CURRENT PLANNING ENVIRONMENT

THIS CHAPTER PROVIDES AN OVERVIEW OF CURRENT AND EMERGING ISSUES THAT ARE LIKELY TO INFLUENCE WATER SUPPLY AND DEMAND CONDITIONS IN SOUTHERN NEVADA OVER THE 50-YEAR PLANNING HORIZON.

INTRODUCTION

Water supply and demand conditions have changed significantly in Southern Nevada over the past century. The community rose to these challenges time and again by developing new water resources and facilities and by significantly reducing water demands through progressive water conservation efforts.

Ingenuity and resolve are again required to address new challenges that emerged at the beginning of the 21st century. Continuing today, these challenges include changing hydrologic, climate and economic conditions. Individually or combined, these factors significantly influence local water demands and the resources and facilities needed to support those demands over time.

This chapter details the planning and response efforts taken by the SNWA, with community support, to minimize impacts. It also provides insight into current and future efforts required over the SNWA's 50-year planning horizon. As further described below, additional, significant and sustained efforts are needed to balance supply and demand, locally and within the Colorado River Basin. Ongoing adaptive management efforts are also required to address rapidly changing resource conditions.

The latter requires close monitoring and proactive planning. The 2025 Plan includes the latest information available at the time of publication. The SNWA will continue to monitor and address evolving conditions regularly as part of its water planning activities and annual resource planning process.

DROUGHT AND CLIMATE CHANGE

Southern Nevada depends on the Colorado River for approximately 90 percent of its overall water resource supply. These flows are derived primarily from snowmelt runoff originating in southwestern Wyoming, western Colorado, northeastern Utah and northwestern New Mexico.

Beginning in 2000 and continuing today, the Colorado River Basin has experienced drought conditions that quickly developed into the worst drought in the Basin's recorded history. During this timeframe, snowfall and runoff into the Basin were well below the historical average. Combined with warming temperatures, these factors resulted in the lowest 25-year runoff period on record (Figure 2.1). Since 2000, average inflows were about 12.4 million acre-feet per year (MAFY)—flows in almost half of these years were at or below 11.0 MAFY.

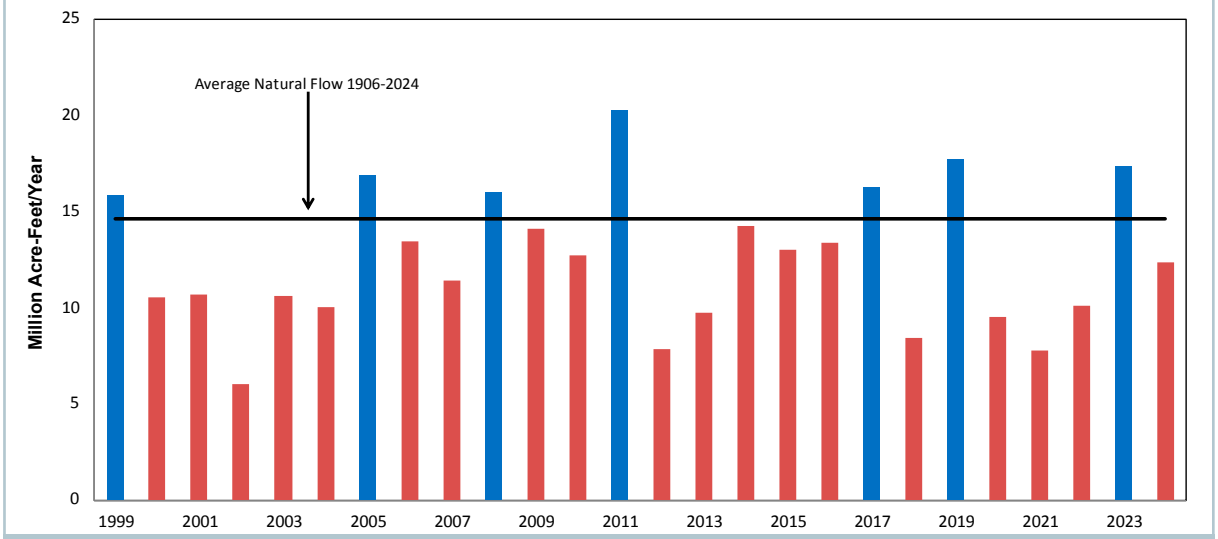


FIGURE 2.1 **Annual Colorado River Natural Flow 1999–2024**[1]

Average annual inflows since 2000 are lower than the amount of water allocated to the Colorado River Basin states and Mexico (16.5 MAFY) and substantially lower than the 1906 - 1921 historical average flow considered in determining compact allocations (about 18.0 MAFY).

The persistence of decades-long drought and changing climate conditions has resulted in significant water level declines at major system reservoirs. As of late 2024, the combined water storage in the Colorado River's two primary reservoirs (Lake Mead and Lake Powell) was at just 36 percent of capacity.[2] As described below and in Chapter 4, further water-level declines are expected.

Drought has become synonymous with the Colorado River over the last 25 years. This term can be misleading, implying a transient condition that will end. Today, the best scientific projections available suggest that current Colorado River conditions will not only continue but worsen. Leading climate scientists warn of a permanent shift to a drier future, something known as "aridification." In simple terms, aridification refers to drying conditions that result from warming. It is often measured by the reduction of average soil moisture content.[3] From a timescale perspective, aridification represents long-term change rather than seasonal variation or periodic droughts.

Recent studies show that warming temperatures within the Colorado River Basin are significantly contributing to current conditions, including reduced streamflows.[4] As demonstrated in recent years and when ground conditions are dry, near-normal precipitation does not equate to near-normal runoff. For example, Colorado River inflows were just 32 percent of average in 2021 despite near-normal snowpack (89 percent of normal). Record warm temperatures leading into the winter season significantly reduced soil moisture. As a result, the dry soil soaked up more water, and less water made its way to the river. The basin experienced similar conditions in 2022 and 2024, including near-normal to above-average snowpack and reduced inflows.

Warming is primarily a result of increased concentrations of greenhouse gases in the Earth's atmosphere. Since the early 20th century, observations indicate that global mean annual air temperatures have warmed 1.8°F.[5] Consistent with global trends, warming has also occurred in the southwestern United States. While climate change models project that warming trends will continue (Figure 2.2), the magnitude of change at a given location will depend in part on global mitigation efforts to reduce greenhouse gas emissions.

Locally, projections indicate that Clark County will warm between 5-10°F by the end of the century.[6] Compared to relatively uniform projected temperature increases in the Southwest, precipitation patterns are highly variable and show substantial shifts in where and how the precipitation falls.

