



**Technical Documentation Version 6.2**

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# **Workspace**

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**C A D S W E S**

**Center for Advanced Decision Support for Water and Environmental Systems**

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# Workspace Table of Contents

<b>Introduction .....</b>	<b>1</b>
<b>General Workspace Features .....</b>	<b>1</b>
Font and Text Size .....	2
Toolbar and workspace buttons .....	3
RPL Set buttons .....	4
Context Menu - Right Click .....	4
<b>Model Navigation .....</b>	<b>5</b>
The Locator View .....	5
Scrolling .....	6
The Simulation Object List .....	6
Zooming on the Workspace .....	6
Workspace Cursor Modes: Select / Hand Drag / Locator Mode .....	7
Normal Selection Mode .....	7
Hand Drag Mode .....	7
In-View Locator Mode .....	7
Closing all Dialogs .....	8
<b>The Canvas or Workspace Views .....</b>	<b>8</b>
Simulation View .....	9
Canvas Properties.....	9
Background Image.....	10
Accounting View .....	11
Geospatial view .....	11
Introduction to GIS concepts.....	12
The Geospatial Canvas Configuration Dialog .....	14
Object Coordinates.....	19
<b>Objects on the Workspace .....</b>	<b>21</b>
The Object Palette .....	21
Pulling Objects off the Palette .....	22
Selecting Objects .....	22
Deselecting Objects .....	23
Moving Objects on the Workspace .....	23
Lock Icon Positions Controls .....	24
Show Commas in Numbers .....	24
Clearing the Workspace .....	24

Importing and Exporting Objects .....	24
Export.....	25
Import.....	26
Export/Import Tips.....	26
<b>Links on the Workspace .....</b>	<b>27</b>
Viewing Links .....	27
Creating Links .....	28
Deleting Links .....	28
<b>Display Groups .....</b>	<b>28</b>
Link Groups .....	29
Selecting Links.....	29
Predefined Link Groups .....	30
Supply Groups .....	30
Account Groups .....	30
Object Groups .....	31
<b>Exporting and Printing Model Images .....</b>	<b>31</b>
Exporting Model Images .....	31
Printing Model Images .....	32



# Workspace

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## 1. Introduction

The RiverWare workspace is the RiverWare main window and provides the primary view of the simulation space where models are built and modified. The workspace contains a menu bar and toolbar through which various RiverWare functions are accessed. In the workspace, a model is graphically represented as a network of objects with links connecting the objects. The workspace allows for exploration of the model through a number of viewing options:

1. A zooming interface.
2. Context sensitive pop-ups providing information about objects and links.
3. Scrolling bars to pan across the model.
4. The ability to select multiple objects by selecting a region of the workspace or to select single objects.
5. A dockable listview window displaying a list of all objects on the workspace.
6. The ability to resize the workspace to display a larger or smaller region of the model.

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## 2. General Workspace Features

The workspace features a main menu bar in which the various functions of RiverWare are organized into pull-down menus. The workspace also contains a dockable toolbar featuring shortcut buttons to some key RiverWare functions and a dockable object listview window of all the objects on the workspace. The workspace is the entire RiverWare window.

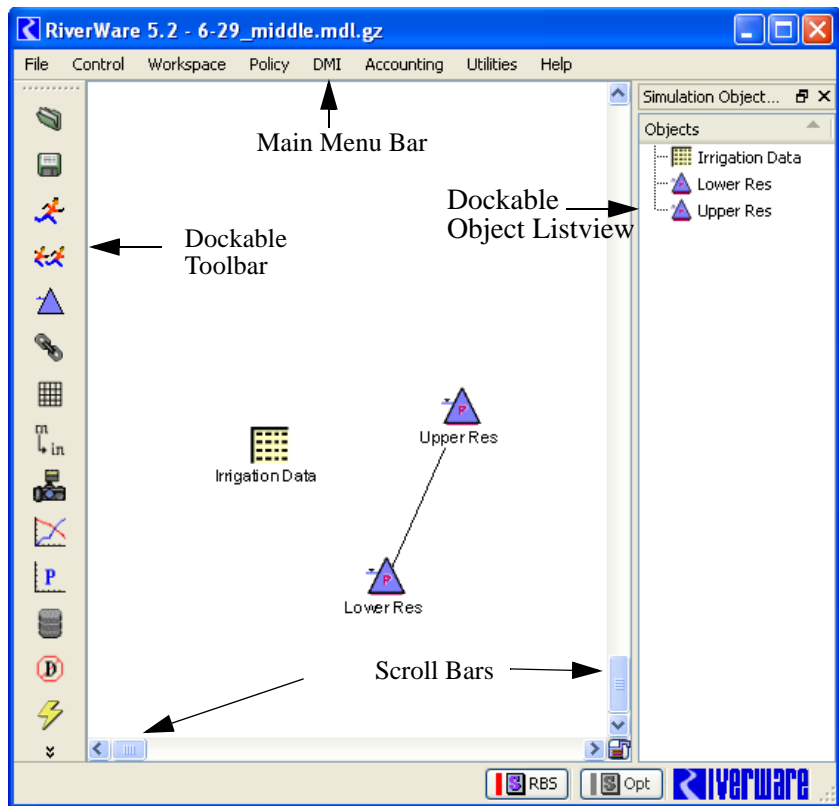
- **Resizing:** The workspace can be resized by clicking on any of the corners and dragging the workspace to the desired size.
- **Scrolling:** The scroll bars can be used to view different regions of the workspace. The default locations of the scroll bars are the lower corners of the workspace.

- **Docking Windows:** The dockable windows can be moved to new positions on the workspace or completely detached from the workspace by clicking on the raised grey lines (the handle) of the window and dragging it to a new position. If you undock and/or close the toolbar or object list, you can reshew them using the **Utilities** ➔ **Windows** ➔ **Show Simulation Object List** or **Toolbar** menus.

## 2.1 Font and Text Size








The font, size and style used for menus, lists and other text can be changed from the **Utilities** ➔ **Windows** ➔ **Set Font** menu. There are few limitations with this feature:

- The font setting is only changed during a single RiverWare session. It does not persist between sessions; this may be changed in the future.
- The font setting does not affect:
  - Workspace canvas text (i.e. object names) - Canvas fonts can be changed from the workspace canvas properties [HERE \(Section 4.1.1\)](#).
  - Existing SCT's - Fonts on the SCT can be changed in the SCT's configuration menu [HERE \(SCT.pdf, Section 3.4\)](#). New SCTs will inherit the font specified for the windows/dialogs.
  - RiverWare Policy Language expressions - Fonts for RPL expressions can be configured from the RPL Layout Editor [HERE \(RPLUserInterface.pdf, Section 3.2.2\)](#).
- Various fonts seem to work well in RiverWare if they are reasonably sized but some dialogs don't display extreme-sized fonts.


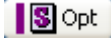


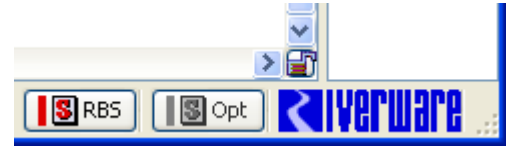
## 2.2 Toolbar and workspace buttons

The toolbar in RiverWare is dockable, meaning it can be moved from one side of the workspace to the other or exist as an independent dialog. The workspace has the following buttons:

Icon	Action	Icon	Action
	Load a model		Open the DMI manager
	Save a model		Open the Model Run Analysis tool
	Open the Run Control Dialog		Close Dialogs
	Open the Multiple Run Control Dialog		Open the Help file in Adobe Acrobat Reader
	Open the Object Palette		Switch between the Simulation View, Geospatial View and the Accounting View (if Accounting is enabled)
	Open the Link Manager dialog		Zoom in
	Load a SCT		Zoom out
	Open the Unit Converter		Normal Selection Mode
	Open the Snapshot Manager		Hand Drag Mode
	Open the Output Manager		In-view Locator Mode
	Open an empty plot dialog		Show Locator Window
	Show the loaded RBS ruleset		Show the loaded optimization goal set;

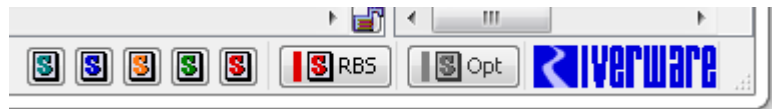
## 2.3 RPL Set buttons

The workspace has buttons on the bottom of the dialog to show the loaded RBS ruleset  or optimization goal set . The bar is colored (red for RBS, purple for Opt) when there is a loaded set, grey when there isn't. So in the screenshot to the right, there IS a loaded RBS ruleset, but no loaded Opt goal set. Click one of the buttons (when loaded) to raise the loaded set to the top.



Also shown are color coded icons for any opened:

- Ruleset, goal set, or global function set opened from a file
- Embedded sets (OLAM, expression slots, Init rules, Iterative MRM) that contain at least one group

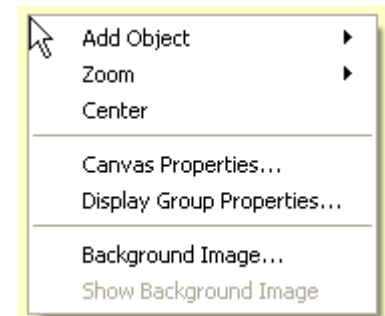


Mouse over any icon for a tool tip indicating the location or click to open that set. Also, the sets are still available through the **Policy** menu. For more information and the color code for sets, click [HERE \(RPLUserInterface.pdf, Section 1.1\)](#).

## 2.4 Context Menu - Right Click

The Simulation Workspace right click context menu (when not clicking on a simulation object icon) has the following options.

- **Add Object:** Add an object
- **Zoom:** Choose the desired zoom level
- **Center** re-centers the visible Workspace area on the clicked point.
- **Canvas Properties...**, Click [HERE \(Section 4.1.1\)](#)
- **Display Group Properties...**, Click [HERE \(Section 7\)](#)
- **Background Image...** brings up a new Background Image Configuration dialog. Click [HERE \(Section 4.1.2\)](#)
- **Show Background Image** (a checkbox) either shows or hides the configured background image. This item is enabled only if a background image is configured. This checkbox state is also represented as a checkbox in the Background Image Configuration dialog. Click [HERE \(Section 4.1.2\)](#)
- **Object Coordinates** (Geospatial view only) shows the geospatial coordinates for the objects on the workspace.




### 3. Model Navigation

Large models can rarely be viewed in their entirety on the workspace, making it difficult to locate objects. There are, however, multiple ways of navigating through a model on the workspace or locating particular objects within a model. These methods are described in greater detail below.

