NHD Reach Indexing Tool
User's Guide

Also includes information about the other NHD Toolkit extensions:

NHD Load/Unload Workspace
NHD Arc2Shape
NHD Navigate

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Table of Contents

Table of Contents (cont)

Introducing the NHD Toolkit

The NHD Toolkit is a collection of ArcView (version 3.1 or higher 3.x) extensions that are designed to assist users in the understanding and the use of the National Hydrography Dataset (NHD). The NHD Toolkit currently contains the following extensions:

- *NHD Load/Unload Workspace.* This extension allows you to load, unload, and symbolize NHD workspaces. The extension allows the user to select a standard set of features to load, or make a custom selection.

- *NHD Arc2Shape.* This extension converts NHD data from NHDinArc format (coverages) to NHDinSHP format (shapefiles). Reprojection of the data can be conveniently performed during the conversion.

- *NHD Navigate.* This extension will perform navigations on all NHD workspaces loaded into a current View and display the navigation results. You can specify the beginning and ending points of the navigation, as well as the direction (upstream or downstream) and distance to travel.

- *NHD Reach Indexing Tool (NHD-RIT).* The NHD-RIT is a tool for associating surface water entities, like trout waters or high quality waters, with the NHD. The NHD-RIT uses ESRI's dynamic segmentation model to build event tables which store information about the NHD reaches. The NHD-RIT allows the user to map surface water attributes without editing the underlying NHD coverage.

When you download and install the NHD Toolkit on your computer you get all four extensions. You can download the NHD Toolkit on the Internet at http://nhd.usgs.gov/tools.html.

What is the National Hydrography Dataset (NHD)?

NHD is a nationally consistent hydrography dataset for the United States. It is the culmination of recent cooperative efforts between the U.S. Environmental Protection Agency (EPA) and the U.S. Geological Survey (USGS). It combines elements of the USGS digital line graph (DLG) hydrography files and the USEPA Reach File (RF3). NHD is designed to serve three simultaneous functions for surface waters:

1. Provide a standard unique identifier (reach code) for each part of the surface water network, for isolated streams, and for certain types of waterbodies,
2. Contain a tabular routing (navigation) network of these features, and
3. Include a digital map representation of these features.

The significance of the reach codes is that they provide a common nomenclature for georeferencing surface water entities. The benefit of using a reach file like NHD for surface water indexing is that the surface water data becomes anchored to reaches with unique identifiers. This provides nationally consistent locational information, as well as data compatibility between agencies and programs. Other benefits of using NHD are that the maintenance of a national coverage will allow users to benefit from the enhancements of other users, and use of NHD will ensure institutional memory for work performed using the national standard. Using a national standard also ensures a readily accessible replacement for coverages that are inadvertently damaged during processing.

More information about NHD is available from http://nhd.usgs.gov.

Getting Started with the NHD Toolkit

Requirements

The NHD Toolkit requires the following hardware:

- A 200 MHz Pentium (or equivalent) personal computer with 64MB of RAM running Windows 95/98/NT/2000.

- A 15-inch or larger color graphics monitor

- Substantial available hard disk space; 100 MB are recommended.

- ArcView version 3.1 or higher.

Obtaining and Working with NHD

In order to use the NHD Toolkit, you also need NHD workspaces. You can download NHD workspaces from http://nhd.usgs.gov.

NHD is distributed as ARC/INFO workspaces that have been tarred and compressed (*.tgz). Each workspace contains data for one 8 digit USGS Hydrologic Cataloging Unit (CU). These workspaces must be decompressed using tar.exe and gzip.exe. These freeware utilities are part of the NHD Toolkit installation and are located in your NHDToolkit/NHDZcommon directory. If you use WinZip*, you must be certain to use version 8.0 or later which preserves files that are 0 bytes in size.

To unzip a NHD workspace, simply place the tar and gzip executable files in the same directory as the compressed file, and enter the following commands in a DOS prompt window.

To unzip:
c:\ gzip -d 02040301.tgz

To untar:
c:\ tar xvf 02040301.tar

The NHD-RIT includes a utility (**Uncompress NHD Workspace**) that will run tar and gzip for you from ArcView. You can also use this utility to decompress multiple workspaces in a single step.

* *Note:* You can use WinZip version 8.0 to decompress NHD workspaces.

Appending NHD Coverages

If you wish to work with NHD workspaces that cover more than USGS CU's, you can append them using the Append NHD AML available from http://nhd.usgs.gov/tools.html. This AML can be used in ARC/INFO to properly append NHD workspaces. These appended workspaces can be used with any of the NHD Toolkit extensions.

Working with Projected Coverages

NHD coverages are distributed as unprojected (geographic - decimal degree) data. If you wish to work with NHD in a different projection, it is recommended that you use a projected NHD shapefile with the NHD-RIT. This ensures an accurate translation of your reach indexing data, should you choose to reproject it. Reprojected NHD shapefiles can be created from the NHD coverages using the NHDArc2Shape extension included in the NHD Toolkit.

The NHD Toolkit is compatible with projected workspaces where the distance units are degrees, meters or feet. There are also a few other requirements that are enforced when a user attempts to load an NHD workspace. The requirements for projected data are as follows:

•   If the workspace is in ARC/INFO format and there is a projection file (nhd/prj.adf) that contains a Datum, the Datum must be NAD83 or NAD27. Otherwise, if there is a spheroid in the projection file, the last four positions must be numeric.

•   If the workspace is in ARC/INFO coverage format, and there is no projection file (nhd/prj.adf) then the user is prompted with the standard ArcView projection dialog. The user should select GRS80 or Clark 1866 as the Spheroid. The Toolkit will not support any other options.

•   If the workspace is in shapefile format, and there is a projection file (nhd/linearrch.prj) that contains a Datum, the value must be "D_North_American_1983" or "D_GRS_1980".

•   If the workspace is in shapefile format and there is no projection file (nhd/linearrch.prj), then the user is prompted with the standard ArcView projection dialog and should

respond with either GRS80 or Clark1866 as the Spereoid. The Toolkit will not support any other options.

Installing the NHD Toolkit.

Double click on the **nhdtoolkit4_0_0.exe** (or higher version) file that you downloaded from the NHD website. The installation program will guide you through the installation process. You should run the installation on the machine where ArcView is installed, so if you run ArcView over a network, you should run the installation on the server computer. When you have finished the installation, NHD Load/ Unload Workspace, NHD Reach Indexing Tool, NHD Navigate and NHD Arc2Shape will be available as extensions under your ArcView File menu.
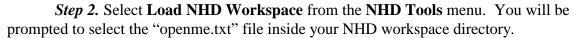
The installation will create an **NHDToolkit** directory on your computer. This directory contains files needed by the extensions as well as the on-line help files. Please do not delete this directory as it will cause the Toolkit extensions to malfunction. The NHD-RIT will also create a **RIT** folder in your temp directory after your first use of the RIT. Your user and source information for use in the metadata is stored in this directory. If you delete this directory, you will have to re-enter this information.
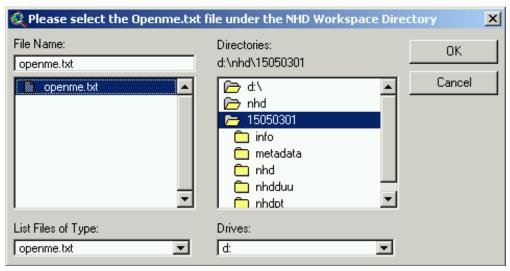
NHD Load/Unload Workspace

The NHD Load/Unload Workspace extension allows users to load and symbolize the different features contained in an NHD workspace. The extension will also initialize links between the tables and feature data in the loaded NHD workspaces.

Loading an NHD Workspace
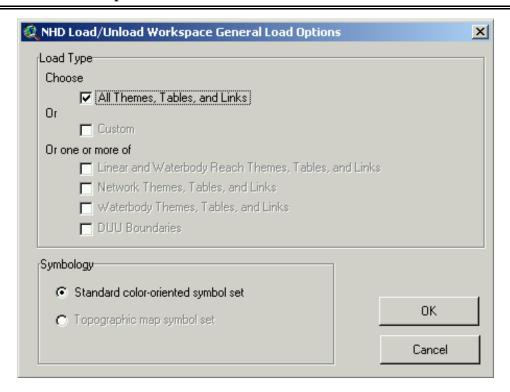
Step 1. To use NHD Load/Unload Workspace, choose **Extensions...** from the **File** menu in your ArcView project, check the checkbox for **NHD Load/Unload Workspace** and click **OK**. This will add an **NHD_Tools** menu to your View.

Step 2. Select **Load NHD Workspace** from the **NHD Tools** menu. You will be prompted to select the "openme.txt" file inside your NHD workspace directory.
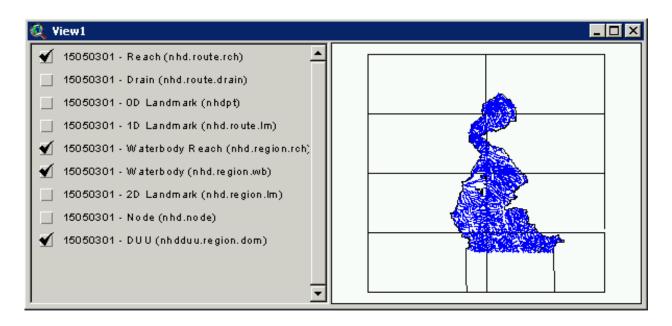
Navigate to this file and click **OK**. (*Note:* You must have decompressed NHD workspaces before you can use NHD Load/Unload Workspace.)

Step 3. You are then prompted to select your desired load options. This allows you to select specific NHD features and links that you would like to load into your project. If you are unsure what to choose, choose **All Themes, Tables and Links**.

Click **OK**. This will load the NHD themes into your View.

If you would like more information about the NHD themes in your View, please refer to the reference documents available on the Internet at http://nhd.usgs.gov/techref.html. The "NHDinArc QuickStart" and "Concepts and Content" documents are highly recommended for new NHD users.

Other Features

Unload NHD Workspace(s)

This feature allows you remove any NHD workspaces you have loaded from your ArcView project. **Unload NHD Workspace** will remove all theme, tables and links that you have loaded in.

Note: If you use ArcView's **Delete Themes** option from the **View** menu to remove NHD themes, it will cause NHD Load to malfunction.

Show NHD Tables

This feature allows you to view the NHD tables that you have loaded into your View. When you choose **Show NHD Tables** from the **NHD_Tools** menu, you are presented with a dialog that allows you to choose which type of tables you would like to view.

When you click **OK**, NHD Load/Unload Workspace will tile the tables in your ArcView Window so that you can view them. You can make selections in the View, or the tables and the associated records in the other tables will be highlighted. To learn more about which table links may be available, see the **Show NHD Tables** help topic in the **NHD Load/Unload Workspace Help** available from your ArcView Help menu.

Hide NHD Tables

This feature will hide the tables in your ArcView window that you displayed using **Show NHD Tables**.

Change View Name

This feature allows you change the name of your active View. When you are using NHD Load, this is the only method you should use to change your View name. If you change your View name using the **Properties** option from the View menu it may cause NHD Load/Unload Workspace to malfunction.
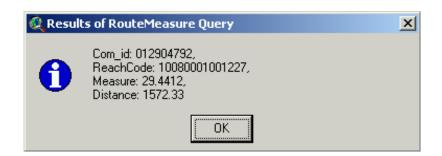
Refresh Loaded Workspace(s)

NHD Load/Unload workspace creates files in your temp directory that store information about the linkages ArcView puts in place when you load a workspace. If these temp files are deleted, ArcView will prompt you for their location when you open a saved ArcView project where you used NHD Load/Unload workspace. **Refresh Loaded Workspace(s)** will recreate these files for you so that you may continue to use your project. This feature is also useful for restoring a workspace in your View when a theme, table or link is inadvertently renamed or deleted from the project.

Display Measure

Display Measure is a tool button in your ArcView View. Display measure will return the Route and Measure information for NHD Route themes. This information will vary depending on the active route theme. Network Reach themes, Drains, and 1D Landmarks are all route themes in NHD. **Display Measure** will also display a graphic point on the location clicked. When you use Display Measure on the NHD Reach theme, a distance value is also displayed. This distance is the distance in meters from the start point of the reach (0 measure) to the point of the click.

Results of RouteMeasure Query

Com_id: 012904792,
ReachCode: 10080001001227,
Measure: 29.4412,
Distance: 1572.33

OK

NHD Arc2Shape
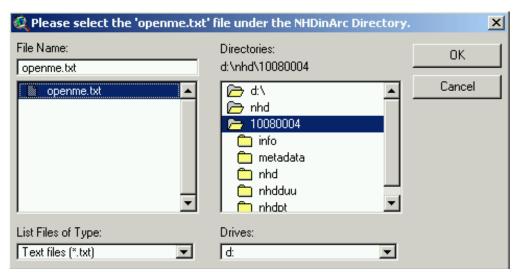
NHD Arc2Shape converts NHD data from NHDinARC format (coverages) to NHDinSHP format (shapefiles). Using NHDinSHP may improve performance when using NHD data with ArcView. Converting NHD workspace to NHDinSHP format also eliminates a known measure problem with NHDinARC workspaces that have the following text at the bottom the openme.txt file.

"FOD2ARC Version 1.80 rmfix patch"

NHD Arc2Shape also provides an easy way for users to convert geographic NHDinARC workspaces to projected shapefile format.

Using NHD Arc2Shape

Step 1. To use **NHD Arc2Shape**, choose **Extensions...** from the **File** menu in your ArcView project, check the checkbox for **NHD Arc2Shape** and click **OK**. This will add an **NHD_Tools** menu to your View if you do not already have one.

Step 2. Select **Convert Arc2Shape** from the **NHD_Tools** menu. You will be prompted to select the "openme.txt" file in your NHD workspace directory.

Navigate to the "openme.txt" file in the workspace you would like to convert and click **OK**.

