

Chapter 5

Working with the Stream Alignment

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Chapter 5

Working with the Stream Alignment

The **Stream Alignment**, illustrated in Figure 5.1, represents the river system in the watershed. It indicates where confluences and bifurcations occur and provides a sense of distance and scale.

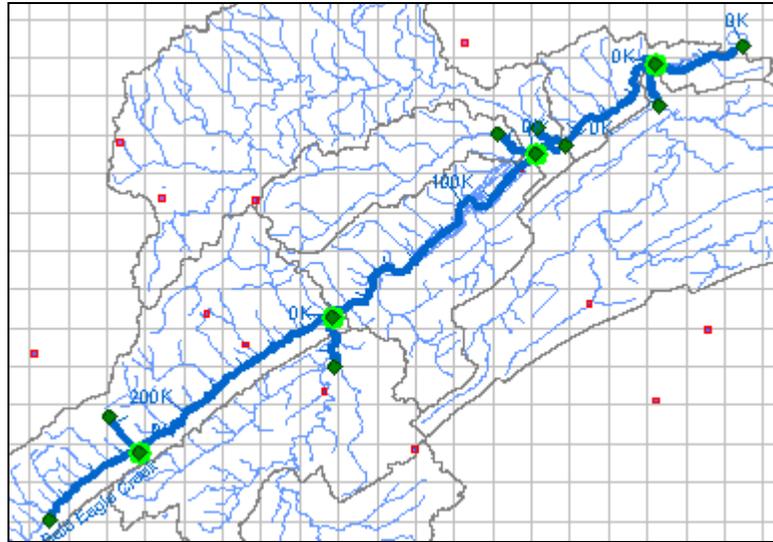


Figure 5.1 Stream Alignment

In the **Watershed Setup Module**, Stream Elements (Figure 5.2), Stream Nodes (Figure 5.3), and Stream Junctions (Figure 5.4) are the components of a Stream Alignment.

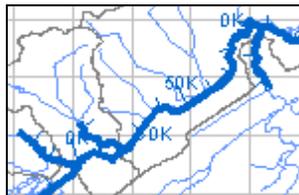


Figure 5.2 Stream Elements

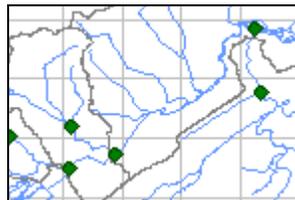


Figure 5.3 Stream Nodes

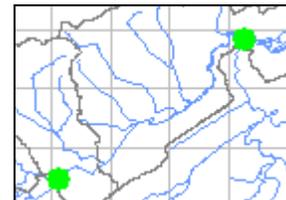


Figure 5.4 Stream Junctions

When you create a Stream Alignment, you draw it as a set of connected, multi-segmented lines. The Stream Alignment must have at least two nodes, defining the beginning and end of a stream element. Figure 5.5 illustrates the relationship of line segments, stream elements, and the Stream Alignment.

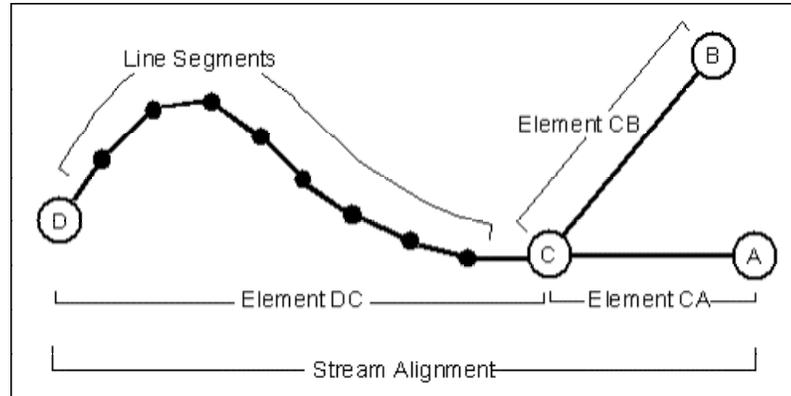


Figure 5.5 Relationship of Line Segments, Stream Elements, and Stream Alignment

ResSim creates and labels stream stations (or river stations) automatically along each stream element. By default, the station at the downstream end of an element is Station 0 (zero), and the stationing increases upstream along the element according to the linear distance between nodes on the stream element in the watershed coordinate system. You can override the default stationing by editing the station values of the stream nodes at the upstream and downstream ends of the stream element, as well as by adding additional nodes along the stream element.

Stream stationing is based on the geographic extents you define when you draw a stream element. If you have set the geographic extents to represent feet, either manually or by importing a layer projected in feet, the station labels will represent feet.

After you have drawn a Stream Alignment in the display area, you can edit, rename, delete, and move its component stream elements, stream nodes, and stream junctions using the Stream Alignment shortcut menus.