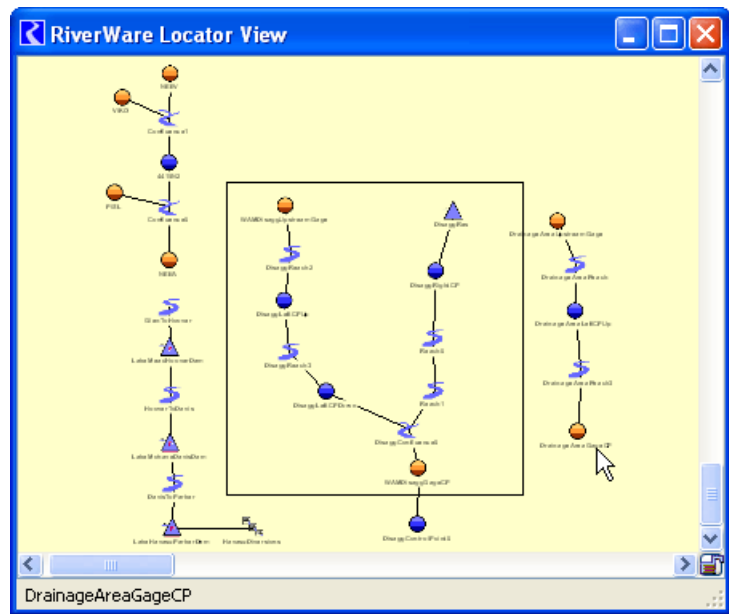
#### 3.1 The Locator View

A generalized overview of a model can be accessed with the locator view. The locator view displays the entire workspace on a miniature scale. The locator view is accessed by:

- Selecting the locator button from the workspace toolbar 
- Selecting **Workspace** ➔ **Open Locator** from the menu bar.

The rectangle represents the current displayed portion of the workspace. Dragging the rectangle to different regions of the model in the locator view will cause that region to be displayed on the workspace.

A status bar shows the name of the Simulation Object near the mouse cursor. (See the bottom of the image). This function even while dragging the inscribed rectangle.



The Locator View implements a Context Menu (right-click) having these two operations:

- **Center.** This re-centers the inscribed rectangle at the clicked position. This is useful especially if the inscribed rectangle (representing the visible area of the workspace) is not visible within the Locator View -- that would occur if the workspace is currently scrolled to an area which doesn't contain any Simulation Object icons.
- **Rescale:** Recomputes the Locator View scale, e.g. if Simulation Objects have been added to the Workspace.

The locator view provides only a general model overview. It can be used to navigate to particular regions of the model. There is also the In-View Locator mode described [HERE \(Section 3.5.3\)](#).

### 3.2 Scrolling

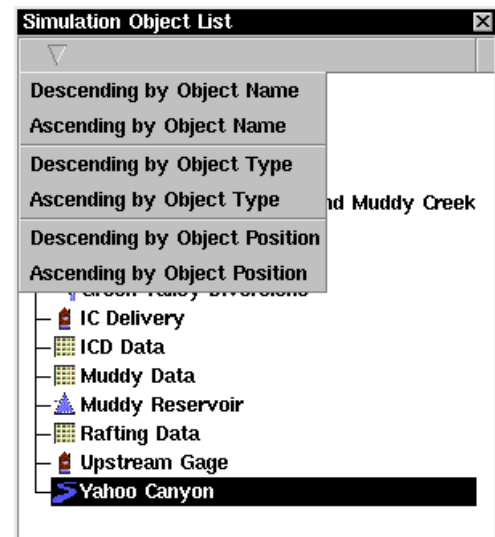
If a model is not particularly large or is familiar, it is possible to move to the desired region of the model using the scroll bars. By default, the scroll bars are located in the lower corners of the workspace. Adjusting the scroll bars will pan the model to the desired location.

### 3.3 The Simulation Object List

The dockable object list window provides the most comprehensive means of locating a specific object within a model. The object list window can be detached from the workspace and be positioned at a desired location.

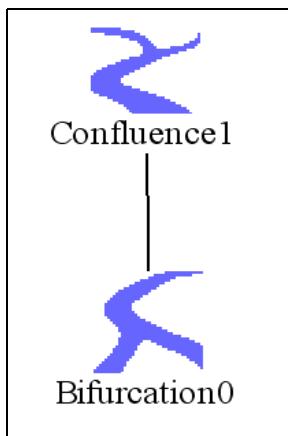
Objects in the list window can be organized by name, type, or position in the model. Objects are further organized in ascending or descending lists according to the sorting selection. Clicking the desired object in the listview window automatically causes that object to be selected on the workspace.

If you undock and/or close the object list, you can reshown it using the **Utilities** → **Windows** → **Show Simulation Object List** menu.

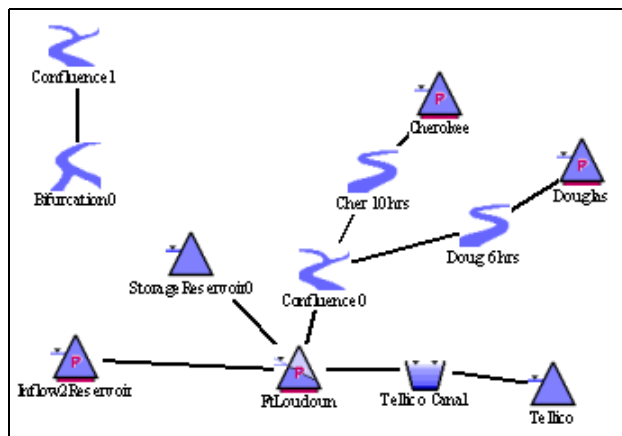


### 3.4 Zooming on the Workspace

RiverWare features zooming capabilities to magnify objects or zoom out to examine a model in less detail. The zoom features can be accessed by clicking on the zoom buttons (see right) on the toolbar or by right clicking with the mouse on the workspace.



Zooming Out: 200%

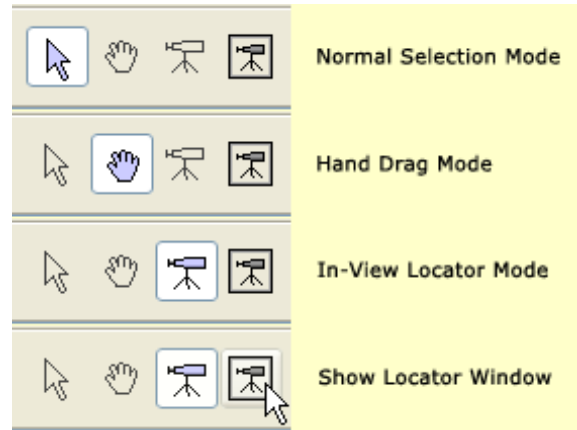


Zooming In: 50%



### 3.5 Workspace Cursor Modes: Select / Hand Drag / Locator Mode

The Simulation Workspace has three cursor selection modes. These define the effect of clicking and dragging the mouse on the workspace. Note, these are implemented on the Simulation workspace, not the Accounting workspace.



#### 3.5.1 Normal Selection Mode

Normal Selection Model is used for selecting and repositioning Simulation Object icons on the workspace.

Multiple proximate icons can be selected by dragging a rectangle over the icons (with the mouse drag operation started *off of* any icon). Clicking an icon while holding down the Control key toggles the icon in or out of the selected set.

A set of selected icons can be moved together by starting the icon drag *on* one of the selected icons. An icon move operation can be aborted by hitting the Esc (escape) key *before* releasing the mouse button.

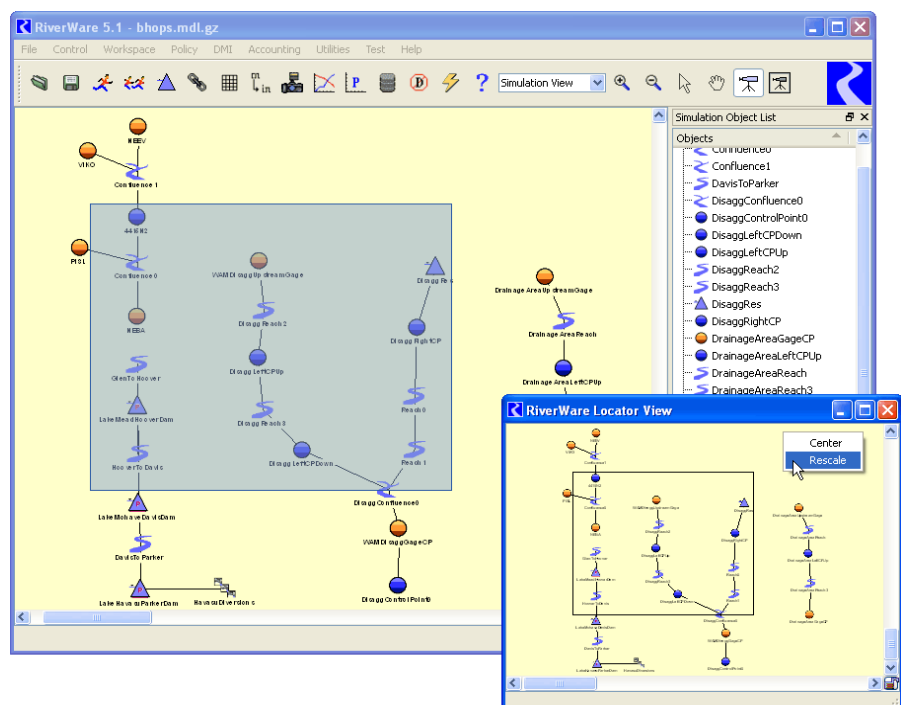
#### 3.5.2 Hand Drag Mode

Hand Drag Mode allows the user to move the workspace canvas within the visible workspace area. This is analogous to operating the Workspace's scrollbars.

#### 3.5.3 In-View Locator Mode

In-View Locator Mode is an alternative to the separate Locator Window.

Selecting this mode causes the workspace to temporarily rescale to show the scope of all of the Simulation Object icons within the visible area of the Workspace. The rectangular region of the normally visible area (at the currently set zoom level) is shown as an inscribed rectangle. (On Windows, the inscribed rectangle is shaded). In the In-View Locator Mode, the inscribed rectangle can be dragged once; upon releasing




the mouse button, the workspace is scrolled to the new indicated area and the cursor mode reverts to the prior mode (i.e. the mode which was active at the time of selecting the In-View Locator Mode).

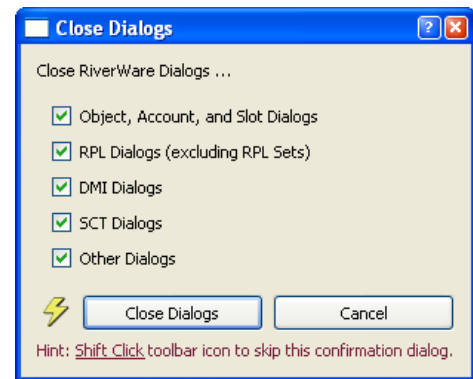
The user can also operate the Locator function in a separate window by clicking the **Show Locator Window** button. See the next section.

