The 3rd NARBO
Training Workshop

K-MODSIM DSS

EXERCISE

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Getting Started

- Installation
  - Microsoft .NET framework 1.1 or higher version has to be installed in your computer before the K-MODSIM installation.
    - Ex) dotnetfx.exe
  - Double-click the “ModsimV8Setup.msi” file to install K-MODSIM version 8.

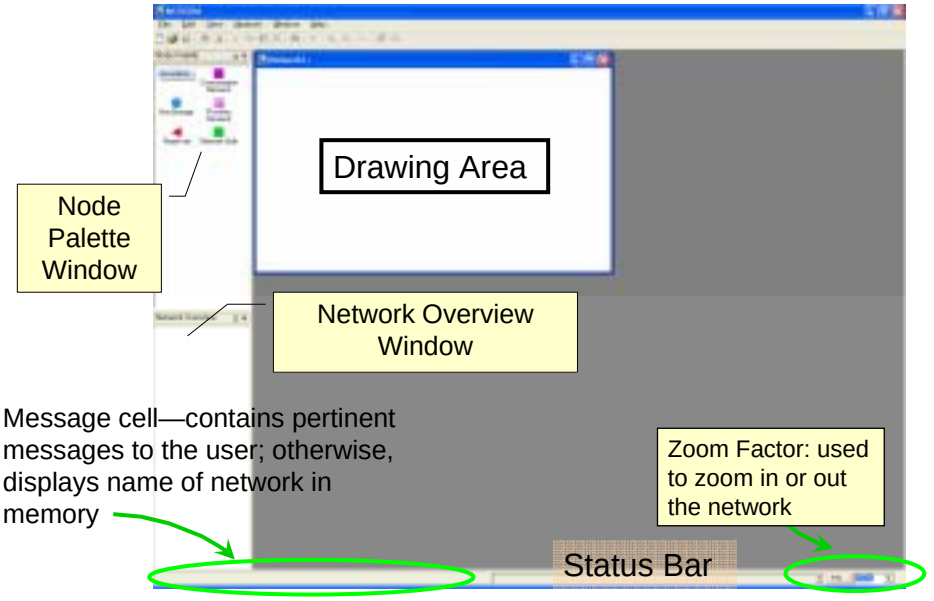
Getting Started

- Short-cut Icon
  - After the installation, you can see the short-cut icon on your wallpaper of Windows.

- Execution of K-MODSIM
  - Just double-click the Modsim 8.0 Beta icon to run the K-MODSIM.
  - Or Start menu-Modsim 8.0 Beta

Getting Started

Explore K-MODSIM GUI



Before Starting Exercise

- Make a new folder with Windows Explorer to proceed the exercise.
  - C://Program Files/CSU/Modsim 8.0 Beta/Example
  - The Example folder is going to be a working directory for K-MODSIM exercise.
- Move the given “K-Modsim_Exercise.xy” file to the Example folder.

K-MODSIM Network Creation

- We will now construct a network in the K-MODSIM GUI.
- Select New under the File menu, then you can see a new empty canvas where you can draw a new network.

Creation of Nodes

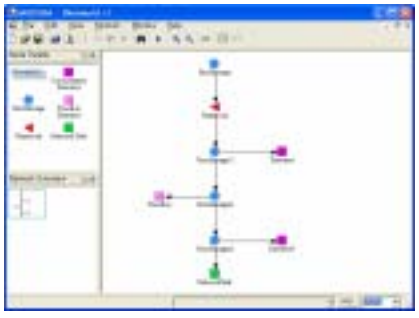
- We will create all the nodes first, and then the links.
  - Reservoir Node
  - NonStorage Node
  - NetworkSink Node
  - Demand Node
- Left click on the desired node in the Node Palette.
- Click on the canvas where node to be located or drag & drop the node.
- If you make a mistake, right click & choose “delete” or left click the node & press “delete” key.

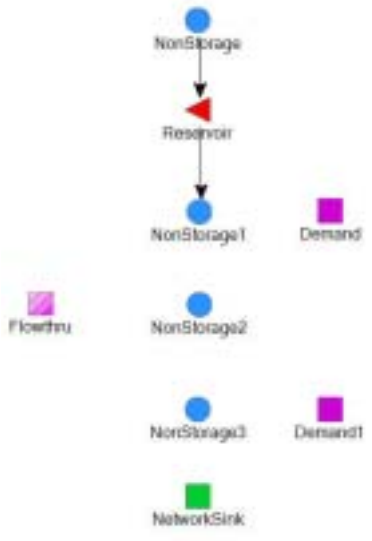
Reposition or Moving the Nodes

- To reposition a node, click on the node then drag to new position
  - Selected node are highlighted with yellow rectangle
- To move multiple objects at same time, left click the node with the shift button pressed.

Connecting Nodes with Links

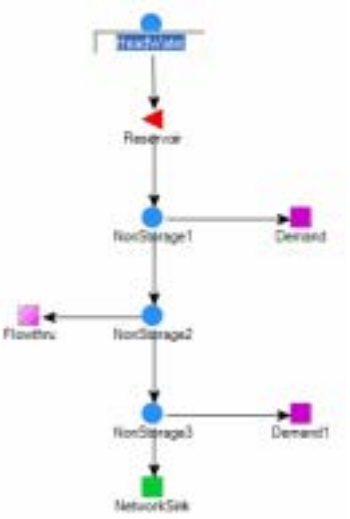
- Point the cursor near a node and you can see a finger and then drag down to the other node to connect with links.
- The arrow-end of the link shows the direction of flows.





Renaming the Nodes

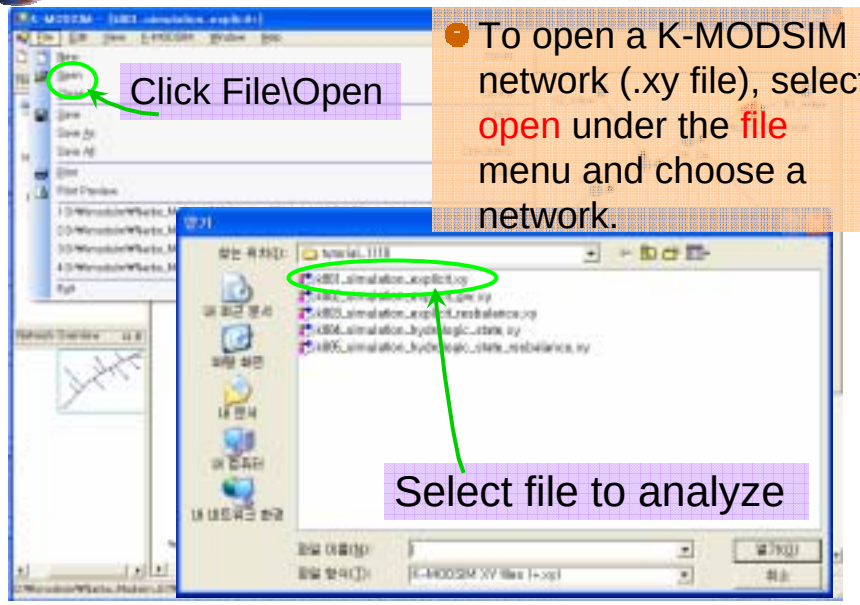
- K-MODSIM has 5 types of nodes.
- Left click a node name then you can enter the new node name – No Spaces!
- After creating a network, data and properties for each node and link should be entered.



Exercise Cases

- Case 1: Explicit Target
- Case 2: Explicit Target + Groundwater
- Case 3: Explicit Target + Groundwater + Reservoir Balancing
- Case 4: Conditional Rules (Hydrologic States) + Groundwater
- Case 5: Conditional Rules (Hydrologic States) + Groundwater + Reservoir Balancing

Opening a Network

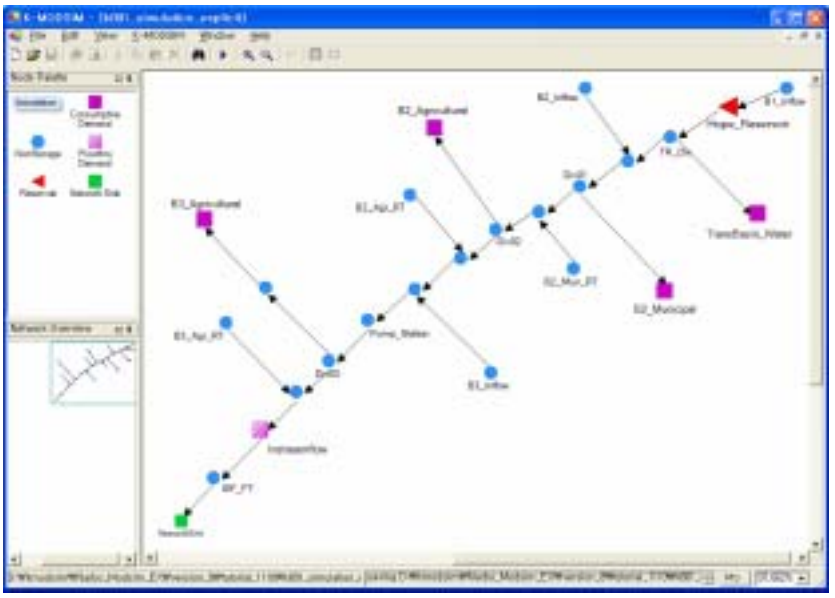


- To open a K-MODSIM network (.xy file), select open under the file menu and choose a network.

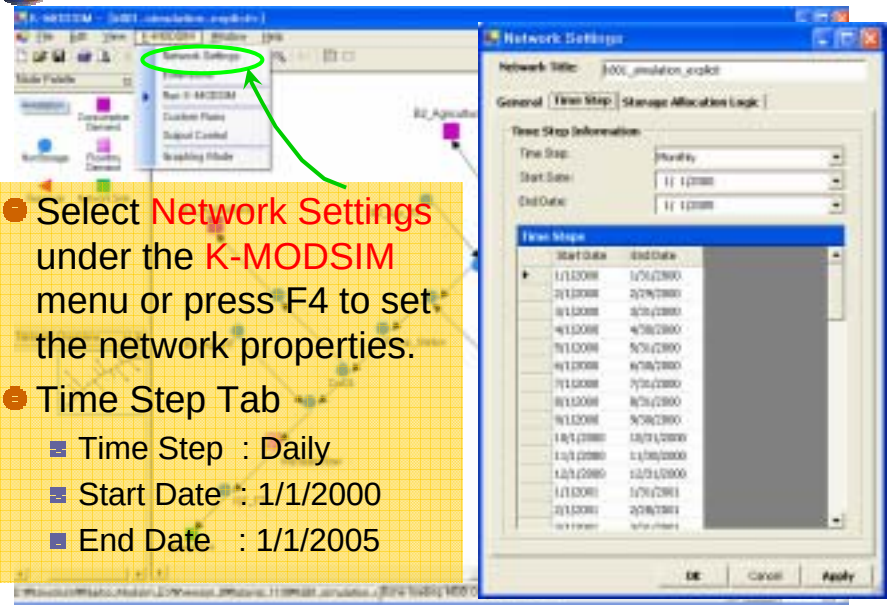
Case 1 Problem

- Purposes
  - To calibrate the basin-wide water allocation model using historical data and historical reservoir target
- Problem Description
  - Use the Results of RRFS (Natural Inflow Data)
  - Use Explicit Reservoir Target Storage
  - Consider Transbasin Water, Municipal and Agricultural Demand and Instream Flow Demand
  - Consider Return Flows
    - Municipal Demand: 0.6
    - Agricultural Demand: 0.3
  - Evaluate Reservoir Storage, Hydropower, and Shortages of Demand Nodes