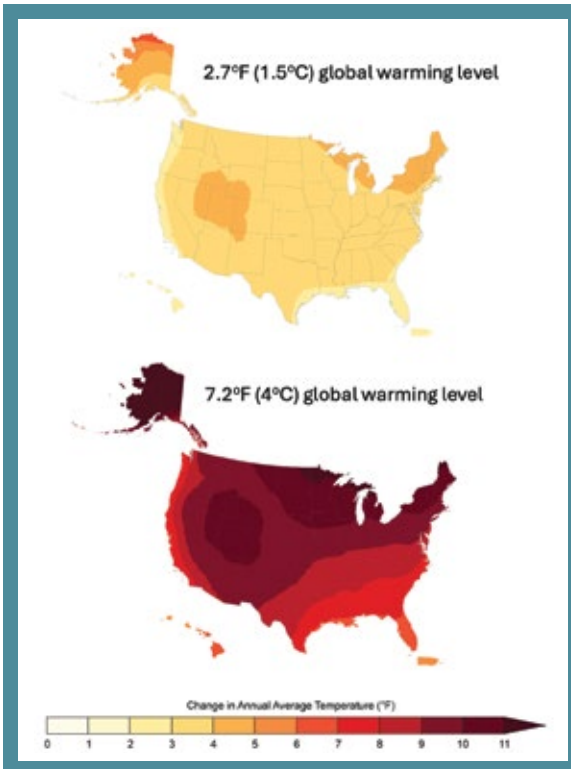


FIGURE 2.2 **Climate Change Range of Possible Future Warming in North America compared to historic 1851-1900**
(2023) National Climate Assessment

Water resource managers must carefully consider climate change and climate change impacts as part of their planning processes. Direct climate change impacts will revolve around water quantity, particularly the form and distribution of precipitation and increasing water demands. In addition, rising temperatures will cause a greater percentage of precipitation to occur in the form of rain rather than snow. As previously noted, snowpack will melt earlier and be less efficient as runoff due to dry soil conditions and increasing temperatures. This may result in significant water supply reductions in some areas,

while others experience greater frequency and severity of flood events.[7] Other important considerations include changes to water quality from rising stream flow temperatures and changes in reservoir volumes.

Changing hydrology and climate conditions pose two interrelated challenges for Southern Nevada: reduced Colorado River resources and potential increases to local water demands.

Water Supply Impacts

Lake Mead water levels have declined approximately 152 feet since 2000 and further water-level declines are expected. While Colorado River water users have worked effectively since the onset of drought to develop and implement shortage sharing, contingency and other plans to bolster Lake Mead water levels, resource challenges reached a tipping point in 2022.

Modeling by the U.S. Bureau of Reclamation in June 2022 determined that additional, urgent and extraordinary actions are needed to prevent water and power supply disruptions associated with operations at Lake Mead and Lake Powell, the Colorado River's two primary reservoirs. The following section outlines key policy initiatives currently being implemented and details the status of policy discussions currently underway to protect water and power operations in the Colorado River Basin.

Interim Guidelines. In 2007, the Secretary of the Interior issued a Record of Decision for the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead (Interim Guidelines).[8] Among other things, the Interim Guidelines established rules for implementing shortages in the Lower Basin.

According to the Interim Guidelines, the Secretary of the Interior will make a shortage declaration based on projected Lake Mead water levels as determined by U.S. Bureau of Reclamation Colorado River modeling efforts. The forecast is reviewed annually in August; a shortage declaration will be made if Lake Mead is forecasted to be at or below 1,075 feet on January 1 of the following year.

Drought Contingency Plan. In addition to mandatory shortage reductions defined by the Interim Guidelines, the SNWA and Lower Colorado River Basin water users in Arizona and California will make contributions as defined by the Lower Basin Drought Contingency Plan Agreement (DCP).[9] The DCP was approved in 2019 to help mitigate drought impacts (see also Adaptive Management). Like the Interim Guidelines, thresholds for DCP contributions are based on the U.S. Bureau of Reclamation's August projection of Lake Mead elevation on January 1 of the succeeding year.

DCP contributions and shortage reductions are staged to increase as Lake Mead water levels decline. As shown in Figure 2.3, Nevada's obligation under these agreements ranges from 8,000 AFY to a combined maximum of 30,000 AFY. The maximum total obligation under the Interim Guidelines and DCP for all parties, including Mexico, is 1.375 MAFY through 2026. Appendix 4 includes shortage amounts and DCP contributions by state.

If at any time the U.S. Bureau of Reclamation's minimum probable forecast of Lake Mead elevation is projected to be at or below an elevation of 1,030 feet, the Secretary of the Interior will consult with Lower Basin stakeholders to determine if additional actions are needed to protect Lake Mead's elevation from declining below 1,020 feet.[10]

LAKE MEAD WATER LEVEL (FT)	SHORTAGE AMOUNT (AFY)	DCP CONTRIBUTION (AFY)	TOTAL (AFY)
ABOVE 1,090	0	0	0
AT OR BELOW 1,090	0	8,000	8,000
AT OR BELOW 1,075	13,000	8,000	21,000
BELOW 1,050	17,000	8,000	25,000
AT OR BELOW 1,045	17,000	10,000	27,000
BELOW 1,025	20,000	10,000	30,000

FIGURE 2.3 **Nevada Shortage/DCP Contribution**

The Interim Guidelines and DCP expire at the end of 2026. At the time of the 2025 Plan publication, discussions regarding post-2026 system operations were ongoing. Generally, the states are contemplating additional conservation to reduce water use.

Nevada and Arizona began making DCP contributions in 2020 and have made contributions every year since. Mexico also made contributions under the Binational Water Scarcity Contingency Plan during the same time frame.[11] Lake Mead water levels continued to decline even with DCP contributions, and the Secretary of the Interior made the first-ever Tier 1 and Tier 2 shortage declarations in 2022 and 2023, respectively. These shortage declarations reduced total

Colorado River supplies available to Nevada, Arizona and Mexico by 613,000 AFY in 2022 and 717,000 AFY in 2023. Nevada's share of this amount was 21,000 AFY in 2022 and 25,000 AFY in 2023.

Colorado River conditions improved in 2023 with above average snowpack and runoff into the basin that gave reservoir water levels a temporary boost. In accordance with the Interim Guidelines, the Secretary of the Interior declared a Tier 1 shortage in 2023 for 2024 operations. Nevada's total obligation was 21,000 AFY and total obligations by all parties, including Mexico, were 613,000 AFY. Precipitation and snowpack were slightly above average in 2024 but inflows to Lake Powell were approximately 83 percent of average. The U.S. Bureau of Reclamation's 2024 August 24-month study forecasts a Lake Mead elevation of 1,062 feet on January 1, 2025, resulting in a Tier 1 shortage.[12]

Emergency Actions. The Secretary of the Interior began meeting with Colorado River stakeholders in 2021 to establish additional plans and actions through 2026 to protect Lake Mead's elevation from declining below 1,020 feet. Lake Mead water levels have long been a focal point for action. However, discussions between the Seven Basin States and the federal government evolved in 2022 when consecutive years of poor runoff and low system-wide reservoir storage conditions prompted growing concern about impacts on water and hydropower operations at Lake Powell.