### 3.6 Closing all Dialogs

All opened dialogs can be closed at once using the Close

Dialogs feature.  When this button is clicked, the dialog shown to the right opens. The dialog allows the user to select the types of dialogs that should be closed (all are selected by default) including

- Object, Account, and Slots
- RPL Dialogs (the highest RPL Set editors do not close)
- DMI Dialogs
- SCT Dialogs
- Other Dialogs



Then the **Close Dialogs** button closes the selected types. This utility never closes the **Workspace**. In addition, two types of dialogs are just minimized instead of being closed:

- **RPL Set editors**. Actually closing those dialogs would also remove the RPL Sets from the RiverWare session.
- **SCTs** not yet associated with (i.e. saved as) an SCT file.

As the text in the dialog shows, the user can also Shift-Click on the  button and it will close all the dialogs without first seeing the **Close Dialogs** window.

---

**Hint:** This tool is particularly useful when the user has opened many slot, object, or account dialogs and they wish to close all of them. If the user cannot even find the workspace in order to do this action, there is a menu option on most of those dialogs to **File ➔ Show Workspace....** Once the workspace is shown, the lightning bolt can be used to close all the dialogs.

---

## 4. The Canvas or Workspace Views

The canvas is the region within the workspace in which models are built and displayed. There are three versions of the canvas which display different “Views” of the objects and connection. The Simulation View displays a schematic of the basin; objects are linked together to form a network. The Accounting

View (when accounting is enabled) shows a similar schematic, but each object is displayed as a rectangle which contains all the accounts on that object. The third view, the Geospatial View, allows you to geo-reference objects and a background image. Because of the difference in how the network is displayed in each view, there are different configuration options for each canvas. The following sections describe each canvas and the configuration options.

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**Note:** Each canvas is configured separately. Although the configuration dialogs are the same for the Simulation and Accounting Views, their settings are not shared. Thus, you can configure each independently.

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## 4.1 Simulation View

The Simulation View displays a schematic of the basin; objects are represented by icons and are linked together to form a network. Note, the Simulation View was the original view in RiverWare. As such, most of the screenshots in the RiverWare documentation reference this view when describing models.

### 4.1.1 Canvas Properties

The canvas properties dialog is accessed:

- from the menu: **Workspace** ➔ **Canvas Properties**
- by right click on the workspace and then select **Canvas Properties**.

This dialog allows you to change the following attributes of the canvas:

- **Canvas Width:** number of pixels
- **Canvas Height:** number of pixels
- **Set Background Color**
- **Set Text Color**
- **Set Canvas Font** including the style and size

## 4.1.2 Background Image

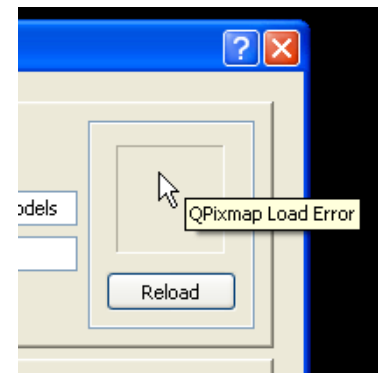
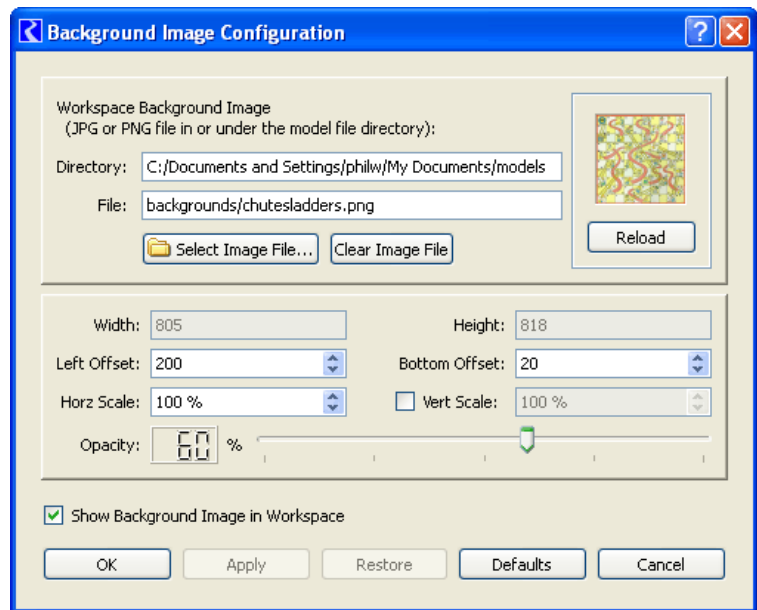
The Simulation Workspace supports the ability to show an image loaded from an image file (JPEG or PNG) as the background. The utility is accessed by right-clicking on the workspace and choosing **Background Image...**

The path of the selected image is preserved in the model file (if the model file is saved after configuring the background image). When loading a model with a configured background image file, if the background image file does not actually exist at the recorded path, the model loads without a problem, and the currently-invalid image file path is retained.

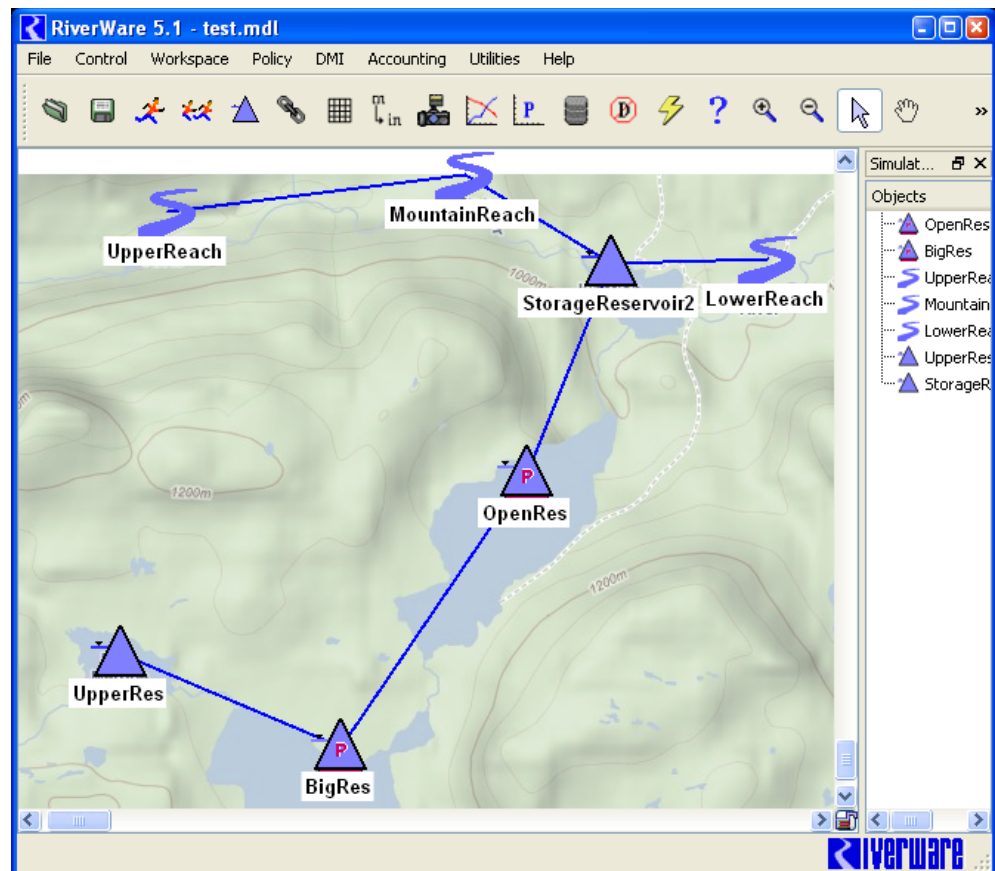
If the selected image file does not represent a valid, supported image file format, the thumbnail (small image preview) will be blank, and the Tooltip on the thumbnail will indicate an error. *See the image to the right.*

Configurable background image properties include:

- The image file path (to a JPG or PNG image file).
- The left offset of the image -- number of pixels from the left side of the workspace.
- The bottom offset of the image -- the number of pixels from the bottom of the workspace.
- The horizontal scale. (100% represents full image scale).
- An optionally independent vertical scale. (100% represents full image scale). If an independent vertical scale is not specified, the configured horizontal scale is used also for the vertical dimension.
- An opacity factor, as a percentage. Zero percent is completely transparent (invisible). 100% is complete opacity -- which generally is too opaque unless the actual image is already “faded”.
- A toggle indicating whether or not the background image should actually be shown. This has the same state as the similar toggle in the workspace’s context menu. *See the prior section.*



A typical use of a background image is a map. This works well if you can reasonably position the icons at approximate positions and/or you do not have or wish to use geospatial coordinate data. But, georeferencing is available on the Geospatial View [HERE](#) (Section 4.3).



## 4.2 Accounting View

If accounting is enabled, the accounting network is displayed in the **Accounting View**, and can be selected by the option menu on the toolbar. The accounting view provides a representation of the physical objects, as well as, the accounts on those objects where the network can be displayed without occluding or modifying the original physical network.

General configuration of the accounting view is identical to the Simulation View [HERE](#) (Section 4.1.1), but remember, the settings are not shared but are independent.

More information on the Workspace Accounting View, please see the Accounting Documentation [HERE](#) ([Accounting.pdf](#), Section 7.4).

## 4.3 Geospatial view

The Geospatial View of the workspace provides a spatially coherent display of the modeled basin by associating a map projection and its cartesian coordinate system with the view. Users locate objects and a background map image in this coordinate system, allowing RiverWare to display a schematic view of the modeled basin overlaid in registry with the map. That is, RiverWare objects are displayed at their

location on the map. By providing an intuitive and information-rich view of a basin, the Geospatial view complements the Simulation and Accounting views of the workspace.

The key features of the Geospatial View are:

- The Geospatial canvas has an associated map projection and location (rectangular extent) within the projection's coordinate system.
- A map image with a known location in the coordinate system can be displayed in the background layer of the view.
- Images can be georeferenced interactively or automatically via an accompanying world file.
- The background image (map) can be changed to another with the same projection without requiring any change to the spatial locations (geospatial view coordinates) of the objects.
- Objects are geo-referenced (given spatial coordinates) and displayed at that location.
- A distinction is made between an object's *display* and *actual* spatial coordinates.
- Object coordinates can be shared between models and external GIS applications.
- Additional control over the schematic view is provided including sizing and labelling of the icons.
- The coordinates of the mouse in the map projection are continuously presented in the status bar.

### 4.3.1 Introduction to GIS concepts

Graphical information systems (GISs) support storage, analysis, and display of spatial data. This section introduces some basic GIS terminology and concepts which are relevant to the Geospatial View.