>   ***Step 3.*** If your NHD Workspace is unprojected (Geographic), you will be prompted to select a projection for your converted workspace. You can choose "No Projection", the "Current View Projection" or the "EPA Albers Projection". Make your choice and click **OK**.

>   ***Step 4 .*** You will be prompted to select a name and storage location for your NHDinSHP workspace. The default name is the "Original Workspace Name" + "shp" and the default location is the directory where your NHDinARC workspace is stored. Choose a name and storage location, or accept the defaults and click **OK**.

>   ***Step 5.*** You will get a message box when the conversion has been completed successfully.

>   Your converted workspace will have a directory structure similar to the NHDinArc workspace. To load the NHDinSHP workspace in to your project, use NHD Load/Unload Workspace and navigate to the openme.txt file just like you would for an NHDinArc workspace.

Running NHD Arc2Shape in Batch Mode

>   You can also use NHD Arc2Shape to convert batches of NHDinARC workspaces to NHDinSHP. NHD Arc2Shape contains a sample script that you can modify to facilitate this process. Before you can run a batch processing script, you need to create a text file that contains the file names and path names of the NHDinARC workspaces you would like to convert, with the file name and path name of the desired output file on the same line.

Sample Batch Text File
d:\nhd\nhdcovdata\03070102 d:\nhd\nhdshapedata\03070102shp d:\nhd\nhdcovdata\03140201 d:\nhd\nhdshapedata\03140201shp

Once your have created a text file with this format, you can run **NHD Arc2Shape** in batch mode using the following steps.

Step 1. Go to your ArcView project window. Select **Scripts** in the project window and click **New**.

Step 2. Select **Load System Script...** from the **Script** menu and scroll down to the script called "nhda2s.batchrun" and click **Select**.

Step 3. You can use this script to run your batch conversion job by modifying it in three places that are marked with "****". The first part of the code you need to change is the pathname for your batch file.

```
Code Sample
'------------------------------------------------------------------------
'******** 1) Replace path name in the following line with the name ****
'******** and location of your text file containing the list of coverage/shapes ****
myfromFile = ("d:\projects\nhd\batchlist.txt").asfilename
'------------------------------------------------------------------------
```

Replace the "d:\projects\nhd\batchlist.txt" text in the code with the pathname for the batch text file you created.

Step 4. The next parameter for you to change is location where you would like **NHD Arc2Shape** to store the output log text file. When you run **NHD Arc2Shape** in batch mode, it will not display any errors encountered during the conversion, but it will write them to a log file. It is a good idea to review this log file after each batch conversion.

```
Code Sample
'------------------------------------------------------------------------
'******* 2) Replace path name in the following line with the name ****
'******* and location you want to use for the log file ****
logfile = "d:\projects\nhd\nhdcovdata\logfile.txt"
'------------------------------------------------------------------------
```

Change the "d:\projects\nhd\nhdcovdata" to the pathname where you would like the output log file to be stored.

Step 5. The last parameter to define is the desired projection. If your data are already projected, set this to '**none**'. If your data are Geographic, you can choose to project the workspaces to the current View projection, to EPA Albers, or you can define your own projection (please see the ArcView help files for details on defining your specific projection).

Code Sample

```
'------------------------------------------------------------------------
'******** 3) Indicate the projection in the following line ****
'******** Do not use Nil!  ****
myProjection = "none"
' Or you could get the projection from your View
'myProjection = av.getproject.finddoc("View1").getprojection
' Or you could un-comment the above lines to create and then use the
' EPA albers Projection. Also un-comment the following line
'myProjection = AlbersPrj
'------------------------------------------------------------------------
```

In the code sample above, ArcView will ignore lines of text that start with a single quote ('). You do not need to make any changes if you do not wish to change the data projection. If you wish to use the View projection, remove the ' from the "myProjection = av.getproject.finddoc("View1").getprojection" line and add one to the "myProjection = "none"" line. Make a similar change if you wish to use EPA Albers.

Step 6. Choose **Compile** from the **Script** Menu. If your script compiles successfully, then select **Run** from the **Script** menu. ArcView will convert the workspaces listed in your batch text file.

NHD Navigate

The NHD Navigate extension allows users to perform navigation on all NHD workspaces loaded into the current view and display the navigation results. NHD workspaces should be loaded into the current view using the NHD Load/Unload Workspace extension that is also a part of the NHD ArcView Toolkit. In order to perform navigations, you need to include the Network Reach theme when you load the NHD workspace using NHD Load.

Using NHD Navigate

Step 1. To use **NHD Navigate**, choose **Extensions...** from the **File** menu in your ArcView project, check the check box for **NHD Load/Unload Workspace** and **NHD Navigate**. Open a View.

Step 2. Use **Load NHD Workspace** from the **NHD_Tools** menu to load an NHD workspace into your View. Make sure your load includes the **NHD Reach Theme**.

Step 3. Make the **NHD Reach Theme** active, click on the one of the NHD Navigate Tool choices (rightmost tool button with blue arrow), then click on the location on the **NHD Reach Theme** where you would like to start your navigation.

Step 4. Your Navigation Results will be added to your View as a theme. This theme will be replaced with new results each time you perform additional navigations.

NHD Navigate can perform navigations across multiple NHD workspaces that have been loaded with NHD Load. You can also set parameters for your navigation (see the **Navigation Options** section).
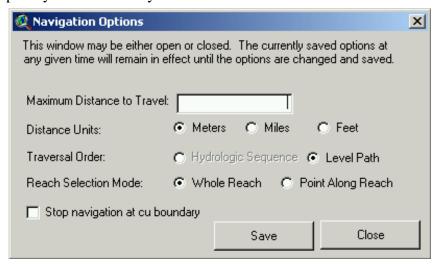
Types of Navigation

When you load the NHD Navigate extension into your View, you get a drop down button tool that allows you to select the type of navigation you would like to perform. To use navigate simply click on the desired tool, then click on the location on the NHD reach theme where you would like to start the navigation.

|		
↑	**Upstream Mainstem**	Selects all mainstem reaches upstream from the selected point on a reach.
	Upstream Mainstem with tributaries	Selects all mainstem and tributary reaches upstream from the selected point on a reach.
↓	**Downstream Mainstem**	Selects all mainstem reaches downstream from the selected point on a reach.
	Downstream Mainstem with divergences	Selects all mainstem reaches and divergences downstream from the selected point on a reach.
	Point to Point	Selects all reaches along the flow path between two selected points.

Other Features
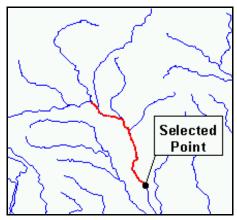
Navigation Options

You can define different parameters for your navigation by selecting **Navigation Options** from the **NHD_Tools** menu. When you change the setting in the **Navigation Options** dialog, your changes will only take effect after you click the **Save** button. This button is only visible after you have made changes. If you change the value in the "Maximum Distance to travel" text box, be sure to press your <Enter> key to make the **Save** button visible.

Maximum Distance to Travel

   This option allows you to specify a distance for your navigation. You can specify whether you want the distance units to be in meters or miles using the **Distance Units** radio buttons. For example, you could specify 10 miles in the **Naviagtion Options** dialog. Then when you performed an "Upstream Mainstem" navigation, your navigation results would contain the mainstem reaches 10 miles above the point you selected.
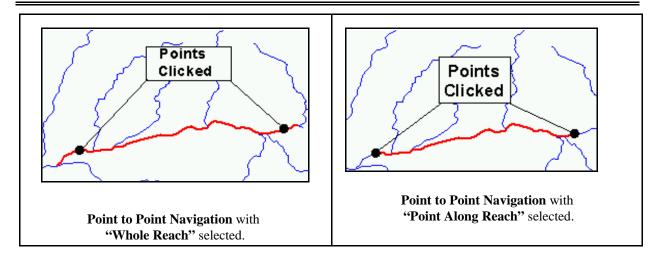

**Upstream Mainstem Navigation
with 10 mile distance.**

   If you wish to stop using a migration distance, delete the value from the "Maximum Distance to Travel" box.

Reach Selection Mode

   You can specify whether you want the reach selection mode to be **Whole Reach** or **Point Along Reach**. **Whole Reach** will start your selection at the downstream endpoint of the reach you select, or in the case of **Point to Point** navigation, it will include the entire reach for the start and end points of your selection. **Point Along Reach** will start your navigation at the measure along the reach where you click, or in the case of **Point to Point** navigation, the navigation results will start and end at the points you define.

Point to Point Navigation with **"Whole Reach"** selected.

Point to Point Navigation with **"Point Along Reach"** selected.

Clear Navigation Start

      This feature is designed for use with the **Point to Point Navigation** tool. If you have selected a starting point for your navigation, and would like to remove or change it, you can select **Clear Navigation Start** from the **NHD_Tools** menu and your selection will be cleared.

NHD Reach Indexing Tool

Overview

Georeferencing is the process of locating an entity in 'real world' coordinates. An example would be obtaining latitude and longitude coordinates for a person's home. Reach Indexing is the process of georeferencing surface water entities, like Clean Water Act Section 303(d) waterbodies, to a spatial database such as the National Hydrography Dataset (NHD). The Reach Indexing Tool for the National Hydrography Dataset (NHD-RIT) is designed to provide an interactive Geographic Information System (GIS) interface to assist users with the georeferencing process. The NHD-RIT is ideal for indexing any surface water entity, from habitat types to point source dischargers to fish consumption advisories.

A previous version of this tool, the RF3-RIT, was used to georeference thousands of streams and lakes, and staff in over 15 states have been trained in the use of RF3-RIT. An automated methodology has been developed for migrating existing Reach Indexing work performed with the RF3-RIT to the new NHD format. If you have existing reach indexing work that needs to be converted, please contact Kimberly Sparks (ksparks@rti.org).

What does the NHD-RIT do?

There are many kinds of surface water data (like Fish Consumption Advisories or habitat types) that are suitable for mapping to a GIS hydrography coverage. One method for associating attributes with an existing coverage is to create additional fields in the coverage attribute table and populate those fields with the desired values. The problem with this methodology is that modifying the NHD attribute tables destroys the integrity of the nationally consistent coverage. If many programs modify the NHD attribute tables in different ways, these data become difficult to compile and analyze. Also, if the spatial structure of NHD is modified by an individual user, the function of the NHD Reach Codes as unique locational data for individual reaches is destroyed. ***Therefore it is undesirable to modify the underlying structure of NHD.***

The NHD-RIT uses the dynamic segmentation data model available in ArcView. This data model allows entities to be related to spatial database components (NHD reaches) without editing the spatial objects themselves in any way. The dynamic segmentation model is based on the idea that attributes of a feature can be displayed by simply specifying the start and end points of the feature along an arc, instead of joining the attributes directly to the arc attribute table. The start and end points of these dynamic segments are stored in the "F_meas" (From measure) and "T_meas" (To measure) fields in the NHD-RIT event table. The linear events are displayed as linear features along the reach. The dynamic segmentation model can be used to georeference

point or linear features to a routed linear coverage. Point event features have a single measured position (P_meas) instead of a "To" and 'From" measurement and are displayed as a single point on a reach. Each record in the event table displays as an "event" reach. The use of events allows users to index multiple entities to the same NHD reach or set of reaches. It also allows the user to index an entity to a portion of a reach without having to modify the spatial extent of the reach itself.

The NHD-RIT automates the process of creating NHD event tables and georeferencing surface water entities. It is designed for users who are familiar with ArcView. The NHD-RIT can be used by any organization that has a mandate to monitor and track surface water information. The NHD event tables created by the NHD-RIT provide three fields to store attribute data entered by the user: Entity ID, Attribute Program and Attribute Value. Entity ID is frequently used to store a unique identifier for a surface water entity (like a Fish Consumption Advisory) that can be linked to an outside database that contains detailed information about the entity. Attribute Value can be used to store a non unique descriptor about the surface waters, such as habitat type or substrate. Attribute Program can be used to identify the Agency or Program that is the source of the information. More information about georeferencing concepts is available at http://www.epa.gov/owow/monitoring/georef.

What's New in Version 3.0 of the NHD-RIT?

New Features

Custom Shape Themes. The NHD-RIT version 3.0 allows you to create custom shape themes to represent features that are not stored in the NHD Hydrography. For example, you can create custom polygons in bays and estuaries to represent shellfish harvesting areas. When you use the NHD-RIT to create custom shape themes, metadata files are created and maintained, and you can also take advantage of the other RIT features while using these themes, like using an ID List.

State Border Snapping. This feature allows you to make sure that the surface water features you have reach indexed do not go beyond the boundaries of your state's jurisdiction. Reach Indexing that extends beyond the state boundary will be clipped to the state polygon, and waters that fall just short of the state line will be snapped to the border using a user defined tolerance. In order to use this feature, you need to have a polygon shapefile that represents your state border, with an attribute field that has the two letter abbreviation for the state.

NHD-RIT Functionality

The NHD-RIT can create two main types of themes; themes georeferenced to NHD (event and waterbody themes) and Custom Shape Themes which represent features which are not in NHD. When you are using the RIT, you want to make sure you use the NHD methods as often as possible, as this allows you to take advantage of the unique identifiers in NHD so you can integrate and analyze your data with other programs.

You can create and manipulate three kinds of themes georeferenced to NHD with the NHD-RIT:

1. *Linear event themes* which are georeferenced to the NHD Network Reach Theme,
2. *Point event themes* which are georeferenced to the NHD Network Reach Theme, and
3. *Waterbody themes* which are created using the NHD Waterbody Reach Theme.

The linear and point event themes use the dynamic segmentation model for display. Linear event tables contain fields for the NHD reach code, and To and From positions along the reach that allow the event segment to display.

Select Fields from a Linear Event Table

F_meas	T_meas	Rch_code	Attr_prg	Attr_val	Entity_ID	State
0.00	100.00	07100005000296	Program	Value	Unique Identifier	ST
0.00	50.00	07100005000297	Program	Value	Unique Identifier	ST

F_meas and T_meas are the "from" and "to" measure fields respectively. Typically the measures along an NHD reach go from 0.00 to 100.00, unless the reach is an artificial path (NHD reaches that go through lakes, ponds or wide rivers), in which case the measures go from 0.00 to 200.00. When the from and to measures vary from these values, you know that only a portion of a reach has been indexed.

