

**PNW HYDROGRAPHY FRAMEWORK
EVENT MANAGEMENT TOOLS**

USER GUIDE

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A. Introduction

The purpose of this document is to provide technical instructions on how to operate the PNW Hydrography Framework Event Management Tools (HEM Tools). These tools are a set of shared components to allow for creation, management, and refresh of event data that is referenced to hydrography data in the NHD format. Each section of the user guide is followed by an exercise with step-by-step instructions on how to complete a specific set of tasks. Although it is possible to complete these tasks by using only the user guide, some specific steps may not be included in the user guide description of the tasks. The exercises should also be completed if you are learning how to use the new tools for the first time or lack ArcGIS experience.

In order for the HEM tools to function, the user must add NHDinGEO Hydrography data to their ArcMap session. While there are many useful tables and featureclasses within the NHDinGEO dataset, at a minimum, the user must add the NHDFlowline featureclass (with a built network) to the map. For more information about the National Hydrography Dataset, go to:

<http://nhd.usgs.gov>.

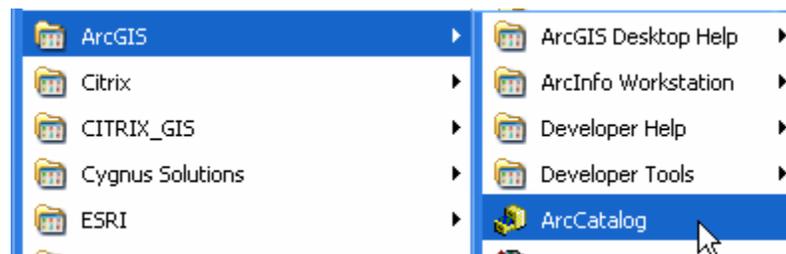
B. ArcCatalog Tools

Event Table Manager

The Event Table Manager is provided to manage Hydro Event Table featureclasses. Using this tool for creating, modifying, and deleting event featureclasses ensures that the tracking tables that are used in conjunction with the editing tools are properly maintained.

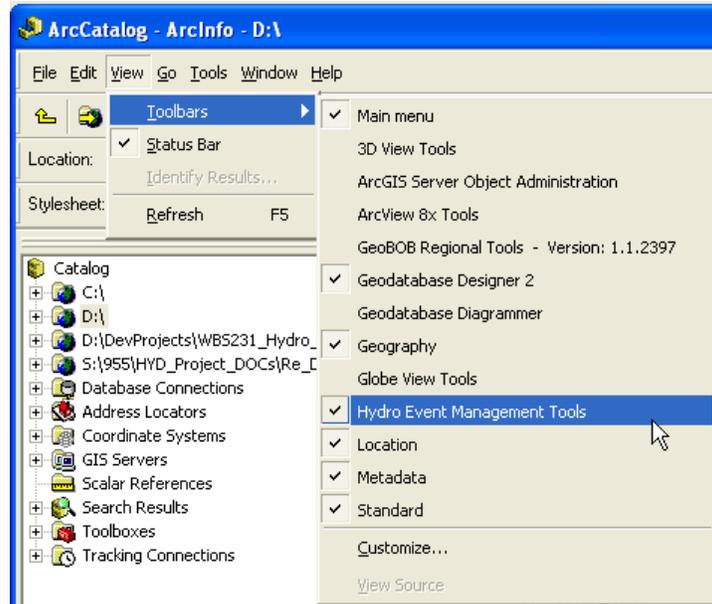
The Hydro Event Management Tools toolbar can be added to ArcCatalog and ArcMap. We will start working with the toolbar in ArcCatalog and then look at the tools available in ArcMap.

Launch ArcCatalog.



Once ArcCatalog opens you need to add the Hydro Event Management toolbar to your ArcCatalog session.

From the View menu select Toolbars, from the list of available toolbars select Hydro Event Management Tools.



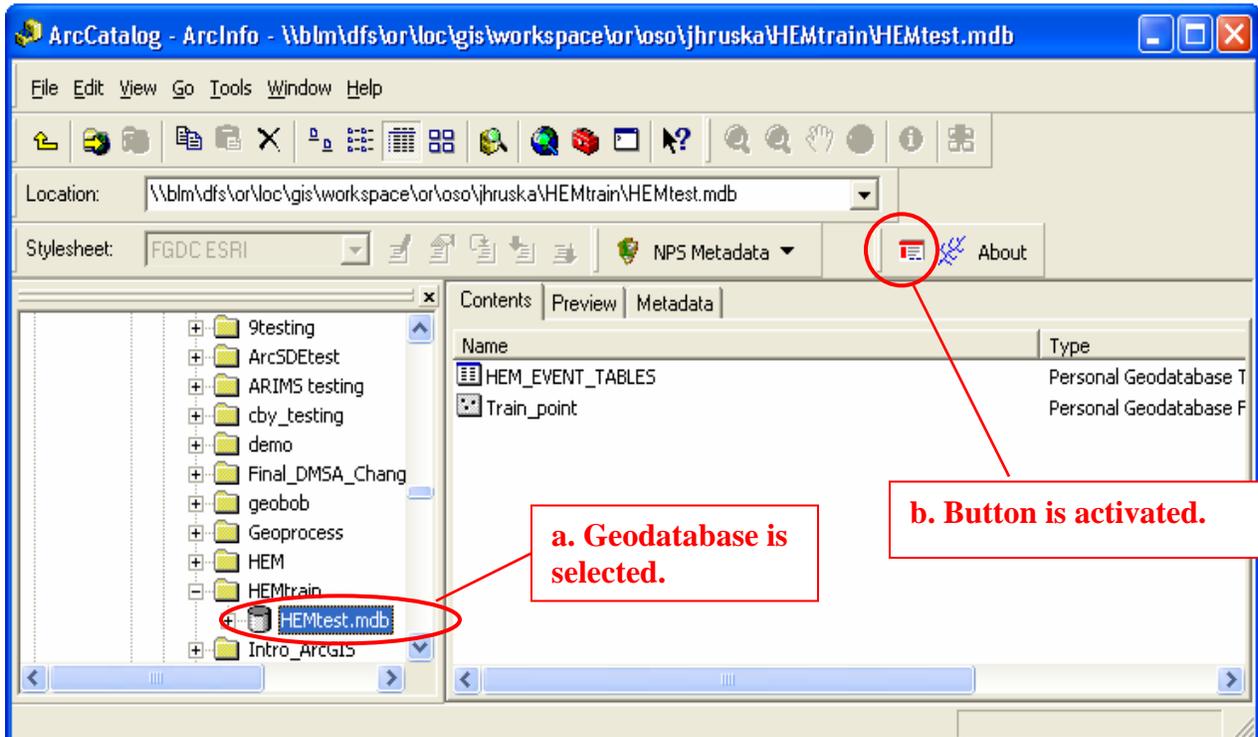
The Hydro Event Management Tools toolbar will be added to your ArcCatalog session. If needed dock the toolbar.



