific contractors or water users.

[110] Agreement Among the United States of America, Through the Department of the Interior, Bureau of Reclamation, the Central Arizona Water Conservation District, the Metropolitan Water District of Southern California, Denver Water, and the Southern Nevada Water Authority, for a Pilot Program for Funding the Creation of Colorado River System Water Through Voluntary Water Conservation and Reductions in Use, Agreement No. 14-XX-30-W0574, July 30, 2014, at https://www.usbr.gov/lc/region/programs/PilotSysConsProg/PilotSCPFundingAgreement7-30-2014.pdf.

[111] Lower Colorado Region, "Pilot System Conservation Program," at https://www.usbr.gov/lc/region/programs/PilotSysConsProg/pilotsystem.html. Accessed January 17, 2023.

[112] For more information, see Upper Colorado River Commission, "System Conservation Pilot Program," at http://www.ucrcommission.com/system-conservation-pilot-program/.

[113] For more information on the 1994 U.S.-Mexico Water Treaty and Colorado River water sharing issues with Mexico, see CRS Report R45430, *Sharing the Colorado River and the Rio Grande: Cooperation and Conflict with Mexico*, by Nicole T. Carter, Stephen P. Mulligan, and Charles V. Stern.

[114] International Boundary & Water Commission, "Minutes between the United States and Mexican Sections of the IBWC," at https://www.ibwc.gov/Treaties_Minutes/Minutes.html.

negotiations, on March 19, 2019, Reclamation and the Colorado River Basin states finalized DCPs for both the Upper Basin and the Lower Basin. These plans, which are an overlay of the 2007 Interim Guidelines discussed above, required final authorization by Congress to be implemented. Congress approved the plans on April 16, 2019, in the Colorado River Drought Contingency Plan Authorization Act; like the 2007 guidelines, these plans are scheduled to be in place through 2026. At the time of their enactment, the combined efforts represented by the DCPs were expected to cut the risk of Colorado River reservoirs reaching critically low elevations by approximately 50 %.[115] Each of the basin-level DCPs is discussed below in more detail.

Upper Basin Drought Contingency Plan

The Upper Basin DCP aims to protect against Lake Powell reaching critically low elevations through coordinated Upper Basin reservoir operations. It also authorizes storage of conserved water in the Upper Basin that would serve as the foundation for a water use reduction effort (i.e., a *Demand Management Program*) that may be developed in the future.[116]

Under the Upper Basin DCP's Drought Response Operations Agreement (DROA), the Upper Basin states agree to operate system units to keep the surface of Lake Powell above 3,525 feet, which is 35 feet above "minimum power pool" (i.e., 3,490 feet, the minimum elevation needed to run the dam's hydroelectric plant). Under DROA, the two main mechanisms to do this are altering the timing of releases from Glen Canyon Dam and operating "initial unit" reservoirs on the mainstem of the Colorado River (e.g., Navajo Reservoir, Blue Mesa Reservoir, and Flaming Gorge Reservoir) to protect Lake Powell elevations, potentially through storage drawdown. Operational changes may occur either through DROA's emergency provisions, which allow the Secretary of the Interior to make supplemental water deliveries at his or her discretion (after consultation with basin states), or through a planning process establishing formal triggers for Upper Basin water deliveries to Lake Powell, based on agreed-upon hydrological targets.

The other primary component of the Upper Basin DCP, the Upper Basin DCP Demand Management Program, has not been formally established. It would entail willing seller/buyer agreements allowing for temporary paid reductions in water use that would provide for more storage volume in Lake Powell. As noted, the Upper Colorado River Commission operated an Upper Basin System Conservation Pilot Program from 2015 to 2018; that program compensated water users for temporary, voluntary efforts that resulted in additional water conserved in Lake Powell. A future Upper Basin DCP Demand Management Program may expand on some of those efforts.

Due to falling lake levels, Reclamation implemented drought response operations under DROA that led to reduced storage in other Upper Basin mainstem reservoirs in 2021 and 2022.[117] Separately, Reclamation also began planning efforts under DROA, known as the *Drought Response Operations Plan*, and approved this plan in 2022.[118] Reclamation modeling indicates that these efforts, combined with improved hydrology in 2023, are expected to stabilize Lake Powell storage levels in the next two years (**Figure 5**).

[115] U.S. Congress, House Committee on Natural Resources, Subcommittee on Water, Oceans, and Wildlife, *Oversight Hearing on the Colorado River Drought Contingency Plan*, 116th Cong., 1st sess., March 28, 2019, H.Hrg. 116-10 (Washington: GPO, 2019). Hereinafter, *2019 House Natural Resources DCP Hearing*.

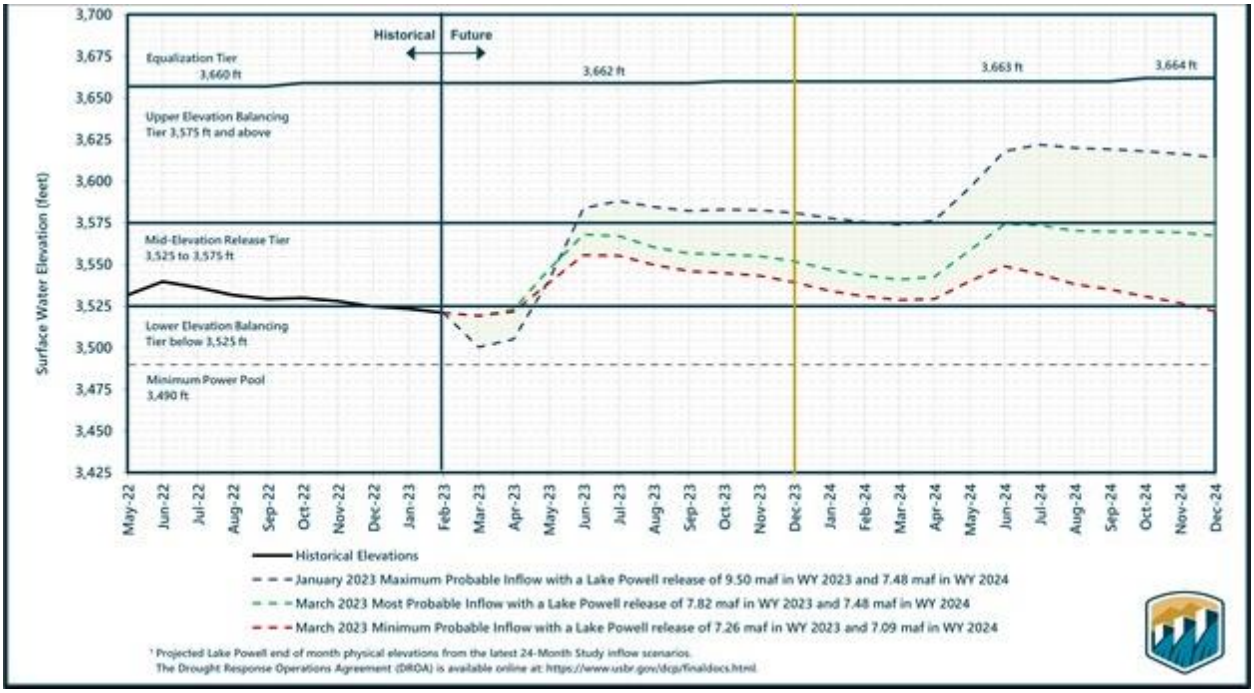
[116] While such a mechanism exists for the Lower Basin, a comparable program has not been developed in the Upper Basin.

