~~Practitioner~~ Seth's Perspectives on Western U.S. Water Challenges

May 13, 2025

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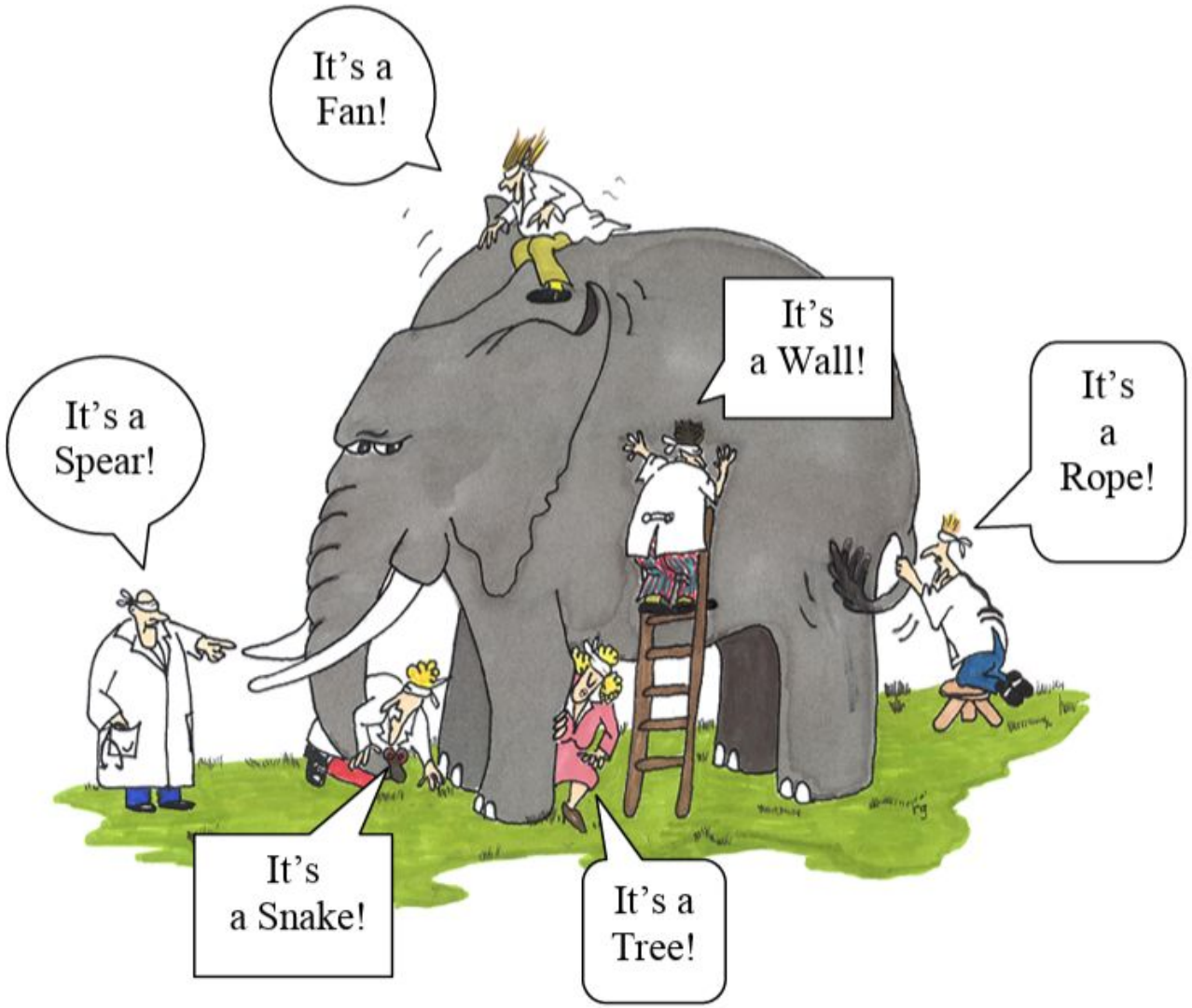
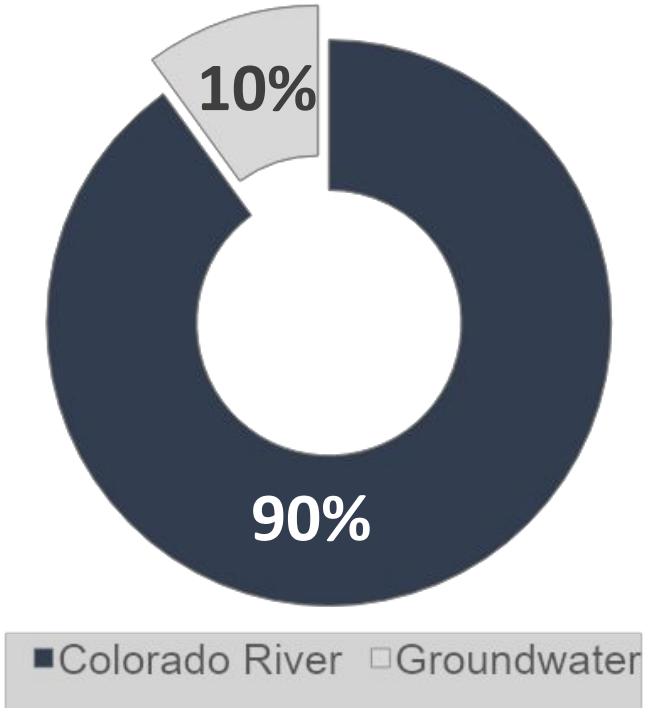
Colorado River Program Manager