5.1 Creating a New Stream Alignment

You must be in the **Watershed Setup Module** to create a Stream Alignment in ResSim. Although it is not necessary, you will find it useful to display a background map of the river system as a guideline for creating your stream alignment. If your stream alignment is going to be based on a map layer, the map layer should already have been included in the watershed by copying the map files into the “maps” directory. The map layer should contain water features, such as stream channels and reservoirs or lakes. Use this map layer as a guide while creating the stream alignment. By doing this, the units of the labels on the stream alignment will be the same as the units of the water feature layer (i.e., if your water feature layer is projected in state plane coordinates (feet), then the labels on the stream alignment will be in feet). Refer to Chapters 3 and 4 for more information about adding and displaying maps.

You can either digitize a stream alignment by hand or import a stream alignment from an ArcView® shapefile. The following are the steps for digitizing a stream alignment (see Section 5.3 for details on importing a stream alignment).

To create a stream alignment:

1. You must be in the **Watershed Setup Module**. On the **Module** list, select **Watershed Setup**.
2. On the map toolbar, press the **Stream Alignment Tool** .
3. Determine an *upstream* location where you want to start a stream element (typically, you will begin at the upstream end of the mainstem and end at the most downstream location of the primary river in your watershed).
4. Hold down the **CTRL** key. Starting at the *upstream* end, draw the stream element by clicking the left mouse button at each vertex point as illustrated in Figure 5.6.

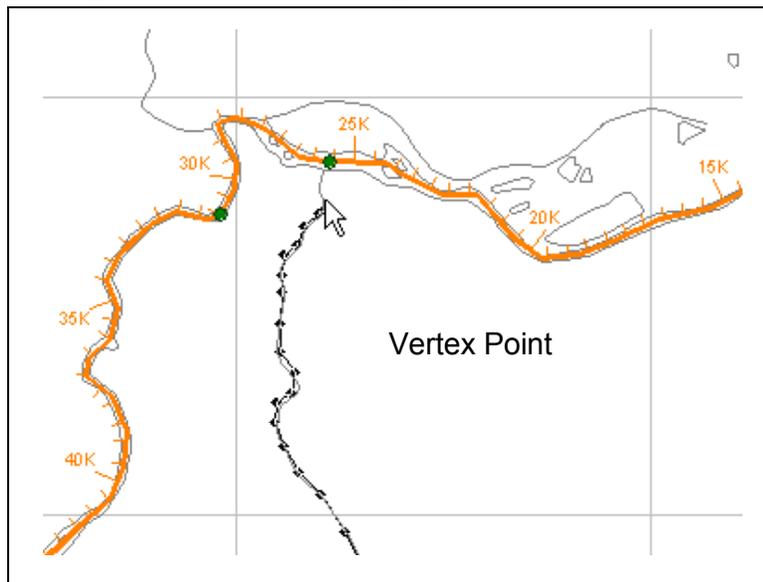


Figure 5.6 Drawing a Stream Element

5. Continue *downstream* (while *continuing to hold down the CTRL* key) and before placing the last point of the stream element, release the **CTRL** key, and then click the left mouse button at the last downstream location. This creates the ending stream node of the stream element.
6. The **Create New Stream** dialog box (Figure 5.7) opens. You can either accept the default name or enter a new name. Also, you can enter a description for the stream element. Click **OK** to close the **Create New Stream** dialog box.

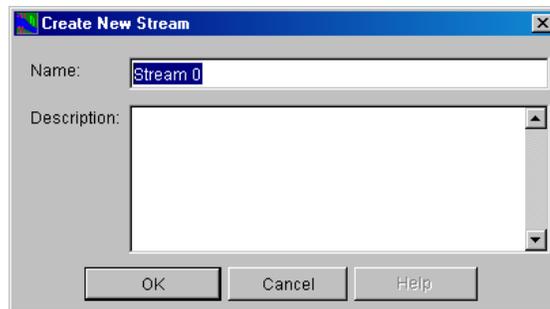


Figure 5.7 Create New Stream Dialog Box

7. Repeat steps 4 through 6 to add more stream elements to your stream alignment.
8. To create a confluence or bifurcation, end the stream element by clicking directly on an existing stream element. After naming the new stream element, the **Connect Stream Reaches** dialog box (Figure 5.8) will appear. You need to determine whether you want to connect the new stream element to the existing stream element. Click **Yes** if you want the two stream elements connected; otherwise click **No**. If you selected **No**, and if there are additional existing streams that are possible candidates for connecting your new stream element to, then a subsequent **Connect Stream Reaches** dialog will appear to give you the opportunity to connect to the existing stream.