[117] For example, in 2021, 180,000 AF was transferred to Lake Powell from Flaming Gorge Reservoir (125,000 AF), Blue Mesa Reservoir (36,000 AF), and Navajo Reservoir (20,000 AF).

[118] For more information, see Reclamation, Colorado River Basin Drought Contingency Plans, at "Drought Response Operations Agreement," at https://www.usbr.gov/dcp/droa.html.

Figure 5. Lake Powell End-of-Month Elevation Projections

(January and March 2023 24-month study inflow scenarios)



Source: U.S. Bureau of Reclamation, "24-Month Study Projections," March 2023, at https://www.usbr.gov/lc/region/g4000/riverops/24ms-projections.html.

Notes: WY = Water Year. DROA = Drought Response Operations Agreement.

Lower Basin Drought Contingency Plan

The Lower Basin DCP is designed to require Arizona, California, and Nevada to curtail deliveries and thereby contribute additional water to Lake Mead storage at predetermined "trigger" elevations. It is also designed to create additional flexibility to incentivize voluntary conservation of water to be stored in Lake Mead, thereby increasing lake levels. Under the DCP, Nevada and Arizona (which were already set to have their supplies curtailed beginning at 1,075 feet under the 2007 Interim Guidelines) have committed to contributing additional supplies to maintain higher lake levels (i.e., beyond previous commitments). These reductions begin at 1,090 feet and would reach their maximums when reservoir levels drop below 1,025 feet. The Lower Basin DCP includes—for the first time—delivery cutbacks for California. These curtailments begin with a 200,000 AF delivery reduction at Lake Mead elevations between 1,040 and 1,045 feet and would increase by 50,000 AF for each additional 5 foot drop in Lake Mead elevation below 1,040 feet, to as much as 350,000 AF at elevations of 1,025 feet or lower.

The curtailments in the Lower Basin DCP are in addition to those agreed to under the 2007 Interim Guidelines and under Minute 323 with Mexico. Specific and cumulative reductions are shown in **Table 1**. In addition to the state-level reductions, under the Lower Basin DCP Reclamation also agreed to pursue efforts to add 100,000 AF or more of system water within the basin. Some of the largest and most controversial reductions under the Lower Basin DCP were committed to by Arizona, where pursuant to previous changes under the 2004 AWSA, a large group of agricultural users were already facing major cutbacks to their CAP water supplies prior to the enactment of DCP.

Table 1. Lower Basin Water Delivery Curtailment Volumes Under Existing Agreements

(values in thousands of acre-feet)

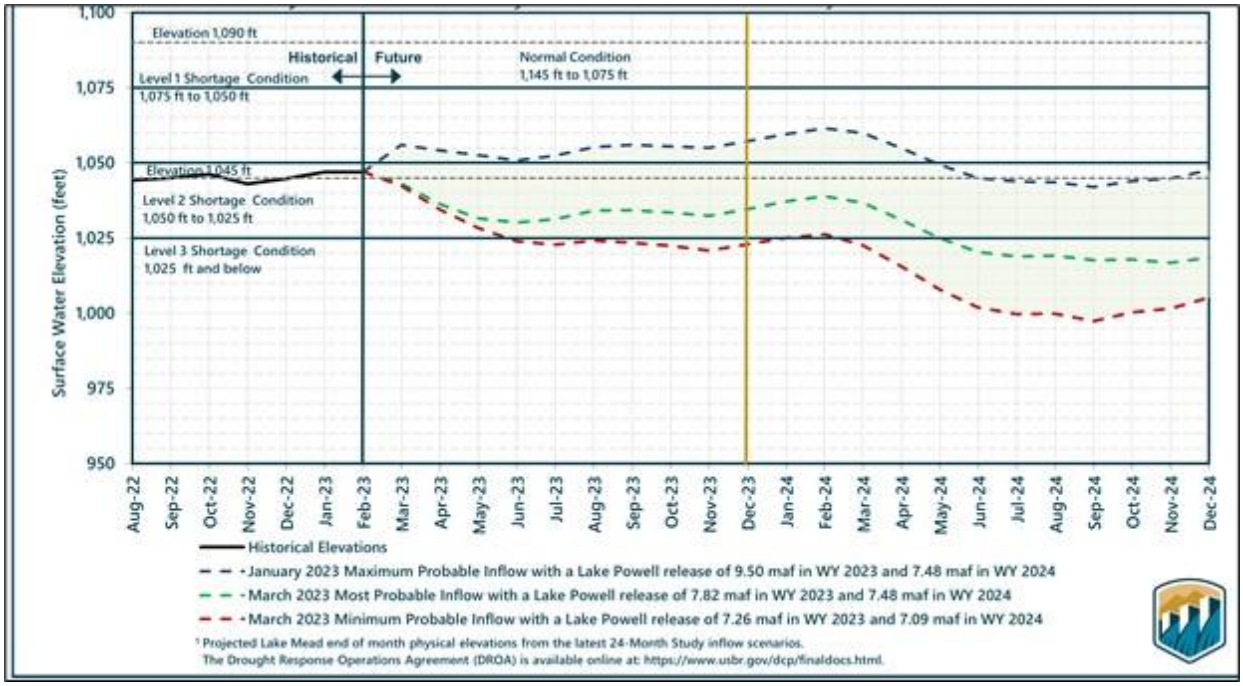
Lake Mead Elevation (ft)	2007 Interim Shortage Guidelines		Minute 323 Delivery Reductions	DCP Curtailment			Binational Water Scarcity Conting. Plan	Total Volume of Curtailment (% of Lower Colorado River Apportionment)				
	AZ	NV	Mexico	AZ	NV	CA	Mexico	AZ	NV	CA	Lower Basin	Mexico
1,090 ->1,075	0	0	0	192	8	0	41	192 (6.8%)	8 (2.6%)	0 (0%)	200	41
1,075 ->1,050	320	13	50	192	8	0	30	512 (18.2%)	21 (7%)	0 (0%)	533	80
1,050 ->1,045	400	17	70	192	8	0	34	592 (21.1%)	25 (8.3%)	0 (0%)	617	104
1,045 ->1,040	400	17	70	240	10	200	76	640 (22.8%)	27 (9.0%)	200 (4.5%)	867	146
1,040 ->1,035	400	17	70	240	10	250	84	640 (22.8%)	27 (9.0%)	250 (5.6%)	917	154
1,035 ->1,030	400	17	70	240	10	300	92	640 (22.8%)	27 (9.0%)	300 (6.8%)	967	162
1,030 - 1,025	400	17	70	240	10	350	101	640 (22.8%)	27 (9.0%)	350 (7.9%)	1,017	171
<1,025	480	20	125	240	10	350	150	720 (22.8%)	30 (10.0%)	350 (7.9%)	1,100	275