Unregulated inflows to Lake Powell between 2020 and 2022 was the second lowest three-year period since 1964, resulting in significant water level declines. As a result, Lake Powell's storage capacity was at its lowest point since the reservoir was filled, putting water and power operations in jeopardy. With agreement among the Seven Basin States, the federal government updated its 2022 operating plan and reduced planned releases from Glen Canyon Dam by 480,000 acre-feet. This action further decreased the water level of Lake Mead but was neutral regarding future shortage determinations for 2022 and 2023.

Hoover Dam

The U.S. Bureau of Reclamation continues to project Lake Mead may drop below elevation 1,020 feet in 2027. This risk underscores the need for continued actions to balance system supply and demand as further described in this chapter.

In April 2023, the Secretary of the Interior amended the 2023 reservoir operations and increased the 2023 water year release from Lake Powell. Consistent with a 2019 Drought Response Operations Agreement between the federal government and the Upper Basin States, the U.S. Bureau of Reclamation also conducted Drought Response Operations with the release and recovery of water between Flaming Gorge and Lake Powell.[13]

The U.S. Bureau of Reclamation conducted modeling in mid-2022 that considered impacts to Lake Mead and Lake Powell water levels under current agreements and with the persistence of dry hydrology. The results indicated that reservoir elevations could drop below minimum power pool within the next few years. With further water level declines, they could reach dead pool, the point at which the reservoirs can no longer release water to downstream users. The U.S. Bureau of Reclamation also began investigating engineering options to allow for the release of water below dead pool at Lake Powell.

This modeling effort prompted the federal government to call upon the Seven Basin States to develop a plan to reduce water use. With consideration to recent hydrology improvements, the Lower Basin States submitted a letter to the federal government in May 2023 that outlines a plan by Nevada, Arizona and California to conserve 3.0 million acre-feet through 2026.[14]

The U.S. Bureau of Reclamation evaluated the proposal as part of its Supplemental Environmental Impact Statement (SEIS) process. As further discussed below, the Secretary of the Interior signed the 2024 Near-term Operations Record of Decision in May 2024 to implement the Lower Basin's commitment to conserve 3.0 million acre feet of water to address critical elevations in lakes Powell and Mead in the near term through 2026. This action, including the states' Reservoir Protection Conservation (RPC) commitment, helps to protect critical reservoir elevations and allows the states to focus on longer term solutions as part of post-2026 negotiations.

Demand Impacts

Completed in 2012, the U.S. Bureau of Reclamation released a study that projects a median imbalance of 3.2 million acre-feet per year (AFY) between supply and demand by 2060 due to climate change and increased demands within the Basin.[15] This study and the more recent 2020 State of the Science Report recognize the amount of water apportioned within the Colorado River Basin exceeds long-term average historic inflows. As detailed in the preceding pages, this situation has been exacerbated by drought and climate change over the last two decades.

Lake Mead Water Level Decline

State of the Science Report

Increasing water demand, dry conditions and warming temperatures have impacted the Colorado River in recent years, creating greater uncertainty about the basin's future water supply availability. To more clearly understand the latest and best available science on these and related topics, the SNWA and other Colorado River Basin states and water managers pursued the creation of the Colorado River Basin Climate and Hydrology: State of the Science Report.[16]

The report integrates nearly 800 peer-reviewed studies, agency reports and other sources to assess the state of the science and the technical methods relevant to water resources in the Colorado River Basin. Further, it establishes a shared understanding of the physical setting, as well as the latest data, tools and research that underpins Colorado River water resource management.

Report findings confirm that temperature trends are increasing while precipitation, snowpack water volume and annual streamflow trends are decreasing. The SNWA and others will use the report—which identifies both challenges and opportunities—to improve the short-term and mid-term forecasting and long-term projections for the Colorado River system. This information and associated work efforts will expand the SNWA's resource management and planning capacity.

Dry-cooled evaporative cooling system

Landscape irrigation and evaporative cooling are the two largest consumptive water uses in Southern Nevada. Water used for landscaping and evaporative cooling is lost to the system because it cannot be captured, treated and returned to the Colorado River for reuse.

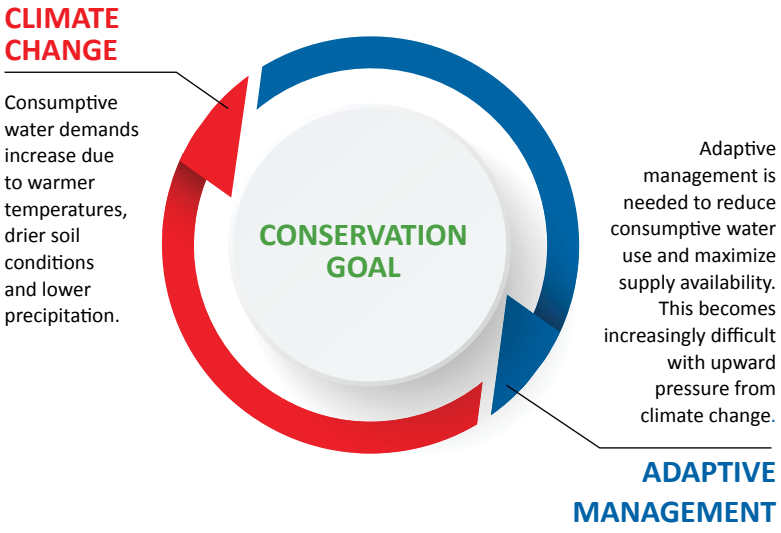
Temperature changes can also affect water resources by placing additional demands on already strained water supplies. Like humans, plants need more water as temperatures warm. As climate change brings hotter daytime temperatures, warmer overnight lows and a longer growing season, landscape water use is expected to rise. Similarly, demands on existing evaporative cooling systems are anticipated to increase as these systems work harder and longer to achieve target comfort settings for more days each year and during temperature extremes.

The SNWA anticipates that local water demands could increase by more than 10 gallons per capita per day (GPCD) due to the upward pressure of climate change and system age. As described in Chapter 3, the SNWA has implemented several policy and program changes that target reductions in consumptive water use associated with the installation and irrigation of non-functional turf, and development of new evaporative cooling systems.

These studies recognize that climate change will also affect the amount of water available for use and overall demands. Water evaporation and evapotranspiration rates will increase as temperatures warm, resulting in higher water demands for agricultural irrigation and landscaping uses. Reductions in use among those who share the Colorado River are needed to ensure supply and demand are balanced and that the river is managed sustainably.

In Southern Nevada, the expected impacts of climate change are similar to that of drought. These include extended durations of low Lake Mead elevations, water quality changes and possible reductions of Colorado River resources. The SNWA also anticipates potential increases in water use to compensate for warmer and drier conditions, particularly water uses associated with landscape irrigation and evaporative cooling systems. Trees, grass and other landscape plants require more water more frequently as temperatures warm. Similarly, cooling systems run longer and harder, particularly overnight and in the shoulder seasons, to maintain comfort settings.