Locations on the spherical earth are most often represented as a pair of coordinates representing latitude and longitude. For some applications, a third coordinate representing an elevation relative to mean sea level is also used. To display a part of the curved surface of the earth on a flat surface necessarily requires a projection, and GIS systems typically represent flat display locations as cartesian coordinates in a plane onto which the surface of the globe has been projected.

Several standards have been developed to provide agreed-upon coordinate systems for a given area. These standard coordinate systems define a set of map projections which together cover the target area. One common coordinate system which covers the globe is the Universal Transverse Mercator (UTM) coordinate system. This system defines a projection for the northern and southern areas of each of 60 longitudinal zones spanning the globe. For example, in the projection UTM Zone 11 North, the coordinates eastings = 397,800 m, northings = 4,922,900 m, corresponds to a location in central Oregon, USA.

Another standard coordinate system is the State Plane coordinate system which defines a set of projections for the United States. In this system, each state is divided into one or more zones, so a location is specified by a state, zone designation, and x, y coordinates.

Note that a standard coordinate system defines a mathematical coordinate system corresponding to each projection of a set of projections; when these two uses of the term "coordinate system" would be confusing, we use the term to refer to the standard, and use the term "projection" or "map projection" for the component (mathematical) coordinate systems.

Coordinates, whether they be geographic (latitude and longitude) or correspond to a map projection, are specific to a datum. A datum is a reference surface and surveyed coordinates for a set of actual points and lines. Examples of common datums include the North American Datum of 1983 (NAD83) and the World Geodetic System of 1984 (WGS84).

The Geospatial View has a map projection associated with it, and everything displayed in that view (e.g., object icons, background image) needs to be displayed in that projection. Because RiverWare assumes that a single projection is shared between the Geospatial View, the object coordinates, and the map, RiverWare does not need to know the mathematical details of that projection.

### 4.3.2 The Geospatial Canvas Configuration Dialog

The Geospatial View is most useful when a map of the basin exists for which some coordinates within the map projection are known. If this information is not available, consider using the Simulation View with a background image.

The Canvas Configuration Dialog allows you to specify information about your geo-referenced image and how it relates to the RiverWare workspace. It is accessed by:

- right clicking on the geospatial workspace and choosing **Canvas Properties**.
- using the **Workspace** → **Canvas Properties** menu when the Geospatial View is shown.

Following is a description of each part of the Canvas Configuration Dialog.

#### Projection / Coordinate System

**System:** In this panel, you provides information about the Geospatial View's map projection and coordinate system. Note that RiverWare requires that the projection's vertical and horizontal dimensions are the same. The user provides the following setting for the projection:

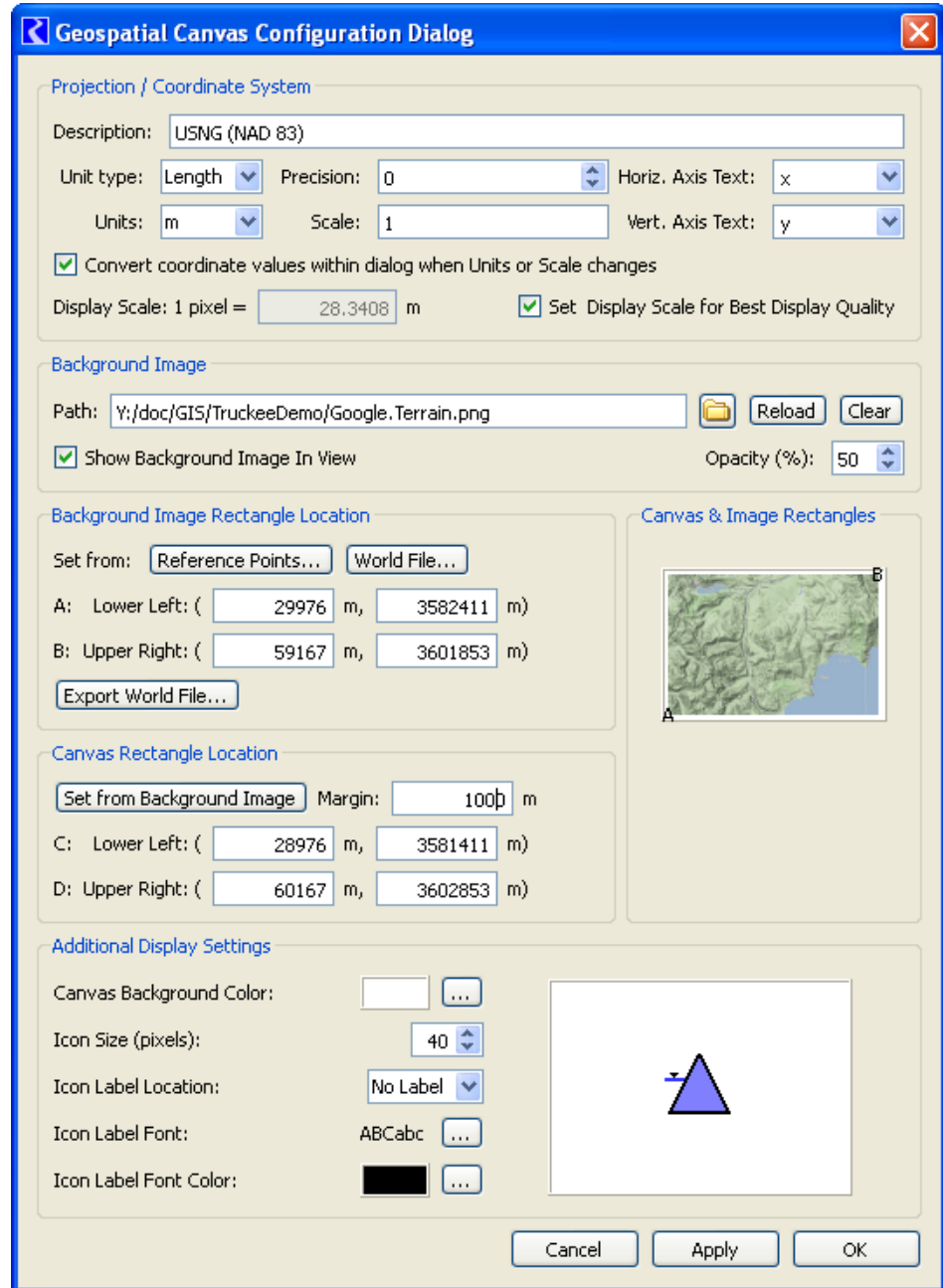


Figure 1: The Geospatial View's Canvas Configuration Dialog.

- **Description:** textual description of the projection. This could include a technical description of the projection such as “UTM NAD83 Zone 11N”, but RiverWare will not make any assumptions about the description contents. This text field is strictly a description for your use, and is not used elsewhere.
- **Unit type:** unit type of the projection coordinate system: Length or None.
- **User units:** the preferred units for displaying coordinates.
- **Scale:** the preferred scale for displaying coordinates.
- **Precision:** number of digits to the right of the decimal point with which to display coordinates.
- **Horiz. Axis Text:** label associated with the horizontal dimension of the projection’s coordinate system. It is usually “x” or “Easting” but you can also select <custom> and enter your own text.
- **Vert. Axis Text:** label associated with the vertical dimension of the projection’s coordinate system. It is usually “y” or “Northing” but you can also select <custom> and enter your own text.
- **Convert coordinate values within dialog when Units or Scale changes:** When you change units or scale, do you want existing values to be converted to the new units/scale.
- **Display Scale:** the projection units per pixel used for displaying the canvas on the screen at a zoom factor of 100%. This setting relates the projection to the screen display of the canvas. When the **Set Display Scale for Best Quality Display** box is checked, RiverWare sets this automatically, usually using the display scale which leads one pixel in the background image to be displayed as one pixel on the screen.

**Background Image:** Image files are specified by full path names with environment variable expansion. Currently two image formats are supported: JPEG and PNG. Environment variables are specified using the \$PATH syntax. If the image changes outside of RiverWare you may need to **Reload** it using the button.

When an image is loaded, RiverWare checks for the presence of an associated file in the world file format, a plain text file format developed by ESRI for georeferencing raster map images. If RiverWare detects a world file for the image, the user is presented with a dialog asking if they would like to use the contents of the world file to locate the image image in the projection’s coordinate system.

A valid world file contains 6 lines, each containing a floating point value, denoted here by the letters A-F. These values define an affine transformation from pixel coordinates to projection coordinates in the form:

$$x_1 = Ax + By + C$$

$$y_1 = Dx + Ey + F$$

where

$x_1$  = calculated x-coordinate of the projection location

$y_1$  = calculated y-coordinate of the projection location

$x$  = column number of a pixel in the image

$y$  = row number of a pixel in the image

$A$  = x-scale; dimension of a pixel in map units in x direction

B, D = rotation terms

C, F = translation terms; x,y map coordinates of the center of the upper left pixel

E = negative of y-scale; dimension of a pixel in map units in y direction

The Geospatial View assumes rectangular pixels with no rotation, thus not all map images that can be described with a world file can be displayed as background images. When a world file is loaded, RiverWare checks that B and D are zero and that A and E are equal, and notifies the user if one of these conditions is violated.

For many GIS applications, creating an image with a world file is relatively straightforward. For example, to do this in ArcMap 10.0, select File->Export Map...”, then check the “Write World File” checkbox option within the subsequent dialog. On the other hand, when this is not possible, the world file format is simple enough that it can be created by hand with a text editor.

Within the Background Image panel, you can also specify whether to **Show Background Image in View** and set the % **Opacity**.

**Background Image Rectangle Location:** In order to display the background image at the proper location on the canvas, RiverWare needs to know its location in the projection’s coordinate system. There are several alternatives for providing this information if RiverWare did not read it from a world file when the image was loaded. The first is to directly enter the coordinates of the lower left and upper right corners of the image’s rectangle.

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**Note:** When you enter a set of two coordinates (four values), you really only need to enter three values, RiverWare will compute the fourth.

---


Another option for registering the image is to click on the **Set from: World File** button. RiverWare will then present a file chooser dialog for specifying the world file containing the image’s georeferencing information.

If no world file is available and if the coordinates of the image corners are not known, then a third option is to provide coordinates for two specific locations in the map, in which case RiverWare will use these reference point coordinates to compute projection coordinates from the full image. To provide this information to RiverWare, select the **Set from: Reference Points** button. This opens the **Image Location Dialog** which displays a view of your image. For this utility, a reference point is a location for which you know the coordinates and you can locate in the image. Only 2 reference points are needed to locate the image in the projection coordinate system. As shown in the image, you do three steps


- Step 1.

Locate a reference point in the image. Use the zooming tools to get as close as possible to the first reference location. Click on the 


button and then click in the

image to locate the first reference point one. Zoom/Scroll to the 2nd reference location. Click on the second button 

- Step 2.

