

# THE BATHTUB RING

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## Shrinking Lake Mead: Impacts on Water Supply, Hydropower, Recreation and the Environment

### OVERVIEW OF THE BASIN AND LAKE MEAD

The Colorado River is the water supply for approximately 40 million people, irrigating over 5.5 million acres of land across seven states and two countries. Virtually every drop of the Colorado River is allocated to a consumptive use. In addition to supplying water, the Colorado River is an important source of hydroelectricity, water recreation, tourism and ecological habitat.



Increasing demand combined with prolonged multi-year climatic drought has led to precipitously low reservoir levels in Lake Mead, which is impounded behind Hoover Dam. If the drought continues, Lake Mead will likely drop below 1075', triggering the first set of mandated water delivery curtailments set forth in the Interim Guidelines.

#### PROJECT OBJECTIVES

We examined physical and economic impacts to water deliveries, hydropower generation, recreation, and the environment as Lake Mead levels drop to the key elevations identified in the Interim Guidelines: 1075', 1050', 1025', and 1000'.

#### KEY FINDINGS

Vulnerability varies by state due to differences in the magnitude of curtailments and water uses. Although attention is paid to the impacts of water delivery curtailments, there are substantial economic losses associated with changes to recreation, hydropower generation, and downstream ecosystems.

**1** WHAT ARE THE DISTRIBUTIONAL EFFECTS TO EACH STATE AND SECTOR OF WATER DELIVERY CURTAILMENTS AT EACH KEY ELEVATION?



WATER CURTAILMENT DOESN'T PREDICT VULNERABILITY

**2** WHAT ARE THE OPERATIONAL AND FINANCIAL IMPLICATIONS OF REDUCED RESERVOIR LEVELS ON GENERATION AT HOOVER DAM?



COST OF HYDROPOWER COULD ROUGHLY QUINTUPLE

**3** WHAT ARE THE CHANGES IN RECREATIONAL USE AT LAKE MEAD NATIONAL RECREATION AREA?



ANNUAL VISITATION COULD BE REDUCED BY ALMOST HALF

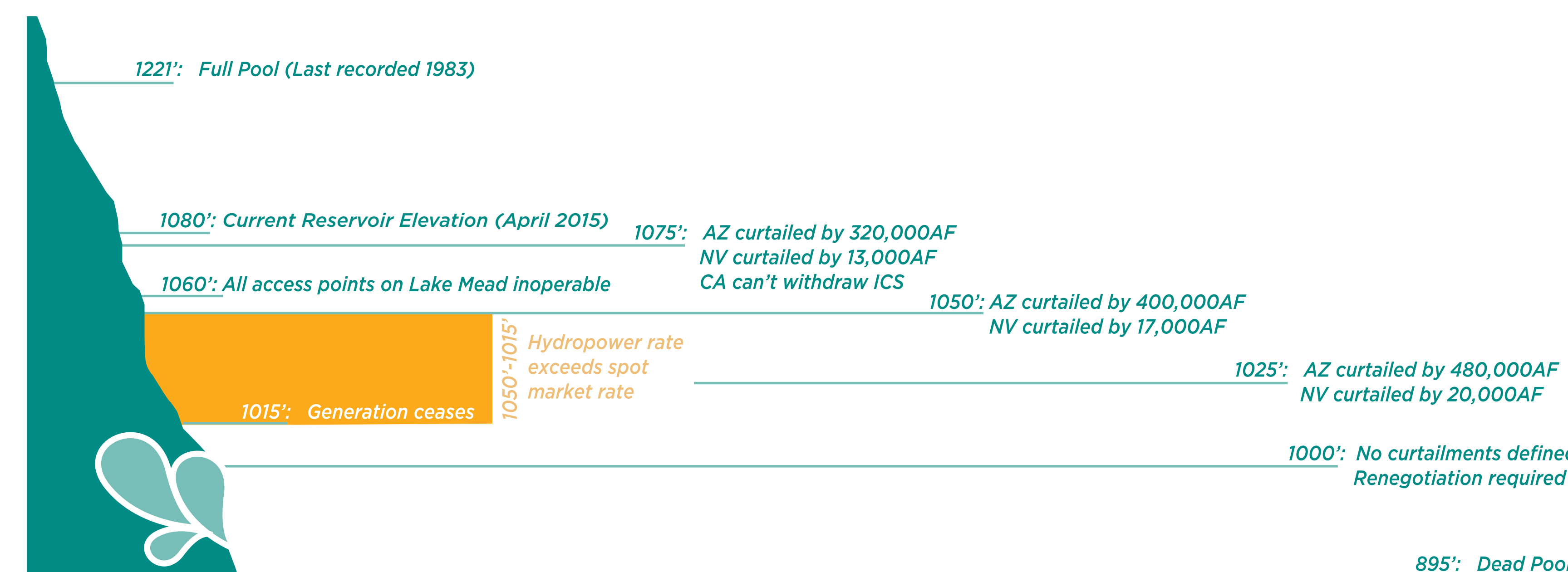
**4** ARE THERE OTHER ENVIRONMENTAL IMPACTS ASSOCIATED WITH DECLINING RESERVOIR LEVELS?



