Fontenelle Operational Rules Outline for Probabilistic Midterm Model

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Data

Data Object

July 1 Target Elevation = 6500 ft
August 1 Target Elevation = 6505.5 ft
April 1 Target Elevation = 6468 ft
Max Elevation = 6506 ft
Min Flow = 300 cfs
Safe Channel Capacity = 11500 cfs

Rules

In order of priority.

Rules for Extreme Conditions

Min Flow

Execution Constraint: In 1,2,3 order, only execute if any of the Normal Operations rules have executed

Description: Prevents the total outflow from dropping below the "Min Flow"

If release is below "Min Flow"
- Set release to "Min Flow"

Max Elevation

Execution Constraint: In 1,2,3 order, only execute if any of the Normal Operations rules have executed

Description: Prevents overtopping by releasing whatever necessary, even if "Safe Channel Capacity" is exceeded.

If Elevation > "Max Elevation"
- Set release so "Max Elevation" is not violated
- Use GetMaxOutflowGivenHW

Safe Channel Capacity

Execution Constraint: In 1,2,3 order, only execute if any of the Normal Operations rules have executed

Description: Prevents outflow from exceeding "Safe Chanel Capacity" unless there is a chance of overtopping, in which case, the max elevation rule will take precedence.

If Release is above "Safe Channel Capacity"

- Set Release to “Safe Channel Capacity”

Rules for Normal Operations: These are mutually exclusive so order does not matter except for the last rule which must be the lowest priority.

Set September-November Baseflow

Execution Constraint: Month is September

Description: This rule is the first of two that set the steady baseflow at Fontenelle. This rule looks ahead at the forecasted volumes and determines what the max steady flow for the months of September-March can be.

Set to September-March to outflow that will meet “April 1 Target Elevation”

Compute change in volume given “April 1 Target Elevation” and current elevation
Add volume gain from forecasts September-March (7 months)
Compute max steady flow over September-March (7 months)

Set December-March Baseflow

Execution Constraint: Month is December

Description: Set December-March outflow to steady value that will meet “April 1 Target Elevation”

Compute change in volume given “April 1 Target Elevation” and current elevation
Add volume gain from forecasts December-March (4 months)
Compute max steady flow over December-March (4 months)

Set April or August Release

Execution Constraint: Month is April or August

Description: Set April Release to “Power Plant Capacity”. Only set if Outflow at current timestep has a value, otherwise power and spill methods will fail.

Set total outflow with GetMaxReleaseGivenInflow
- Incorporates PeakPowerCalc method
- Incorporates monthlySpillCalc method

Rule applies to both April and August.

Set Baseflow in off-month

Execution Constraint: Month is October, November, January, February, March or May

Description: Handles the case when the model is started in any month without an explicit decision to be made. These months are “slaves” to other rules.

Set release in current month to release in previous month.

Set June Outflow

Execution Constraint: Month is June

Description: Set June release to meet “July 1 Target Elevation”

Use SolveOutflow
- Inflow from forecast
- Beginning storage from last time step
- Ending storage from “July 1 Target Elevation”

Set July Outflow

Execution Constraint: Month is July

Description: Set July release to meet “August 1 Target Elevation”

Use SolveOutflow
- Inflow from forecast
- Beginning storage from last time step
- Ending storage from “July 1 Target Elevation”

Set Unset Outflow

Description: Set Fontenelle outflow to the inflow. This is the lowest priority rule. Sets the outflow to a dummy value for the spill and power methods. Dependencies are then registered for higher priority rules.