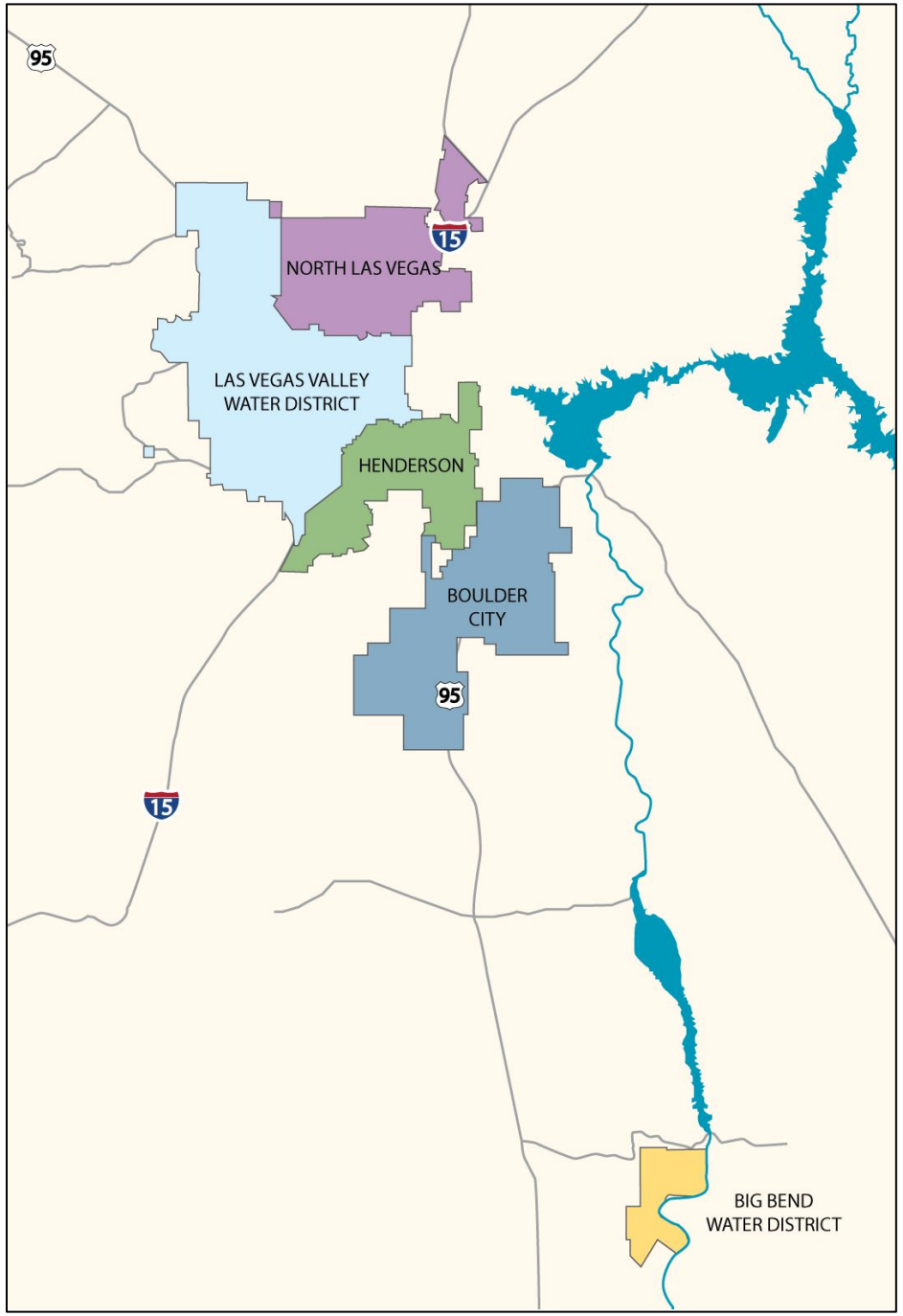
Southern Nevada Water Authority



Himmelfarb et al. 2002

Southern Nevada Water Authority





Southern Nevada Water Authority

- Resource management at **regional level**
- **7 water and wastewater agencies**
- Includes 4 cities and unincorporated county
- **2 treatment plants (900 MGD)**
- **253 miles** of large-diameter transmission mains
- **50 reservoirs** (414 MG storage)
- **35 ROFC valves**

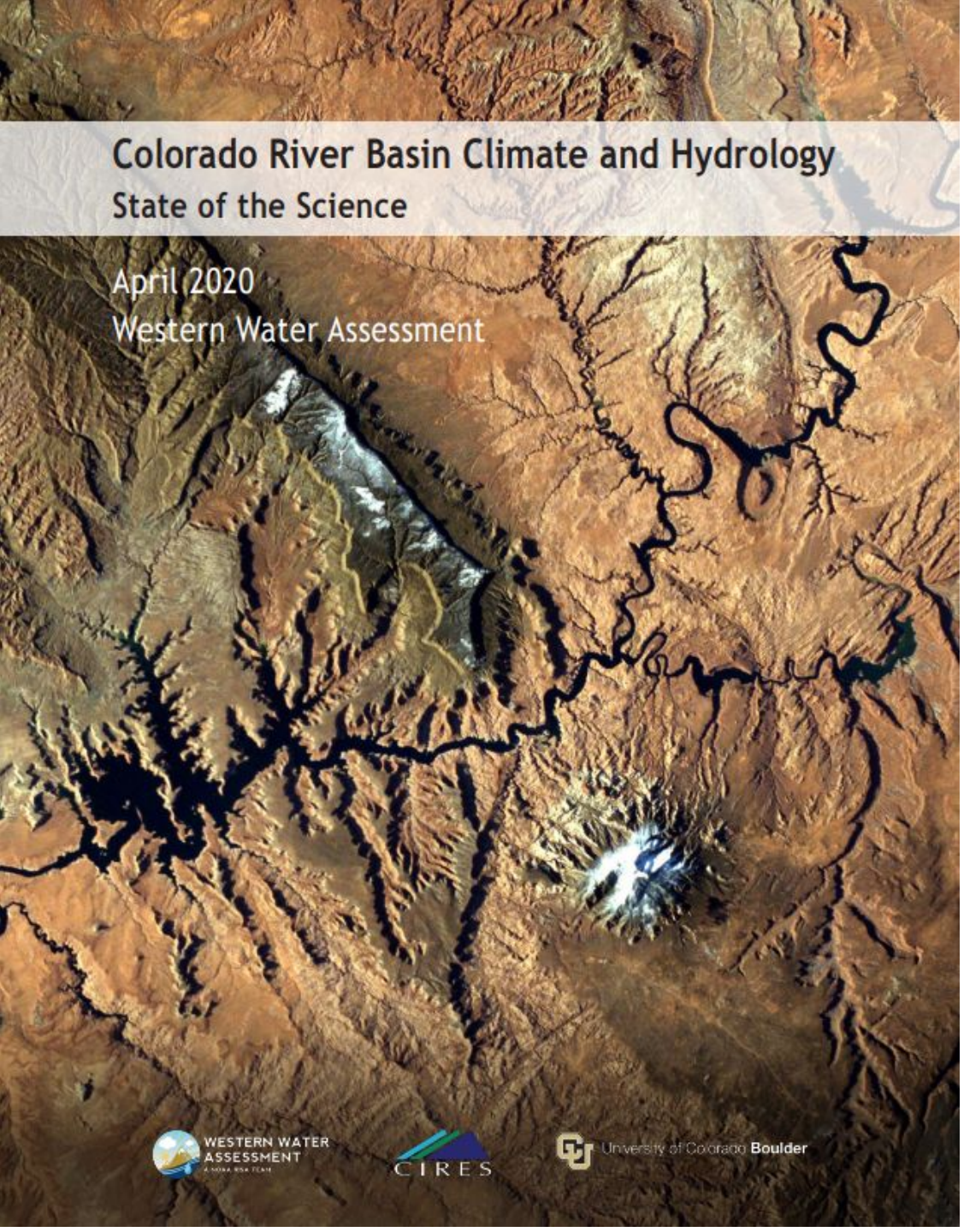
Colorado River Climate and Hydrology Work Group

Four Questions to Answer

1. What are pressing water sustainability challenges currently being faced in the West?
2. What are the primary drivers of water demand, and how are they expected to change over time?
3. How is climate variability impacting water availability and quality in the region?
4. What current strategies are being used to build long-term water resilience across sectors?

Q.1 - What are pressing water sustainability challenges currently being faced in the West?