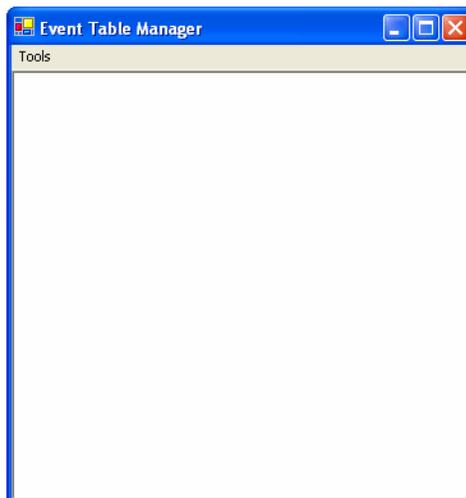
The Hydro Event Management Tools toolbar in ArcCatalog allows you to create and manage hydro events that are contained inside of a geodatabase (Personal or SDE). Most of the features on the toolbar are inactive until you select a geodatabase that contains your hydro events.

Note: The following examples show the creation of a new geodatabase to store point and line events. New point and line events can also be created in an existing NHD geodatabase. Users should consult their agency spatial database administrators for guidance on organizing their spatial data.

Select a geodatabase to enable the Event Featureclass Manager button.

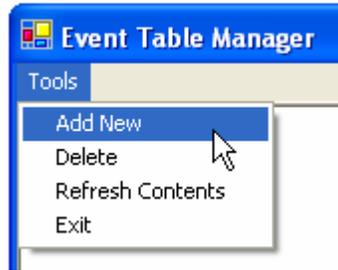


Click the Event Featureclass Manager button to open the Event Table Manager dialog box.

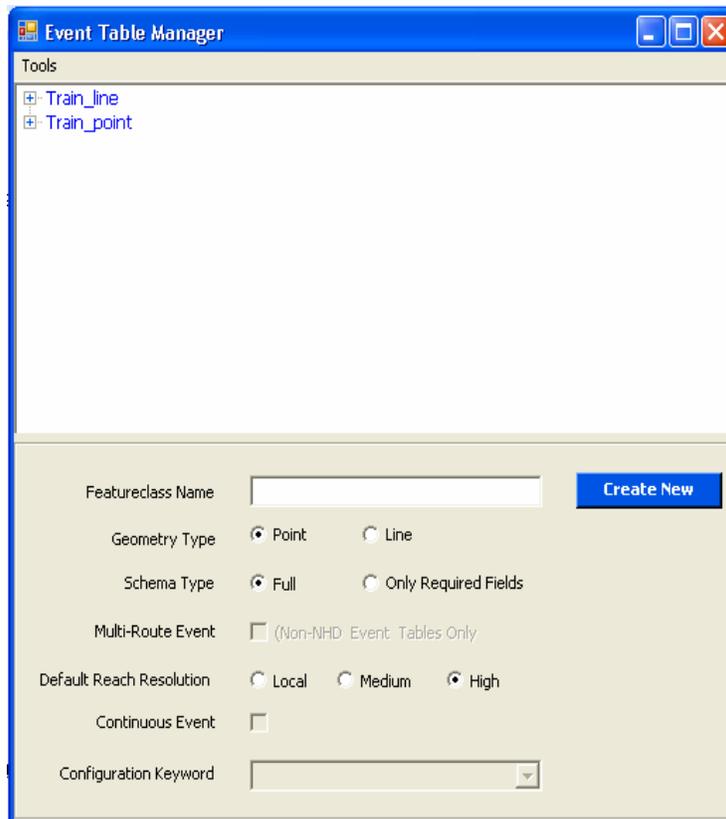


The Event Table Manager will allow you to add a new featureclass to the geodatabase that you have selected. By using this tool the featureclass will be created with all of the required fields that are needed for a hydro event featureclass. The Event Table Manager window can also be used to modify existing featureclasses that have already been created.

From the Event Table Manager select, Tools → Add New.



Once you select add new, the lower half of the Event Table Manager form will appear and be enabled.



Type in the name of the new featureclass.



Select if the featureclass will contain point or line data.



Choose if you want the schema of the new feature to include all fields (Full) or only required fields. Selecting Full will add all fields specified in the NHD Event Table structure.

Schema Type Full Only Required Fields

If Line is selected, specify if the event featureclass contains multi-route events.