As described in Chapter 3 and detailed below, upward pressure from climate change and water losses due to system age could increase local water demands by 10 gallons per capita per day (GPCD) or more by 2035.[17] Among other actions, improving the efficiency of turf irrigation and cooling uses will reduce the upward pressure of climate change, helping to keep local supply and demand in balance.



LOCAL ECONOMIC CONDITIONS

Southern Nevada's economic situation changed drastically in 2007 when the national economy began to experience its most significant decline since the 1930s. Hit harder than almost any other region in the nation, this period of recession marked the first time in decades that the Las Vegas area experienced a sustained period of little or no growth.

The economy has improved steadily in the region since 2012. However, conditions changed again in March 2020, when a global pandemic quickly spread within the community and throughout the world. Locally, Southern Nevada experienced a profound rise in unemployment due to non-essential business closures and the sudden halt to gaming and tourism activity.

Employment and economic activity began to recover as initial restrictions on the gaming industry eased in June 2020.[18] From a record high unemployment rate of 31.1 percent in 2020 to 6.7 percent in July 2024, the community's economic recovery is ongoing.[19] Home values also increased substantially during the same time frame, primarily due to low supply and growing demand.

As shown in Figure 2.4, municipal water providers experienced a significant increase in new service connections beginning in 2021.[20] A series of federal interest rate hikes between 2022 and 2023 had a cooling effect on the local housing market. However, new service connections have since returned to 2018-2020 norms.

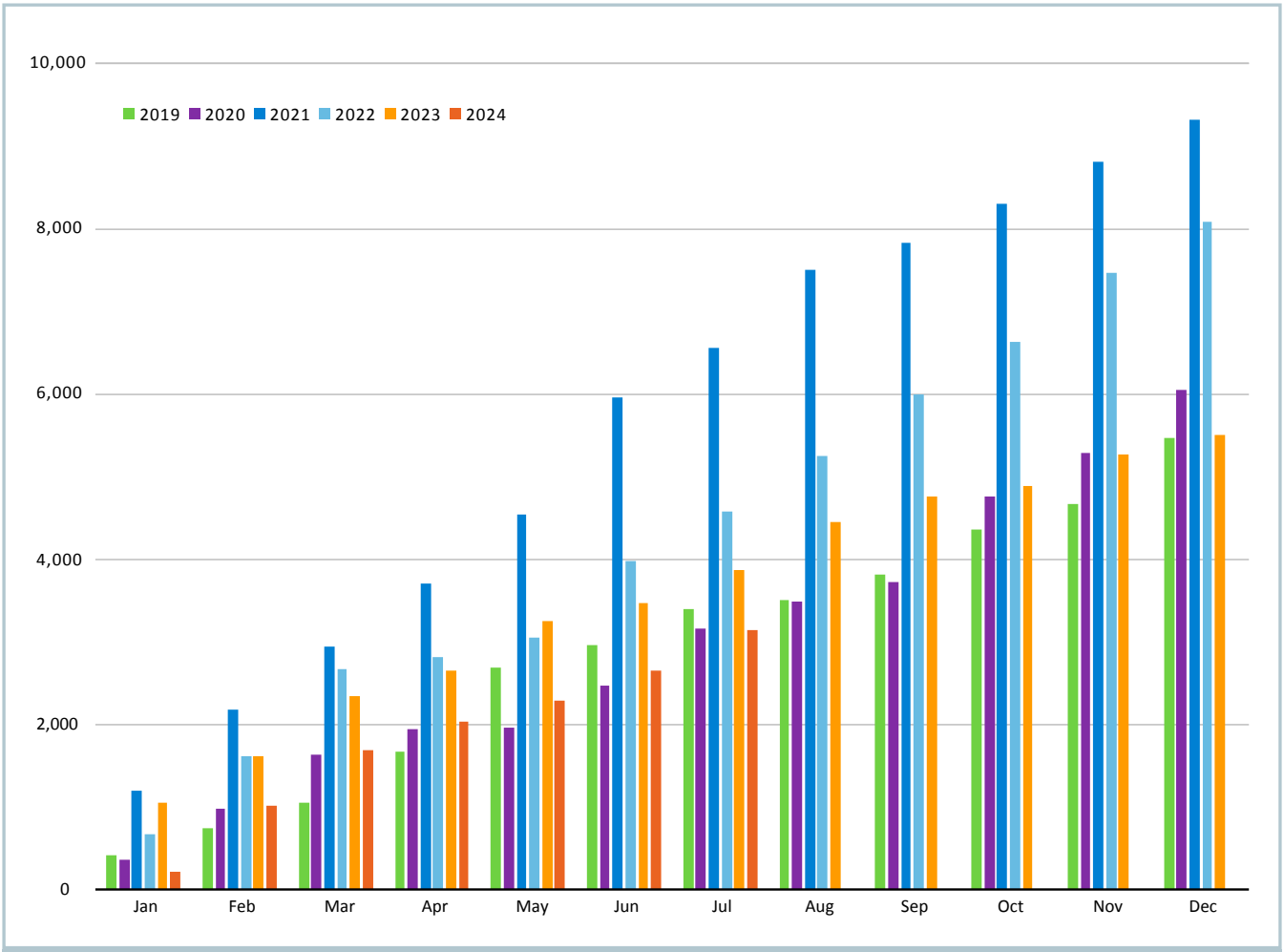


FIGURE 2.4 **Las Vegas Valley Water District New Service Connections**

Figure 2.5 shows historical Clark County population, including a reduction in population from 2020 to 2023.[21] This reduction reflects adjustment for the 2020 U.S. Census demographic information over time rather than change from year to year. According to the Center for Business and Economic Research (CBER) at the University of Nevada, Las Vegas, growth will likely continue. The 2024 forecast estimates a population of 2.83 million by 2035 and 3.34 million by 2060.[22] This represents a very slight downward shift in the near term. Overall, the 2024 forecast is higher compared with the prior year's forecast, beginning in 2030 through the forecasting horizon.

As demonstrated by Southern Nevada's unpredictable past, population increases could occur faster or slower than forecasted. Significant shifts, such as those in the past, could affect local water demands and the resources available to meet those demands over time. As described in Chapter 3 and Chapter 4, the 2025 Plan details conservation actions needed to help balance supply and demand.

ADAPTIVE MANAGEMENT

Adaptive management relies on continuous assessment, flexible planning and action. As the region's wholesale water provider, the SNWA is responsible for anticipating future demands and taking the steps necessary to meet those demands over time. As discussed earlier in this chapter, the current planning environment contains significant uncertainties—drought and climate change have impacted water facilities, water supply availability, water quality and water demand. In addition, Southern Nevada's local economy and its growth rate make predicting future water demands challenging, particularly given the region's previous growth history.

The following sections detail how the SNWA plans to address these challenges. While some steps are being taken now to protect current water supplies from the effects of changing hydrologic and climate conditions, other steps are considered long-term continuous efforts that will remain a priority for many years to come.