Point event tables are similar to linear event tables, except that instead of a "from" and "to" measure, they have a single P_meas, or "point" measure. This value identifies where along a reach a point should display.

Selected Fields from a Point Event Table

P_meas	Rch_code	Attr_prg	Attr_val	Entity_ID	State
56.69	07100005000296	Program	Value	Unique Identifier	ST

The areal features in NHD (polygons) that represent lakes and reservoirs are referred to as "waterbodies" in NHD. There is no dynamic segmentation model for polygons, so the NHD-RIT allows you to reach index NHD waterbodies by creating a waterbody shapefile. The table

structure for the waterbody shapefile is similar to those for linear and point events, but there are no measure fields.

It is important to note that linear and point event themes are simple *.dbf files that ArcView can display using the NHD Network Reach Theme. The waterbody theme created by the NHD-RIT is a shapefile, and requires all of the component files (*.shp. *.shx, *.dbf) for display in ArcView.

You can also create point, line or polygon custom shape themes. The standard fields in the custom shapefiles are similar to the event and waterbody tables, except that there are no NHD reach code values or measures.

Using the NHD-RIT

After you have installed the NHD Toolkit, the NHD-RIT is available as an ArcView extension.

> To activate the NHD-RIT, choose **Extensions...** from the **File** menu. Scroll down until you see **NHD Reach Indexing Tool**. Check the associated check box and click **OK**.

When you open a new View you will see an NHD-RIT menu, as well as the NHD_Tools menu and several new buttons and tools (NHD Toolkit buttons and tools have blue icons) . See the *Function Reference* section of this User Guide for detailed descriptions of each menu, button and tool.

Before you can use the NHD-RIT, you need to load an NHD Workspace to georeference surface water entities to. Loading the NHD-RIT automatically adds the NHD Load extension. When loading NHD workspaces for Reach Indexing, performance time of the NHD-RIT is greatly increased if you only add the reach themes.

Loading an NHD Workspace for Reach Indexing

1.   Choose **Load NHD Workspace** from the **NHD_Tools** menu. Navigate to the "openme.txt" file located inside the workspace directory for your NHD coverage.

2.   When prompted to select a **Load Type**, choose **Linear and Waterbody Reach Themes, Tables and Links** and click **OK**. The two reach themes are loaded into the View.

Now that you have loaded an NHD workspace into your View, you can create a new event theme, or load an existing event theme into the project.

Creating a New Event/Waterbody Theme

Step 1. Once you have added the **NHD Reach** and **Waterbody Reach Themes** to your View, you can create a new event table by selecting NHD reaches and choosing one of the NHD-RIT add event features. The procedure varies slightly depending on the type of event table (linear, point or waterbody) you would like to create.

   Adding events to a new linear event theme. Make the **NHD Reach Theme** active and select the reaches you would like to reach index. Click on the **Add Linear Event(s) or entire waterbodie(s)** button (shown below), or choose **Add Linear Event(s) or entire waterbodie(s)** from the pop-up menu that is activated by right clicking on the View to create the new events. Proceed to Step 2.

   Adding events to a new point event theme. Make the **NHD Reach Theme** active and click on the **Add point event on reach** button (shown below). Click on the location where you would like to create a point. Proceed to Step 2.

   Adding waterbodies to a new waterbody theme. Make the **NHD Waterbody Reach Theme** active, click on the **Select Entire Waterbody(ies)** button (shown below), then draw a polygon around the lake(s) of interest. Each time you click, another vertex will be added to your selection polygon. Double click when you are finished. You can also add lakes by selecting them using the ArcView **Select Feature** tool (or other selection method) and using the **Add Linear Event(s) or entire waterbodie(s)** button or pop-up menu choice.

Step 2. You will be notified that no event table currently exists for the current route.

Click **OK** and you will be prompted to create one. On the next dialog, make sure the **Create new event/waterbody** table radio button is selected and click **OK.**

Step.3. You will be prompted to select or enter an ID for the new events. Enter/Select the appropriate values and click **OK**.

Step 4. You will then be prompted to choose a storage location for your new event table.   You can assign the new event/waterbody table any name you like. The NHD-RIT will suggest the following default names.
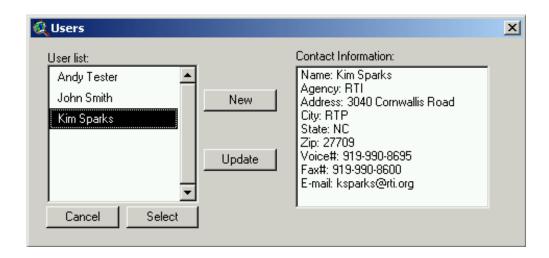
Table Feature Type	Default Name
Linear Event Table	<NHDcoverageName>L.dbf
Point Event Table	<NHDcoverageName>P.dbf
Waterbody Table	<NHDcoverageName>W.dbf

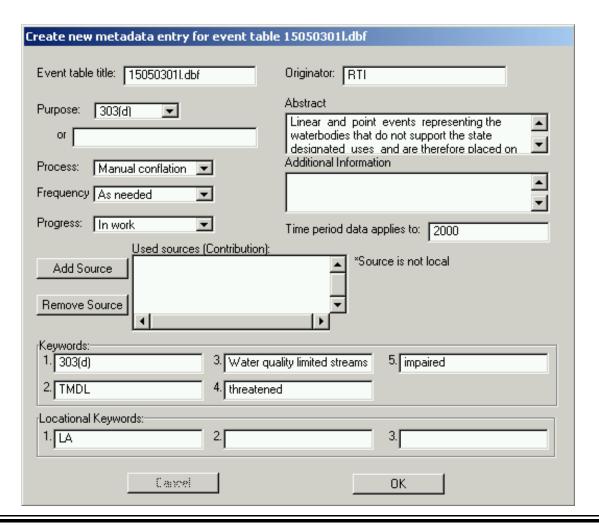Make the appropriate changes to the dialog and click **OK**.

Note: If an event/waterbody table with the same name as the one you are creating already exists in your working directory, the NHD-RIT will prompt you to see if you want to overwrite the existing table. If you choose **Yes**, then the existing event table will be deleted, as well as any other files in your working directory that have the same prefix. For example, an event table named "303dwaters.dbf" would be deleted, and any file with that name as a prefix (like "303dwaters_list.dbf") would also be deleted.

Step 5. If this is the first event/waterbody theme that you are working with in the View and you are working with Geographic data (decimal degrees), then you will be prompted to choose a projection for your View. The View projection you select will not affect the underlying data. (If you are not prompted, don't worry about this).
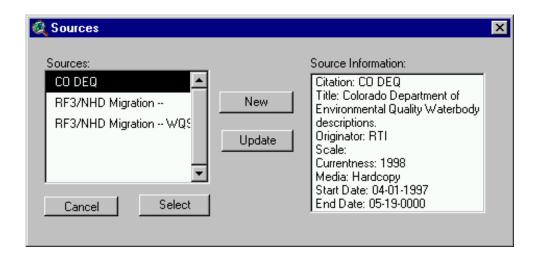
Step 6. You are then prompted to create metadata for the event table. Click on the **Create New** button. You will be prompted to enter **User Information**. If you have not used the NHD-RIT before on the computer where you are working, you will need to enter your user information. Otherwise, you can select your name from the list of users.

Enter/Select the user information as appropriate and click **Select**. The **Create new metadata entry...** dialog opens.

You must fill this information out completely, including adding a source by clicking on the **Add Source** button. The **Add Source** button will open a dialog that will allow you to choose an existing source entry, or create a new entry.

Either select an existing source and click **Select** or click **New** to create a new entry. After you've entered the information for a new source entry, click **OK**, then click **Select** on the **Sources** dialog. If you'd like to enter multiple sources for your indexing, you can modify the percent contributed by each source by double clicking on the source name in the **Create New Metadata...** dialog.

When you have finished entering metadata, click **OK** on the **Create new metadata...** dialog. The new event/waterbody table will be created and your event/waterbody theme will be added to your View. Your new event/waterbody theme will have the same name in the View as the event table you created.
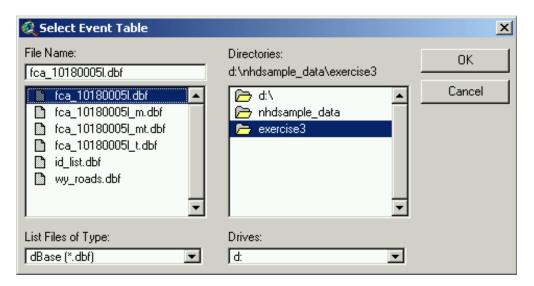
Step 7. To continue working in your new event/waterbody theme, continue to select reaches in the **NHD Reach Theme** or the **NHD Waterbody Reach Theme** and use the appropriate Add tool for the desired feature.

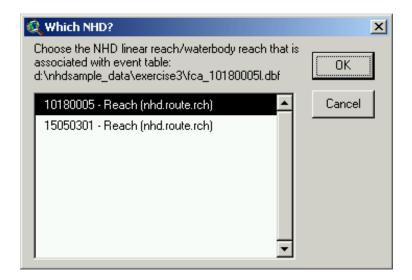## Adding an Existing Event/Waterbody Theme

Step 1. If you downloaded event tables from the web, or acquired them from another NHD-RIT user, the event tables may be in bundled format (eventTableName.tgz). If this is the case, run **Import Bundled Files** from the **NHD_tools** menu. Otherwise move on to Step 2.

To use **Import Bundled Files**, select this choice from **NHD_Tools** and use the dialog to navigate to the location of your .tgz files. Select the bundles you would like to import, and click **OK**.

Step 2. Before your can add an existing event/waterbody theme to your View, you need to have an NHD workspace in your View that contains the reaches your indexing work is georeferenced to. Use **NHD Load** to load the **NHD Reach** and **Waterbody Reach Themes** to your View.

Step 3. Choose **Load NHD Event Theme** from the **NHD-RIT** menu. Make sure the **Load existing event/waterbody table** radio button is selected on the **Select/Load event/waterbody table** dialog and click **OK**.

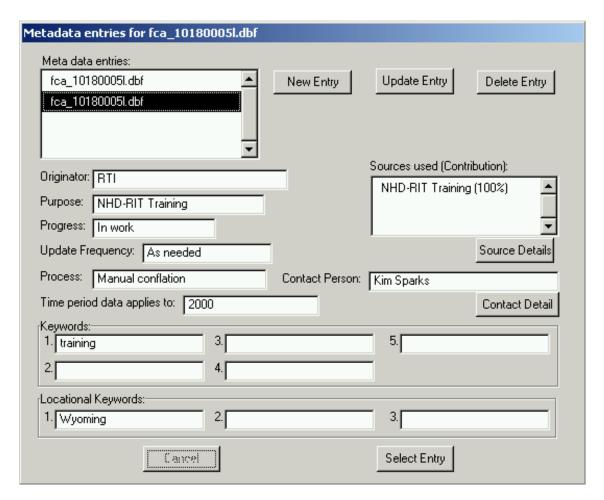*Step 4.* Navigate to the event/waterbody table you would like to load and click **OK**.

If you have more than one NHD workspace in your View, you will be prompted to select the workspace that is associated with the event/waterbody theme that you are adding.

Choose the correct NHD theme and click **OK**.

Step 5. The first time you edit an event theme, you will be prompted about metadata. To continue to use the metadata information that is already associated with the event table, select the existing entry and click **Select Entry**. To modify the existing metadata information, click **Update Entry**. To create new metadata information (perhaps for a new data source) click **New Entry**. You can also view the User and Source Information from this dialog.
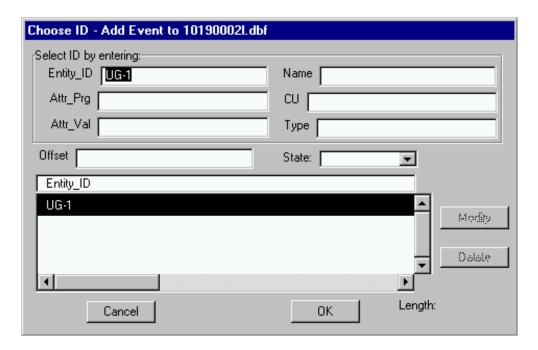

Editing Event/ Waterbody Themes

In ArcView, when dealing with themes in a View, operations must be performed on themes that are "active". The NHD-RIT employs a similar concept for keeping track of which event theme you would like to edit. When you make the NHD Reach Theme or the NHD Waterbody Reach Theme active, the NHD-RIT displays the name of the currently editable theme in the View title bar.

The NHD-RIT will also let you know which theme is being edited in the **Choose ID** dialog when you are adding new events/waterbodies.

If you need to change the "editable" event/waterbody theme associated with an NHD coverage, and the event/waterbody theme you want to edit is already in your Project, choose **Load NHD Event Theme** from the **NHD-RIT** menu. Select the Event/Waterbody theme you wish to edit from the list box in the lower portion of the dialog and click **OK**. When you "create new" or "load existing" event/waterbody themes to the View, they are automatically set to the editable theme.

Sometimes the NHD-RIT is unable to determine which event/waterbody theme you wish to edit. An example would be when you add a feature for which there is no current event theme in the View (you try to add a point event, but there are no point event themes in your View). You will get a message box similar to the one pictured below.

No corresponding event types

The current event table for the route is linear, yet you are creating a point event. Please select or create a point event table.