Multi-Route Event (Non-NHD Event Tables Only)

If Line is selected, specify if the event featureclass contains continuous events.

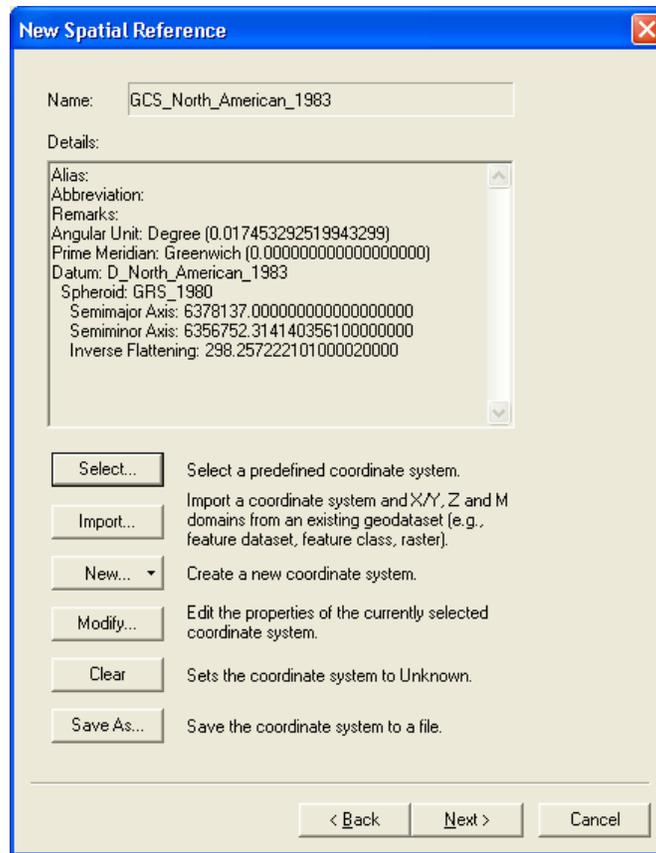
Continuous Event

Once these steps have been completed, click the Create New button.

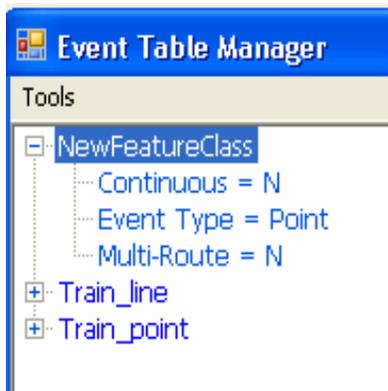


Clicking the Create New button will open the ArcCatalog New Spatial Reference dialog. You must complete the spatial reference information before continuing. For more information on designating a spatial reference, see the ArcCatalog user help. If the spatial reference is not correctly assigned, you may experience problems using the event editing tools.

A spatial reference can be chosen by clicking the Select button or if you already have a feature class that has the same spatial reference that you are going to use for this new feature class you can import the spatial reference from an existing feature by clicking the import button.



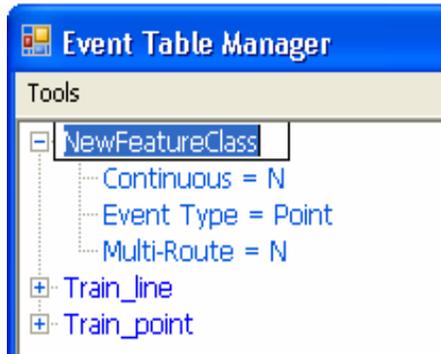
After the spatial reference is selected the Event Table Manager will display the new featureclass properties.



Modifying Event Featureclasses

There are some attributes that can be modified once an event featureclass has been created. These are; the name of the featureclass and if the linear event is continuous. To modify these values, do the following.

To modify the name, click on the name of the featureclass to select it, and then click on the name a second time. This will enable you to type over the name with the new value.

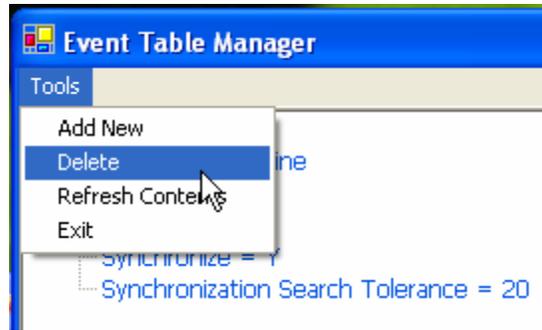


To modify the Continuous value, right click on the name of the featureclass and select Set Continuous → Yes or No.



Delete a Featureclass

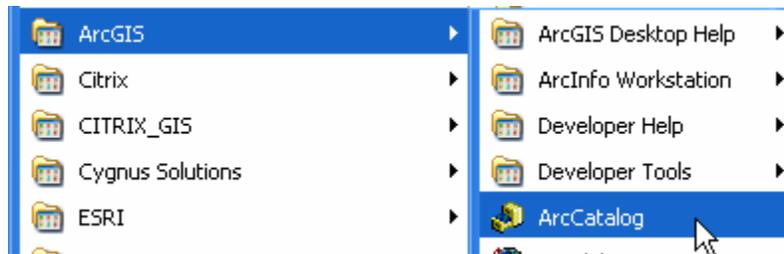
To delete a featureclass, click on the name of the featureclass and from the Tools menu, select Delete.