Lake Mead Facility Improvements

Lake Mead's surface elevation is down by approximately 152 feet since 2000. In 2022, Lake Mead reached 1,041 feet, the lowest point since the lake began filling in the 1930s.[23] Based on current and forecasted conditions, there remains a high probability that Lake Mead water levels will continue to decline, potentially reaching an elevation of 1,000 feet or lower without additional actions beyond those currently identified through the 2026 timeframe. Protecting Lake Mead from continued water level decline is a priority for Colorado River stakeholders. As noted earlier in this chapter, below a Lake Mead elevation of 895 feet, Hoover Dam can no longer deliver Colorado River water to downstream users.

Until 2020, SNWA pumping facilities were limited in their operating range relative to the elevation of Lake Mead (Figure 2.6). To mitigate impacts associated with a potential Lake Mead water level decline below 1,000 feet

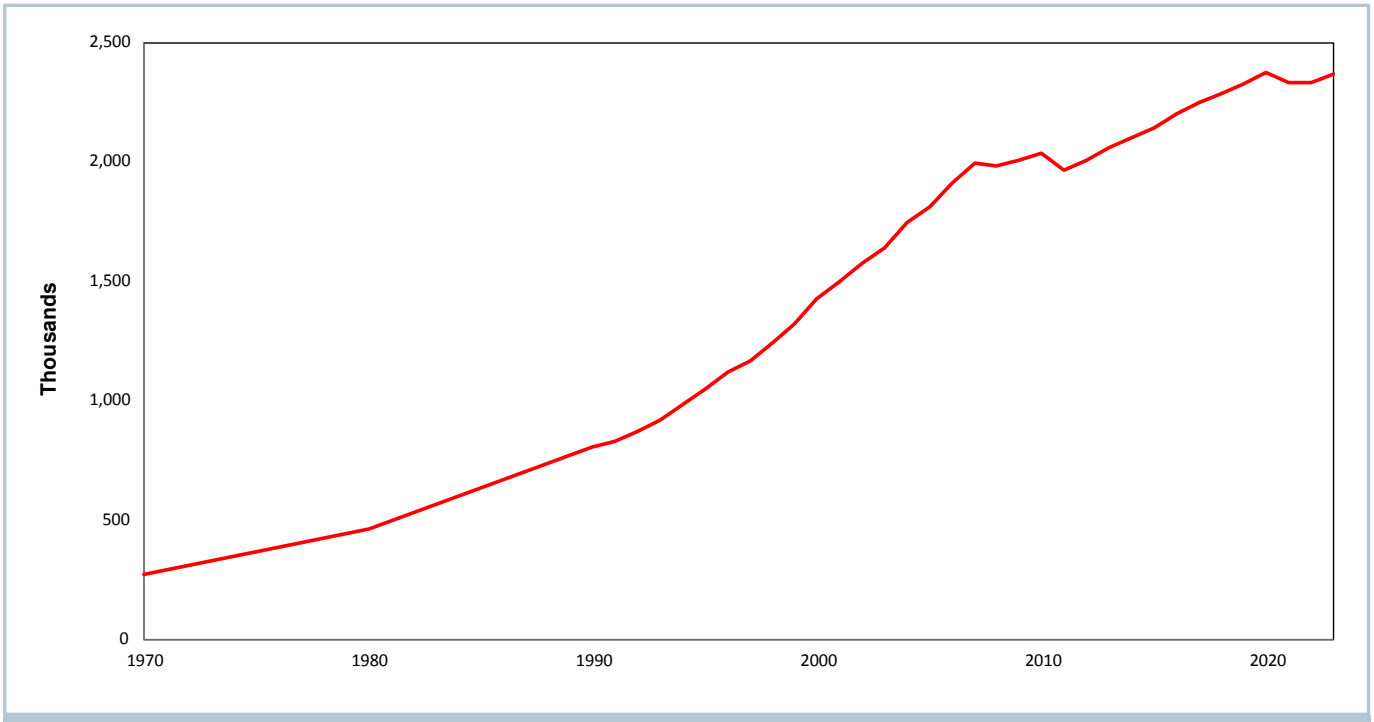


FIGURE 2.5 **Historical Clark County Population**

and potential water quality concerns during low reservoir conditions, the SNWA constructed a new intake and pumping station at Lake Mead.

The SNWA put its new intake (Intake No. 3) into service in 2015 and operated the Low Lake Level Pumping Station for 2022 and part of 2023. Together, these facilities preserve existing capacity and allow the SNWA to pump from a Lake Mead elevation of 875 feet. This elevation is approximately 20 feet below the minimum elevation that Hoover Dam can release water downstream. Major construction efforts were based, in part, on the recommendation of a prior Integrated Resource Planning Advisory Committee. The Committee determined that the risk of Lake Mead's elevation falling below 1,000 feet is not acceptable for Southern Nevada due to the potential impacts on water delivery and resource availability.

These adaptive management measures help to ensure reliable water service for Southern Nevada, even during extremely low reservoir conditions, and provide new opportunities for the SNWA to explore water supply agreements with other downstream Colorado River users.

Water Conservation

The SNWA continues to implement one of the most progressive water conservation programs in the nation, which yielded significant water savings since the early 2000s, even as the community grew. By the end of 2023, Southern Nevada's consumptive use of Colorado River resources was 187,000 AFY. This amount is well below any Colorado River water supply reduction that may occur under existing rules.

The SNWA does not anticipate near-term customer impacts associated with federal shortage declarations or implementation of the DCP due to community response efforts as further described below. However, response measures associated with post-2026 negotiations have not yet been defined and could result in significant additional limitations on Colorado River water supplies. Continued water conservation will remain a critical priority in the years ahead. Meeting the community's long-term water resource needs will require significant and sustained contributions from all community sectors on an ongoing basis.

As further described in Chapter 3, the SNWA has enhanced education, outreach and incentive programs to support continued water savings. Meanwhile, additional conservation policies and programs are planned for future implementation as Southern Nevada continues to adapt to changing supply and demand conditions.

Interstate Collaboration

The Colorado River Basin States are working collaboratively with U.S. federal partners and Mexico to augment water supplies, improve system efficiency, and protect hydropower generation and access to water supplies. These efforts range from investing in infrastructure improvements in Mexico to system efficiency and water conservation efforts that have mutual benefit to Colorado River Basin water users.