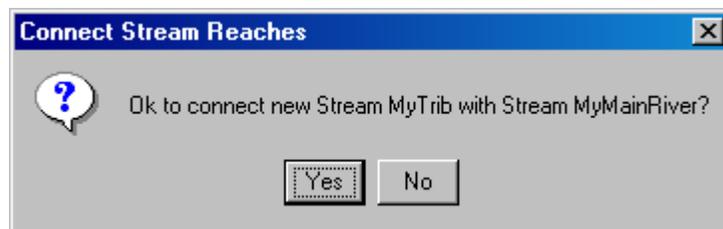


Figure 5.8 Connect Stream Reaches Dialog Box

When multiple stream elements are connected (e.g., at a confluence), a stream junction is automatically created and appears as a highlighted green circle (a “light green halo”) as shown in Figure 5.9.

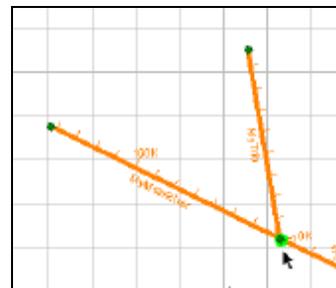


Figure 5.9 Stream Junction

9. Once you have completed the creation of your stream alignment, save your work. From the **File** menu, select **Save Watershed** and the stream alignment for your watershed will be saved.

5.2 Editing an Existing Stream Alignment

After drawing a stream alignment in the display area, there are many options available for revising your stream alignment. To edit your stream alignment, you must be in the **Watershed Setup Module**. The **Zoom Tool** can be used to help magnify the stream network, thus providing more detail to make editing the stream alignment easier.

This section describes the following capabilities for editing your Stream Alignment:

- ❖ how to refine and re-shape your stream alignment (by moving/adding/deleting vertex points of the stream elements)
- ❖ how to review stream stationing and provide a stream element description (by using the stream element editor)
- ❖ how to rename and delete stream elements
- ❖ how to add and edit stream nodes (for defining stream stationing)
- ❖ how to move and edit stream junctions
- ❖ how to reverse the flow direction of a stream element
- ❖ how to disconnect a stream element



Since the Stream Alignment may be referenced by other models, care should be used when making any changes to it.

5.2.1 Moving Vertices of a Stream Element

To move a vertex of an existing Stream Element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, double-click anywhere on the stream element. The stream element you select will turn red and all the vertices of that stream element will turn blue.
3. Click on the vertex you want to move, and drag it to a new location, as illustrated in Figure 5.10.

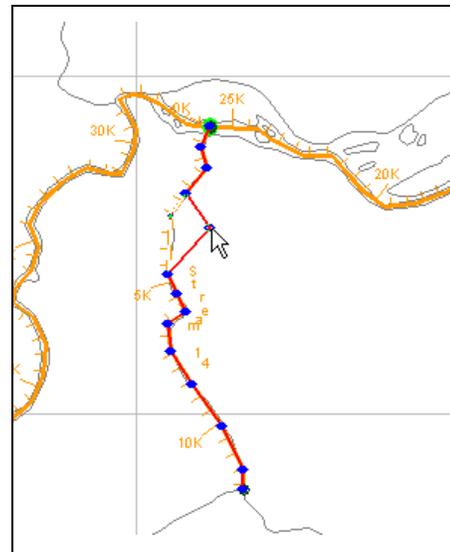


Figure 5.10 Moving Stream Element Vertices

5.2.2 Adding Vertices to a Stream Element

To add vertex points to an existing stream element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, double-click anywhere on the stream element. The stream element you select will turn red and all the vertices of that stream element will turn blue.
3. Place the pointer on the selected stream element where you want to add a vertex point. Hold down the **CTRL** key and click. A blue point will appear on the selected stream where you have added a vertex point.

5.2.3 Deleting Vertices from a Stream Element

To delete vertex points from an existing stream element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, double-click anywhere on the stream element. The stream element you select will turn red and all the vertices of that stream element will turn blue.
3. Hold down the **SHIFT+CTRL** keys and click on the vertex point to be deleted. The blue vertex point will disappear from the stream element, and the stream will straighten between the two adjacent vertices.

5.2.4 Editing a Stream Element

To edit a Stream Element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, right-click on the stream you want to edit.
3. From the shortcut menu (Figure 5.11), select **Edit Stream Element** to open the **Stream Editor** (Figure 5.12).