OK

When you click **OK** you will be able to create a new event/waterbody theme, load an existing theme into the project, or select an event theme that is already available in the View.
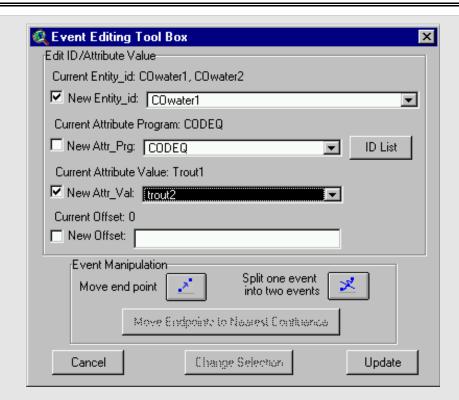
Editing Values in the Event/Waterbody Table

You can change the current Entity ID, Attribute Value (Attr_val), or Attribute Program (Attr_prg) values you've reach indexed in your Event/Waterbody table using the **Event Editing Tool Box.**

Editing Events/Waterbodies

1. Make the Event/Waterbody table active and select the entities you wish to modify.
2. Click on the **Edit events/waterbodies** button, or choose **Edit events/waterbodies** from the pop-up menu that is activated by right clicking in the View.

E

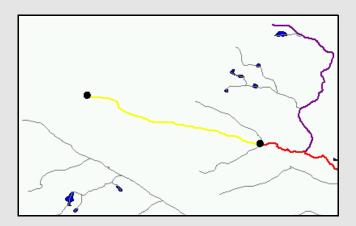This activates the **Event Editing Tool Box**.

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3. Use the drop down lists to change the values of any of the attribute fields, or type in a new offset value. Only values that are marked in the check box will be modified when you click **Update**. If you wish to add new values, click on the **ID List** button to call the **Choose ID** dialog.

Changing the Spatial Extent of Linear Events

You can also use the **Event Editing Tool Box** to modify the spatial extent of existing events. The two spatial modifications that you can perform are moving the end point on an existing event, or dividing one event into two events.

Moving End Points

1. Make the linear event theme active and select the linear event you would like to modify (only select one event).
2. Click on the **Edit events/waterbodies** button to activate the **Event Editing Tool Box.**
3. Click on the **Move endpoint** button. The NHD-RIT will display the current endpoints of the selected events. (*Note*: You may need to move the **Event Editing Tool Box** dialog out of the way to see the endpoints.)
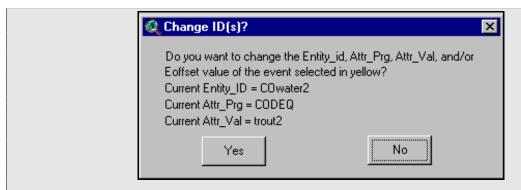
4.   Click on the location that you would like to move the end point to. The NHD-RIT will select the endpoint closest to the location you clicked and ask if it is the endpoint you would like to move.

5.   If the selected endpoint is the correct one, click **Yes** and the end point will be moved to the desired location. If the incorrect end point is selected, click **No** and the NHD-RIT will select the other end point and ask again. Click **Yes** to move that end point to the location indicated.

If you move an endpoint of an event within 10% of the reaches distance to the end point of the reach, the event endpoint will "snap" to the end of the reach. This 10% value is the default setting for the NHD-RIT. If you would like to change this value, choose **Change Snapping Distance** from the **NHD-RIT** menu. The snapping distance you choose will also affect the creation of point events.

Splitting One Event into Two
1.   Make the linear event theme active and select the event you would like to split into two (select only one).
2.   Click on the **Edit events/waterbodies** button to activate the **Event Editing Tool Box.**
3.   Click on the **Split one event into two events** button, then click on the location where you would like to divide the event (you may need to move the Event Editing Tool Box out of the way to do this).
4.   The NHD-RIT will divide the segment, select one half and ask if you would like to change the attribute values that are currently assigned to the new event.

Change ID(s)?

Do you want to change the Entity_id, Attr_Prg, Attr_Val, and/or
Eoffset value of the event selected in yellow?
Current Entity_ID = COwater2
Current Attr_Prg = CODEQ
Current Attr_Val = trout2

[Yes]   [No]

> If you click **Yes**, you will be able to enter/select new values using the **Choose ID** dialog. If you click **No** the values will remain unchanged.

5.   The NHD-RIT will then select the other half of the split event and ask if you would like to change the attribute values.

6.   Even if you do not change the attribute values of either piece, the original event will now exist as two separate events.

If you split an event in error, or wish to merge events that lie on the same reach, you can use **Merge Events**. To use this feature, select the events that you would like to merge and select **Merge Events** from the **NHD-RIT** menu. **Merge Events** will only work if the selected events have the same Entity_ID, Attribute Value and Attribute Program.

Deleting Events/Waterbodies

You can delete events or waterbodies by selecting them and clicking on the **Delete events/waterbodies** button.

D

Delete events/waterbodies is also available from the pop-up menu that is activated when you right click on the View.

If you delete all of the events in an event/waterbody table, the event table and associated files should be deleted from the disk. Sometimes the NHD-RIT can not delete these files because they are in use by ArcView. If this occurs you will be presented with a message box that tells you which files could not be deleted. You should delete them after you have completed your indexing session and closed ArcView.

Note: It is important to delete events or waterbodies using the delete function available through the NHD-RIT. If you delete events or waterbodies using other methods, the associated metadata and transaction files will be out of sync with the event/waterbody table.

The NHD-RIT also offers an **Undo Delete** function. **Undo Delete** will restore the events/waterbodies from your most recent delete. **Undo Delete** also restores the associated metadata and transaction files. **Undo Delete** is available as a button and from the **NHD-RIT** menu.

Copying Events

In some cases, there may be a need to assign more than one set of attributes to the same area of stream. You can represent these areas in linear event tables by creating multiple events on the same NHD reach, and then defining an offset value, so that the copy will display along side of the original reach. There are two ways to create copied events.

1.	Make the event table active, select the events you would like to copy, and select **Copy Events** from the NHD-RIT menu, or from the pop-up menu that is activated by right clicking on the View. Assign the appropriate attribute values and be sure to set an **Offset** value (see information about offset values below).
	Or
2.	Make the NHD Network Reach Theme active, select the area you wish to copy and use the **Add event(s) or entire waterbody(ies)** button, or select it from the pop-up menu that is activated by right clicking on the View. Assign the appropriate attribute values and be sure to set an **Offset**.

The Offset value that you set depends on your View projection units. If you wish to display multiple copies of a single event, simply set different offset values. If you set a negative offset value, it will change the side of the reach the copy displays on. The following values are recommended. They can be modified as necessary to achieve the desired display.

View Projection Units	First Offset	Second Offset	Third Offset
Decimal Degrees	.001	.002	.003
Meters	100	200	300
Feet	300	600	900

Note: The offset value stored in your event table (eoffset field) is stored in coverage units, but you enter the offset value in View units. If your View is not projected, then coverage units = view units.

Due to a known problem with ArcView, offset events do not always display. You will have the best success if you work in the same View projection as your data projection.

To force offsets to draw, make the linear event theme active and click the **Draw Offsets** button, or select **Draw Offsets** from the **NHD-RIT** menu. Then click ArcView's **Clear Selected Features** button and your offsets will display.

Special Tools for Adding Events/Waterbodies

Add Partial Waterbody

Add partial waterbody allows you to index only a portion of a lake. You might wish to do this if there is a change in the lake composition, or perhaps a change in jurisdiction. The **Add partial waterbody** button is available as a drop down tool below the **Add Waterbody(ies)** button.

To add a partial waterbody

1. Make the NHD Waterbody Reach theme active and click the **Add partial waterbody** button.
2. Draw a polygon around the lake area of interest. Each time you click, another vertex will be added to your selection polygon (be sure to only include one lake in your selection polygon). Double click when you are finished.

You can merge partial waterbodies on the same waterbody reach using the **Merge Events** feature. To use this feature, select the waterbodies that you would like to merge and select

Merge Events from the **NHD-RIT** menu. You can only merge waterbodies that have the same Entity_ID, Attribute Value and Attribute Program.

Adding Offset Points

You may wish to index a point that does not lie directly on an NHD reach. You can use the **Add offset point** tool to reach index these areas. **Add offset point** is available as a drop down tool below the **Add point event on reach** button.
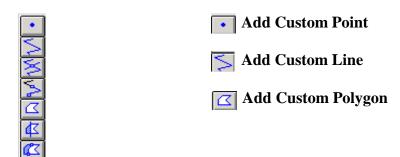
To add an offset point

1.   Make the **NHD Reach** theme active and click the **Add offset point** button.
2.   Click on the location where you would like to add a point. The NHD-RIT will add a point at the selected location. The new point will be georeferenced to the nearest NHD Transport reach.

Creating a New Custom Shape Theme

You can create a Custom Shape Theme in your NHD-RIT project by using one of the Add tools from the Custom Shapes tool drop down.

Add Custom Point

Add Custom Line

Add Custom Polygon
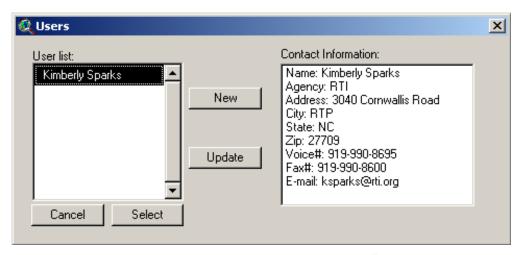
Custom Shapes Tool Drop Down

Step 1. Click on one of the **Add Custom Shape** tools and draw the feature you would like to add. If you are using the **Add Custom Line** or **Add Custom Polygon** tool, click once and drag to make the shape. Click once, each time you want to add a vertex, and double click when you

are finished. You can also create a new custom shapes theme by selecting features in an existing theme and clicking on the "**A**" button.
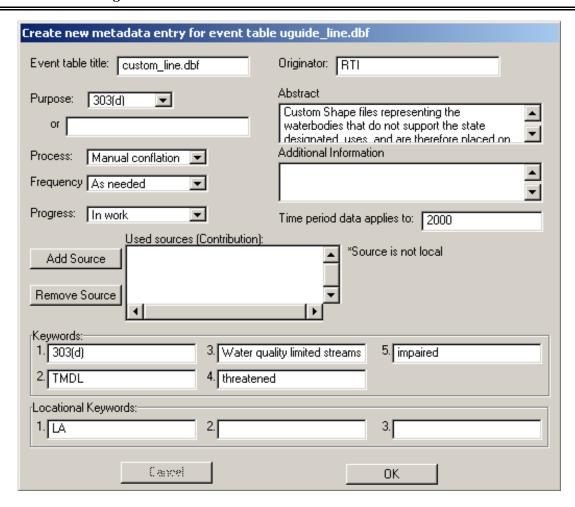
Step 2. You will be prompted to create a new custom theme. Make sure the **Create new Custom Theme** radio button is selected and click **OK**.

Step 3. You will be prompted to select a storage location for your new custom theme. You can name your custom theme anything you like. The default name is Custom_<feature type>.shp. Make the appropriate changes to the dialog and click OK.

Step 4. If there are no other NHD-RIT themes in your view, you will be prompted to enter projection information for your new shapefile. Select your desired projection and click **OK**. You will then be prompted for projection units and datum. Make the appropriate selections.

If there are other NHD-RIT themes in your view, then your new theme will have the same projection information as the other themes in your View.
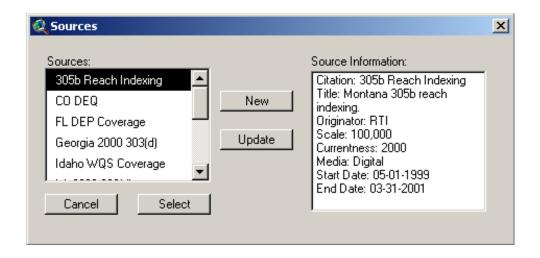
Step 5. Next you will be prompted to select or enter an ID for the new shape. Enter/Select the appropriate values and click **OK**.

Step 6. You are then prompted to create metadata for the new custom shapefile. Click on the **Create New** button. You will be prompted to enter **User Information**. If you have not used the NHD-RIT before on the computer where you are working, you will need to enter your user information. Otherwise, you can select your name from the list of users.

Enter/Select the user information as appropriate and click **Select**. The **Create new metadata entry...** Dialog opens.

You must fill out this information completely, including adding a source by clicking on the **Add Source** button. The Add Source button will open a dialog that will allow you to choose an existing source entry, or create a new entry.

Either select an existing source and click **Select** or click **New** to create a new entry. After you've entered the information for a new source entry, click **OK**, then click **Select** on the **Sources** dialog. If you'd like to enter multiple sources for your work, you can modify the percent contributed by each source by double clicking on the source name in the **Create New Metadata...** dialog.

When you have finished entering metadata, click **OK** on the **Create new metadata...** dialog. The new custom shapefile will be created and your custom shape theme will be added to your View. Your new event/waterbody theme will have the same name in the View as the custom shapefile you created.
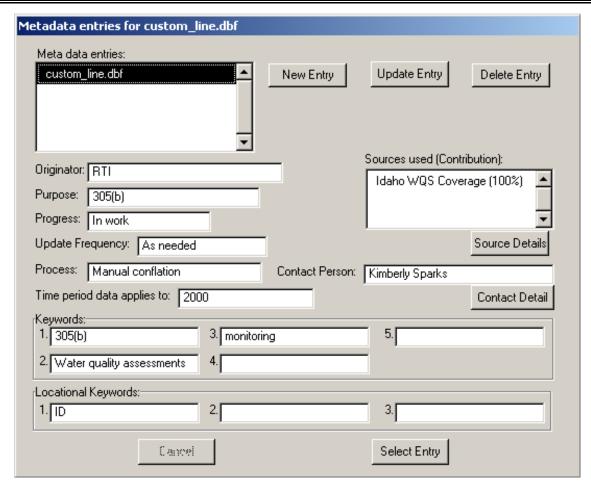
Step 7. To continue working on your new custom shape theme, you can either use the add shape tools to add additional features, or you can select features in existing shapefiles and use the "**A**" button to add them to your custom shapes theme.

Loading an Existing Custom Shape Theme

Step 1. If you downloaded custom shapefiles from the web, or acquired them from another NHD-RIT user, the files may be in bundled format (customshapefilename.tgz). If this is the case, run **Import Bundled Files** from the **NHD_tools** menu. Otherwise, move on to Step 2.