- Supply decline and variability
- Planning for future demands
- Optimizing operations
- Infrastructure needs
- Financial limitations
- Shifting societal support and values



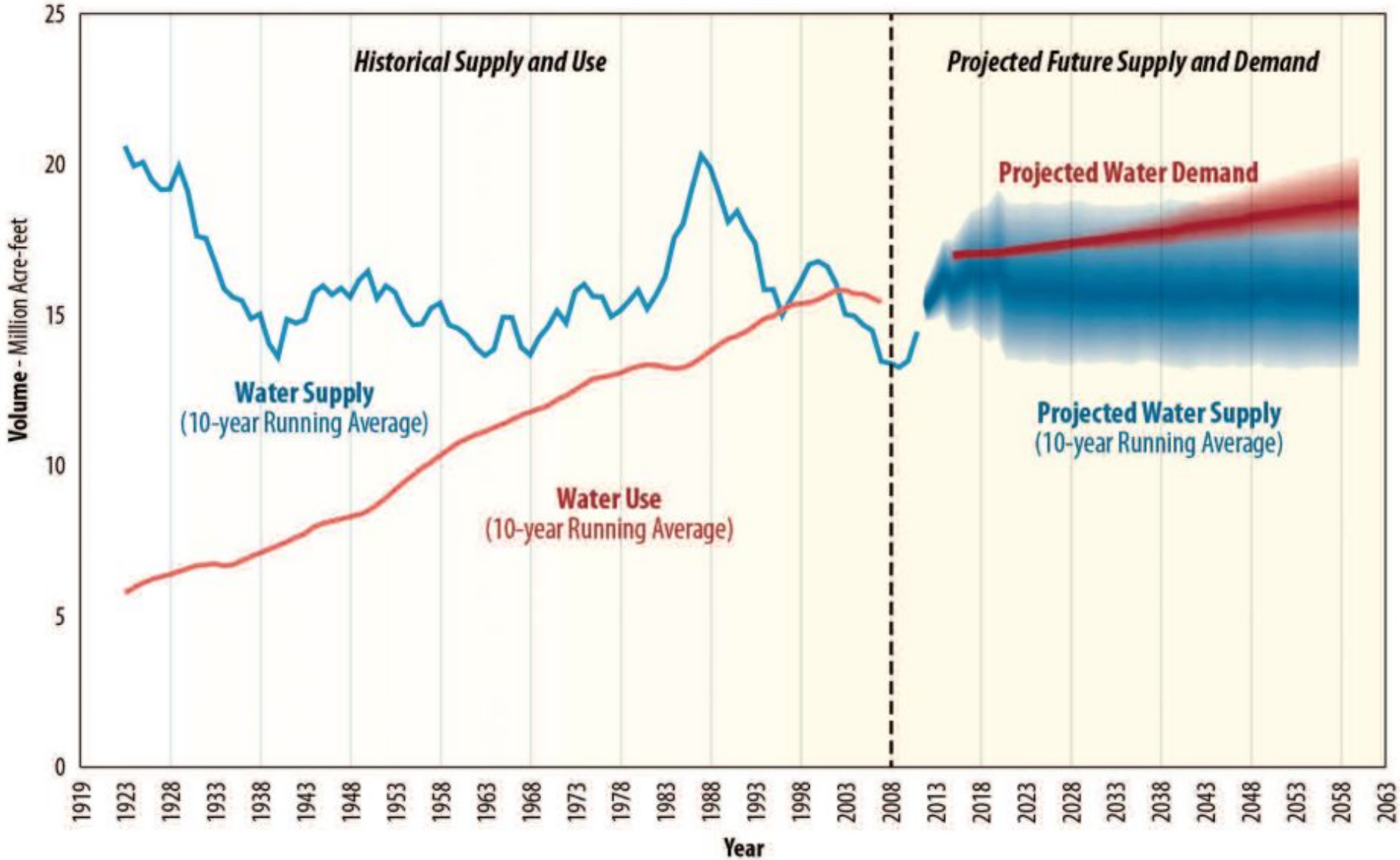
Lots of science challenges

Report by the
Western Water Assessment,
a NOAA Climate Adaptation Partnership

Lukas and Payton (eds) 2020

FIGURE 2

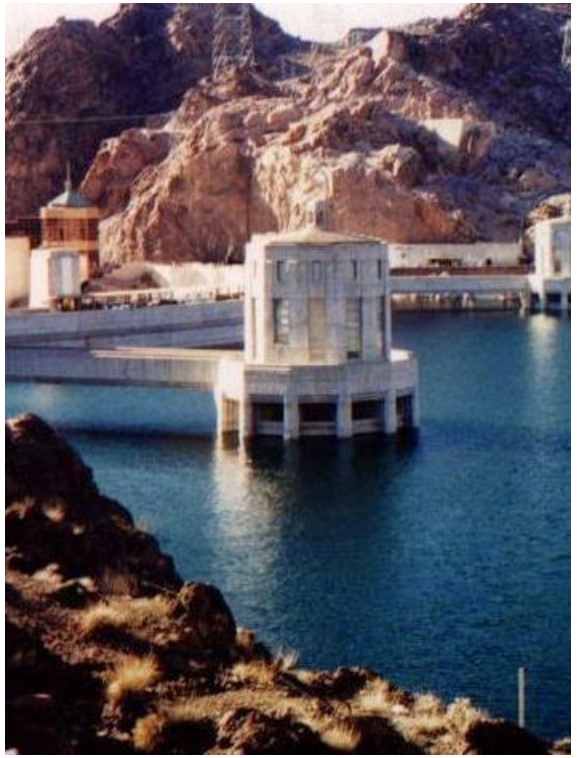
Historical Supply and Use[1] and Projected Future Colorado River Basin Water Supply and Demand

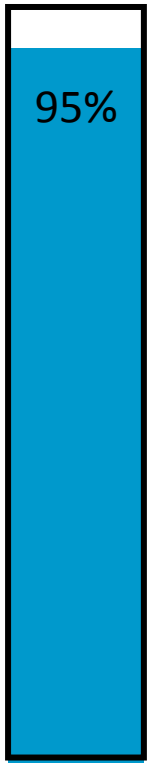


[1] Water use and demand include Mexico's allotment and losses such as those due to reservoir evaporation, native vegetation, and operational inefficiencies.

