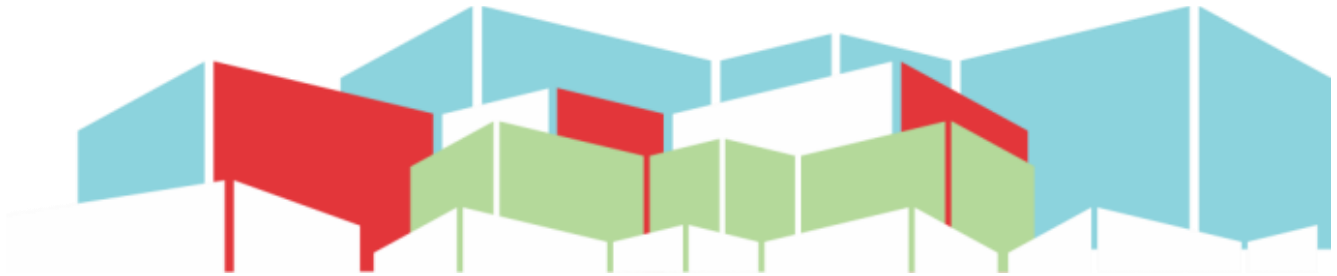
Water Conservation in Action:
Best Practices from Southern Nevada

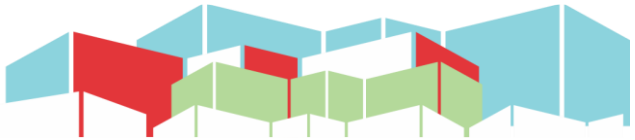
Dr. Michael A. Bernardo, P.E.
Enterprise Conservation Manager
Southern Nevada Water Authority



Learning Objectives

By the end of this session, participants will be able to:

- **Understand** Southern Nevada's water challenges and conservation strategies.
- **Identify** policies, incentives, & best practices that can help reduce water consumption.
- **Evaluate** water-efficient cooling technologies and their operational tradeoffs.
- **Apply** lessons from Southern Nevada to improve water efficiency in their own facilities.



NFMT west

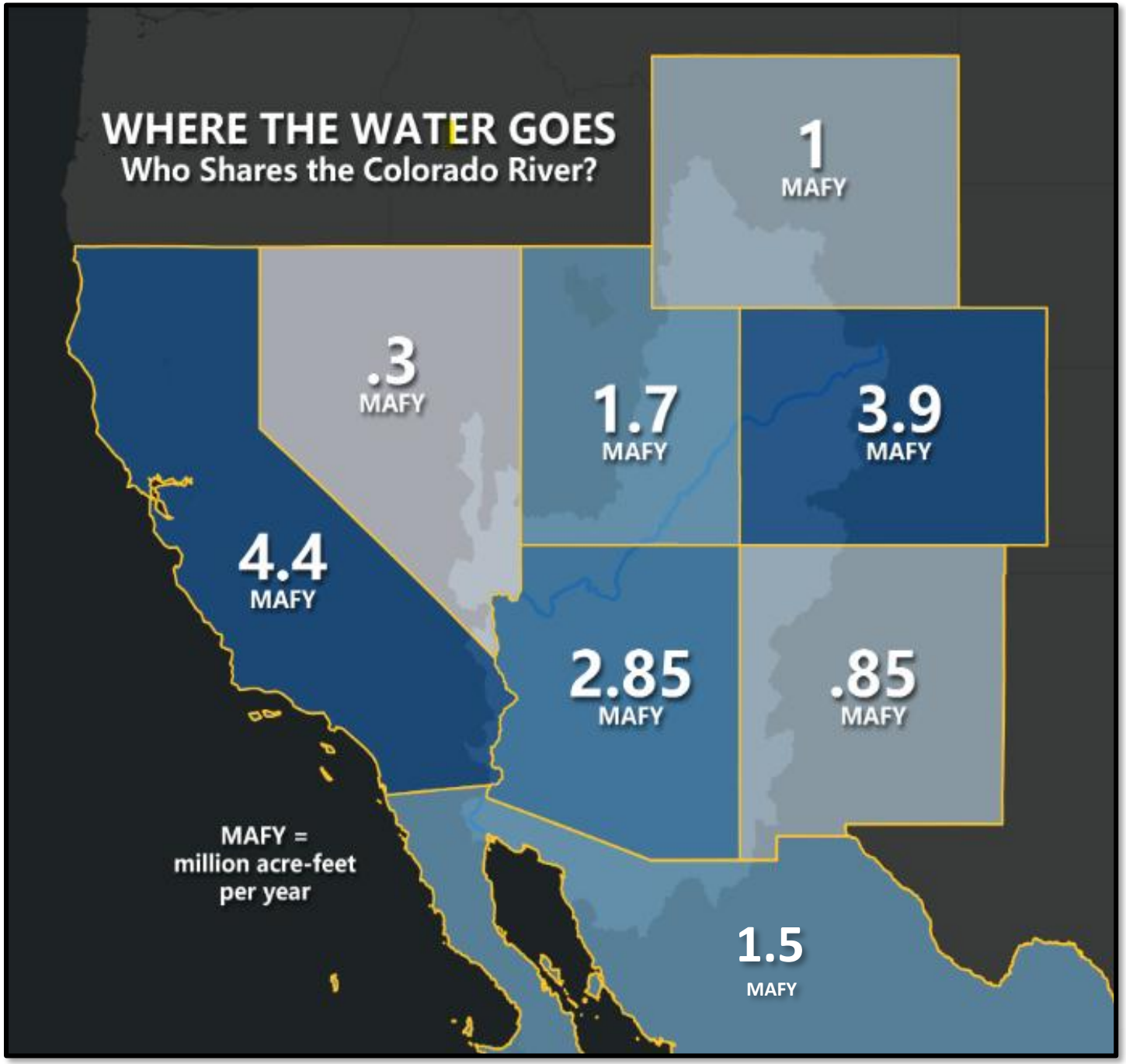
Colorado River Overview

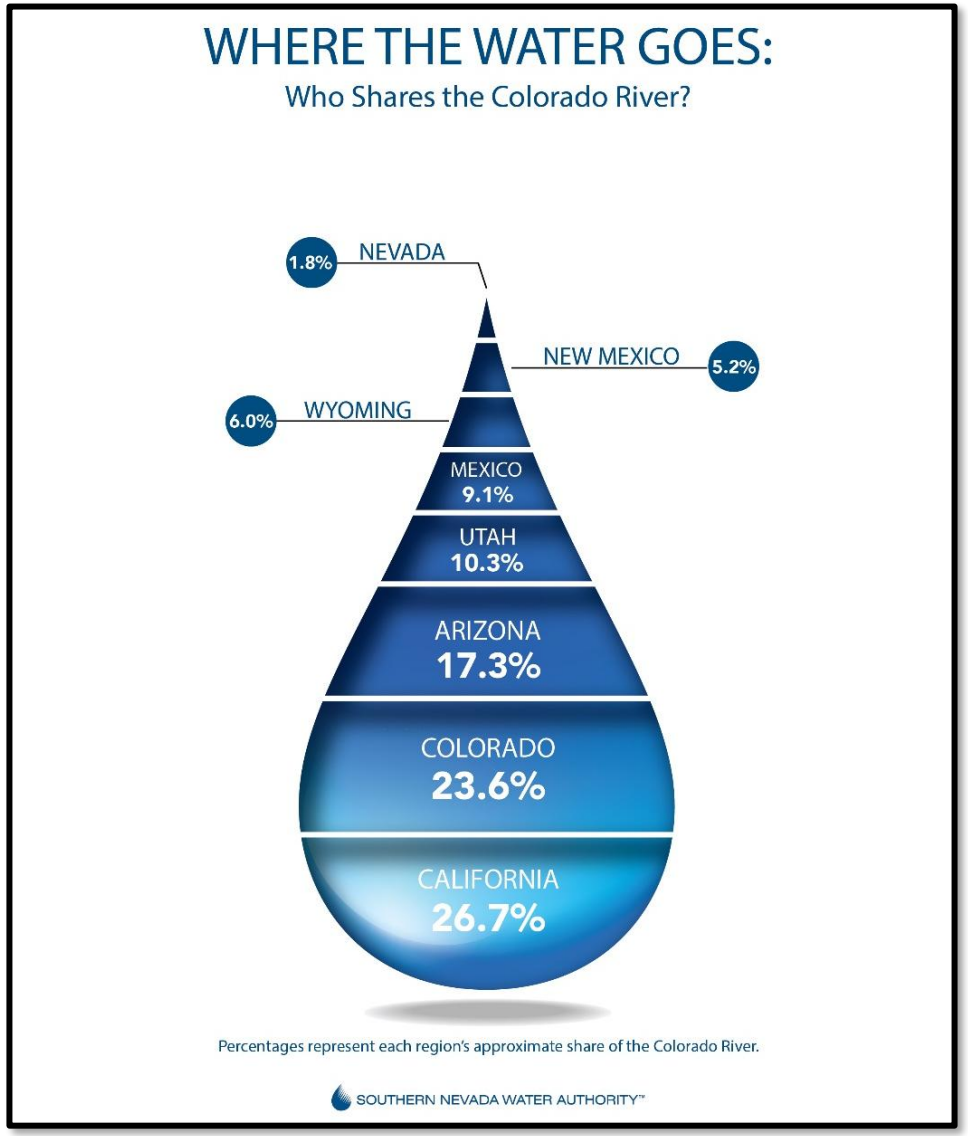
Colorado River resources are shared among 7 states and the country of Mexico.

Nevada accesses its Colorado River allocation through facilities in Lake Mead.