For the first reference point corresponding to , enter the coordinates in the dialog.

- Step 3.

For the second reference point corresponding to , enter either the x or y coordinate; the other coordinate will be computed by RiverWare.

Click **OK** to confirm the entry and close the dialog.

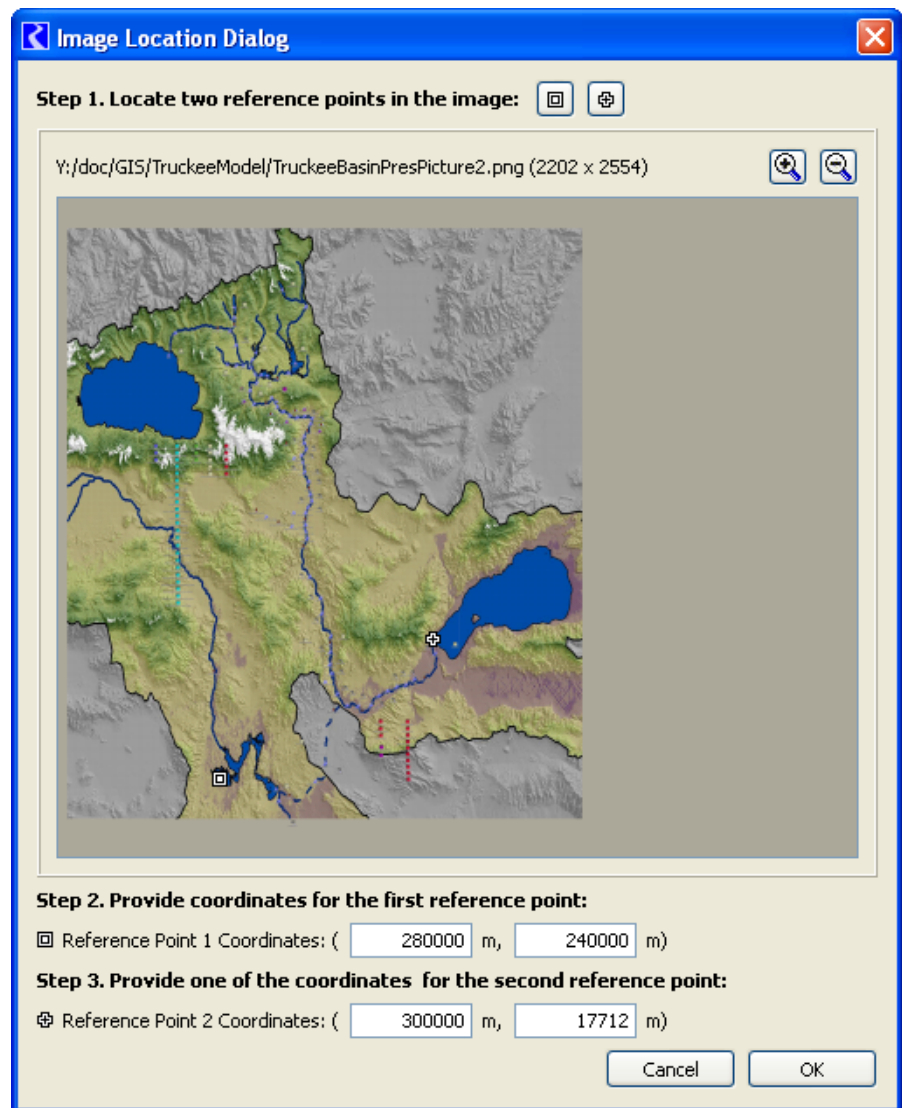


Figure 2: The Geospatial View's Image Location Dialog

If you have set the background image rectangle location interactively, either by entering the corner coordinates directly or by specifying the coordinates for two reference points, you can export the corresponding georeferencing information by selecting the **Export World File** button. RiverWare will allow you to select a file name and write the background image's georeferencing information to that file in the world file format. This file can then be used to automatically register the image within other RiverWare models or with any application that can supports the world file format.

**Canvas Rectangle Location:** In the Canvas Rectangle Location area, you specify where the canvas rectangle lies in the projection's coordinate system, by giving the coordinates of the lower left and upper right corners of that rectangle. Selecting the **Set from Background Image** button will set the location to be that of the Background Image with an optional margin added to each side.

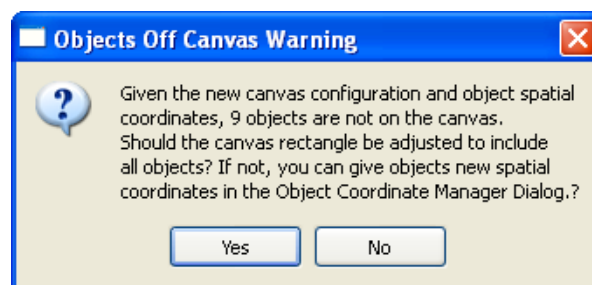
**Canvas & Image Rectangles:** This panel provides a high-level view of the canvas and image rectangles, drawn as rectangles whose size and relationship to each other matches that defined in the Background Image Rectangle Location and Canvas Rectangle Location panels. The locations of each coordinate (A, B, C, and D) are shown in the thumbnail.

**Additional Display Settings:** In this area, you can specify additional display settings for the geospatial workspace:

- **Canvas Background Color:** Click the button to bring up a color chooser.
- **Icon Size:** Enter a new value for the RiverWare icon size at 100% zoom factor. Note, the standard size is 40 pixels. Currently, this setting is “global” for the geospatial canvas. In the future, this may be changed to a per-object setting.
- **Icon Label Location:** choose the location of the label: below, above, left, right of the object. Note that **No Label** is an option. Currently, this setting is “global” for the geospatial canvas. In the future, this may be changed to a per-object setting.
- **Icon Label Font:** Provide a font and size for the label text.
- **Icon Label Font Color:** Choose a color for the object label text.

All selections in this frame are applied to the sample reservoir icon immediately, but are applied to your workspace when the **OK** or **Apply** button are clicked.

If you click **OK** or **Apply** and one or more Object Coordinates do not fall within the defined canvas boundaries, you will be prompted with the warning dialog shown. If you click **Yes**, the canvas will be extended to fit all objects. If you click **No**, the canvas boundaries will remain the same and objects will be off the canvas. You can then use the **Object Coordinate Dialog** (describe below) to reposition objects within the canvas.



Following are some strategies for dealing with overlapping icons which is sometimes called “icon clustering.”

- Use smaller icons and place labels to one side or the other.
- Give clustered objects **display** spatial coordinates that allow for a clear display, deviating somewhat from their **actual** coordinates as necessary.

### 4.3.3 Object Coordinates

To support the Geospatial View of the workspace, RiverWare associates coordinates in the view's projection with each object on the workspace. To provide more flexibility for the user, this is distinguished between **Actual** and **Display** spatial coordinates. Actual coordinates are the static coordinates of the object which may come from other sources. The display coordinates are the location where the object is shown on the geospatial view. Often the display coordinates differ from the actual coordinates because the object was moved slightly for less icon clustering or better display.

When an object is created, it is given a location in the Simulation and Accounting Views based on where you place the object. In the Geospatial View spatial coordinates will be initialized in a similar way. Then, RiverWare provide the following mechanisms to edit or specify spatial coordinates:

- The **Object Spatial Coordinates Manager** dialog displays spatial coordinates for all objects in a single dialog. This dialog supports editing of individual values as well as cut/paste/copy (see section below for more details). This also provide a mechanism to facilitate reconciliation of an object's actual and display spatial coordinates.
- Moving an object's icon in the Geospatial View (by using the drag and drop) will change the object's **Display Coordinates** accordingly.
- Import the **Actual Coordinates** from an ESRI shape file.

Following is a description of the Object Coordinate Manager Dialog which is used to edit/view object coordinates. The **Object Coordinate Manager** is non-modal and accessed by right-clicking on the main workspace (in the Geospatial View) and then selecting **Object Coordinates...**

The **Object Coordinate Manager** dialog displays both the display and actual spatial coordinates for all workspace objects. This dialog supports editing of individual fields as well as cut/paste/copy. For each object, both the display and actual spatial coordinates are displayed. Following are operations that you can perform through the dialog:

- **Sort:** Objects in the table can be sorted using the Sort pulldown menu. There are options to sort by Object Type, Object Name, Display X or Y, Actual X or Y, and Custom. To use the Custom sort, highlight one or more objects and use the blue up and down arrows to sort the objects.
- **Editing:** Values in the dialog are only editable when the appropriate **Enable Editing** toggle is selected. Then, double click on a value and type in a new number.
- **Show Data Objects:** The Show Data Objects toggle allows you to specify whether you wish to see data objects.
- **Show on Workspace:** Select one or more objects, then right-click and select **Show on Workspace** to highlight and select the objects on the workspace.
- **Copy Display/Actual Coordinates to the other:** The **Operations** menu has options to **Copy Display Coordinates to Actual Coordinates** and **Copy Actual Coordinates to Display Coordinates**. This allows you to move coordinates easily between the display and actual. Note, these operations copy ALL values in the column, not the selected ones. When you do this operation, it may overwrite data. Thus, a warning dialog is provided for you to confirm or cancel the operation.
- **Export Copy/Import Paste Values:** You can copy or paste any value(s) to/from the system clipboard and then to/from external text or Excel files or back to this dialog. This gives you a lot of flexibility in how you move data. Notes, when you copy/paste values, it is operating on the selected values in the sort order as it is displayed. There is also an option to **Export Copy with the Object Names** to also export the RiverWare object name. These operations are available from the right click context menu.
- **Importing/Exporting Coordinates:** Import and export spatial coordinates through the ESRI shape file format. In this context, the shape file format is a collection of three files with different suffixes:

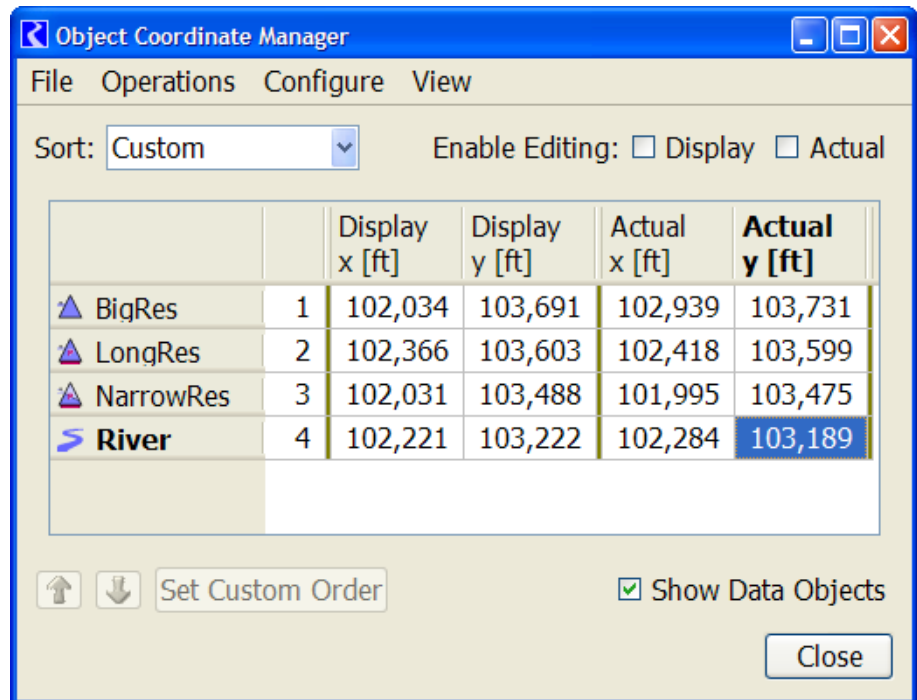


Figure 3: The Object Coordinate Manager Dialog

- .shp - objects represented as points.
- .shx - indices into .shp file
- .dbf - object attributes (initially object name and object type)

RiverWare supports export of the spatial coordinates of all or selected objects. When coordinates are imported, the user will be warned that the existing coordinates will be overwritten and notified when coordinates for unknown objects are encountered.