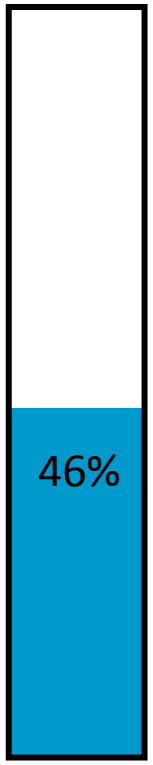
BOR 2012

1999

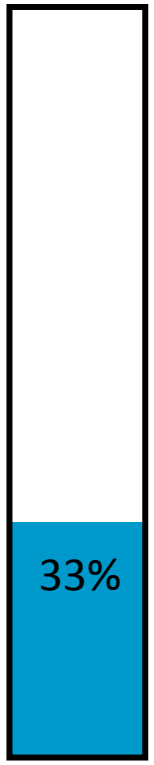




2004

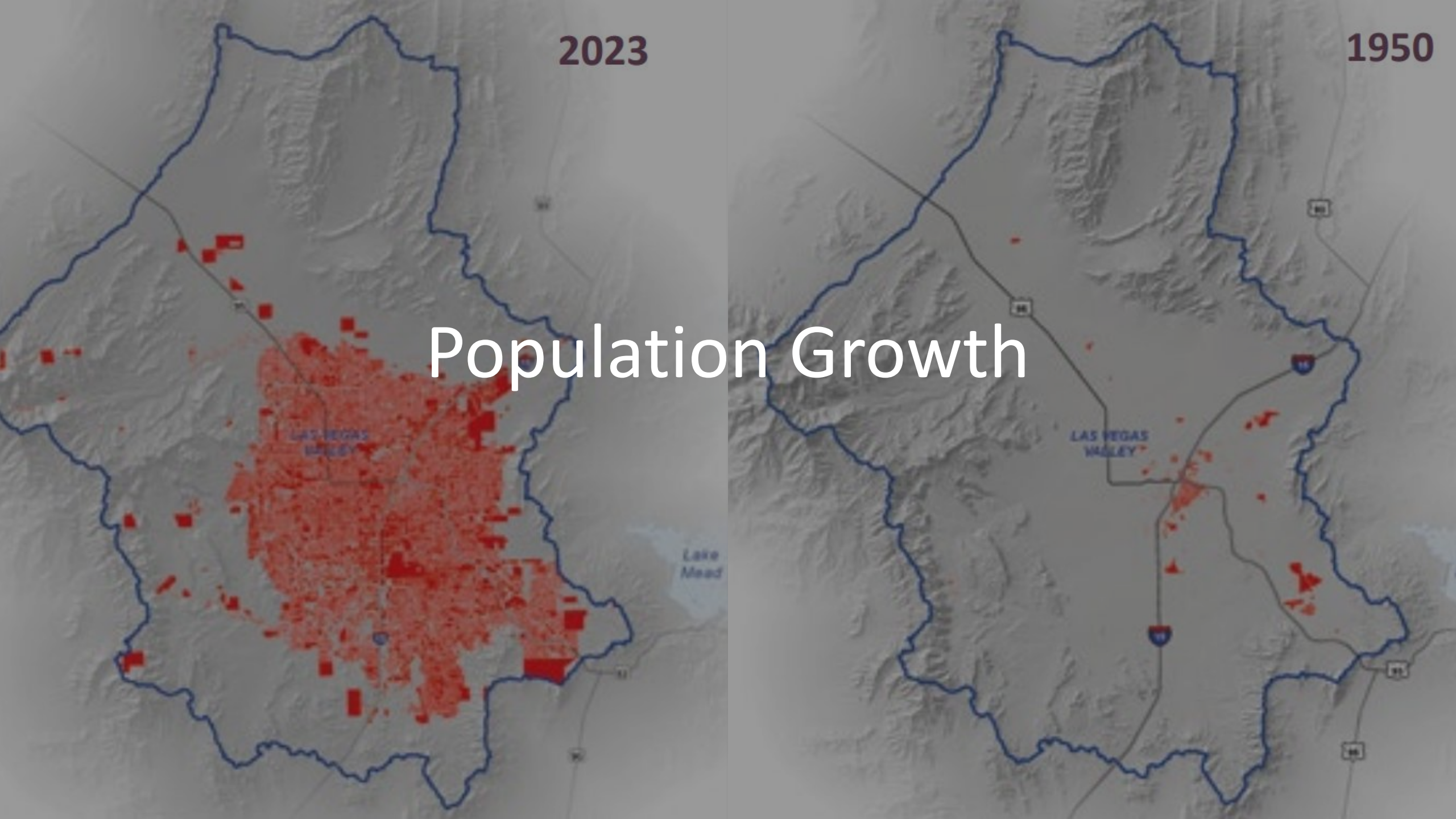


2025



Q2. - What are the primary drivers of water demand, and how are they expected to change over time?

