Step 2. Specify Lake Mead Inflow

Each Lake Mead inflow for the year will be specified by the host at the beginning of each timestep. This ensures an accurate representation of uncertainty and unreliability in inflow for Colorado River Basin management. The inflow represents the sum of gaged flows for the gages most immediately upstream of Lake Mead.

The annual Lake Mead inflow magnitude has been determined by using data from the data sheet, *HydrologicScenarios* (Salehabadi DATE). All Ensembles and traces were used in determining Lake Mead's inflow. Using code written in Python, three consecutive smallest values in each trace were found.

Although these values represent the inflow to Lee's Ferry, they can also be used to represent inflow value to Lake Mead during arid years. This is because the amount of water gained from Lee's Ferry to Lake Mead is only VALUE and it is the purpose of these sessions to study conditions under low inflow.

Because Lake Mead inflow is uncertain—and likely differing from historical inflows because of climate change—we can only specify inflow as a scenario (Table 2a) (Rosenberg, 2022).

Table 2a. Scenarios of Lake Mead Inflow (Rosenberg, 2022).

Scenario (MAF each year)	Powell release (MAF each year)	Grand Canyon tributary flow (MAF each year)	Years of Powell release	Notes on Grand Canyon tributary flows
14	13	1	2011, 1997–1998, 1983–1987	Average reported by Wang and Schmidt (2020)
12	11	1	1996, 1999	Average reported by Wang and Schmidt (2020)
11	10	1	1973	Average reported by Wang and Schmidt (2020)
10	9	1	2012, 2015–2019	Average reported by Wang and Schmidt (2020)
9	8.2	0.8	2007, 2013	Within interquartile range (Rosenberg 2021a)
9	8.1	0.9	2002, 2009–2010	Within interquartile range (Rosenberg 2021a)
8.6	8.0	0.6	1989, 1992	Three-year sequences (Rosenberg 2021a)
8.4	7.5	0.9	2014	Within interquartile range (Rosenberg 2021a)
8	7.3	0.7	2017	Sequences of up to five years (Rosenberg 2021a)
7	6.4	0.6	Not observed; not in guidelines	Three-year sequences (Rosenberg 2021a)

For reference, historical Lake Mead inflows since 1990 varied from 8 to 16 million acre-feet per year (Figure 3) with the preponderance of inflows between 9 and 10 maf per year (corresponding to a Lake Powell release between 8.23 and 9 maf per year; Figure 4).

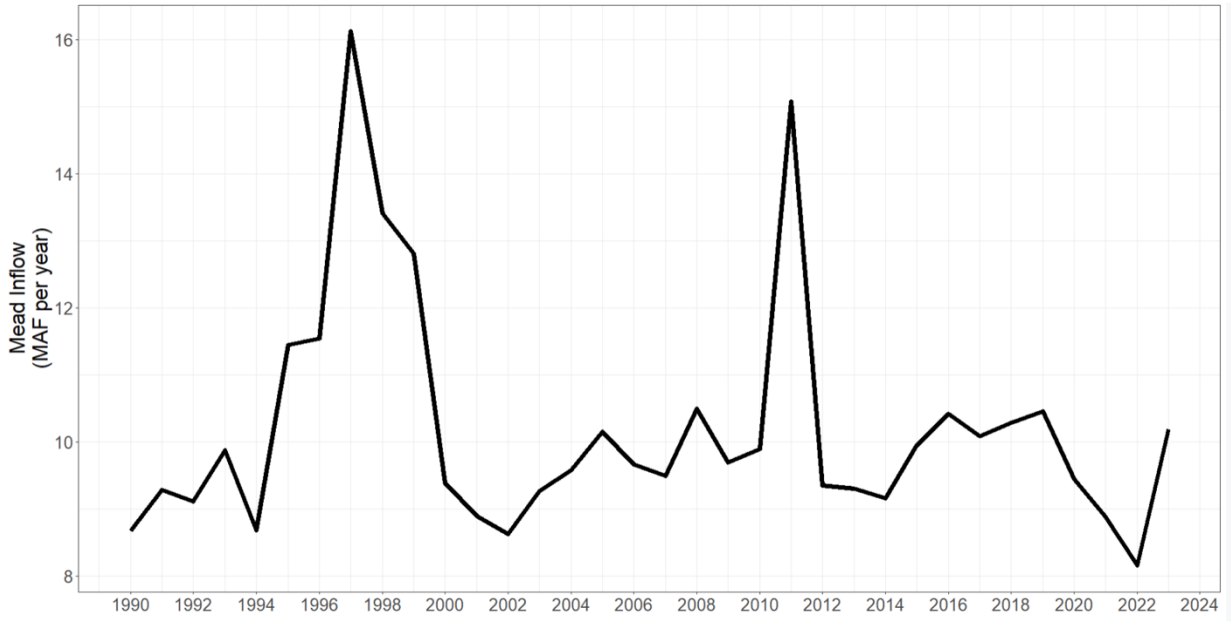

Figure 3. Lake Mead inflow as measured by nearest USGS gages.