Case 1 Network



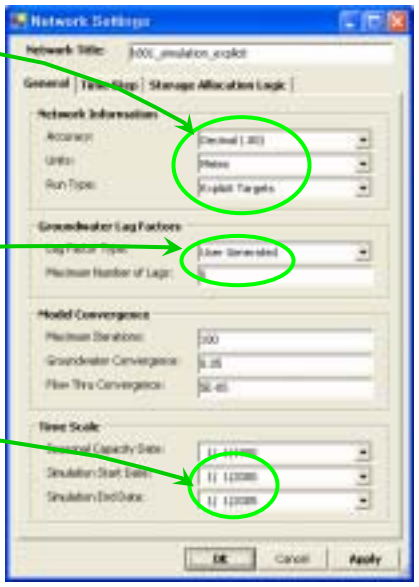
Network Settings



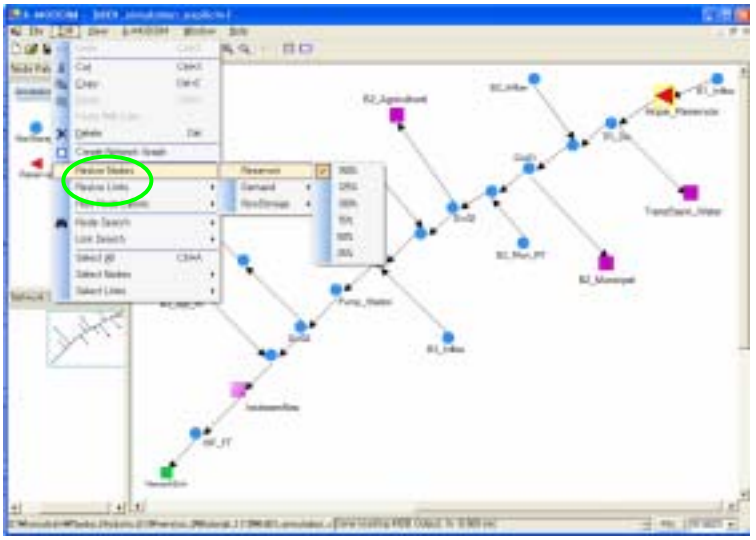
- Select Network Settings under the K-MODSIM menu or press F4 to set the network properties.
- Time Step Tab
  - Time Step : Daily
  - Start Date : 1/1/2000
  - End Date : 1/1/2005

Network Settings

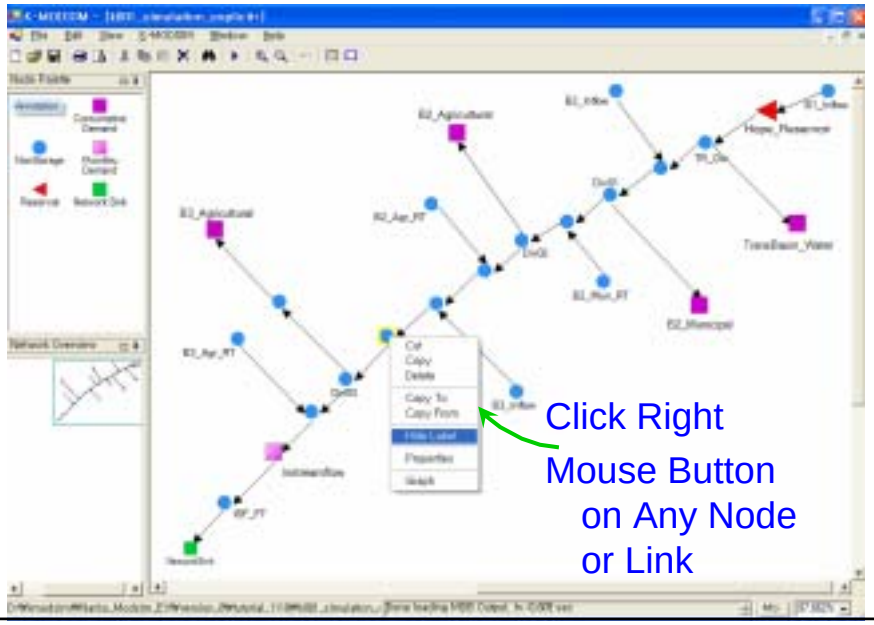
- Network Information
  - Accuracy
  - Unit
  - Run Type
- Groundwater Lag Factors
- Time Scale
  - Simulation Start Date:1/1/2000
  - Simulation End Date:1/1/2005