Following is a diagram of the possible movement of coordinate data within RiverWare. Note, any operation using the system clipboard involves a Copy/Cut/Paste which involves Export Copy and Import Paste within RiverWare.

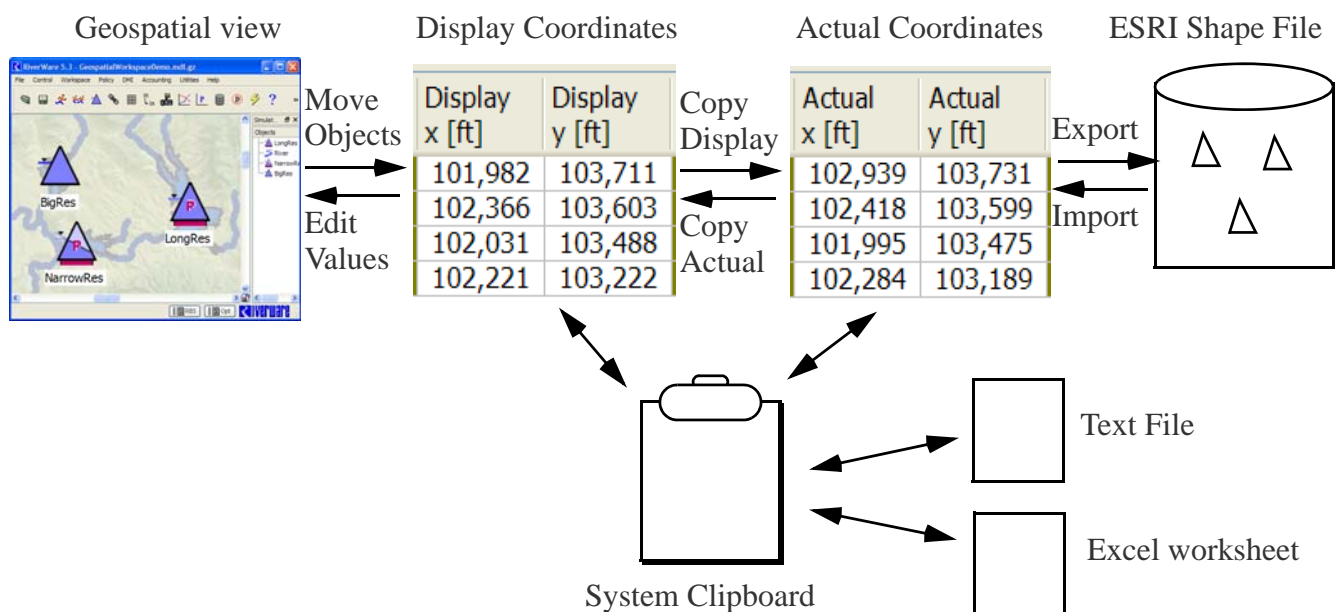


Figure 4: Data Operations in the Object Coordinate Manager Dialog


## 5. Objects on the Workspace

The workspace displays the objects representing features in the basin. The object icons are a convenient way to visualize the physical layout of a modeled system. These objects also contain the data and the physical process algorithms that drive the simulation. This section describes how to manage objects on the workspace.

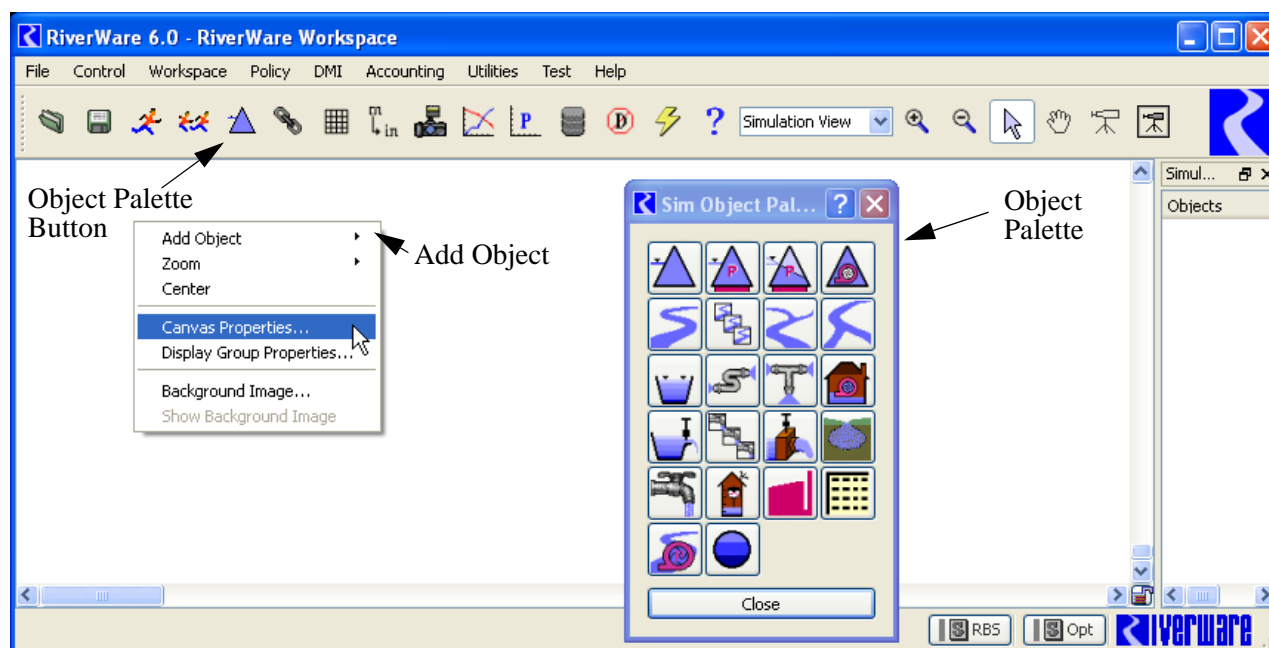
### 5.1 The Object Palette

Objects are added to the workspace using the object palette. The **Palette** contains all of the available object types used to represent features of a river basin. It is the source from which objects are

instantiated on the workspace. To place objects on the workspace, drag them off the object palette and place them in the desired location on the workspace. The object palette is accessed:

- by clicking on the object palette selector button on the main toolbar. 
- selecting **Workspace** ➔ **Objects** ➔ **Object Palette from the menu bar**.
- by right clicking with the mouse on the workspace. This will bring up a small window with the option to **Add Object**. Selecting the “add object” option opens a list of all objects. Clicking on the desired object will place it on the workspace.

The coordinates of the objects on the workspace are saved with the model so that objects will remain in position.



## 5.2 Pulling Objects off the Palette

An object is created by clicking on its icon and dragging it off the **Palette** onto the workspace. At the time an object is created, default attributes are defined by several sources. The first timestep and timestep size in SeriesSlots are matched to the **Run Control** run time settings. Display units and other slot configurations default to internal RiverWare units and configurations, unless other settings are specified in the RiverWare Resource Database (RiverWareDB) file. Default user methods are also selected for new objects. Slots associated with the selected controller and Methods are allocated in memory. For more information on each type of object, click [HERE \(Objects.pdf\)](#).

## 5.3 Selecting Objects

Objects can be selected for various reasons such as moving them, deleting them, or adding them to a subbasin. Once an object or group of objects has been selected, it will be highlighted both on the workspace and in the dockable listview window.

There are three ways to select an object on the workspace:

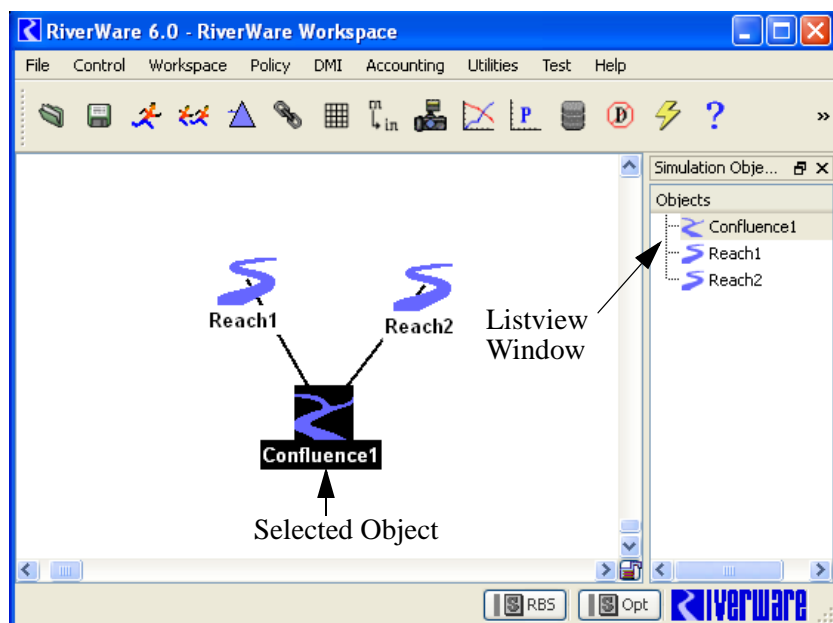
- Single clicking on the object's icon.
- Drawing a rectangle around the object. To select multiple objects at the same time, draw a rectangle around a group of objects.
- Single clicking on the object in the dockable listview window. Holding down <ctrl> or <shift> on the keyboard allows selection of multiple objects in the listview window.

## 5.4 Deselecting Objects

To deselect an object or group of objects simply click on a blank area in the workspace. Single clicking on a selected object in the listview window and typing <ctrl> will also deselect the object.