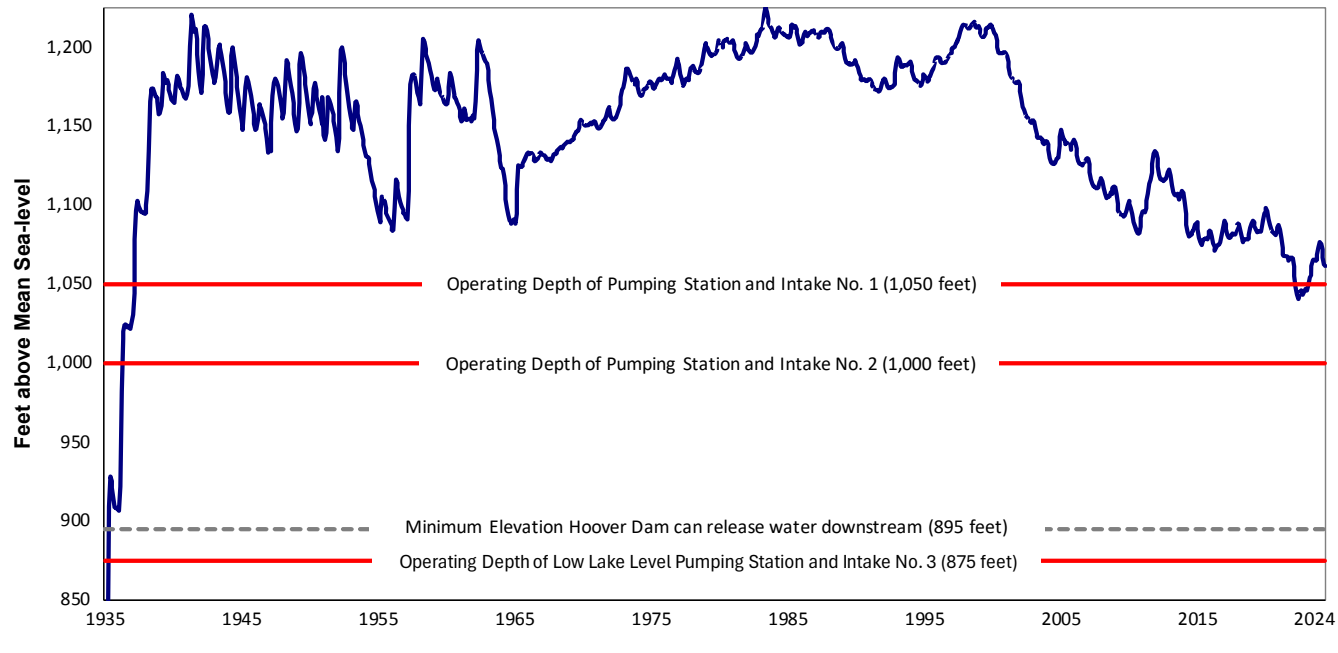
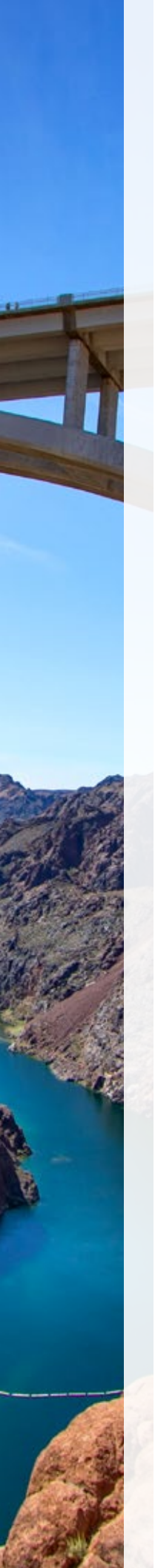


FIGURE 2.6 **Historical Lake Mead Elevations**



As shown in Figure 2.7, water banking and other collaborative efforts have reduced Lake Mead's water level decline by approximately 105 feet in 2023.

Drought Response Actions. Between 2014 and 2021, the SNWA entered into three agreements with federal, state, philanthropic organizations and other Colorado River water users to help mitigate the impacts of ongoing drought and bolster reservoir elevations.[24, 25, 26]

As further described below, these efforts were designed to protect against critical reservoir elevations that threaten hydropower generation at Glen Canyon and Hoover dams and preserve access to water supplies for millions of Lower Basin water users. However, as noted previously, additional action is required. Deliberations among the federal government and Colorado River Basin states are underway to identify additional response actions.

The SNWA and other Colorado River partners agreed to forgo off-stream banking efforts to leave water in Lake Mead as part of one agreement. Under other agreements, the U.S. Bureau of Reclamation partnered with municipal stakeholders to pay for conservation projects that benefit the Colorado River system as a whole. Projects included land fallowing, agricultural water efficiency, wastewater effluent recovery, turf removal and other water conservation efforts. Unlike water resources in the SNWA Water Resource Portfolio, water conserved as part of these agreements benefits the entire Colorado River system by increasing reservoir elevations. These resources cannot be recovered by any individual water user.

Drought Contingency Plan. The Upper and Lower Colorado River Basin states adopted drought contingency plans in 2019 that build upon the Interim Guidelines. Authorized by Congress, the plans recognize the increased potential for lakes Powell and Mead to reach critically low elevations and the increasing potential for water supply interruptions. Together, the plans commit the states and federal government to additional actions designed to improve reservoir storage and preserve system operations during low lake level conditions.

Beyond the mandatory shortage reductions prescribed under the Interim Guidelines, the DCP requires additional water contributions by the Lower Basin States, including Nevada, Arizona and—for the first time—California. Together, these states will contribute between 200,000 AFY and 1.1 million AFY when Lake Mead is at or below 1,090 feet. Like the Interim Guidelines, DCP contributions are based on Lake Mead water levels. With implementation of the DCP and as part of its Water Scarcity Plan, Mexico joined the states' efforts to store additional water in Lake Mead.

Implementation of the DCP will help keep more water in the Colorado River for the benefit of all water users and the environment; help slow Lake Mead water level declines to preserve critical elevations; and allow states to withdraw some of their contributions when Lake Mead water levels recover. It also expands and

