Voluntary Water Conservation Program for Lake Mead: Current Account Balances, Credits, and Debits

David E. Rosenberg

July 23, 2024

Description

This is an R Markdown document. The following plots show the current status of the voluntary, credited water conservation program for Lake Mead. The plots support the analysis of the work: "Lake Mead Water Conservation Accounts: Examples, Successes, Challenges, and Potential Improvements post 2026."

The water conservation program is defined by the 2007 Interim Guidelines and amended by a 2019 agreement that adds mandatory water conservation amounts. In the voluntary conservation programs, states reduce use from their historical allocations, leave the conserved water in Lake Mead, and withdraw the conserved water at a future date under certain restrictions. The water mandatory conservation targets increase as Lake Mead level drops. Those targets can be met by converting previously conserved water in a conservation account or undertaking new conservation efforts.

1. A stacked bar chart compares voluntary conservation account balances by state and year. These balances are compared to the overall and individual state max balances allowed by the 2007 Interim Guidelines and 2019 Drought Contingency Plan (DCP).
2. A stacked bar chart compares annual voluntary water conservation efforts by state. Credits are shown as positive and withdraws as negative. These credits and debits are compared to the maximum allowed amounts.

Additional Figures

3. A bar plot shows the the number of years water in the conservation account can be used to make the state's mandatory target before the conservation account is depleted for three lake levels. This ratio is the conservation account balance divided by the mandatory target. This ratio assumes there is no new voluntary conservation or withdraws during that time. The number of years fall as Lake Mead level drops and mandatory targets increase.
4. A bar plot shows the ratio of the conservation account withdrawal limit to the mandatory conservation target at three different Lake Mead water levels. If account withdrawal limits are enforced, this ratio represents the fraction of the mandatory conservation target the state could make from it's conservation account each year. This ratio assumes there is sufficient water in the conservation account.
5. A bar plot shows the ratio of the conservation account deposit limit to the required mandatory conservation target at three different Lake Mead water levels. If deposit limits are enforced, this ratio shows how well a state can keep up year-to-year with its required mandatory conservation targets by continuing to conserve, add that water to it's conservation account, then transfer and use the conservation account water to meet it's mandatory conservation target. Conserving, adding to one's conservation account, and transfering to meet a mandatory conservation target is preferred to a new conservation.

This approach is preferred because water conserved **this** year and credited to the conservation account can be used to meet this or **next** year's mandatory target. Should Lake Mead level rise during the year, the state retains access to its conserved water whereas new conservation is lost.

6. A bar plot shows each state's historical ability to meet mandatory conservation targets at three different Lake Mead water levels. Historical ability is the ratio of the largest annual deposit to a conservation account on record to the mandatory conservation target. The historical ability shows whether a state has historically conserved at the volume to meet it's mandatory conservation target. States below 100% have never before conserved at the level required by the DCP. They do not yet have a track record for water conservation.

Data from USBR annual accounting reports: https://www.usbr.gov/lc/region/g4000/wtracct.html. Note most recent data is for 2023.

Observations

1. The water conservation accounting program for Lake Mead is popular and well used (Figures 1 and 2).
2. As of 2022 Arizona, California, and Nevada have saved and deposited ~3.1 million acre feet (MAF) – above the current 2.7 MAF maximum limit (Figure 1).
3. The states should raise their individual and combined conservation account limits to more transparently represent situation with account balances larger than the limits. At the same time, the limit on conservation account balances must stay below Lake Mead's physical active storage so conserved water is recoverable.
4. Arizona has yet to conserve water at the annual volumes required for it's mandatory conservation targets (Figures 3, 4, 5, 6). In contrast, California and Nevada already have a track record of conserving at the mandatory conservation targets.