THE GREATEST ENVIRONMENTAL IMPACTS ARE INDIRECT

### IMPACTS BY ELEVATION

This analysis doesn't project when Lake Mead will reach the curtailment elevations, but instead provides both quantitative and qualitative frameworks to support decision-making as shortages occur. The following graphic depicts a handful of impacts by elevation, providing an understanding of potential tradeoffs between stakeholder needs.



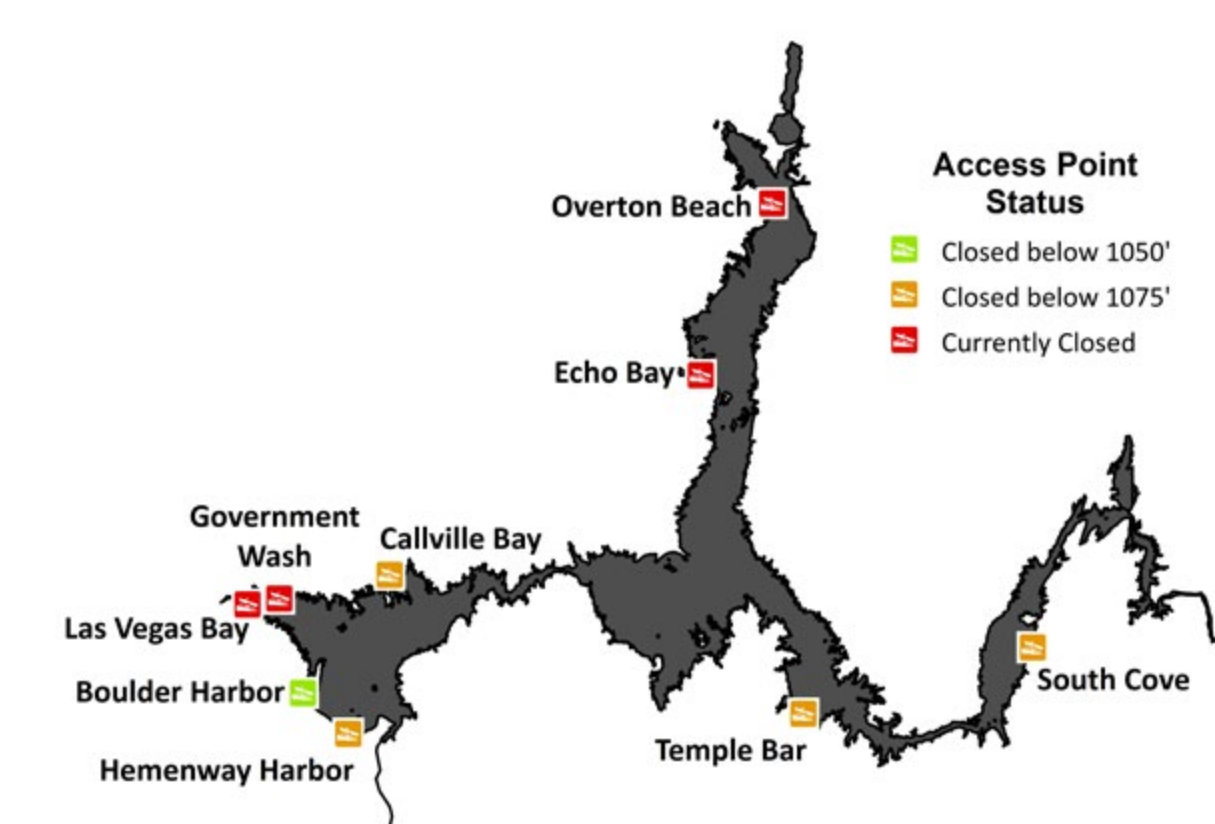
### ANNUAL VISITATION COULD BE REDUCED BY ALMOST HALF

Currently, the National Park Service predicts that no access points will be operable below 1060' despite an additional infrastructure investment of \$5 million in 2015.

Visitation is projected to drop from:

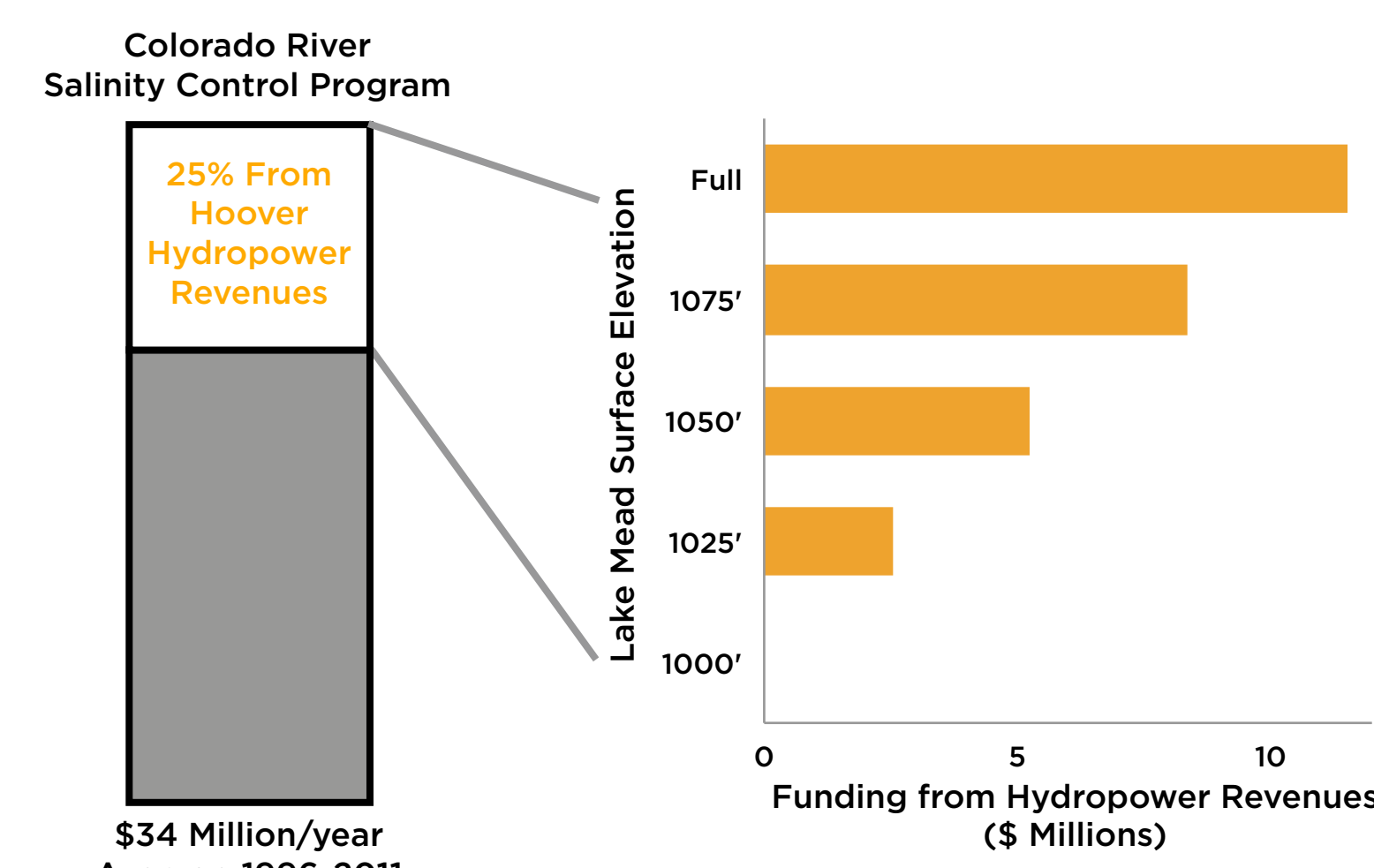
7 → 4 MILLION

The decrease will be compounded by the inoperability of access points.



### THE GREATEST ENVIRONMENTAL IMPACTS ARE INDIRECT

Reduced agricultural runoff could threaten the Colorado River Delta since it is the main water source for the Delta's remaining ecosystems. Funding for the Salinity Control Program will be reduced due to declines in hydropower revenue.