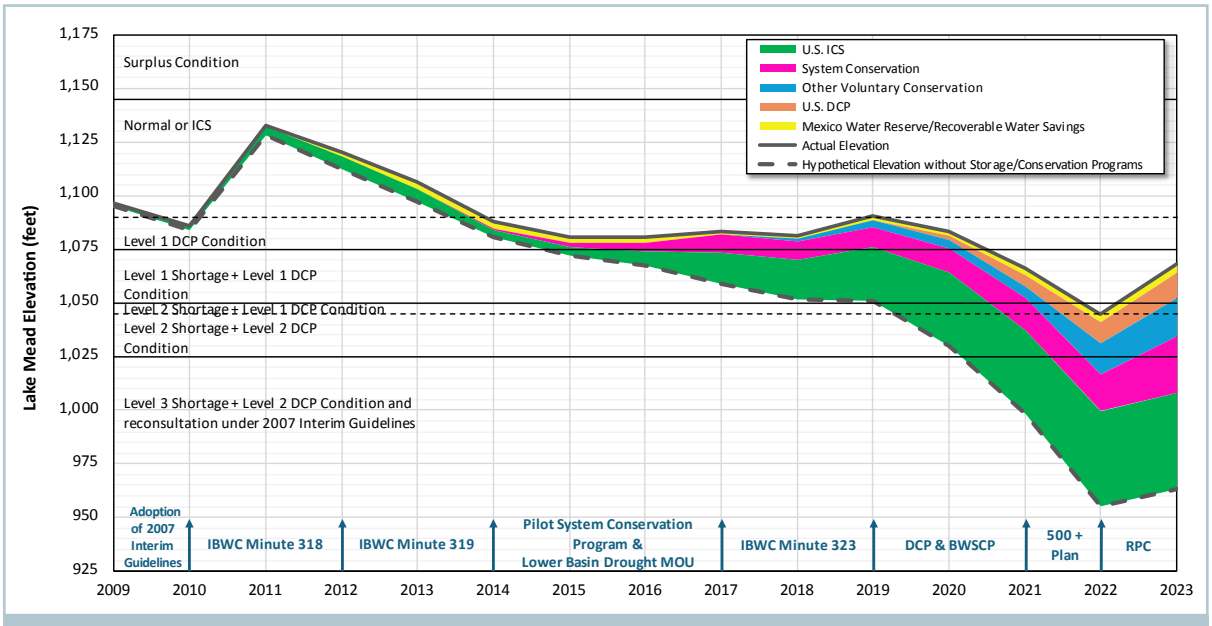


FIGURE 2.7 **Benefits to Lake Mead Storage**[27]

modifies creation and recovery provisions for Intentionally Created Surplus (ICS). The SNWA plans to meet its commitments under the Interim Guidelines and DCP with conservation savings and temporary resources as described below and in Chapter 3.

500+ Plan. In 2021, the Lower Basin States and the U.S. Bureau of Reclamation entered into a Memorandum of Understanding commonly called the "500+ Plan."[28] This cooperative effort facilitated near-term actions to help maintain Lake Mead above elevation 1,020 feet and supported efforts to generate an additional 500,000 AF of voluntary conservation in each year between 2022 and 2023, relative to the U.S. Bureau of Reclamation's June 2021 operational projections. The parties made progress towards achieving the 500+ Plan conservation goal and many of the projects continue to conserve water today. Investments in conservation efficiency projects are in addition to shortage reductions or other required water conservation activities.

Water Banking Efforts. The Seven States have worked collaboratively over the years to store or "bank" available Colorado River water and other unused supplies through various storage efforts. As of 2023, the SNWA has banked resources in the Southern Nevada Water Bank, Arizona and California water banks, and Lake Mead (in the form of ICS).

As noted above, the DCP builds upon the Interim Guidelines by requiring Lower Basin states to store additional water in Lake Mead and expands recovery provisions during a declared shortage. This provides increased access to banked supplies and enhances operational flexibility for the SNWA and other Colorado River water users. To the extent possible, the SNWA will continue water banking efforts to build temporary reserves and help stabilize Lake Mead water levels.

Conservation Memorandum of Understanding. In August 2022, the SNWA joined four municipal water providers in signing a Conservation Memorandum of Understanding (MOU) that commits the parties to actions to reduce Colorado River water use in their respective service areas. Specifically, MOU participants agreed to expand water efficiency programs, replace non-functional turf, increase water reuse and recycling programs where feasible and implement water efficiency strategies and best management practices. In November 2022, 28 additional municipal and public water agencies from across the Colorado River basin joined the MOU, significantly expanding the reach and impact of this effort.[29]

Reservoir Protection Conservation. The Secretary of the Interior signed the 2024 Near-term Operations Record of Decision (ROD) in May 2024.[30] The ROD implements the Lower Basin's commitment to conserve 3.0 million acre-feet of water as Reservoir Protection Conservation (RPC) through 2026, helping to address critical elevations at Lake Mead and Powell.

Adaptive Management in Action

Over the years, SNWA has taken several adaptive management steps to reduce impacts to water supplies and facilities in response to drought and climate change. These include:

- Reduced consumptive use of Colorado River supplies by approximately 138,000 AFY (approximately 45 billion gallons) between 2002 and 2023, even with the addition of more than 786,000 new residents.
- Stored twelve times Nevada's 2023 Colorado River consumptive use through increased water banking, storage and recharge efforts.
- Completed new Intake No. 3 and Low Lake Level Pumping Station (L3PS) to ensure continued delivery of Colorado River water supplies under low reservoir conditions.
- Acquired and developed surface water in Clark County through resource leases and purchases.
- Worked with Colorado River stakeholders to develop and implement innovative programs and agreements to improve resource management, preserve Colorado River operations for Lower Basin water users and increase the flexible use of Colorado River resources.

Low Lake Level Pumping Station

The ROD supplements the 2007 Interim Guidelines, addressing the potential for continued low runoff conditions in the Basin. The SNWA contributed 124,000 acre-feet of water toward the RPC commitment in 2023. Through 2023, the parties have saved approximately 1.18 million acre-feet. Southern Nevada remains committed to ongoing participation through 2026 to preserve storage and bolster Lake Mead water levels.

Recognizing the mutual benefits of proactive measures to mitigate declining Lake Mead water levels, the US and Mexico developed a complementary program for Mexico to conserve an additional 400,000 acre-feet by 2026.

Applying Best Available Climate Science

The SNWA continues to work with federal, state and local water agencies to enhance understanding of future water supply and demand uncertainty, and improve short and mid-term forecasts and long-term projections. A key accomplishment of these efforts is the creation of the Colorado River Basin Climate and Hydrology: State of the Science report.

Likewise, to better understand and adapt to climate change effects on water-related infrastructure and water resources, the SNWA initiated collaborative efforts with both climate scientists and other water agencies. The SNWA has received funding through a WaterSMART grant from the U.S. Bureau

Lake Mead and the Las Vegas valley

of Reclamation to evaluate potential changes in Lake Mead water quality using SNWA's advanced Lake Mead model.[31] The Lake Mead study considered the potential impacts of low lake elevations and increasing air temperatures due to climate change on a suite of water quality measures. In 2022, the SNWA received additional funding to expand the model's forecasting functionality.

The SNWA is also a founding member of the Water Utility Climate Alliance (WUCA).[32] Comprised of 12 of the largest water agencies in the United States, WUCA is dedicated to enhancing climate change research and improving water management decision-making to ensure that water utilities will be positioned to respond to climate change and protect water supplies.

The SNWA is collaborating with other WUCA members to advocate for climate change research that better meets the needs of the water sector; evaluate methods used to understand the influence of climate change on water providers; and identify decision and adaptation strategies employed to address long-term climate change.

Supply and Demand Forecasting

As in prior years, the SNWA has taken a scenario-based planning approach with its 2025 Plan to address possible changes to water supply availability and demands. This conservative approach considers various water demand and supply conditions, including shortage and climate change impacts.

CHAPTER SUMMARY

The Colorado River community is facing a period of extreme uncertainty brought about by supply and demand imbalance resulting from overallocation and climate change. While stakeholders throughout the Basin have worked collaboratively for years to address and adapt to changing conditions, additional and urgent action is required to protect critical elevations at Lake Mead and Lake Powell.