### Deleting Objects from the Workspace

- Deleting objects from the workspace is accomplished by selecting one or more objects, then right-clicking one of them. Selecting **Delete Object** from the menu. A confirmation dialog appears to inform that the Selected Objects will be removed from workspace.



This deletion can also be accomplished by selecting one or more objects and pushing the **Delete** key or by selecting the objects and using the main menus: **Workspace** ➤ **Objects** ➤ **Delete Selected Object(s)**. In both cases, confirmation is still required.

## 5.5 Moving Objects on the Workspace

An object can be moved by selecting it and holding down the mouse button while dragging the object to the desired location. This will readjust the links to the object as well. A set of selected objects can be moved while maintaining their relative positions. The selected objects remain visible on the workspace during the move. Moving objects will change the **Display Coordinates** on the Geospatial view but will not change the **Actual Coordinates** described [HERE \(Section 4.3.3\)](#).

## 5.6 Lock Icon Positions Controls

The moving of Simulation Object icons on the Workspace can be disabled by locking icon positions as follows:

- The Lock Icon Button in the corner between the two Workspace scrollbars.
- The menu **Workspace** ➔ **Lock Object Positions**



## 5.7 Show Commas in Numbers

RiverWare gives the option to show commas as a thousands separator in slot values (slot dialogs, SCT, accounts, and exchanges) and numeric values entered into a RPL expressions. Commas are shown by default but can be turned off by clicking on the **Workspace** ➔ **Show Commas in Numbers** option. When the option is selected, all values will update automatically.

## 5.8 Clearing the Workspace

All objects can be cleared from the workspace using the following action: **Workspace** ➔ **Clear Workspace**. A confirmation dialog appears warning that all objects on workspace will be removed. All rulesets will also be cleared and any unsaved changes will be lost.

## 5.9 Importing and Exporting Objects

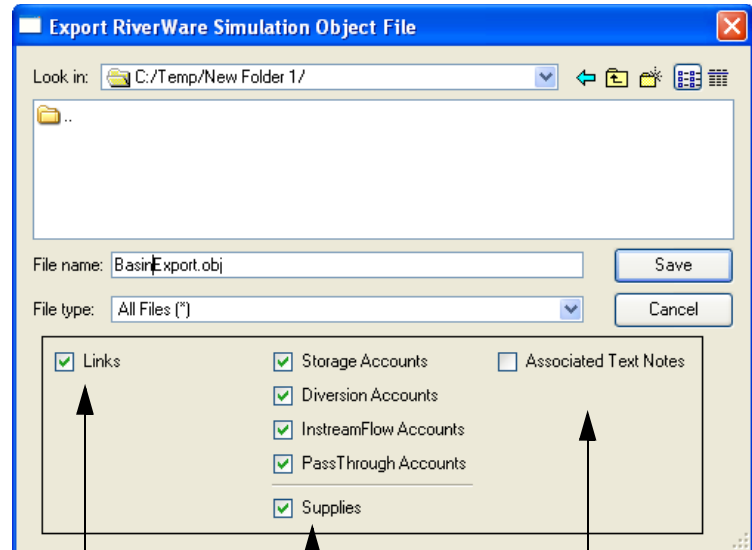
Objects can be exported to a file and then imported into the same or another model. Exporting one or more objects includes exporting slot data, method selections and optionally links, accounts and supplies. Objects can be imported and exported to and from the workspace as follows:

### 5.9.1 Export

To **export**, first select, one or more objects. Then select **Workspace** → **Objects** → **Export Object** from the main workspace. The user is then presented with a dialog used to specify how the object(s) should be exported and to which file the object(s) should be written.

The following options are available for exporting depending on the model and possibly the selected objects' components.

- **Links:** Specify whether to write **Links** between slots.
- **Accounts:** In an accounting model, select the type of accounts to export: **Storage, Diversion, Instream Flow, and/or Passthrough** accounts.
- **Supplies:** In an accounting model, specify whether supplies should be exported.
- **Text Notes:** Specify whether to write **Associated Text Notes** - Click [HERE \(Slots.pdf, Section 5\)](#) for more information on text notes.



Export Links

Export  
Accounts and/or  
Supplies

Export Text  
Notes

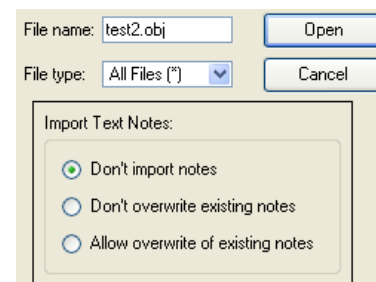
When exporting objects and links, only those links between exported objects will be written. Similarly, only those supplies between exported accounts will be written. In addition, the following are not exported:

- Subbasin membership of exported objects
- Computational subbasins
- Workspace display groups including Link, Object, Supply, and Account Groups
- Accounting exchanges including paybacks
- Accounting user defined object level methods - These may be exported separately from the RPL set. Note that method selection is exported on objects. It is important to export/import the object level accounting methods first as imported objects cannot reference methods that do not exist in the model
- For snapshots data objects, the reference to the original slot. When plotting slots and their snapshots from the output manager, the output manager cannot automatically plot a slot and its imported snapshots.

## 5.9.2 Import

To **import**, use the **Workspace** ➤ **Objects** ➤ **Import Object** menu from the RiverWare workspace. On import, the objects will have the same name as the original object unless an object by the same name already exists in the model. In this case, an integer is added to the object's name. The following options are available on import.

- Specify whether text notes should be imported as follows (Click [HERE \(Slots.pdf, Section 5\)](#) for more information on text notes):
  - **Don't import notes**
  - Import but **Don't overwrite existing notes**
  - Import and **Allow overwrite of existing notes**



Imported objects are automatically selected (highlighted). Typically the user will then move all of the imported objects immediately to the desired location by dragging them on the workspace. This is especially true if they are on top of other objects. While the objects are still selected, it may be useful to create a subbasin of these objects so they may be easily selected later. Click [HERE \(Subbasins.pdf, Section 2\)](#) for information on how to create a subbasin from the selected objects.

Following are the limitations when importing objects. Objects are similar to model files, they can only be imported in models that have the same or higher version number, e.g. an object exported from a 5.0 model can only be imported into RiverWare 5.0, 5.1, etc.

On import, the objects will be placed at the same coordinates as the objects in the model from which they were exported in both the simulation and accounting views. If the workspace is too small to accommodate these new objects, the workspace will grow to exactly fit the imported objects (including a small border). Note, before RiverWare before 5.0, the coordinates of the objects on the accounting workspace were not exported. Therefore, if these objects are imported, they will be placed in the default location.

In an accounting model, if an account has the same priority date as an existing account in the model, 1 second is added to the priority date of the imported account and a warning message is posted.

When an object or supply is imported and the name already exists in the model, the newly imported objects will be renamed by adding a number to the end of the name. The supplies will then be renamed using the default supply naming convention, “Object# Account to Object# Account”. A warning message is posted. If this new name is not available, because of multiple supplies between the same two accounts, the word “DUPL” is added to the end of the supply name to make it unique. These supply names can be changed from the account configuration. Accounts should not need to be renamed as account names are not unique only the object names are.

## 5.9.3 Export/Import Tips

There are a number of scenarios in which import/export of objects could be useful. One such example is when a team of modelers wish to break up a model and have various people work on different components. Following are some tips for this process.

Each team member would take the full model and then pare it down to the desired objects, do the modeling work and then re-combine the pieces into one model. To pare down a model, it is typically better to delete unused objects than to export and re-import the desired objects into another model. By deleting objects, the Run Control parameters--run range, timestep length, controller, settings--are preserved. Also, the output devices, DMI's, object level accounting methods are then available in the pared down model.


To then re-combine the model with the original, it is best to delete the objects from the original model and then import the new objects from the pared down version(s). This prevents naming conflicts and having to re-name newly imported objects.

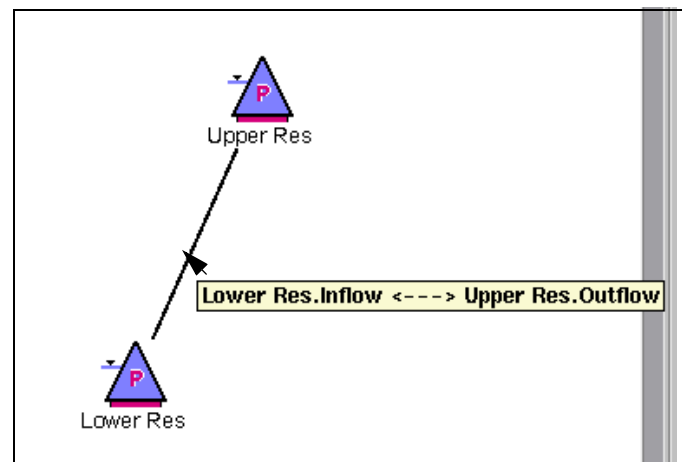
## 6. Links on the Workspace

Links are the connections between slots on objects which pass information during a simulation run. They propagate a value from a slot on one object to a slot on a different object. Several links may exist between different slots on two objects, but only one line is represented on the workspace. There are two methods for viewing, creating and deleting links in RiverWare: **Edit Links** dialog, described [HERE \(ModelBuilding.pdf, Section 6.2\)](#), and “Quick Links”. Using quick links is typically the easiest way to view, create, and delete links. Quick links consist of using the right-mouse button and the resulting context menus, and is described below.

### 6.1 Viewing Links

In models with many links, it can be difficult to determine which objects and slots a particular link is connecting. By hovering over the link with the mouse cursor, all the connected objects and slots associated with that link are displayed in a tool-tip pop-up window as shown. The link name is also shown in the workspace status bar (lower left corner). This can be useful because as long as the mouse is over the link, the name is shown in the status bar. Tool tips only show the name for a few second.

Also, in the **Open Object, Slots** tab, linked slots are marked with a . Right clicking on a linked slot brings up a context menu. Highlighting **Linked Slots** displays a list of all slots linked to the selected slot. Clicking a slot on this context menu will open that slot.



## 6.2 Creating Links

Quick links can be used to create links by first clicking on an object with the right mouse button. A context menu dialog appears. Selecting **Link** then prompts the user to select a slot to start a new link. A link is started. Then, the user selects another object to which the link will end, again starting with the right mouse button. The user then clicks **Link** and is prompted to select a slot on that object. After a slot is selected, the link appears on the workspace connecting the two objects.