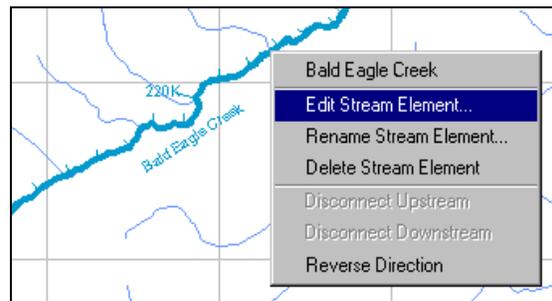


Figure 5.11 Stream Alignment Shortcut Menu

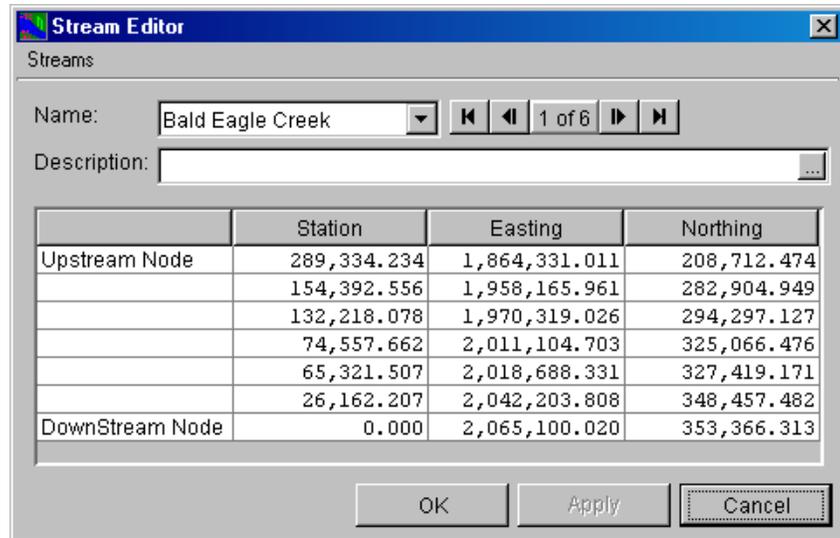


Figure 5.12 Stream Editor

The **Stream Editor** displays a summary of the stream name, description, stationing, and coordinates for a stream element. *You can edit only the description.*

Stream name:

The Stream Editor displays the name of the Stream Element you have selected in the list along with all available Stream Elements in the watershed. Also, left and right arrows (navigator buttons) allow you to click through the Stream Elements in the watershed.

Description:

To edit the Description of the Stream Element, you can type into the text area or click the **...** button to access the **Enter Description** dialog box (Figure 5.13)

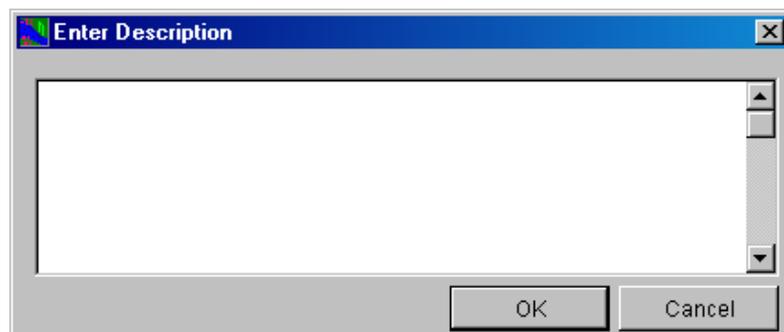


Figure 5.13 Enter Description Dialog Box - Stream Element

Stationing:

The Stream Editor provides you with a report of the stream stationing and coordinates of the Upstream and Downstream nodes, plus any stream nodes in between them. Use the **Stream Node Editor** (described in Section 5.2.8) to edit the stream stationing of the nodes.

5.2.5 Renaming a Stream Element

To rename a stream element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, right-click on the stream element and select **Rename Stream Element**.
3. Enter a new **Name** and **Description** for the stream element in the **Name Stream** dialog box illustrated in Figure 5.14.

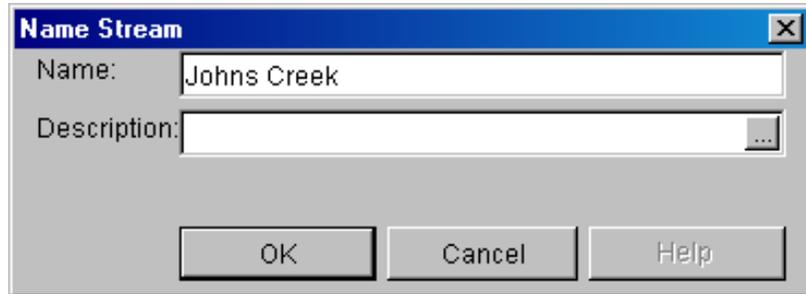


Figure 5.14 Name Stream Dialog Box

5.2.6 Deleting a Stream Element

To delete a stream element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, right-click on the stream element and select **Delete Stream Element**.
3. When the confirmation message (shown below in Figure 5.15) appears, select either **Yes** or **No**.