- 16.5 million acre-feet allocated annually
- Watershed spans 7 states and Mexico
- Serves ~40 million people
- Irrigates about 3 million acres of farmland which makes up 75% of total annual water use
- Current Storage is 33%
- Allocations exceed average flow by 15-20%
- Climate Change may further reduce flow by 5-15%

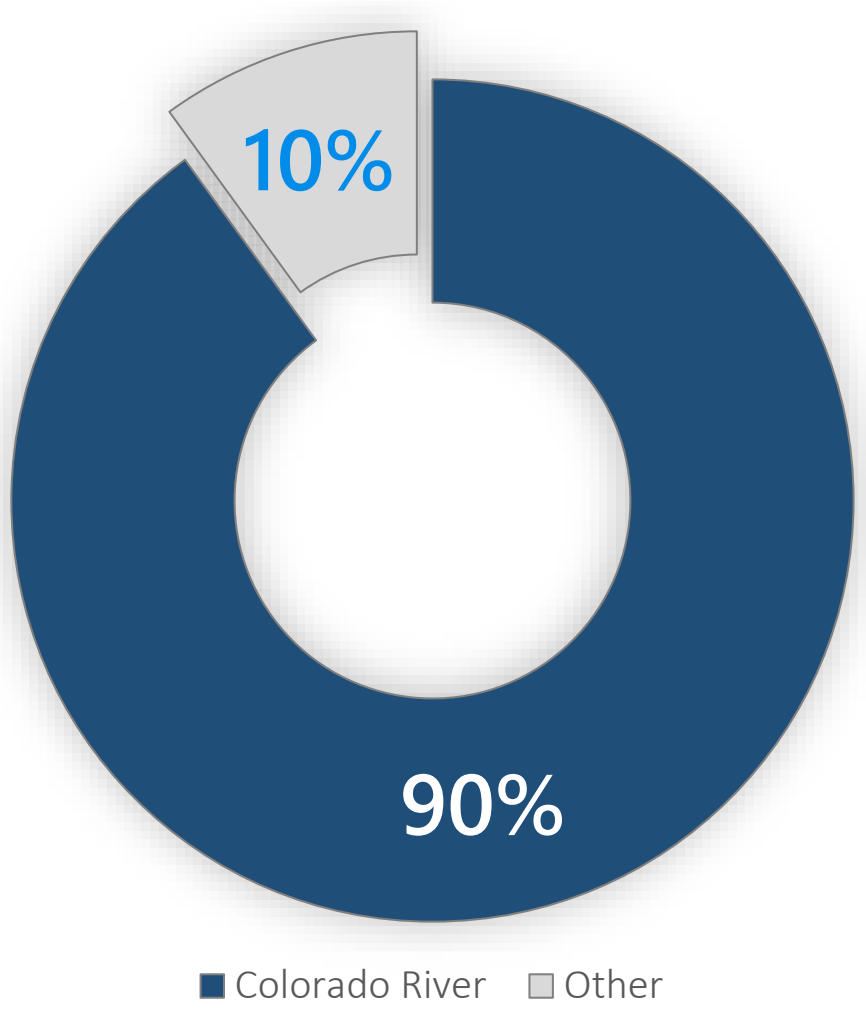



WHERE THE WATER GOES
Who Shares the Colorado River?
1
MAFY
.3
MAFY
1.7
MAFY
3.9
MAFY
4.4
MAFY
2.85
MAFY
.85
MAFY
1.5
MAFY
MAFY =
million acre-feet
per year


WHERE THE WATER GOES:
Who Shares the Colorado River?
1.8% NEVADA
NEW MEXICO 5.2%
6.0% WYOMING
MEXICO 9.1%
UTAH 10.3%
ARIZONA 17.3%
COLORADO 23.6%
CALIFORNIA 26.7%
Percentages represent each region's approximate share of the Colorado River.
SOUTHERN NEVADA WATER AUTHORITY™

Southern Nevada Water Use:

Southern Nevada is nearly fully reliant on the Colorado River to meet the community's water demands.



Who We Are: **SNWA**

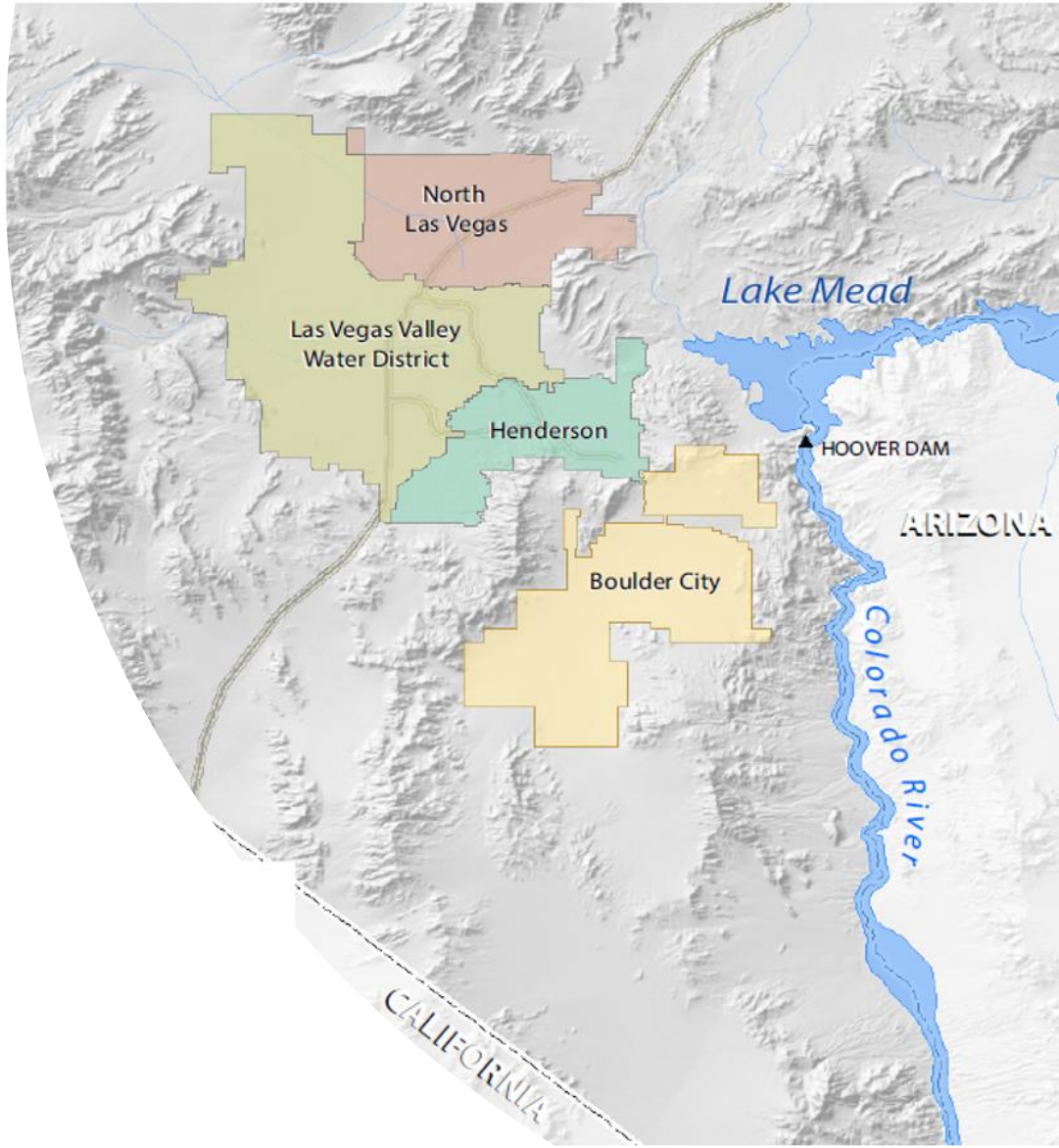
SOUTHERN NEVADA WATER AUTHORITY®

Formed in 1991 in an effort to address Southern Nevada's unique water needs on a regional basis.

SNWA is committed to managing the region's water resources and developing solutions that will ensure adequate future water supplies for the Las Vegas valley.

Member Agencies include:

- Boulder City
- Clark County Water Reclamation District
- City of Henderson
- City of Las Vegas
- Las Vegas Valley Water District
- North Las Vegas
- Big Bend Water District (Laughlin)



SNWA's Major Responsibilities



WATER SUPPLY PLANNING

Developing and managing regional water supplies



CONSERVATION

Incentives, Education, Regulation, and Pricing



WATER QUALITY

Maintaining and protecting water quality



INFRASTRUCTURE

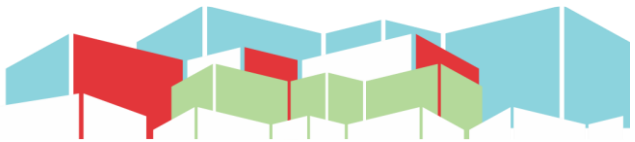
Building and operating major facilities



STEWARDSHIP

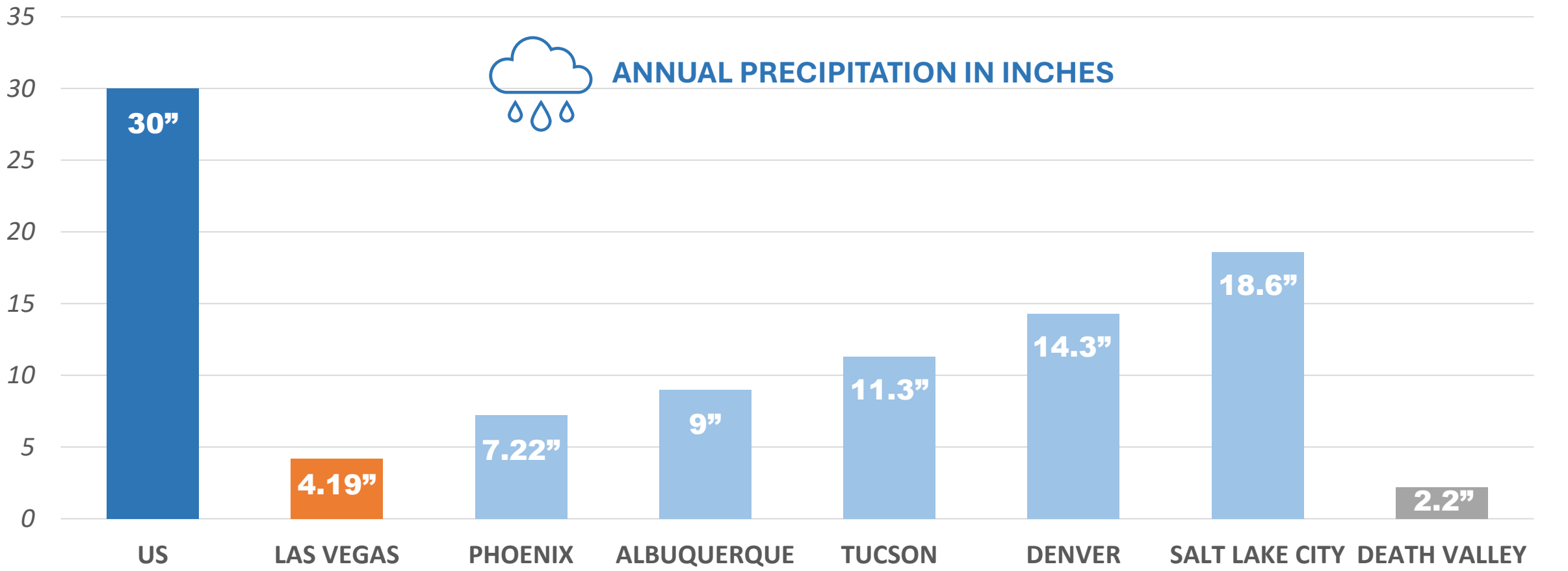
Protecting environmental resources

Southern Nevada has spent decades preparing for drought to ensure the reliability of water supplies for Southern Nevada

