



**Technical Documentation Version 7.3**

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# **Object User Interface**

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Center for Advanced Decision Support for  
Water and Environmental Systems (CADSWES)

UNIVERSITY OF COLORADO **BOULDER**

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# Object Dialogs

This document describes the user interface for the Object Viewer and Open Object dialog then presents a tool used to select methods on multiple objects. Additional information on display of objects on the workspace can be found as follows:

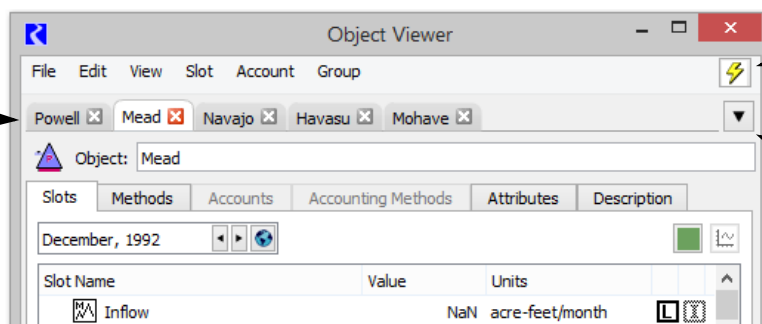
- Adding, selecting, and deleting objects is presented [HERE \(Workspace.pdf, Section 5\)](#).
- Importing and exporting of objects and links, is covered [HERE \(Workspace.pdf, Section 5.11\)](#).
- Display groups, covered [HERE \(Workspace.pdf, Section 7\)](#), allow you to change how objects are labeled, their layer and the color and line properties on the accounting workspace.
- Clustering objects together into a single icon on the workspace can be found [HERE \(Workspace.pdf, Section 8\)](#).

The objects on the RiverWare workspace represent the physical layout of a modeled system. These objects contain the data and the physical process algorithms used in the simulation. To access the data and the methods (functions) which define the object, use the **Object Viewer** and/or the **Open Object** dialog.

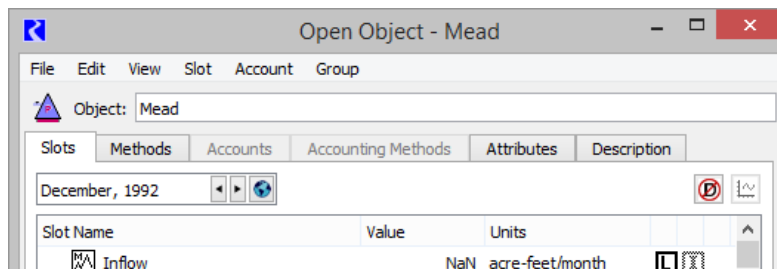
## 1. Object Viewer vs Open Object Dialogs

Open an object by double-clicking its object icon on the workspace or by double-clicking on the name in the workspace object list. By default, the **Object Viewer** is shown with a tab for the Object. Following is a screenshot showing both an Object Viewer and Open Object dialog:

Object Viewer:  
Object Tabs



Open Object:

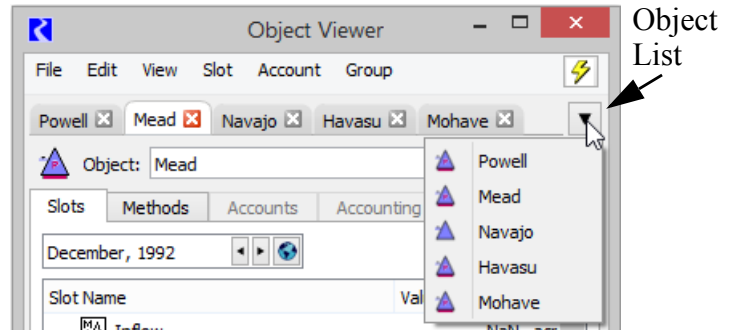


Note that the menu bar options will be the same. They are dynamically updated in the Viewer based on the object selected.

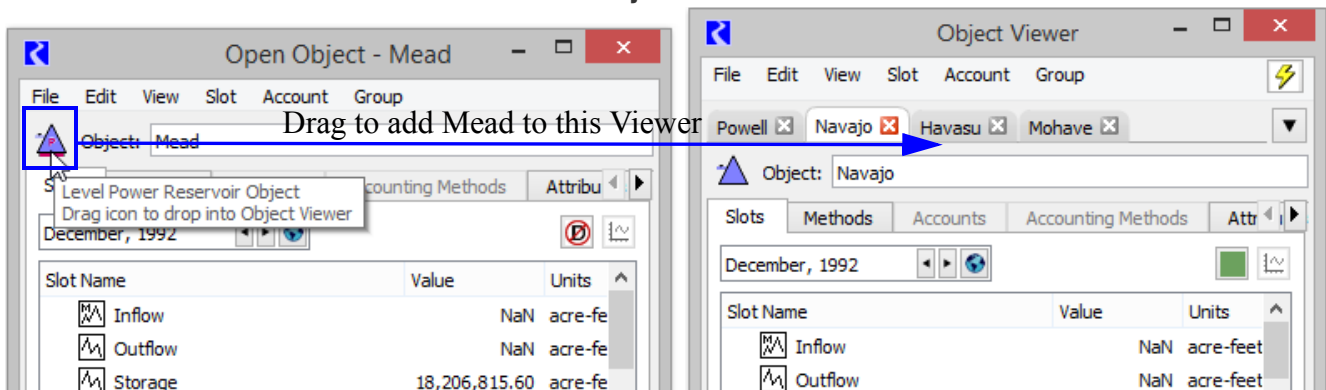
The Object Viewer is the default dialog used to look at an object. It is convenient as all objects open in the one dialog. Click on the tabs to switch between objects. Or use the Object list menu on the right of the tabs. This is particularly useful if you have many objects in the viewer.

**Arranging tabs:** Drag the tabs left and right to re-arrange.

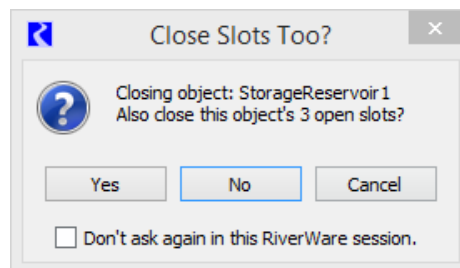
**Undocking Objects:** To look at two objects at once, drag the tab off of the viewer to create an Open Object dialog for that object. Or use the **File → Undock Object** menu or **File Undock all Objects**.



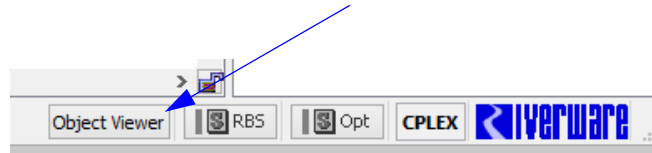
**Redocking Objects:** To move an Open Object dialog back onto the viewer, grab the Object Icon and drag it anywhere onto the Viewer. A new tab will be created. Or use the **File → Dock In Object Viewer** menu.



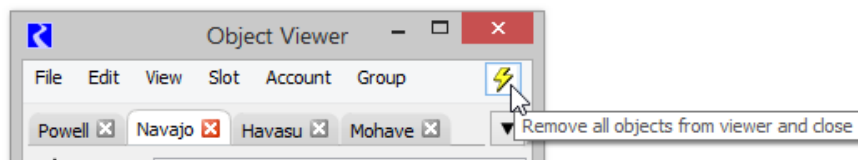
**Closing an Object:** Use the red X on the tab to close an object tab that is on the viewer. If you also have slots from that object shown in either the Slot Viewer or separate dialogs, you will be prompted with a confirmation asking if you want to close those slots too:



**Closing the Viewer:** Use the red X on the viewer dialog to close the viewer. This will close the dialog, but all objects will remain in the viewer. Reopen the viewer and show the previously opened objects using the **Object Viewer** button in the lower right of the workspace.

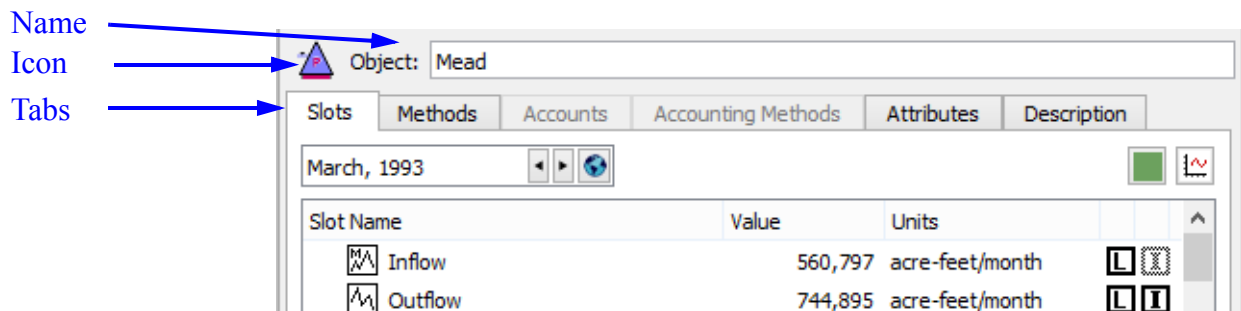


Use the yellow lightning bolt to **Remove all objects from Viewer and close**.



## 2. Using the Object Dialogs

Regardless of whether you use the **Object Viewer** or individual **Open Object** dialog, the content is the same. All objects use the same format:



The dialog is organized by tabs:

**Slots:** numerical model data

**Methods:** user-selectable algorithms that represent physical and other processes

**Accounts** (when enabled): containers to track water type or ownership

**Accounting Methods** (when enabled): methods that correspond to water type or ownership

**Attributes:** optional user defined attributes and values representing meta data for the object

**Description:** optional text description of the object.

## 2.1 Naming an Object

You can change the name of any object by clicking in the **Object Name** text field.

- User defined names may be any combination of letters, numbers, spaces and underscores, but no other characters. Names are case-sensitive and are not limited in length, but excessively long names will be displayed in their entirety, making the workspace visually cluttered.

**Note:** If you are renaming an object whose old name appears in RPL sets, a dialog asks if you want to search RPL sets for the old name and optionally replace occurrences with the new name. Answering **yes** will bring up the RPL Search and Replace dialog with the results of a search for the old name in all RPL sets and with the new name filled into the **Replace with** field. You can examine the occurrences and choose to replace some or all of them with the new name.

## 2.2 Slots Tab

The **Slots** tab contains information about each of the object's slots. This information may include the slot **Type**, **Value**, and **Status** information.

