



Technical Documentation Version 5.1

Object User Interface



C A D S W E S

Center for Advanced Decision Support for Water and Environmental Systems

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Object User Interface Table of Contents

Open Object Dialogs	1
Naming an Object	2
Engineering Slots View	2
Slot Names.....	3
Slot Types	3
Slot Value	3
Link Status.....	3
Input Status	3
Selecting a Slot	3
Plot Button.....	3
Dispatch Details	4
Slot Up/Down Arrows.....	4
User Methods and Categories	4
Selecting Methods	5
Memory Allocation for Method-specific Slots	5
Method Dependencies	5
Selecting Methods on Multiple Objects	5
Open Aggregate Objects	6
Open AggObject Dialogs.....	6
Viewing Element Slots and Methods.....	6
Accounts View	6
Description View	7
Multiple Object Method Selector	8
Purpose	8
Quick Usage Overview	8
Invoking the Dialog	9
Overview of the Dialog	9
The Object List	9
Adding Objects.....	10
Removing Objects.....	11
Filtering Objects.....	11
Selecting objects.....	11
Selecting a Method Category	11
Determining Which Objects Have a Given Category Activated	12
Determining the Currently Active Method	12
Selecting a New Engineering Method	12
Confirming the changes	13

Updating the Objects 13

Object User Interface

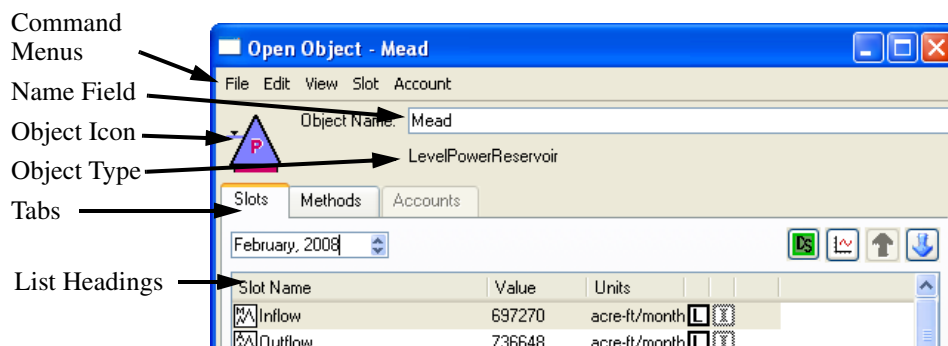
This document describes the user interface for the Open Object dialogs then presents a tool used to select methods on multiple objects. Additional information on adding, selecting, and deleting objects is presented [HERE \(Workspace.pdf, Section 4\)](#). Importing and exporting of objects and links, is covered [HERE \(Workspace.pdf, Section 4.8\)](#).

1. Open Object Dialogs

The object icons on the RiverWare workspace are a convenient way to visualize the physical layout of a modeled system. These objects contain the data and the physical process algorithms which drive the simulation. To access the data and the Methods (functions) which define the algorithms, use the **Open Object** dialog.

- Open an object double-clicking its object icon on the workspace or by double-clicking on the name in the object listview. An **Open Object** dialog appears. Only one **Open Object** dialog may be opened for each object. Double-clicking on the object icon again simply brings the existing **Open Object** window to the top.

All objects use the same format of **Open Object** dialog. The command menus are located along the top bar as shown in the following screenshot



The dialog is organized by tabs which are used to switch the display in the main portion of the dialog between engineering **Slots**, engineering **Methods**, and **Accounts**. Slots contain numerical model data. Methods are user-selectable algorithms in the physical process model. When the **Open Object** dialog is invoked, the **Slots** tab is displayed by default.