- Humans
- Crops
- Atmosphere


2023
1950
Population Growth
LAS VEGAS VALLEY
Lake Mead
LAS VEGAS VALLEY

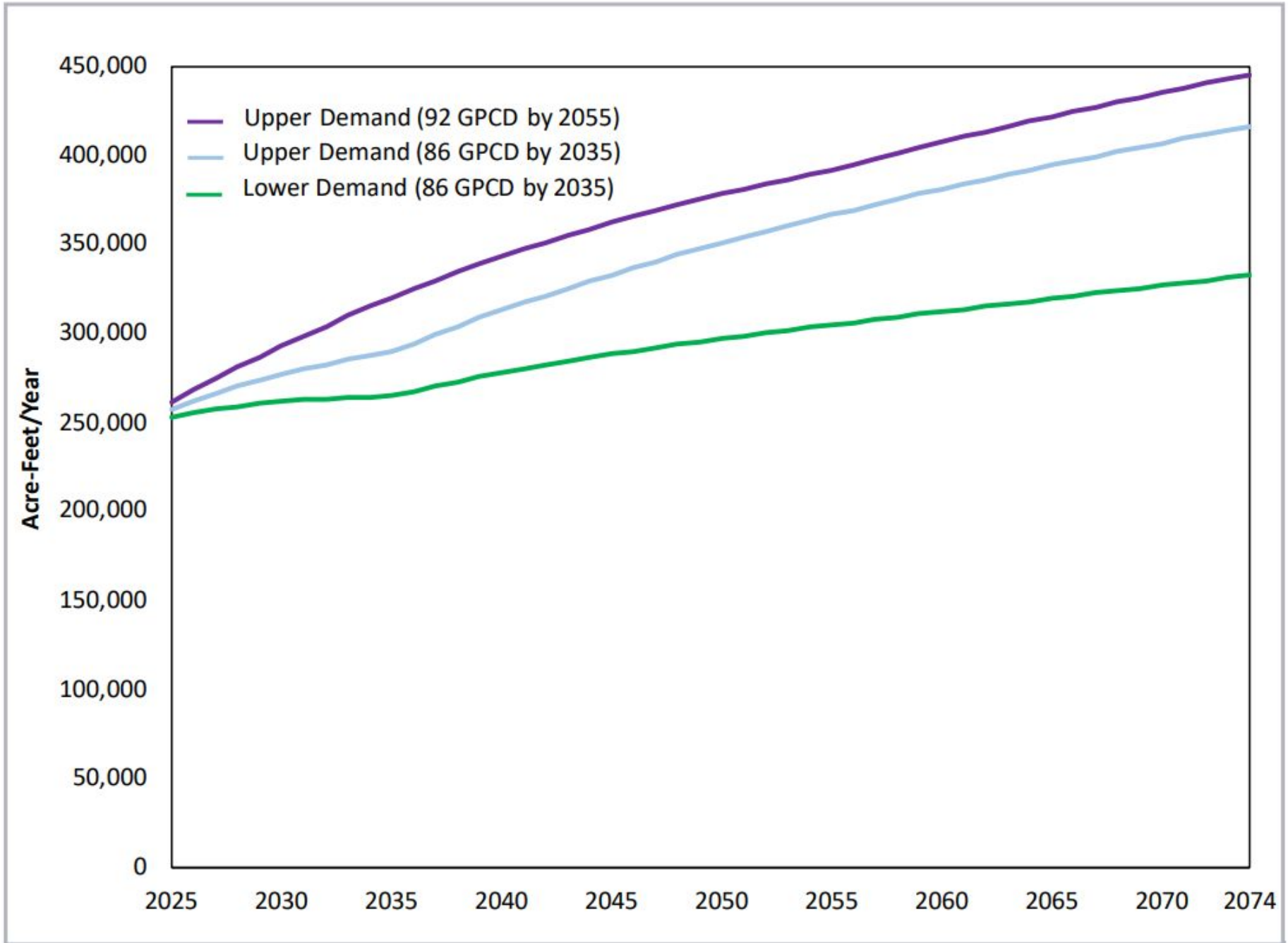


FIGURE 4.3 **SNWA Projected Water Demand**

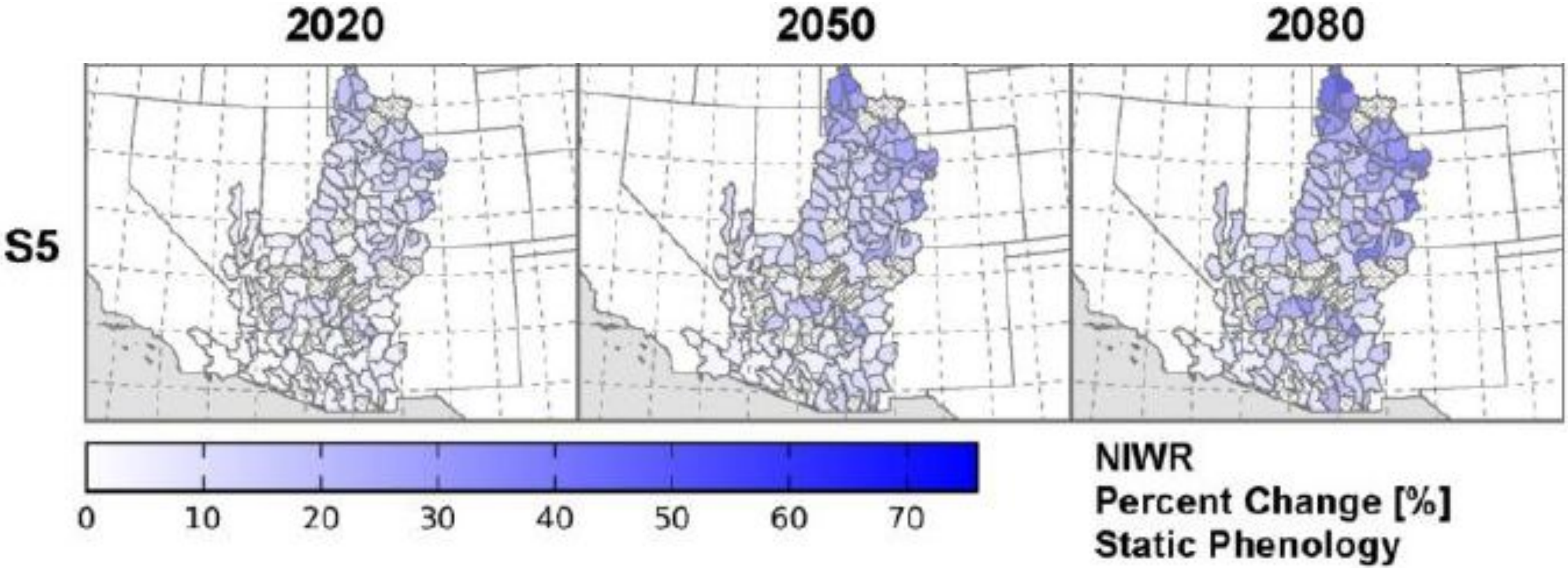


Figure 19.—Colorado River Basin – Spatial distribution of projected net irrigation water requirements (NIWR) percent change for different climate scenarios and time periods assuming static phenology for annual crops (S1 = WD, S2 = WW, S3 = HD, S4 = HW, S5 = Central).

Huntington et al. 2015

Trends in Evaporative Demands

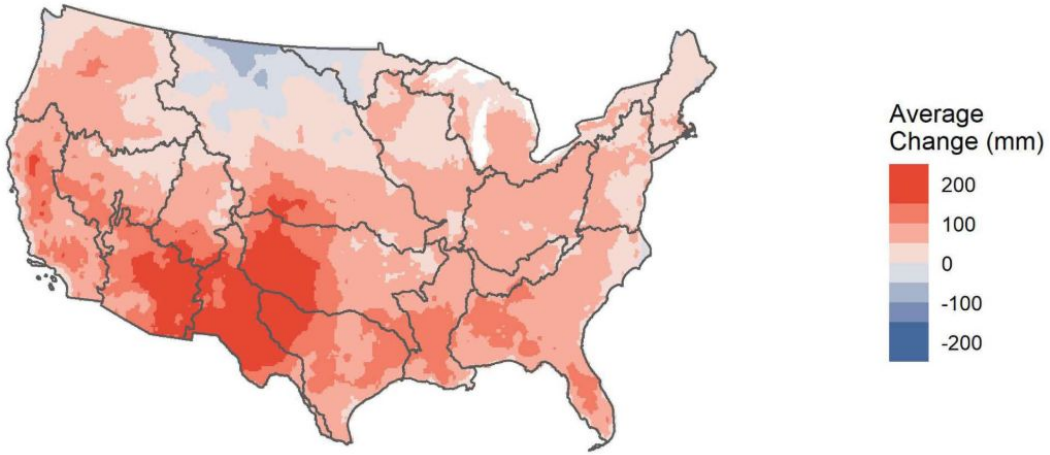


Figure showing changes in atmospheric thirst, measured in terms of reference evapotranspiration (mm), from 1980-2020. The largest changes are centered over the Rio Grande region of the southwestern U.S.

Credit: DRI.

Albano et al. 2022

Trends in Extreme Evaporative Demands (Thirstwaves)

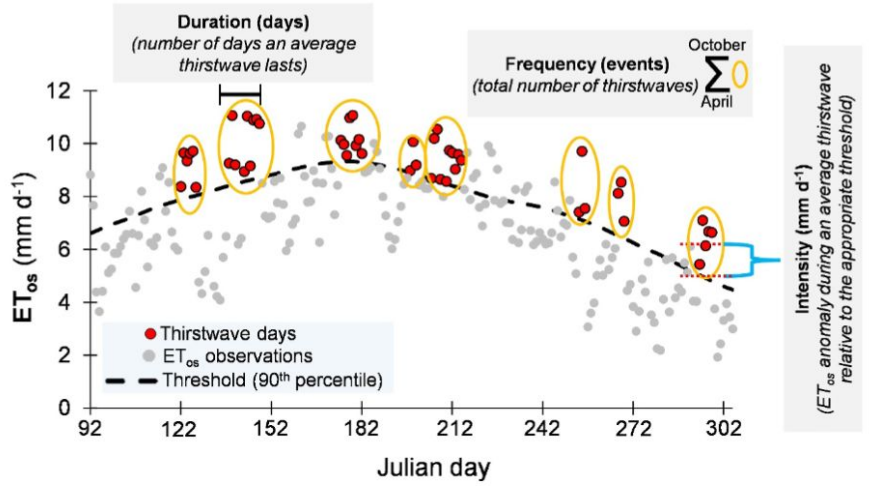


Figure 1. A schematic that conceptualizes the three thirstwave characteristics (intensity, duration, and frequency) using example observations.

Kukal and Hobbins 2025

Q.3 - How is climate variability impacting water availability and quality in the region?

