HEC-ResSim 3.0

Enhancements and New Capabilities

Fauwaz Hanbali

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USACE Hydrologic Engineering Center

HEC-ResSim Program

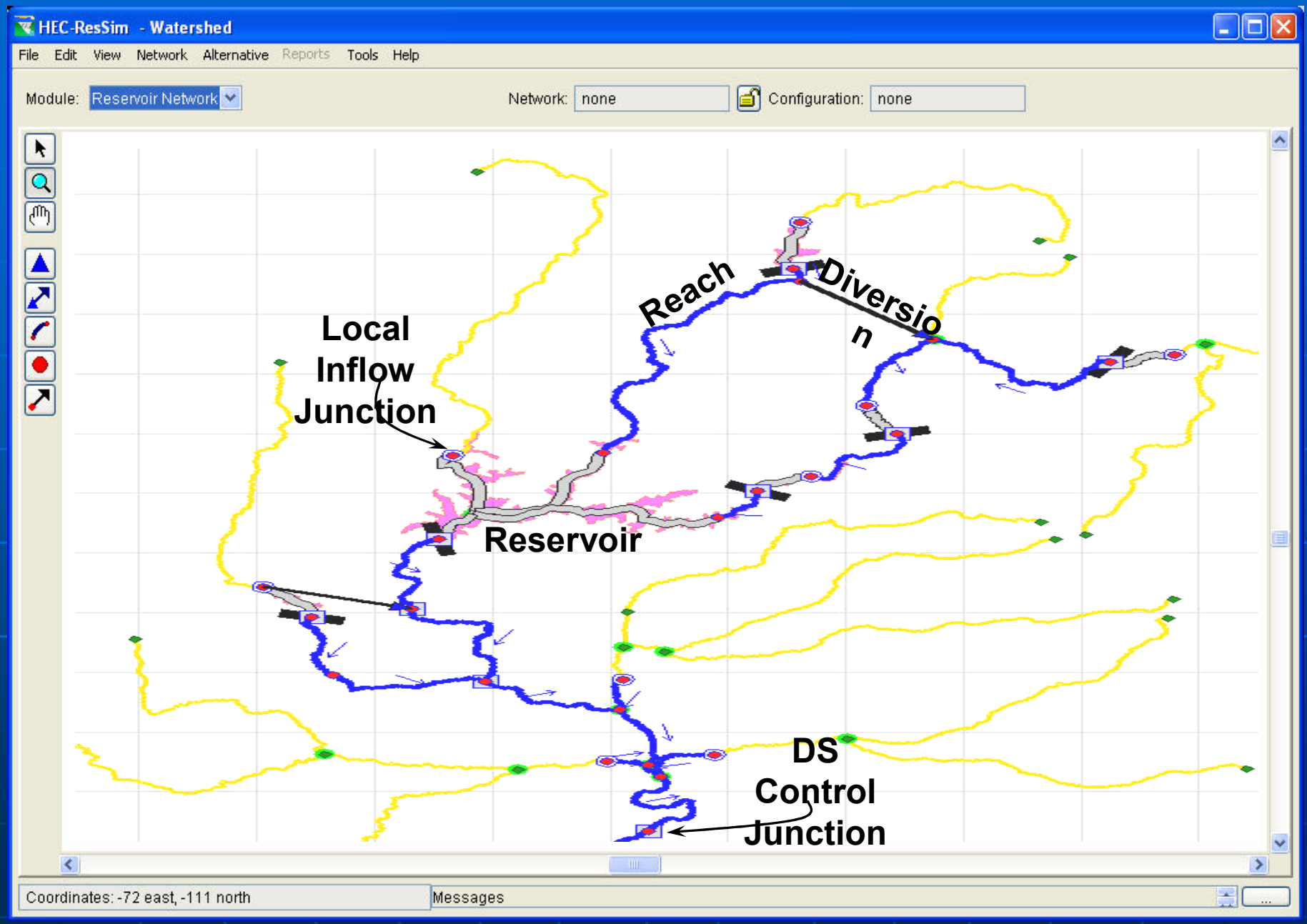
- HEC Next Generation Software
- Real-time and planning application for water control management systems
- V2.0 Public Release (October 2003)
- New Capabilities ~ upcoming V3.0

Standard Capabilities

- Networked Reservoir and Flow Routing
- Guide Curve and Zone-Based Reservoir Operation
- At-site Release Function Rules
- Downstream Control Function Rules
- Parallel and Tandem System Operation
- Incidental and Scheduled Hydropower
- Emergency Gate Operation
- Release Overrides