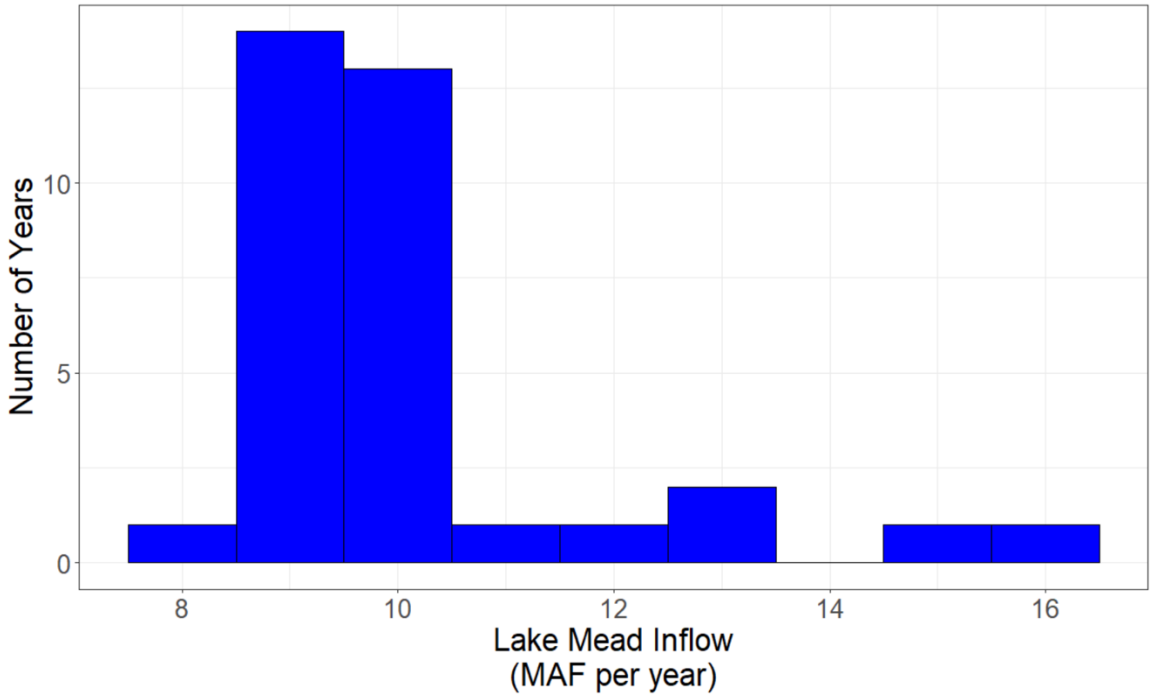

Figure 4. Histogram of Lake Mead inflows as measured by the nearest gages.

Additionally note that Colorado River flow near Peachtree is the annual Lake Powell release plus 600,000 to 1 million acre-feet of gains along Grand Canyon (Rosenberg, 2022; Wang and Schmidt, 2020; Figure 5).