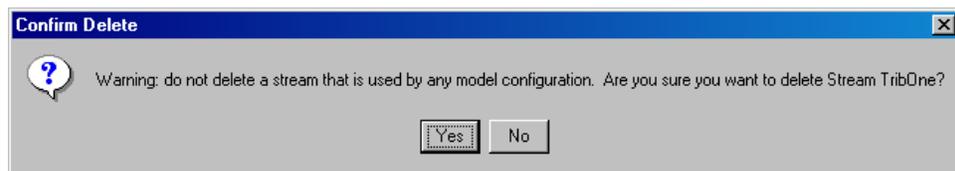


Figure 5.15 Confirmation Message when Deleting a Stream Element



It is important to remember that other models may use the same stream alignment, so be sure to confirm with other modelers before deleting any stream elements.

5.2.7 Inserting a Stream Node

By default, ResSim generates beginning and ending stream nodes for each stream element. Also, stream nodes are automatically created where stream elements connect (stream junctions). Since stream nodes are used for establishing the stream stationing, you may want to include additional stream nodes along your stream element for locations where you want to define specific stream stationing.



It is important to keep in mind when defining the stream stations that the locations you specify for stationing are common to all models that use stationing in their computations.

To insert a stream node on an existing Stream Alignment:

1. Lock  the configuration.
4. Using the **Stream Node Tool** , hold down the **CTRL** key and right-click on the Stream Alignment in the place where the stream node is to be inserted.
5. When you right-click on the stream station node, a shortcut menu appears (Figure 5.16).
6. From the shortcut menu on the stream node, you can choose **Edit Node**, which will bring up the **Stream Node Editor** illustrated in Figure 5.17.

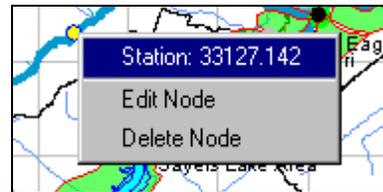


Figure 5.16 Stream Node Shortcut Menu

5.2.8 Editing a Stream Node

The **Stream Node Editor** (Figure 5.17) displays the location information for the node.

1. The **Use Default Stationing** check box is selected by default. When you select this option, the current location of the selected node displays in the Stream Node Editor.
2. If you want to specify the exact location for the node on the stream element, “deselect” the **Use Default Stationing** to make the Station box editable.
3. Enter the location for the station directly into the Station box, and then click **OK**.

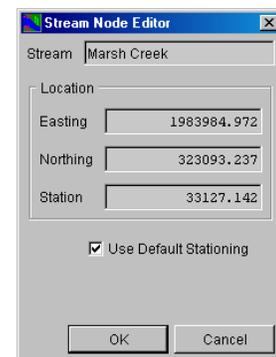


Figure 5.17 Stream Node Editor

5.2.9 Deleting a Stream Node

Since stream nodes define the stream stationing that may be referenced by other models, care should be used when deleting stream nodes.

To delete a stream node from an existing Stream Alignment:

1. Lock  the configuration.
2. Find the stream node you wish to delete.
3. Using the **Stream Node Tool** , right-click on the stream node.
4. Select **Delete Node** from the shortcut menu.
5. A **Confirm Delete** message will display (Figure 5.18) asking you whether you really want to delete the selected stream node.
6. Click **Yes** and the message will close and the stream node will be deleted from the stream element.

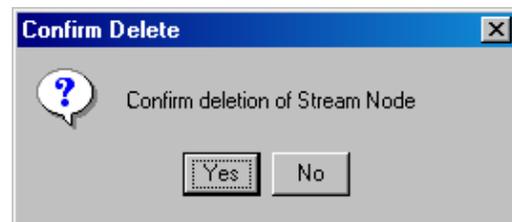


Figure 5.18 Confirm Delete of Stream Node

5.2.10 Moving a Stream Junction

When two stream elements intersect (e.g., at a confluence), a Stream Junction is automatically created. A stream junction is multiple stream nodes at one location and is represented by a dark green circle with a light green halo around the circle. Although ResSim generates default stream junctions when you create the Stream Alignment, you can move them as needed.

To move a Stream Junction along an existing Stream Alignment:

1. Lock  the configuration.
2. With the **Stream Node Tool**  selected, double-click on the stream junction. The stream junction you select will turn dark green and will have small squares (handles) at each corner (Figure 5.19).
3. To move the stream junction, click and drag it along the stream element to its new position.

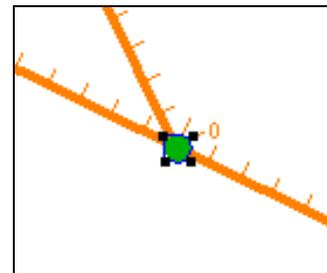


Figure 5.19 Moving a Stream Junction

5.2.11 Editing a Stream Junction

To edit a Stream Junction:

1. Lock  the configuration.
2. Using the **Stream Node Tool** , right-click on the Stream Junction to access the shortcut menu (Figure 5.20).