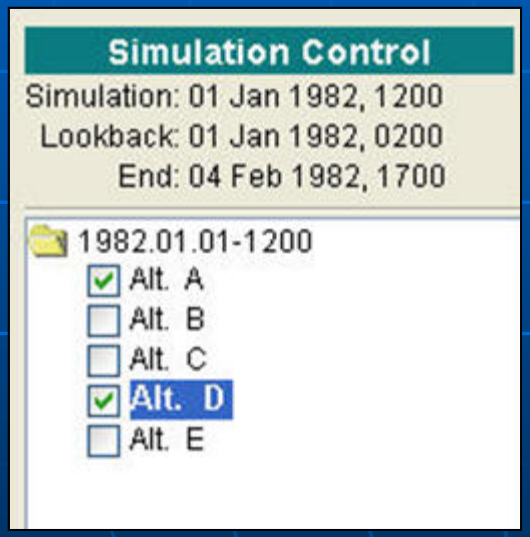
Network Elements

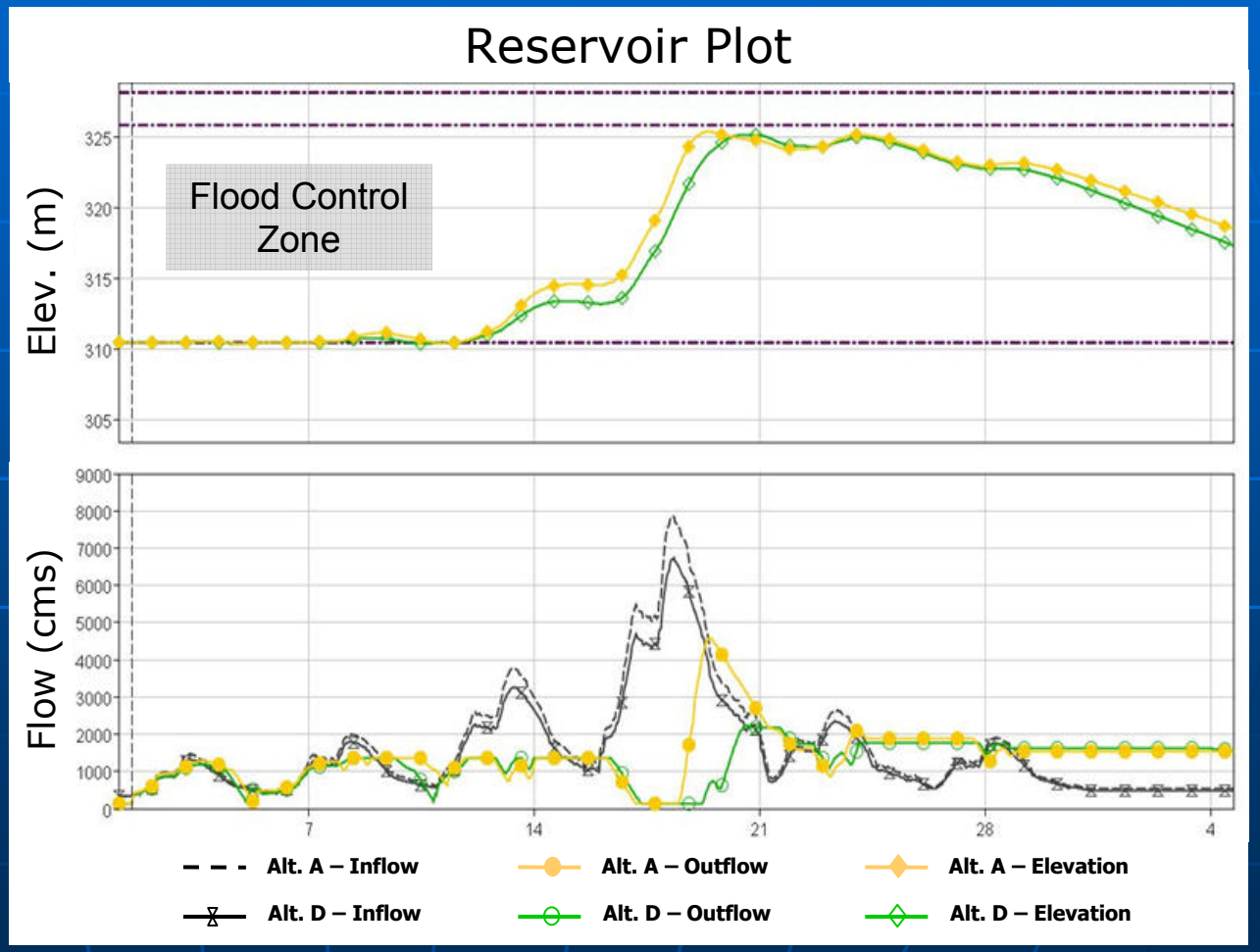
- Reservoirs – mass balance, release decision
- Reaches – flow routing, losses
- Diversions – withdrawals, routing, losses
- Junctions – control points and connections (link reservoirs, reaches, diversions, plus local inflows)