On each of the tabs, the order of items in the list can be sorted by clicking on the List Headings and choosing a sort order. Sort order options include:

- Default
- Custom (Click [HERE \(Section 1.2.9\)](#) for more information)
- Ascending/Descending by Type

- Ascending/Descending by Column (alphabetical)

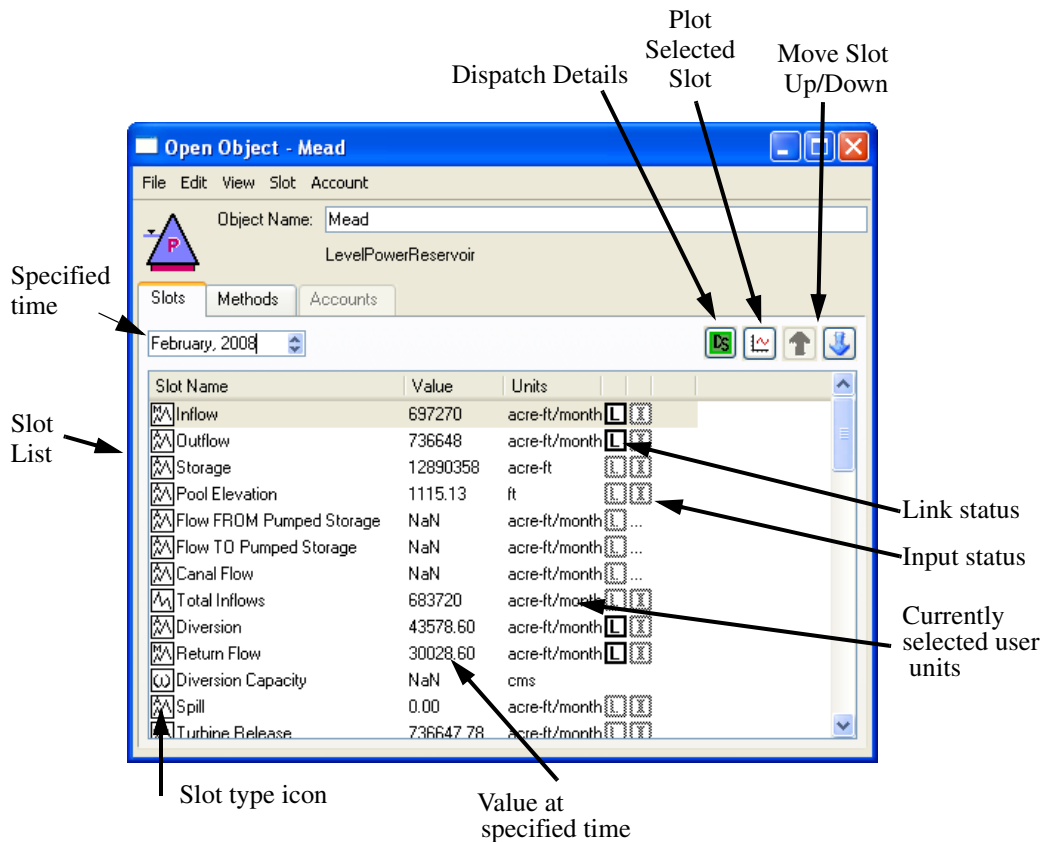
1.1 Naming an Object

Objects are instantiated with default names. The names are the object type followed by *n*, where *n* is the smallest number beginning with 0 which forms a unique name for that object type on the workspace. You can change the name of any object by clicking in the **Object Name:** text field. A single click places the cursor in the name, allowing you to type and delete characters individually. A double click will highlight the entire name which you can then overwrite.

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.

1.2 Engineering Slots View

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



The order of the slots is user configurable and can be saved with the model file. Clicking on either the Slot Name, Value, or Units column header will give you a menu for sorting the slots. Under the View

menu the slot configuration can be saved and then applied to other objects. Another way to sort the slots is by using the up and down arrows next to the plot button. When a slot is highlighted, you can move it up and down in the slot list (you can also select a slot and “drag” it).

1.2.1 Slot Names

The names of the slots are pre-defined in the object code for all objects except the Data Object, on which you can create and name your own slots. The list includes all slots which are currently “active;” i.e., associated with the object in general (for the selected controller) or associated with currently selected User Methods.