The screenshot shows the 'Slots' tab for the 'Mead' object. The table displays the following data:

Slot Name	Value	Units	Link status	Input status	Custom slot
Inflow	526,771	acre-feet/month	[Link icon]	[Input icon]	[Custom slot icon]
Outflow	868,785	acre-feet/month	[Link icon]	[Input icon]	[Custom slot icon]
Storage	17,815,698.24	acre-feet	[Link icon]	[Input icon]	[Custom slot icon]
Pool Elevation	1,164.42	feet	[Link icon]	[Input icon]	[Custom slot icon]
Flow FROM Pumped Storage	NaN	acre-feet/month	[Link icon]	[Input icon]	[Custom slot icon]
Flow TO Pumped Storage	NaN	acre-feet/month	[Link icon]	[Input icon]	[Custom slot icon]
Canal Flow	NaN	acre-feet/month	[Link icon]	[Input icon]	[Custom slot icon]

Annotations in the image point to various features:

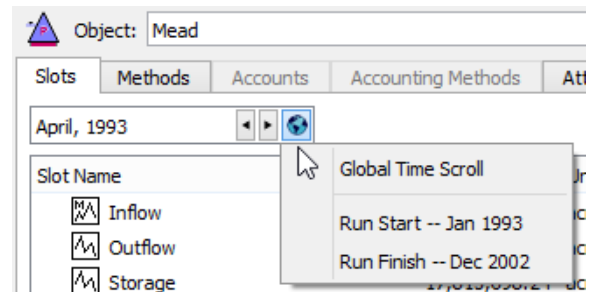
- Specified Time:** Points to the date 'April, 1993' at the top of the dialog.
- Slot Names:** Points to the 'Slot Name' column header.
- Slot type Icon:** Points to the icons in the 'Slot Name' column.
- Value at Specified Time:** Points to the 'Value' column.
- Display Units:** Points to the 'Units' column.
- Dispatch Details:** Points to the 'Ds' icon in the top right.
- Plot Slot:** Points to the plot icon in the top right.
- Link status:** Points to the link status icons in the right column.
- Input status:** Points to the input status icons in the right column.
- Custom slot:** Points to the custom slot icons in the right column.
- Sorting:** Points to the sorting arrows at the bottom of the table.
- Filtering:** Points to the 'Filter Slots' checkbox at the bottom.

The order of the slots is user configurable and can be saved with the model file as described [HERE](#) (Section 2.2.2).

## 2.2.1 Slots Tab Tour

Following is a description of all of the pieces of the slots tab:

**Specified Time:** The datetime spinner allows you to choose the date at which values are displayed in the slot list. The right arrow advances forward in time while the left arrow goes backward in time. Click the globe icon and choose **Global Time Scroll** to scroll all dialogs that reference a model timestep (E.g. slots, objects, plots, and model run analysis) to that date.








**Slot Names:** The names of simulations slots are pre-determined and cannot be changed. Custom slots, which you can create on any object can be named as desired.

**Slot Type Icons:** Different types of slots are used for representing different types of data. The icons in the type column indicate the type of the slot. The various types of slots are described in the slot documentation [HERE \(Slots.pdf, Section 4\)](#).

**Slot Value:** The **Value** field of the Slot List displays the value at the specified time in the slot. The value is displayed with the format selected by the user. When an object is first created, its values are all **NaN** (not-a-number).

**Slot Units:** The units shown are defined in the active Unit Scheme for that slot.



**Dispatch Details:** The Dispatch Details icon and button     displays the status of dispatching for the given object at the specified timestep (not including rule effects). Mouse over the button to see a tool tip that summarizes the dispatch behavior. Click on the button to open the model run analysis **Dispatch Behavior Details** for the given object. Click [HERE \(ModelRunAnalysis, Section 1.2.1\)](#) for more information on this utility. Shift-click on the button to show the **Special Results Details** [HERE \(USACE\\_SWD.pdf, Section 5.5\)](#).

**Plot Button:** The **Plot** button  opens a plot dialog to display the values in the selected slot(s).

**Link Status:** The Link Status indicator is bold when the slot is linked to another slot. Only timeseries slots may be linked; therefore, only timeseries slots display the Link Status.

**Input Status:** The Input Status indicator is bold when at the value at that timestep is flagged as an input. Only timeseries slots may have input flag; therefore, only timeseries slots display the Input Status.





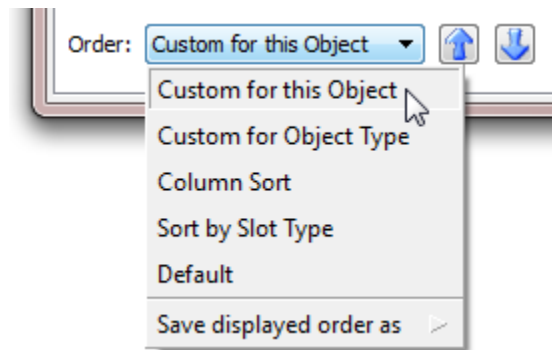
**Custom Slot indicator:** The custom slot icon  is shown when the slot is custom (i.e. created by a user). Simulation slots do not have any icon in this column. In addition, custom slot icons have a pale yellow background. 

## 2.2.2 Sorting Slots

Following are the options for sorting and filtering slots:

**Sorting Options:** In the Slots tab, the following sorting orders are supported as shown in the **Order** menu at the bottom of the tab:

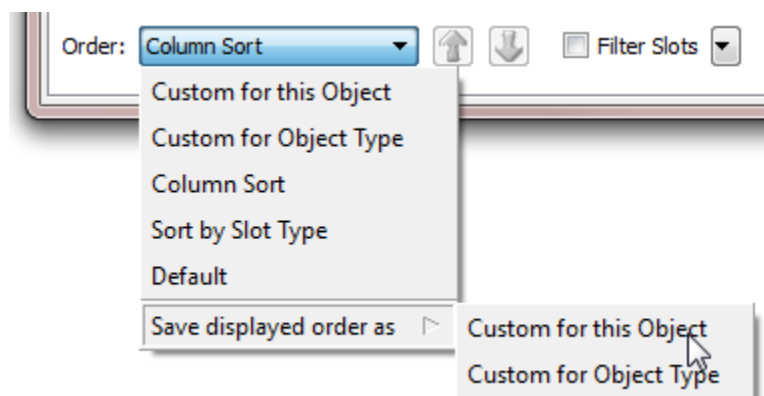
- **Custom for this Object:** Show a custom order for this object only. In this mode, the up and down arrows   are enabled and you can re-arrange slots. Select one or more slots, then click the arrows to move them up or down.
- **Custom for this Object Type:** Show the custom order defined for objects of this type, i.e. Storage Reservoir, Reach, Water User,...
- **Column Sort:** Sort the slots alphabetically/numerically by column. In this mode, the column headers are enabled. Click on any header to rearrange by that parameter. If you click on a column header in any other mode, it will automatically switch to **Column Sort** order and then sort by that column.
- **Sort by Slot Type:** Group slots of the same type together and show Slot Groups together.
- **Default:** Use the internally defined slot order.



**Saving the Order as Custom:** As you can see, there are two custom orders you can define and use, one for this object and one for objects of this type. You can only re-arrange slots in the **Custom for this Object** mode. But you can save any order to either of these custom orders. At the bottom of the **Order** menu is a sub menu **Save displayed order as**:

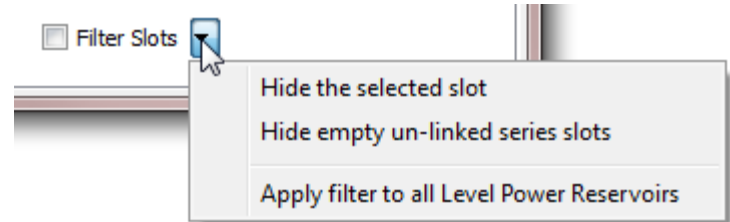
- **Custom for this Object**
- **Custom for Object Type**

When an object opens, it first tries to use the **Custom for this Object** order if defined, then the **Custom for Object Type** order if defined, and finally, it uses the **Default** order if neither of the other two are defined.



### 2.2.3 Filtering Slots

Like the sorting mechanism, filtering allows you to create a more meaningful view of the slots on the object. Filtering allows you to hide the slots you do not wish to see, perhaps because you are not using them. Filtering is controlled by two controls on the lower right part of the Slots tab, the check box and the pull-down menu.



The **Filter Slots** check box enables and disables the filtering. This immediately conveys whether some slots are hidden, and provides an easy way to temporarily show all slots without losing the configured show/hide states for the slots


The pull-down menu defines how you wish to filter:

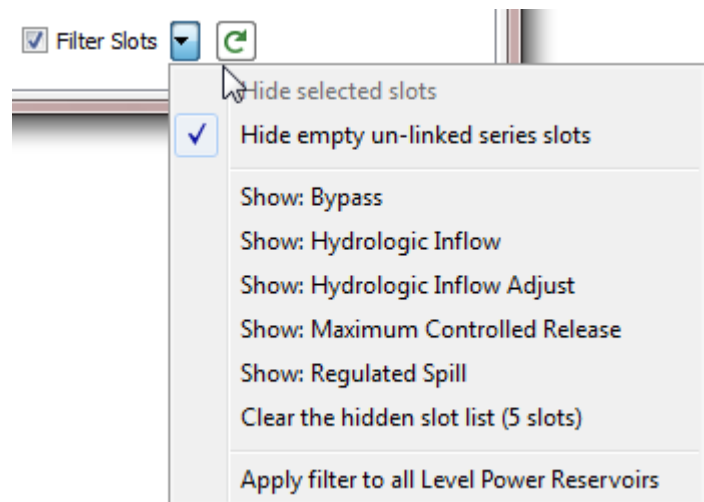
- **Hide Selected Slots** operation can be applied to the selected set of slots.
- **Hide empty un-linked series slots** will hide all series slots that do not have any values (i.e. NaNs only).

Once either of these options is chosen, the menu will say what is hidden and allow you to un-hide all or some of the slots.

Use the **Show: <slot>** menu to un-hide the slot. Use the **Clear the hidden slot list** menu to un-hide all of these slots.

Select the **Hide empty un-linked series slots** to show these hidden slots.

Since this option depends on the values in the slots, there is a refresh button to update the dialog. 



Finally, the **Apply filter to All <objects>**

operation applies the filter settings to all objects of that type. This, along with the custom sort order described above, is a convenient way to make all objects of the same type appear the same.

### 2.2.4 Creating Custom Slots

The **Slot** menu and the right click **Add Slot** menu has the following options to create custom slots:

- **Add Series Slot**
- **Add Series Slot with Expression**

- **Add Integer Indexed Series Slots**
- **Add AggSeries Slot**
- **Add Integer Indexed AggSeries Slot**
- **Add Series Slot with Periodic Input**
- **Add Table Slot**
- **Add Statistical Table Slot**
- **Add Periodic Slot, Text Headers**
- **Add Periodic Slot, Numeric Headers**
- **Add Scalar Slot**
- **Add Scalar Slot with Expression**
- **Add Mass Balance Summary**
- **Add Time Aggregation Series Slot**

#### ***2.2.4.1 Creating and Configuring Series Slots***

Series slots are created through the **Slot** ➔ **Add Series Slot** menu. Custom Series slots on a Object can be linked to any linkable slot on the workspace. Click [HERE \(Slots.pdf, Section 4.1\)](#) for more information.

#### ***2.2.4.2 Creating and Configuring Table Slots***

You can add a table slot of any dimension and units. Click [HERE \(Slots.pdf, Section 4.9\)](#) for more information.

#### ***2.2.4.3 Creating and Configuring Statistical Table Slots***

Statistical table slots allow you to specify a statistical function, such as a flow duration curve, which is computed at the end of a run using the data in the slot(s). This statistical analysis data can then be plotted or exported to another application.

Click [HERE \(Slots.pdf, Section 4.11\)](#) for more information.