HEC-ResSim - Watershed
File Edit View Network Alternative Reports Tools Help
Module: Reservoir Network
Network: none
Configuration: none
Local Inflow Junction
Reach
Diversion
Reservoir
DS Control Junction
Coordinates: -72 east, -111 north
Messages

Simulation & Analysis

- Multiple Alternatives



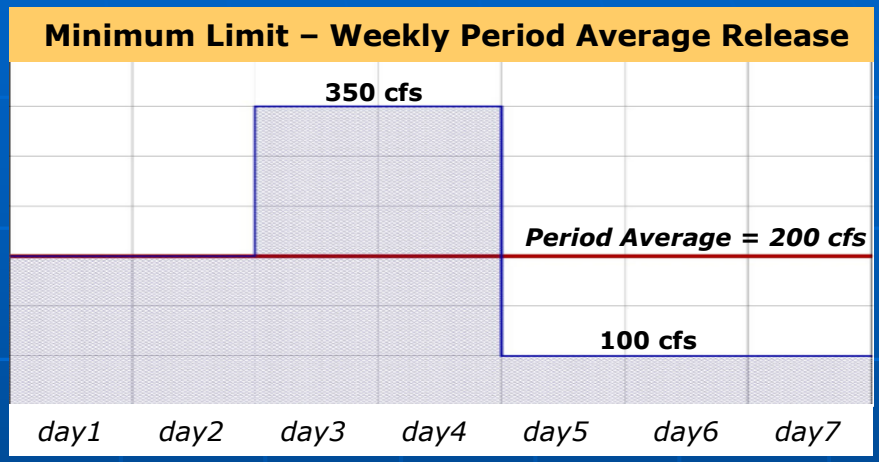


New Capabilities

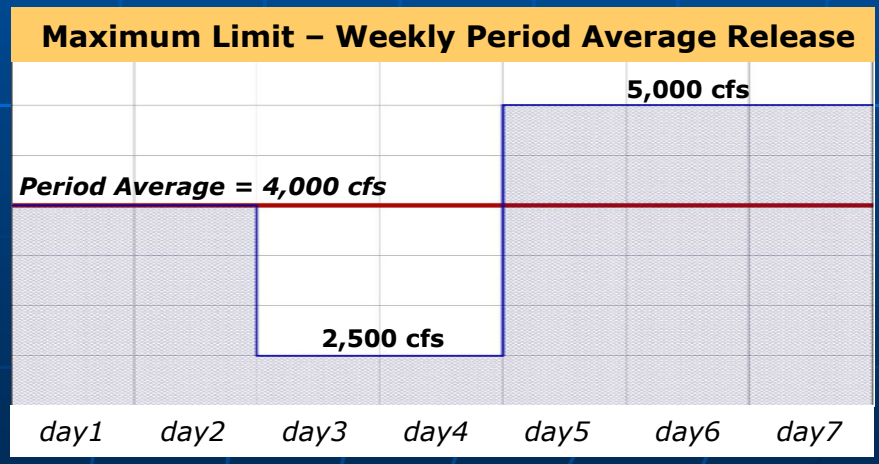
- Period average flow limit criteria
- If-then-else
- User-scripted State Variables
- User-scripted Rules
  - Report Builder
- Outlet Outages
- Release Allocations
- System Hydropower
- Pump-back Storage