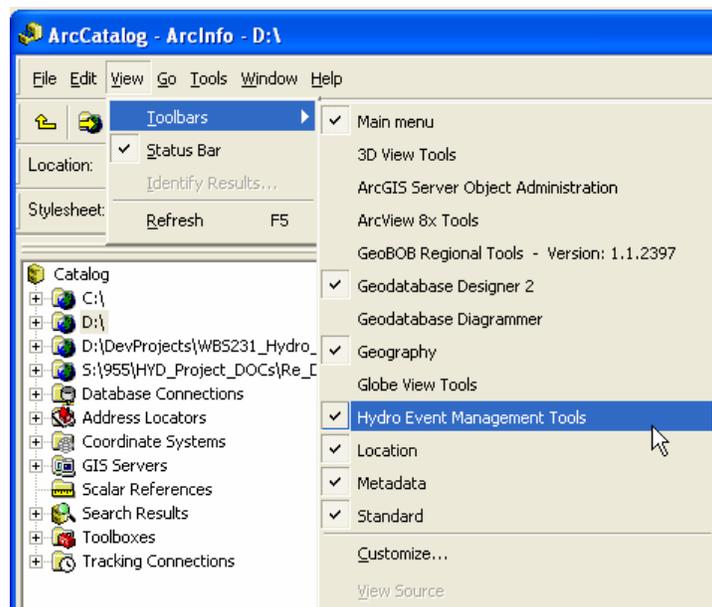
Ex. 1 – Create Featureclasses

The first exercise will be used to create the new featureclasses that will be used throughout the training. After the first exercise has been completed the following exercises do not need to be finished before advancing to the next exercise. Exercises may also be skipped if the student only wants to focus on a single tool after the first exercise is finished.

Launch ArcCatalog.

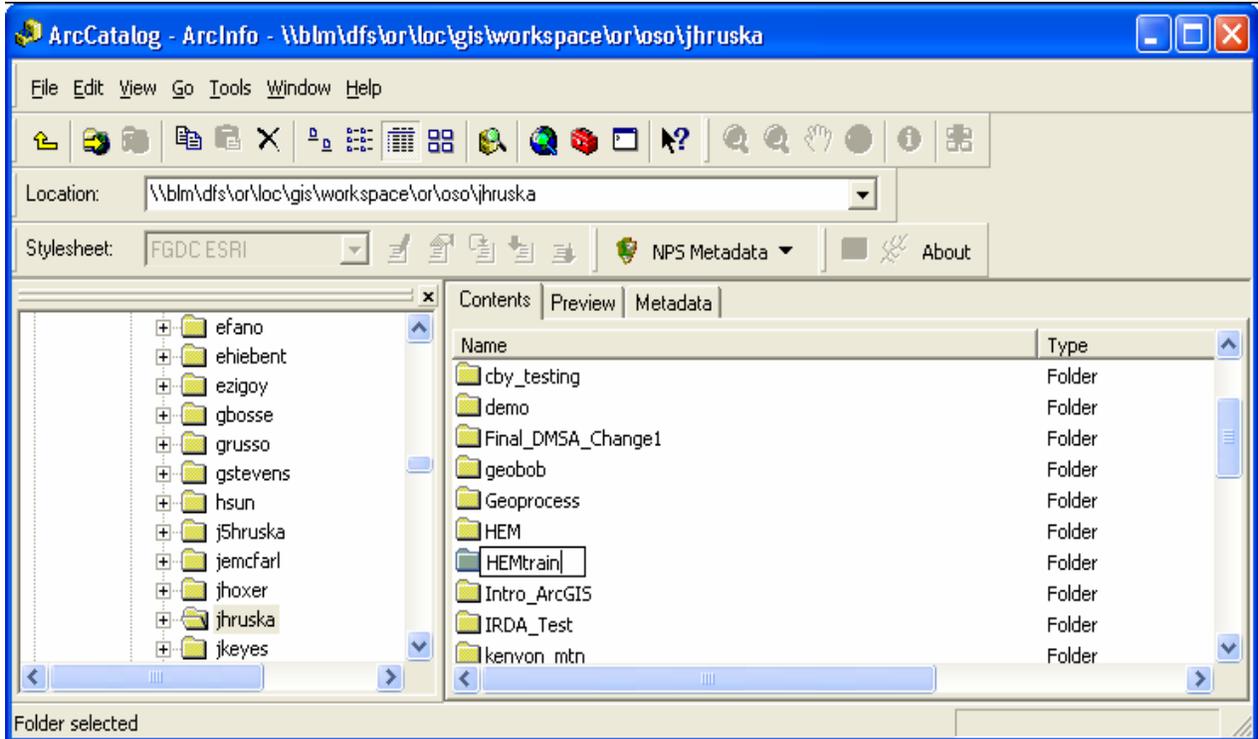


If needed turn on the HEM toolbar.

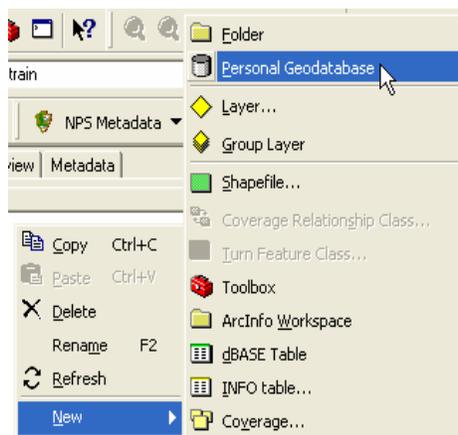


You will be creating a new geodatabase and featureclasses inside of your Citrix workspace.

Use ArcCatalog to navigate to your Citrix workspace and create a new folder called HEMtrain (i.e., [\\blm\dfs\or\loc\gis\workspace\or\oso\jhruska](#)).



Inside of the new folder, right click and select New → Personal Geodatabase.



Name the new Geodatabase HEMtest.mdb.