#### ***2.2.4.4 Creating and Configuring Periodic Slots***

Periodic slots are used to represent data which repeats at regular time intervals. An example might be a set of evaporation coefficients for a reservoir. The rate of evaporation varies with such factors as temperature and wind speed, factors which vary seasonally. It is natural to assume that this variation is the same for each year. If this sort of data were entered into a series slot, then the same data would need to be repeated every year. This would be impractical and inconvenient for the user. On the other hand, if this data were entered in to a table slot, then the data would lose the time element associated with each

value. This would make it difficult to look up or interpolate values with respect to time. The periodic slot meets the needs not met by these other slots.

You can create two different types of periodic slots, slots with text headers for the columns and slots with numeric headers for the columns. Select **View** ➤ **Configure** to configure the periodic slot. Click [HERE \(Slots.pdf, Section 4.12\)](#) for more information.

#### **2.2.4.5 Creating Expression Slots**

Expression slots are computational expressions that contain other slot names as variables. They are used to calculate quantities such as “combined Storage of all Reservoirs,” “weekly average Outflow of Hoover Dam,” or “the ratio of Hydrologic Inflow to Reach Inflow at selected structures.” To add a Series slot with expression select **Slot** ➤ **Add Series Slot with Expression**. To add a Scalar slot with expression select **Slot** ➤ **Add Scalar Slot with Expression**. Click [HERE \(Slots.pdf, Section 4.6\)](#) for more information.

#### **2.2.4.6 Creating Mass Balance Summaries**

The Mass Balance Summary slot is a user-defined hierarchy of series slot collections used to check (i.e. sum) mass balance across many objects. The collections are themselves series slots representing the sum of the contained slots. These slots can be used within RPL expressions and any other place where series slots are used. Click [HERE \(Slots.pdf, Section 4.16\)](#) for more information.

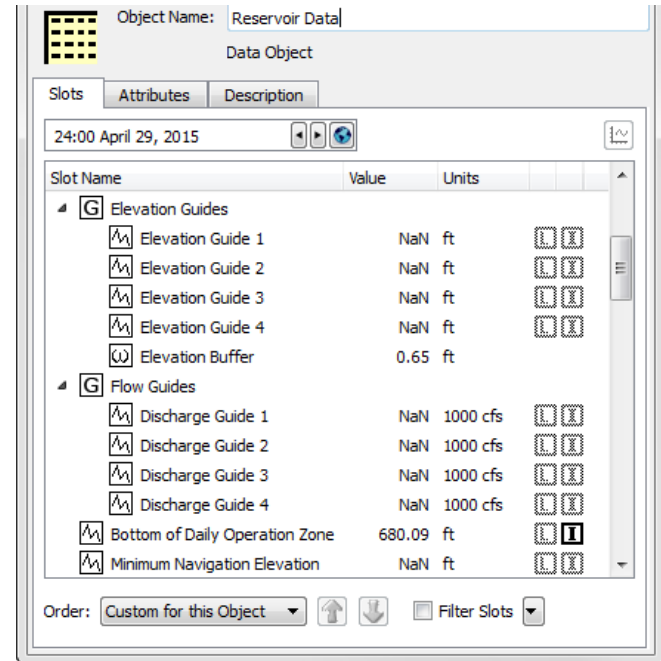
#### **2.2.4.7 Creating Time Aggregation Series Slots**

Time Aggregation Series Slots temporally aggregate other series slot. Click [HERE \(Slots.pdf, Section 4.7\)](#) for more information.

## 2.2.5 Slot Groups

Slots (on non aggregate objects) can be grouped together within the Open Object dialog in named **Slot Groups**. Slot group items are indicated with a boxed **[G]** icon. Any slot can be in at most one slot group.

Slot groups do not change the relationship between a slot and its containing object -- the slot is still functionally, and internally, contained directly within the object. The complete name of the slot does not change when moving the slot into and out from a slot group. Slot names and slot group names on any particular object are unique. That is, no slot and slot group on a particular object can have the same name. Also, it is not possible for slots in distinct groups on the same object to have the same name.



### 2.2.5.1 Showing Slot Groups:

**Slot Groups** can be shown or hidden using a toggle in either the:

- **Group** ➔ **Show Slot Groups** menu
- Right click context menu **Show Slot Groups**

When the **Show Slot Groups** checkbox is off, slots are presented in the traditional way, as a single-level list of slot items.

---

**Note:** The state of this toggle is **global** within the RiverWare session: turning the **Show Slot Groups** checkbox on or off changes all **Open Object** dialogs for objects. This setting is saved in the RiverWare model file.

---

When **Slot Groups** are not shown, The “tree” ornamentation is hidden. Sorting of slots by name (e.g. after clicking in the “Slot Name” column header) is done without regard to placement of slots within slot groups. Other operations in the Group menu are disabled.

When **Slot Groups** are shown, the **Group ➤ Expand All Slot Groups** and **Group ➤ Collapse All Slot Groups** menu items open or close all slot group tree items, respectively.

---

**Note:** When shown, Slot Groups are shown in the slots tab according to the selected sorting Order presented at the bottom of the dialog. You can sort them alphabetically, by slot type and group, or through the custom sorting. These options are described [HERE \(Section 2.2.2\)](#).

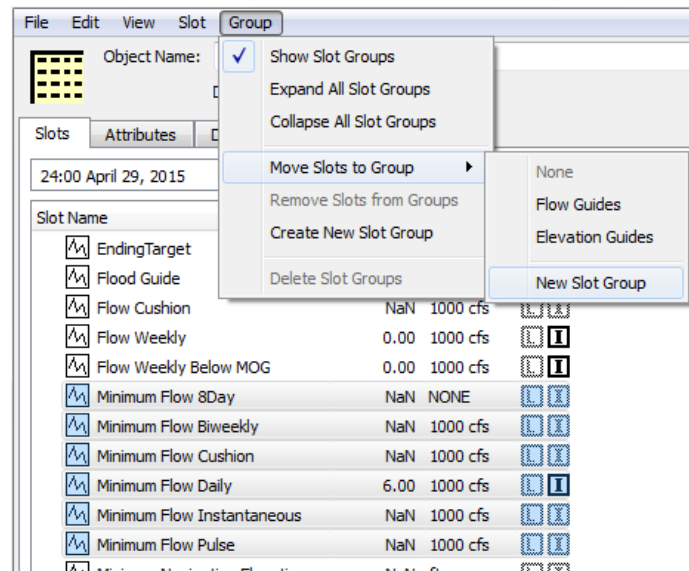
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### 2.2.5.2 Creating Slot Groups and Adding Slots

There are two ways to create a slot group:

1. Select one or more slots, then use the right click context menu or the Group menu and choose **Move Slots to Group** ➔ **New Slot Group**. Then change the name of the new group as desired.
2. Use the **Group** ➔ **Create New Slot Group** menu. Then change the name of the new group as desired. Then select some slots and choose **Move Slots to Group** and choose the new group.

The new group name must be distinct from the names of all slots and other slot groups on the object, and cannot be **None**.



### 2.2.5.3 Removing Slots from a Group

There are two ways to remove a slot from a group:

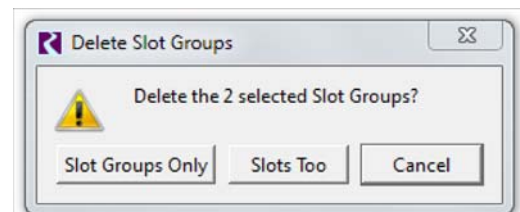
1. Select the slot(s) to remove and use the right click context menu or **Group** menu and choose **Remove Slots from Groups**.
2. Select the slot(s) to remove and choose **Move Slots to Group** ➔ **None**.

In both cases, the slot is removed from the group but continues to exist on the object.

### 2.2.5.4 Deleting Slot Groups and Slots

To remove or delete a **Slot Group**, select the group and choose **Delete Slot Groups** from either the right-click context menu or the **Group** menu. A confirmation dialog opens with three choices:

- **Slot Groups Only:** deletes only the group but not any slots.
- **Slots Too:** delete the group and all slots within the selected groups.
- **Cancel:** abort the deletion operation.



### 2.2.5.5 Using Slot Groups

The following Slot Menu operations also operate on slot groups, when selected:

**Copy Slot Groups:** The **Copy Slot Groups** operation copies the currently selected slot groups and containing slots to the system clipboard. Those slot groups then become available to be pasted within the same object, or in the **Open Object** dialog for a different object.

**Paste Slot Groups:** The **Paste Slot Groups** operation pastes the Slot Clipboard's slot groups into the object. If the object already has a slot group with the name of a slot group in the clipboard, then that existing slot group instance *is used* as the target for the paste operation -- i.e. that existing slot group will receive the slots from the analogous slot group in the clipboard. When pasting slots from a copied slot group, if slots having the same name already exist on the destination object, slightly differently named slots (copies) will be created from the copied slot group -- a distinct four-digit numeric number will be added to slot names, after having removed trailing digits, spaces, and underscore characters. After the paste operation, only the newly created slot groups and slots will be selected within the Open Object Dialog's slot list.

**Duplicate Slot Groups:** Whereas the **Paste Slot Group** operation (above) always uses an existing slot group having the copied group's name, the **Duplicate Slot Groups** operation always creates new, slightly differently named, slot groups from the currently selected slot groups. It also copies the groups' slots, which are also given modified names.

**Copy Slot Groups to Objects...:** This operation is a high level copy operation as described [HERE \(Section 2.2.7\)](#).

**Move Slot Groups to Object...:** This operation is described [HERE \(Section 2.2.8\)](#).

## 2.2.6 Copy / Paste Slots

Slots on any object (and slot groups) can be copied and then pasted to another object. With one or more slots selected, use the **Slot ➤ Copy Slots** (Ctrl-C) and **Slot ➤ Paste Slots** (Ctrl-V) menu to do this copy/paste action.

In addition, for a single object, you can use the **Slot ➤ Duplicate Slots** menu to create a duplicate of the slots, with slightly different names. The pasted custom slot name change consists of a different set of four digits at the end of the slot name. When modifying a slot name to insure uniqueness, all trailing digits, spaces, and underscores are first removed from the slot name, and an underscore and four digits are then appended.