1.2.2 Slot Types

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 \(Slots.pdf, Section 3\)](#).

1.2.3 Slot Value

The **Value** field of the Slot List displays the currently selected user units and the calculated 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).

1.2.4 Link Status

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

1.2.5 Input Status

The Input Status indicator is highlighted when at least one value in the SeriesSlot is flagged as an INPUT. Only timeseries slots may have values flagged as INPUT; therefore, only timeseries slots display the Input Status.

1.2.6 Selecting a Slot

A slot is selected from the list by clicking anywhere on its row. The entire row is highlighted to indicate this selection. Only one slot may be selected at a time. When a slot is selected, you can right click to activate right mouse button menus.




1.2.7 Plot Button

The **Plot** button  invokes a plotter session to display the values in the selected slot.

1.2.8 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). Click on the button to open the model run analysis dispatch details for the given object. Click [HERE \(ModelRunAnalysis, Section 1.2\)](#) for more information on this utility.

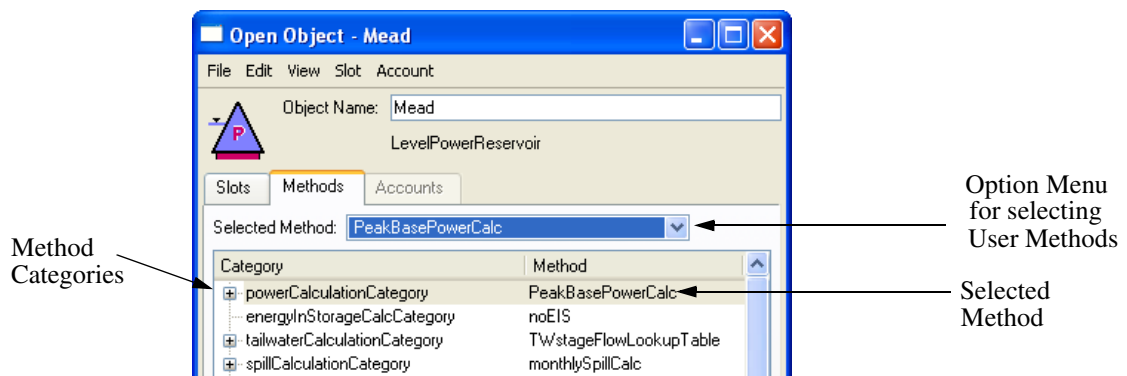
1.2.9 Slot Up/Down Arrows

The up/down arrows   are used to move the selected slots up or down in the list. The **View**  **Save Object-Type Slot Order** can be used to save the order created by moving objects up or down in the list. This order can be restored by clicking on the Slot Name heading and choosing the **Saved Object-Type Order** sorting order.

1.3 User Methods and Categories

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 nine Methods for calculating Power: noPowerCalc, No Power Turbine Flow, plantPowerCalc, plantPowerEquation, unitGeneratorPowerCalc, PeakBasePowerCalc, PeakPowerCalc, PeakPowerEquation and LCRPowerCalc. 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 LCRPowerCalc 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. To switch to the **Methods** view, click on the **Methods** tab or select **View**  **Engineering Methods**. The display of the main portion of the dialog changes to the **Methods** view.



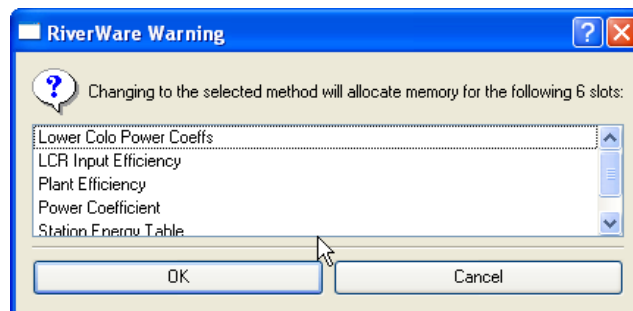
1.3.1 Selecting Methods

Objects are configured to represent the features in your basin using Methods. These are selected from the **Methods** tab of the **Open Object** dialog. Methods are organized into Categories. For example, on a Reach, the Routing category contains methods used to specify how routing should be simulated. 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.