REDUCTIONS IN AGRICULTURAL RETURN FLOWS MAY IMPACT DELTA ECOSYSTEMS

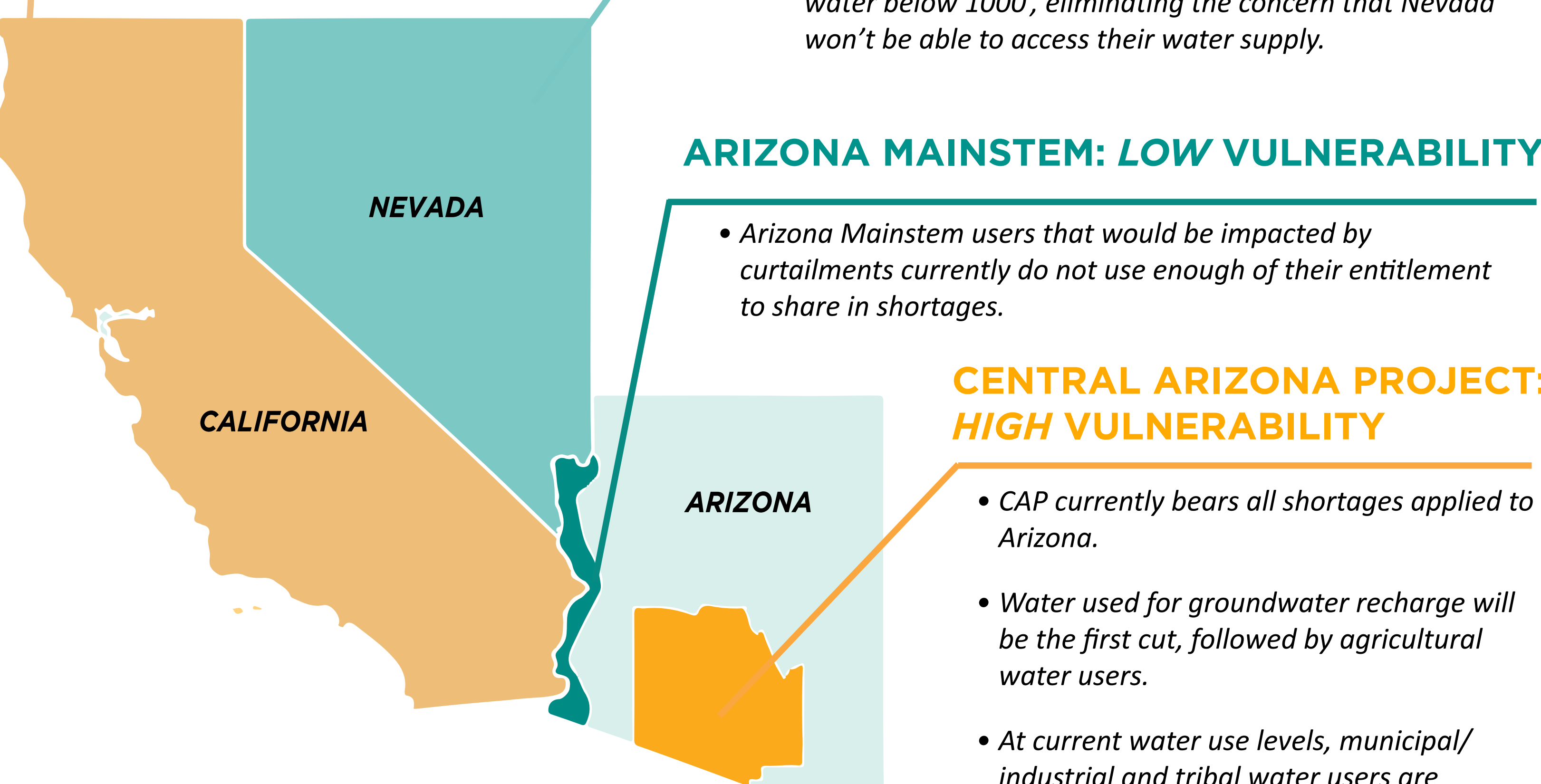
1/4 OF THE FUNDING FOR THE SALINITY CONTROL PROGRAM WILL BE IMPACTED

### WATER CURTAILMENT DOESN'T PREDICT VULNERABILITY

While it is generally assumed that Nevada water users are among the most vulnerable to water supply curtailments, and California users are not vulnerable, there are compelling reasons to conclude that the opposite is true. Impacts to Central Arizona Project users, as expected, will be significant, but will be confined to agricultural users, not municipal or tribal water users.

#### CALIFORNIA: HIGH VULNERABILITY | NEVADA: LOW VULNERABILITY

- California receives no curtailments due to their senior status.
- Municipal/industrial water users are vulnerable because they lose the ability to divert Intentionally Created Surplus water.
- The Southern Nevada Water Authority return flow credit program allows Nevada to keep their consumptive water use below their apportionment.
- A third water intake in Lake Mead allows SNWA to withdraw water below 1000', eliminating the concern that Nevada won't be able to access their water supply.