Table 2.2

Variability and persistence in basin precipitation and streamflow over the 1906–2016 period. See text for explanation of indices. (Data: runoff from Reclamation, after Prairie and Callejo (2005); precipitation from NOAA NCEI)

Region/gage and variable	Coefficient of Variation (CV)	Lag-1 Persistence
Upper Basin annual precipitation	0.16	-0.10
Lees Ferry annual natural streamflow	0.29	0.23
Lower Basin annual precipitation	0.21	-0.01
Little Colorado annual gaged streamflow	0.73	0.05

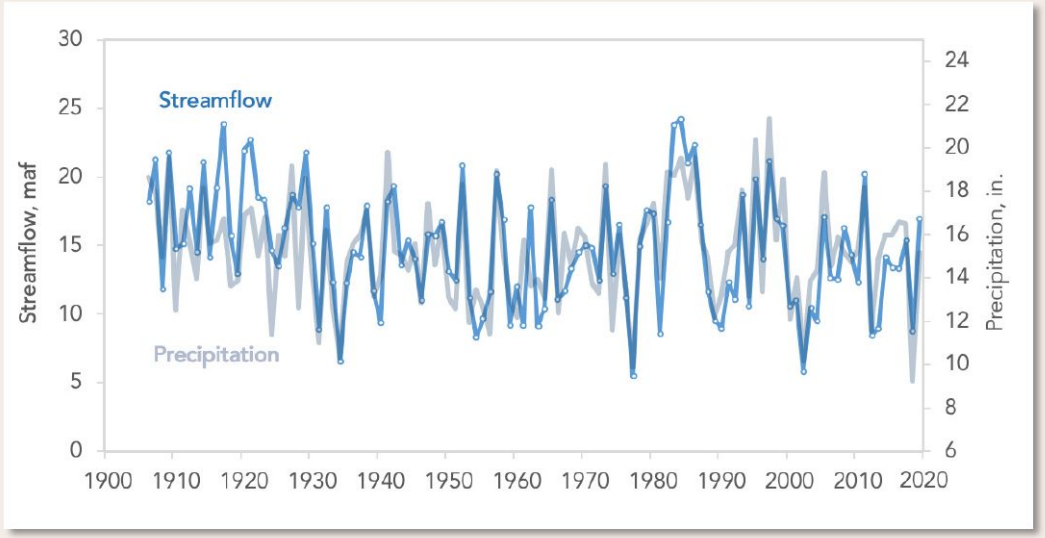
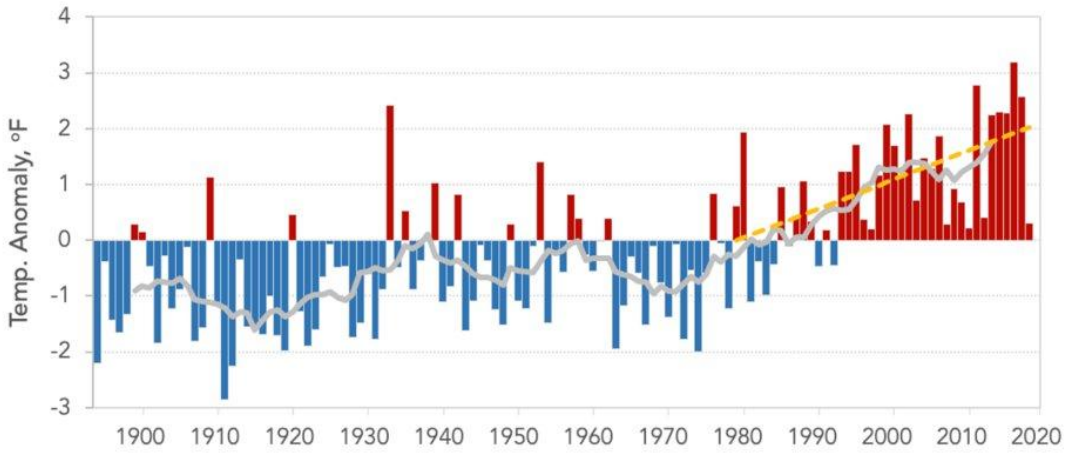


Figure 2.6

Upper Basin water-year precipitation compared with Colorado River at Lees Ferry water-year natural streamflow, 1906–2019. The correlation between the two time-series is 0.77 (R^2 = 0.61) over the entire record, with higher correlations over more recent periods. (Data: precipitation, NOAA NCEI; streamflow, Reclamation)

Lukas and Payton (eds) 2020

Climate Variability Impacting Water Availability



Annually averaged temperature departure from 1970-1999 average

Uncertainty Range
-1.5% to -7.5% flow
per 1° F increase

- "…there is now substantial evidence from both hydrologic model experiments and analyses of the observed record that recent warming temperatures have already had a role in reducing Colorado River flows. Those studies also indicate that the magnitude of the incremental impact of climate warming on streamflow remains uncertain."

Lukas and Payton (eds) 2020

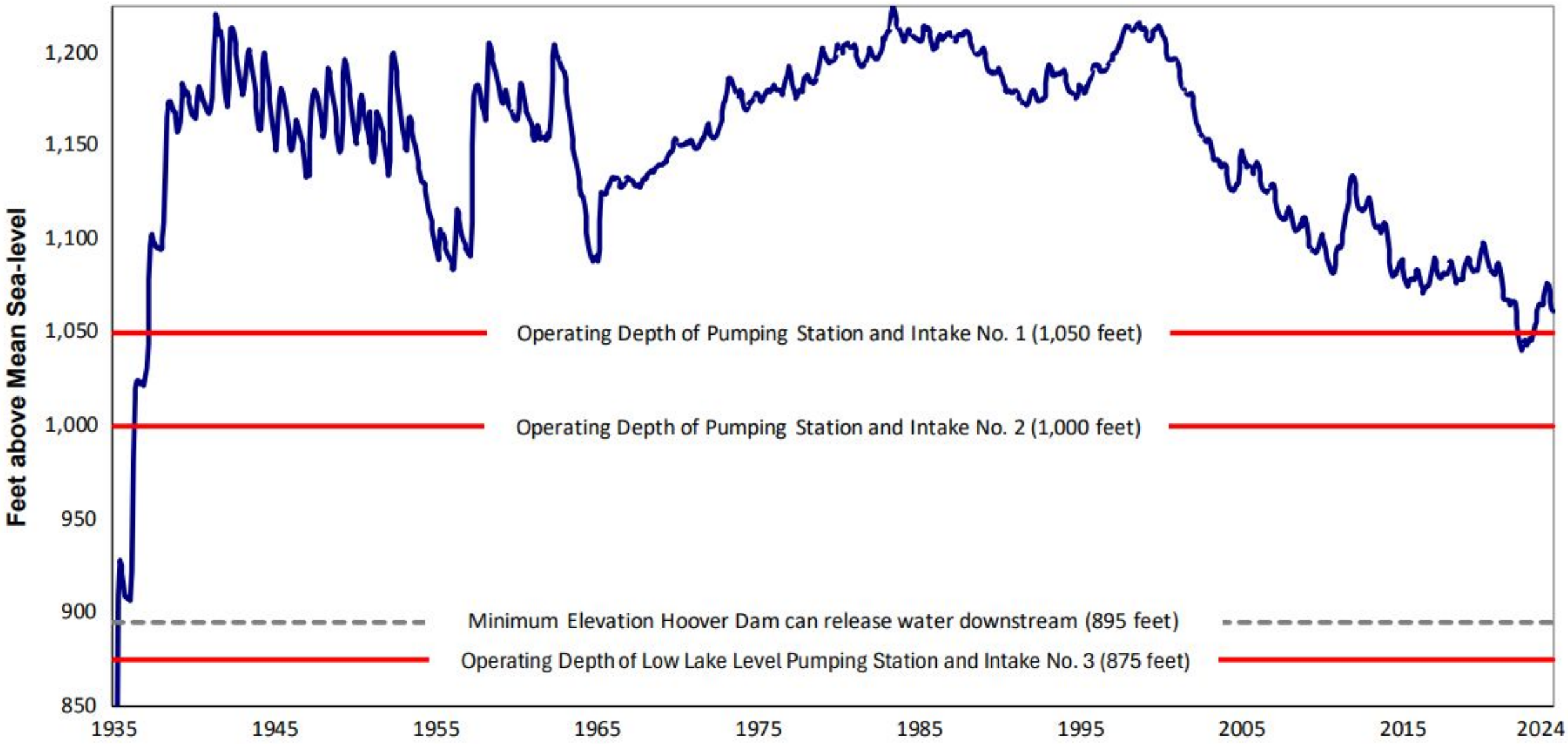


FIGURE 2.6 **Historical Lake Mead Elevations**

Climate Variability Impacting Water Quality

Table 7. Management strategies.

