

Workshop 9 – Tying It All Together

- Part 1 – Drought operations (Level of effort: 2)
- Part 2 – Fixing your colleague's mess (Level of effort: 1)
- Part 3 – Simulating different storm events (Level of effort: 2)

➤ **Part 1 – Drought Operations (Level of effort: 2)**

Problem Statement

The Crazy Mountain watershed is facing an extreme drought that is forecasted to last up to six months. Reservoir and local inflows are expected to drop well below water demand rates and flows required to conserve fish habitats. You are charged with developing drought operations to guide the reservoir through the drought as best you can to minimize the length of critical shortages. Use **release overrides** and **elevation targets** features of ResSim to specify the drought operations.

Tasks

1. Open the watershed
 - Open the watershed **WS9_Start**
 - Open the Simulation Module and select the **Drought** simulation.
NOTE: This simulation contains one alternative named **1996Drought** using the Regulation Plan operation set. The simulation is defined from May 11, 1996 through October 30, 1996, with a lookback date of May 10, 1996. Time-series and simulation timestep are daily. The time-series of inflow to Crazy Mountain reach all-time crazy lows less than 200 cfs! Local flows at Villanova, Bethesda, and River Pointe are identical to the Crazy Mountain inflow, except the Villanova time-series is multiplied by a factor of 0.25. Local inflows at Rockville and Greenfield hover around 2,250 and 3,300 cfs respectively. Reservoir elevation starts at 676.8 feet (0.2 ft below top of drought contingency pool).
 - Plot reservoir releases and observe operations over the simulation period.

Question

- l) How does the reservoir behave? What rules influence this behavior? How low does the reservoir level get? When?

- Plot flow at the Reservoir, Rockville, and Greenfield.
- II) When are flow criteria listed below violated? Use the table to note times when the criteria are violated.

| Criteria | Location | Dam Tailwater | Rockville | Greenfield |
|-------------------------------|----------|---------------|-----------|------------|
| Maintain Flow above 300 cfs | | | | |
| Maintain Flow above 700 cfs | | | | |
| Maintain Flow above 2,500 cfs | | | | |
| Maintain Flow above 3,500 cfs | | | | |

- III) What would be more desirable behaviors / operations so that the reservoir does not draw down so close to the inactive pool during the drought?

Now let's try to implement drought operations to match your proposed solutions. You will use **Elevation Targets** and **Release Overrides**, which are both set in the Simulation Module after an alternative has been computed. The primers in the following steps will show you how to use these program features. Then, you are left to develop your drought operation criteria.

2. Setting **Elevation Targets**

- Make a **New Trial** of the **1996Drought** alternative and compute.

- Set **Elevation Targets** over a specific time window so that the reservoir will make releases to achieve that level. For example, after the reservoir draws storage below 660.0 feet, set 660 feet as the elevation target and the reservoir will make releases to try to maintain that elevation.
 - From the **Simulation Menu**, select **Overrides** and the alternative name. The **Release Overrides** window will appear.
 - On the **Elevation Target** tab, scroll down to the date where you want to enter your target. Enter the target elevation (660) and press enter. After clicking out of the cell, the table entry will turn blue, indicating an override has been made active. A red trace will appear on the plot to the right.

Tip

If you want to make the elevation entered active for successive dates, use the mouse to highlight the desired dates, including the one you just entered above. Right-click and select **Fill**. In the **Table Fill Options** window, select **Repeat Fill** and click **OK**. The elevation targets will be entered, appear in blue in the table, and will be noted by a red trace on the plot.

Tip

To turn off an override, highlight the override in the table, and click the **Unspecify** button.

- Set your elevation overrides. Click **Apply** and **OK** to close the Release Overrides window. Re-compute the simulation.

Question

- IV) What Elevation Targets did you try and how did they affect the operation through the drought?

3. Setting Release Overrides

- Make a second **New Trial** of the **1996Drought** alternative and compute.