Sources: Table by CRS, using data in the 2007 Interim Shortage Guidelines, Minute 323 between Mexico and the United States, *Lower Basin Drought Contingency Plan*, and the Binational Water Scarcity Contingency Plan in Minute 323 between Mexico and the United States.

In 2019, at the time of the passage of the Colorado River Drought Contingency Plan Authorization Act, Reclamation asserted that the Lower Basin DCP would significantly reduce the risk of Lake Mead elevations falling below critical elevation of 1,020 feet.[119] Combined with the commitments from Mexico, total planned cutbacks under shortage scenarios (i.e., all commitments to date, combined) were expected to decrease Lower Basin consumptive use by 241,000 AF to 1.375 MAF per year, depending on the curtailments triggered by Lake Mead's elevation.[120] Despite these efforts, Lake Mead has continued to decline since the Lower Basin DCP was finalized, and is projected to continue to decline despite improved hydrology in 2023 (**Figure 6**). These developments have triggered additional Lower Basin conservation efforts.

Figure 6. Lake Mead End of Month Elevation Projections

(January 2023 and March 2023 24-month study inflow scenarios)



Source: U.S. Bureau of Reclamation, "24-Month Study Projections," March 2023, at https://www.usbr.gov/lc/region/g4000/riverops/24ms-projections.html.

2023 Draft Supplemental Environmental Impact Statement

At a June 14, 2022, Senate hearing, the Commissioner of Reclamation announced that basin states would need to conserve between 2 MAF and 4 MAF in 2023 and 2024 to protect Lake Mead and Lake Powell storage volumes over the near-term (2023-2026) period.[121] These amounts would be *in addition* to the previous commitments discussed above. At the time, the

[119] 2019 House Natural Resources DCP Hearing.

[120] For a summary of the curtailments that add up to this amount, see "1,090 - >1,075" row of **Table 1**.

[121] U.S. Congress, Senate Committee on Energy and Natural Resources, *Short And Long Term Solutions To Extreme Drought In The Western U.S.*, Statement of the Honorable Camille Touton, 117th Cong., 2nd sess., June 14, 2022. Hereinafter, 2022 Drought Hearing. These amounts were based on a 2022 Reclamation analysis. See Reclamation, "Colorado River System Mid Term Projections," June 16, 2022, at https://www.usbr.gov/ColoradoRiverBasin/documents/20220616-ColoradoRiverSystemMid-termProjections-Presentation.pdf.

Commissioner noted that if the targets were not met with voluntary actions by the states by August 2022, DOI was prepared to act unilaterally.[122]

No major water savings commitments were announced in response to Reclamation's June statement.[123] In late October 2022, Reclamation announced its intent to revise the 2007 Interim Guidelines in 2023 and 2024 (i.e., prior to post-2026 operational changes to the guidelines, which are proceeding separately) so as to address continued low runoff conditions in the basin. As part of the proposed guideline modifications, Reclamation published its notice of intent to prepare a supplemental environmental impact statement (SEIS) in the *Federal Register* in November 2022.[124] In the SEIS, Reclamation is analyzing alternatives for three areas of the 2007 guidelines: Lake Mead operations during shortage conditions, coordinated operation of Lake Powell and Lake Mead, and midyear review for implementation of the operational guidelines. Reclamation indicated that it would, among other things, consider a "framework agreement" alternative developed as a "consensus-based" set of actions from states and others.[125]

On January 31, 2023, all of the basin states except California submitted a combined proposal for Reclamation modeling (the *Six State Proposal*) in response to the November SEIS notice.[126] California submitted its own proposal (the *California Proposal*) separately.[127] The Six State Proposal requested that Reclamation model in its SEIS 1.543-1.943 MAF per year in new delivery reductions on Lower Colorado River Basin contractors (i.e., reductions in addition to previous commitments). Those additional reductions would be implemented through two mechanisms. First, reductions to account for 1.543 MAF of evaporative losses (referred to as an *Infrastructure Protection Volume*) would be allocated among Lower Basin contractors and Mexico, which would be assessed at most Lake Mead elevations based on stream reach (i.e., position in the basin relative to bodies of water affected by evaporation) and recent consumptive use levels.[128] Second, additional operational tier changes and delivery reductions are tied to Lake Mead elevations of 1,050 feet and lower.[129] The Six State Proposal's cumulative reductions from current levels would be proportionally greater for California than for Arizona and Nevada.[130] For its part, the California Proposal would include 1.0-1.95 MAF per year in new delivery reductions for Lower Basin contractors (not varying based on evaporation), depending on Lake Mead

[122] 2022 Drought Hearing.