Concern	Management Response
Warmer releases from dammed reservoir to downstream system	Increase WSEL of managed reservoir to prevent epilimnetic releases
HABs caused by rising winter water temperatures	Decrease WSEL of managed reservoir to facilitate Autumn and winter cooling
Increased nutrient concentrations	Manage inflow nutrient concentration into reservoir
Reductions in DO	No suggestion at this time
Stronger, persistent thermal stratification	No suggestion at this time
Degradation in raw water quality for treatment and distribution	Increase WSEL of managed reservoir to prevent epilimnetic withdrawals

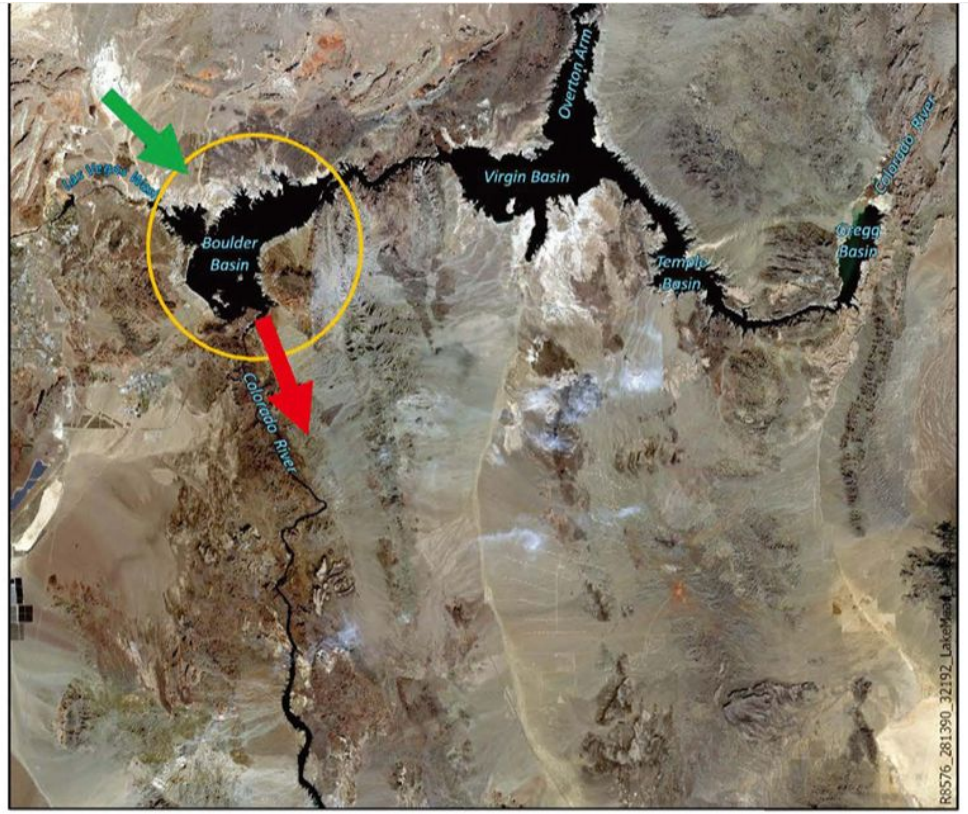


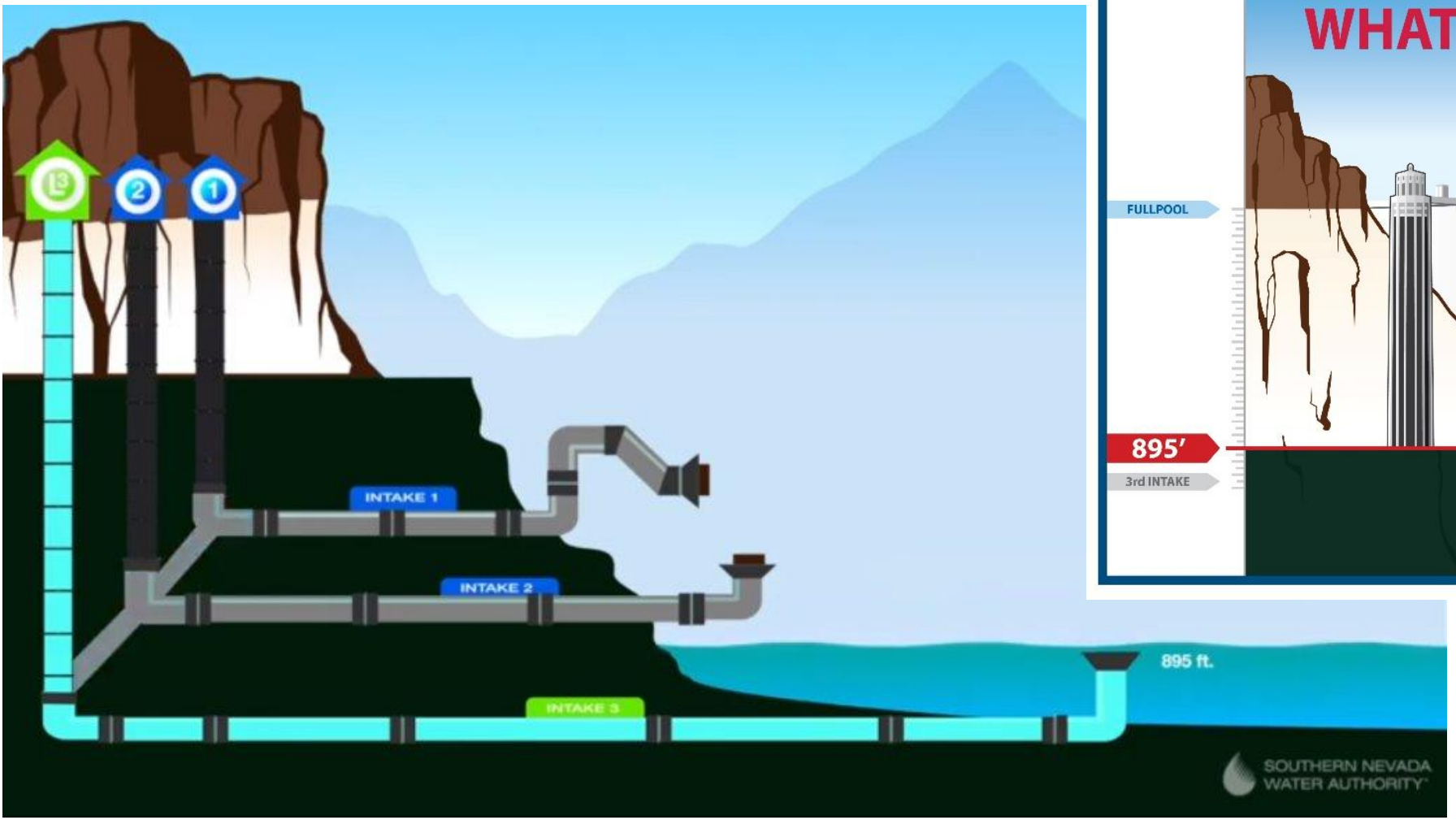
Figure 1. Lake Mead Map. Las Vegas Wash inflow into Boulder Basin is circled in yellow. Outflow is through the Colorado River south out of Boulder Basin (red arrows). Las Vegas Wash influent is highlighted by the green arrow.