- Set **Release Overrides** over a specific time window so that the reservoir will release that amount of water.
 - Open the Release Overrides window again (**Simulation** menu, **Overrides** option; select the name of the alternative).
 - In the **Release Overrides** window, select the **Release** tab.
 - Specify values in the **Release** column, like for the elevation targets.

Question

- V) What release overrides did you try and how did they affect the operation through the drought?

4. Setting a combination of Release and Elevation Overrides

- Now, please develop a program of drought operations using both the release overrides and elevation targets to guide operations through the 6-month crazy drought. (Make a third **New Trial** of the **1996Drough** alternative)

Question

- VI) Please describe the drought operations you implemented to manage through the 6-month drought. How did these operations improve ability to meet water demands?

➤ Part 2 – Fixing your colleague’s mess (Level of effort: 1)

Problem Statement

One of your esteemed office mates recently left for a two week cruise in the islands of the South Pacific. Three days after they left, your boss appears at your desk frantic. Your colleague did not run an important ResSim flood control simulation for Crazy Mountain prior to setting sail. Your boss tried to run the simulation, but error messages keep appearing on compute. Your boss needs the information for an important meeting in an hour. Knowing that you attended the ResSim class, she asks you to identify the errors, fix them, and run the simulation post haste.

Tasks

1. Open the simulation, **Your Colleagues Mess**, and troubleshoot the alternative **Errors** until it will compute. Analyze the compute error messages you receive for clues to solve the mystery. Your boss is depending on you!

Questions

VII) Is all the lookback data defined for your colleague’s alternative? What is missing? In what module did you make the correction?

VIII) Are the DSS files and paths complete and mapped properly?

IX) If you are still getting an error “Data undefined for Time Window”, check the simulation period against the data for which the DSS records are defined. What is the discrepancy and how did you fix it?

- In the simulation module, select Edit from the Simulation menu. Change the end date to 28Jun and the time to 0200. Check the box labeled Run New Extract.

X) Now that the alternative successfully computes, what is the maximum elevation and release for the reservoir during the simulation?

➤ Part 3 – Simulating different storm events (Level of effort: 2)

Problem Statement

The Greenville City Commission has decided to reallocate storage at Crazy Mountain Reservoir. The commission wants to know what size flood event the reservoir can safely pass before the major flood pool fills and the reservoir starts making releases above 20,000 cfs (uncontrolled spills). Because you have experience with ResSim, city officials have asked you to answer the question.

Tasks

1. Open the simulation **Maximum Flood Control** and review the alternative **Big Water**. Notice that the conservation pool has been raised and the flood pool has been reduced in storage capacity. Also, all reservoir and local inflows are 2-times as large as the values studied in previous workshops. The Big Water alternative represents a size 2 storm event.

Questions

XI) In the Big Water alternative, how were inflow values adjusted to simulate the size 2 event? *Hint – check the Alternative Editor*

- Simulate the size 2 event.

XII) For the size 2 event, what was the maximum reservoir elevation and release? Did the uncontrolled spillway operate? *Hint – look at the Reservoir Summary Report*

2. Setup and simulate successfully larger events until the major flood pool fills and the reservoir starts making uncontrolled releases. Note that you have two options for setting up and simulating successfully larger events in ResSim.
 - Option #1: In the Network Module, make a new alternative from an existing alternative. Select the **Big Water** alternative and **Save As** a new alternative. On the **Time-Series** tab for the new alternative, link in new hydrographs for larger events. Note that the dss file "Ventura.dss" contains hydrographs for the size 2 and size 4 events (F part = "2X1997Flood" and "4X1997Flood"). In the Simulation Module, add the new alternative to the simulation. Be sure to run a new extract before computing the new alternative.
 - Option #2: In the Simulation Module with **Big Water** Alternative Set As Active, use the junction editor to adjust the **factor** at each junction where a local inflow is specified.

Questions

XIII) For the size 4 event, what was the maximum reservoir elevation and release? Did the uncontrolled spillway operate?

XIV) For what size storm event does Crazy Mountain Reservoir first make uncontrolled spills? *Hint – test whole number storm levels, i.e. 3, 4, 6, etc.*

XV) What was the maximum elevation and release made for that event?