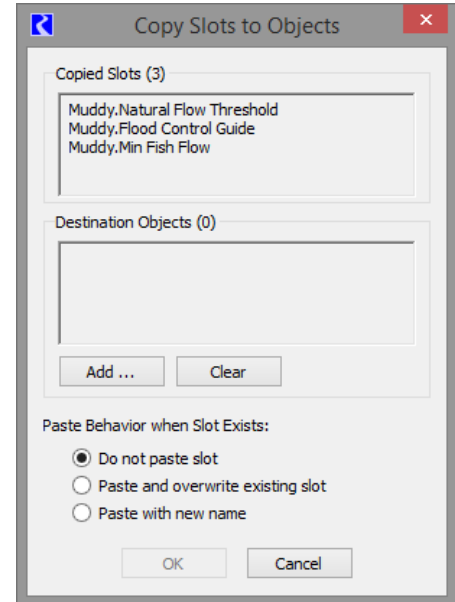


## 2.2.7 Copy Slots to Objects

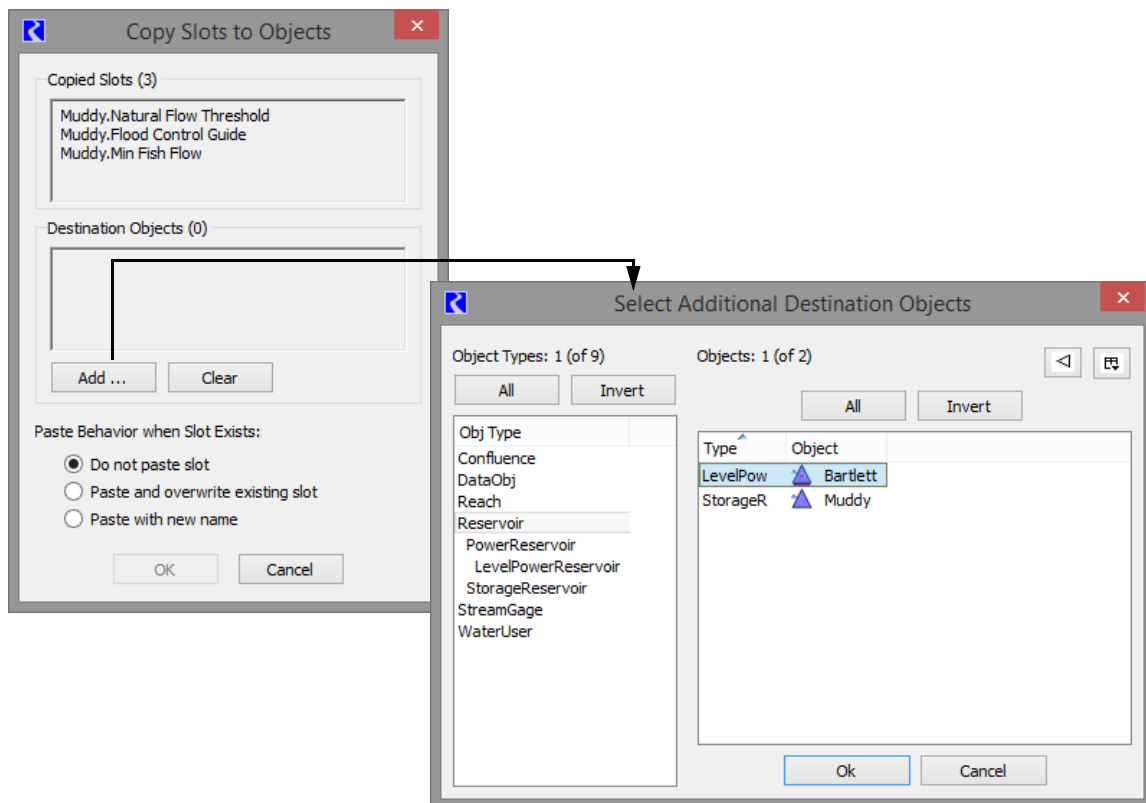
This section describes a high level utility that allows you to copy selected slots (and **Slot Groups** as described [HERE \(Section 2.2.5\)](#)) and paste copies to multiple specified objects. This is particularly useful if you have consistent custom slots on simulation objects or data objects. For example, you may have 20 reservoirs and each has custom slots that contain policy or summary data. This utility allows you to configure or update one set of slots and then copy and paste the slots to all 20 reservoirs. Options are provided to specify to overwrite existing slots or add new slots.

To use the tool, select slots (or **Slot Groups**) on the Open Object dialog **Slots** tab. Then, use the **Slot** ➔ **Copy Slots to Objects...** menu. The dialog to the right opens.

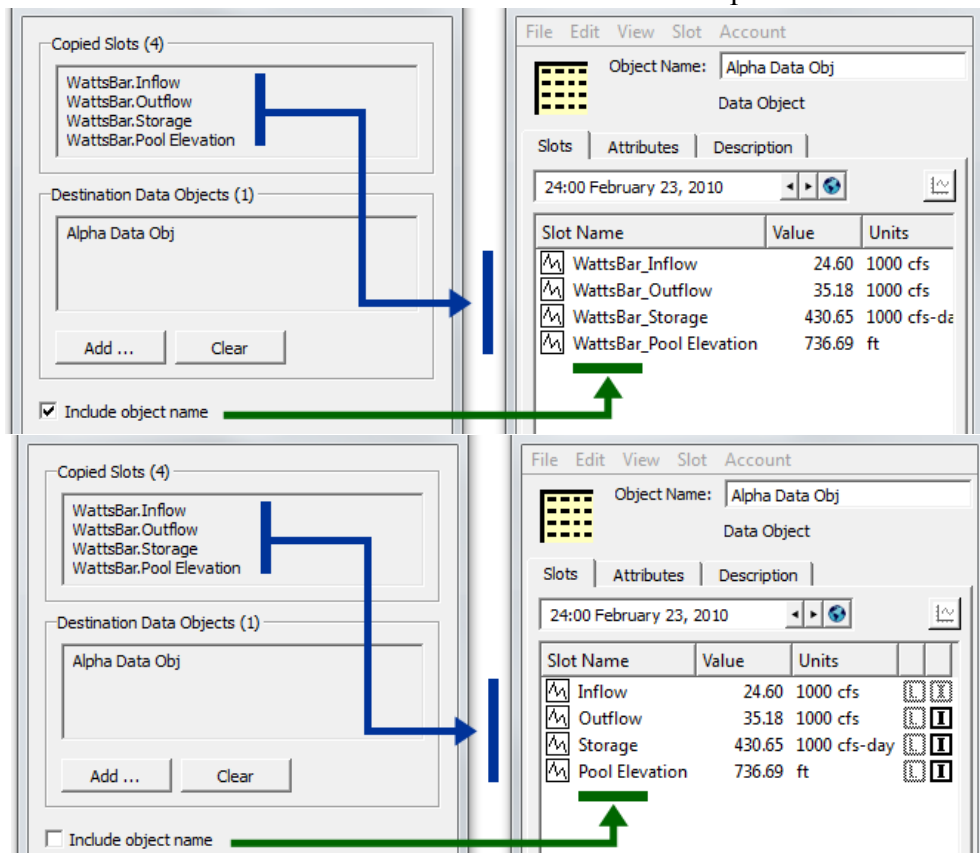
The upper portion shows the slots that will be copied. The middle box shows the **Destination Objects**.



Click the **Add** button to choose a set of Destination Objects as shown in the screenshot below.



Use the **Clear** button to erase that list and start over. The **Include object name** check box is shown only when copying slots from a simulation object (e.g. a from a Reservoir). For the conventional Paste Slots operation, slots which were copied from a simulation object, the newly created (pasted) slots have names starting with the original simulation object's name. But when slots had been instead copied from a Data Object, the name of that data object is not pre-pended to the new slots' names. The **Include Object Name** allows modification of the behavior of the Paste Slots operation.



The lower part of the dialog lets you choose what to do when a slot of the same name exists on the destination object. The **Paste Behavior when Slot Exists** buttons control the behavior when a destination object already has a slot with the name of the copied slot (taking into account the **Include Object Name** option described above). It supports these three options:

- **Do not paste slot:** Leave existing matching slot on destination object intact.
- **Paste and overwrite existing slot:** Replace existing matching slot on destination object with copied slot.
- **Paste with new name:** Add a new copy of slot to the destination object with a new slot name.

Clicking the **OK** button performs the **Copy Slots to Objects** operation, as configured within the dialog. This shows a popup dialog indicating the result of the operation.

---

**Note:** Simulation slots cannot be overwritten.

---

## 2.2.8 Move Slots to Object

This section describes a utility that allows you to move selected custom slots (and **Slot Groups** as described [HERE \(Section 2.2.5\)](#)) to a specified object. The move operation will cut the original slots and paste it to the new object. This is particularly useful to move custom slots from a data object to a simulation object.

To use the tool, select one or more custom slots (or **Slot Groups**) on the Open Object dialog **Slots** tab. Then, use the **Slot** ➔ **Move Slots to Object...** menu. The dialog to the right opens.

The upper portion shows a list of the slots that will be moved. The middle area shows the **From Object:** and the **To Object:**.

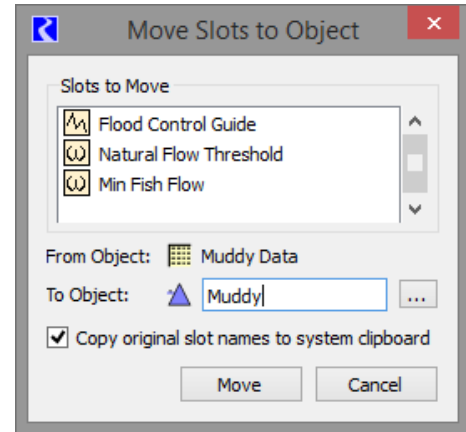
Click the **chooser** button  to choose a single destination object.

The **Copy original slot names to system clipboard** checkbox indicates whether the list of slot names (i.e. Object.Slot) is copied to the System Clipboard.

When ready, click the **Move** button. A confirmation dialog is presented. Once confirmed, the cut and paste sequence is performed and then the destination object's dialog is shown with the slots selected.

If the slot name already exists on the destination object, the move operation is aborted and no slots are moved (none are created and none are deleted).

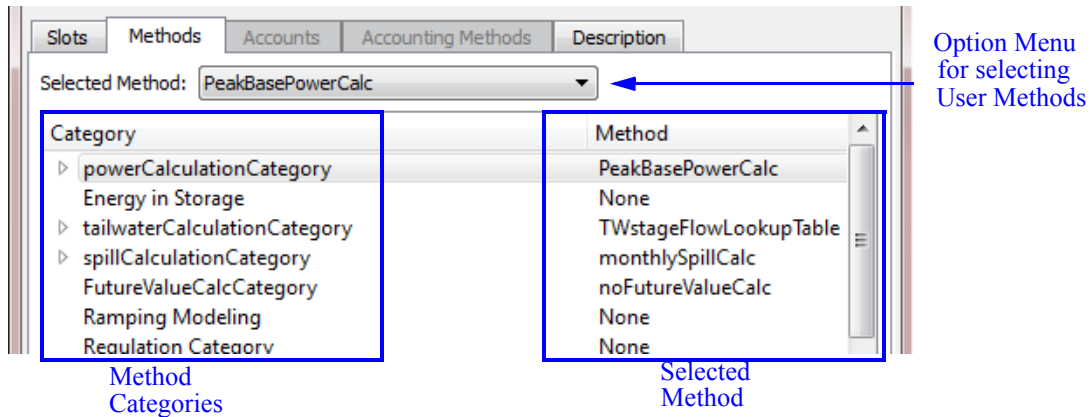
Note, when you move slots from one object to another, references to the slot on the original object may be broken. For example, RPL sets, DMIs, Scripts, and Model Reports may need to be modified. There is currently no automatic support to update the slot reference but the slot names can be copied to the system clipboard and you can use that as a guide. Search for each of the slots in the respective utilities and update accordingly.