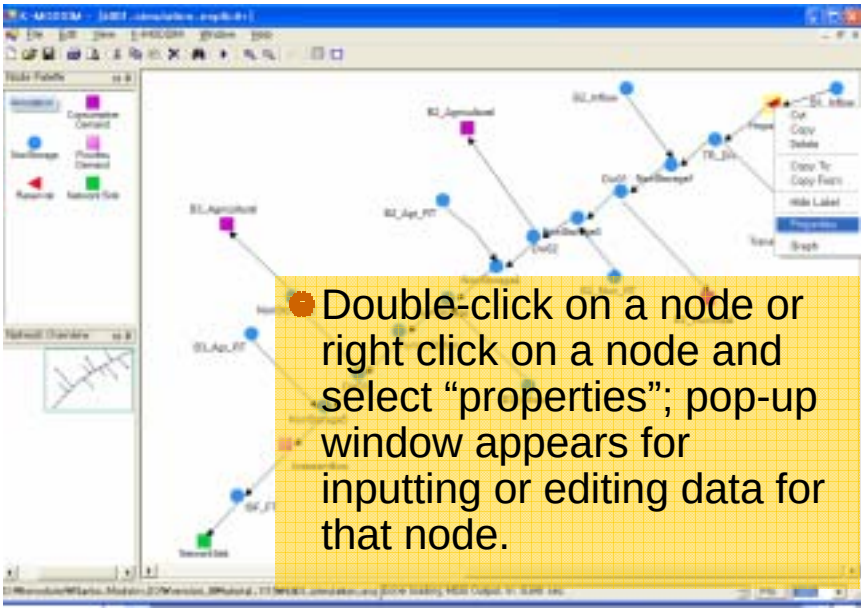
Resize Nodes and Links



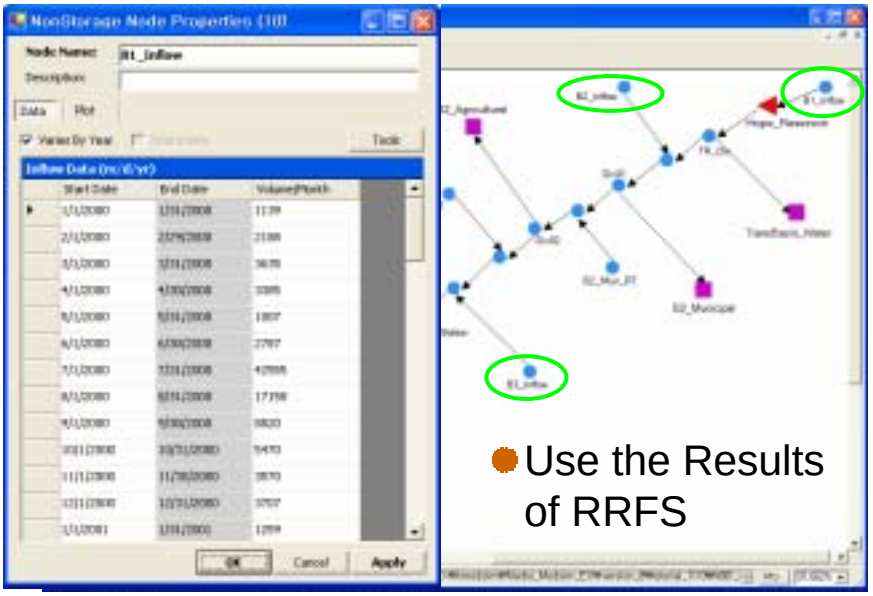
Hide or View Label



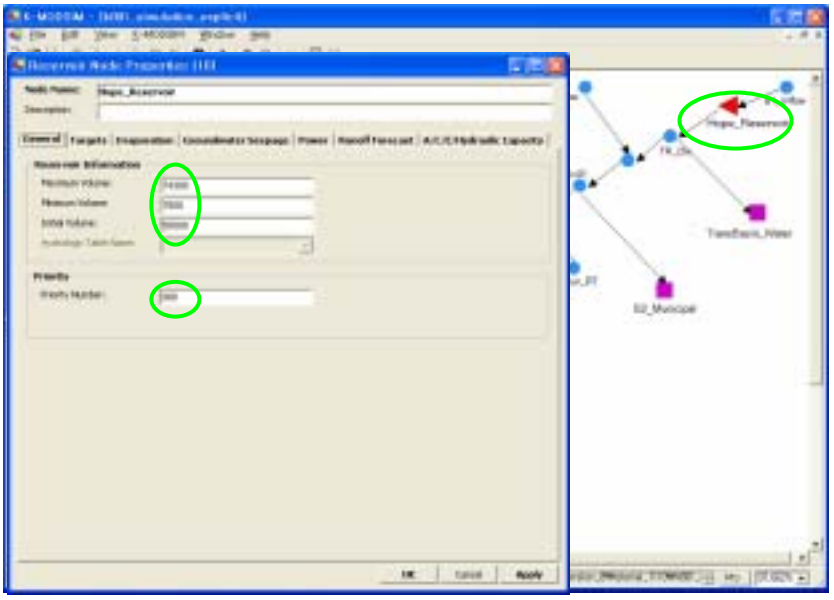
Data Input



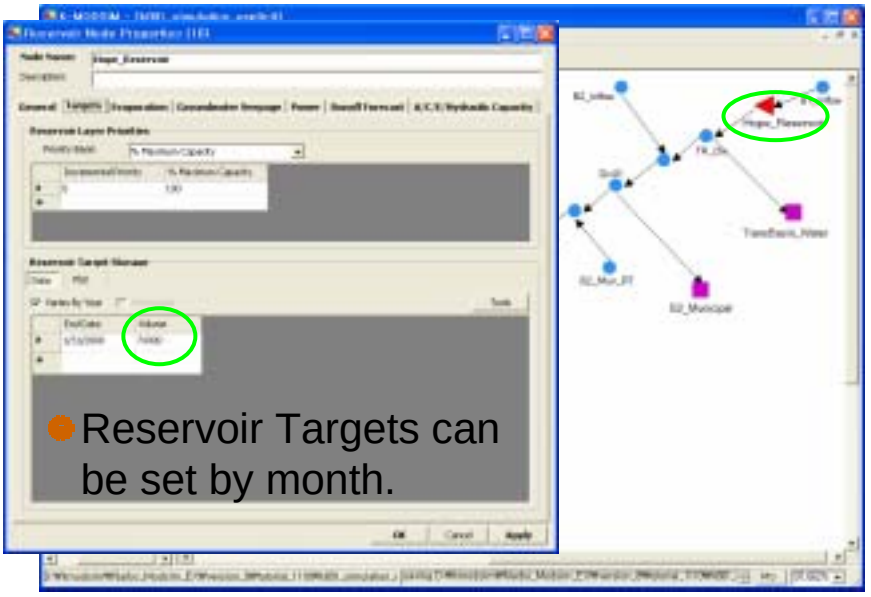
Inflow Data Input



Reservoir Volumes & Priority

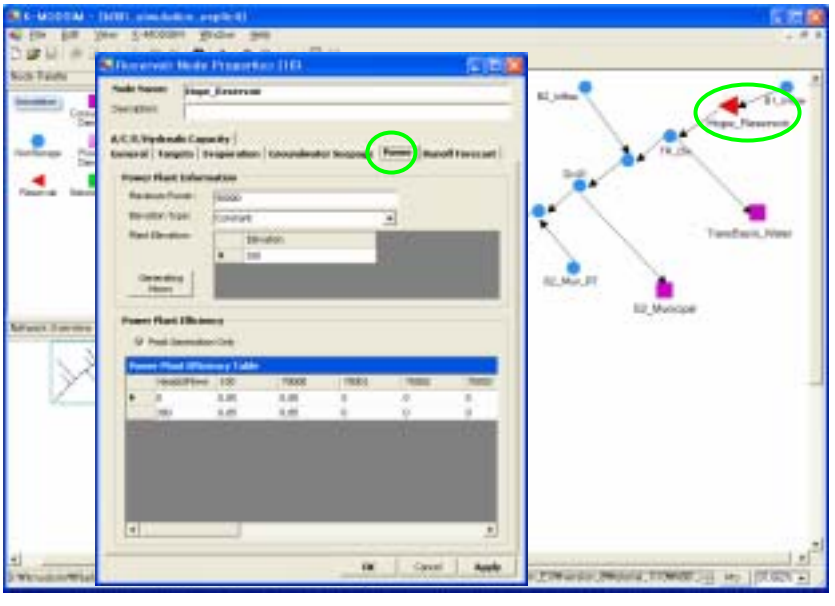


Reservoir Target Setting

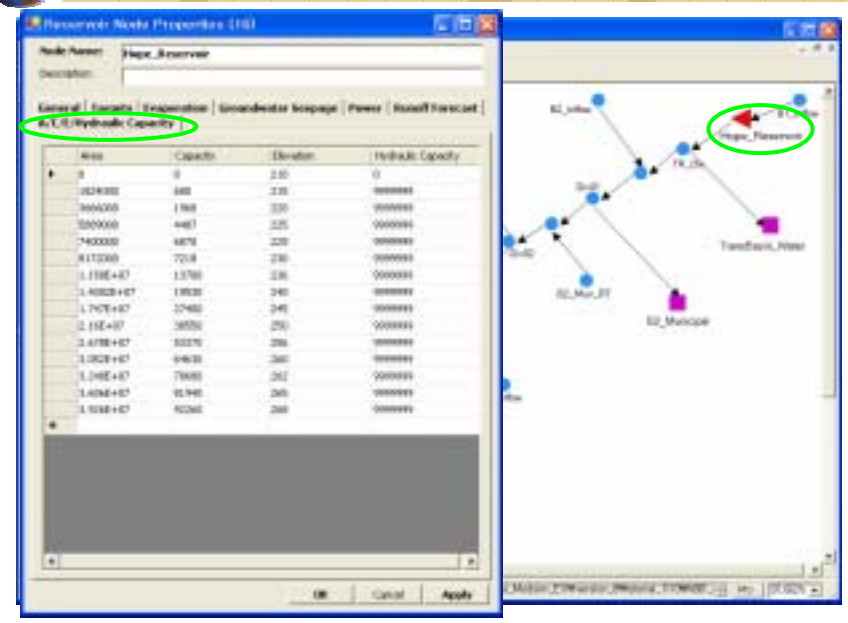


- Reservoir Targets can be set by month.