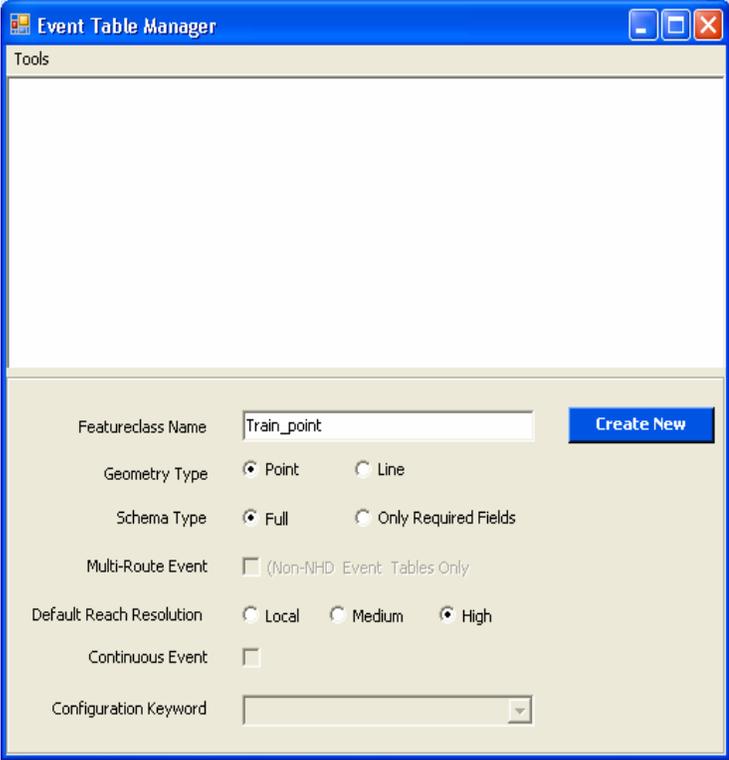


Now that the new Geodatabase has been created we can create the new featureclasses inside of it using the Hydro Event Management Tools toolbar.

Make sure the new database is selected in the Catalog tree (the left side of ArcCatalog) and click the Event Featureclass Manager button .

From the Tools menu in the Event Table Manager window that opens, select Add New.

Fill out the lower half of the Event Table Manager screen to match the following:

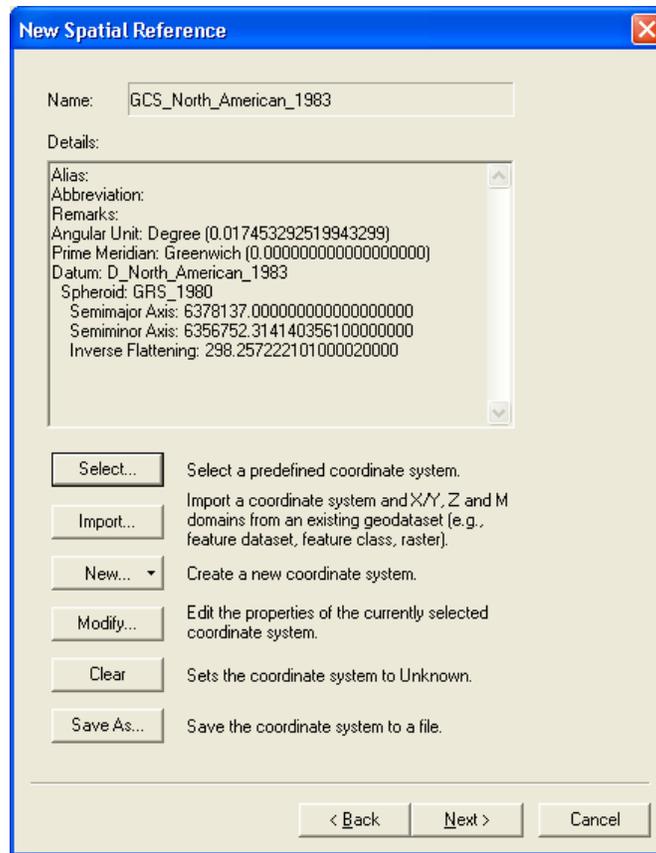


After you have filled in the window click the Create New button to create your new point featureclass.

Since a brand new featureclass is being created, you need to tell the software what the Spatial Reference information will be for that featureclass. In this case we will select the North America Geographic 1983 projection.

Select → Geographic → North America → North American Datum 1983.prj → Add

The properties of the GCS83 projection should now be displayed in the Spatial Information window.

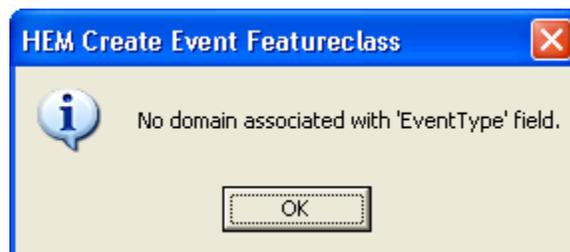


Click Next to move to the X/Y Domain properties.

Note: The X/Y domain can also be defined if needed. In this example we will use the default values. For more information about setting the X/Y domain for your new featureclass see the ESRI Help about projections.

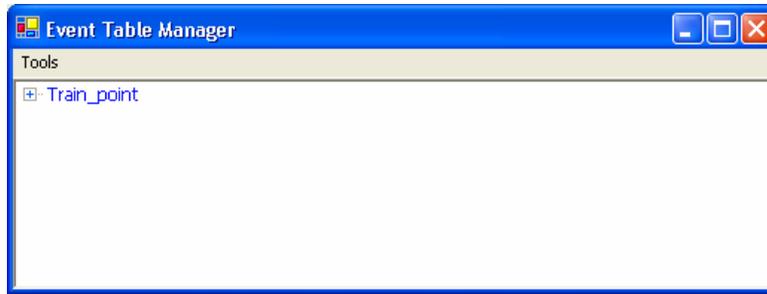
Click Next to accept the default X/Y domain, and click Finish to accept the default precision.