## 2.3 Methods Tab

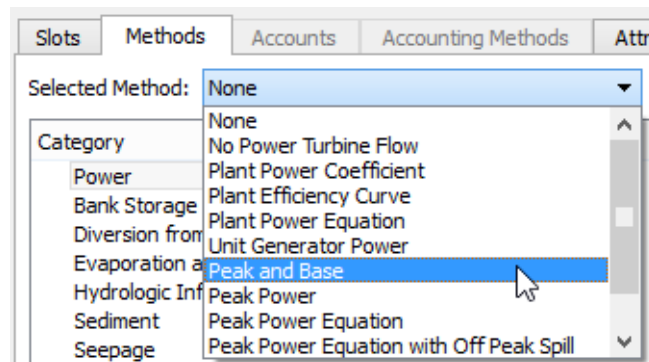
User Methods allow each object's physical process calculations to be customized. User Method Categories are defined for calculations such as evaporation, bank storage, power generation, spill, routing, tailwater and canal flow. Each Method Category contains one or more User Methods. For example, the Power Calculation Category contains many different methods for calculating Power. Some of these are general methods, designed for a variety of users. Others have been developed using custom calculations to meet the needs of particular groups, such as the LCR Power method which is used on the Lower Colorado Daily model.

The **Methods** display contains a scrollable list of Method Categories on the left and the corresponding selected User Method for each category on the right.



### 2.3.1 Selecting Methods

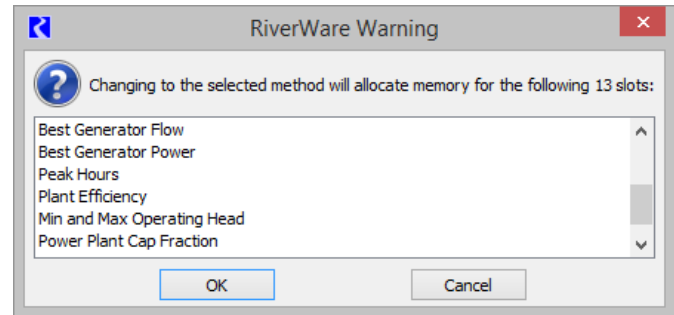
Objects are configured to represent the features in your basin using methods. These are selected from the **Methods** tab of the **Open Object** dialog. All of the user methods available within a Category can be viewed by selecting the Category and clicking on the **Selected Method** pull down menu.



### 2.3.2 Memory Allocation for Method-specific Slots

Many user methods have special data needs beyond the general data needs of the object. In order to keep the size of the model in memory to a minimum, memory is allocated only for slots which are needed; i.e., general slots required by the object or slots associated with the Methods which have been selected. For example, all reservoirs need Inflow, Outflow and Storage slots. However, the list of slots associated with hydropower generation depends on which User Method is selected in the Power category.

To avoid allocating memory unnecessarily, the default User Method for all categories is an empty method which has no slots and performs no calculations. Sometimes the empty default method is NOT a valid choice; you must select another method for simulation to proceed normally. For some categories, the empty method is a valid choice.



### 2.3.3 Method Dependencies

Some categories and user methods are not always available, as their availability depends on the other user methods that have been selected. For example, available user methods in the Power Release category depend on which method is selected in the Power category.

### 2.3.4 Selecting Methods on Multiple Objects

To select the same method on multiple objects, use the Multiple Object Method Selector by right-clicking on a category and selecting **Show in the Multiple Object Method Selector**. For more information on using the Multi-Object Method selector, please click [HERE \(Section 4\)](#).

## 2.4 Aggregate Objects

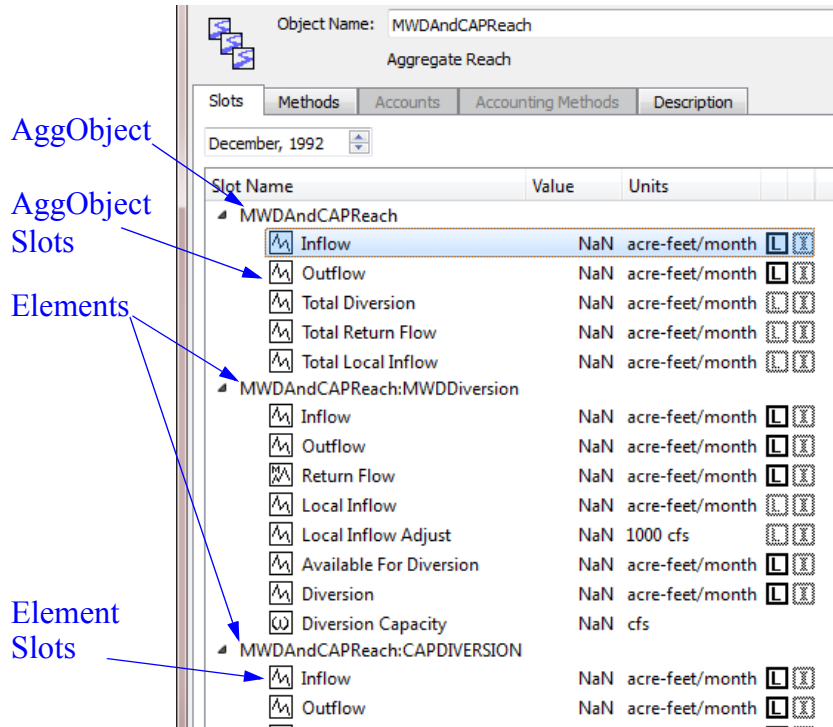
RiverWare has three types of aggregate object (AggObjects): the Aggregate Reach (AggReach), which contains one or more element Reach objects, the Aggregate Diversion Site (AggDiversionSite), which contains zero or more element Water User objects, and the Aggregate Distribution Canal (AggDistributionCanal) which contains one or more element Distribution Canal objects. The aggregate object manages the linking structure of its elements and may also manage the solution methods for the elements. The AggDiversionSite has object solution methods independent of the behavior of its elements and may, therefore, stand alone.

### 2.4.1 AggObject Dialogs

The **Open Object** dialog for the AggObjects contains tree-views for both the **Slots** and **Methods** displays, where element objects are added and accessed. Also, the main menu bar has two additional items, **Elements** and **Link Structure** (the **Link Structure** item is not available for AggReaches or AggDistributionCanals). The first item listed is always the Aggregate Object itself. The remaining items (below the Aggregate Object) are the elements.

### 2.4.2 Viewing Element Slots and Methods

The slots or methods specific to the element objects are viewed in the lower portion of the **Open Object** dialog by clicking on the tree-view triangle to the left of the element name. If the **Open Object** dialog is in the **Slots** display, the tree-view shows the slots associated with the elements. If **Methods** is selected, the tree-view shows the method categories for the elements, if any exist.




---

**Note:** Slot groups are not allowed on aggregate objects.

---

## 2.5 Accounts Tab

When Accounting is enabled, the **Accounts** display contains a scrollable list of Accounts that reside on the object. To switch to the **Accounts** view, click on the **Accounts** tab or select **View** ➔ **Accounts**. The display of the main portion of the dialog changes to the **Accounts** view. The Accounts view is described more in the Accounting documentation [HERE \(Accounting.pdf\)](#).

## 2.6 Accounting Methods Tab

When accounting is enabled and an accounting controller is selected, the **Accounting Methods** tab is added to the **Open Object** dialog. It displays the following which can then be changed by the user:

- Available categories

- Selected method for each category
- Execution time

More information on this tab can be found [HERE \(Accounting.pdf\)](#).

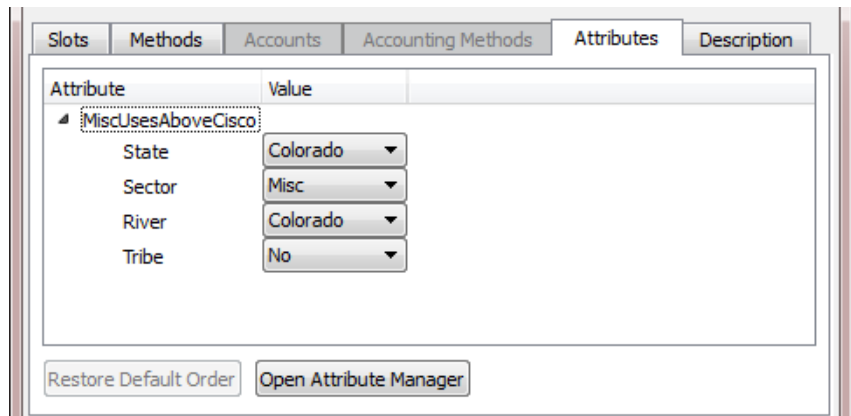
## 2.7 Attributes Tab

The **Open Object** dialog displays attributes and values on the **Attributes** tab. The tab has one row per Attribute defined for that type of object.

Attributes are defined in the Object Attribute Manager as described [HERE \(Section 3.1\)](#). Use one of the following methods to open this manager:

- The **Open Attribute Manager** button,
- **View** ➔ **Object Attributes Manager** menu, or
- right-click context menu to open the **Object Attributes Manager**.

The row lists the Attribute name and the value. A menu on the row allows you to select a different value for that attribute. No apply is necessary. To modify or view attributes on many objects, use the Edit Attributes on Objects menu, described [HERE \(Section 3.2\)](#). Use the **View** ➔ **Edit Attributes on Objects** menu (or right click context menu) to open that dialog.

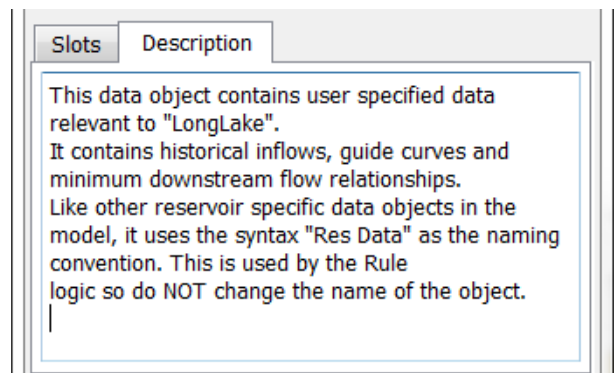


## 2.8 Description View

The **Description** tab allows you to enter a description of the object. Click on the **Description** tab to open the description area. Following is a screenshot of the description tab:

The normal cut/copy/paste (to the system clipboard) are available.

You can also enter a description of each slot on the object. Click [HERE \(Slots.pdf, Section 2.2\)](#) for more information.





# Object Attributes

## 3. Object Attributes

Object Attributes are user defined Object meta data that allow you to define an Attribute for one or more types of objects. You then define values and assign those value to specific objects. For example, you might have 300 water users in your system. With this functionality, you can define, for example, a “Use” attribute and a “Jurisdiction” attribute. Then you can specify for each water user, its Use, i.e. Municipal, Industrial, or Agricultural, and its Jurisdiction, i.e. “Local”, “State”, “Federal”, etc. Each Attribute and Value is user defined and customized, both the text that you use and which objects types and specific objects to which they apply.

You can use attributes and values in user defined RPL expression and data analysis. For example, you could write an expression that sums up all diversions that represent the Municipal, Local uses. Or compute all depletions by a particular State.

Following is a bulleted list of features of attributes:

- There can be many attributes defined in a model, each has one or more possible values. A particular object can have zero or more attributes, but for each attribute, only ONE value is possible.
- An Attribute can be specific to one or more classes of objects (reach, water user, storage reservoir) including all objects.
- Attributes and values are strings.
- Attributes and Values are defined in the Attribute Manager.
- Values can be assigned from either the **Edit Attributes on Objects** or the **Open Object** dialog.
- Attributes and values are displayed on the Open Object dialog.
- Attributes and values accessible from RPL.
- The Selector dialogs have a filter to assist with selecting objects: **Has Attribute Value**.
- You can export/import the attributes and values from one RiverWare model to another.