1.3.2 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 Calculation 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; the user must select another Method for simulation to proceed normally. For some Categories, the empty Method is a valid choice.



1.3.3 Method Dependencies

Some Method 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 powerReleaseCalcCategory depend on which Method is selected in the powerCalculationCategory.

1.3.4 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 \(Section 2\)](#).

1.4 Open 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. (See the online documentation in the RiverWare Help Menu for a detailed description of the Methods on the AggObjects and their elements.)

1.4.1 Open AggObject Dialogs

The **Open Object** dialog for the AggObjects is similar to the standard **Open Object** dialog except that it contains tree-views for both the **Engineering Slots** and **Engineering 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.

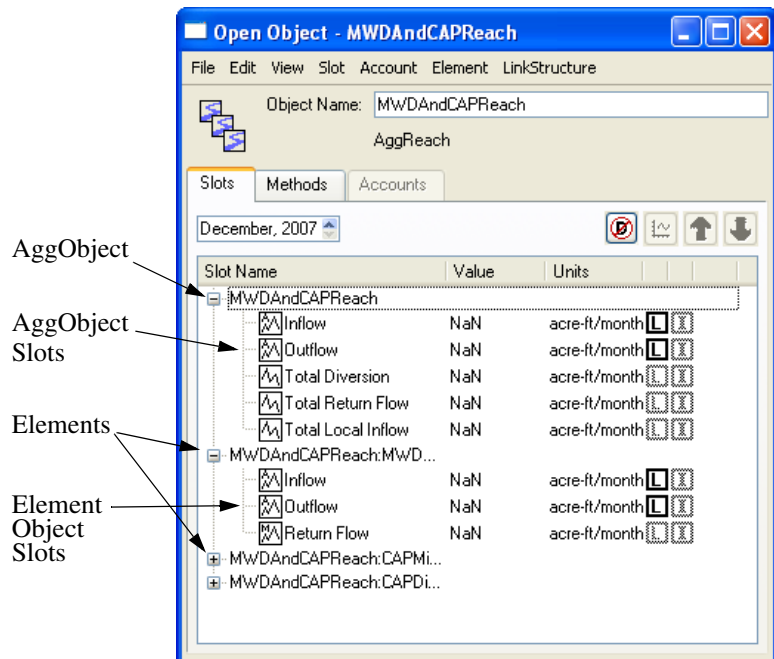
1.4.2 Viewing Element Slots and Methods

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 **Engineering Slots** display, the tree-view shows the slots associated with the elements. If **Engineering Methods** is selected, the tree-view shows the method categories for the elements, if any exist.

1.5 Accounts View

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 \(Accounting.pdf, Section 7.4\)](#).

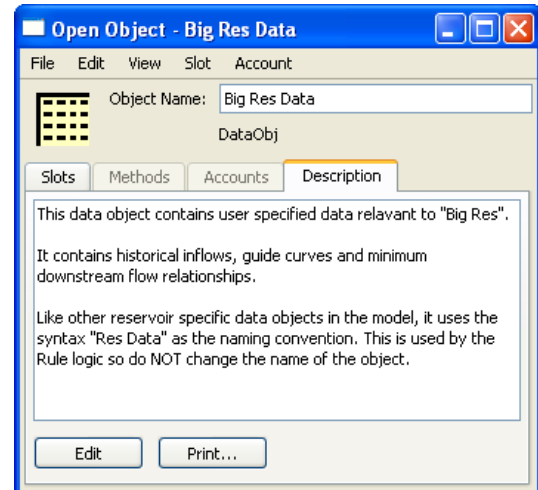


1.6 Description View

On data objects, the **Description** tab allows the user to enter a description of the data object. Clicking on the **Description** tab or choosing **View** ➔ **Description** opens the description area. Following is a screenshot of the description tab:

To edit or add a description, the user clicks the **Edit** button. The normal cut/copy/paste (to the system clipboard) are available. When finished editing, the user clicks the **OK** to confirm or the **Cancel Edit** to cancel.