[123] In a July 18, 2022, letter to Reclamation, the Upper Colorado River Commission declined to contribute a specific volume of cutbacks to these efforts, and instead laid out a five-point plan as the basis for its water conservation efforts. Letter from Charles Cullom, Director, Upper Colorado River Commission, to Camille Touton, Commissioner, U.S. Bureau of Reclamation, July 18, 2022, at http://www.ucrcommission.com/wp-content/uploads/2022/07/2022-July-18-Letter-to-Reclamation.pdf.

[124] Bureau of Reclamation, "Notice of Intent To Prepare a Supplemental Environmental Impact Statement for December 2007 Record of Decision Entitled Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations For Lake Powell and Lake Mead," 87 *Federal Register* 69042, November 17, 2022. Hereinafter, November 2022 Notice.

[125] November 2022 Notice.

[126] Letter from Colorado River Basin State Representatives of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming to Tanya Trujillo, Assistant Secretary, Water & Science, U.S. Department of the Interior, January 31, 2023. Hereinafter, Six State Proposal.

[127] Letter from Colorado River Board of California to Deputy Interior Secretary Tommy Beaudreau et al., U.S. Department of the Interior, January 31, 2023. Hereinafter, California Proposal.

[128] This amount also assumes the assessment of evaporative losses on Mexico.

[129] Six State Proposal. These reductions would move the current Tier 3 reduction schedule (which begins at 1,025 feet) up to a Lake Mead elevation of 1,050 feet, and would institute additional delivery reductions at Lake Mead elevations of 1,030 feet or lower.

[130] CRS analysis of Six State Proposal.

elevations. These reductions would be phased in on a schedule, starting with 1.0 MAF in reductions at a Lake Mead elevation of 1,045 feet, with additional reductions beyond that amount beginning at 1,025 feet. For the first 1.0 MAF, the California Proposal's reductions would be proportionally greater for Arizona and Nevada than for itself; the state also did not assume any reductions for Mexico.[131] Both state proposals also suggest changes to Lake Powell's operational tiers to allow more water to be left in that reservoir, although they would do so in different ways.

On April 11, 2023, Reclamation released its draft SEIS.[132] The document included modeling for a "no action" alternative and two action alternatives. The primary difference between the two action alternatives is the approach for apportioning reductions for new shortage operations at Lake Mead. Action Alternative 1 assumes additional reductions based on priority order of water rights.[133] Action Alternative 2 assumes the Secretary would use existing federal authorities to impose the same percentage-based delivery reductions on all Lower Basin users, regardless of water rights priority.[134] Both alternatives would impose an equal amount of additional reductions in 2024 (0.20-1.166 MAF), which are tied to Lake Mead elevations. These additional reductions would result in cumulative 2024 reductions (i.e., including all prior commitments) of up to 2.083 MAF. The differing methodologies for the two alternatives would result in almost all reductions being borne by Arizona and Nevada under Alternative 1, whereas Alternative 2 would apportion reductions among Lower Basin users in all states based on water usage.[135]

Reclamation's draft SEIS also models potential additional curtailments of 0.167-1.917 MAF in 2025 and 2026 if Lake Mead falls below 1,035 feet in those years (**Figure 7**). While the 2024 reductions in the draft SEIS are generally less than those contemplated in the state proposals, the 2025 and 2026 reductions would be greater than those proposed by the states if adopted and added to the 2024 reductions. **Table 3** shows how 2025-2026 reductions would be apportioned at the state level.

[131] The proposal did not specify the allocation of reductions in excess of 1.0 MAF.

[132] Bureau of Reclamation, *Near Term Colorado River Operations*, Draft Supplemental Environmental Impact Statement, April 2023, at https://www.usbr.gov/ColoradoRiverBasin/SEIS.html. Hereinafter, 2023 Draft SEIS.

[133] As explained in the draft SEIS, "[p]riority refers the distribution of Colorado River water in the Lower Division States of Arizona, California, and Nevada as subject to laws, judicial rulings and decrees, contracts, interstate compacts, and operating criteria, known as the "Law of the River," which apportion available water between the states and establish certain priorities in use." 2023 Draft SEIS at pp. 2-7.

[134] The draft SEIS did not include reductions based on evaporation similar to the Six State State Proposal, although the apportionment of reductions based on water use is in effect similar to the evaporative loss-based approach. Additionally, the draft SEIS explains that Alternative 2 incorporates priority-based reductions from the existing 2007 Interim Guidelines and 2019 drought contingency plans, and then imposes the same percentage of additional reductions to all lower basin users in order to achieve the same total level of reductions as Alternative 1. Ibid., pp. 2-14.

[135] The Supreme Court has determined the Secretary of the Interior is not bound by a single approach to addressing Colorado River supply shortages in the Lower Basin. See Arizona v. California, 373 U.S. at 593. The Court stated that the Secretary may consider reducing Lower Basin deliveries proportionally to statutory allocations of the first 7.5 MAF (California 4.4/7.5, Arizona 2.8/7.5, and Nevada 0.3/7.5), but the Secretary also has the authority and discretion to elect an alternate basis for apportioning shortages, subject to statutory constraints. Ibid., pp. 592–593.

Table 2. Proposed New 2024 Lower Colorado River Basin State Water Curtailments in SEIS Action Alternatives