This document discusses the **Object Attribute Manager** and **Edit Attributes on Objects** dialogs.

### 3.1 Object Attributes Manager

The **Object Attributes Manager** is accessible from each **Open Object** dialog and from the **Workspace** ➔ **Objects** ➔ **Object Attributes Manager** menu. The purpose of this dialog is creating, deleting, and otherwise managing attributes and their values. The function of applying values to multiple objects is provided by the **Edit Attributes on Objects** dialog [HERE \(Section 3.2\)](#).



### 3.1.1 Define Attributes and Values

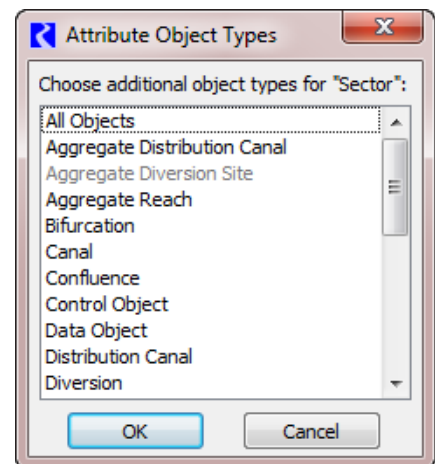
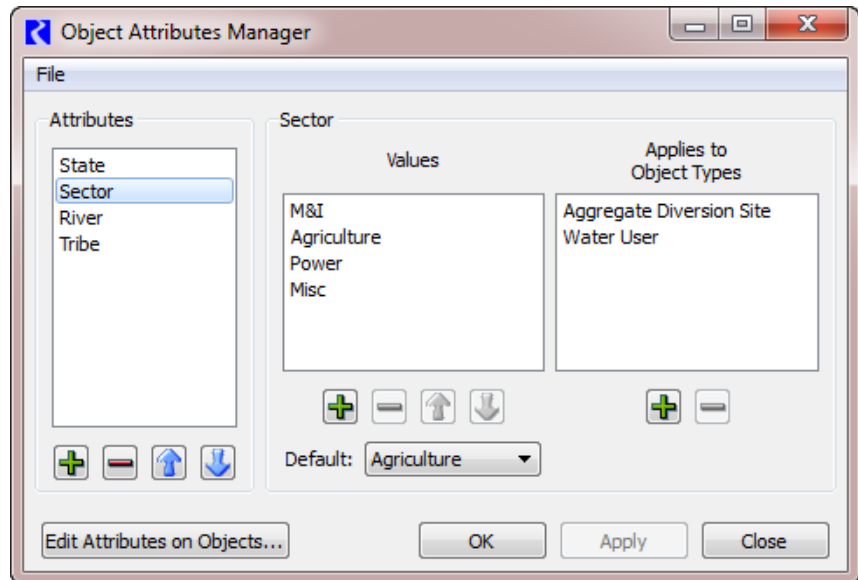
The Object Attributes Manager is used to define attributes and their legal values. There is no limit to the number of attributes or number of values for a given attribute.

The dialog has three main areas as described right to left.

- **Attributes:** Add or delete an attribute using + and - buttons. Rename by double clicking the name. Move the selected items up or down within the list with the arrow buttons.
- **Values:** Define the legal values for each attribute. For the selected attribute, the center list shows the legal values. Add or delete a value using + and - buttons. Rename by double clicking the name. Move the selected items up or down within the list with the arrow buttons. The **Default** menu is used to specify the default value for new objects or the first time you apply the attribute to a set of objects. There is no automatic or pre-defined NULL or NONE value. You must create this if desired. The empty string is not allowed as a value.
- **Applies to Object Types:** For the selected Attribute, add or remove the object types to which this attribute applies using the + and - buttons. Object Types are always listed in alphabetical order. The first one is All Objects.

Additionally, if any of the selected set of values (to be removed) are currently used on any objects, a warning message will be displayed indicating which values are used and the number of objects using them.

Right-click context menus allow you to add and delete functions, as well as copy and paste (for text to and from the system clipboard).

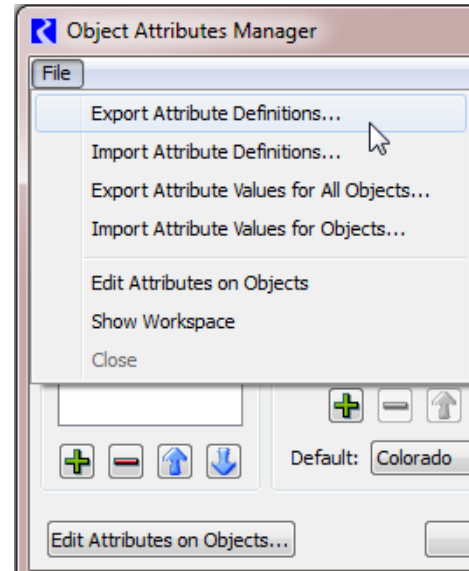


### 3.1.2 Import / Export

Sometimes, you may wish to move attributes and values from one model to another. Use the Import and Export features on the Object Attributes Manager.

The following is a description of the actions in the File menu for importing and exporting.

- **Export Attribute Definitions:** Export only the attribute definitions including the Attributes, legal values, and the possible objects types on which they can be used.
- **Import Attribute Definitions:** Import the attribute definitions that were exported.
- **Export Attribute Values for All Objects:** Export the Attribute values specified on each object. For example, this would export that LakeA has the value Colorado for the State attribute.
- **Import Attribute Values for Objects:** Import the attribute values that were exported.



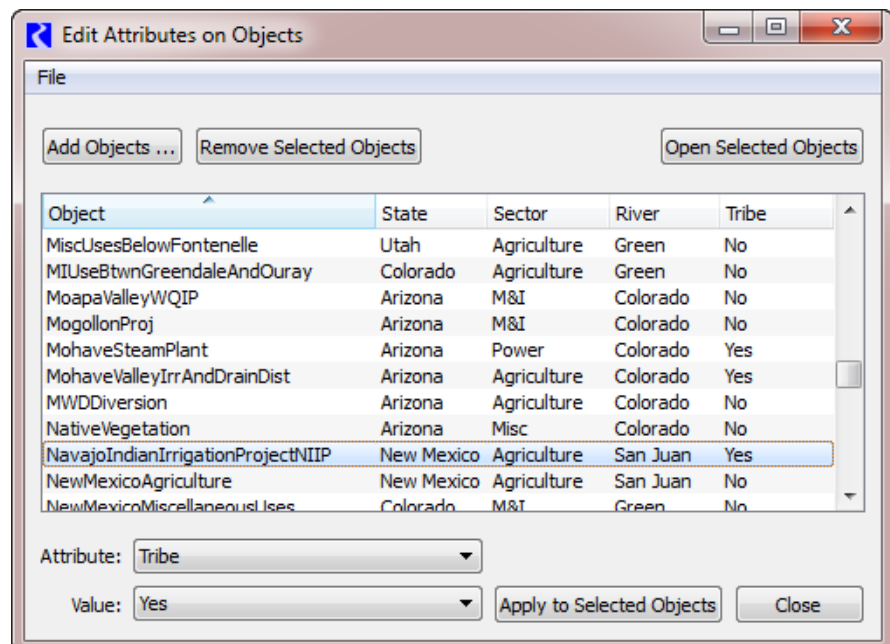
To copy all attributes and values from one model to another model that has no attributes defined, you would need to export both the definitions and values. Then in the new model, import the definitions first and then the values.

### 3.2 Edit Attributes on Objects

The **Edit Attributes on Objects** dialog displays the attributes and value for a selection of objects, and supports applying new values to all or some of those objects. The dialog image illustrates the tool.

The following features are supported:

- Add objects to the list of objects by clicking on the **Add Objects** button. Use the selector filter **Has Attribute**



**Value** to find objects that already have the desired Attribute/Values. For more information, go [HERE \(Selector.pdf, Section 2\)](#).

- Each object is added as a row in the table.
- Remove the selected objects in the list by clicking the **Remove Selected Objects** button.
- Use the **Open Selected Objects** button to open the selected set of objects to their Attributes tab.
- Each column represents an attribute defined in the model. The values are then shown on each row. If an attribute does not apply to a selected object, the cell is blank.
- Columns are sortable and rearrange-able.
- Use the right-click context menu to copy a list of objects, attributes, values to the system clipboard.

To change the value of a particular attribute for one or more objects shown in the dialog,

1. Highlight/select the desired objects.
2. Select an Attribute and the new Value from the menus at the bottom of the dialog. In this example screenshot, we have chosen the State attribute and want to assign the specified objects to have the Colorado Value.

The screenshot shows a dialog box with two dropdown menus and a button. The first dropdown menu is labeled 'Attribute:' and has 'State' selected. The second dropdown menu is labeled 'Value:' and has 'Colorado' selected. To the right of the second dropdown menu is a button labeled 'Apply to Selected Objects'.

3. Click **Apply to Selected Objects** to apply that value to those selected objects.

The change is immediate.

### 3.3 Accessing Attributes from RPL:

To access Attribute and Value information from RPL, use the following predefined functions:

- **ObjectAttributeValue:** [HERE \(RPLPredefinedFunctions.pdf, Section 136\)](#) - Get the value (as a string) for the specified Attribute on the specified Object.
- **ObjectHasAttributeValue:** [HERE \(RPLPredefinedFunctions.pdf, Section 137\)](#) - Return a Boolean of whether the particular Object has the specified Attribute Value.
- **ObjectsFromAttributeValue:** [HERE \(RPLPredefinedFunctions.pdf, Section 140\)](#) - Get a list of all of the objects that have the specified value for the specified attribute.

# Multiple Object Method Selector

## 4. Multiple Object Method Selector

### 4.1 Purpose

Before the **Multiple Object Method Selector** dialog box was available, a user had to select methods from the **Open Object** dialog for each object. For example, if a new engineering method was developed for use for all reservoirs in basin, a user would have to select this new method on each Reservoir object. For large models, this could be a tedious and time-consuming task. The purpose of the **Multiple Object Method Selector** is to allow the user to set an engineering method for a group of objects from a single dialog.

All objects of the same type do not necessarily have the same engineering methods or method categories available. For example, it is not always possible for a user to select a given method on *all* Level Power Reservoirs. The currently selected engineering methods on an object determine the currently available methods and method categories.

To overcome these difficulties, this dialog indicates which objects have a given method *category* available and therefore which objects will need to be re-configured in order to make the given category available. The dialog similarly indicates which engineering *methods* are available on each object for a given category. Once an engineering category and method is selected, the dialog only changes the engineering method on objects which have the desired category and method available.

### 4.2 Quick Usage Overview

- Open the **Multiple Object Method Selector** from the main Riverware workspace: **Workspace** ➤ **Objects** ➤ **Select Methods on Objects...**
- Add objects to the object list by clicking the **Add Objects...** button, then select objects in the object selector and click **Ok**.
- Optionally, filter the objects by type.
- Highlight the desired objects to which a new method should apply.
- Select a category from the category list.
- Verify that the category is available on the desired objects by inspecting the **Current Method** column in the object list.
- Select a new method from the method list.
- Verify that the selected method is available on all desired objects by inspecting the **Available** column in the object list.