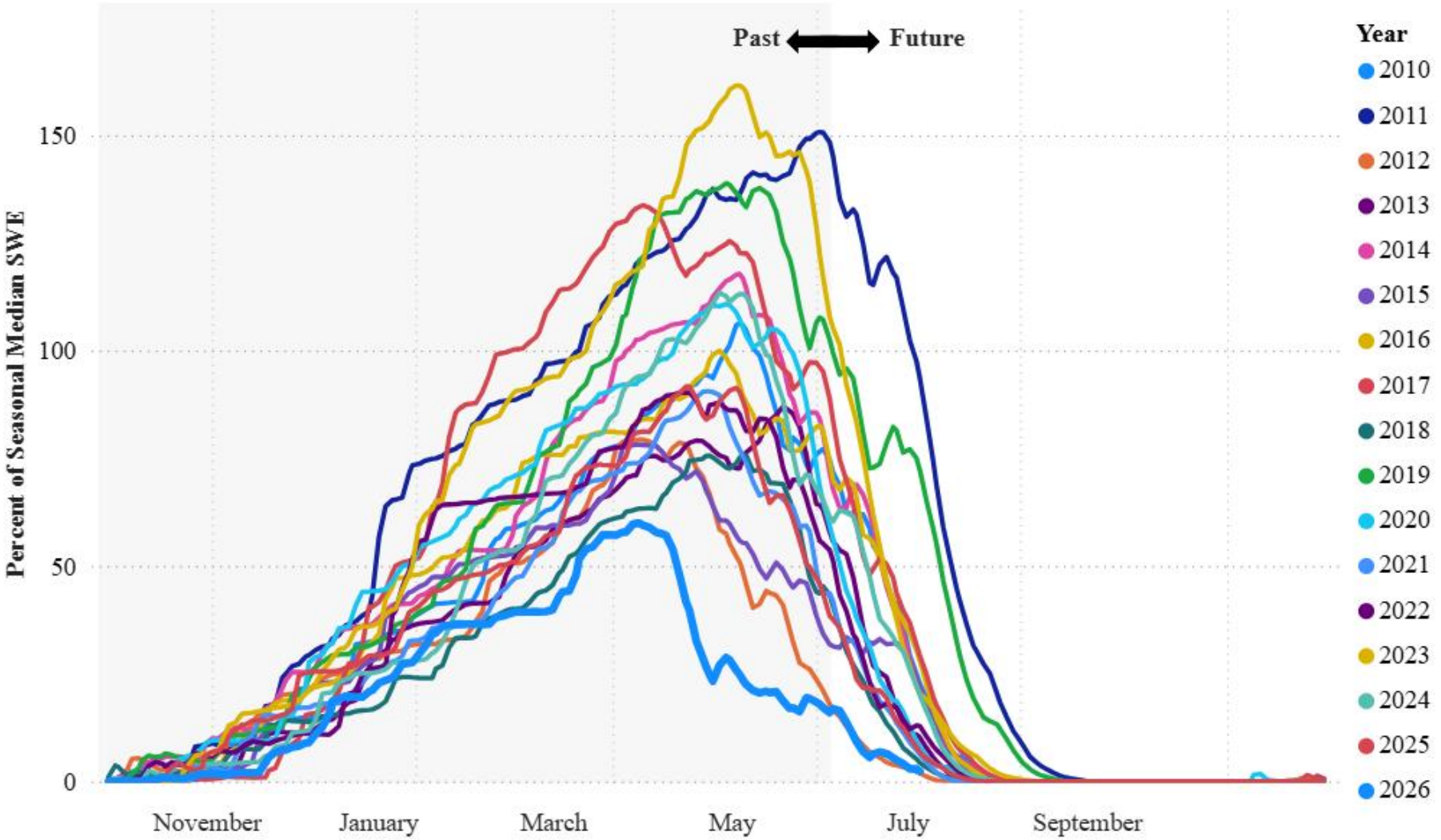




Las Vegas is the driest metropolitan area in the United States.



Snow Water Equivalent (SWE) in Upper Colorado Region

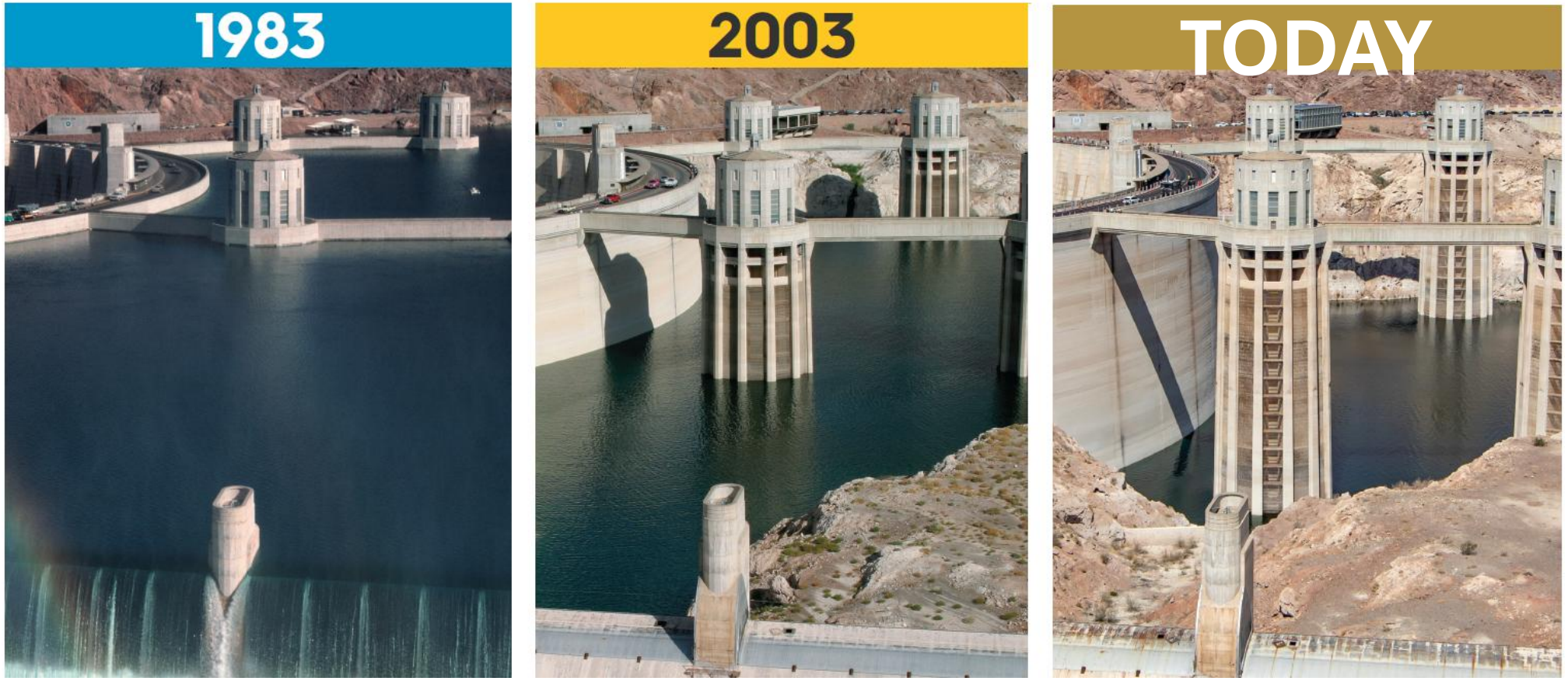


Water Year Rankings (1991-2026)

Rank	Year	Peak SWE (inches)	Percent of Median Peak SWE (%)
1	1997	24.6	165.9
2	1993	24.1	162.7
3	2023	23.9	161.5
4	2011	22.3	150.8
5	2008	21.7	146.3
6	1995	21.5	145.5
7	2005	20.6	138.9
8	2019	20.5	138.8
9	2017	19.8	133.7
10	1996	19.4	130.9
11	1998	18.8	127.1
12	2006	18.8	127.0
13	2009	18.5	125.2
14	2014	17.4	117.8
15	2024	16.8	113.4
16	2020	16.4	110.8
17	1999	16.3	110.1
18	2001	16.0	108.3
19	2000	16.0	108.1
20	2010	15.7	106.3
21	1991	15.6	105.1
22	2003	15.4	103.9
23	2016	14.8	99.9
24	1994	14.8	99.8
25	2004	14.4	97.4
26	1992	13.8	93.3
27	2025	13.6	91.7
28	2021	13.4	90.5
29	2022	13.4	90.3
30	2013	12.9	87.0
31	2007	12.2	82.5
32	2012	11.7	79.3
33	2015	11.6	78.2
34	2018	11.2	75.8
35	2002	11.0	74.2
36	2026	8.9	59.9

Last updated: 6/2/2026

Severe and sustained drought conditions continue to impact critical storage reserves in the Colorado River Basin.



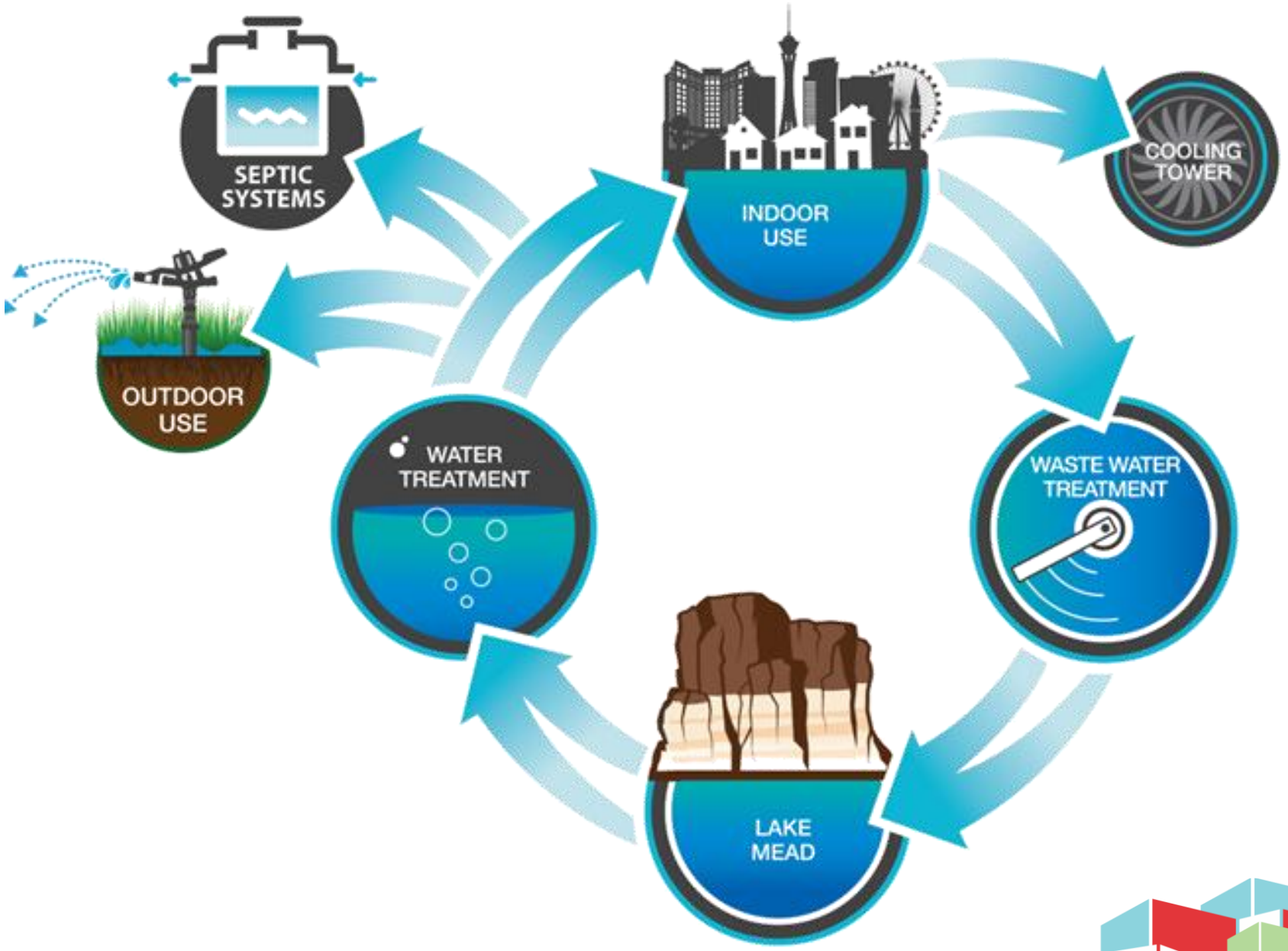
Fortunately, the SNWA has spent decades preparing for drought to ensure the reliability of water supplies for Southern Nevada