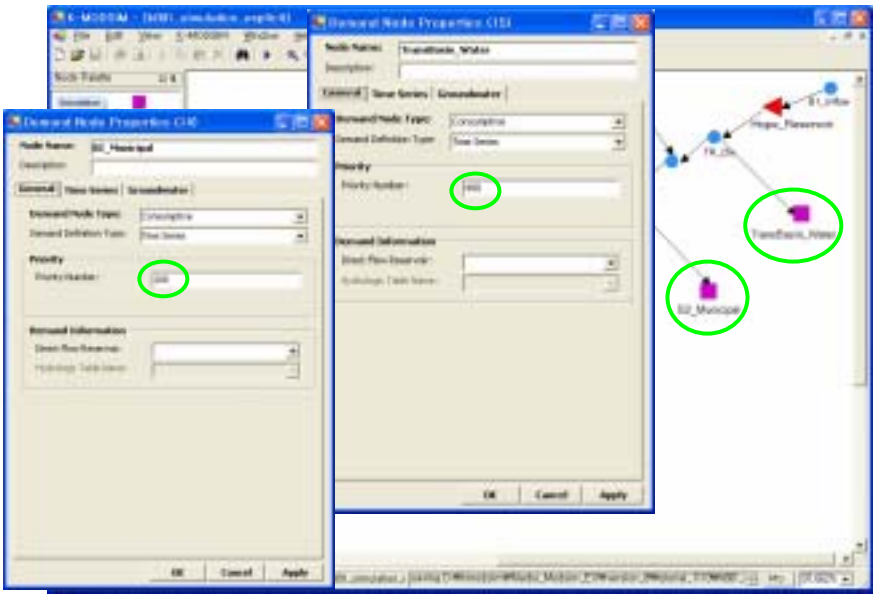
Hydropower



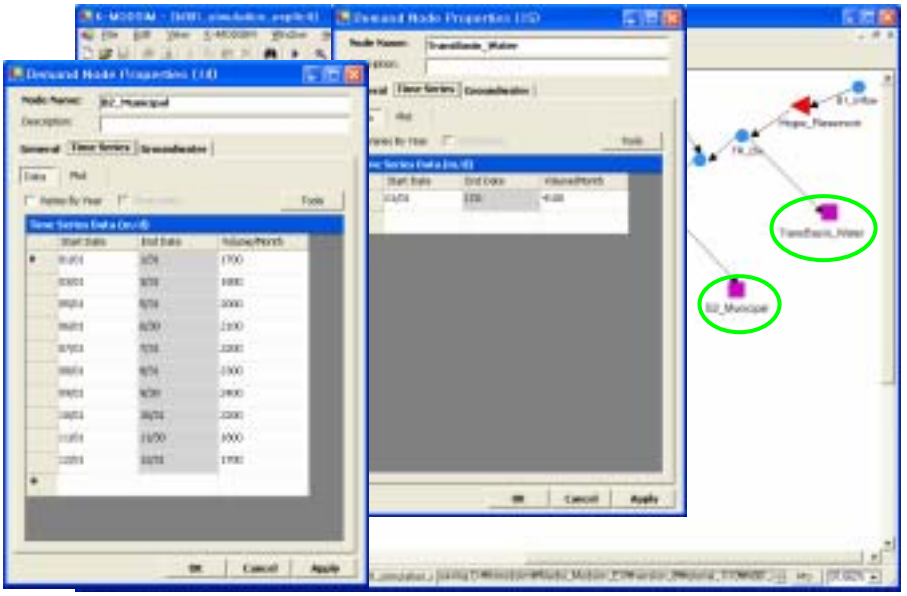
Area-Capacity-Elevation



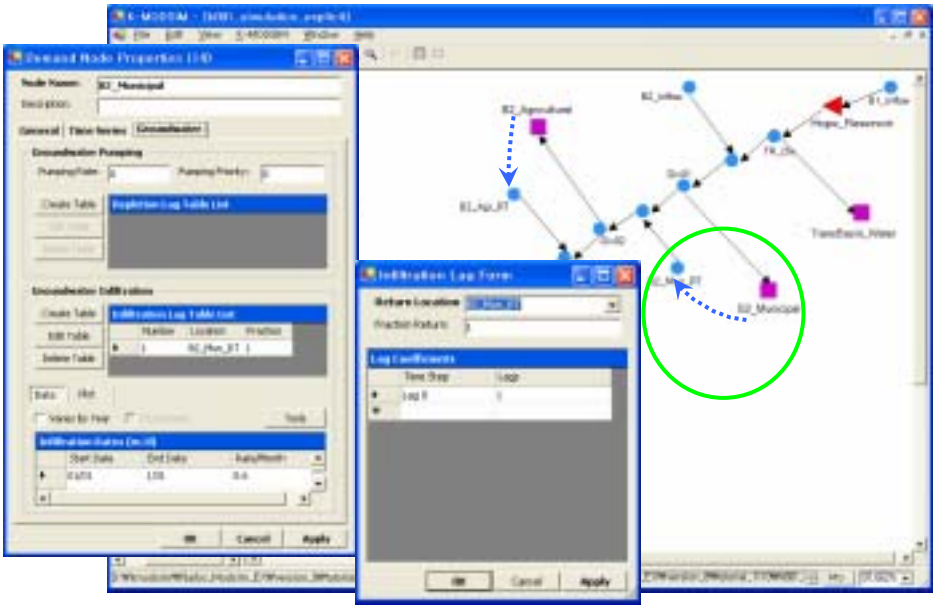
Demand Node Type & Priority



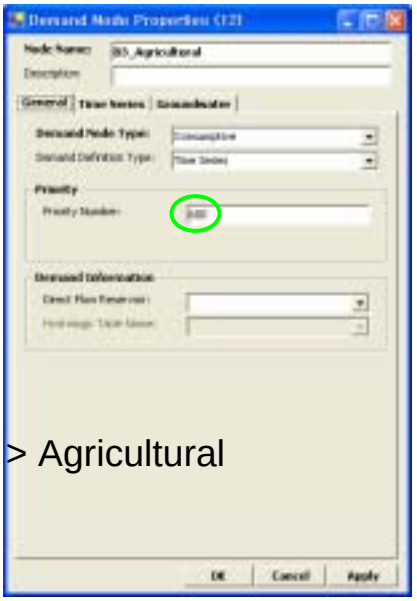
Demand Data Setting



Return Flow Setting

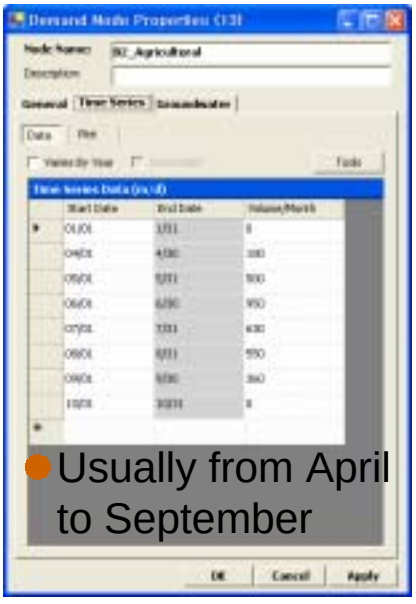


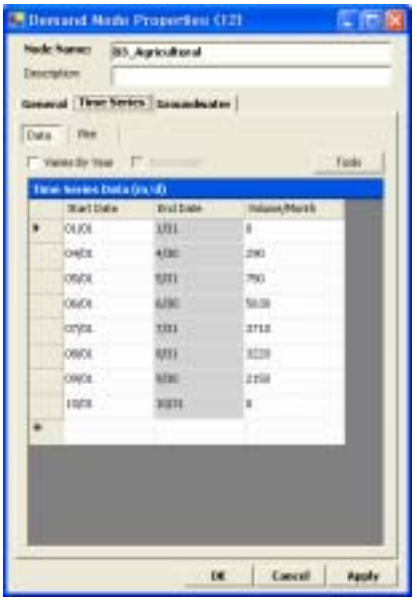
Agricultural Demand Setting



- Priority
  - Municipal > Industrial > Agricultural

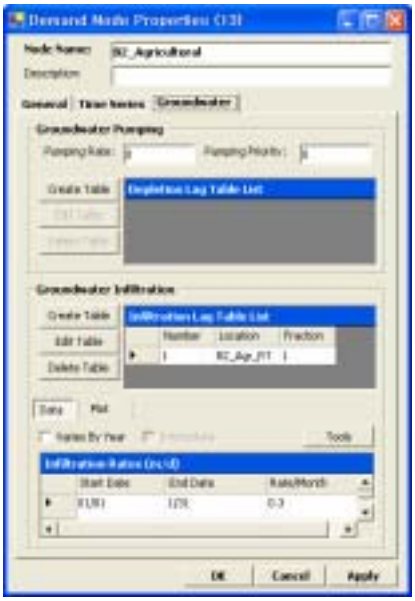
Agricultural Demand Input

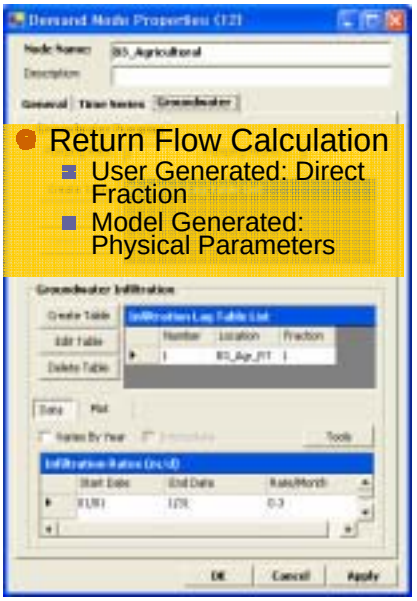




- Usually from April to September

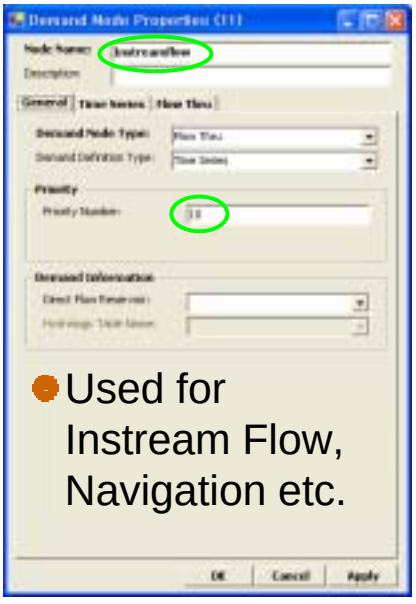
Return Flow





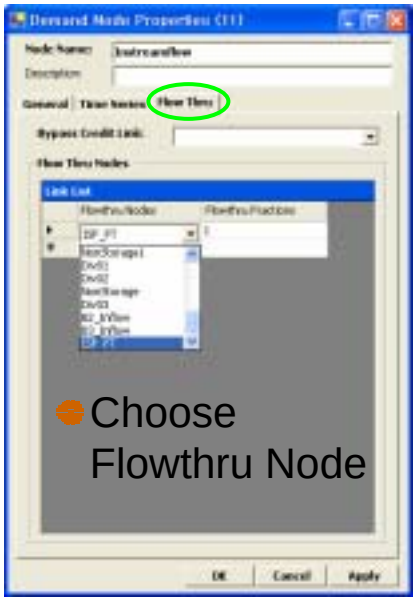
- Return Flow Calculation
  - User Generated: Direct Fraction
  - Model Generated: Physical Parameters

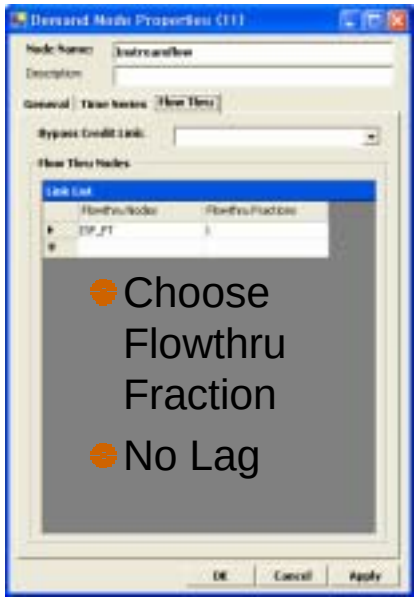
Flowthru Demand Setting



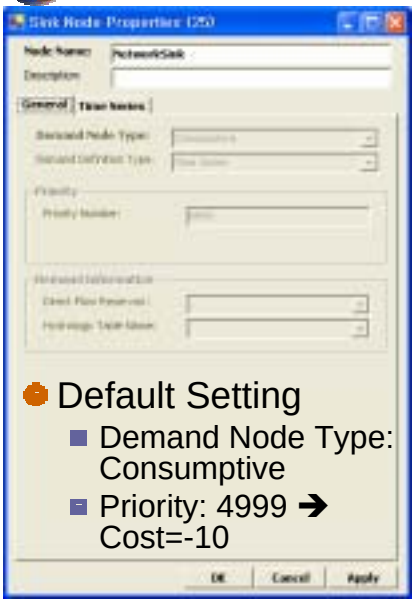
- Used for Instream Flow, Navigation etc.