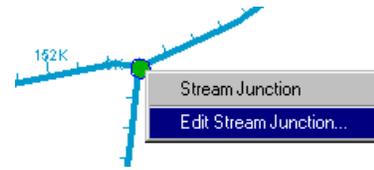


Figure 5.20 Stream Junction Shortcut Menu

3. Select **Edit Junction** to open the **Stream Junction Editor** (Figure 5.21).

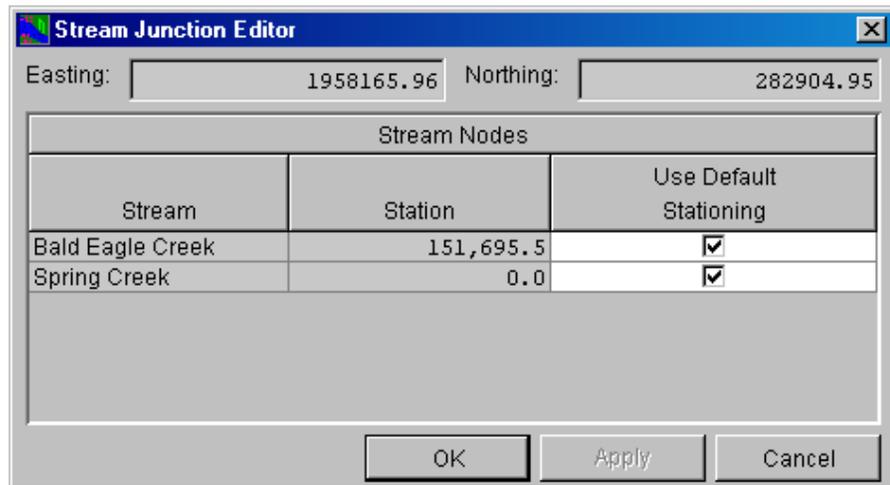


Figure 5.21 Stream Junction Editor

The Stream Junction Editor displays the list of stream nodes associated with a junction and allows you to edit the stationing of each of the nodes by deselecting the “Use Default Stationing” box and entering the desired station.

5.2.12 Reversing the Direction of a Stream

If you find that you have inadvertently drawn your stream element in the wrong direction (e.g., downstream to upstream when it should be upstream to downstream), then instead of having to delete the stream element and redraw it, you can choose to reverse the direction of the stream element.

To reverse the direction of a stream element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, right-click on the stream element and select **Reverse Direction** from the shortcut menu.

3. A warning message (Figure 5.22) will open asking you whether you really want to reverse the direction of the stream element.

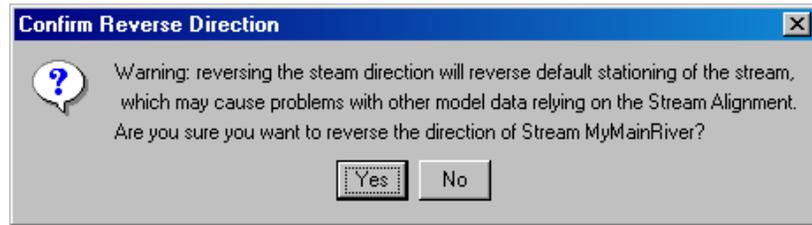


Figure 5.22 Confirm Reverse Direction of Stream Element

4. Click **Yes** and the warning message will close and the stream element's direction will be reversed.

5.2.13 Disconnecting a Stream Element

A stream element can be connected to another stream element (e.g., at the confluence of two streams). If, for some reason, you need to disconnect the stream element from another stream element, you can do so.

To disconnect a stream element from another stream element:

1. Lock  the configuration.
2. With the **Stream Alignment Tool**  selected, right-click on the stream element you want to disconnect and select either **Disconnect Upstream** or **Disconnect Downstream**, as appropriate, from the shortcut menu.
3. The stream element will now be disconnected from the other stream element. On the display area, the upstream (or downstream) point will physically move away from the connecting stream element and a stream node will remain where the stream element was originally connected.

5.3 Importing a Stream Alignment

To import a stream alignment you must first have as an *active map layer* (see “Adding a New Map Layer” in Chapter 3, Section 3.4.2) an ArcView® shapefile which represents the stream system of your watershed. This shapefile must have an attribute that is the name of each stream, and each stream must form a contiguous line with one upstream point and one downstream point.

To import a stream alignment:

1. You must be in the **Watershed Setup Module**. From the **Module** list, select **Watershed Setup**.
2. Add the map layer that will be imported to the display area (see “Adding a New Map Layer” in Chapter 3, Section 3.4.2 to add a map layer).
3. From the **Watershed** menu, point to **Import**, and then select **Stream Alignment**.
4. The **Import Stream Alignment** dialog box (Figure 5.23) will open.