The next steps will be hard and require participation from every water use sector in every community that relies on the river. Significant water use reductions are needed to protect systems operations, which include water and power supply delivery for approximately 40 million people. Meeting this moment requires unprecedented levels of cooperation and action. Response efforts will likely come at a steep cost for many communities, requiring major investments from stakeholders across the Basin.

The SNWA will continue to play a key role in helping to develop and implement Colorado River response efforts.

However, Southern Nevada's risk profile is much lower due to the planning, adaptation and extraordinary investments made to secure Southern Nevada's water supply. With community support, the SNWA has taken deliberate steps to bolster supplies, reduce demands and fortify water delivery facilities. Thoughtfully planned and executed over decades, our actions make Southern Nevada one of the most water-secure communities in the Colorado River Basin.

There is still much work that lies ahead. As one of the fastest-warming and fastest-growing communities in the United States, Southern Nevada must continue to anticipate, mitigate and adapt to changing conditions. Conservation remains a critical priority for our desert community, and continued progress is required. Doing so will help to ensure our operational and water efficiency plans can be executed in a thoughtful, well-coordinated way that reduces impacts on our community.

Meeting the challenges ahead will require significant and ongoing adaptive management investments. Key efforts include:

- Continuing to set and achieve water conservation goals through aggressive water conservation efforts;
- Working with SNWA member agencies to develop policies and programs to ensure new development has the smallest possible consumptive water use footprint;
- Collaborating with Colorado River stakeholders to protect critical elevations at Lake Mead and Lake Powell;
- Working with Colorado River stakeholders for conservation and flexible use of Colorado River supplies (for example, water banking) and collaborative future water resource projects;
- Continuing to secure temporary resources to offset long-term impacts associated with shortage while working to bring other permanent resources online when needed;
- Addressing uncertainty by planning to a range of future supply and demand possibilities; and
- Collaborating with climate scientists and other agencies to understand and evaluate climate change and its potential impacts on water supplies and facilities.

ENDNOTES

1 The U.S. Bureau of Reclamation and the U.S. Geological Survey estimate the yearly "natural flow" of the Colorado River at Lees Ferry, defined as the flow of the river without reservoirs, dams or diversions. Natural flow estimates for the period of 1906 to 2020 are official, while estimates for the period of 2021 through 2024 are provisional and were last updated by the U.S. Bureau of Reclamation in April 2024 (as of 8/15/24).

2 Lower Colorado Water Supply Report, U.S. Bureau of Reclamation, August 2024.

3 "Climate Change and the Aridification of North America," Jonathan T. Overpeck, Bradley Udall. Proceedings of the National Academy of Sciences, June 20, 2020.

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6 "Kalansky, J., Sheffield, A., Cayan, D., and Pierce, D. 2018. Climate Conditions in Clark County, NV. Southern Nevada Water Authority.

7 Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.). USGCRP, 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Report-in-Brief U.S. Global Change Research Program, Washington, DC, USA, 186 pp.

8 "Record of Decision Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, December 2007," signed December 13, 2007 by Dirk Kempthorne, Secretary of the Department of Interior.

9 "Agreement Concerning Colorado River Drought Contingency Management and Operations," 2019.

10 "Exhibit 1 to the Lower Basin Drought Contingency Plan Agreement, Lower Basin Drought Contingency Operations," 2019.

11 Minute No. 323," between the International Boundary and Water Commission of the United States and Mexico for the extension of cooperative measures and adoption of a binational water scarcity contingency plan in the Colorado River Basin. September 21, 2017.

12 August 2024 Most Probable 24-Month Study, U.S. Bureau of Reclamation, August 2024.

13 Between March 2023 and April 2024, the U.S. Bureau of Reclamation reduced releases from upstream reservoirs to recover 489,000 acre-feet of Drought Response Operation Releases associated with the Drought Contingency Plan.

14 Letter from Lower Basin States to Commissioner Touton, May 23, 2023.

15 Colorado River Basin Water Supply and Demand Study," December 2012, U.S. Bureau of Reclamation.

16 Lukas, J. and Payton, E., eds. 2020. Colorado River Basin Climate and Hydrology: State of the Science. Western Water Assessment, University of Colorado Boulder. DOI. https://doi.org/10.25810/3hv-w477.

17 "Changes in Water Use Under Regional Climate Change Scenarios," 2013, Water Research Foundation (Project #4263) prepared by Jack C. Kiefer, John M. Clayton, Benedykt Dziegielewski, and James Henderson.

18 "Local Area Unemployment Statistics," U.S. Bureau of Labor Statistics, July, 2024

19 Ibid.

20 Las Vegas Valley Water District (LVVWD) New Service Connections, 2018 - 2023. LVVWD is the largest municipal water provider in Southern Nevada and data is used to illustrate increased demands for new service connections. Other providers also experienced increased demands.

21 Clark County Population data 1970-1980 are decadal counts from the U.S. Census Bureau. Clark County Population data 1990-2023 are annual estimates prepared by the Clark County Comprehensive Planning Department.

22 "Population Forecasts: Long-term Projections Clark County Nevada Population Forecast 2024-2060," June 2024, Center for Business and Economic Research at the University of Nevada, Las Vegas.

23 "Historical Reservoir Levels, Lake Mead at Hoover Dam," U.S. Bureau of Reclamation.

24 "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," entered into July 30, 2014 and amended August 12, 2015; March 8, 2016; and July 6, 2018.

25 "Memorandum of Understanding 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, the Southern Nevada Water Authority, the Arizona Department of Water Resources, the Colorado River Board of California and the Colorado River Commission of Nevada for Pilot Drought Response Actions," entered into December 10, 2014.

26 Funding Agreement among the U.S. Bureau of Reclamation, Central Arizona Water Conservation District, Metropolitan Water District of Southern California", and the SNWA, 2021.

27 End of calendar year 2023 balances of U.S. ICS and Mexico's Water Reserve, system conservation water, and other voluntary contributions to Lake Mead are based on U.S. Bureau of Reclamation accounting records obtained from publicly available sources and through records requests.

28 A Lower Basin Memorandum of Understanding established a cooperative effort commonly referred to as the "500 Plus Plan" to facilitate near term actions to maintain the water surface elevation of Lake Mead. The 500 Plus Plan aimed to generate an additional 500,000 AF of voluntary conservation calendar year in 2022 and 2023.

29 "Memorandum of Understanding by and among Colorado River Basin Municipal and Public Water Providers," November 15, 2022.

30 "Supplement to the 2007 Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, Record of Decision," signed May 6, 2024 by Deb Haaland, Secretary of the Interior.

31 The SNWA's Lake Mead Model was developed with Flow Science Inc., with funding from SNWA member agencies and the National Park Service. Funding for climate change model simulations was provided through a WaterSMART Grant from the Bureau of Reclamation, with matching contributions from the City of San Diego, Metropolitan Water District of Southern California and the SNWA.

32 The Water Utility Climate Alliance (WUCA) has funded and published several reports and white papers on climate change. The publications are accessible at: www.wucaonline.org/html/actions_publications.html.