Destination & Fractions

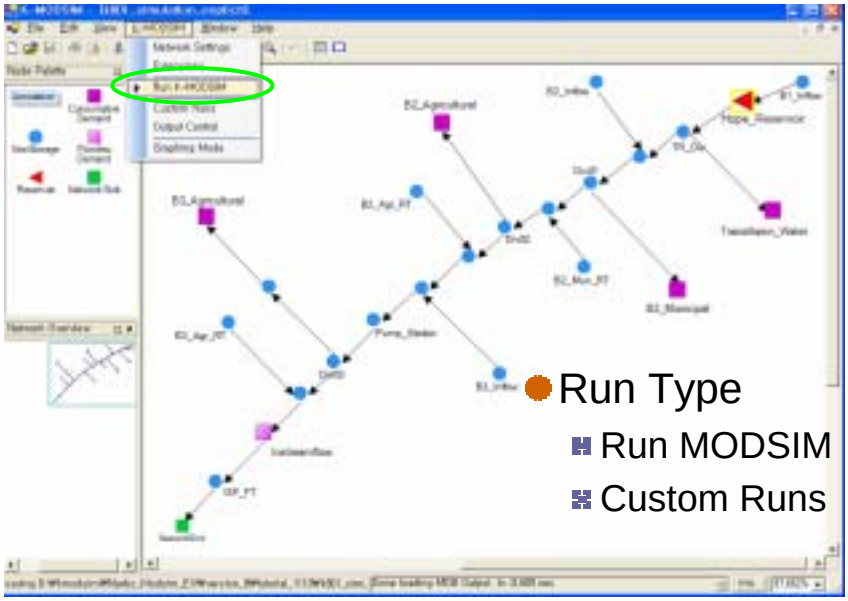




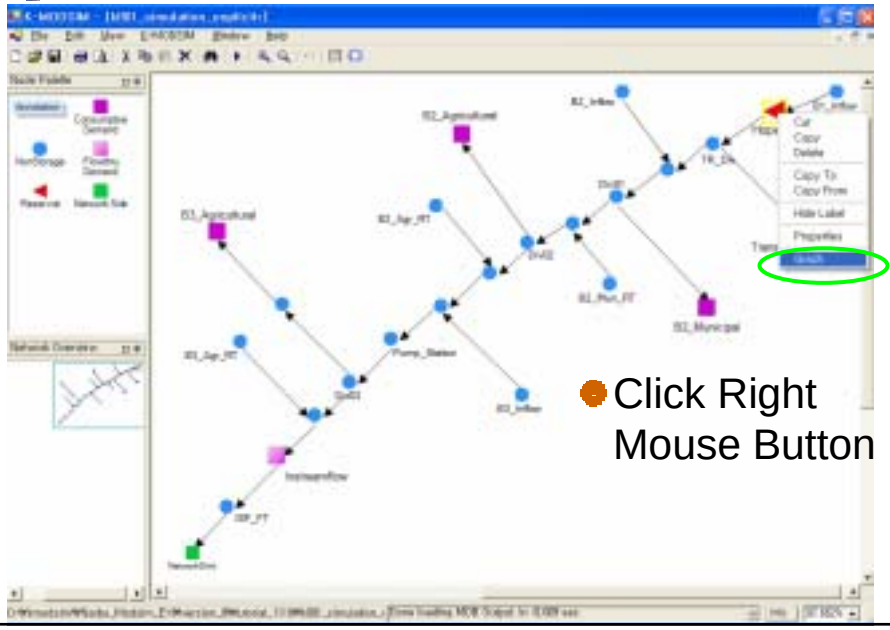
Network Sink Node Setting



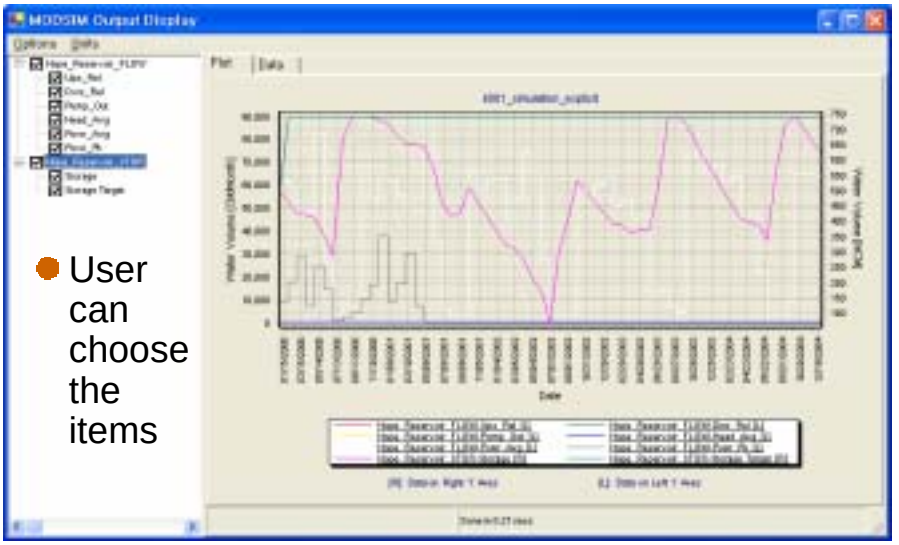
K-MODSIM Run



Graphical Display of Output

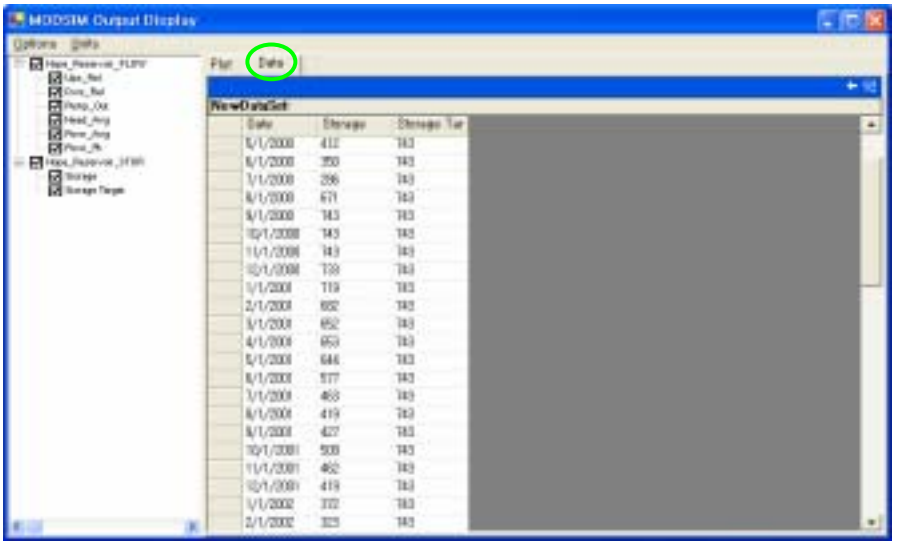


Case 1 Results: Reservoir(Graphs)

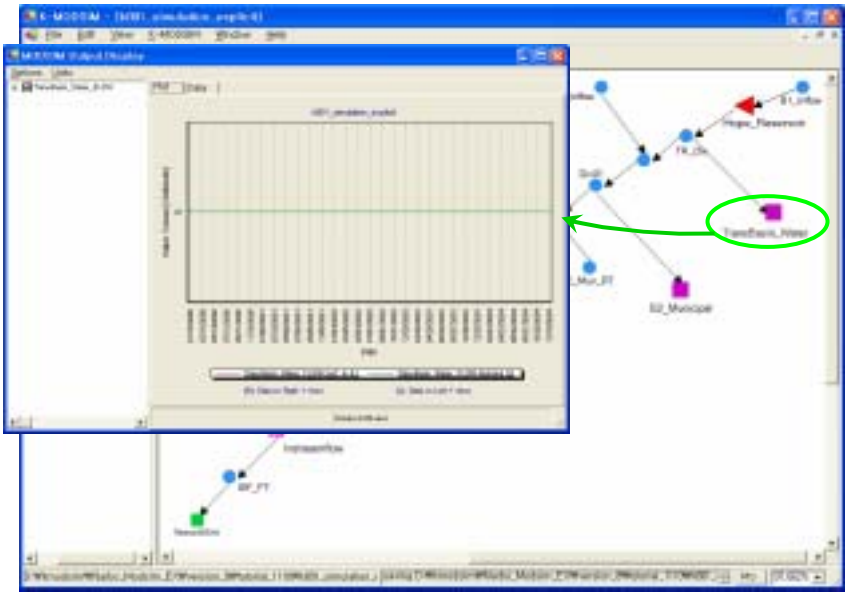


- User can choose the items

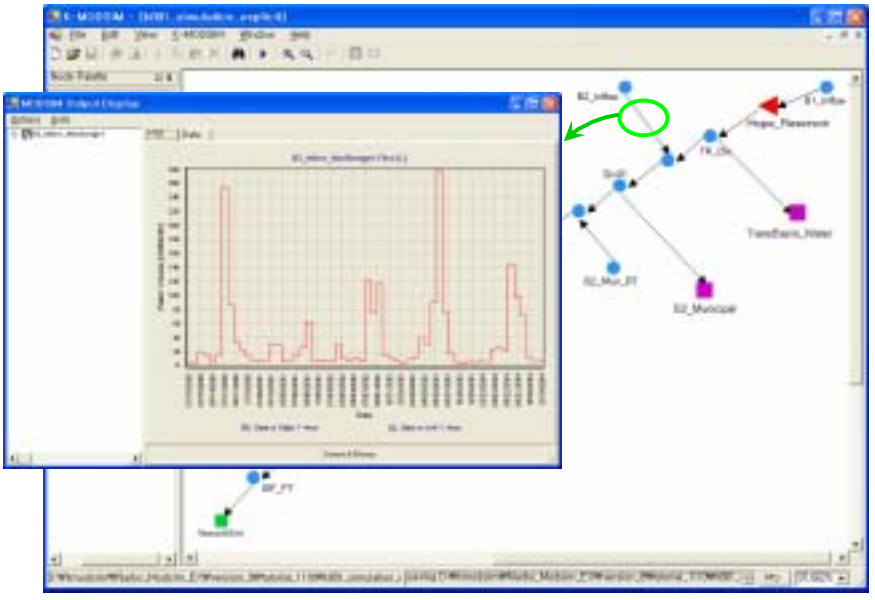
Case 1 Results: Reservoir(Data)



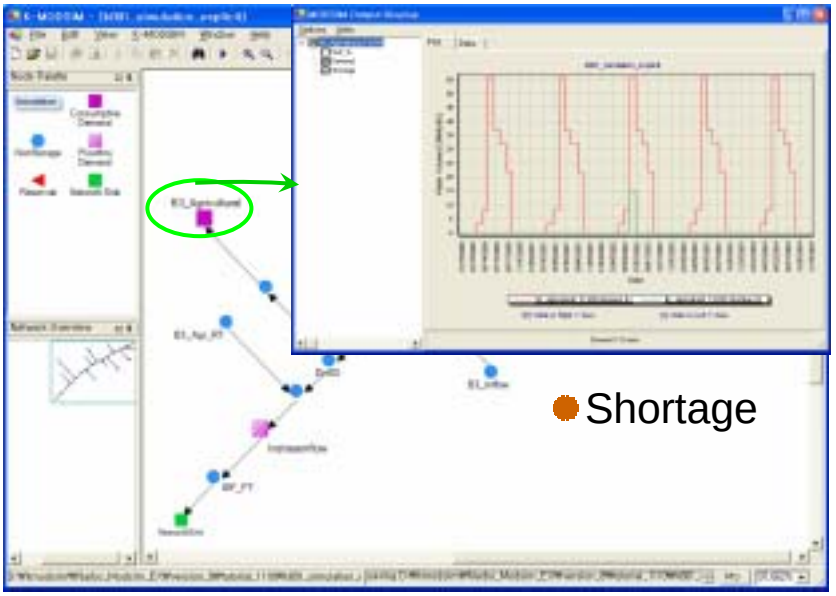
Case 1 Result: Transbasin Water



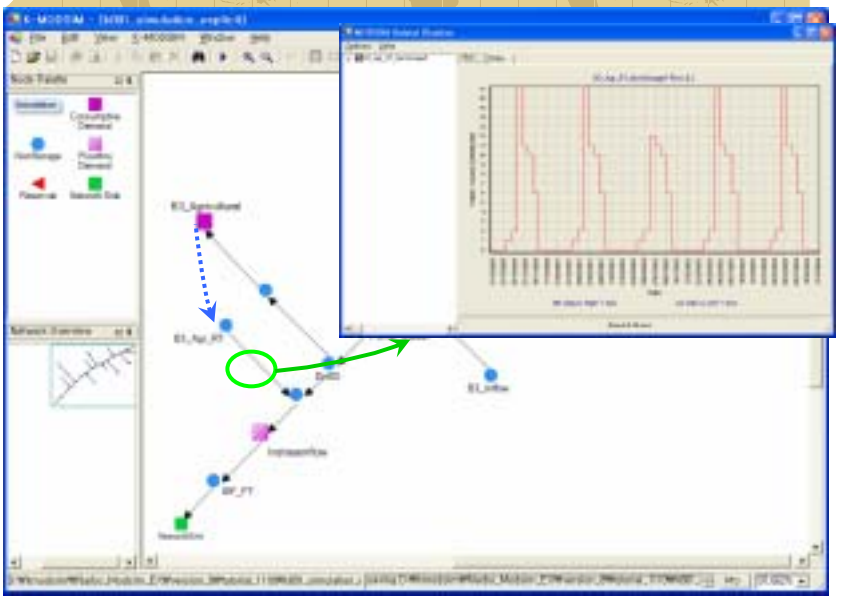
Case 1 Result: Link Flow



Case 1 Result: Agricultural Dem.