Additional Water Delivery Reductions (in 1,000 acre-feet) Beyond Baseline

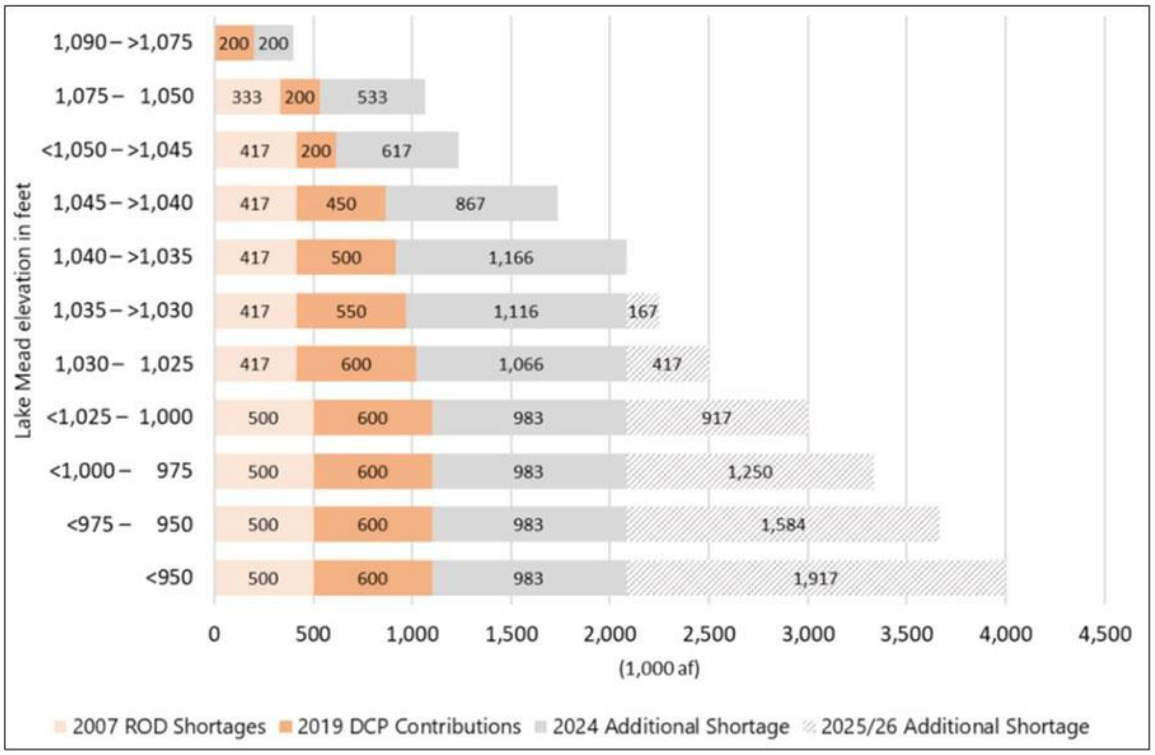
	Action Alternative 1			Action Alternative 2		
Lake Mead Elevation (ft)	**AZ**	**NV**	**CA**	**AZ**	**NV**	**CA**
1,090-1,075	192	8	—	75	8	117
1,075-1,050	511	22	—	199	2	313
1,010-1,045	593	24	—	230	25	362
1,045-1,040	1,025	42	—	324	35	509
1,040-1,035	1,098	56	12	435	47	684
1,035-1,030	1,098	56	—	417	45	655
1,030-1,025	1,098	56	—	398	43	625
1,025-1,000	1,018	53	—	367	39	577
1,000-975	1,018	53	—	367	39	577
975-950	1,018	53	—	367	39	577
<950	1,018	53	—	367	39	577

Source: CRS, based on Bureau of Reclamation, *Near Term Colorado River Operations*, Draft Supplemental Environmental Impact Statement, April 2023.

Notes: SEIS = Supplemental Environmental Impact Statement.

Figure 7. Modeled Lower Basin Shortages and Existing Contributions, 2023 Draft SEIS

Potential Shortage Contributions by Agreement/Source



Source: Bureau of Reclamation, *Near Term Colorado River Operations*, Draft Supplemental Environmental Impact Statement, April 2023.

Notes: SEIS = Supplemental Environmental Impact Statement; DCP = Drought Contingency Plan; 2007 ROD = 2007 Interim Guidelines Record of Decision.

Table 3. 2025-2026 Lower Colorado River Basin State Water Cuts in SEIS Action Alternatives

Additional Water Delivery Reductions (in 1,000 acre-feet) Beyond Baseline Agreements

	Action Alternative 1			Action Alternative 2		
Lake Mead Elevation (ft)	**AZ**	**NV**	**CA**	**AZ**	**NV**	**CA**
1,090-1,075	192	8	—	75	8	117
1,075-1,050	511	22	—	199	2	313
1,010-1,045	593	24	—	230	25	362
1,045-1,040	1,025	42	—	324	35	509
1,040-1,035	1,098	56	12	435	47	684
1,035-1,030	1,131	63	89	479	51	753
1,030-1,025	1,180	73	230	554	59	870
1,025-1,000	1,198	90	612	709	76	1,115
1,000-975	1,263	103	867	834	89	1,310

Lake Mead Elevation (ft)	Action Alternative 1			Action Alternative 2		
	AZ	NV	CA	AZ	NV	CA
975-950	1,329	117	1,122	958	103	1,510
<950	1,394	130	1,376	1,083	116	1,701

Source: CRS, based on Bureau of Reclamation, *Near Term Colorado River Operations*, Draft Supplemental Environmental Impact Statement, April 2023.

Notes: SEIS = Supplemental Environmental Impact Statement.

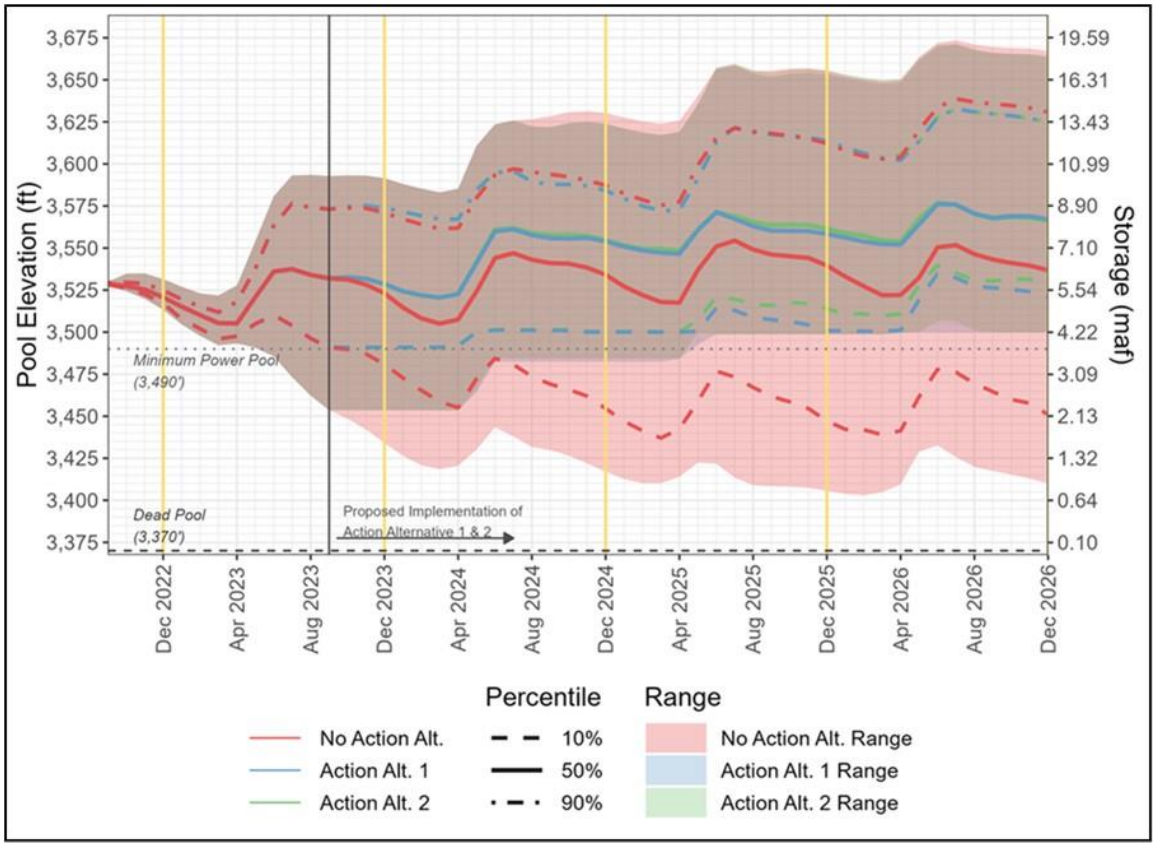
Outside of the approach to Lower Basin shortage operations, the action alternatives include similar proposals for other areas within the scope of the SEIS. For instance, both alternatives would alter Lake Powell releases so that, at lower Lake Powell levels, releases would be below the compact's required average of 7.5 MAF per year (potentially as low as 6.0 MAF per year).[136] Both also would allow for midyear review of Lake Mead hydrology and operations to increase reductions for Lower Basin users outside of the current August determination window for future year operations.