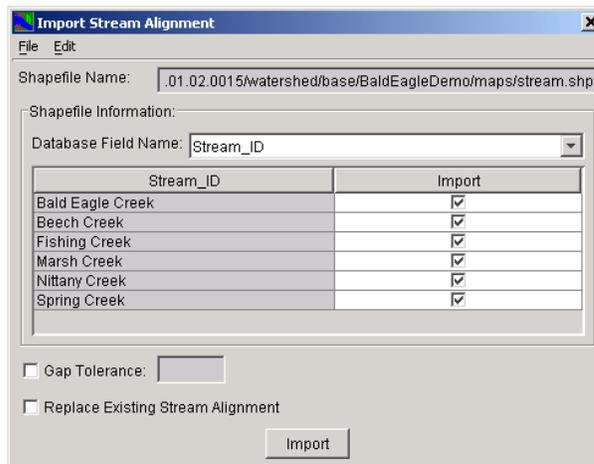


Figure 5.23 Import Stream Alignment Dialog Box

5. In the **Shapefile Name** box is displayed one of the ArcView® shapefiles defined as *active map layers* in your watershed. ResSim automatically selects the first shapefile that contains polylines. Therefore, if this is not the desired shapefile, then from the **File** menu, select **Choose Shapefile**.
6. The **Choose Shapefile** dialog box (Figure 5.24) will open. In the **Available** box, is a list of the available polyline shapefiles that you have added as map layers. In the **Selected** box, is the polyline shapefile that has been chosen. To choose a different polyline shapefile, use the **Add** and **Remove** buttons to get the correct shapefile. In Figure 5.24, the polyline shapefile to be used for importing the stream alignment is *stream.shp*.

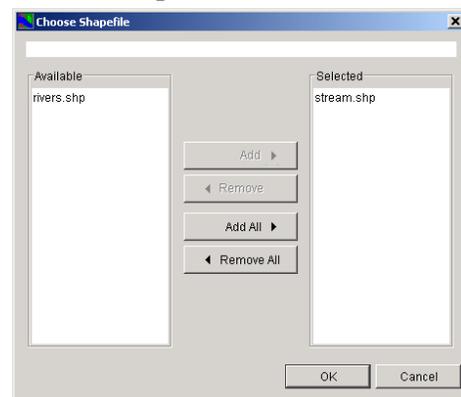


Figure 5.24 Choose Shapefile Dialog Box

7. Once the correct shapefile has been chosen, the required attribute is the name of each stream. The program automatically searches for a database field name of **Stream_ID**. If there is not a database field name of **Stream_ID**, then in the **Database Field Name** list, you must select the database field name that contains the names of each stream. In the example shown in Figure 5.23, for the shapefile *stream.shp*, the database field name is *Stream_ID*.
8. When you have selected the correct database field name, the table will list the stream names. If each stream is a contiguous line with one upstream point and one downstream point, then the checkbox in the **Import** column of the table will be set. If there is something wrong with the line that represents a stream, the checkbox will not be set, and ResSim will not import that stream element.
9. **Gap Tolerance** (see Figure 5.23) is used to connect stream elements that have a gap between the end point and the junction with another stream. By default, the **Gap Tolerance** is set to zero (0.0), so ResSim can connect streams to other streams. If you click **Gap Tolerance**, then you need to enter a value larger than zero in the **Gap Tolerance** box, which will allow ResSim to connect streams that might have a larger gap between them.
10. The **Replace Existing Stream Alignment** box, allows you to replace the existing stream alignment with the one being imported from the selected ArcView® shapefile.
11. Once everything is set, click **Import**. The stream alignment will be automatically drawn in the display area. From the **File** menu, choose **Close** and the **Import Stream Alignment** dialog box (Figure 5.23) will close.

5.4 Exporting a Stream Alignment

If you have digitized a stream alignment by hand, you might want to save that stream alignment as an ArcView® shapefile. To export a stream alignment you must have a stream alignment in the display area.

To export a stream alignment:

1. You must be in the **Watershed Setup Module**. On the **Module** list, click **Watershed Setup**.
2. From the **Watershed** menu, point to **Export**, and then select **Stream Alignment**.

3. A **Save File** browser (Figure 5.25) will open. Enter a name in the **File Name** box. Click **OK**, the **Save File** browser will close, and you will have an ArcView® shapefile of the displayed stream alignment.