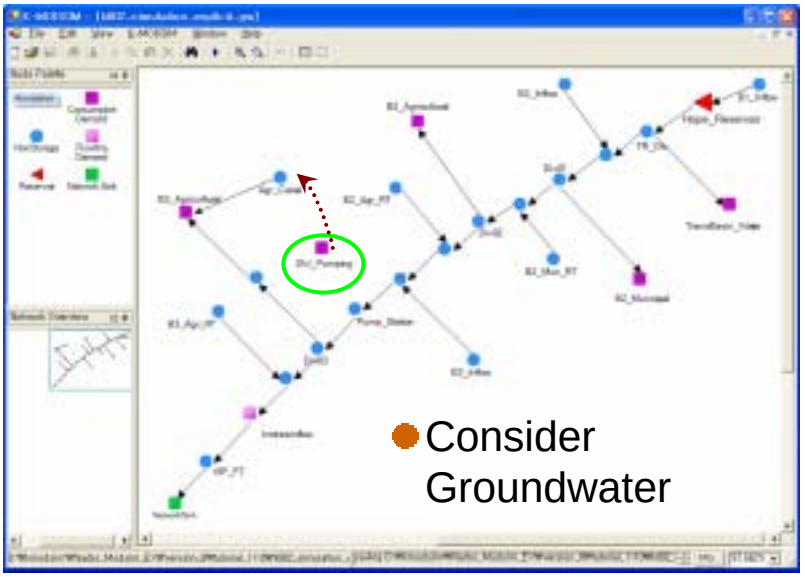
Case 1 Result: Return Flow



Case 2 Problem

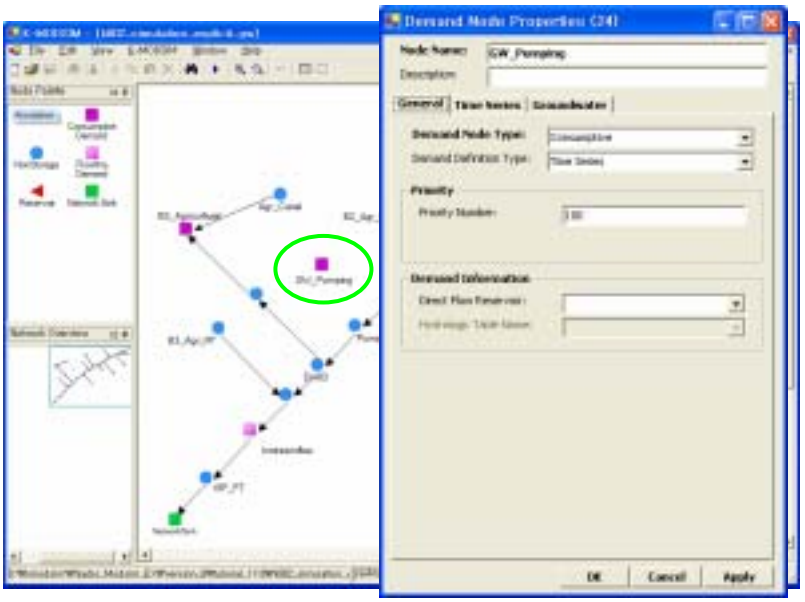
- Purposes
  - To simulate the basin-wide water allocation model using conjunctive use option
- Problem Description
  - Use the Results of RRFS (Natural Inflow Data)
  - Use Explicit Reservoir Target Storage
  - Consider Transbasin Water, Municipal and Agricultural Demand and Instream Flow Demand
  - Consider Return Flows (0.6, 0.3)
  - Consider Groundwater Pumping
  - Evaluate Reservoir Storage, Hydropower, and Shortages of Demand Nodes

Case 2 Network

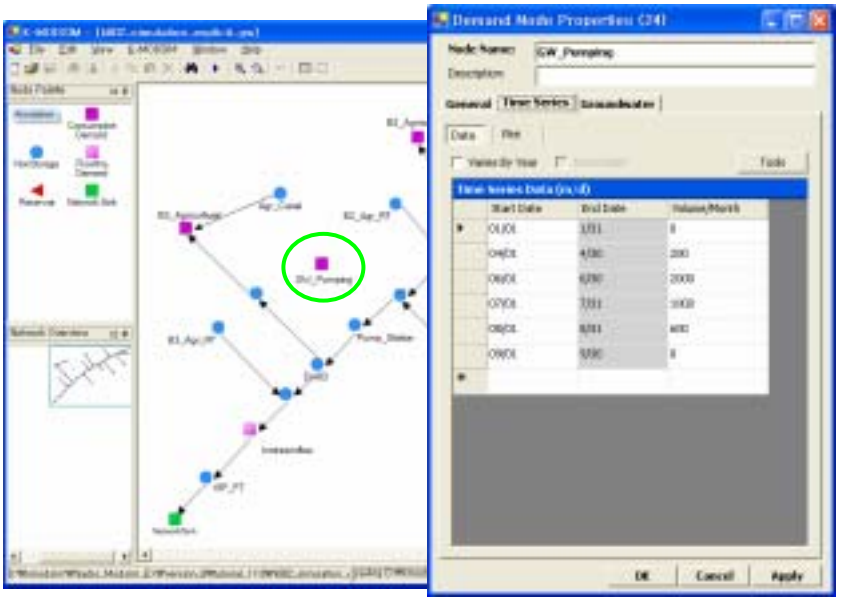


- Consider Groundwater

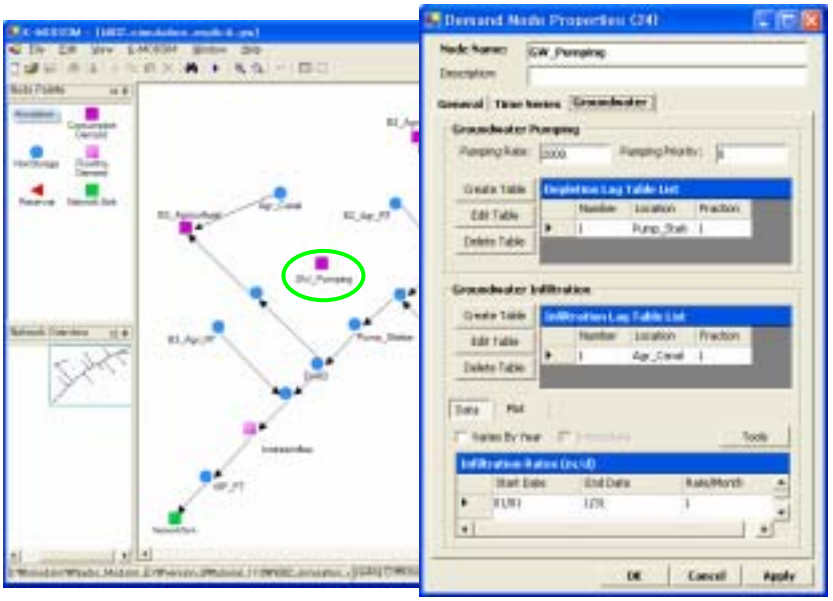
Groundwater Pumping Node



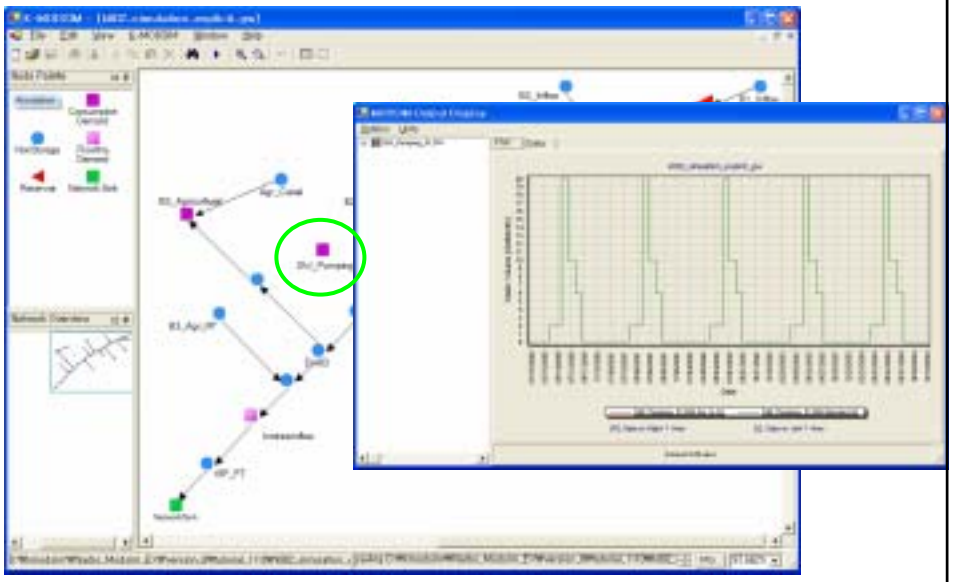
Groundwater Pumping Node



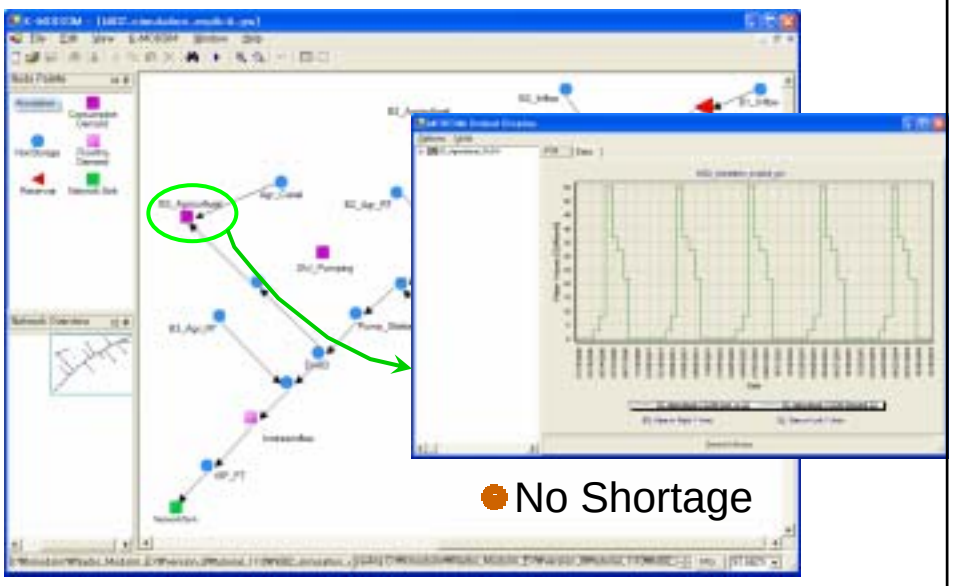
Groundwater Pumping Node



Case 2 Result: GW Pumping



Case 2 Result: Agricultural Dem.