Period Average Flow Limits

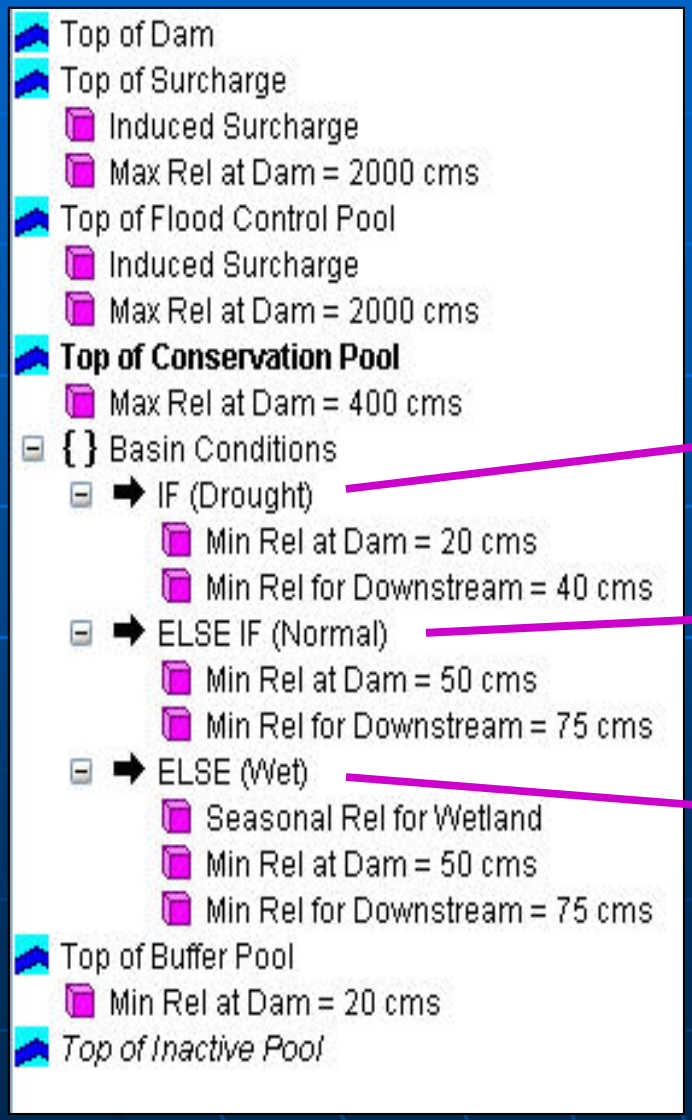
- New option for flow limit goals as daily or weekly period averages



- Fluctuating flows are allowed for intervals within period, but period average requirement is satisfied



IF-THEN-ELSE



- Operational constraints with conditional statements
- Compound conditions
- Nested if-then-else

current inflow < 85% of Average
Or current inflow < 50 cms

current inflow > 85% of Average
And current inflow < 120% of Average

current inflow > 120% of Average
And current Date > 20 Mar 2005
And current Date < 15 Apr 2005

State Variable

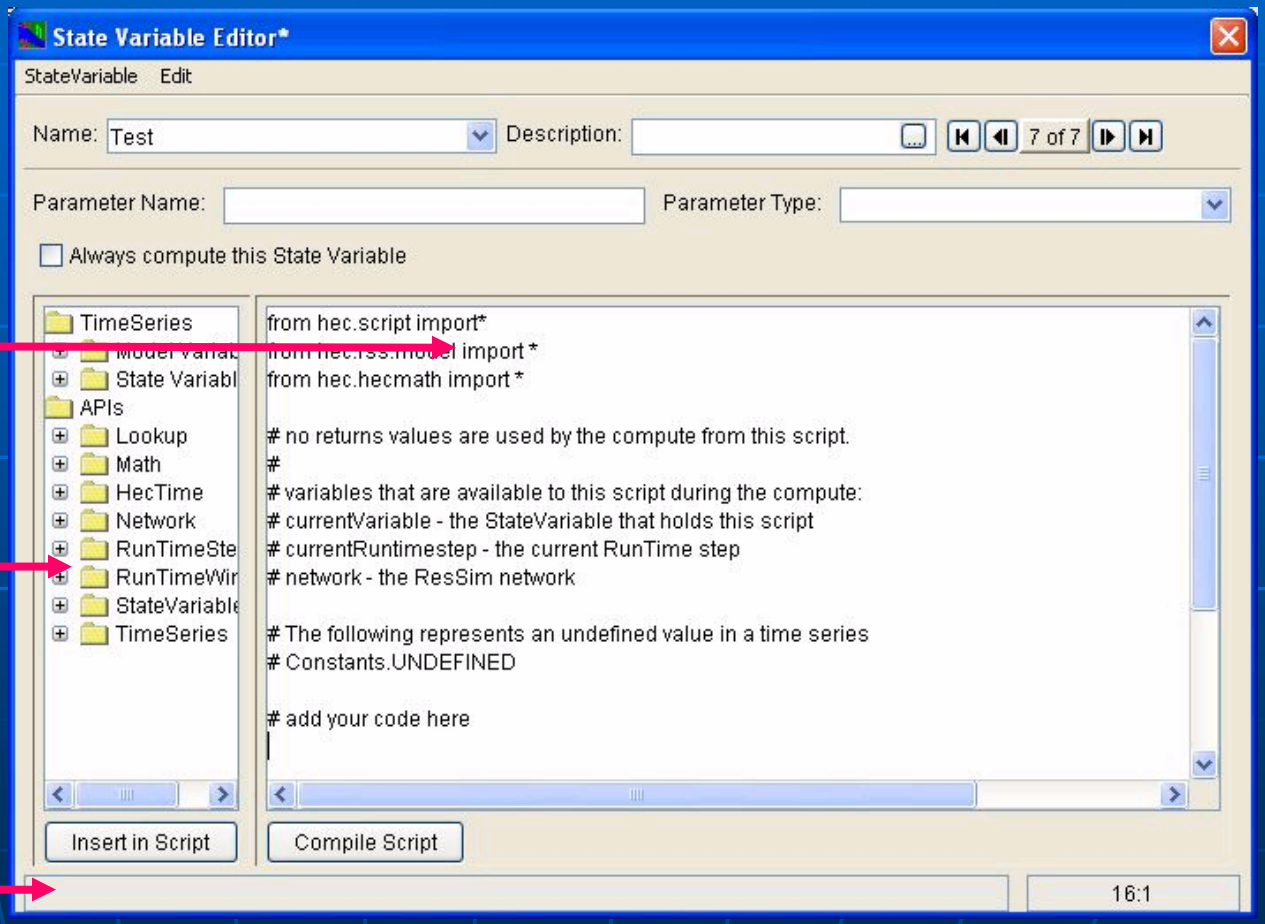
- User-defined variable whose value ResSim computes by executing a *user-created script* at every time step throughout the simulation period
- Computation of non-standard model variables, such as:
  - Basin wetness
  - Drought level
  - System storage
- Scripting in Jython using an editor with access to standard ResSim model variables and methods