INFRASTRUCTURE
Constructing major facilities and asset management

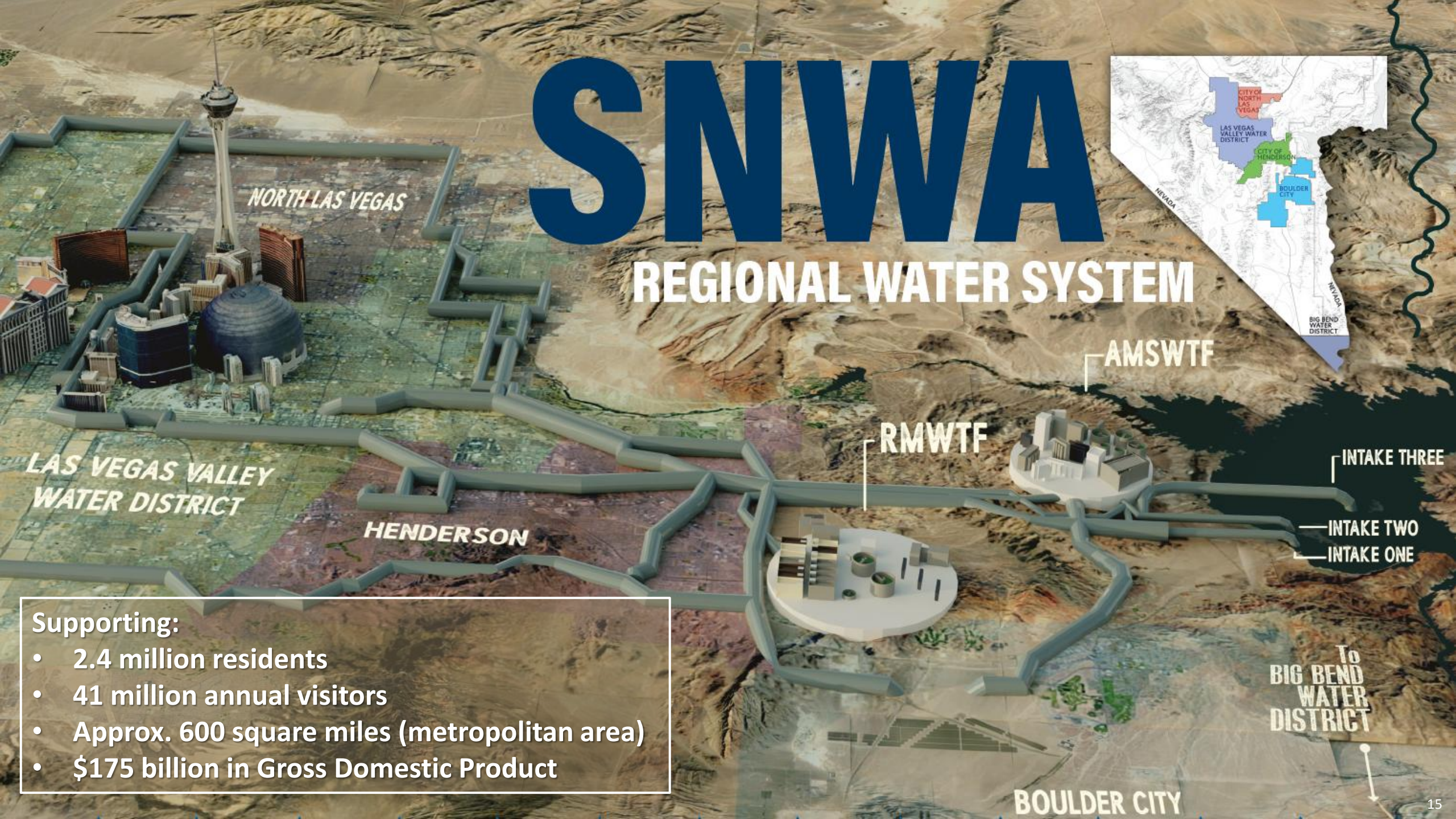
WATER BANKING
Storing water supplies for the future

CONSERVATION
Incentives, programs, regulation & pricing

RESOURCE PLANNING
Working with partners & developing comprehensive plans to manage supplies



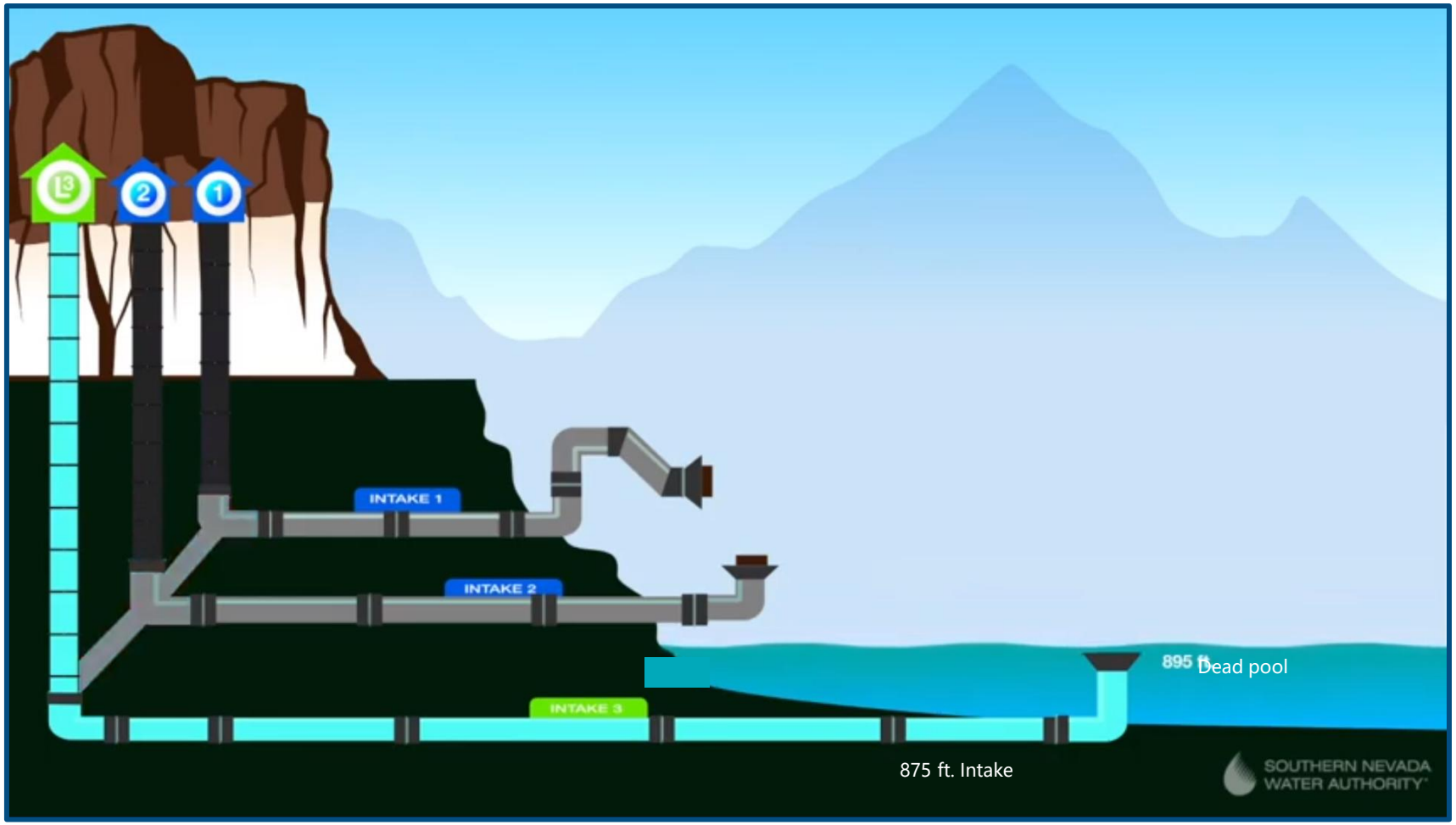
Southern Nevada recycles 99% of water used indoors, thereby extending the availability of its resources.

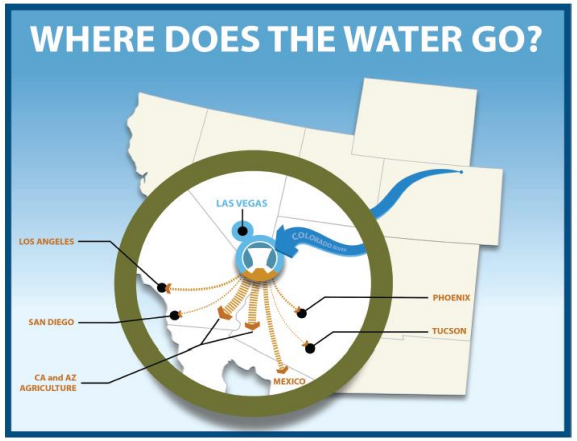


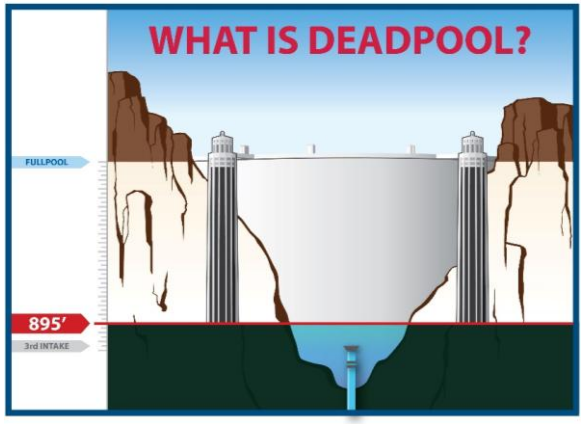
Supporting:

- 2.4 million residents
- 41 million annual visitors
- Approx. 600 square miles (metropolitan area)
- $175 billion in Gross Domestic Product

Infrastructure ensures Southern Nevada's access to water despite declining lake levels.