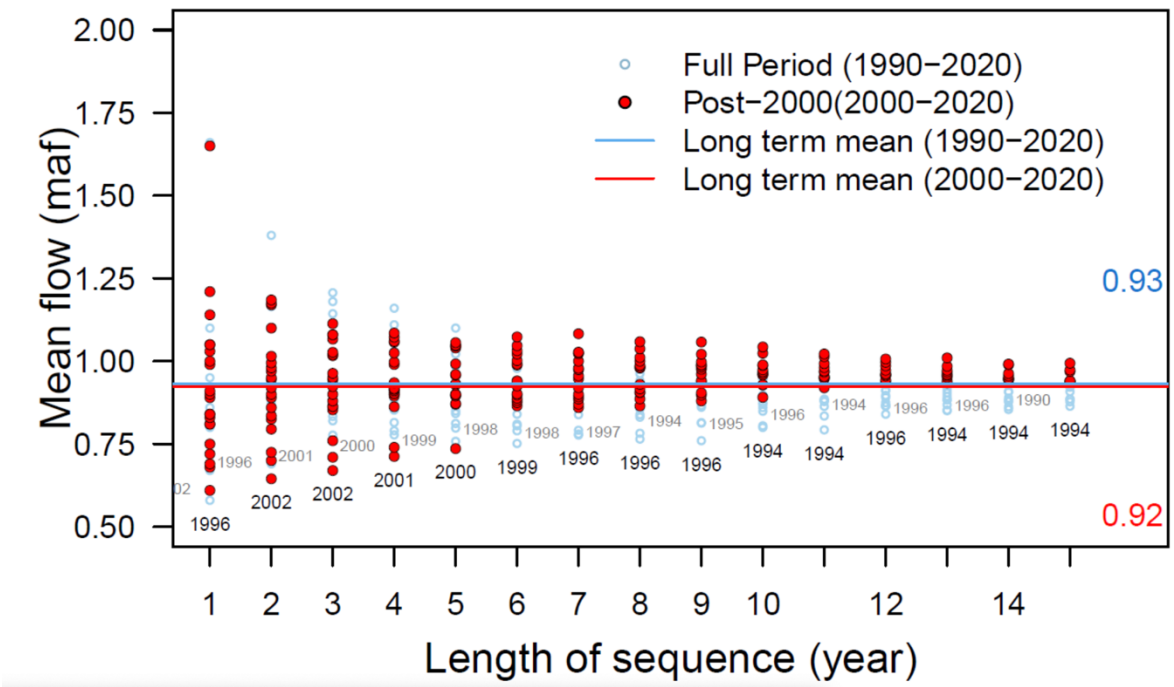

Figure 5. Mean Grand Canyon tributary flow (Glen Canyon Dam to Lake Mead) for different sequence lengths.

Further note that different methods to estimate Lake Mead inflow give different values (Figure 6). For example:

- Nearest USGS gages.
- Inflow data downloaded from the Reclamation Application Programming Interface (API; https:
- //www.usbr.gov/lc/region/g4000/riverops/_HdbWebQuery.html).
- Back calculate from Lake Mead storage, release, Nevada Diversion, and Lake Mead evaporation data also retrieved from the Reclamation API.
- Back calculate from Lake Mead storage, release, Nevada Diversion, and Lake Mead evaporation (1990 to present). Here we use evaporation data from elevation-storage-area relationship from Colorado River Simulation System (CRSS) model.

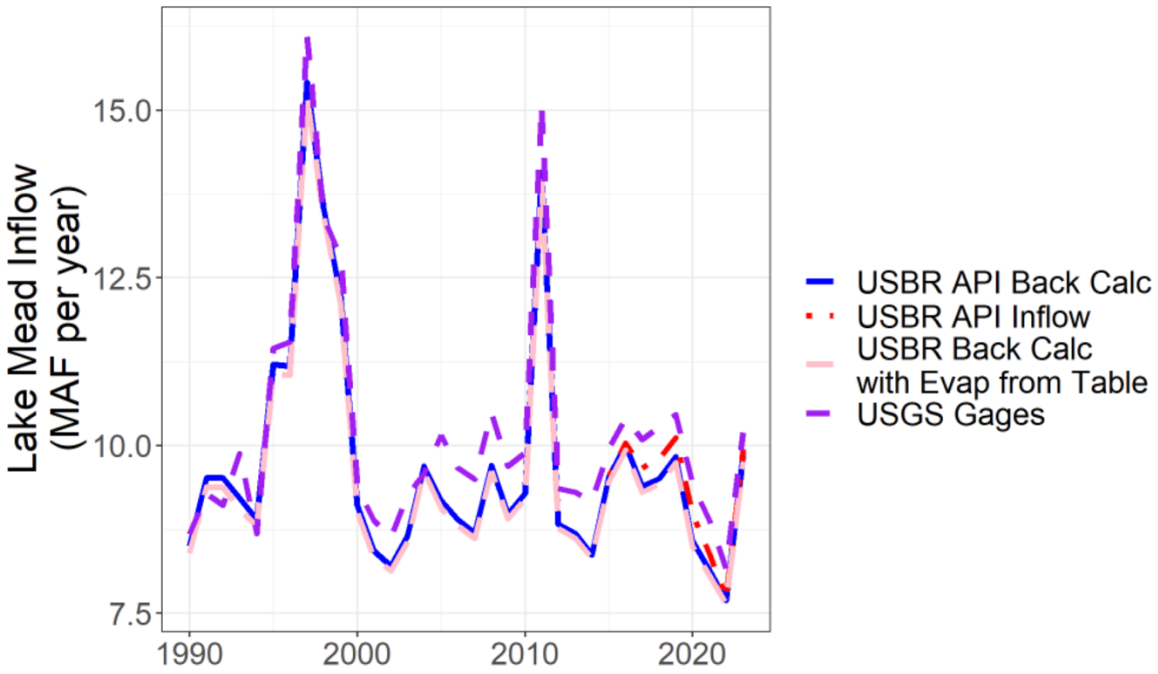

Figure 6. Differing values for Lake Mead inflow as estimated by different methods. This work uses gages closest to Lake Mead because these values gave the *largest* annual inflows.

2A. Beginning of year reservoir storage

In Year 1 (Column C), beginning of year reservoir storage is the Lake Mead volumes specified in Cell B19.

In subsequent years (Columns D, E, …), the Lake Mead storage volume is the is the storage at the end of the prior year (Row 134).