Reclamation's draft SEIS analysis projects that both action alternatives would significantly reduce the chances of Lake Powell reaching minimum power pool in 2024-2026 (**Figure 8**). For Lake Mead, Reclamation projects that the alternatives would initially reduce reservoir storage in 2023 and 2024 (due to reduced releases from Lake Powell), before increasing these storage levels in 2025 and 2026 (**Figure 9**). Reclamation also projects that the action alternatives would keep Lake Mead above its minimum power pool level (950 ft) under most scenarios. The SEIS analyzes a variety of other projected impacts associated with each alternative, as well as additional analysis of the likely cuts for individual contractor groups within each state.[137]

[136] At Lake Powell elevations between 3,500 and 3,525 feet, releases to the Lower Basin would be maintained at 6.0 MAF. At elevations below 3,500 feet, releases could be further reduced.

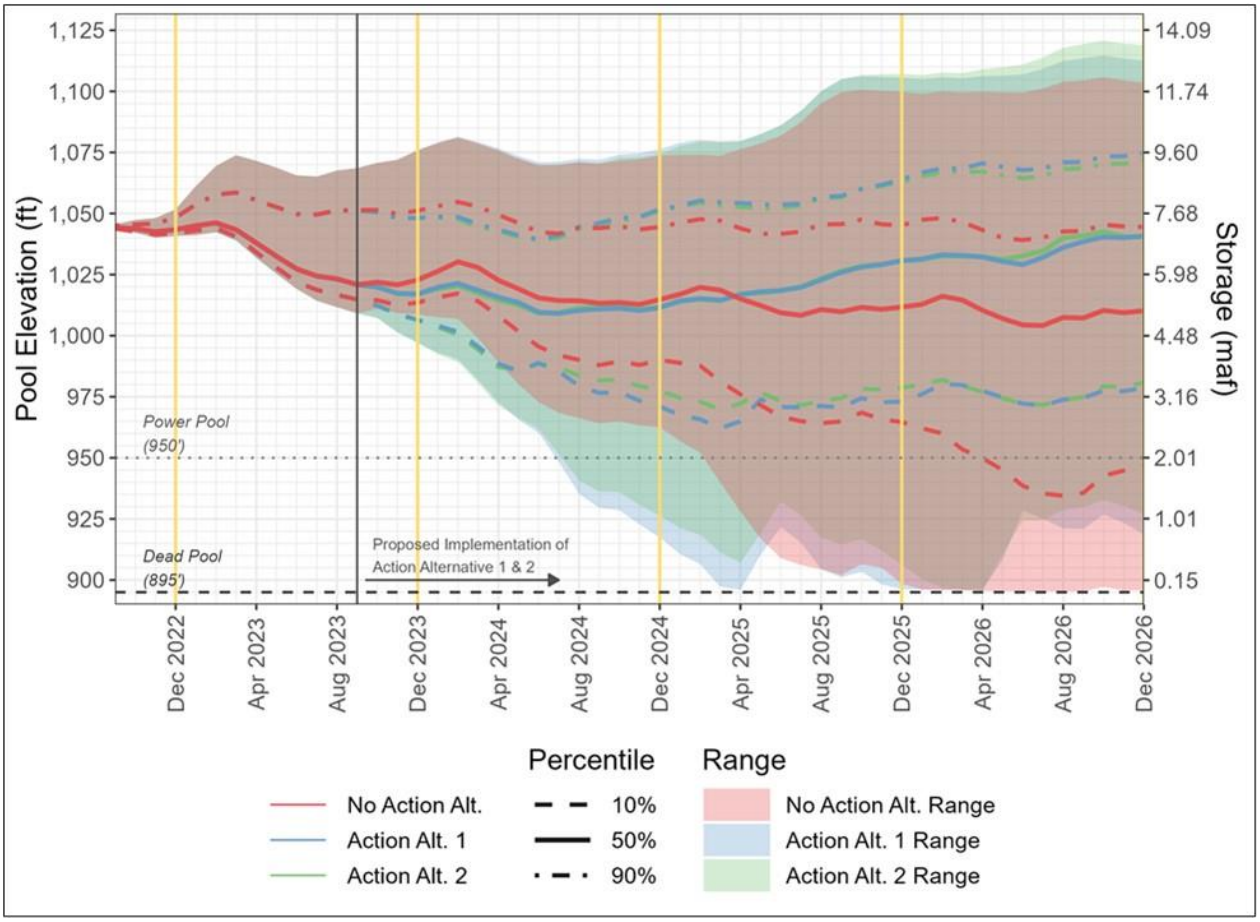
[137] See 2023 Draft SEIS, pp 2-24–2-38.