State Variable Editor

Script Pane
(editor window)

Object Pane
(API window)

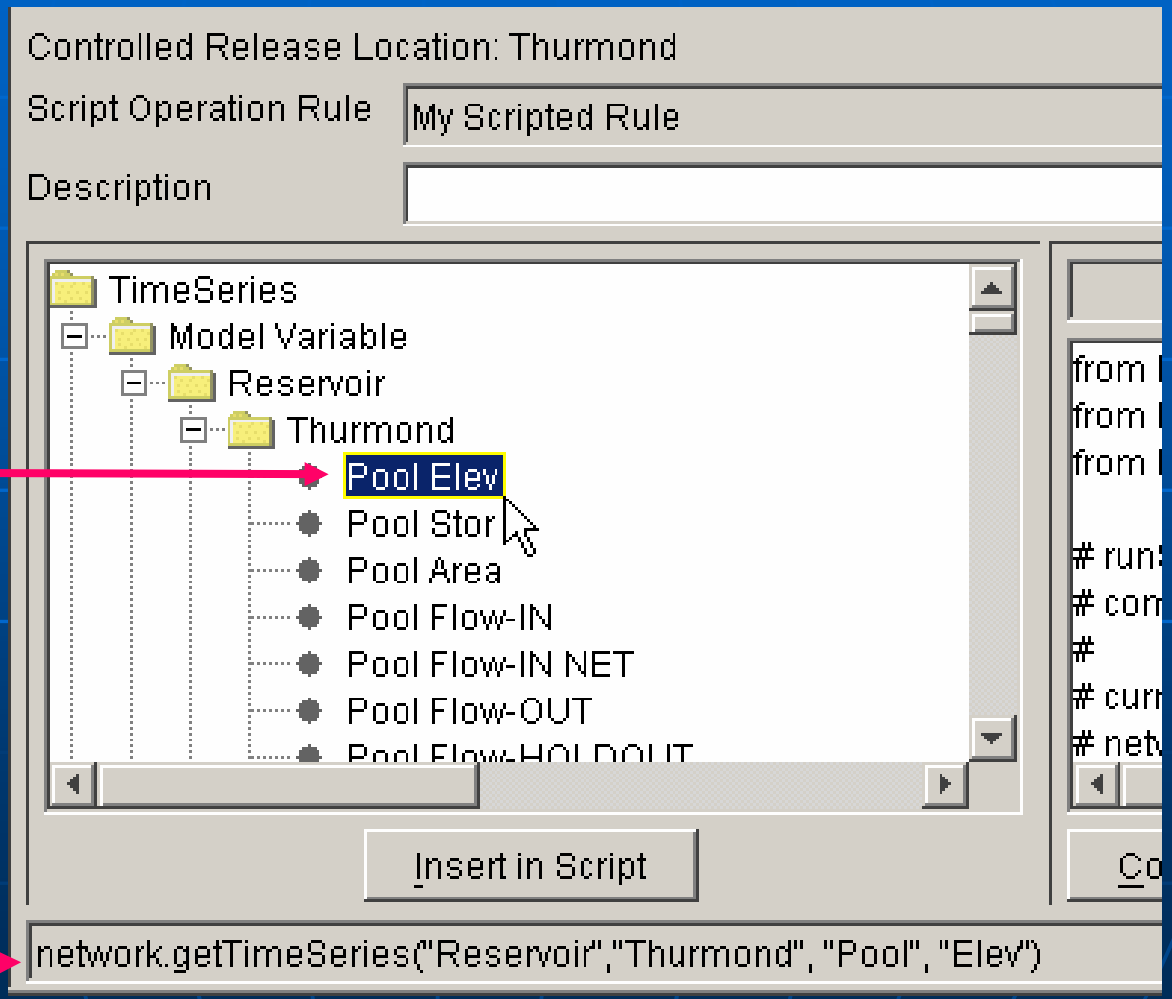
API preview bar



User-Scripted Rule

- A rule that can be added and prioritized in a certain operation set
- Defining complex criteria that depends on various parameters, conditions, and special calculations
- Scripting in Jython using an editor with access to standard objects for ResSim model variables and methods

Scripted Rule Editor



Object API Item

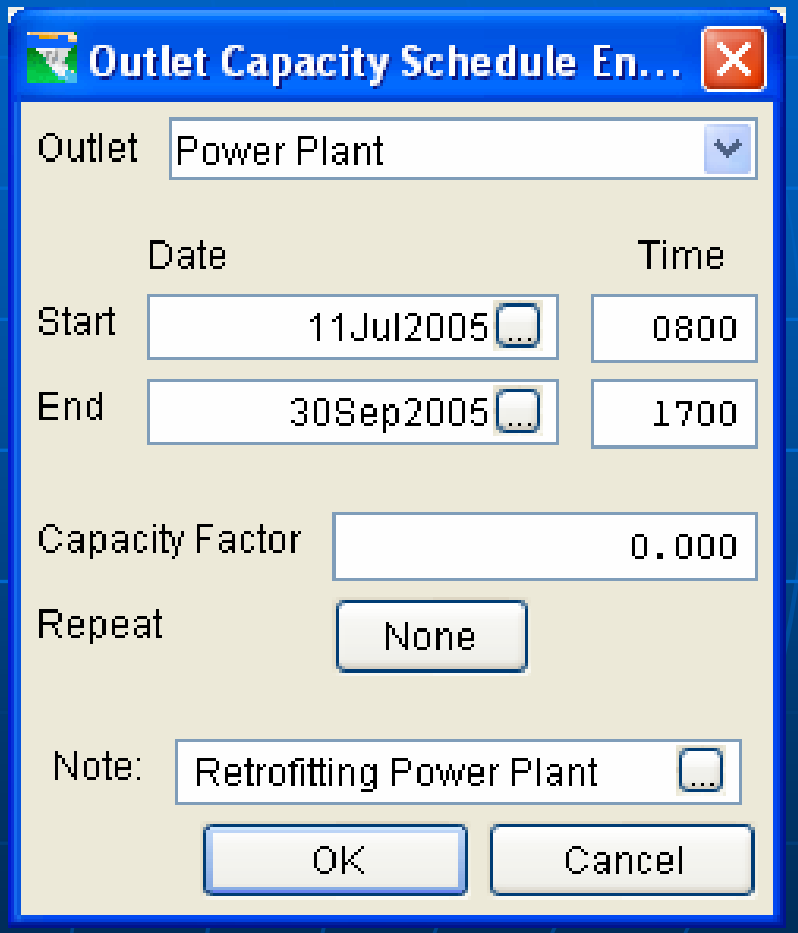
Object API text

Example Script

```
from hec.rss.model import OpRule
from hec.rss.model import OpValue

def runScript(currentRule, network, currentRunTimeStep):
    # create new Operation Value (OpValue) to return
    opValue = OpValue()

    # set the type and value of the OpValue
    inflowTS= network.getTimeSeries("Reservoir","Friant", "Pool", "Flow-IN")
    inflow= inflowTS.getCurrentValue(currentRunTimeStep)

    if inflow > 5000:
        opValue.init(OpRule.RULETYPE_SPEC, inflow)
    else:
        opValue.init(OpRule.RULETYPE_MAX, 5000)

    # return the OpValue
    return opValue
```


Outlet Outages

- Capacity Override factor (0.0-1.0)
- Maintenance or offline schedule
- Repeatable outage interval
  - None
  - Daily
  - Weekly
  - Monthly
  - Yearly