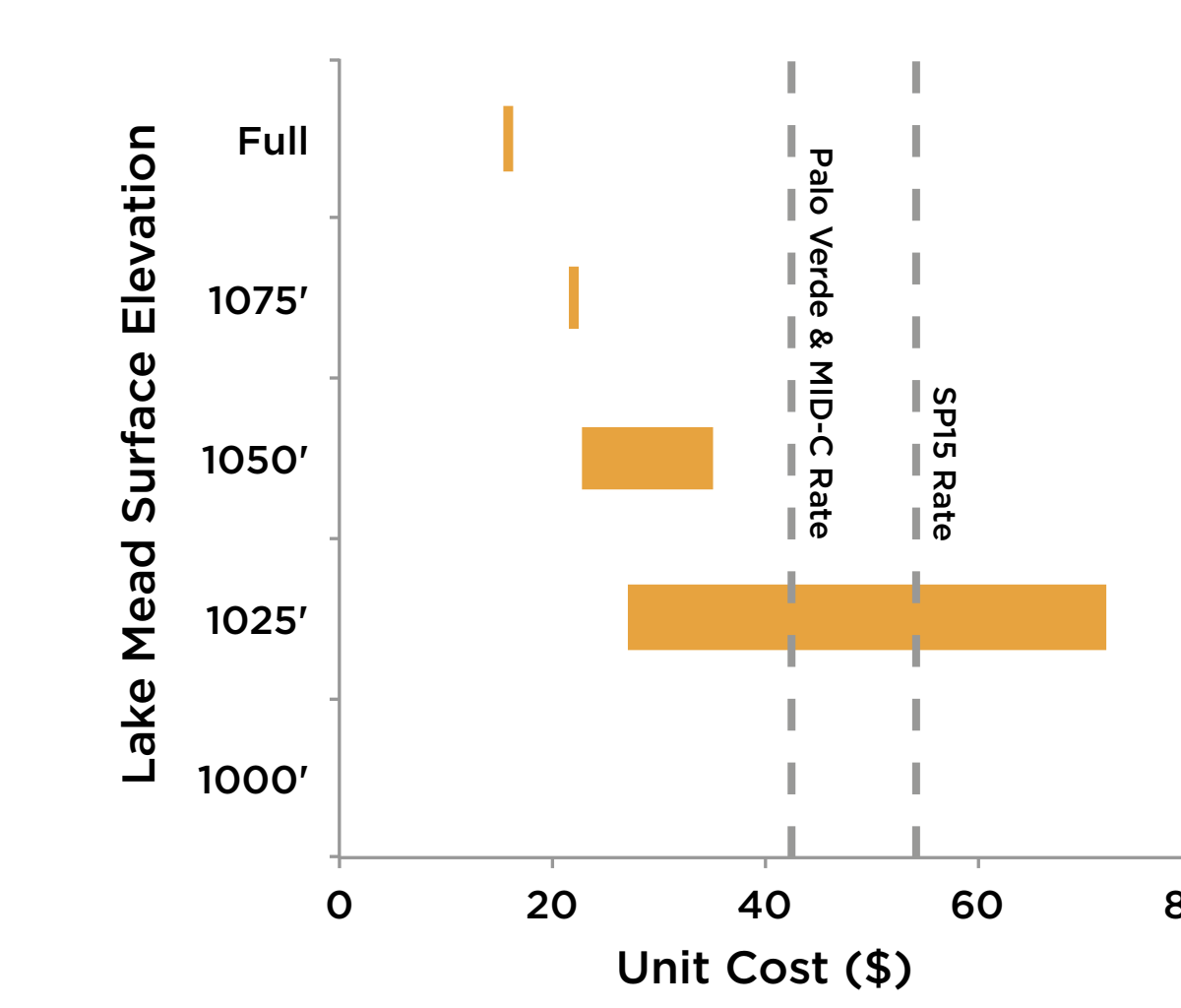
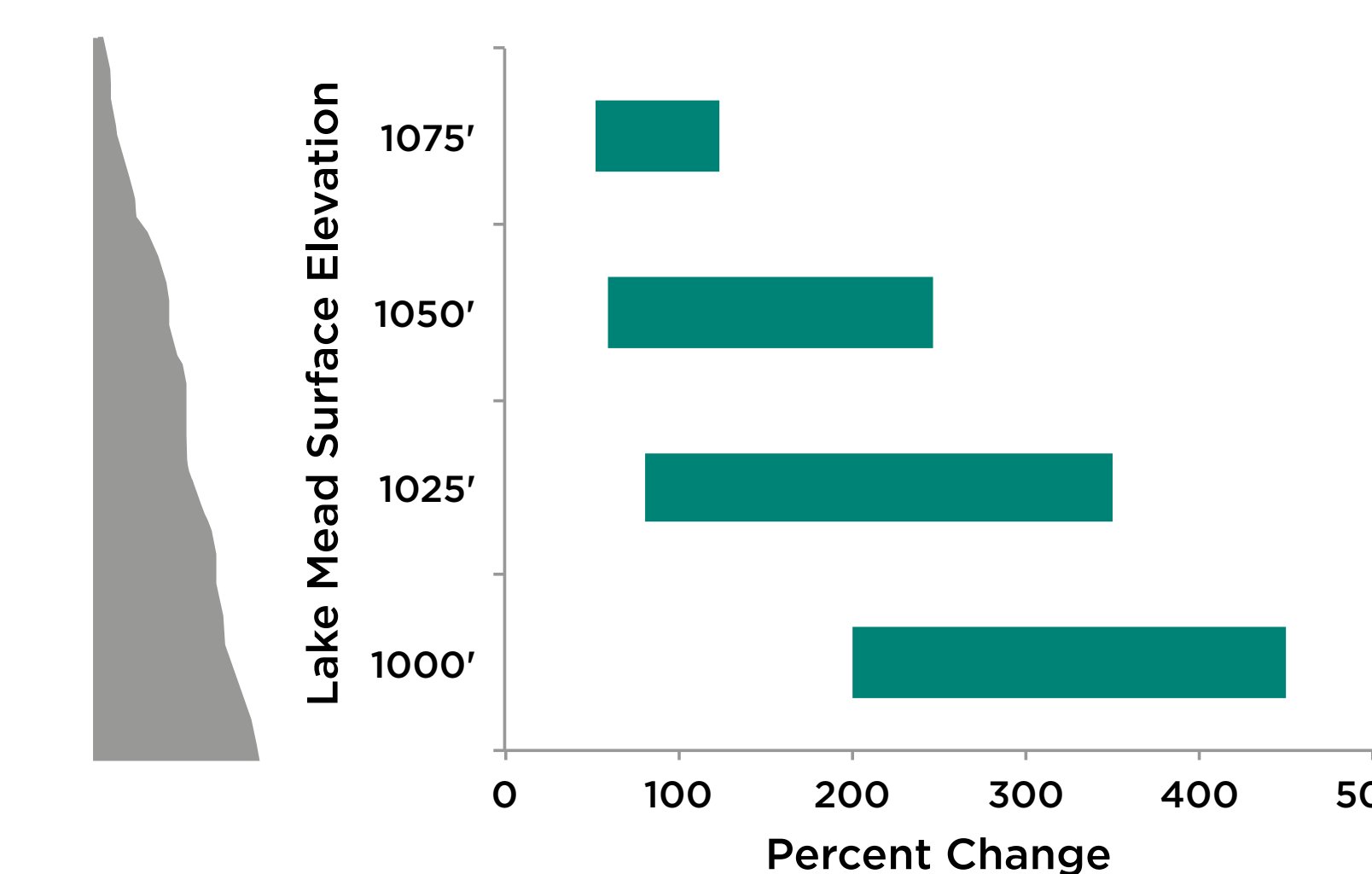


### COST OF HYDROPOWER COULD ROUGHLY QUINTUPLE

Hydropower generation will decline as Lake Mead shrinks, increasing energy costs. Costs paid by contractors for hydropower and spot market power will roughly double at 1075', triple at 1050', quadruple at 1025' and quintuple at 1000'. Though hydropower rates will surpass spot market rates at lower elevations, Hoover customers are contractually bound to purchase Hoover power until 2067.

With each 25' drop, total costs increase by roughly 100% compared to a full reservoir.

Hydropower rates will exceed spot market rates.



#### CROSS SECTOR INTERACTIONS

Increased costs will be borne by urban residents, farmers, and commercial operators.

CAP's and MWD's pumping costs will increase, causing increased water rates.

#### ACKNOWLEDGEMENTS:

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