There are five major uses of water that cannot be recovered in our community:











1) Landscape Irrigation
2) Evaporative Cooling
3) Water Feature Evaporation
4) Export Products
5) Septic Systems

Southern Nevada's conservation program promotes the efficient use of water resources and relies on four key tenets:

REGULATIONS

Development codes, watering restrictions and other local ordinances help keep the use of water efficient.

PROGRAMS

Incentive programs offer rebates for water-saving technologies and practices, such as car washes, landscape removal and pool covers.

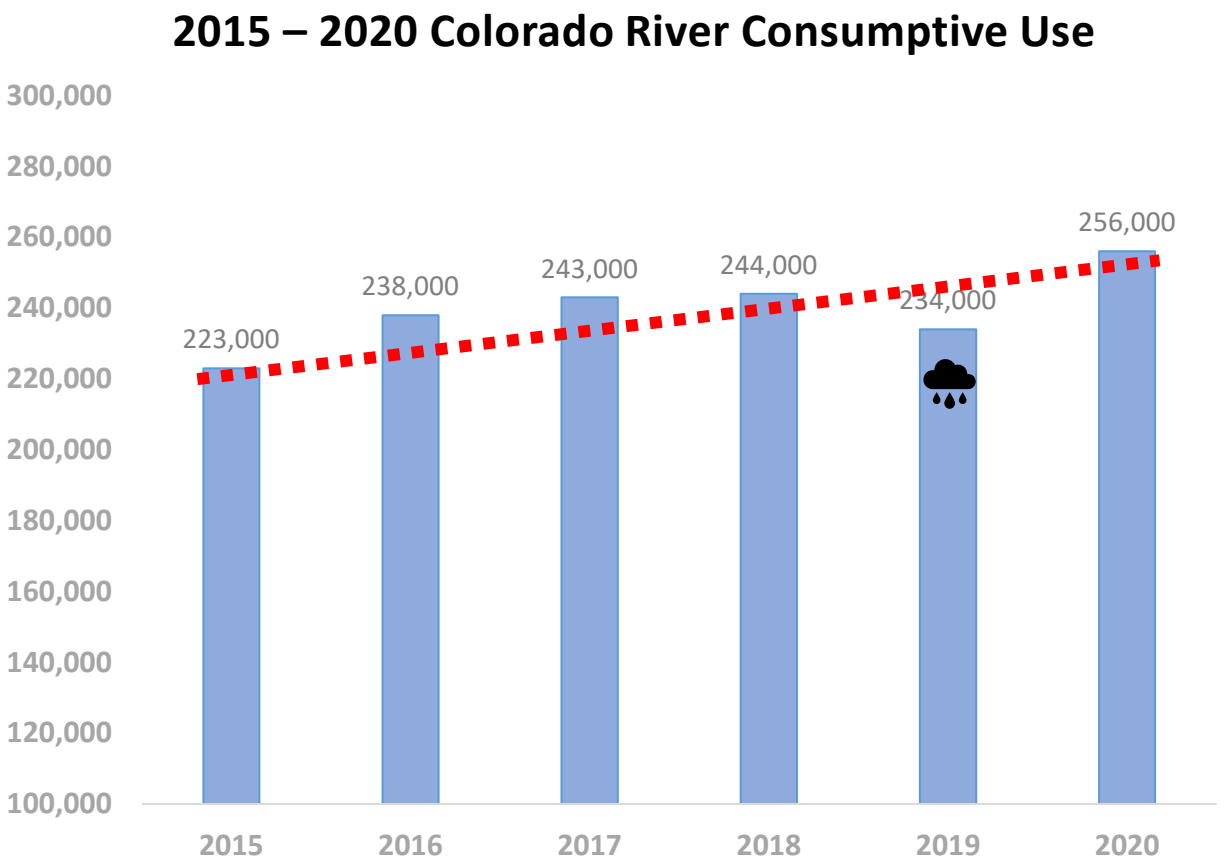
PRICING

Local purveyors establish water rates that send conservation signals, but remain competitive among similarly-sized western cities

EDUCATION

Tools such as the Speakers Bureau program, Youth Advisory Council, websites, publications, social media and public access TV shows help reinforce messaging

Beginning in 2015, water use began increasing despite ongoing conservation programs.



Following a period of increasing water use, the SNWA Board established a new water conservation goal in 2021 (86 GPCD).

Initiatives were developed to focus on the reduction of consumptive and inefficient water uses.

NONFUNCTIONAL GRASS: AB 356 prohibits nonfunctional grass by 2027

SEPTIC: Municipal water supplies cannot be discharged in septic tanks

EVAPORATIVE COOLING: New buildings are prohibited from using evaporative cooling

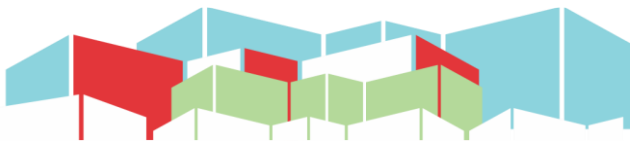
SWIMMING POOLS: New pools are limited to 600 sq. ft. surface area

WATER PRICING: Punitive water rates for top 10% of single-family residential users

NEW GRASS: New grass installations are limited to parks, schools and cemeteries

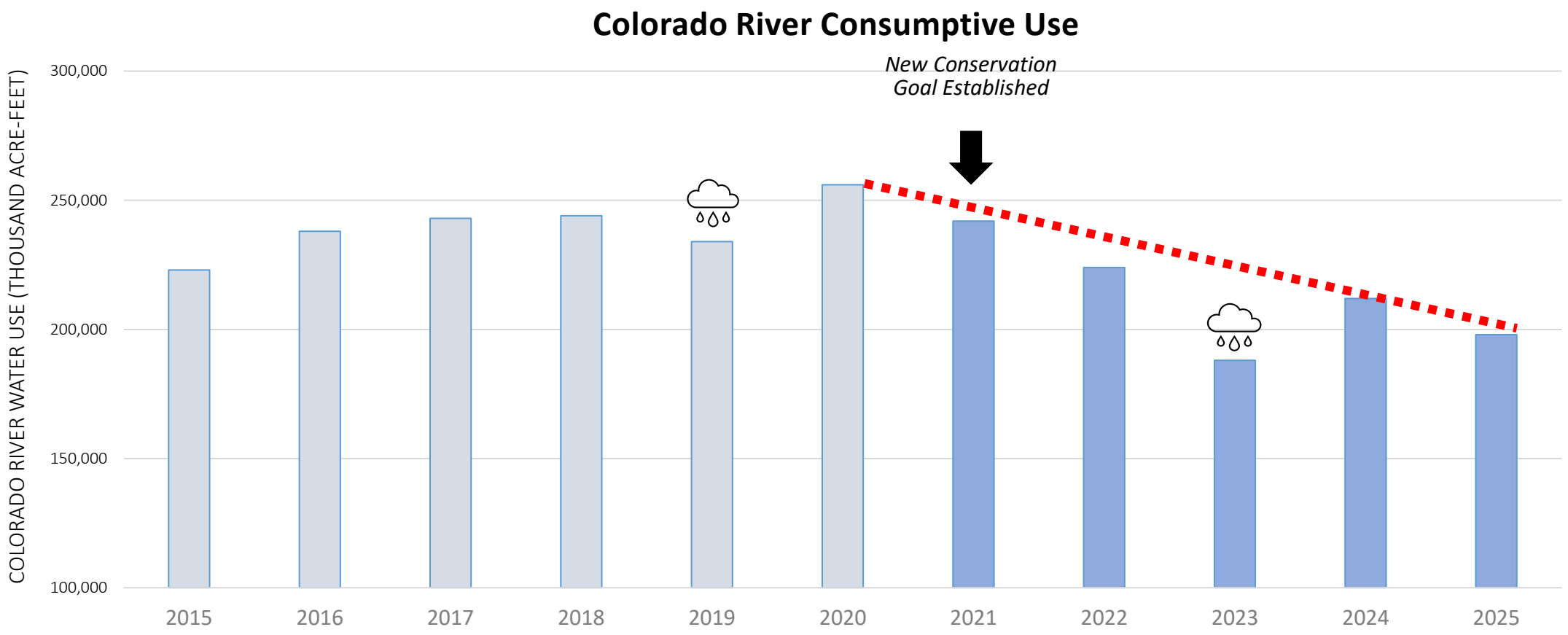
GOLF COURSES: Golf course water budgets were reduced by one-third. No new golf courses.

FOUNTAINS: New ornamental water features are prohibited, including resorts

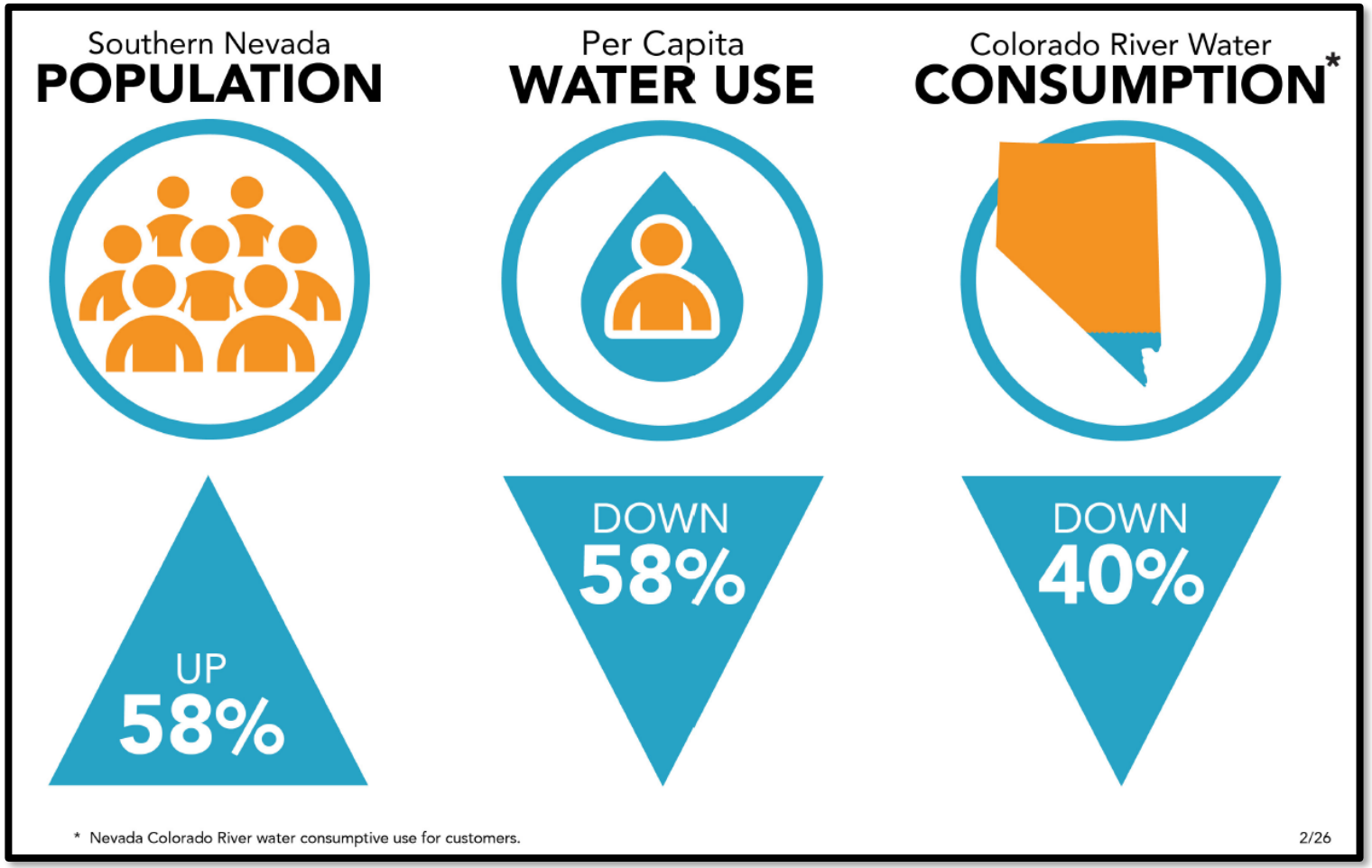


NFMT west

When everyone contributes to conservation, we see the results.