To use **Import Bundled Files**, select this choice from **NHD_Tools** menu and use the dialog to navigate to the location of your .tgz files. Select the bundles you would like to import, and click **OK**.

Step 2. Choose **Load Custom Shape Theme** from the **NHD-RIT** menu. Make sure the **Load Existing Custom Theme** radio button is selected on the **Create a Custom Theme** dialog and click **OK**.

Step 3. Navigate to the custom shapefile you would like to load and click **OK**.

Step 4. The first time you edit the custom shapefile with the NHD-RIT, you will be prompted about metadata. To continue to use the metadata information that is already associated with the custom shape theme, select the existing entry and click **Select Entry**. To modify the existing metadata information, click **Update Entry**. To create new metadata information (perhaps for a new data source) click **New Entry**. You can also view the User and Source Information from this dialog.

Editing Custom Shapefiles

Editing Values in the Custom Shape Theme
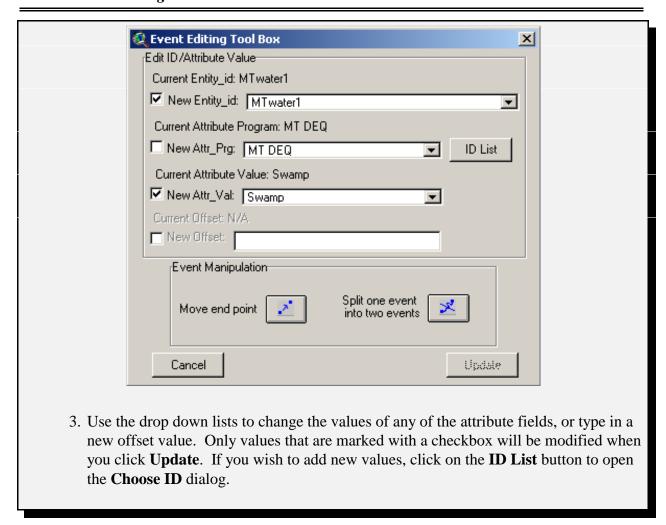
You can change the current Entity ID, Attribute Value (Attr_val), or Attribute Program (Attr_prg) values you've reach indexed in your Custom Shape Theme using the **Event Editing Tool Box**.

Editing Custom Shapes

1. Make the Custom Shape Theme you wish to edit active, and select the entities you wish to modify.
2. Click on the **Edit events/waterbodies** button, or choose **Edit events/waterbodies** from the pop-up menu that is activated by right clicking in the View.

This activates the **Event Editing Tool Box**.

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3. Use the drop down lists to change the values of any of the attribute fields, or type in a new offset value. Only values that are marked with a checkbox will be modified when you click **Update**. If you wish to add new values, click on the **ID List** button to open the **Choose ID** dialog.
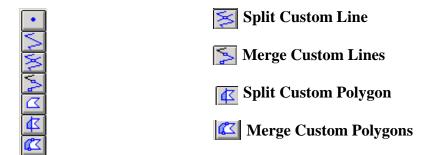
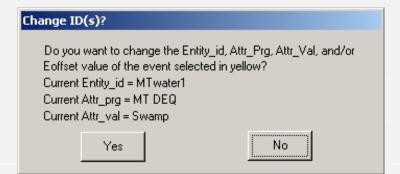**Changing the Spatial Extent of Custom Shapes**

You can change the spatial extent of Custom Lines or Polygons by splitting them in two, or by merging them together. These split and merge tools are shown below.

 Split Custom Line

 Merge Custom Lines

 Split Custom Polygon

 Merge Custom Polygons

Custom Shapes Tool Drop Down

Splitting Custom Lines or Polygons

1. Make the Custom Line or Polygon theme active and select the shape you would like to split into two (select only one).
2. Click on the appropriate splitting tool from the **Custom Shapes Tool** drop down. Click with this tool near the location where you like to make the split, hold your mouse button down and drag it across to define the split. Double click when you are finished.
3. The NHD-RIT will divide the segment, select one piece and ask if you would like to change the attribute values that are currently assigned to the new event.

> If you click **Yes**, you will be able to enter/select new values using the **Choose ID** dialog. If you click **No**, the values will remain unchanged.
4. The NHD-RIT will then select the other piece of the shape and ask if you would like to change the attribute values.
5. Even if you do not change the attribute values for either piece, the original shape will now exist as two separate features.

If you split a custom shape in error, or wish to merge shapes, you can use the custom shapes merge tools. Select the shapes you would like to merge, then select the appropriate tool The merge tools will only work on custom shapes that have the same Entity_ID, Attribute Value, and Attribute Program.

Deleting Custom Shapes

You can delete custom shapes by selecting them and clicking on the **Delete Events/Waterbodies** button.

Delete Events/Waterbodies is also available from the pop-up menu that is activated when you right click on the view.

Using NHD Navigate with the NHD-RIT

You can add navigation results from the NHD Navigate extension to an NHD event table that you have created or loaded using the NHD-RIT. You can only do this for navigations that do not cross NHD Workspaces. The **Stop navigation at CU boundary** check box in the **Navigation Options** will ensure that your navigations do not cross workspace boundaries when you are dealing with CU level workspaces. After you have performed a navigation, click on the **Add Linear Event(s) or Entire Waterbody(ies)** (blue A icon) button. Select/Enter an Entity ID, Attribute Value and Attribute Program when prompted, click **OK** and your navigation will be added to the event table. If you have a Navigation Results theme in your View, and you have a selection in the active reach theme, when you select **Add Linear Event(s) or Entire Waterbody(ies)** the NHD-RIT will prompt you to see whether you would like to add the Navigation Results to the View or the selection in the reach theme. After you add Navigation results to an NHD-RIT event theme, the Navigations Results theme will be removed from your View.

Other Features

Using an ID list

As you reach index, it can be helpful to work with a list of values you would like to use in your event tables to prevent a lot of repetitive typing and typos. The NHD-RIT allows you to use a list contained in a dbase file you've created, or the NHD-RIT can create a file and build the list as you work. You can also choose to work without a list. The dbase file that contains the ID's is referred to as an ID list. An ID list has six fields that the NHD-RIT can use:

- Entity ID
- Attribute Value
- Attribute Program

- Name
- USGS 8 digit Cataloging Unit
- Type

Entity ID, Attribute Value and Attribute Program are the only values that are actually stored in the event table. The other three fields (Name, USGS Cataloging Unit, and Type) are available to aid the user in selecting the correct values from the list (it is much easier to search for a stream name visually than an Entity_ID). There are no required naming conventions for fields in the ID list.

The NHD-RIT offers 5 options for working with an ID list. The default is to work without a list (**No List**). If you wish to use another method, choose **Change ID List** from the **NHD-RIT** menu.

The ID list options are as follows:

- **Create New** -- You do not currently have an ID list, but you would like the NHD-RIT to create one for you. The NHD-RIT will build a table with records for each combination of values (Entity_ID, Attr_prg and Attr_val) that you enter. When you choose this option, you will be prompted to select a name and directory location for your ID list. The NHD-RIT will also allow you to choose the field names in the ID list. This option will only require you to enter new values one time, after which you can select them from your list.

- **Load Existing** -- You already have a table with Entity ID's or attribute values you would like to use in your event table. This dbf file can have any name, and there are no required naming conventions for the fields in the table. When you load an existing table, you are prompted to define which field corresponds with which event table value. *Note:* The fields that represent Entity_ID, Attr_Val, and Attr_prg in your ID list must be character fields. You will get an error if they are numeric fields.

- **Create From Database** -- This option will allow you to extract an ID list from an existing database like the TMDL Tracking System or the 305(b) Assessment Database. This feature is not implemented in version 3.0 of the NHD-RIT, but may be available in future versions.

- **No List** (default) -- This option allows you to enter the values you want in the event table each time you add or edit an event. No list is created. When this option is used, the Choose ID dialog allows you to select from a list of values that exist in the event
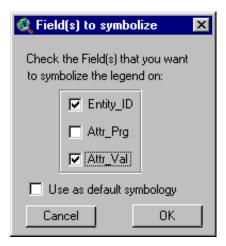
table being edited.

- **Select Loaded** -- Use this option to select an ID list you have already loaded in to your project. You may have several ID lists loaded into your project, but you may only select ID's for indexing from one list at a time.

Changing Legend Symbology

The NHD-RIT can update the legend for your event/waterbody and custom shape themes as you reach index. You can classify your legend by Entity_ID, Attr_prg, Attr_val, any combination of two of those fields, or using all three fields.

To change the legend symbology, select **Change Legend Symbology** from the **NHD-RIT** menu. Check all of the values you would like to use for legend classification and click **OK**.

Select Reaches by Waterbody Name

Select Reaches by Waterbody Name is available from the **NHD-RIT** menu as well as the pop-up menu that is activated by right clicking on the View. This feature provides an easy method for you to select waters in NHD using waterbody name. When you choose **Select Reaches by Waterbody Name**, a dialog appears that allows you to select one or more names from the active NHD reach theme. You can also search for a name by typing the first few letters into the "Search Names for:" box. When you click **OK**, the NHD reaches with the names you selected will be selected in your View. You can then use **Add linear event(s) or entire waterbodie(s)** to add them to your event/waterbody theme. It is a good idea to examine your selection before your add it to your event/waterbody theme.

View/Update Metadata

       View/Update Metadata is available from the **NHD-RIT** menu. It allows you to modify the current metadata information for an active event/waterbody or custom shape theme in your View. You can view the current user information and source information. You can also delete any old metadata entries that no longer apply to the event table.
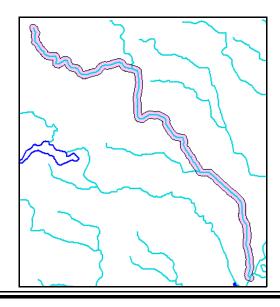
View/Update Users

       View/Update Users is available from the **NHD-RIT** menu. It allows you to change or modify the current user information for your project. Changes you make to the user information will be reflected in the metadata for the event/waterbody and custom shape themes you are working with.

Convert to NHD Events

       Convert to NHD Events allows you to convert existing GIS information containing surface water entities to NHD event tables. Any type of data that can be added to an ArcView View (ARC/INFO coverage, shapefile, latitude/longitude coordinates) can be converted. You can convert all three feature types (point, line and waterbody) and coverages of multiple extents. For example, if you wish to convert a coverage that contains waters for a state basin that is comprised of three 8-digit USGS cataloging units, as long as you load the appropriate NHD workspaces into your View, events will be created for the entire state basin area. You can also migrate surface waters from multiple coverages to NHD event tables using this feature.
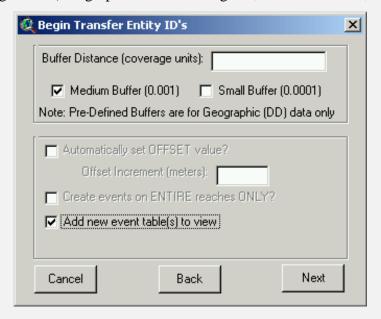
       The NHD-RIT migrates the surface waters in your coverage to NHD events by generating a buffer area around each entity, selecting the NHD reaches that fall within the buffer and creating corresponding events. An example of a buffer area for a linear surface water is shown in the figure below.

The NHD-RIT will prompt you to enter a buffer distance for the migration. Increasing the buffer size will increase the number of NHD reaches that are selected for each entity in your coverage. This can decrease the accuracy of the migration. Prior experience has shown that a buffer distance of 100 m (equivalent to .001 when working in decimal degrees) works well for coverages whose line work is similar to NHD.
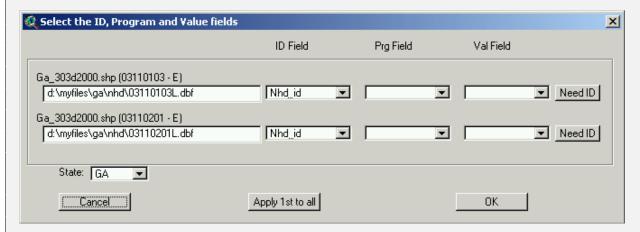

To use "Convert to NHD Events"

6.   Add the coverage(s) you would like to convert to NHD events to your View. Use **NHD Load** to add the appropriate NHD workspaces.

7.   Choose **Convert to NHD events** from the **NHD-RIT** menu. Select the theme(s) you would like to convert to NHD events and click **Next**. (Remember, these themes can be linear, point and/or polygon themes.)

8.   You are then prompted to select the NHD coverages/shapefiles you would like to have events migrated to. Select the **Reach Themes** for migrating points and linear events and the **Waterbody Reach Theme** for migrating polygons. Select themes for all of the NHD workspaces you would like to migrate events to. Click **Next**.

9.   Next you are prompted to select a buffer distance. You should enter the buffer distance in your coverage units (Geographic = decimal degrees, Albers = meters, etc).

This dialog has a check box that allows you to add the new event table(s) that are created during the migration to the View (this is a good idea if you wish to view the results). Check the appropriate options and click **Next**.

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10. You are then prompted to specify which fields in your coverage attribute tables are equivalent to the Entity_ID, Attribute Program or Attribute Value fields in the event table.

Use the **Apply 1ˢᵗ to All** button to apply the values you select for the first theme to the remaining themes. You can change the name and storage location of the event table that will be created by modifying the path name in the text box. You must enter a path name that already exists (i.e. the migration will not create a directory for you). You can also choose the state your surface waters are located in and the State field will be populated in each event/waterbody table. Make your selections, then click on the **Need ID** button to enter metadata for each event table you are creating. Enter all of the required information, then click **OK** on the metadata entry form. Click **OK** on the **Select ID...** form.