A message is displayed telling you that there is no domain associated with the Event Type field; this is OK for now.



Click OK to dismiss this box.

Your new featureclass should now be listed in the Event Table Manager window.



Repeat the above steps to create a line featureclass named Train_line.

- Tools → Add New
- Featureclass Name = Train_line
- Geometry Type = Line
- Set the Spatial Reference to: North American Datum 1983.prj (GCS83).

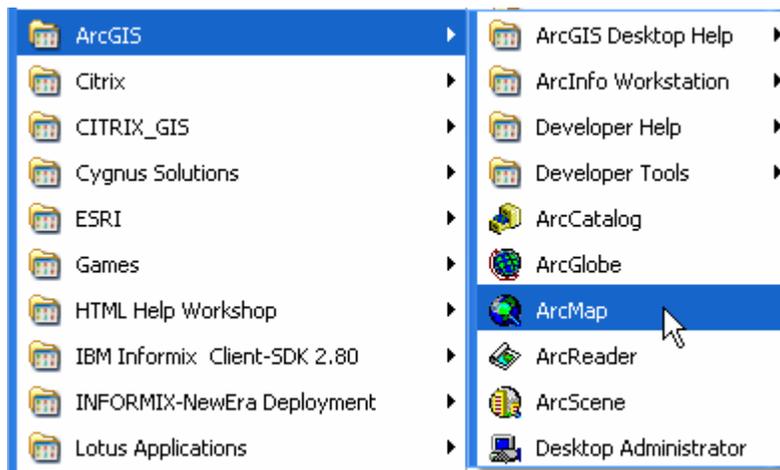
We will use the two new featureclasses that were created in the next exercise.

Close ArcCatalog.

End Exercise 1

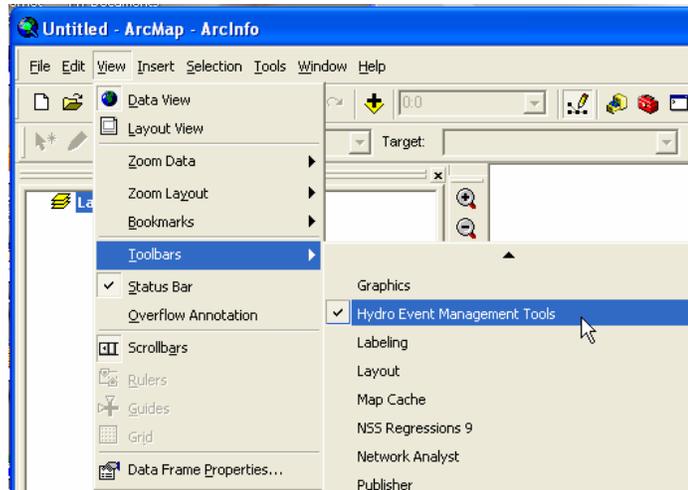
C. Event Editing

Once you have created a new featureclass, that featureclass can be edited in ArcMap.

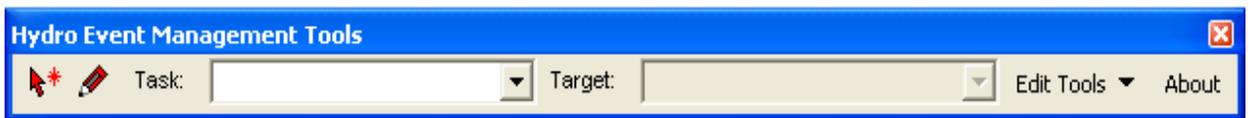


Toolbar Overview

The Supervised Edits tools are contained on a custom toolbar. To add the toolbar to your ArcMap session, select View → Toolbars → Hydro Event Management Tools.



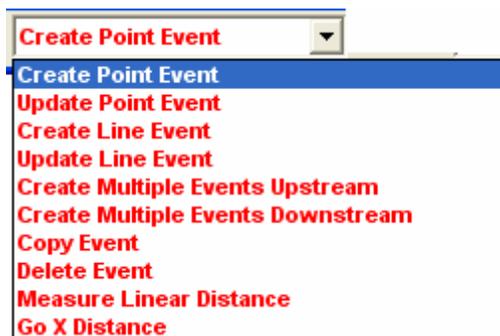
The Hydro Event Management Tools toolbar will be activated and can be docked wherever you like.



 Event Selection Tool – Used for selecting existing event records; useful for copying and deleting events. Draw a box or click to select a feature

 Event Sketch Tool – Used for defining the point location or end points for event records.

Event Edit Tasks – List of edit options.



Includes:

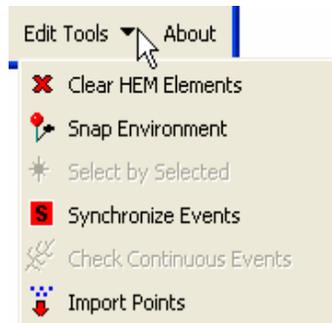
- Create Point Event
- Update Point Event
- Create Line Event
- Update Line Event
- Create Multiple Events Upstream

- Create Multiple Events Downstream
- Copy Event
- Delete Event
- Measure Linear Distance
- Go X Distance

Event Edit Targets – Used for defining the target event featureclass for the edit; used in conjunction with creating and copying events.



Edit Tools – The Edit Tools dropdown contains additional edit tools that may be used while creating or editing new events.