Since 2002, Southern Nevada has been able to significantly reduce water use while its population grew by over 800,000 residents.



Evaporative Cooling Moratorium

Building to the Conditions

No one would question building to earthquake safety standards in San Francisco or hurricane standards in Florida.

In Southern Nevada, water scarcity is our natural disaster.







Evaporative Cooling

Commercial/industrial cooling systems use billions of gallons of water every year, despite technologies being available that use no water.





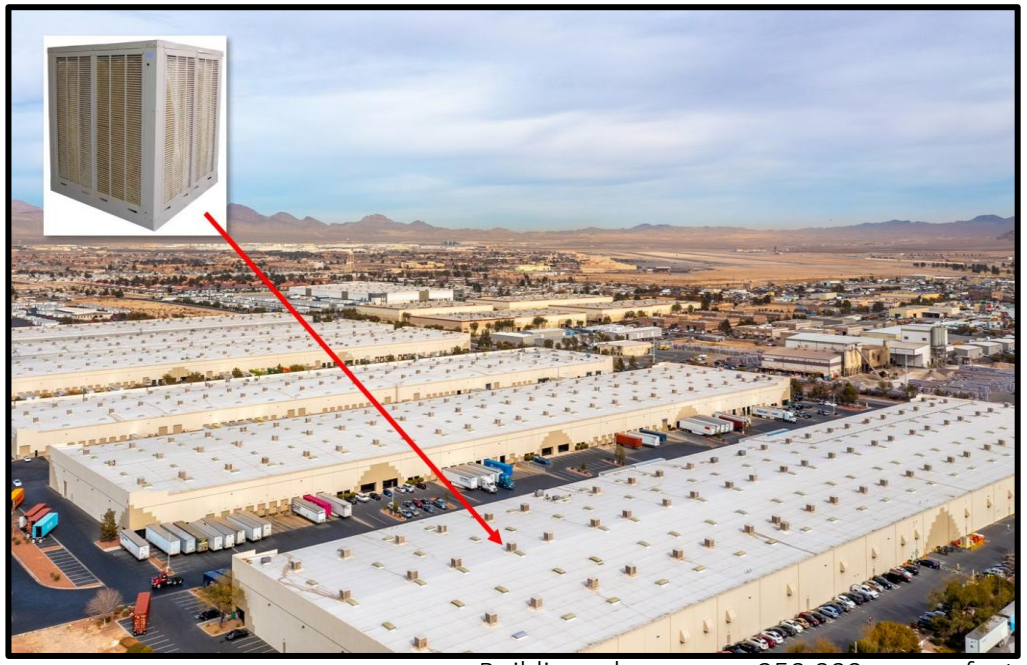
Mapping Future Economic Growth

Southern Nevada has an opportunity to chart its own course by deciding what kind of development it embraces and how those entities operate

What return on investment does this community want for its remaining water?

- One evaporatively cooled 250,000-square-foot warehouse can consume as much water as ~1,000 dry-cooled professional buildings
- One large evaporatively cooled data center can consume roughly the same volume of water annually as ~10,000 homes built to new efficiency standards

While building as we have for decades may provide a small competitive advantage, in the desert Southwest, a reliable water supply is the ultimate competitive advantage



Buildings shown are ~250,000 square feet

The SNWA is taking two distinct approaches to address evaporative cooling in existing facilities versus new facilities

Existing Facilities

- Voluntary participation
- Significant financial incentives
- Replacement/optimization options



New Facilities

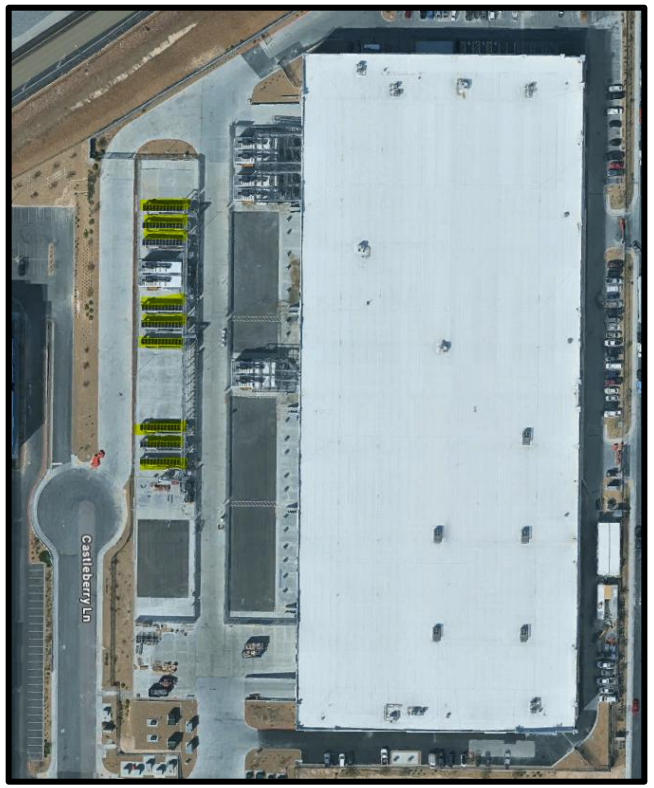
- Mandatory restrictions
- Enforced through building code
- Supported through service rules



NFMT west

Examples

Large Dry/Hybrid Cooling Projects in Las Vegas



Novva Data Center - 5,310 Tons
(Air-Cooled)



Grand Prix Plaza - 800 Tons
(Air-Cooled)

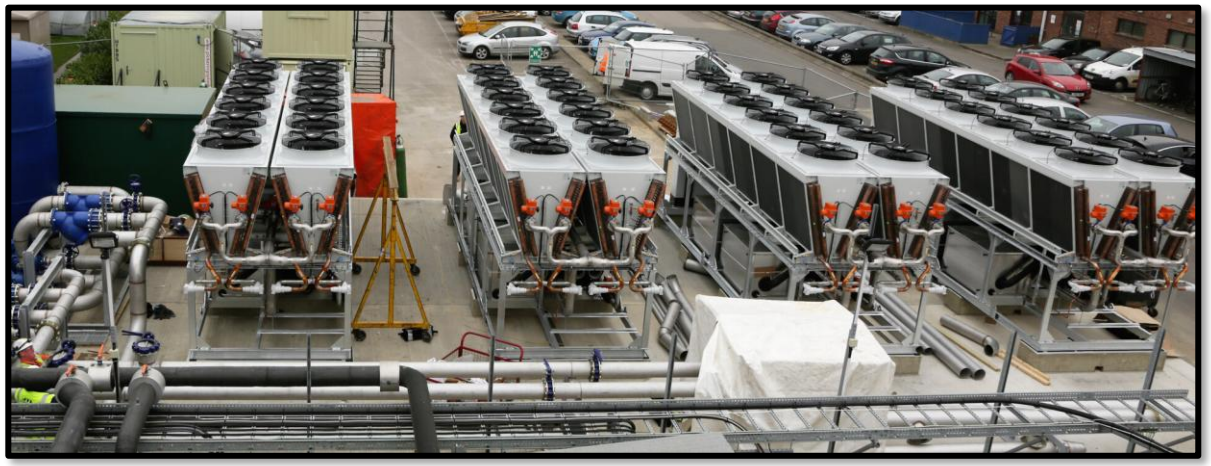


Forum Shops – 1,825 Tons
(*Adiabatic/Hybrid*)

Evaporative Cooling – Hybrid Systems

Adiabatic "Hybrid" Cooler

Adiabatic cooling systems work by using water to pre-cool the air flowing through a closed loop coil. Adiabatic coolers run in two modes: wet (or "pre-cooler") operation and dry operation. Wet operation is only activated during peak demand conditions (e.g., times of high outdoor temperatures and/or during high internal cooling loads conditions). A fan draws outside air through the unit where water is sprayed into the air. When the water encounters the warm air, water evaporates, and heat is dissipated. When outdoor temperatures are low and cooling loads are minimal, the system operates in dry mode, operating like a conventional finned dry cooler. Adiabatic cooling systems have a wide range of water savings because water use is heavily influenced on the operating conditions and how the system is controlled. These systems do not circulate water, which has the added benefit of no water treatment reducing operation costs.



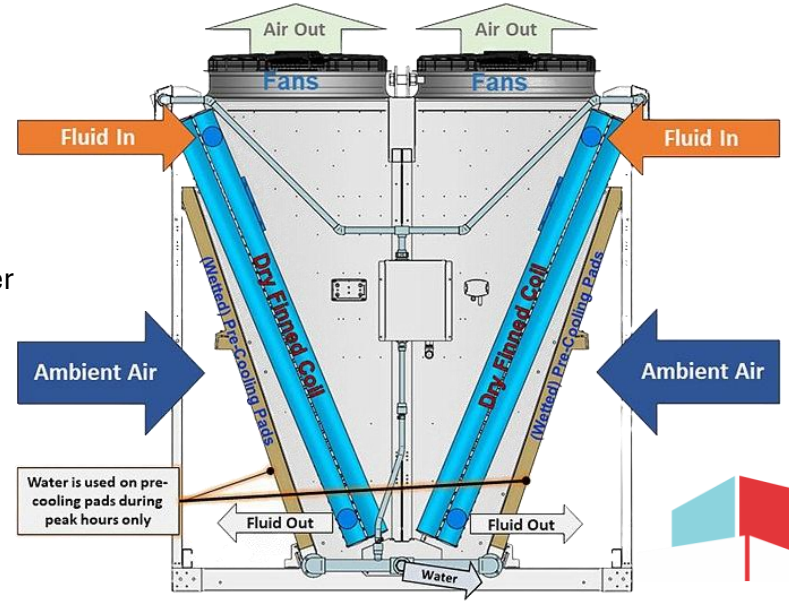
Above: Mechanism of an adiabatic cooling system. Water is used to pre-cool the ambient air before it's blown onto the condenser coils. Pre-cooling can add 25% more cooling capacity to a dry cooling unit and lower operating (electricity) costs.