Requested Citation

David E. Rosenberg (2024), "Lake Mead Water Conservation Accounts: Examples, Successes, Challenges, and Potential Improvements post-2026–Account Balances, Credits, and Debits." Utah State University. Logan, Utah. https://github.com/dzeke/ColoradoRiverCollaborate/tree/main/LakeMeadWaterConservationProgramAnalysis/ICS.

```
##    tidyverse       readxl RColorBrewer        dplyr        expss     reshape2
##         TRUE         TRUE         TRUE         TRUE         TRUE         TRUE
##       pracma    lubridate directlabels         plyr      stringr      ggplot2
##         TRUE         TRUE         TRUE         TRUE         TRUE         TRUE
##       ggpubr
##         TRUE
```

```
## [1] "ICS balance as fraction of Mead storage"
```

```
## [1] "35.6%"
```

```
## [1] "Percent of Upper Colorado River Basin area of entire continential US area"
```

```
## [1] "3.5%"
```

Figure 1. Lake Mead water conservation account balances

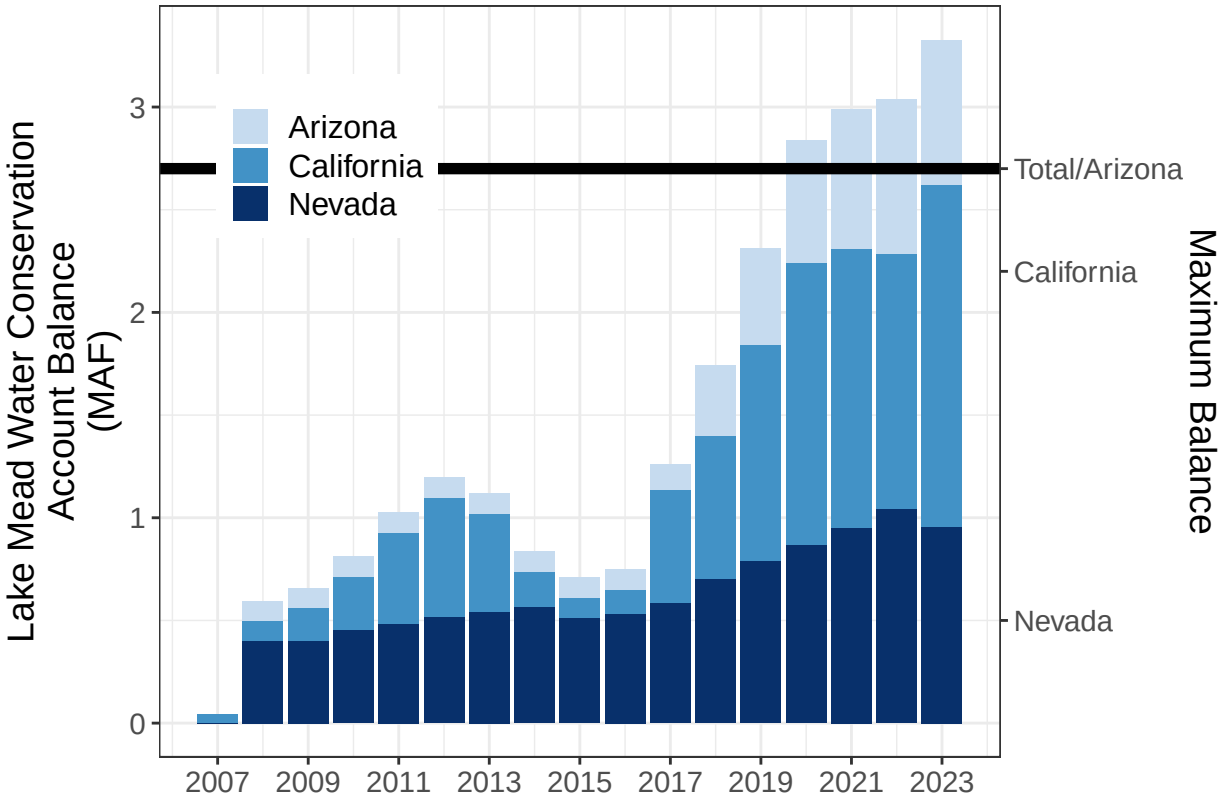

Figure 2. Lake Mead conservation account deposits and withdrawals