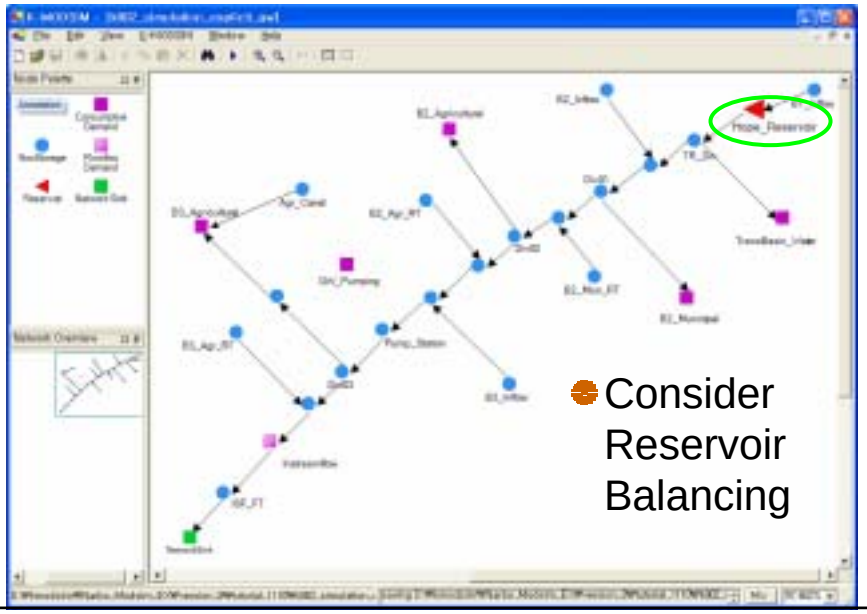


- No Shortage

Case 3 Problem

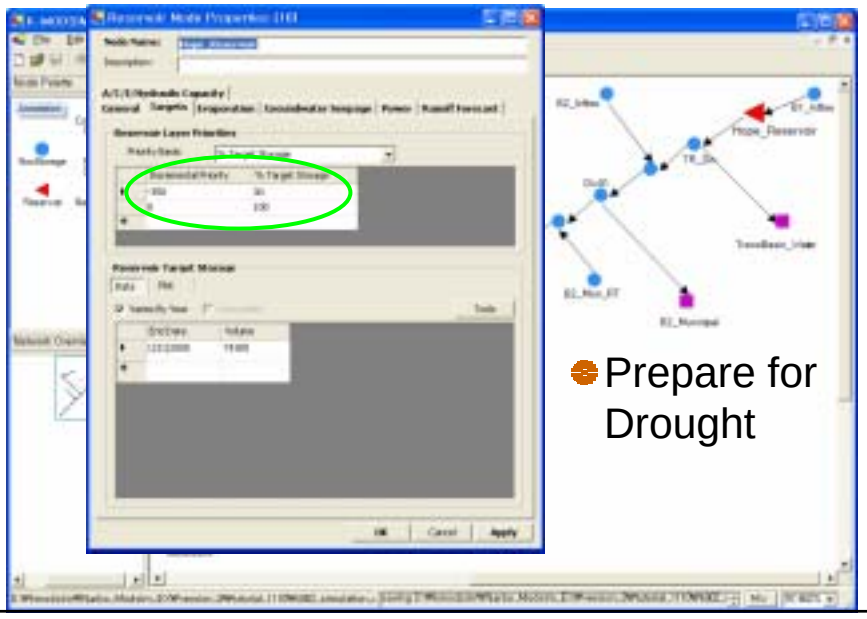
- Purposes
  - To simulate the basin-wide water allocation model considering uncertainties of reservoir operation rule
- Problem Description
  - Use the Results of RRFS (Natural Inflow Data)
  - Use Explicit Reservoir Target Storage
  - Consider Transbasin Water, Municipal and Agricultural Demand and Instream Flow Demand
  - Consider Return Flows (0.6, 0.3)
  - Consider Groundwater Pumping
  - Consider Reservoir Balancing in Operation
    - Reservoir Zoning & Change the Priorities of Zones
  - Evaluate Reservoir Storage, Hydropower, and Shortages of Demand Nodes

Case 3 Network



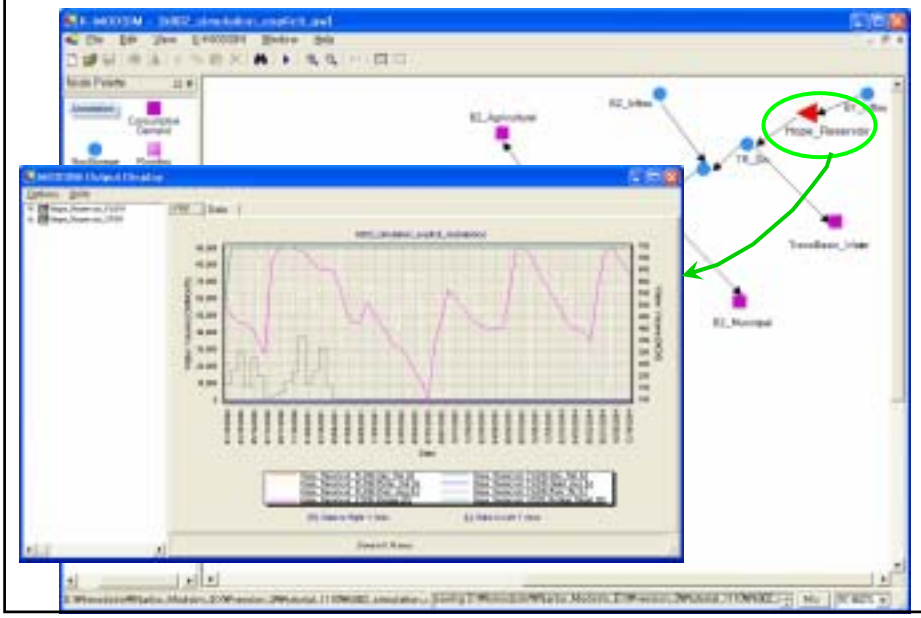
- Consider Reservoir Balancing

Reservoir Balancing Setting



- Prepare for Drought

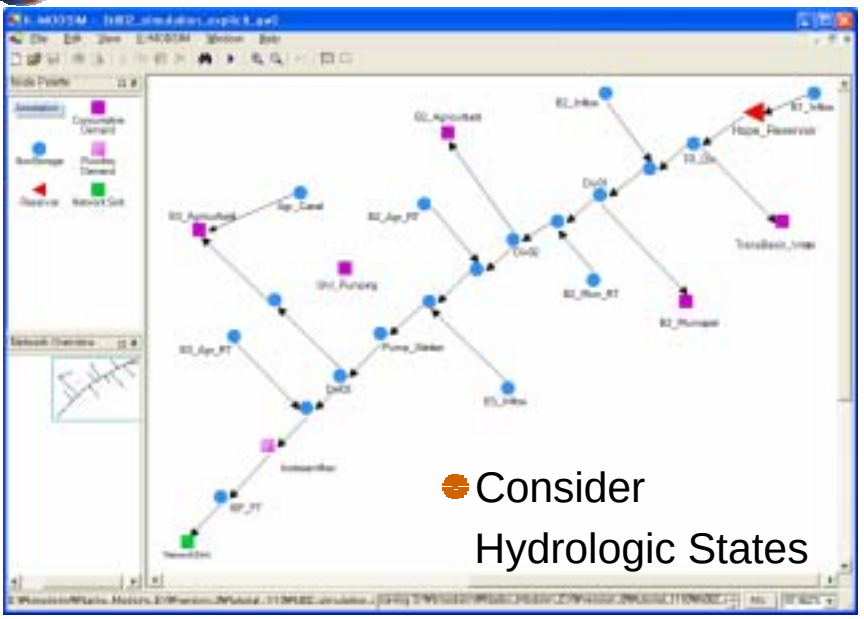
Case 3 Result: Reservoir Storage



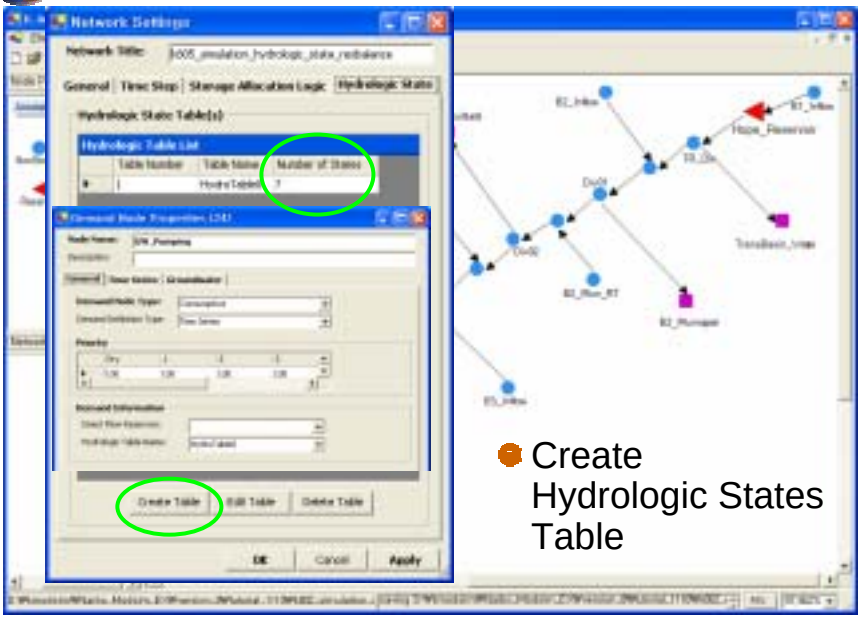
Case 4 Problem

- Purposes
  - To demonstrate the real operation of the basin-wide water allocation using hydrologic state condition
- Problem Description
  - Use the Results of RRFS (Natural Inflow Data)
  - Use Explicit Reservoir Target Storage
  - Consider Transbasin Water, Municipal and Agricultural Demand and Instream Flow Demand
  - Consider Return Flows (0.6, 0.3) and Groundwater Pumping
  - Consider Hydrologic States in Operation
    - Use Conditional Rules
  - Evaluate Reservoir Storage, Hydropower, and Shortages of Demand Nodes