## 6.3 Deleting Links

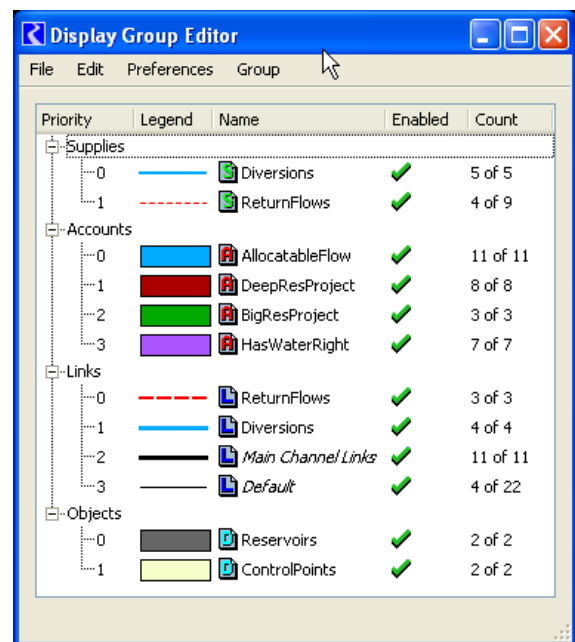
Links can be deleted between objects by hovering over the link with the cursor and right clicking. This brings up a context menu with the option to **Delete Link**. Mousing over the **Delete Link** menu will bring up a list of all the links in that location. Selecting a link from the list will cause that link to be deleted.

# 7. Display Groups

The appearance of links, objects, accounts, and supplies on the workspace can be manipulated using the Display Group Editor. The dialog is accessed by:

- Selecting **Workspace** ➔ **Display Group Properties** or
- right clicking with the mouse on the workspace and choosing **Display Group Properties**.

This brings up a window with the option to select **Display Group Properties**. The Display Group Editor provides the ability to create groups of links, groups of objects, and if accounting is enabled, groups of supplies and groups of accounts. The display properties and the membership of a group can be changed by double-clicking on that group. The membership of the groups need not be mutually exclusive. The groups are prioritized. For example, if two link groups contain the same link, the group highest in the list (lowest priority number) will be used to set the display properties of that link. Display groups can be enabled and disabled by clicking on the checkmark in the **Enabled** column.

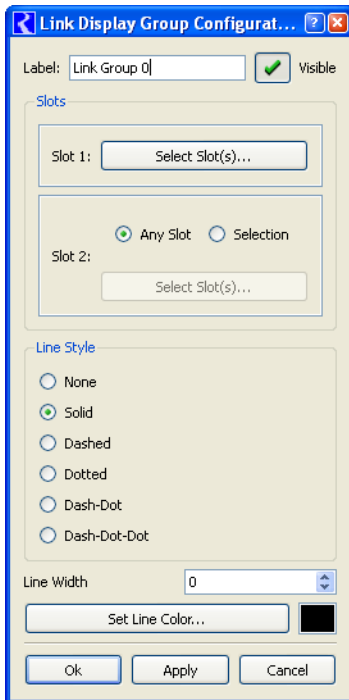


The **Count** column provides information on the number of items in the group of the form XX of YY

where YY is the number of items in the group's set selection, and XX is the number of those items which are governed by that group (i.e. not currently governed by an enabled, superior group).

Note: The counts are not automatically updated if you delete objects, accounts, links, or supplies. The counts can be updated manually with the **Groups** ➔ **Update Item Counts** menu item. They are also updated when the Display Group Editor dialog box is reshown.

## 7.1 Link Groups

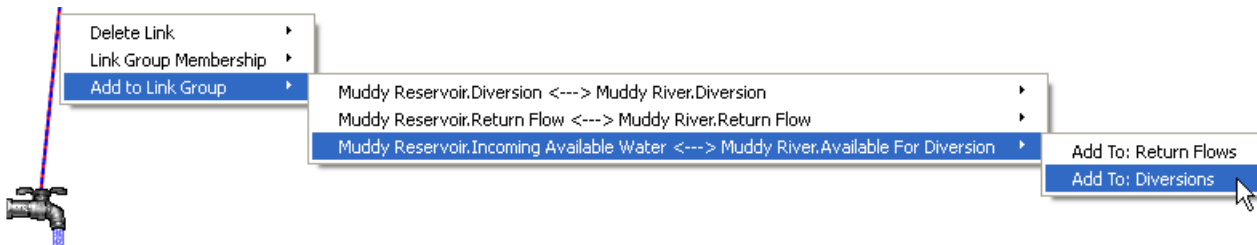


A link group can be created by selecting **Group** ➔ **Add Link Group** in the Display Group Editor. Double-clicking on the new link group entry will bring up the Link Display Group Configuration dialog. The membership of the group and the line style, visibility, color, and width of the group members can be set with this dialog. The membership of the group is controlled by selecting one or both of the links' slots. Pressing either of the **Select Slots(s)...** buttons will bring up a slot selector dialog.

### 7.1.1 Selecting Links

From the Workspace, a link can be added to link group by right-clicking on the link(s) between two objects, mousing over the **Add to Link Group** option, mousing over the desired link (there can be multiple links on the same “line” between two objects), and selecting the desired **Add to:** <link group>.

Equivalently, links can be added to a link group within the Display Group Editor. This approach allows multiple links to be added to a link group at once. By double-clicking on the desired link group, the Link Display Group Configuration window is opened. The slot on one end of the link is selected by clicking **Select Slot(s)** in the **Slot 1** field. If the **Any Slot** toggle is selected in the **Slot 2** field then all links to any of the slots listed in the **Slot 1** field will be associated with the display group. While the Link Display Group Configuration dialog does not display the links associated with a particular group, the slot selector dialog “remembers” the selected links. Therefore, the user can view the links associated with a group by clicking on the **Select Slots(s)...** button. To make a more specific selection of links, slots can be selected in the **Slot 2** field if the **Selection** toggle is enabled. Only those links that are connected to a slot in the **Slot 1** field AND the **Slot 2** field will be associated with the display group.

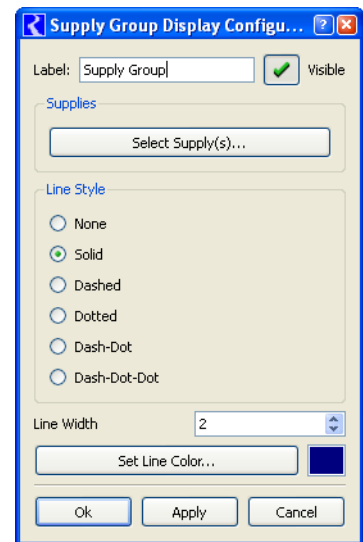


## 7.1.2 Predefined Link Groups

Two predefined link groups are provided for all models: *Main Channel Links*, and *Default*. The *Main Channel Links* group contains all links between main channel upstream slots and main channel downstream slots. The *Default* link group contains all links on the workspace.

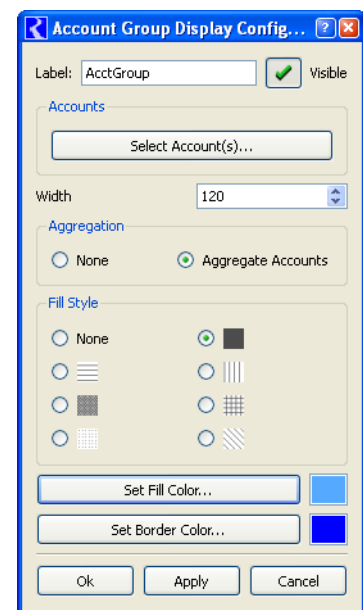
## 7.2 Supply Groups

Supply groups are active only if accounting is enabled. A supply group can be created by selecting **Group** ➔ **Add Supply Group** in the Display Group Editor. Double-clicking on the new supply group entry will bring up the Supply Display Group Configuration dialog. The membership of the group and the line style, color, and width of the group members can be set with this dialog. The membership of the group is controlled by pressing the **Select Supply(s)...** button. More information on Supply Groups is given [HERE \(Accounting.pdf, Supply Groups\)](#).



## 7.3 Account Groups

Account groups are active only if accounting is enabled. An account group can be created by selecting **Group** ➔ **Add Account Group** in the Display Group Editor. Double-clicking on the new account group entry will bring up the Account Display Group Configuration dialog. The membership of the group and the fill style, fill color, account width, account aggregation, and border color of the group members can be set with this dialog. The membership of the group is controlled by pressing the **Select Account(s)...** button. If account aggregation is selected, the selected accounts, on a particular simulation object, will be collapsed into one icon. The icon will appear as a “stacked” group of accounts to indicate the presence of more than one account. An account can also be added to an Account Display Group by right-clicking on the account on the workspace, mousing over **Add to Account Group**, and clicking on the desired Account Display Group. If the account is already a member of an Account Display Group, this option will be replaced with **Account Group Membership**. Mousing over this option will show the display group to which the account belongs. More information on Account Groups is given [HERE \(Accounting.pdf, Account Groups\)](#).



## 7.4 Object Groups

The display options associated with object groups apply to both the Simulation View and the Accounting View of the RiverWare workspace (some options apply only to accounting). An object group can be created by selecting **Group** → **Add Object Group** in the Display Group Editor. Double-clicking on the new object group entry will bring up the Object Display Group Configuration dialog. The membership of the group and the fill style, fill color, visibility, drawing layer, and border color of the group members can be set with this dialog. The membership of the group is controlled by pressing the **Select Object(s)...** button. An object can also be added to an Object Display Group by right-clicking on the object on the workspace, mousing over **Add to Object Group**, and clicking on the desired Object Display Group. If the object is already a member of an Object Display Group, this option will be replaced with **Object Group Membership**. Mousing over this option will show the display group to which the object belongs. The fill style, fill color, and border color apply only to objects in the Accounting View as indicated in the Object Display Group Configuration dialog. The Drawing Layer option is useful when simulation objects are stacked on top of each other on the workspace. The user can control the order of the layering or stacking by specifying the Drawing Layer. Objects with a higher priority Drawing Layer (lower numerical value) will be displayed on top of objects with a lower priority Drawing Layer.

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## 8. Exporting and Printing Model Images

It is possible to export or print an image of the workspace for use in presentations or other graphic applications.

### 8.1 Exporting Model Images

Selecting **File** → **Export Workspace Image** brings up the options to export the entire workspace image or only the visible portion of the workspace. The image can be saved in the following formats: PNG, BMP, JPG, PMB, PGM, PPM, XMP, or XMB. It is also possible to specify image resolution, width, and height in the export dialog.

In general, users will get the best results if they use PNG instead of JPG. PNG is very much like GIF, but has an open specification. (GIF is proprietary). JPG is lossy, but best for images with a lot of continuous variation. GIF and PNG are non-lossy for images with a limited number of colors (no more than 256 colors, which is the case with riverware workspace images, for the most part) -- and they compress really well for images with large blocks of solid color (also an attribute of the workspace). Also, GIF and PNG are much cleaner for the purpose of workspace and plot images. With JPEG, the user may see “wiggles” on edges.

## 8.2 Printing Model Images

The print option prints the entire workspace image. To print the workspace, select **File** ➔ **Print**, which brings up the Setup Printer dialog. In this dialog, various printing options can be selected.