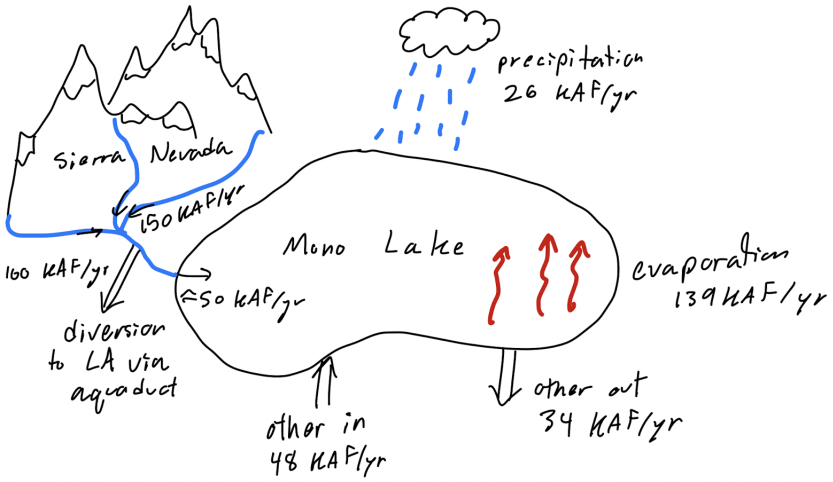
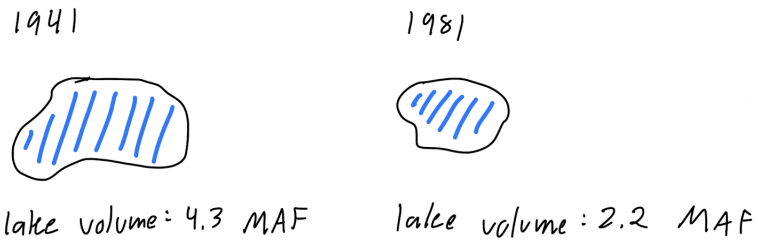
Mono Lake Continued



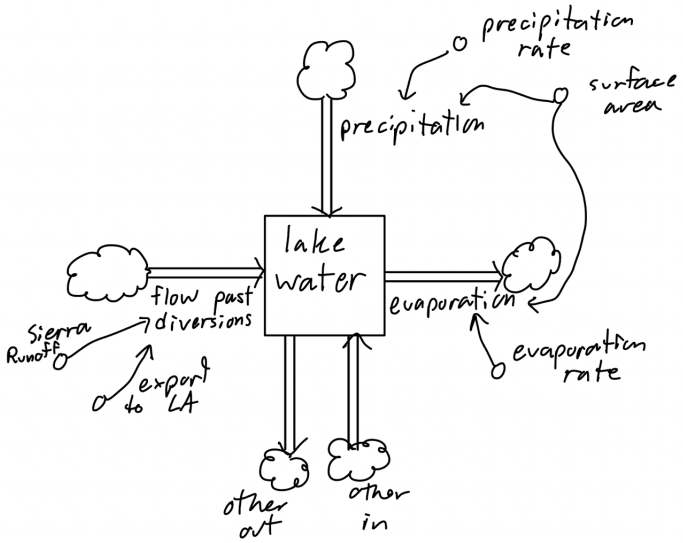
A typical year in Mono Lake looks like:

- Inflows:
  - 50 KAF (Mountain)
  - 48 KAF (Other in)
  - 26 KAF (Precipitation)
  - Total of 124 KAF
- Outflows:
  - 139 KAF (Evaporation)
  - 34 KAF (Other out)
  - Total of 173 KAF
- There is about a 50 KAF/yr deficit in the water balance

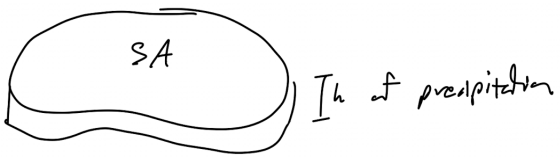


Question: What is the future volume, elevation, salinity of the lake under various model assumptions especially diversion to LA?

We will start with a simple approach, and make it more complex iteratively. Let's start by drawing using stock and flows.



So, precipitation and evaporation are units of height (ft/yr) ⇒ height × SA ⇒ KAF/yr

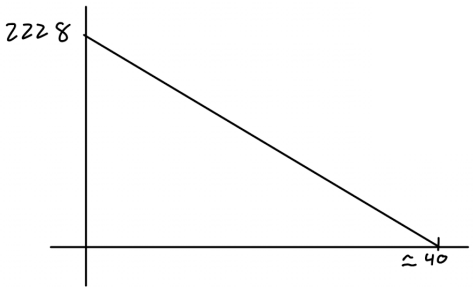


Let lake water = W. $W(0) = 2228$ KAF (this is the amount of water in the lake in 1981). What is our equation?

$$\frac{dW}{dt} = \text{inflows} - \text{outflows}$$

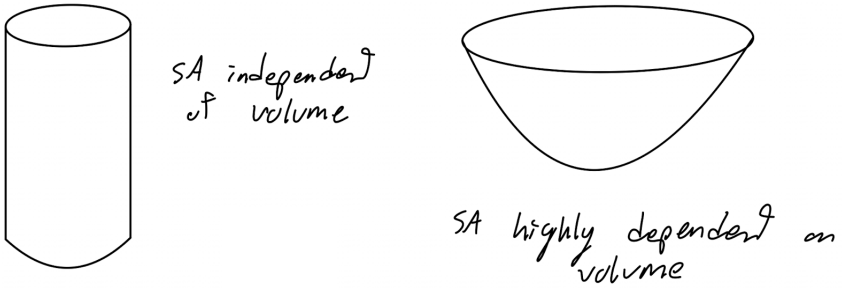
- Inflows:
  - flows_past_diversions = sierra runoff - export to LA
  - other_in = 47.6
  - precipitation = SA × precipitation rate
- Outflows:
  - other_out = 33.6
  - evaporation = SA × evaporation rate
- Converters:
  - evaporation_rate = 3.75 ft/yr
  - precipitation_rate = 0.667 ft/yr
  - sierra_runoff = 150 KAF/yr
  - export_to_LA = 100 KAF/yr
  - SA = 39 KAF

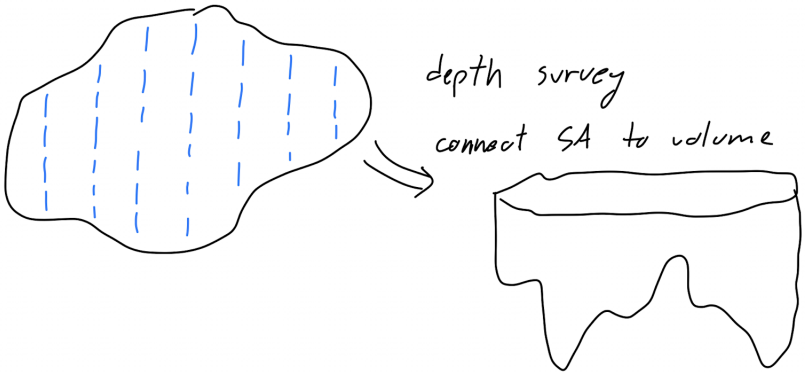
Based on the MATLAB code (which generated the plot below), the model displays linear dynamics, and the lake empties in 40 years.



Linear dynamics occur for $\frac{dW}{dt} = C, \quad C \in \mathbb{R}$

Model 2: Assumption of fixed SA is not reasonable. A smaller volume should mean a smaller surface area.





There is data connecting volume, elevation, and surface area in studies. Let's use this.