Figure 8. Lake Powell Projected Pool Elevations for 2023 SEIS Alternatives



Source: Bureau of Reclamation, *Near Term Colorado River Operations*, Draft Supplemental Environmental Impact Statement, April 2023.

Figure 9. Lake Mead Projected Pool Elevations for 2023 SEIS Alternatives



Source: Bureau of Reclamation, *Near Term Colorado River Operations*, Draft Supplemental Environmental Impact Statement, April 2023.

When Reclamation released the draft SEIS, departmental officials framed the SEIS alternatives as "bookends" meant to define the problem and motivate state officials to collaborate on a compromise option in the final SEIS.[138] For example, the department stated that it does not plan to adopt an approach based entirely on the Law of the River; to date no state (including California) has advocated for such an approach.[139] The draft SEIS must undergo a 45-day public comment period, and a final SEIS is expected to be released in summer 2023.

Issues for Congress

Funding and Oversight of Existing Facilities and Programs

The principal role of Congress as it relates to storage facilities on the Colorado River is funding and oversight of facility operations, construction, and programs to protect and restore listed species (e.g., Glen Canyon Dam Adaptive Management Program and the Upper Colorado River

[138] Jennifer Yachnin, "Interior Offers Extremes on Colorado River Cuts to Spur Compromise," *E&E News*, April 11, 2023.

[139] Ibid.

Endangered Fish Program). In the Upper Basin, Colorado River facilities include the 17 active participating units in the Colorado River Storage Projects, as well as the Navajo-Gallup Water Supply Project. In the Lower Basin, major facilities include the Salt River Project and Theodore Roosevelt Dam, Hoover Dam and All-American Canal, Yuma and Gila Projects, Parker-Davis Project, Central Arizona Project, and Robert B. Griffith Project (now Southern Nevada Water System).

Congressional appropriations in support of Colorado River projects and programs typically account for a portion of overall project budgets. For example, in FY2020, approximately 40% of Lower Colorado River Region's overall budget was funded with discretionary appropriations, with the remainder of funding coming from power revenues (which are made available without further appropriation) and nonfederal partners.[140] In recent years, Congress has also authorized and appropriated funding that has targeted the Colorado River Basin in general (e.g., the Pilot System Conservation Plan). Congress may choose to extend or amend authorities specific to the basin or alter basin funding levels.

While discretionary appropriations for the Colorado River are of ongoing interest to Congress, Congress has also addressed Colorado River funding outside of the regular appropriations process. In the 117th Congress, in Section 50233 of (popularly known as the Inflation Reduction Act, IRA), Congress provided $4.0 billion for projects that mitigate drought in the 17 arid and semiarid *reclamation states* in the West,[141] with priority given to Colorado River Basin activities. This funding is available through FY2026 and may be used for a variety of activities, including some of the previously authorized activities discussed above, as well as compensation for new efforts. Reclamation announced initial plans for this funding on October 12, 2022, in the form of a new program, the *Lower Colorado River Basin System Conservation and Efficiency Program*.[142] The program has three components:

- Under the first component (1a), Colorado River water delivery contractors or entitlement holders submitted proposals resulting in water remaining in Lake Mead at a set price of $330 per acre-foot for a one-year agreement, $365 per acre-foot for a two-year agreement, and $400 per acre-foot for a three-year agreement. These proposals were due in November 2022.
- For the second component (1b), Reclamation accepted proposals for additional water conservation and efficiency projects that could involve a variety of pricing options as proposed by Colorado River water delivery contractors or entitlement holders. These proposals were due in November 2022.
- The third component (2) would allow for proposals to be submitted in early 2023 for long-term system efficiency improvements that will result in multi-year system conservation. These proposals were expected to be solicited in early 2023.

While some agreements under this program have been announced,[143] the full magnitude of water savings that might result from these voluntary agreements is unclear. If the agreements are

[140] Reclamation, *Lower Colorado Region Annual Report, Fiscal Years 2019 & 2020*.

[141] *Reclamation states* refers to the 17 states designated by Congress to be in the Reclamation service area, pursuant to the Reclamation Act of 1902, as amended. 34 Stat. 259.

[142] Reclamation, "Biden-Harris Administration Announces New Steps for Drought Mitigation Funding from Inflation Reduction Act," Press Release, October 12, 2022, at https://www.usbr.gov/newsroom/news-release/4353.

[143] For example, in April 2023, the Biden Administration announced an agreement with the Gila River Indian Community to conserve 125,000 AF of water per year (for three years) with $50 million of IRA funding, as well as an agreement with the Coachella Valley Water District to conserve 30,000 AF of water per year (for three years) with $12

successful, future federal funding similar to that provided in the IRA may continue to be requested to mitigate the effect of long-term drought in the basin and the shift away from current water consumption levels.

In addition to the aforementioned new program being implemented with IRA funding, the Administration also announced that $250 million of the act's funding would go toward Salton Sea restoration activities over the 2022-2026 timeframe.[144] Restoration of the Sea is a high priority of the Imperial Irrigation District, one of the largest water rights holders on the Colorado River.[145]

Tribal Water Rights Settlements and Leasing

Many tribal water rights are senior to other water rights in the basin, and thus are likely to play an important role in the future of the Colorado River. The extent to which tribes develop their water rights, or are willing and able to market their water to other users, has ramifications for water availability in the basin. The 117th Congress authorized a new Indian water rights settlement related to one tribe's rights to Colorado River water (the Hualapai Settlement,) and enacted a new authority for the Colorado River Indian Tribes, one of the largest water rights holders on the river, to enter into agreements to lease a portion of the tribes' Colorado River water (the Colorado River Indian Tribes Water Resiliency Act of 2022,).[146] As previously noted, Congress has approved Indian water rights settlements associated with more than 2.5 MAF of tribal diversion rights on the Colorado River (these rights are a subset of the water allocations per state in which they are located); a portion of this water has been developed to date. Congress may be asked to consider new settlements that would add to this total.