The user can print the description using the **Print...** button. The Printer Selection Dialog is then shown and the user can choose and configure the printer. Printed is the object and description for the data object AND the Object.Slot and slot description for each slot on the object as shown in the following example:



Data Object: Big Res Data

This data object contains user specified data relevant to "Big Res".

It contains historical inflows, guide curves and minimum downstream flow relationships.

Like other reservoir specific data objects in the model, it uses the syntax "Res Data" as the naming convention. This is used by the Rule logic so do NOT change the name of the object.

Slots:

[1] Big Res Data.Historical Flows

[2] Big Res Data.Guide Curve

[3] Big Res Data.Minimum Flow

[1] Slot: Big Res Data.Historical Flows

This slot represents the inflow to the Reservoir on the Big River as measured at the gage directly above CR 122 Bridge. The data was provided by the Big River Irrigation District on 1/23/2008.

[2] Slot: Big Res Data.Guide Curve

Guide curve for the Big Res. It shows the desired pool elevation through the year

[3] Slot: Big Res Data.Minimum Flow

This is the minimum flow below the Big Reservoir.

The user can also enter a description of each slot on a data object. Click [HERE \(Slots.pdf, Section 1.4\)](#) for more information.

Multiple Object Method Selector

2. Multiple Object Method Selector

2.1 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.

2.2 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**.

2.3 Invoking 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.

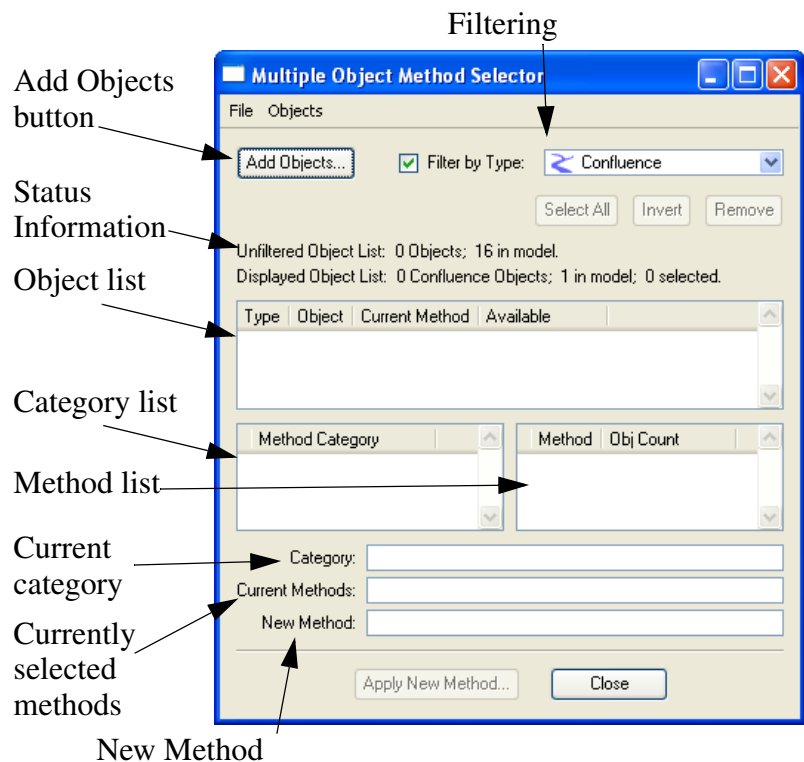
2.4 Overview of the Dialog

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 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.