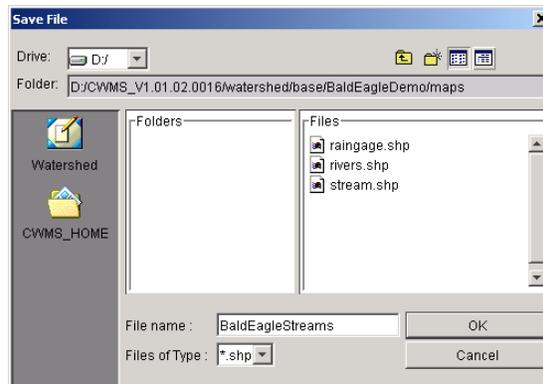


Figure 5.25 Save File Browser

5.5 Configuring Stream Alignment Display Properties

You can change the color, line width, font, and tic mark properties of a Stream Alignment using the **Stream Alignment Properties Editor**. The section on “Viewing and Configuring Layer Properties” in Chapter 4, Section 4.4 describes in detail how to change Stream Alignment display properties.

To change stream alignment properties:

1. From the **View** menu, select **Layers**.
2. The **Layer Selector** dialog box will open.
3. Right-click on the **StreamAlignment** layer in the tree. From the shortcut menu, click **Properties**.
4. The **Stream Alignment Properties** dialog box (Figure 5.26) will open.

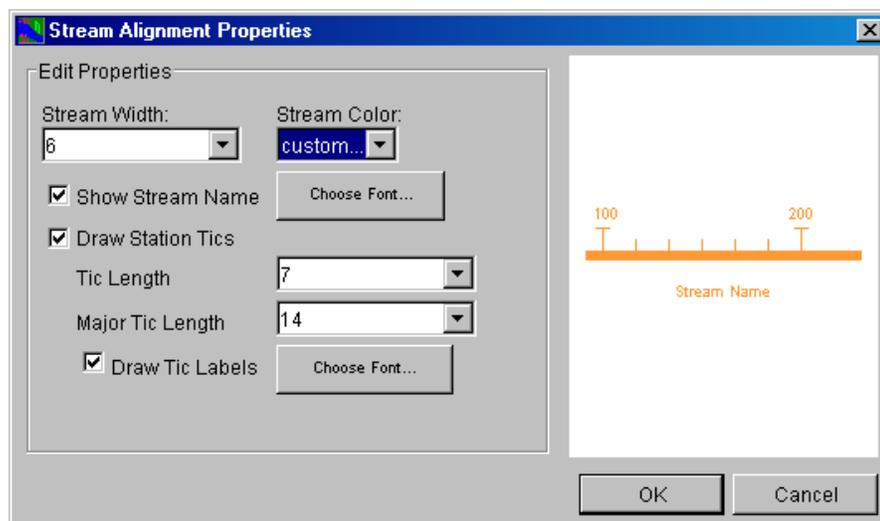


Figure 5.26 Stream Alignment Properties Dialog Box

5. To change the color of the stream alignment layer, select a color from the **Stream Color** list. The preview pane to the right of the **Edit Properties** box will display the selected color.
6. Click **OK** and the **Stream Alignment Properties** dialog box will close and the color change will appear in the display area.
7. Repeat steps 5 and 6 for any other changes you wish to make to the stream alignment properties.
8. Once you have finished, from the **Layer Selector** dialog box, click **OK** to close.

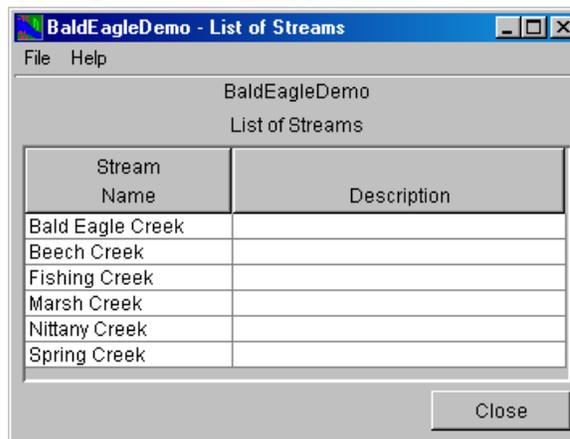
5.6 Saving the Stream Alignment

Since creating a stream alignment can be a very detailed activity, you should save it frequently during its creation. From the **File** menu, click **Save Watershed**. This command will save all of the stream alignment properties and the appropriate files created and used by ResSim for the stream alignment.

5.7 Listing of Streams

Once you have your stream alignment completed, it's a good idea to review the streams in your stream alignment. From the **Watershed Setup Module**, there is a report that contains this information.

1. From the **Reports** menu, select **List of Streams** and a report similar to Figure 5.27 will appear.



Stream Name	Description
Bald Eagle Creek	
Beech Creek	
Fishing Creek	
Marsh Creek	
Nittany Creek	
Spring Creek	

Figure 5.27 List of Streams in Stream Alignment

2. This report provides a list of streams and their descriptions that have been input for the stream alignment.
3. From the **File** menu of the report, you can print the report, or you can export the report as an ASCII tab-delimited file.
4. Click **Close** and the **List of Streams** report will close.