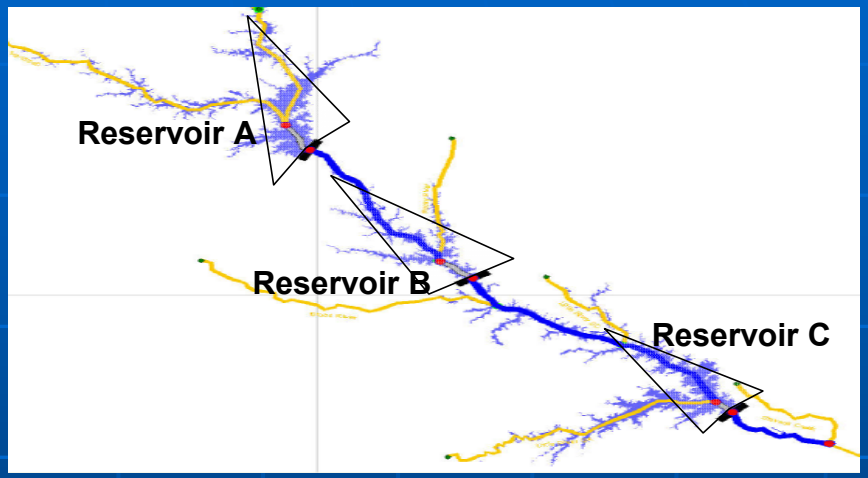


Release Allocations

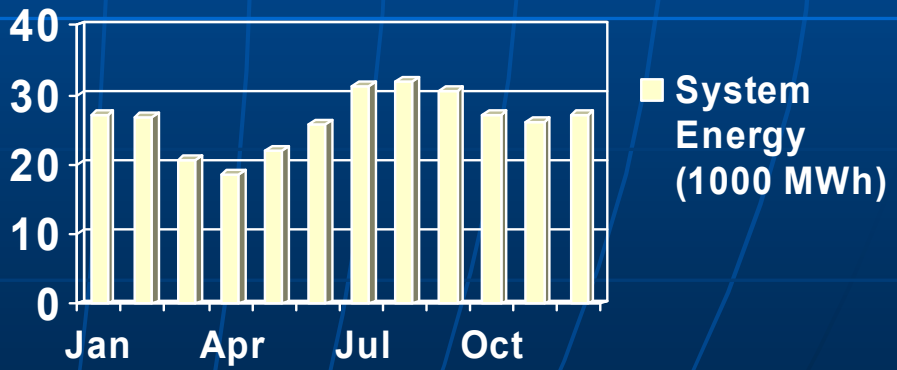
- Allocation options for releases across multiple outlets:
  - **Balanced** releases across multiple outlets (*weighted distribution of releases*)
  - **Sequential** operation of outlets (*prioritized sequence of release*)
  - **Stepped** percent of allocation as function of total release (*combination of balance and sequential allocation schemes*)

System Hydropower

- Storage and energy balance to achieve system-wide targets

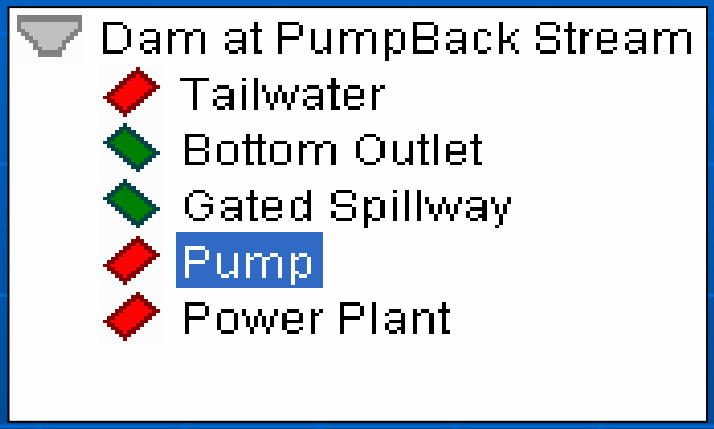


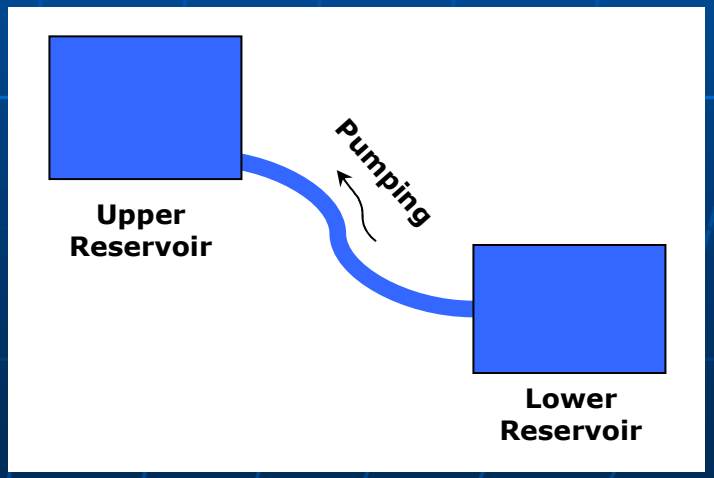
- System generation requirement for a group of reservoirs