When you convert multiple coverages to NHD event/waterbody tables, the NHD-RIT creates an event/waterbody theme for each input coverage, and then merges them together to create one output theme for each feature type. This can result in the creation of overlapping event/waterbodies in the table. You can identify these overlaps in the linear event tables using the NHD-RIT's **Find Overlaps** utility. You should always carefully examine the output of **Convert to NHD Events**.
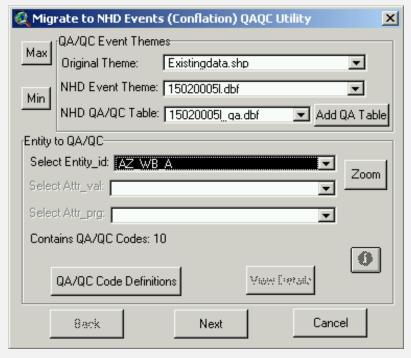
After running the coversion, it is a good idea to examine each entity to make sure it is correctly represented in NHD. You can use the NHD-RIT's **QAQC Converted NHD Events** feature to help with this process.

QAQC Converted NHD Events

As you run the NHD-RIT's **Convert to NHD Events** feature, a QA log is created that stores codes that indicate the success of your conversion. **QAQC Converted NHD Events** aids in the process of comparing your coverage to the converted NHD event themes and shows you the values stored in the QA log. You can only QA one event/waterbody theme at a time.

To use "QAQC Converted NHD Events"

1.   Select **QAQC Converted NHD Events** from the **NHD-RIT** menu.

2.   You will be prompted to navigate to the QA tables that were created during the conversion process. The QA table will be stored in the same directory as the new event table and will be named "EventTableName" + "_QA".

3.   The QA dialog will open. In the three drop down boxes at the top of the dialog, you need to select the original coverage used in the migration, the name of the event table you want to QA, and the name of the corresponding QA table. The original coverage and the new event theme must be in your view in order for this to work. When you select the original covergae, you will be prompted to select the fields in the coverage that correspond to the Entity_ID, Attr_prg, and Attr_val fields in the event table. If you are not using the field you are being prompted for, hit **Cancel**. If the QA table you need is not in the drop down list, you can click on the **Add QA Table** button to add it to the project.

4.   The "Select Entity_id;" drop down will contain the identifiers for all of the surface waters in your source coverage. Choose the first one from the list and click **Zoom**. The NHD-RIT will enlarge the View scale so that you can see the selected entity. If the QA dialog is in the way when you are viewing the selection, you can use the **Min** button to minimize its size in the View. The NHD-RIT classifies your legend as follows for QA:

> Thin Red line – entity in the NHD event theme
> Thick Gray line – entity in the source coverage
> Bright Blue line – NHD reaches

Any place where the red and gray lines do not match up is a place you may need to correct, either using the **Event Editing Toolbox** or by adding new events..
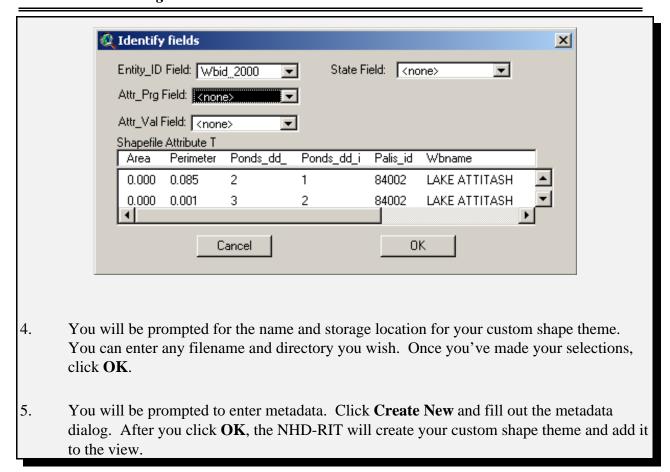
5.   You can use the **Next** and **Back** buttons to step through each entity in the source coverage. For each entity that you examine, the QA dialog will present the QA/QC codes from the QA table. These codes are an indication of how well the migration went, where 10 is a success and 1 indicates a problem. To view the QA/QC code definitions, click on the **QA/QC Code Definitions** button.

Convert to a Custom Shape Theme

Convert to a Custom Shape Theme allows you to convert any shapefile or coverage into a format that is compatible with the RIT. This should only be used for features that are not appropriate for georeferencing to NHD, like shellfish harvesting areas. The advantage of converting themes into this format is that you can then take advantage of all of the editing capability available through the RIT, like creating shapes and using the ID list, while maintaing FDGC compliant metadata.

To use *Convert to a Custom Shape Theme:*

1.   Add the theme you want to convert to the View and make it active.

2.   Select **Convert to a Custom Shape Theme** from the **NHD-RIT** menu.

3.   You will then be prompted to select the fields in the theme attribute table that correspond to the fields in the event table. Select the field you want to use for Entity_ID. The other fields are optional. Once you've made your selections, click **OK**.

4.   You will be prompted for the name and storage location for your custom shape theme. You can enter any filename and directory you wish. Once you've made your selections, click **OK**.

5.   You will be prompted to enter metadata. Click **Create New** and fill out the metadata dialog. After you click **OK**, the NHD-RIT will create your custom shape theme and add it to the view.

Convert to a Custom Shape Theme does not change the shapes that are in your original theme, so there is no QC feature for this tool.

Completing Event/Waterbody Indexing
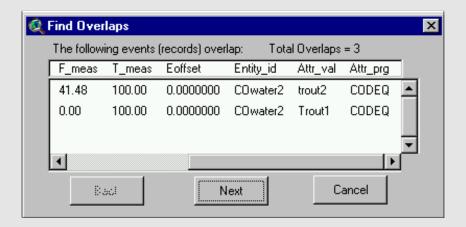
Find Overlaps

When you have finished editing a linear event table, it is a good practice to run **Find Overlaps** (available under the **NHD-RIT** menu). **Find Overlaps** will identify linear event segments that occupy the same spatial extent on an NHD reach, and have the same offset.

To use **Find Overlaps:**

1.   Make the linear event theme active and select **Find Overlaps** from the **NHD-RIT** menu. The NHD-RIT will notify you if your event table does not have any overlaps.

2.   If there are overlaps, the NHD-RIT will open the attribute table for the linear event theme, with the first set of overlapping event records selected. The NHD-RIT will also zoom to the selected overlapping events in your View. A small dialog box will show you the values for the selected records.

3.   There are several ways to resolve an overlapping situation

a. If the values in the attribute fields (Entity_id, Attr_val and Attr_prg) are identical, then the overlapping event is a duplicate and can be deleted. Typically, if there is a difference in the F_meas and T_meas values for the overlapping events, you will want to delete the event that is shorter. If one event has To and From measures of 0 and 100, and the other has measures of 25 and 75, you would delete the second event.

b. To delete an overlapping event, select the event in the attribute table, open the View and use the **Delete events/waterbodies** function. It is a good idea to check the output in your View, to make sure the resulting entity delineation is what you intended.

c. If the values in the attribute fields (Entity_id, Attr_val and Attr_prg) are different, you can resolve the overlap by changing one of the offset values. To change the offset, select the record in the table you wish to modify, return to the View and use the **Edit events/waterbodies** function to change the offset. Visually inspect the results of your edit in the View to ensure the results are what you intended.

4.   After you have resolved the overlap, click on the **Next** button to view the next set of overlapping reaches. The NHD-RIT will notify you when all of the overlaps have been resolved.
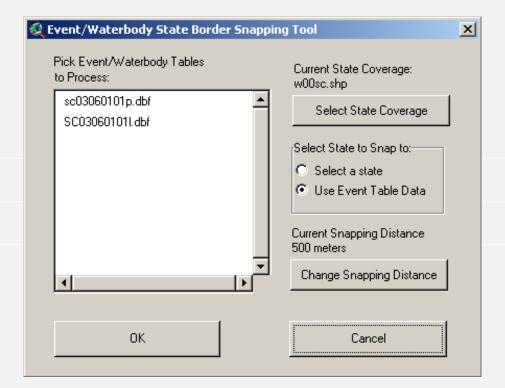
State Border Snapping

You can use **State Border Snapping** to make sure that all of your events and waterbodies are contained in the correct state. This feature will also snap NHD events and waterbodies that stop short of the state boundary, to the state boundary. You set a snapping distance to determine when events should be snapped to the state line. If you do not want to snap events to the state line, set the buffer distance to 0. **State Border Snapping** creates a log file that lists the event, waterbody, and custom shape themes that were processed, as well as any problems that were encountered during the procedure.

In order to use this feature you must have a polygon shapefile for the state of interest, with the two letter abbreviation for the state in one of the attribute fields. You can use this feature on linear and point event tables, waterbody tables and custom shapes (note that no snapping is performed on custom shapes) . **State Border Snapping** will perform the following operations on each feature type:

Feature Type	Output
Linear Events/Custom Lines	**State Border Snapping** will clip all line segments that extend past the state boundary to the state line and delete any segments that are entirely outside of the appropriate state polygon. Linear events will also be snapped to the state line if the distance between the end point of the event and the intersection of the state line along the indexed reach is less than or equal to the snapping distance set by the user.
Point Events/Custom Points	**State Border Snapping** will not modify the locations of points. Any points that are located outside of the specified state will be written to the log file so the user can examine them.
Waterbodies/ Custom Polygons	**State Border Snapping** will delete all polygons that are located entirely outside of the state of interest. It will clip polygons that are intersected by the state border. For NHD waterbodies, **State Border Snapping** checks to see if snapping should occur by generating a buffer around the indexed waterbody using the snapping distance set by the user. If the state border intersects the buffer generated around the waterbody, snapping will occur.
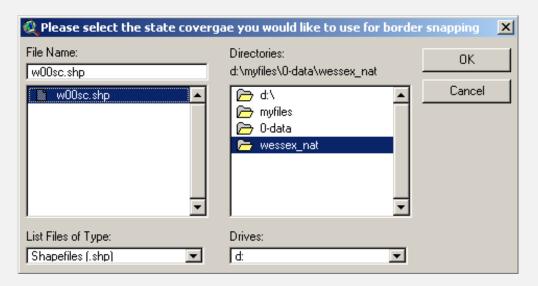
To use **State Border Snapping**:

1.   Load the event/waterbody themes or custom shapes theme you wish to perform border snapping on into your View using the NHD-RIT's **Load NHD Event Theme** or **Load Custom Shape** feature as appropriate.

2.   Select **State Border Snapping** from the **NHD-RIT** menu. This will open the following dialog:
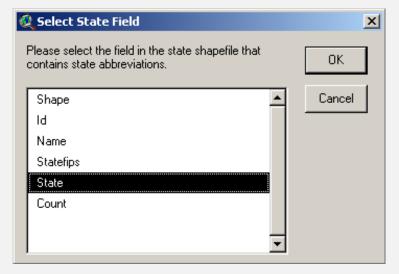
3.   Choose the event/waterbody and custom shapes tables you would like to process from the list on the left hand side of the dialog. Hold down the **Shift** key to select multiple tables.

4.   Click on the **Select State Coverage** button. You will be prompted to navigate to the shapefile containing the state polygons you would like to use.

Navigate to the shapefile and click **OK**.

5.   Next you will be prompted to select the field containing the two letter state abbreviations (For example, a field that would contain "SC" for South Carolina).

Select the appropriate field and click **OK**.

6.   In the **Select State to Snap To** option box you can choose to select a state for border snapping, or you can use the data in the event table. If the event table only contains data for a single state, you can choose the **Select a state** option and the table will be formatted for the state you select. If the event table contains data for multiple states, or you want to run a batch of event tables that are in more than one state, you can choose **Use Event Table Data**. This option will use the values in the State field of the event tables for processing.

        Note: You can only use the **Use Event Table Data** option if the state field is populated in the event table for every record. Otherwise the lack of state data will be noted in the log file and the event/waterbody table or custom shapefile will not be processed.

7.   Click on the **Change Snapping Distance** button to define the tolerance for snapping linear events and NHD waterbodies that fall short of the state line to the border. A snapping distance of 100-500 meters is recommended. If you do not want snapping to occur, set the snapping distance to 0.

8.   Once all of the options are set, click **OK**. You will be prompted for the storage location of the log file. You should review the log file after the process is complete to check for any problems.

Managing all of the output files

Each time you create a new event, waterbody or custom shape theme with the NHD-RIT, the following files are generated.
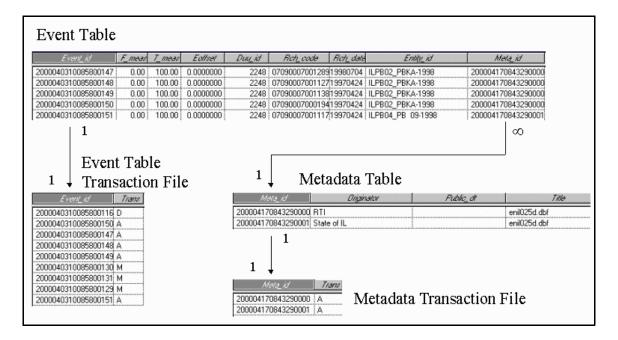
10190006L.dbf (Event Table)	This is the table that contains the reach indexing information (Reach codes, To and From measures, Entity_ID, Attr_val, Attr_prg etc).
10190006L_M.dbf (Metadata Table)	This table stores all of the metadata entered by the user, including the user information and source information. This table can be joined to the event table through the Meta_id field. This relationship allows the NHD-RIT to store record level metadata.
10190006L_T.dbf (Event Table Transaction file)	This file stores information about how the event table was edited. For each addition, edit, or delete that is performed, the unique event id (unique identifier for each event table record) is stored, along with the transaction type and the date and time. This transaction file will be used to upload the reach indexing data to EPA's Reach Address Database (RAD).

10190006L_MT.dbf (Metadata Transaction file)	This file functions similarly to the event table transaction file, except that it records edits to the metadata table.
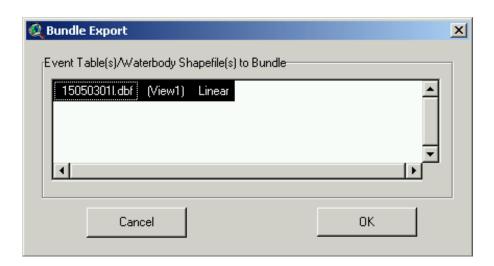
Note than when waterbody tables or custom shapes are created, .shp and .shx files are also created for the shapefile.