2.5 The Object List

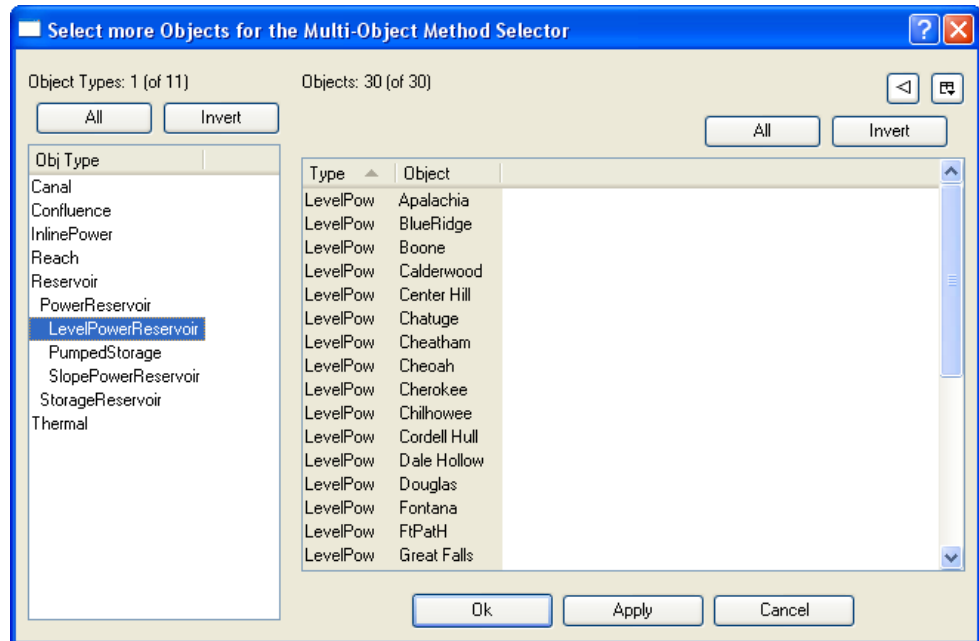
The selection of new methods is performed on the selected objects in the list of objects. This list is created/edited by the user by adding/removing objects, filtering, and finally making a selection.



2.5.1 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.

2.5.2 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**.

2.5.3 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.

2.5.4 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.

2.6 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.

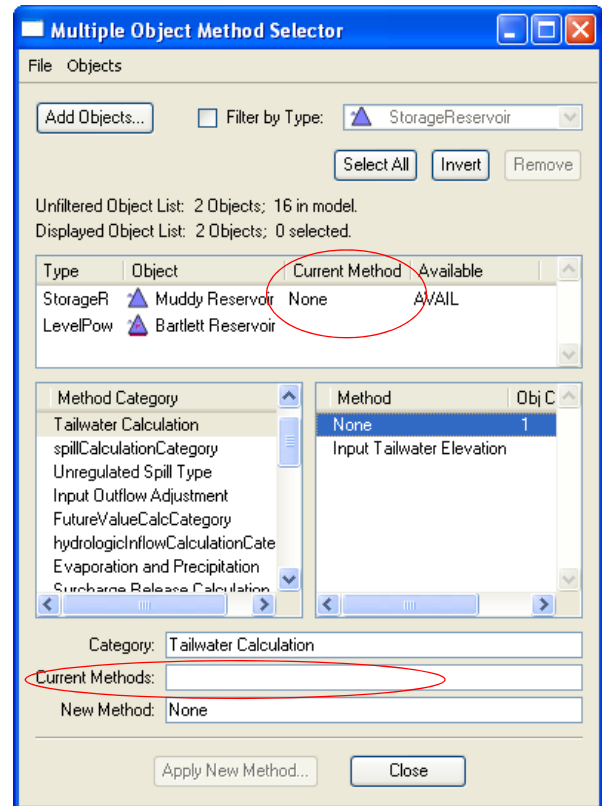
Clicking on a category selects the category. When a category is selected the object list and method selection controls are updated to display information about the selected category.

2.7 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.



2.8 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.

2.9 Selecting a New Engineering 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 fourth 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.

2.10 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.

2.11 Updating 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.