Pump-back Storage

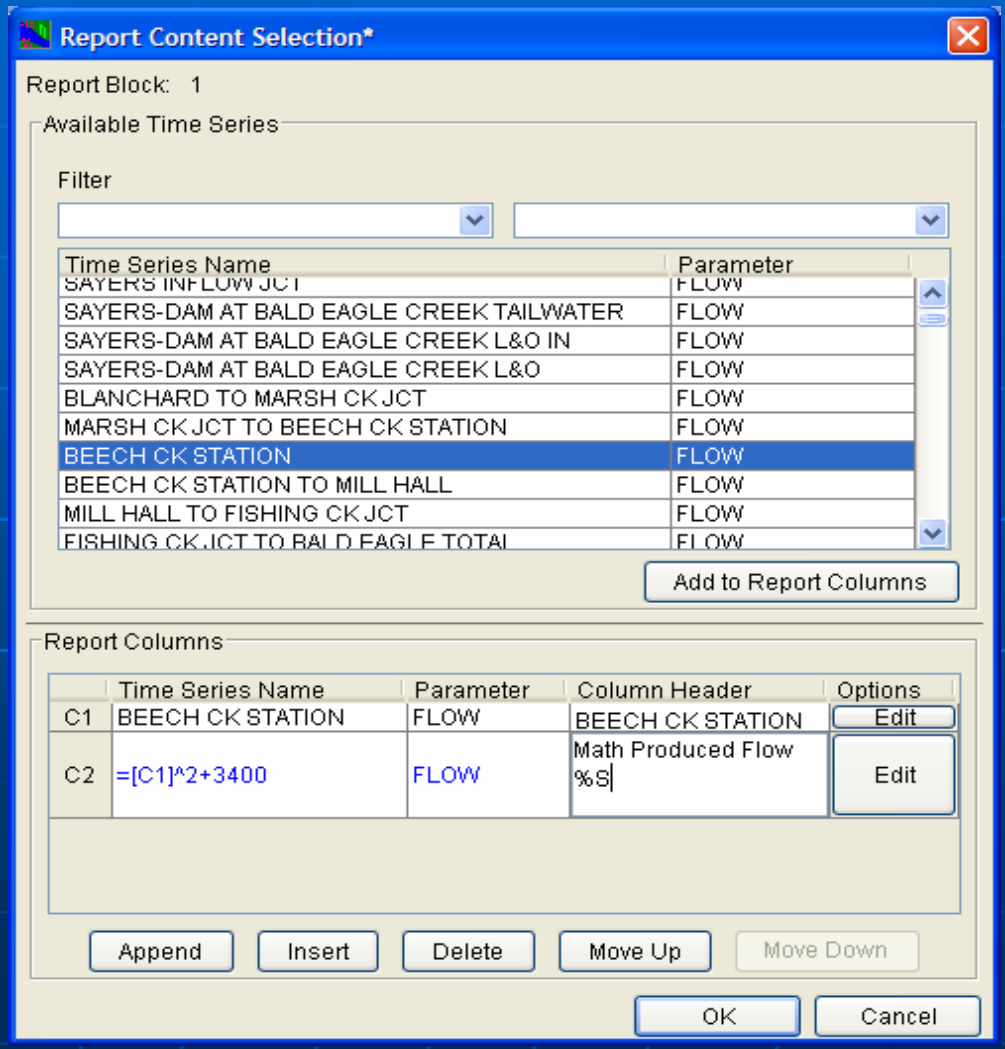
- Downstream source reservoir
- Pumping criteria defined at upper reservoir
  - Target fill level
  - Daily pumping schedule





Report Builder

- User-defined reports
- Time-series catalog & filter
- Column, row, & report block builder
- Column math operation & summary statistics



Recap of Enhancements

- Additional power and flexibility for defining reservoir operating criteria
- Extra control for outlet release allocations
- Expanded hydropower capabilities for system generation and pump-back operation
- User-defined Reports

Version 3.0 Public Release ~ Winter 2005

Contacts

- Joan Klipsh, HEC-ResSim Program Manager
  Water Management Systems Division, HEC
  Joan.D.Klipsh@usace.army.mil
- Fauwaz Hanbali, Hydraulic Engineer
  Water Management Systems Division, HEC
  Fauwaz.U.Hanbali@usace.army.mil

HEC Website http://www.hec.usace.army.mil