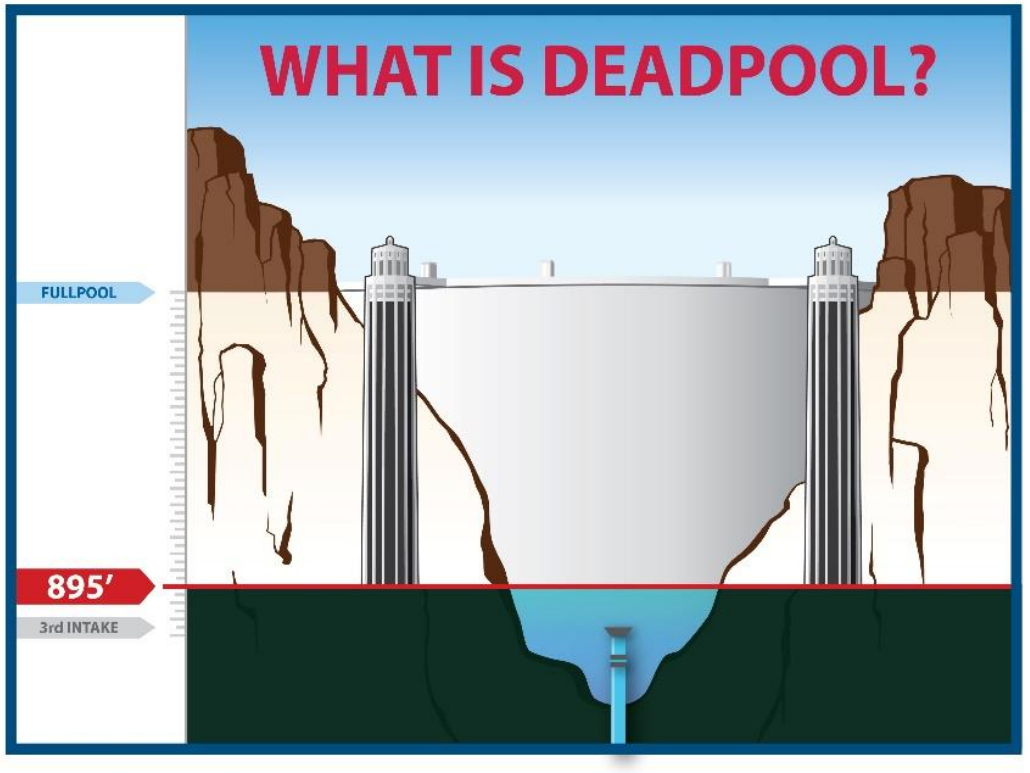
Hannoun et al. 2022

Q.4 - What current strategies are being used to build long-term water resilience across sectors?

- Maintain access
- Operate more efficiently
- Store unused supplies
- Share reductions
- Contribute water to the system
- Implement and pilot water conservation programs

SNWA Infrastructure





SNWA Conservation Programs

- Mandatory and incentivized turf removal
- Mandatory watering schedule
- Water-efficient development codes
- Water waste fees
- Tiered water rate pricing
- Pool size limits
- Golf course water budgets
- Septic system conversions
- Rebate programs
- Marketing

SYSTEM CONSERVATION PILOT PROGRAM

SCPP WEBINAR

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11/13

11:00 - 12:00

NOVEMBER 13, 2023

11 AM –12 PM

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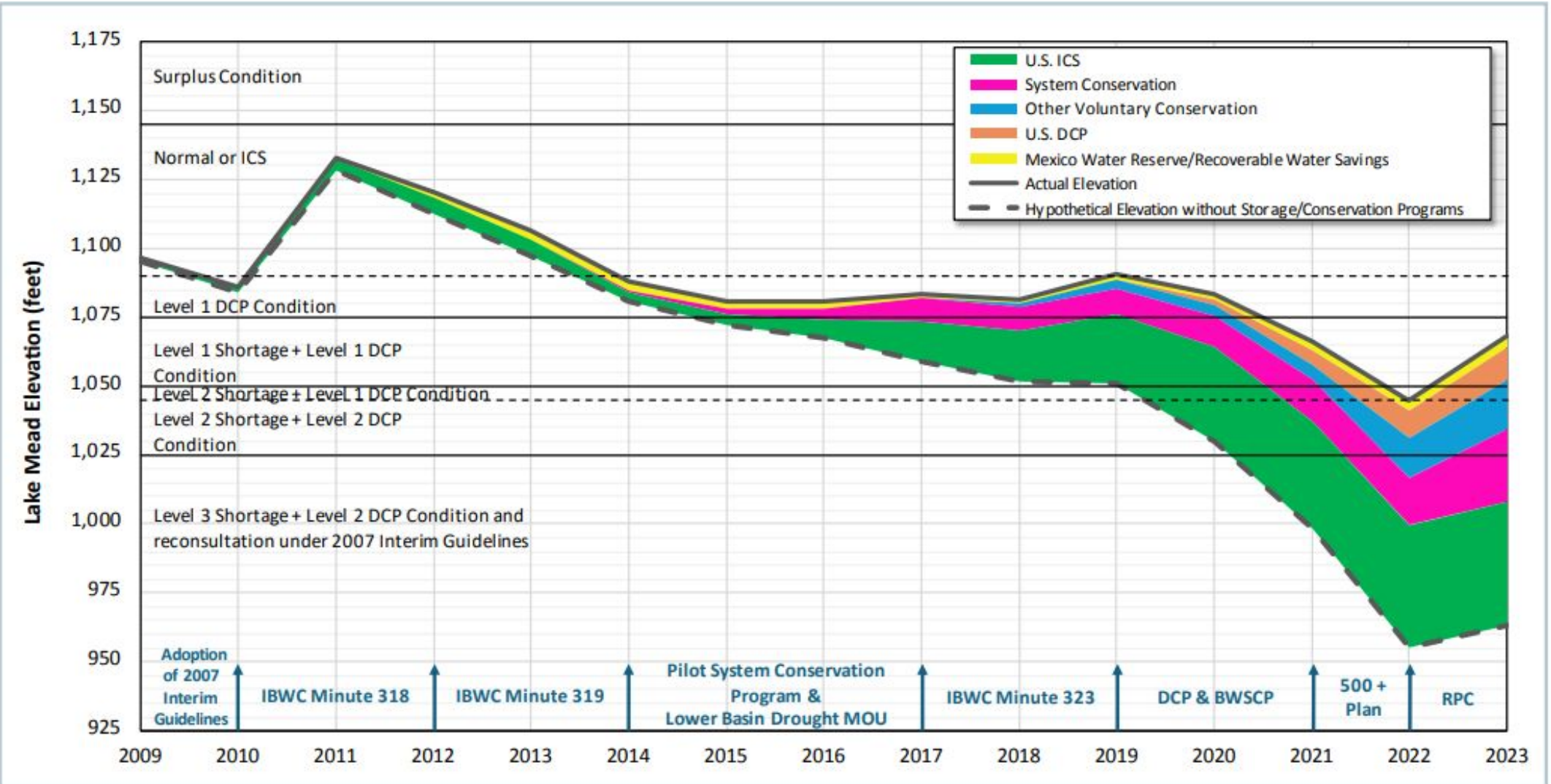

FIGURE 2.7 **Benefits to Lake Mead Storage**[27]

Thank you!

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