

ERTH 260: Inclass Exercise 4 Key
Inputs/Outputs/Net Change: A Budget Approach to Understanding
Lake Oroville Issues in February 2017 (100 points)
Due Wednesday 21 February 2018

1. Background

An important concept in understanding climate change centers on various types of budgets. A budget, simply defined, is the itemized list of inputs and outputs the algebraic sum of which produces a net change. We'll briefly investigate this using the situation at the Oroville Dam in February 2017 as an example.

The water impounded in the reservoir behind the Oroville Dam can be visualized in a number of ways.

- The maximum capacity of the reservoir is **3,537,577 acre feet** when the automatic release into the emergency spillway (ES) will occur.
- The dam itself is **742 feet high** with the top of the dam at **922 feet MSL**.
- The ES lip is at **901 feet MSL**.

The Department of Water Resources (DWR) can control the reservoir by the normal release of water under the dam and by release of water into the spillway. If these two actions do not result in the reservoir level keeping beneath 901 MSL, automatic release occurs through the ES.

2. History

On February 11, 2017, automatic release occurred through the ES, which then began to experience erosion. This erosion led to worry that the ES itself would erode deeply, causing a massive escape of reservoir waters into the Feather River.

This exercise involves you accessing the reservoir/dam information for the Oroville Dam and Reservoir. This is available here:

http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=ORO

3. Assignment

Here are two graphs representing the latest storage (acre feet) in the reservoir and the storage change at Lake Oroville as of 12 February 2017.

OROVILLE DAM (ORO)

Date from 01/14/2017 10:42 through 02/13/2017 10:42 Duration : 30 days

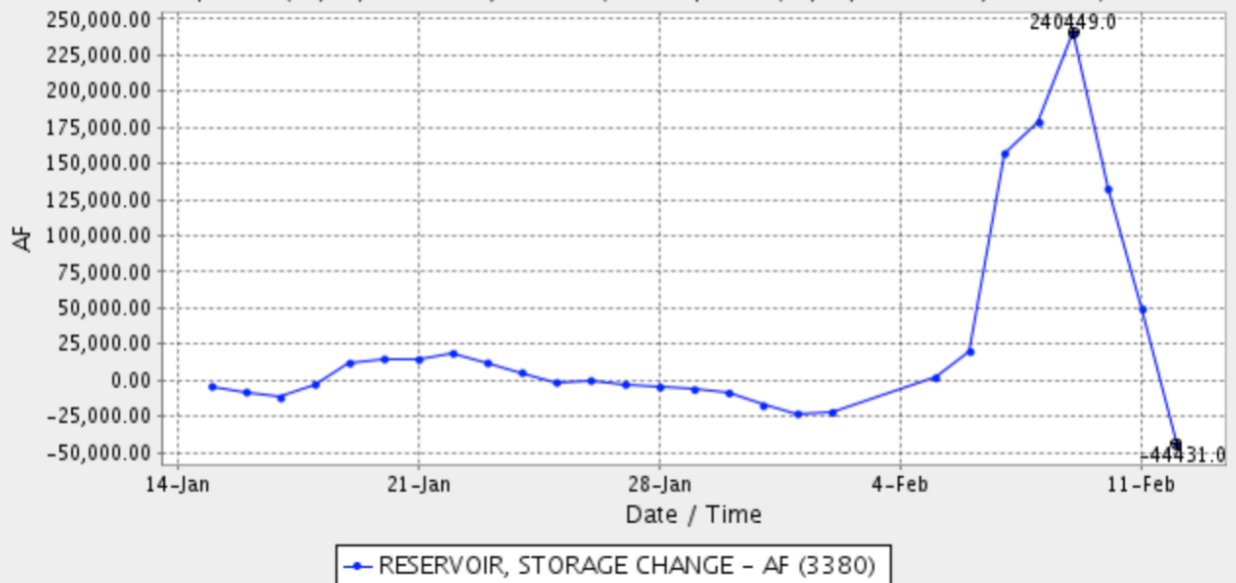
Max of period : (02/11/2017 00:00, 3578366.75) Min of period: (02/02/2017 00:00, 2796832.25)



OROVILLE DAM (ORO)

Date from 01/14/2017 10:24 through 02/13/2017 10:24 Duration : 30 days

Max of period : (02/09/2017 00:00, 240449.0) Min of period: (02/12/2017 00:00, -44431.0)



1. On what date did the reservoir elevation exceed 901 feet and by how many feet was that elevation exceeded? (20 points)

The reservoir elevation exceeded 901 feet on February 11, 2017. It exceeded this elevation by 1.57 feet.

2. The reservoir storage appeared around 2,800,000 acre feet (af) on 3 February and then began to dramatically increase through 10 February. How do the Outflow and Inflow data shown in the table online help to explain that. The reservoir storage changes (apart from those due to evaporation) mostly based upon the simple equation

Storage Change = Inflow - Outflow (in af)

Please answer in complete sentences and please also quote actual outflow and inflow data in cubic feet per second (CFS). (45 points)

Between 3 February and 4 February 2017 the (Inflow - Outflow) balance went from -5562 cfs to 6013 cfs. This positive balance increased to 121245 cfs on 9 February and then decreased to 24965 cfs by 12 February 2017. During that period the reservoir storage increased from 2,796,832 af to 3,578,367 af on 11 February. The balance turned negative after 11 February and the reservoir storage began to decrease.

3. How do the data shown in the table online verify that flow into the ES would be triggered when the reservoir storage exceeded 5,370,000 acre feet? Please answer in a complete sentence. (20 points)

When the reservoir storage achieved 3,578,367 af , slightly exceeding storage capacity, the reservoir elevation achieved 902.57 feet, and the water began passing into the ES.

4. While the Feather River carries runoff from the high Sierra and southern Cascade mountains as input to the reservoir, that input also responds to other factors. What other factor is obvious from an examination of the online data?(20 points)

7.24 inches of rainfall occurred at Oroville Dam from February 3 through February 11.