- Apply the new method to the highlighted objects by pressing the **Apply New Method** button.
- Verify that the objects listed in the confirmation dialog are the objects you intend to affect, and press **OK**.

### 4.3 Accessing the Dialog

The dialog is invoked from the main Riverware workspace using the menu sequence: **Workspace** ➔ **Objects** ➔ **Select Methods on Objects...** This brings up a blank **Multiple Object Method Selector** dialog.

It is also possible to bring up the dialog from the **Open Object, Methods** tab by right clicking on a row and then selecting **Show in the Multiple Object Method Selector**. In this case, the selected object is added to the object list and the selected category and method are already highlighted.

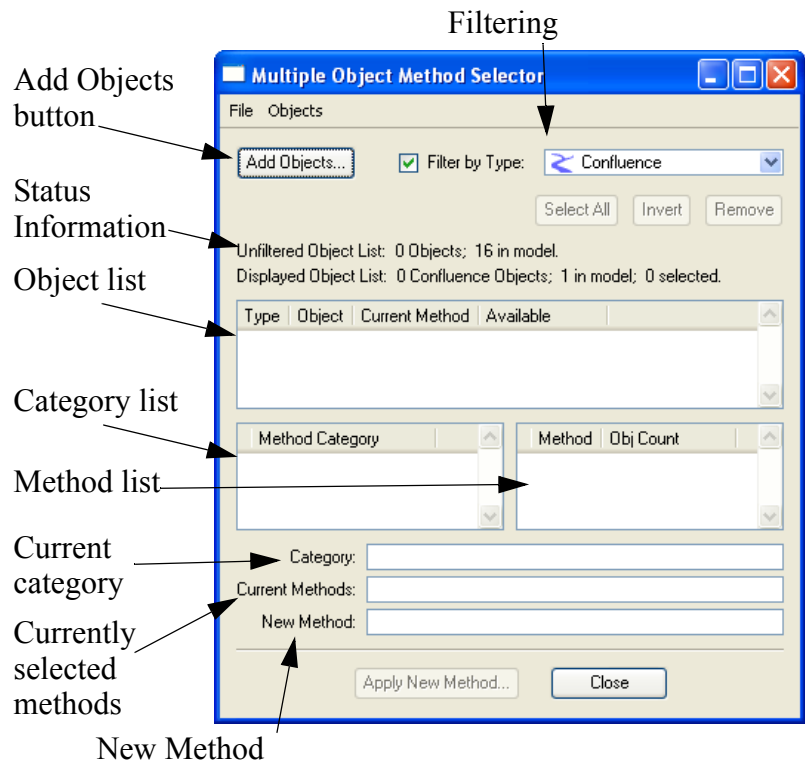
### 4.4 Overview of the Dialog

Selecting methods on multiple objects consists of three steps: selecting a group of objects, selecting a method category, and choosing a new engineering method. These steps are accomplished using the three sections of the dialog. The dialog is designed so that the user progresses from top to bottom with each successive task. From top to bottom, we will refer to these sections as: Object List, Category List, and Method list.

The selection of new methods is performed on the selected objects in the list of objects. This list is created/edited by the user by adding/removing objects, filtering, and finally making a selection.

### 4.5 The Object List

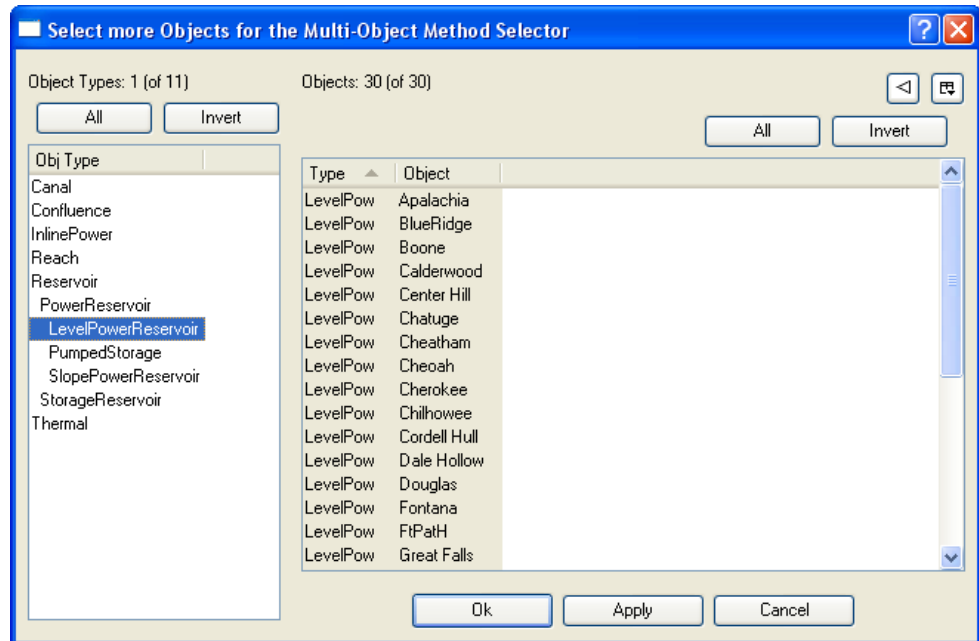
The selection of new methods is performed on the selected objects in the list of objects. This list is created/edited by the user by adding/removing objects, filtering, and finally making a selection.



### 4.5.1 Adding Objects

Adding objects is accomplished using the selector. This dialog is invoked using the **Add Objects...** button or the corresponding menu item: **Objects** → **Invoke Object Selector...**

Use of this dialog proceeds from left to right. The user first selects an **Object Type**. This populates the list of objects of the given type in the **Objects** list. Multiple object types can be selected simultaneously by pressing <Control> while selecting the object types.



Objects in this list can be filtered using the standard object filters: **Object Name Filter**, **Has Accounts Filter**, and **In Subbasin Filter**. The user then selects objects from this list. This can be done by:

- manually selecting individual objects;
- selecting multiple objects by pressing the <Control> key on the keyboard and selecting multiple objects with the mouse;
- selecting all the objects in the list by pressing the “All” button under the Object list in the dialog.

Once the desired set of objects has been selected, the “OK” or “Apply” button adds the objects to the list in the **Multiple Object Method Selector**. For more information on using the selector click [HERE \(Selector.pdf, Section 2\)](#).

If after adding objects to the **Multiple Object Method Selector**, more objects need to be added, the object selector can be invoked again. Objects are appended to the current object set in the **Multiple Object Method Selector**. Note that the list of objects added using the selector is called the “unfiltered list” and can contain many different types of objects.

**Aggregate Objects:** A word about aggregate objects: parent aggregate objects and their child segment objects appear as separate items in this object selector dialog. The parent object will appear as an object of the aggregate type. The child objects will appear as objects of their individual type. For example, an AggReach with 2 child/segment objects are treated as follows: the parent object is an object of type AggReach; the 2 child objects are objects of type Reach. They can each be added by selecting the given type then the given object.

## 4.5.2 Removing Objects

A user removes objects by selecting one or more objects in the list and then clicks the **Remove** button or all objects can be removed using the menu item: **Objects** ➤ **Remove All Objects**.

## 4.5.3 Filtering Objects

When the user adds objects to the list using the **Add Objects** button and the selector, the user is able to select multiple types of objects. Applying new methods is specific to a type of object, e.g. Reach methods do not apply to Reservoirs. If the user adds multiple types of objects, every method category for all object types will be added to the list. It is frequently overwhelming to sort through the various user methods to find the desired method. To avoid this, the object filter can be used to only show objects by type. Click on the toggle to **Filter by Type**: then select a type of object from the drop-down menu. Abstract object types like Reservoir or Power Reservoir can be selected. Now only the objects matching that type are shown in the list. This is now called the “filtered” list.

---

**Note:** If you wish to switch object types, the original list of objects added remains as the non-filtered list. Select a new filter type (including disabling the toggle) to show a different set of objects. The status of the number of objects in the filtered and unfiltered objects lists is shown on the dialog. This filtering functionality allows users to add all the objects in a subbasin or geographic region, then select methods on each type of object without losing the list of objects in the subbasin.

---

## 4.5.4 Selecting objects

Application of a new method is performed on the objects **selected** in the object list, not all of the objects displayed. To select objects, do one of the following:

- manually selecting individual objects
- select multiple objects by highlighting multiple objects or use the <Control> key on the keyboard
- selecting all the objects in the list by pressing the “All” button under the Object list in the dialog.
- invert the selection using the **Invert** button.

Any new method selection will be applied only to the selected objects.

## 4.6 Selecting a Method Category

Once objects have been added to the object list, the category list will be updated to display the *union* of all active categories on the selected objects. It is important to understand that this list displays the *union*, so some objects may not have a given category available.

Note: Object Level Accounting Methods are shown with a grey background.



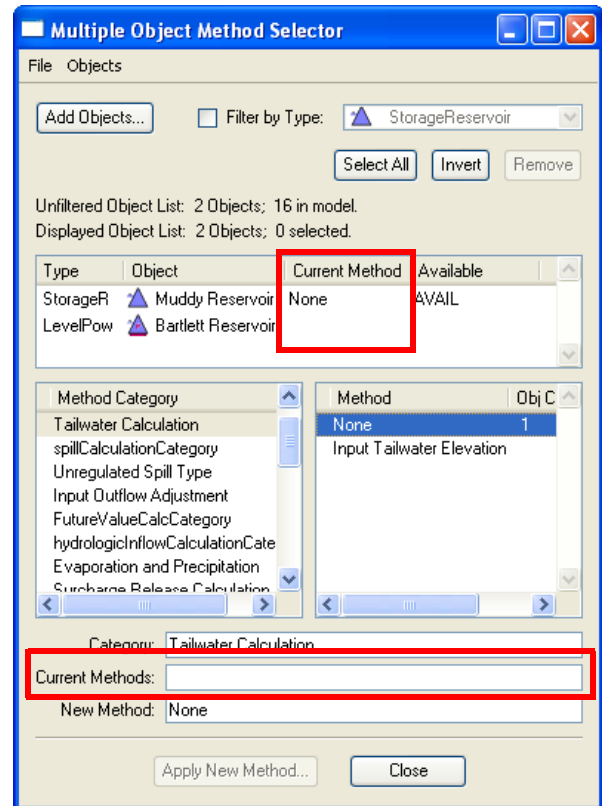
Clicking on a category selects the category. When a category is selected the object list and method selection controls are updated to display information about the selected category.

## 4.7 Determining Which Objects Have a Given Category Activated

When a category is selected, the object list displays which objects have the selected category available. The third column in the object list, “Current Method,” is either:

- empty - indicating that the selected category is not available on this object
- displays a method name - indicating that the selected category is available, and that the displayed method is the currently active method for the category on this object.

The user should scroll through the object list, looking for empty values in the third column. This information is useful when the user intends to set a common method on all the objects in the set. In this case, the user can quickly determine which objects need to be reconfigured to make the desired category available.



## 4.8 Determining the Currently Active Method

Information about the currently active method is contained in 2 places in the dialog: the **Current Method** column in the object list, as discussed previously, and the **Current Methods** text box in the method selection section. The **Current Methods** line displays a comma separated set of selected method for all the objects in the set.