Benefits:

- Significant water savings (20% to 70%)
- No to minimal water treatment required
- Low risk of legionella

Trade-offs:

- Higher initial capital costs compared to a cooling tower
- More energy required for same cooling load
- Limited capacity per unit. More space is often needed



Evaporative Cooling – Hybrid Systems

Closed Circuit “Hybrid” Fluid Cooler

Hybrid closed circuit coolers combine dry and evaporative cooling to maximize energy efficiency while simultaneously reducing water consumption. They can operate in a dry mode when outdoor conditions are favorable, significantly reducing water usage, and in wet mode when the heat load or ambient temperatures are high.

These units are common in buildings with water-source heat pump loops, such as in offices, hotels, and healthcare facilities. Using an open-cooling loop in these settings can significantly risk fouling hundreds of heat exchangers in an apartment complex or similar facility. Closed-circuit systems are also commonly used in data centers, and high-efficiency chiller applications. In a closed-loop system, water loss through evaporation is either reduced or eliminated, depending on the type of cooling equipment used. Similarly, the need for water treatment chemicals can often be reduced or even eliminated in some cases.

Benefits:

- Significant water savings (20% to 50% annually)
- Energy efficient in dry mode
- Increased flexibility in operation and layout
- Less maintenance, including less chemical treatment

Trade-offs:

- Higher initial capital costs
- Slightly less cooling efficiency compared to an open tower
- Slightly larger footprint



Hybrid fluid coolers provide heat rejection in dry mode until the load exceeds dry rejection capacity. At this switch-over point, the unit enters evaporative mode to increase cooling capacity. Operating in wet mode only when needed can dramatically reduce annual water consumption.



Examples

Before



After



Adiabatic System

Forum Shops at Caesars:

Rebate awarded $1,665,625

Estimated annual gallons saved: 17,062,500

Before



After



Fluid Cooler System

Bellagio:
Rebate awarded $1,025,000
Estimated annual gallons saved: 10,500,000

Evaporative Cooling – Air Cooled Chillers

Air-Cooled Chiller

An air-cooled chiller works by absorbing heat from a circulating water loop using a refrigerant, then transferring that heat directly to the surrounding air through a condenser, essentially cooling the water without needing a separate evaporative cooling tower, eliminating water consumption.

These package chiller units use a standard refrigeration cycle where the refrigerant absorbs heat from the chilled water in the evaporator, gets compressed, then releases that heat to the surrounding air in the condenser. They are a reliable, proven technology that is in widespread use.

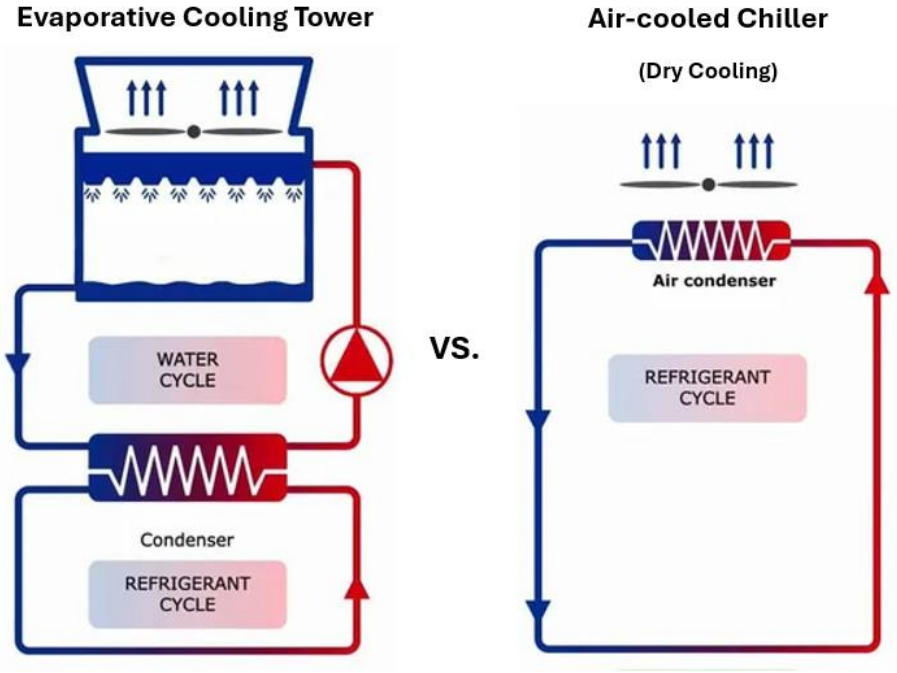
Benefits:

- Runs dry. No water consumption
- No water cost associated with operation
- Can easily be scaled up (e.g. data center operation)
- Lower maintenance, no water treatment required
- No legionella risk

Trade-offs:

- More energy required to operate vs. cooling tower
- Less cooling capacity per unit. More units needed
- Capacity derating occurs in extreme temperatures
- Additional space required





Evaporative Cooling – Heat Pump Air Cooled Chillers

Heat Pump Air-Cooled Chiller

This heat pump scroll inverter system reduces operational costs while providing both cooling and heating. The condenser is air-cooled, meaning it uses ambient air to dissipate heat. Fans draw outdoor air across the condenser coils, where the refrigerant releases heat and cools down before returning to the evaporator. This design eliminates the need for a cooling tower, reducing water consumption and making the system simpler and more cost-effective to install and maintain.

The scroll compressor is at the heart of this chiller. It uses two interleaved scrolls (one stationary and one orbiting) to compress refrigerant, which is crucial for the heating and cooling cycle. Scroll compressors are known for their high efficiency, reliability, and quiet operation compared to other types of compressors. And by removing the cooling tower and hot water boiler, it is possible to save energy in an air-cooled heat pump chiller.

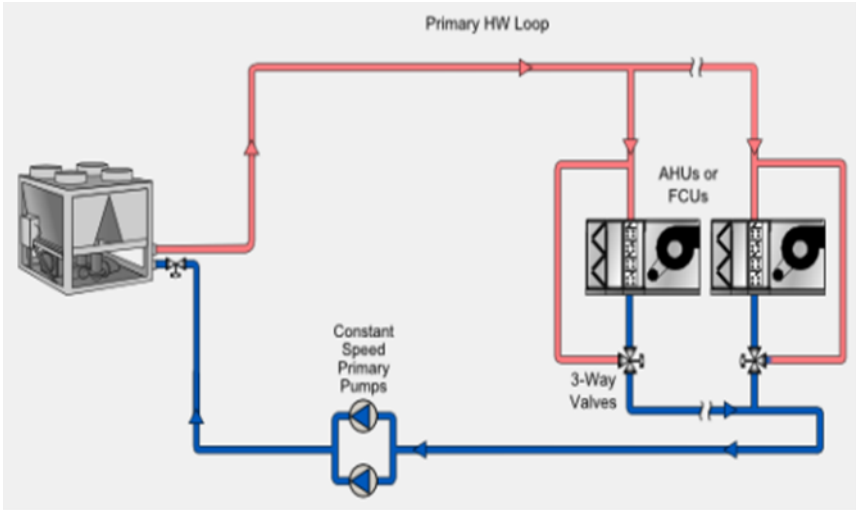


Benefits:

- Very energy efficient
- No water consumption
- Produces cooling and heat
- Can be scaled up
- Compact design

Trade-offs:

- Higher initial costs
- Reduced efficiency in extreme temperatures



Examples

Heat Pump Air Cooled Chillers

Clark County Library District Enterprise Library:
Rebate awarded $129,000
Estimated annual gallons saved: 1,806,000

Before



After



Air Cooled Chillers

Ocean Spray Factory: Rebate awarded $690,000
Estimated annual gallons saved: 4,140,000



Evaporative Cooling - Air Rotation Units

Air-Rotation Units

Air-rotation systems are an alternative to conventional rooftop air conditioning units. Air-rotation units address the air stratification in warehouses and similar tall spaces by continuously circulating the air in the space. The unit picks up air at the floor, removing the coldest air layer supporting the thermal strata. The air is heated or cooled and returned quietly through a screened discharge plenum to create a uniform temperature and a comfortable, more cost-effective conditioned space.

This system eliminates the need for duct work that can interfere with overhead space. Any single zone space of at least 10,000 square feet with ceiling height of 25 feet or greater, is a candidate. One air-rotation unit can handle up to 100,000 square feet of floor space.

Also, ground level mounting eliminates roof penetrations, reduces structural costs, allows ground level service and maintenance, and reduces installation expense over roof mounted systems. Heating can be electric, gas, heat pump, oil, steam, or hot water. Outside air management including economizer are optional.

Benefits:

- No water consumption with DX option
- No rooftop penetrations or additional rooftop support
- No indoor ductwork
- Indoor or outdoor mount options
- Portability

- **Trade-offs:**
- Higher initial capital cost
- Requires concrete base
- Units are more visible



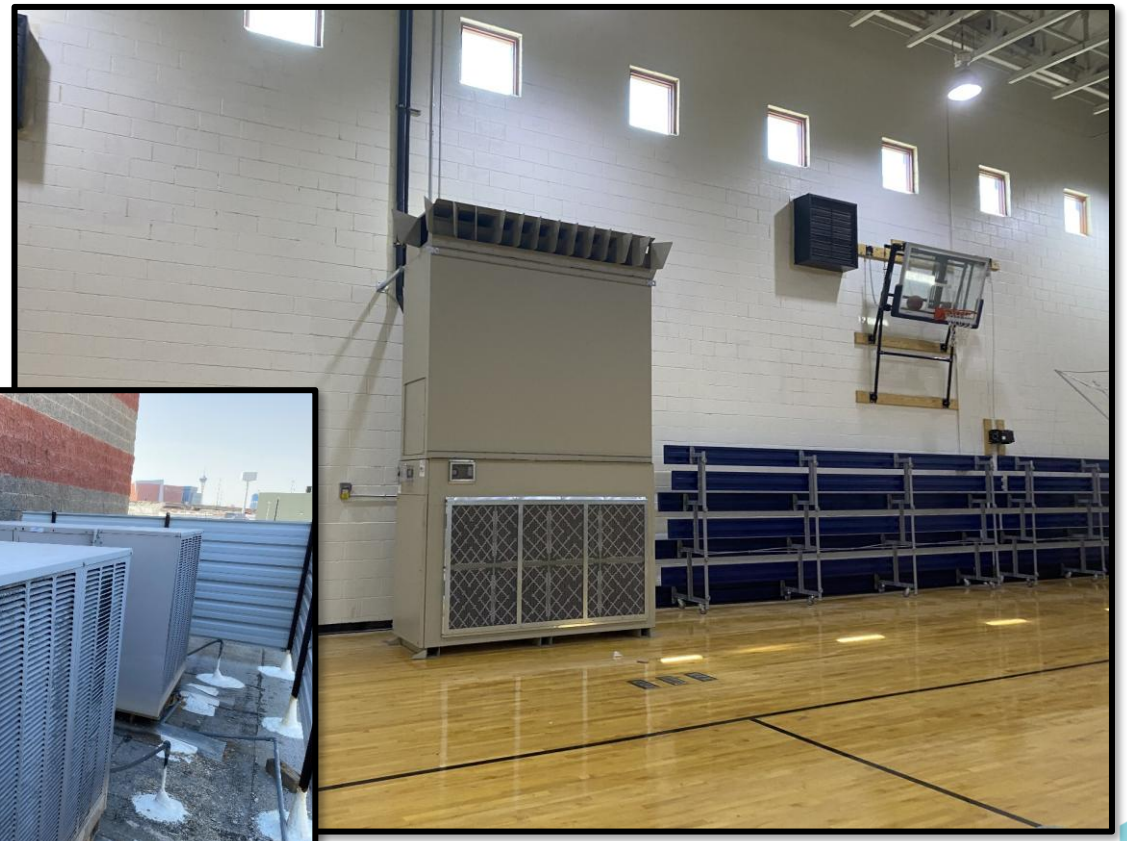


The Las Vegas Raiders practice facility uses three ARU's to cool the field area. While these use a chilled water system, air-cooled options are available.