The following diagram depicts the relationship between these files.

After you are satisfied with the content of your event, waterbody or custom shape theme, you can use the **Export Bundled Files** utility to bundle the event, waterbody or custom shape files with all of the associated metadata and transaction files into a single compressed unit. This format is useful for storing and maintaining your event tables. It is also the format your event tables must be in if you wish to submit them to EPA.

Export Bundled Files is available under the **NHD_Tools** menu.

The **Bundle Export** dialog allows you to export event, waterbody and custom shape themes that are loaded in your project. Select the themes you would like to export and click **OK**. Use the shift key to select more than one NHD-RIT theme. The compressed files will be given the same name as the event, waterbody or custom shape theme and will be stored in the same directory.

Table Type	Compressed File Contents
Linear or Point Event Table (eventTable.tgz)	eventTable.dbf eventTable.shp* eventTable.shx* eventTable_M.dbf eventTable_T.dbf eventTable_MT.dbf
Waterbody Table or Custom Shape (themeName.tgz)	themeName.dbf themeName.shp themeName.shx (and any other shapefile components -- .sbn, .sbx, .ain,.aih) themeName_M.dbf themeName_T.dbf themeName_MT.dbf

The bundled export files contain all of the files listed above under "Compressed File Contents", so you will only need to archive the .tgz files. When you want to reimport these files

for later use with the NHD-RIT, use the **Import Bundled Files** utility available under the **NHD_tools** menu.

> *The **Export Bundled Files** process creates shapefiles for linear and point events. This is to facilitate the use of these event themes, but these shapefiles can also be used by the indexer for mapping and display. *Please note* that these shapefiles are only updated on export. So if you make updates to your linear or point event tables, you must export a bundled file, and then use the shapefile contained in that bundle to view your current work.
>
> **Export Bundled Files** also adds a size field to the event tables. These are for EPA's Reach Addressing Database. Linear event sizes are in meters, waterbody sizes are in square kilometers, and no sizes are calculated for points. These sizes are only updated when you export bundled files, so if you make updates to these event tables and you want to use the sizes, you must export bundled files and then use the event tables in the bundles in order to have current size information.
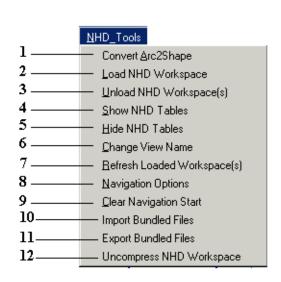
When you use the **Import** or **Export Bundled Files** utility, the NHD-RIT will open a DOS window. If this DOS window does not close when the operation is complete, right click on the dialog menu, check the "Close on Exit" box and click **Apply**.
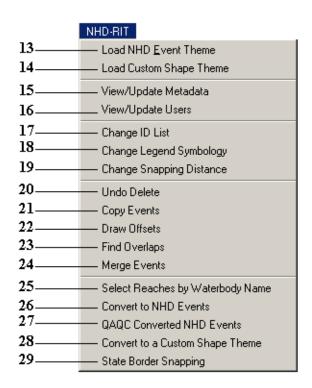
Note: **Export Bundled Files** copies your event tables and associated files to the default "Temp" directory on your computer. It is a good idea to periodically delete these files from your temp directory. On Windows 95/98 machines this is typically "c:\Windows\Temp" and on Windows NT it is "c:\Temp".
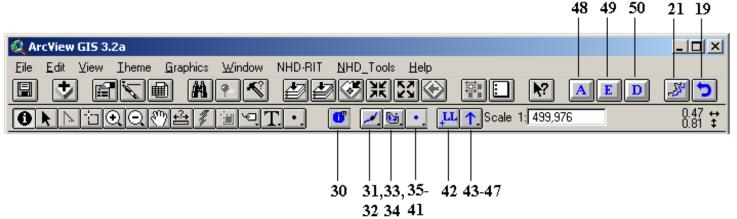
NHD Toolkit Function Reference

The NHD Toolkit Interface

The functions shown below may be available depending on which NHD Toolkit extensions have been loaded into your project. This section contains a brief description of each function by reference number, including which Toolkit extension the feature is part of.

1 - Convert Arc2Shape (*NHD Arc2Shape*)

Convert Arc2Shape converts an NHD workspace in ARC/INFO coverage format to ArcView shapefile format. The resulting NHD shapefile retains the directory structure of the NHD workspace. **Convert Arc2Shape** provides you with the option of projecting your workspace to a desired projection.

2 - Load NHD Workspace (*NHD Load/Unload Workspace*)

Load NHD Workspace allows the user to load an NHD workspace into the current View. You can load all themes, tables and links, or define a custom collection of NHD features to load.

3 - Unload NHD Workspace(s) (*NHD Load/Unload Workspace*)

Unload NHD Workspace(s) allows you to remove NHD workspaces from your View that you have added using **Load NHD Workspace**. **Unload NHD Workspace(s)** will also remove any event/waterbody tables in the project that have been associated with the workspace using the NHD-RIT.

4 - Show NHD Tables (*NHD Load/Unload Workspace*)

Show NHD Tables tiles your ArcView windows so that you can view any NHD tables you've loaded into your project. When you make a selection in the View, or any of the tables, records in any linked tables will also be selected.

5 - Hide NHD Tables (*NHD Load/Unload Workspace*)

Hide NHD Tables closes the NHD table windows in ArcView.

6 - Change View Name (*NHD Load/Unload Workspace*)

You should use **Change View Name** if you would like to change the name of a View in which you have used **Load NHD Workspace** to add NHD themes. If you use conventional ArcView Methods, the **NHD Load/Unload Workspace** extension will malfunction.

7 - Refresh Loaded Workspace(s)

NHD Load/Unload workspace creates files in your temp directory that store information about the linkages ArcView puts in place when you load a workspace. If these temp files are deleted, ArcView will prompt you for their location when you open a saved ArcView

project where you used NHD Load/Unload workspace. **Refresh Loaded Workspace(s)** will recreate these files for you so that you may continue to use your project. This feature is also useful for restoring a workspace in your View when a theme, table or link is inadvertently renamed or deleted from the project.

8 - Navigation Options (*NHD Navigate***)**

       This feature allows you to enter parameters for the navigations you perform using **NHD Navigate**. You can specify whether you would like your navigations to begin with whole reaches or at a specified point along a reach. You can also specify a maximum distance for the navigation.

9 - Clear Navigation Start (*NHD Navigate***)**

       Clear Navigation Start can be used to clear the starting point of a "Point to Point" selection.

10 - Import Bundled Files (*NHD Reach Indexing Tool***)**

       Event/waterbody tables are often stored as tarred and gzipped files that also contain the associated metadata and transaction files. You can use **Import Bundled Files** to import these bundles so that you can use the event/waterbody tables with the **NHD-RIT**.

11 - Export Bundled Files (*NHD Reach Indexing Tool***)**

       Export Bundled Files created tarred and gzipped files for the NHD event/waterbody themes in your view. This feature creates a single archive containing the event table, metadata table and any associated transaction files for each event/waterbody theme. **Export Bundled Files** also creates shapefiles for linear and point events and adds a size field to linear and waterbody themes. The shapefiles and sizes are only updated on export. In order to submit your event tables to EPA for inclusion in the Reach Addressing Database, your event tables must be in this bundled format.

12 - Uncompress NHD Workspace (*NHD Reach Indexing Tool***)**

       Uncompress NHD Workspace can be used to decompress NHD workspaces downloaded from the NHD website (usgs.nhd.gov). This feature calls the freeware tools gzip and tar. Uncompress NHD Workspace is very useful for batch decompression of NHD workspaces.

13 - Load NHD Event Theme (*NHD Reach Indexing Tool*)

Load NHD Event Theme allows you to add an NHD event/waterbody theme to your project. In order to load an event/waterbody theme, you must first load the Network Reach and the Waterbody Reach themes for the corresponding NHD workspace using **NHD Load/Unload Workspace**. You can also use this feature to make an event/waterbody table active for editing with the **NHD-RIT** using the **Select a loaded event/waterbody table** option.

14 - Load Custom Shape Theme (*NHD Reach Indexing Tool*)

Load Custom Shape Theme allows you to add an NHD-RIT Custom Shape theme to your project. You can also use this feature to make the custom shapes theme active for editing with the **NHD-RIT** using the **Select a loaded Custom Theme** option. This affects which custom theme new shapes are added to.

15 - View/Update Metadata (*NHD Reach Indexing Tool*)

View/Update Metadata allows you to update the current metadata for an active event/waterbody table. You can either select a metadata entry that has already been created for the table, make an update to an existing entry, or create a new entry. The metadata entry you select will be associated with each record in the event/waterbody table that you create/modify during your indexing session.

16 - View/Update Users (*NHD Reach Indexing Tool*)

View/Update Users allows you to change the current user for the indexing session, or update the contact information associated with a user. This information is stored in the metadata record associated with the current reach indexing session.

17 - Change ID List (*NHD Reach Indexing Tool*)

An ID list can be used with the NHD-RIT to provide you with a list of identifiers for selection instead of requiring you to type in identifiers. This saves time and reduces the risk of typos that will prevent an associated database from joining with the GIS work. **Change ID List** allows you to select your desired ID List option. You can change your ID list method, or your ID list at any time during your reach indexing session. The default is **No List**, which allows you to choose from the list of values that are already in the current event table.

18 - Change Legend Symbology (*NHD Reach Indexing Tool*)

Change Legend Symbology will classify your event, waterbody or custom shape theme legend by Entity_ID, Attribute Program or Attribute Value, any combination of two of those fields, or using all three fields. You can use the "Use as default symbolgy" check box to apply your selection to all of the event, waterbody and custom shape themes in your project.

19 - Change Snapping Distance (*NHD Reach Indexing Tool*)

By default, the NHD-RIT uses a 10% snapping distance. This means if you move a linear event end point, or add a point event within 10% distance of the reach from its end point, the point will snap to the end point of the reach.   You can use **Change Snapping Distance** to change this snapping percentage. If you do not wish to use snapping, set the value to 0. The snapping distance you select will affect the **Move End Points**, **Add Point Event on Reach** and **Migrate to NHD Events...** features.

20 - Undo Delete (*NHD Reach Indexing Tool*)

You can use **Undo Delete** to restore events/waterbodies that your have deleted using the NHD-RIT's **Delete Events/Waterbodies** feature. It will restore the events/waterbodies from your most recent delete.

21 - Copy Events (*NHD Reach Indexing Tool*)

Copy Events allows you to copy existing linear events and display them offset from the original event. You define the appropriate offset value in your View projection units. The table below suggests some offsets for different View projections. Modify these values as necessary to display your offsets at the desired View scale.

View Projection Units	First Offset	Second Offset	Third Offset
Decimal Degrees	.001	.002	.003
Meters	100	200	300
Feet	300	600	900

Note: The offset value stored in your event table (eoffset field) is stored in coverage units, but you enter the offset value in View units. If your View is not projected, then coverage units = View units.

22 - Draw Offsets (*NHD Reach Indexing Tool*)

Offset events do not always display, due to a known ArcView bug. The **Draw Offsets** button will select the offset reaches and force them to draw. Use ArcView's **Clear Selected Features** button to clear the selection (your offset reaches will remain visible in the View until you pan or change the view scale).

23 - Find Overlaps (*NHD Reach Indexing Tool*)

Find Overlaps will identify linear event segments that occupy the same spatial extent on an NHD reach and that have the same offset value. For more information on using **Find Overlaps** see *Completing Event/Waterbody Indexing* in the NHD-RIT section of the document.

24 - Merge Events (*NHD Reach Indexing Tool*)

Merge Events allows you to merge linear or waterbody events that are located on the same reach. This is useful for restoring events that you have split using **Split One Event into Two** from the Event Editing Toolbox. The events/waterbodies must have the same Entity ID, Attribute Program and Attribute Value in order to be merged.

25 - Select Reaches by Waterbody Name (*NHD Reach Indexing Tool*)

Select Reaches by Waterbody Name allows you to query the active NHD Reach Theme by presenting a list of all reach names available in the workspace. You can select one or more names for selection, and can also search for names using the "Search Names for:" text box.

26 - Convert to NHD Events (*NHD Reach Indexing Tool*)

Convert to NHD Events allows you to convert an existing coverage of surface water entities to NHD event/waterbody tables. You can convert points, lines and waterbody polygon coverages. To run a conversion you need to add the existing coverage to your View and load all of the corresponding NHD workspaces that you would like to create event/waterbody tables for. You can set up a batch migration for multiple workspaces. It is strongly recommended that you carefully examine the output event/waterbody tables. The NHD-RIT's **QAQC Converted Events** feature is designed to help you with this process.

27 - QAQC Converted NHD Events (*NHD Reach Indexing Tool*)

QAQC Converted NHD Events steps you through each surface water entity in your original coverage for comparison against the event/waterbody table created with **Convert to NHD Events**.

28 - Convert to a Custom Shape Theme (*NHD Reach Indexing Tool*)

Convert to a Custom Shape Theme allows you to convert an existing coverage to a format that can be edited with the RIT. This should only be used for features that can not be georeferenced to NHD, like shellfish harvesting areas or groundwater protection areas.

29 - State Border Snapping

State Border Snapping can be used to make sure all of the themes you've created with the NHD-RIT are contained in the appropriate state. Any entities that extend outside of the state will be clipped to the state boundary. You can also choose to snap NHD events and waterbodies to the state border within a user specified tolerance. If you want to use this tool on data that contains information for multiple states, select the **Use Event Table Data** under the **Select State to Snap to:** options on the **State Border Snapping** dialog.

30 - Display Measure (*NHD Load/Unload Workspace*)

Display Measure will return the route and measure information for NHD Route Themes. This information will vary depending on the active route theme. Network Reach themes, Drains and 1 D Landmark features are all route themes in NHD.