## 4.9 Selecting a New Method

Once a category has been selected, the user can select a new method for this category. The new method is selected from the list of methods in the right pane. Once a method is selected, it is added to the **New Method** line at the bottom of the dialog.

Like method categories, methods may not be active on some objects, even though their category is active. The method list displays the *union* of all methods available on the selected objects that have this category active. Since some methods may not be available on all objects, the object list displays whether a given method is available on each object. Once the user has selected a new method from the



method list, the objects list is updated. The forth column in the object list, “Available,” now displays the text “AVAIL” if the selected method is available on the given object, or display nothing if the method is not available on the object.

Once a method has been selected the user should scroll through the object list to determine which objects can have the new method activated. Any method with “AVAIL” in the “Available” column are allowed to have the new method activated. If this column is empty for an object, the object will not be affected if this new method is applied.

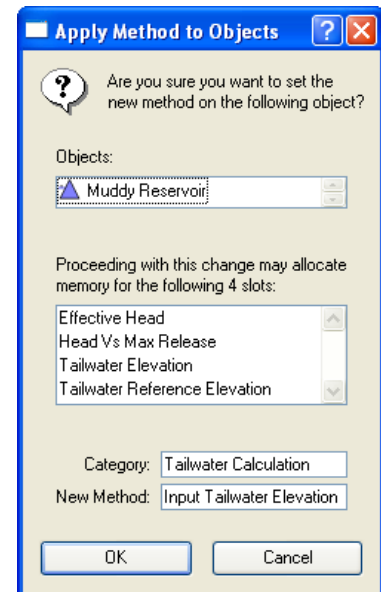
Unlike the OpenObject dialog, selecting a method from this menu does not immediately set the method on all affected objects. Instead, the user must press the “Apply New Method” button to change the method on the objects. This “Apply New Method” button remains inactive until a new method has been selected from the menu, at which time it will be enabled. Pressing the “Apply New Method” button will set this method as the active method on **highlighted** objects in the object list with this category and method available.

## 4.10 Confirming the changes

After the new method has been applied using the “Apply New Method” button, a confirmation dialog appears. This dialog lists all the objects which will have this new method activated. This is the selected objects the list that have the desired category and method available. Cancelling this dialog will prevent the method from being changed on any of the objects. Also, the dialog informs the user of the new slots which may be instantiated when this new engineering method is activated. Cancelling this dialog will prevent the method from being changed on any of the objects.

Once the confirmation dialogs have been accepted, the objects will be modified. A busy cursor indicates that the methods are being changed. For a large set of objects this operation can take some time.

Once the methods have been changed, the **Multiple Object Method Selector** dialog will be updated to display the new methods on the objects. A quick inspection of the object list shows that the method has been changed on the objects with this category and method available.

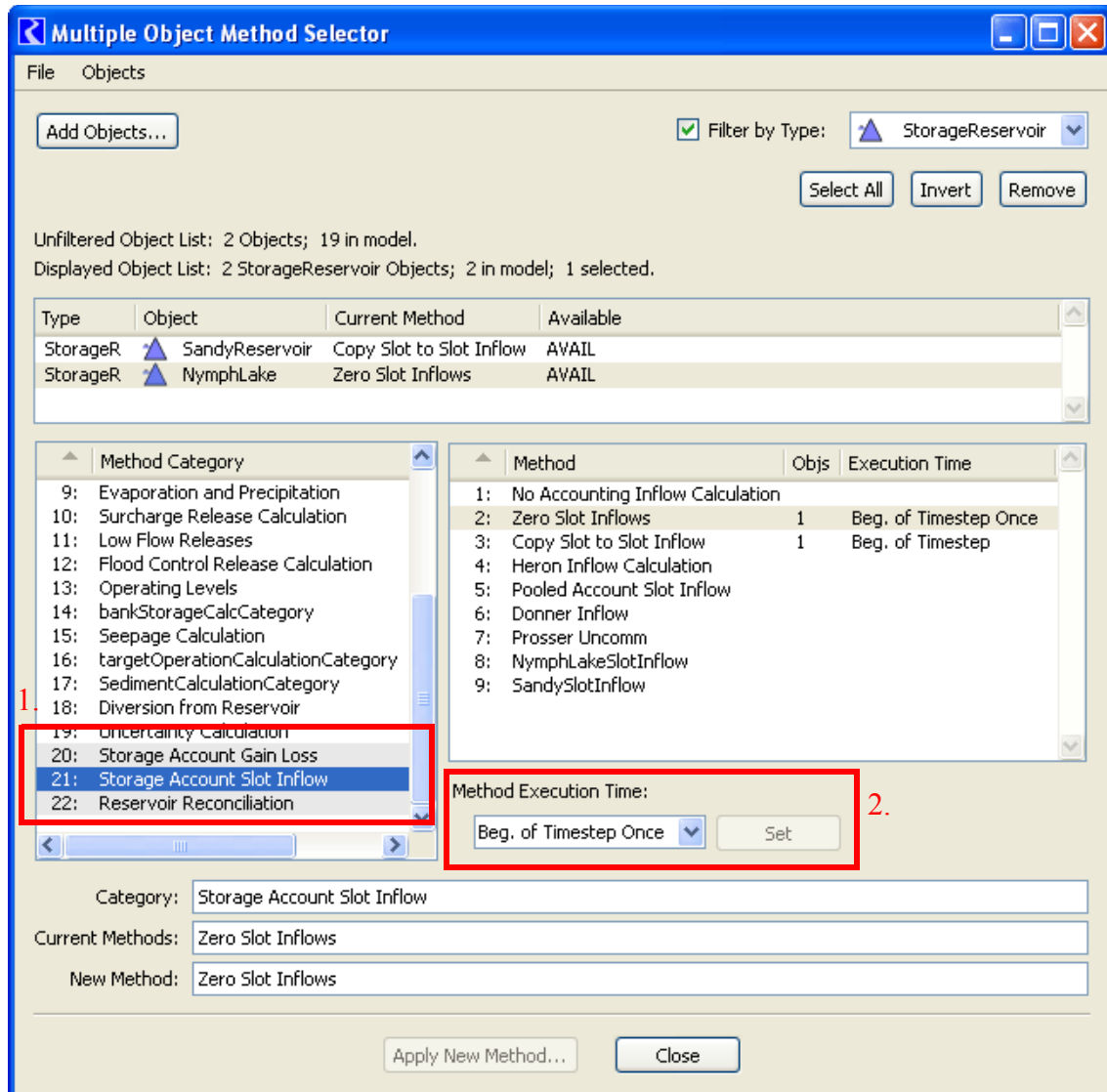


## 4.11 Selecting Object Level Accounting Methods

The Multi-Object Method Selector dialog can be also used to select Object Level Accounting Methods (OLAM). Click [HERE \(Accounting.pdf\)](#) for more information on OLAMs. The image below shows aspects of this dialog specific to OLAMs:

1. OLAM category items are shown with a grey background. *In the image below, see the bottom three rows in the method category list.*

2. When an OLAM category is selected, additional controls are shown below the method list. In the image below, see the “Method Execution Time” combo box and “Set” button. These controls are described on the following pages.



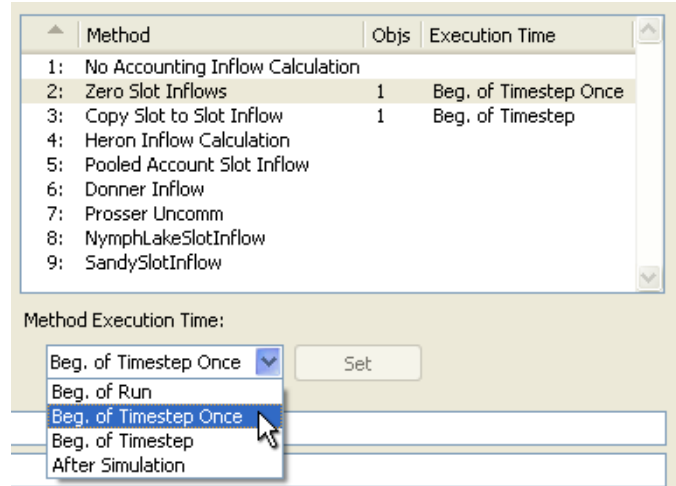
#### 4.11.1 Setting the Execution Time of OLAMs.

When an object level accounting category is selected, that category's method options are shown in the methods list (*shown here*).

When clicking on a method item selected on at least one simulation object, the Method Execution Time combo box is set to the indicated execution time -- or, if multiple execution times are indicated for that method item, one of those several execution times are used. You can select a different execution time in the combo box. Execution times are described [HERE \(Accounting.pdf\)](#).

In this dialog, there are two ways of setting the execution time of OLAM methods:

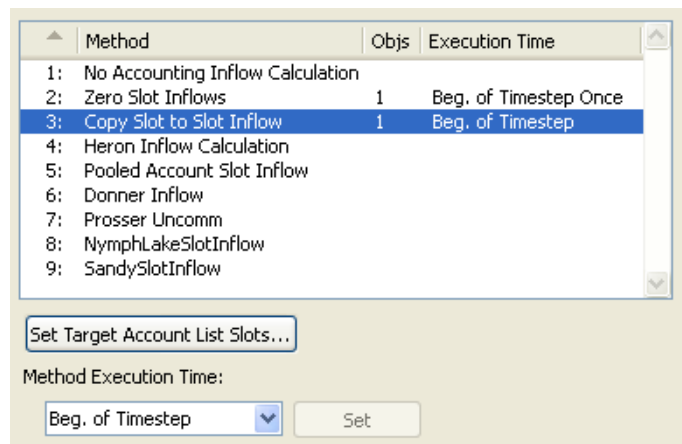
- By clicking the “Set” button next to the Method Execution Time combo box. This effects the methods on the objects currently having that method setting.
- By clicking the “Apply New Method” button at the bottom of this dialog. (*See previous page*). This simultaneously sets the selected method item on the selected objects AND sets the execution times of those methods.



#### 4.11.2 Special support for “Copy Slot to Slot Inflow”: Set Target Account List Slot.

The Multiple Object Method Selector also has special features for the “Copy Slot to Slot Info” OLAM [HERE \(Accounting.pdf\)](#).

When that method is selected, the “Set Target Account List Slots...” button is shown below the methods list. This button is enabled if any objects currently have the “Copy Slot to Slot Info” method selected. Clicking this button brings up the new “Set Target Account on Objects” dialog box.



The “Set Target Account on Objects” dialog operates on each simulation object being editing in the Multi-Object Method Selector which has the “Copy Slot to Slot Inflow” method selected.

The user selects one of three criteria for choosing an Account on each simulation object to be assigned to that object’s Target Account List Slot:

- Account Name
- Water Type
- Water Owner

There must be exactly one Account on each object matching the criteria. This information is displayed in the Status area.

In the case of the “Set List Slots” operation being “ready” (i.e. exactly one

Account matching the entered criteria for each simulation object), the Status panel enumerates the simulation objects; *see the two right-side images*. Otherwise, the Status panel enumerates the simulation objects which either have no Accounts matching the criteria, or have more than one Account matching the criteria. Additionally, when the Water Type or Water Owner criteria are selected, the names of the matching Accounts can optionally be shown.

Clicking the “Set List Slots” button (when enabled) assigns the objects’ Target Account List Slots and closes the dialog.