New Facilities and Other Alterations

Some states may pursue further development of their unused Colorado River water (i.e., rather than cutting their use). For example, one project that would develop Upper Basin waters, the proposed Lake Powell Pipeline (LPP), would direct approximately 86,000 AF of Utah's Upper Basin Colorado River Basin annual apportionment from Lake Powell to Washington County, UT (i.e., the St. George, UT, area, which is technically located within the Lower Basin drainage area).[147] The pipeline would begin near Glen Canyon Dam in Arizona and would run through Arizona and Utah to Sand Hollow Reservoir near St. George, UT. Reclamation is the lead agency for the project under NEPA and is coordinating an environmental impact statement (EIS) for the most recently proposed version of the project.[148]

million in IRA funding. See White House, "Fact Sheet: Biden-Harris Administration Announces New Investments to Protect the Colorado River System," April 6, 2023.

[144] Reclamation, "Inflation Reduction Act Funds Landmark Agreements to Accelerate Salton Sea Restoration," Press Release, November 28, 2022, at https://www.usbr.gov/newsroom/news-release/4380.

[145] For more on Salton Sea restoration, see CRS In Focus IF11104, *Salton Sea Management and Restoration Efforts*, by Pervaze A. Sheikh and Charles V. Stern.

[146] Prior to the legislation's enactment, these tribes, who were awarded their water rights under the Arizona v. California decree, were not able to lease their water. This is not the case for most other tribes with Colorado River water rights.

[147] While St. George, UT, is technically within the Lower Colorado River Basin's drainage, Utah's state allocation comes out of waters available to the Upper Basin. Thus, the LPP would utilize Upper Basin waters.

[148] For project NEPA documents and studies, see https://www.usbr.gov/uc/DocLibrary/EnvironmentalImpactStatements/LakePowellPipeline/index.html#intro.

The debate over the Lake Powell Pipeline is illustrative of the issues future water development proposals may face in the basin. Supporters argue that the pipeline is needed to provide a secondary water source for the St. George area (in addition to its primary water source from the Virgin River). However, environmental groups have argued that the proposed development and diversion of additional Upper Basin waters is ill-advised in light of climate change and the basin's over-allocation.[149] The six other Colorado River Basin states have raised concerns related to the proposed LPP's "legal and operational issues," and have criticized the use of the LPP NEPA process as a de facto forum for resolving a conflict among basin states. The six states previously requested that Reclamation refrain from issuing a final EIS until these issues can be resolved on a consensus basis.[150]

Some groups that oppose new infrastructure development on the Colorado River also have proposed demolition of *existing* infrastructure, in particular Glen Canyon Dam. They argue that removing the dam would be beneficial to listed species and the Grand Canyon's ecosystem and would be a cheaper and less politically problematic option than other options (e.g., fallowing Upper Basin farms to conserve water).[151] For their part, water and power users and most governmental entities oppose these efforts for their potential negative economic impact. Reclamation reports that it is accelerating maintenance actions at Glen Canyon Dam to determine the reliability of using river bypass tubes at the dam to enable Lower Basin releases at storage levels below minimum power pool.[152] Reclamation is also studying the efficacy of physical modifications to Glen Canyon Dam to allow for releases below critical elevations.[153] Removing or significantly altering Glen Canyon Dam would likely require authorization by Congress.

Post-2026 Operations/Agreements

Congress is likely to remain interested in the status of long-term drought in the basin and in the implementation of the DCPs and other related agreements, including their ability to stem further delivery curtailments and add water to the basin's storage reservoirs.[154] Congress also may be interested in broader basin planning. Federally led efforts to finalize operational changes proposed in the 2023 draft SEIS, and to extend the 2007 Interim Guidelines (including the DCPs) beyond the end of 2026, will frame future management of the Colorado River. New agreements that would protect water supplies in both the short and long term may result in additional congressional involvement in basin management in the form of oversight and the consideration of new authorities and/or funding.

[149] Letter from Utah Rivers Council et al. to Rick Baxter, Program Manager, Bureau of Reclamation Provo Area Office, September 8, 2020.

[150] Letter from Colorado River Basin States Representatives of Arizona, California, Colorado, Nevada, New Mexico, and Wyoming to Secretary of the Interior David Bernhardt, September 8, 2020.

[151] Save the Colorado, "Save the Colorado's Policies for Renegotiation of the 2007 Interim Guidelines for Management of the Colorado River," Press Release, November 29, 2022.

[152] Reclamation, "Interior Department Announces Actions to Protect Colorado River System, Sets 2023 Operating Conditions for Lake Powell and Lake Mead," August 16, 2022.

[153] Ibid.

[154] For instance, 2021 and 2022 hearings on drought in the western United States included extensive discussion of drought conditions in the Colorado River Basin. See U.S. Congress, House Committee on Natural Resources, Subcommittee on Water, Oceans, and Wildlife, *The Status of Drought Conditions Throughout the Western United States*, 117th Cong., 1st sess., May 25, 2021 and U.S. Congress, Senate Committee on Energy and Natural Resources, *Short and Long-Term Solutions to Extreme Drought in the Western United States*, 117th Cong., 2nd sess., June 14, 2022.

Concluding Observations

There is wide acknowledgement that existing directives for managing Colorado River Basin waters are inadequate to address the ongoing persistent drought and water uses and do not account for the basin's current and projected hydrology. The original basis for the Colorado River Compact assumed more water than turned out to be available for consumptive uses, and a drought dating to 2000 has exacerbated this issue. Although recent agreements have marginally reduced usage, basin-wide consumptive use (including evaporation) has continued to exceed natural flows in most years. The resulting drawdown of basin storage has left Lakes Mead and Powell at historically low levels that threaten both hydropower production and water deliveries throughout the basin. Water flow projections estimate that flows will continue to decrease, whereas new demands and diversions (e.g., development of tribal water rights) suggest that competition for this water among users will continue to increase.

Despite agreement that some level of water delivery cutbacks will be necessary to protect power generation and reservoir storage, there remain considerable differences of opinion as to what form these actions should take. The question of which entities to subject to water delivery reductions and of what magnitude, as well as what sort of mitigation might accompany these efforts, take on an added level of urgency due to the river's economic importance to many areas. The relative importance of established water rights priorities in the basin, compared to priority for health, safety, and other uses, is a central issue currently facing decisionmakers. Other questions, including what changes to infrastructure (e.g., alterations to dam and water delivery infrastructure), accounting (e.g., whether and how to account for evaporation in the Lower Basin), and/or the basis for basin water management (e.g., water allocations based on inflows rather than set amounts) are also likely to figure into future discussions and negotiations.

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