 Clear HEM Elements – Clears HEM flags and HEM line elements from the map that are created while editing data with the tools.

 Snap Environment – Sets a default snap environment for the edit session and then opens the Editor → Snapping dialog.

 Select by Selected – Selects using the currently selected features.

 Synchronize Events – Tool that facilitates the quick update of event data that has become out of alignment with the underlying hydrography data.

 Check Continuous Events – Makes sure that if the event is continuous it does not have any gaps or overlaps.

 Import Points – Tool that imports point features into a point event featureclass.

 About HEM – Provides the version number of the application.

Point Events

Create New Point Event

To create and edit Point Event data, first add one or more point featureclasses to the map as well as a hydro layer (flowline) and begin an edit session.



Set the Event Edit Task to Create Point Event.

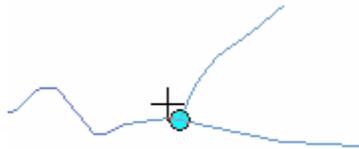


Set the Event Edit Target to the featureclass where you would like to add new records.

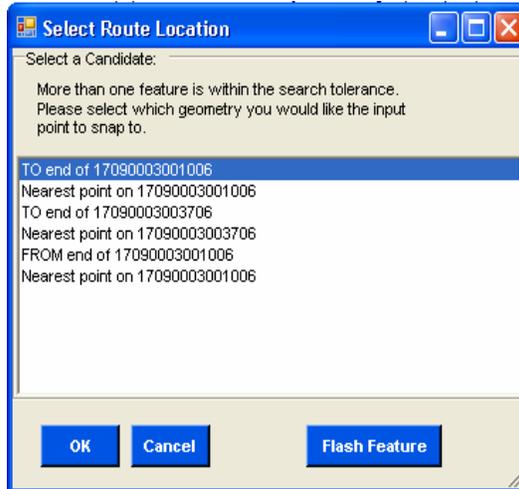


Activate the HEM Event Sketch Tool .

Click at a point along a stream.



If there are multiple Route Location Candidates at the selected point, select the correct Route Location and click the OK button. If you need assistance determining the correct Route Feature, select one of the location candidates from the list and click the Flash Feature button.



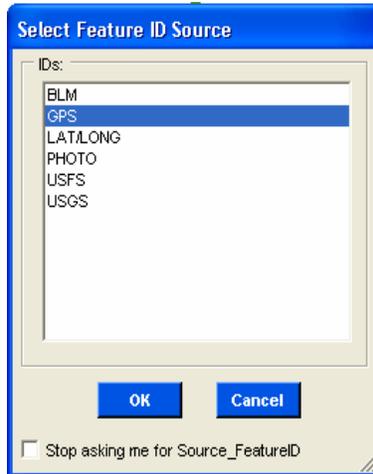
A second window is displayed allowing you to import a value to the Source_FeatureID field if needed.



An existing DBF or Text file can be used to import values to the Source_FeatureID field. Once the file is selected at the beginning of the edit session, a pop up box will ask which value you want to assign to the Source_FeatureID field each time a new feature is created. You will also be given the option to stop using the list of values. If you choose not to use an input source list when you start editing you will need to stop editing and start again to bring back the selection window to select a list to use.

Note. If you are using a DBF it needs to contain a field named SrcID to obtain the list of values from. A text file only needs a single column of values. There is a 40 character limit for each value in the Source_FeatureID field, although values over 40 characters can still be present in your list as long as they are not selected.

If you selected an input list for the Source_FeatureID field select a value from that list to continue the point creation process.



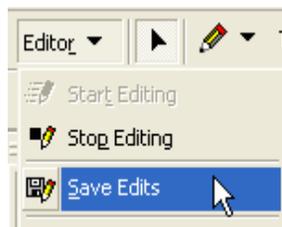
If the point you are creating does not have a value in the list, clicking cancel will continue to the creation event without populating the Source_FeatureID field.

A new point event record will be added to the event featureclass.



Repeat the above steps as needed to complete data entry.

Select Save Edits from the Editor dropdown list to save your edits.



Update Point Event

Change the Event Edit Task to Update Point Event.

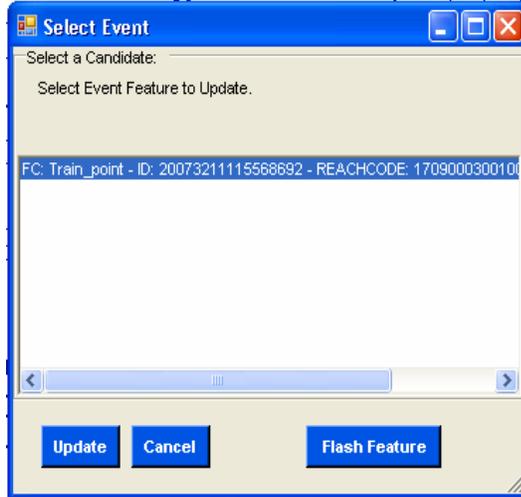


Activate the Event Selection Tool .

Using the Event Selection Tool as you would the ArcMap Selection Tool, select a point event record.

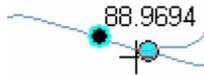


The select event dialog box will open. Select the event record to update from the list and click the OK button.



The HEM Event Edit Sketch Tool should automatically activate. If it does not, activate the HEM Event Edit Sketch Tool .

Click on a stream to define the new location for the point.



The record will then be moved to its new location and its REACHCODE and MEAS attributes updated accordingly.



Property	Value
OID	11
EVENT_ID	20066121554346611
REACHCODE	17090006005926
MEAS	88.96939

Copy Point Event

Change the Event Edit Task to Copy Event.



Select the target event featureclass. The target is the featureclass where the new record will be created. This can be the same featureclass as the record to be copied or a different featureclass.