Case 4 Network

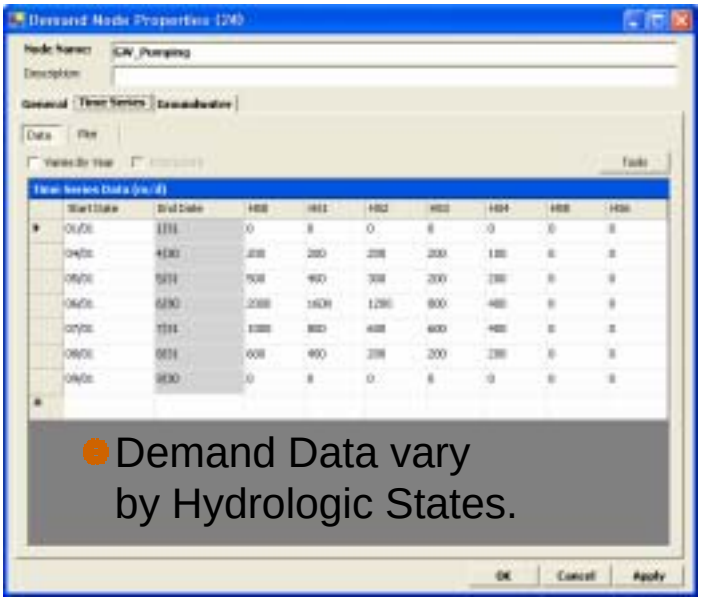


- Consider Hydrologic States



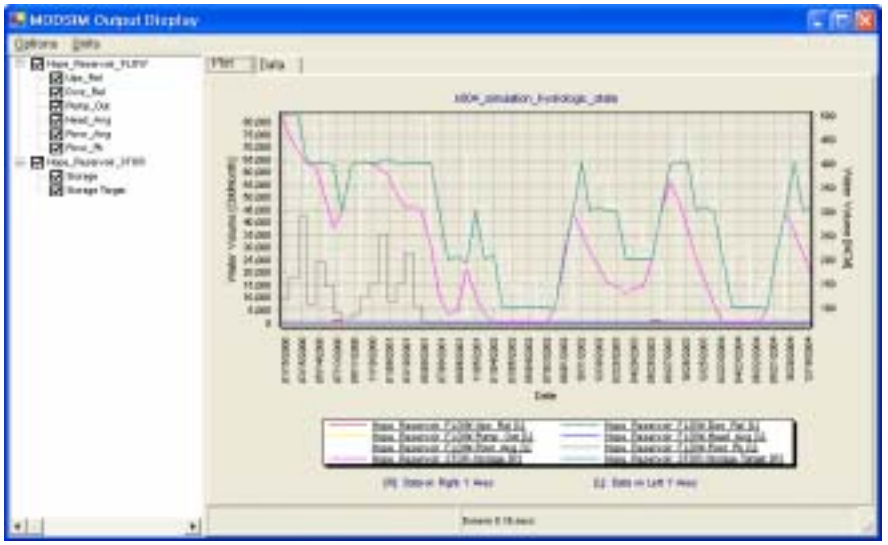
- Create Hydrologic States Table

GW Pumping Input

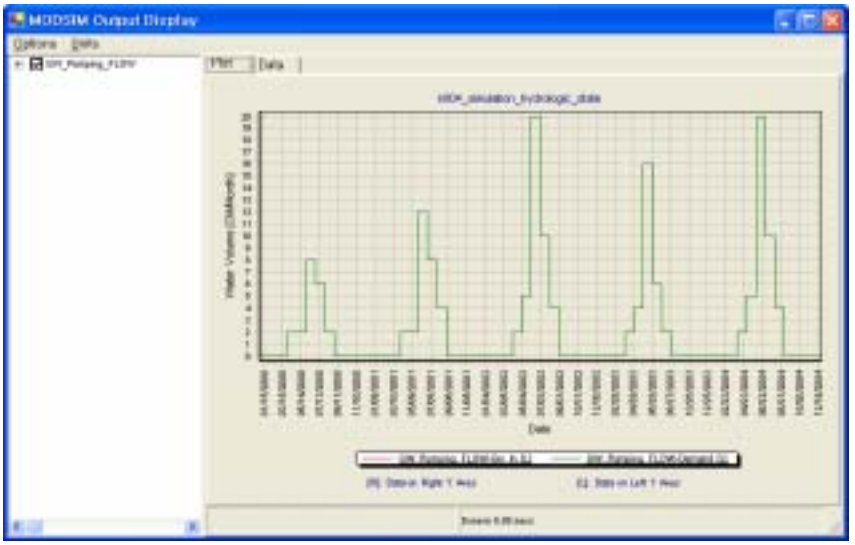


- Demand Data vary by Hydrologic States.

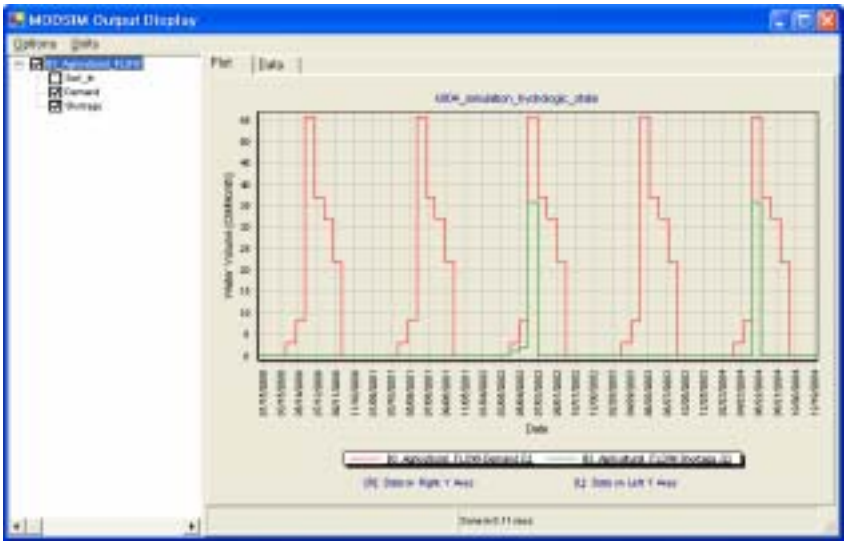
Case 4 Result: Reservoir Storage



Case 4 Result: GW Pumping



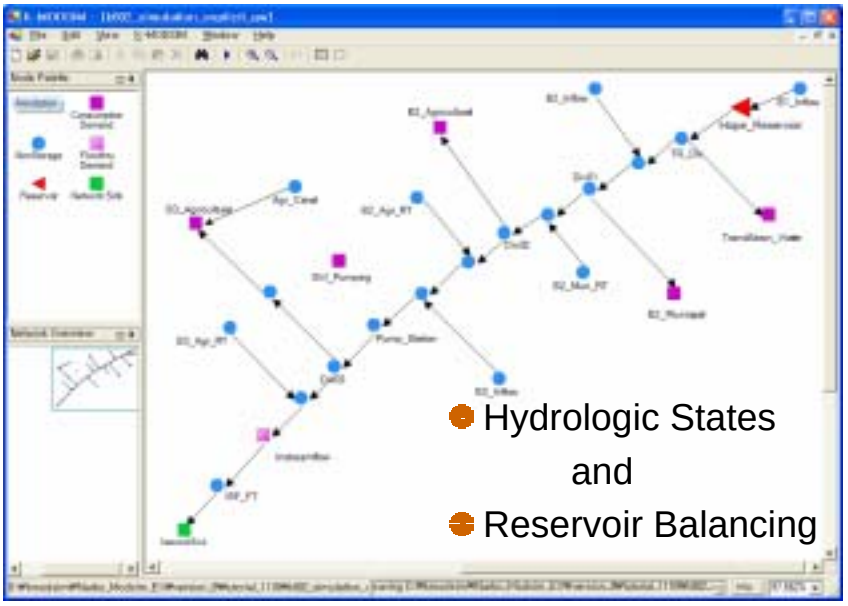
Case 4 Result: Agricultural Dem.



Case 5 Problem

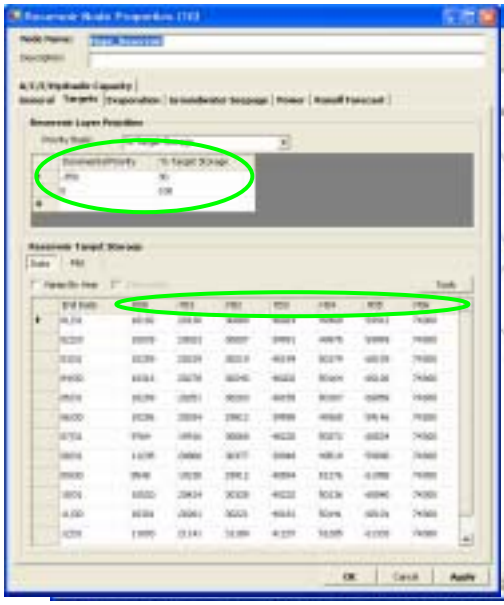
- Purposes
  - To demonstrate the real operation of the basin-wide water allocation considering uncertainties of reservoir operation rule
- Problem Description
  - Use the Results of RRFS (Natural Inflow Data)
  - Use Explicit Reservoir Target Storage
  - Consider Transbasin Water, Municipal and Agricultural Demand and Instream Flow Demand
  - Consider Return Flows (0.6, 0.3) and Groundwater Pumping
  - Consider Hydrologic States in Operation
    - Use Conditional Rules
  - Consider Reservoir Balancing in Operation
    - Reservoir Zoning & Change the Priorities of Zones
  - Evaluate Reservoir Storage, Hydropower, and Shortages of Demand Nodes

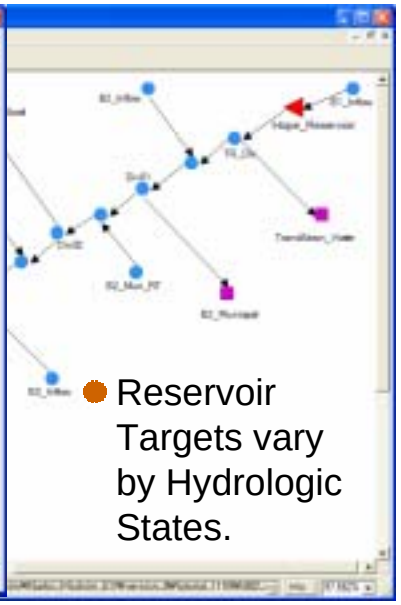
Case 5 Network



- Hydrologic States
- and
- Reservoir Balancing

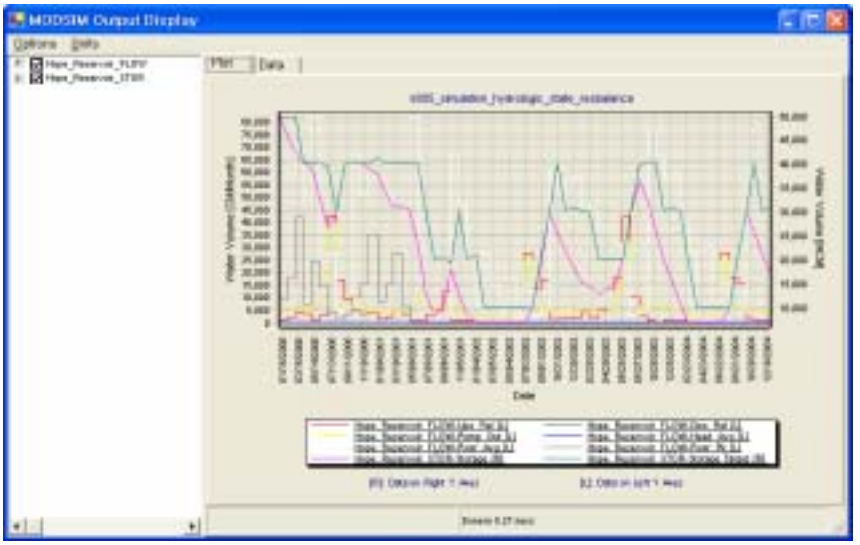
Reservoir Balancing & Target



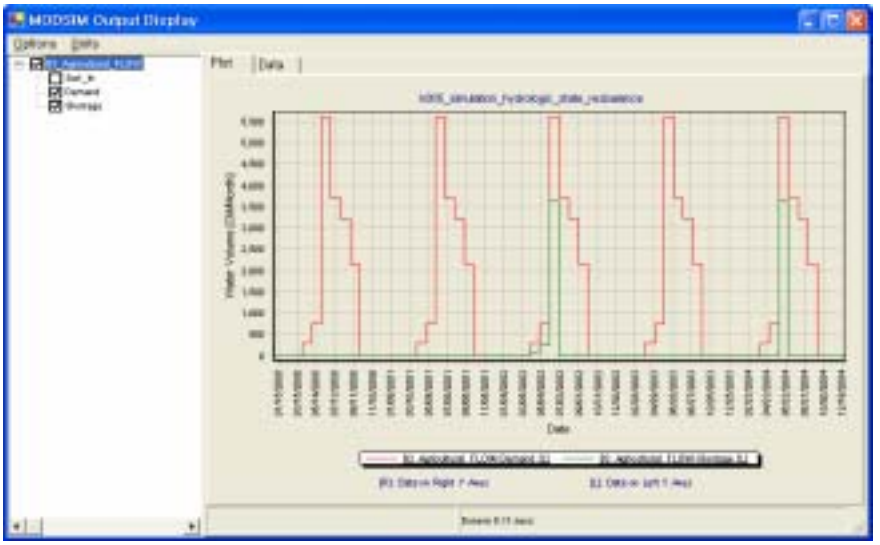


- Reservoir Targets vary by Hydrologic States.

Case 5 Result: Reservoir Storage



Case 5 Result: Agricultural Dem.



Thank You

Very Much!