Examples

Boys and Girls Club:
Rebate awarded $54,000
Estimated annual gallons saved: 324,000

After



Before





City of Henderson Fleet Building:
Rebate awarded $282,000
Estimated annual gallons saved: 3,948,000

NFMT west

Evaporative Cooling – Industrial (HVLS) Fans

HVLS Fans

High-Volume, Low-Speed (HVLS) fans can improve efficiency of climate control systems in large industrial and commercial spaces by providing increased airflow and temperature regulation without using water. Built with heavy-duty materials, these fans are effective for enhancing comfort in areas such as warehouses, gyms, big box retail, and production facilities. HVLS ceiling fans come in various sizes, with some models reaching up to 24 feet in diameter. A single fan can cover an area of 22,000 square feet, making them suitable for expansive facilities over 100,000 square feet.

The Southern Nevada Water Authority through its Water Efficient Technology (WET) program offers cash rebates for projects that replace existing evaporative swamp coolers with HVLS fans (up to 50% of the total number of swamp coolers in a building).

Benefits:
- No water consumption
- May allow for reduction in swamp cooler units
- Provides even temperature distribution throughout building
- Energy efficient
- Eligible for an SNWA rebate if swamp coolers are removed

Trade-offs:
- Does not reduce the ambient temperature
- Best suited to high-ceiling spaces



SNWA Rebate Scenario: A warehouse has 20 swamp coolers and replaces 10 units with HVLS fans and as a result, reduces evaporative water consumption. The SNWA rebate will help cover the cost of purchasing and installing the HVLS fans - up to 50% of the project cost.

Examples

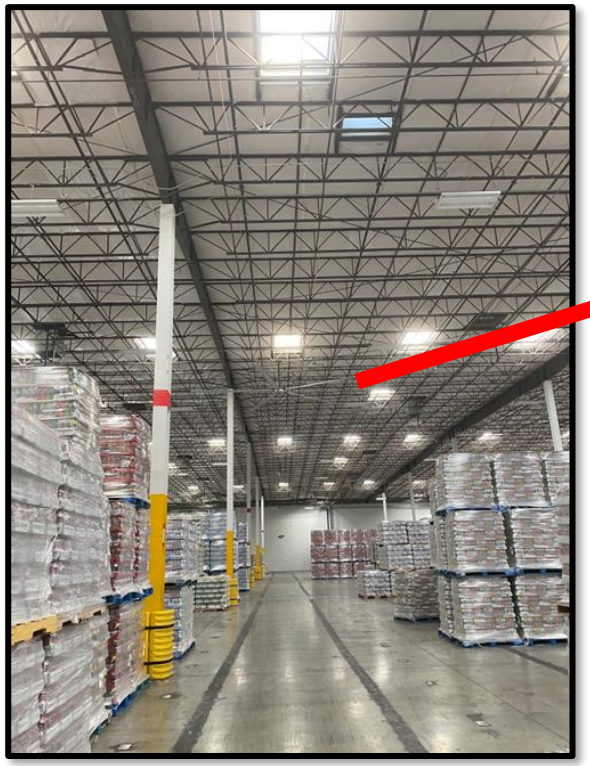
Distribution Warehouse: Rebate awarded $78,900

Estimated annual gallons saved: 3,078,000

Before



After



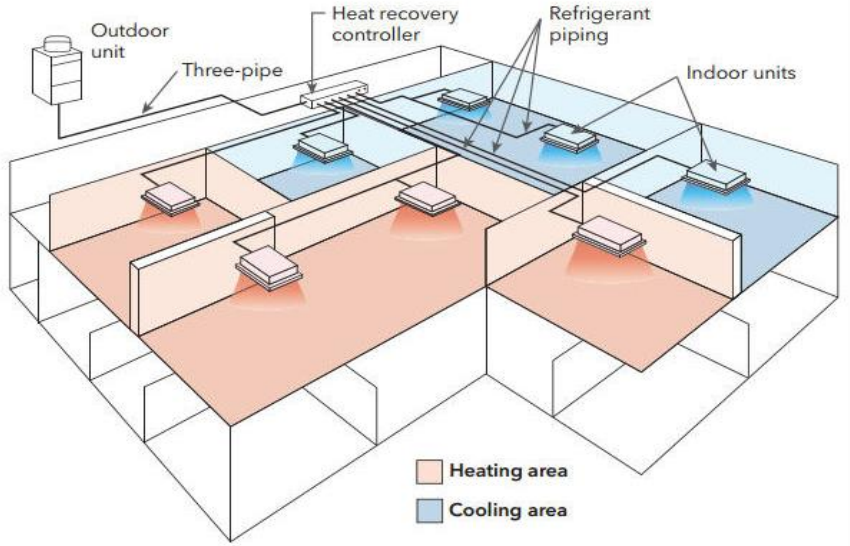


Evaporative Cooling – Variable Refrigerant Flow (VRF) Systems

Variable Refrigerant Flow

A Variable Refrigerant Flow (VRF) HVAC system is a highly efficient and flexible cooling and heating system that provides zoned temperature control through variable refrigerant flow management. While there are several types of VRF configurations, typical applications would include hotels, multifamily buildings, large office complexes and schools.

With dozens of indoor units connected to one outdoor unit, a VRF system operates similar to a multi-split system. Each individual indoor unit determines the capacity it needs based on the current indoor temperature and desired set point. The total demand among all indoor units will determine how the outdoor unit adjusts the refrigerant volume and temperature accordingly. By only supplying the cooling or heating that is needed, the inverter compressor continues to save a large amount of energy during operation.



Benefits:

- Consumes no water
- Provides both heating and cooling (by room/zone)
- Very energy efficient
- Reduces or eliminates boiler/reduces carbon emissions



Trade-offs:

- Higher first cost
- May require specialized knowledge/servicing.

Examples

Church Lutheran Evangelical: Rebate awarded $90,000
Estimated annual gallons saved: 1,260,000



Before

After







Clark County School District Lummis ES project is in progress. Estimated rebate: $487,500

Estimated annual gallons saved: 6,825,000

Swamp Cooler Replacements Projects – Rooftop Package Unit

Rooftop Package Units

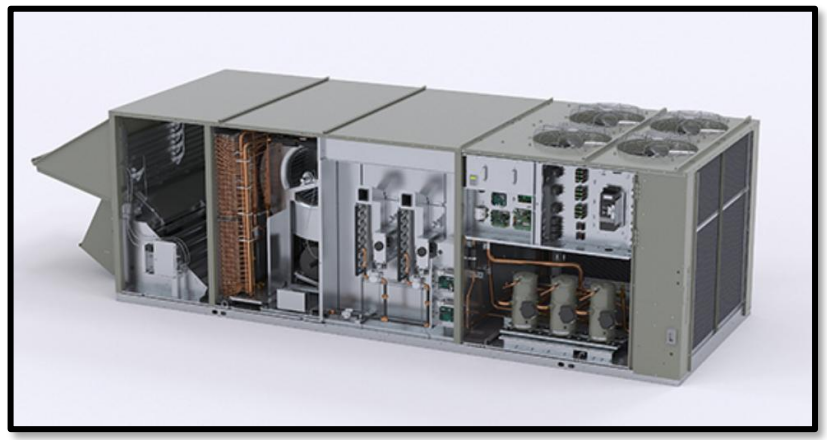
A rooftop package unit (often called an RTU) is a type of HVAC system that is designed to be installed on the roof of a building. These units are "packaged" because they house all the necessary components—such as the compressor, condenser, evaporator, and fan—within a single, compact unit.

They connect directly to the building's ductwork, distributing conditioned air throughout the space. Because the unit is mounted on the roof, it frees up valuable indoor or ground space that would otherwise be occupied by HVAC equipment.

Many modern RTUs are highly energy efficient, incorporating features like variable speed fans and energy recovery systems. They come in various sizes and configurations, making them suitable for a wide range of building types, from retail stores to offices, schools and hospitals. They can provide heating, cooling, or both, depending on the needs of the building.

Benefits:
- No water consumption
- Easy to install and maintain

Trade-offs:
- May need additional roof support





Generally available in sizes between 5 to 50 tons of cooling capacity each, package rooftop units are a reliable and proven waterless cooling technology.

Examples

Before



Bank of America Call Center:
Rebate awarded $450,000

Estimated annual gallons saved: 6,300,000

Tower completely removed



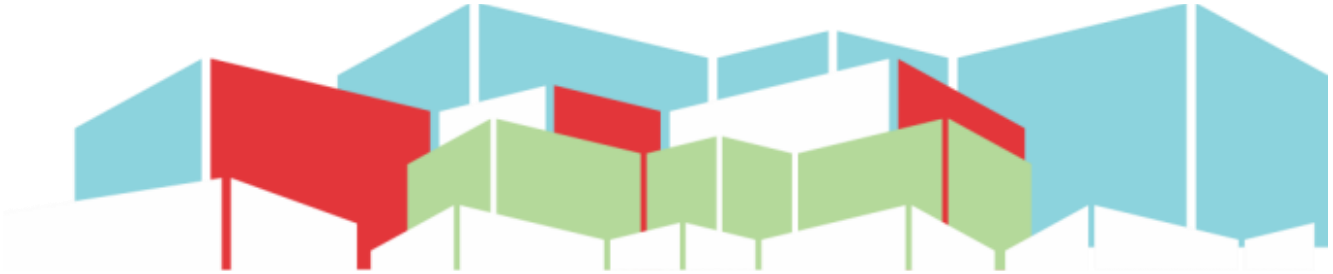
After

Replaced with Rooftop units





Questions?



Thank you for completing a session survey in the **NFMT event app!**

NFMT west