31 - Add Point Event on Reach (*NHD Reach Indexing Tool*)

Add Point Event on Reach allows you to create a point event along an NHD Network Reach segment. This point is georeferenced to NHD using the reach measure value where the point is located (P_meas).

32 - Add Offset Point   (*NHD Reach Indexing Tool*)

Add Offset Point is available as a tool drop down under the **Add Point Event on Reach** tool button. **Add Offset Point** allows you to create a point event that is not located directly on an NHD reach. Offset points are georefenced to NHD using a reach measure value of a nearby reach and an offset value to display them at the desired location.

33 - Add Entire Waterbody(ies)   (*NHD Reach Indexing Tool*)

Add Entire Waterbody(ies) allows you to reach index the waterbody polygons in the NHD Waterbody Reach theme.

34 - Add Partial Waterbody   (*NHD Reach Indexing Tool*)

Add Partial Waterbody is available as a tool drop down under the **Add Entire Waterbody(ies)** tool button. **Add Partial Waterbody(ies)** allows you to reach index a portion of a polygon in the NHD Waterbody Reach theme.

35 - 41 - Custom Shape Tools

These tools allow users to create and modify custom shape features.

	Add Custom Point	Allows the user to create a custom point.
	Add Custom Line	Allows the user to create a custom line.
	Split Custom Line	Allows the user to split one custom line into two.
	Merge Custom Line	Allows the users to merge custom lines that have the same Entity_ID, Attribute Program and Attribute Value into a single feature.
	Add Custom Polygon	Allows the user to create a custom line.
	Split Custom Polygon	Allows the user to split one custom polygon into two.
	Append Custom Polygon	Allows the users to merge custom polygons that have the same Entity_ID, Attribute Program and Attribute Value into a single feature.

42 - LatLong (*NHD Reach Indexing Tool*)

The **LatLong** button will return the latitude and longitude for any point in the active View. To use this tool, click on the **LatLong** button, click on the desired location in the View, and a dialog box will tell you the latitude and longitude coordinates.

43 - 47 - Navigation Tools (*NHD Navigate*)

Several navigation tools are available from this tool dropdown.

↑	**Upstream Mainstem**	Selects all mainstem reaches upstream from the selected point on a reach.
	Upstream Mainstem with tributaries	Selects all mainstem and tributary reaches upstream from the selected point on a reach.
↓	**Downstream Mainstem**	Selects all mainstem reaches downstream from the selected point on a reach.
	Downstream Mainstem with divergences	Selects all mainstem reaches and divergences downstream from the selected point on a reach.
••	**Point to Point**	Selects all reaches along the flow path between two selected points.

48 - Add Linear Event(s) or Partial Waterbody(ies) (*NHD Reach Indexing Tool*)

Add Linear Event(s) or Partial Waterbody(ies) adds selected NHD Network or Waterbody reaches to an associated linear event or waterbody table. If there is no corresponding event/waterbody table for the selected reaches, the NHD-RIT will prompt you to create one. You can also use this feature to add navigation results from **NHD Navigate** to a linear event table. You can also use this feature to add selected shapes from another theme to a custom shapes theme.

49 - Edit Events/Waterbodies (*NHD Reach Indexing Tool*)

Edit Events/Waterbodies opens the **Event Editing Toolbox**. This toolbox allows you to modify the attribute values (Entity ID, Attribute Program, Attribute Value and Offset) for the selected events, waterbodies or custom shapes. You can also modify the spatial extent of a selected event using **Move Endpoints** or **Split One Event into Two Events.**

50 - Delete Events/Waterbodies (*NHD Reach Indexing Tool*)

Delete Events/Waterbodies will delete the selected events, waterbodies or custom shapes from the event/waterbody table. *You should always delete entities from your event, waterbody and custom shapes themes using the **Delete Events** button in the NHD-RIT. If you delete records from the attribute tables using conventional ArcView methods, the associated metadata and transaction files will be out of sync with the NHD-RIT theme.*

Troubleshooting

The Event Editing Tool Box is not responding.

Occasionally when you call the **Event Editing Tool Box**, it is frozen and will not respond to user input. Clicking on the "E" button multiple times will usually "wake up" this dialog box. You can also wake up the Editing Toolbox by clicking on the **Delete** button then hitting "Cancel" when prompted to delete the events (*Note:* This only works if you have not checked the "Do not show this dialog again" check box for the **Delete** feature.

When I use Import Bundled Files, Export Bundled Files or Uncompress NHD Workspace, the DOS window does not close.

When the DOS window opens, right click on the title bar and select **Properties**. Make sure the box that says "**Close on exit**" is checked. You should only have to do this once on your computer (once set it should remain set).

When I try to Add a new feature, the NHD-RIT is prompting me about creating a new event table.

When this happens, the NHD-RIT is either unsure which event theme you are trying to edit, or there may not be a theme in the View for the feature type you are trying to add. If you are working with a theme that exists in your View, choose **Select a loaded event/waterbody table** and select it from the list box in the dialog. If you need to create a new event theme for the feature type you are adding, click **Create new event/waterbody table**.

See *Editing Event/Waterbody Themes* in the *NHD-RIT* section of this User Guide for more information about "editable" themes.

The Entity_ID, Attr_val, or Attr_prg value I want to use in my event table is not available in the Choose ID dialog.

Type the desired values into the text boxes for each field and click **OK**. Depending on the ID List method you are using, the NHD-RIT may prompt you to see if you would like the

new value to be added to your ID list table.

My Offset Reaches do not display.

Due to a known problem with ArcView, offset reaches do not always display in the View. Use the **Draw Offsets** button, then click **Clear Selected** to force them to draw. You will have the best results if you work in a View projection that is the same as your data projection (For example, if your data are Geographic, work in an unprojected View).

How do I know which NHD coverage my event/waterbody table is associated with?

In order for your event table to display, you must have an associated NHD coverage that has a reach segment with a rch_code for each rch_code listed in the event table. (You also need this NHD coverage to edit a waterbody table with the NHD-RIT.) The default naming convention for event/waterbody tables created with the NHD-RIT is <NHDcoveragename>X.dbf where X is the first letter of the feature type (point, linear or waterbody). If the default name was used, your event table should be associated with the coverage that is part of its name. If you have event tables that have been named another way, you may be able to narrow down the list of NHD coverages they could be associated with by examining the rch_code in the event/waterbody table. The first 8 characters of rch_code identify the 8 digit USGS Hydrologic Cataloging Unit the NHD reach is in.

The NHD-RIT caused ArcView to Crash.

The NHD-RIT has been known to fail after intense indexing. The frequency of this problem and the number of event/waterbody tables in your project is largely dependant on the specifications of your computer. The more memory and available resources your computer has, the fewer problems you will encounter.

When ArcView is going to crash, you will see a message such as: 'spatial index cannot be created for ... check available memory' or 'too many files open'. You may also get a message suggesting that ArcView will try to recover. As soon as you get one of these messages, save your project and close ArcView. You can reopen ArcView, and your project and everything will function properly.

If you are unable to save your project before ArcView crashes, don't worry. Your event/waterbody table is saved each time you make an addition or edit. No work will be lost. Simply re-add the event themes you were working with to a new NHD-RIT project and continue working.

My event table will not display correctly.

Sometimes event tables do not display correctly in the ArcView view. This will often occur after using the NHD-RIT's **Delete Event/Waterbody** function. Currently the only way to get the event table to display properly is to close ArcView, create a new NHD-RIT project and re-add the event table to it.

Can I rename my event/waterbody tables?

Renaming event/waterbody tables is not recommended because the metadata files store information about the original event/waterbody table names.

The Tool Button I want to use is grayed out.

As you work with the NHD-RIT, only the tool buttons that can operate on the current active theme are available for use. If the tool you want to use is grayed out, you probably need to change your active theme.

When I try to make a selection in the View, nothing happens.

This is usually due to one of two things. The first is that the theme you wish to make the selection on is not currently active. Make sure the theme is currently active in the View. The other possible problem is that as you create linear events and waterbodies, they display on top of the NHD Transport Reach and Waterbody Reach themes, so you can no longer see your selections in the underlying NHD themes. To view your current selections, simply turn off the linear and waterbody event themes.

My event will not split at the location I selected.

You will have the most success using the **Split One Event into Two Events** tool if you zoom in to the reach you are wanting to split. This increases the accuracy of the split location you select with the mouse pointer.

Sometimes using the **Split One Event into Two Events** tool yields seemingly unpredictable results. This often occurs if you are dealing with an event on an artificial path (NHD reaches that go through lakes, ponds or wide rivers). Due to the way that measures are distributed along artificial paths, these events can be difficult to split. There is currently not a

good solution to this problem in NHD, so our advice for now is to attribute the area of interest as accurately as possible.

Another scenario that leads to unpredictable splitting results is when the underlying NHD reach segment has conflicting measures. You can check for conflicting measures by classifying the NHD Transport Reach theme legend using the line symbol with arrows. If the arrows along a single reach point in opposite directions, you have conflicting measures. This issue can not be resolved until the measures are corrected in NHD. Our advice for now is to attribute the area of interest as accurately as possible.

My Offset Point Event is not at the location I selected.

Offset Points are linked to the nearest NHD reach with a calculated offset value. Offset points display perpendicular to the NHD reach they are linked too. Sometimes the location you select is not perpendicular to the nearest reach, so the point that is added does not display at the desired location. You may be able to get better placement of your point by visually looking for a reach that would be perpendicular with a line to your desired point, adding the point on the reach and setting the offset value manually (through the **Choose ID** dialog). You can use ArcView's measure tool to help you select an appropriate offset value.

When I add my event/waterbody table to the View I get a message that says "Unable to Save Edits, please use the Save Edits as option".

You must have write access to your waterbody/event table and the associated metadata and transaction files to edit them. You cannot edit event/waterbody tables that are on a CDROM or that are on a network where you do not have write access. To use the event/waterbody tables, download them to your local workspace and use Windows Explorer to remove the Read Only property from the files.

When I try to add an event/waterbody to my event/waterbody theme I get an error message that says "Attempt to edit read-only virtual table (vtab)".

You must have write access to your waterbody/event table and the associated metadata and transaction files. You cannot add events/waterbodies to event/waterbody tables that are on a CDROM or that are on a network where you do not have write access. To use the event/waterbody tables, download them to your local workspace and use Windows Explorer to remove the Read Only property from the files.

When I try to add a new ID or modify my ID list I get an error message that says "Attempt to edit read-only virtual table (vtab)".

You must have write access to your ID list order to add records to it or modify it.

When I use Move End Point, I get a message that says "No measure found".

You may get this message if the point you select to move the end point to is not on the NHD reach that has the event on it. Zoom in to the end point you are trying to move and try again. If you are not sure where the start and end points of the underlying NHD reach are, turn off the linear event theme and select the underlying NHD reach. The area selected is the maximum extent for the end points of the NHD event you are editing.

You may also get this error if your underlying NHD coverage has the "FOD2ARC Version 1.80 rmfix patch 1" text in the openme.txt file located inside the workspace directory. You can resolve this error by converting your NHD coverage to a shapefile using the **NHDArc2Shape** extension that is part of this Toolkit.

The NHD-RIT buttons are distorted in my View.

Maximize your ArcView window and your View windows and the buttons should display properly.

When I click on "Split one event into two" I get an error message that says "You can only have one event selected to split".

If you get this message, you have more than one event in your event table selected. If it appears that there is only one selected, you may have overlapping reaches. Clear your selection and select the event reach you wish to split. If you still get the error message, open up the attribute table for your linear event theme, promote the selected records to the top of the table, and either delete one of the overlapping events, or set an offset value.

When I select a linear event, there appears to be another small selection on a nearby reach.

This occurs due to the way measures were assigned to artificial paths in NHD. This is a display error that will occur with events that span a portion of an artificial path reach in NHD coverages or shapefiles. Since it is a display error, your event table data are correct.

NHD Toolkit Terms

Copied Events -- In some cases, surface water entities may have overlapping extents. Dynamic segmentation allows for multiple entities to be referenced to the same NHD reach, but displayed offset from one another, using an offset value entered by the user.

Dynamic Segmentation -- provides a means of linking and displaying surface water attribute data to NHD without requiring the modification of the underlying coordinate data. This surface water data can be linked to any portion of a reach (independent of arc-node topology). It is dynamic segmentation that allows the NHD-RIT to create and display event tables that define waterbodies.

Entities -- Groups of events in an event table that represent a homogeneous surface water unit. Information about these entities may be stored in an associated database and accessed using a unique identifier stored in the "Entity_id" field, or they may have homogeneous attributes stored in the event table itself. A waterbody is an example of an entity.

Event table -- the main output of the NHD-RIT. These .dbf files can be displayed as themes in ArcView using the NHD route coverage. Event tables are linked to NHD through the unique NHD Rch_code, and can be displayed using ERSI's Dynamic Segmentation model.

Event -- a single record in an event table. This record is referenced to one NHD reach through the NHD RCH_code. An event may represent an entire NHD reach, or only a portion of one.

Measures -- To and From measure fields in the event table define where along a reach the event is displayed. In the case of point events, only a single measure (Position measure) is stored to define its location on a reach.

Offset -- the distance a copy of an event is displayed from the associated NHD reach.

Reaches -- a linear reach is a single NHD segment that typically is defined by tributary confluences. The NHD linear drainage network is composed of reaches and each reach has a unique identifier (Rch_code).

Waterbody -- a set of one or more hydrologic features (reaches) that are grouped together for organizational purposes. For example, a 305(b) waterbody may be a small watershed that is assessed for water quality. A waterbody can be composed of several NHD reaches, and their locations are stored in event tables as collections of events. Waterbodies are a type of entity. (Note: 'Waterbody' is also the term used for areal reaches in NHD).

Waterbody reaches -- composed of areal NHD features (lakes/ponds). Each waterbody reach has a unique identifier (Rch_code). Waterbody reaches are not part of the NHD linear drainage network.