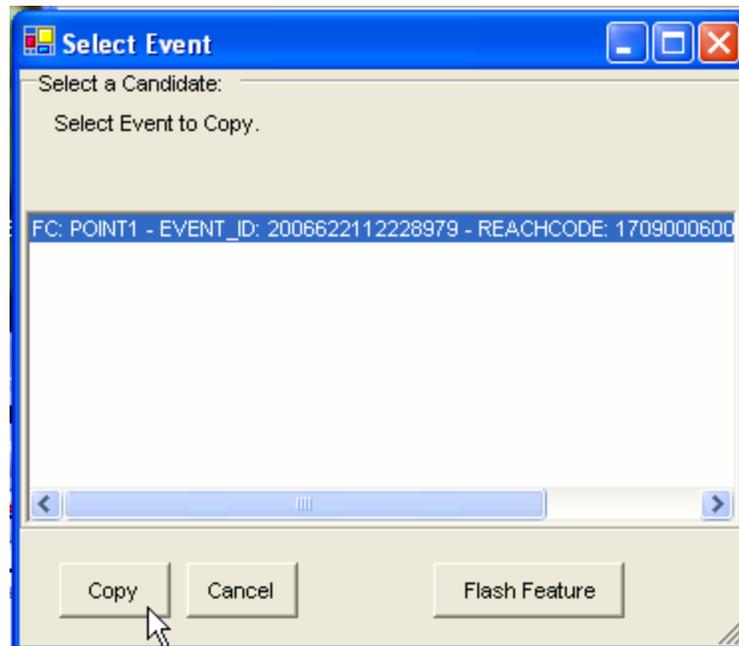


Activate the Event Selection Tool .

Using the Event Selection Tool as you would the ArcMap Selection Tool, select a point event record.

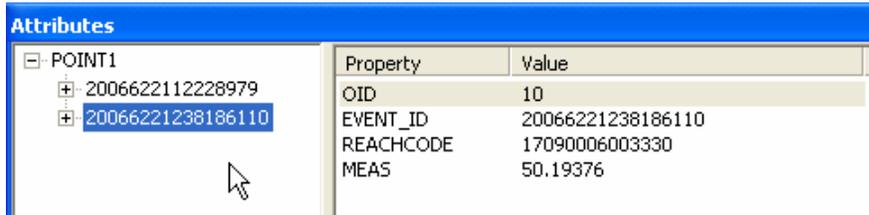


The select event dialog box will open. Select the event record to copy from the list and click the Copy button.



The existing point feature will be copied into the target event featureclass. It is important to note that the copied feature will now stack on top of original feature (the tool copies

the location of the event), so you will need to use the selection tool and attribute table to correctly select the new record. Repeat the above steps to copy additional features.



Delete Point Event

Change the Event Edit Task to Delete Event.



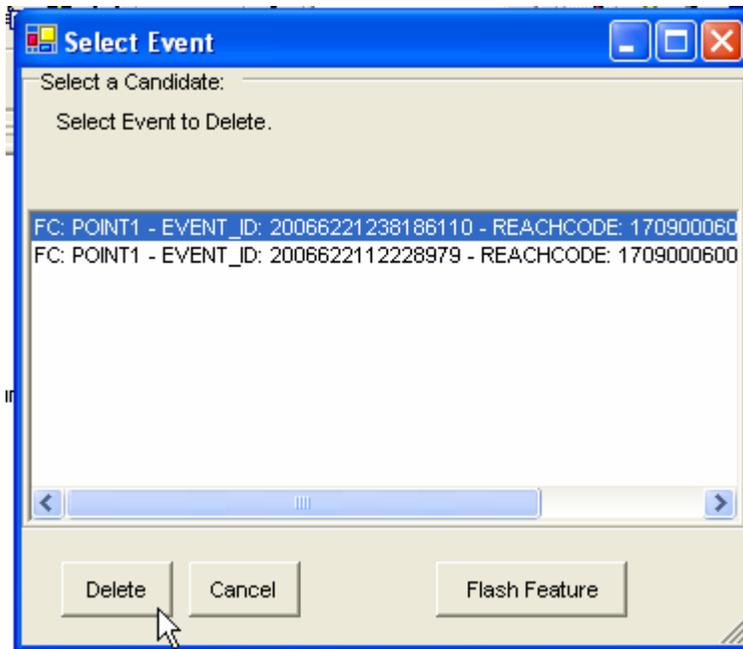
Activate the Event Selection Tool



Using the Event Selection Tool as you would the ArcMap Selection Tool, select a point event record.



The select event dialog box will open. Select the event record to delete from the list and click the Delete button. If there is more than one record in the same spot, there will be multiple entries in the Select Event box.



The selected point feature will be deleted. Repeat the above steps to delete additional records.

Import Point Events

Verify NHDFlowline featureclass and the featureclass of points to be imported have been added to the map document.

Using the ArcMap selection tool,  select the point features to be imported (the Import Points tool only imports the selected records or if none are selected, the tool will import ALL features).

Start Editing.

Set the HEM Task to Create Point Event.



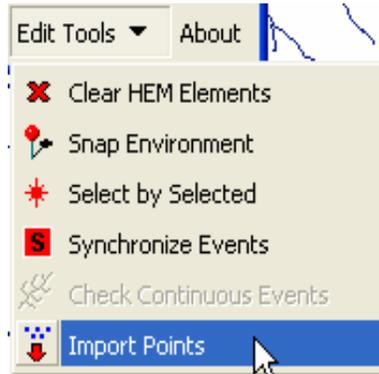
Set the HEM Edit Target to the Point Event Featureclass you want to import events into.



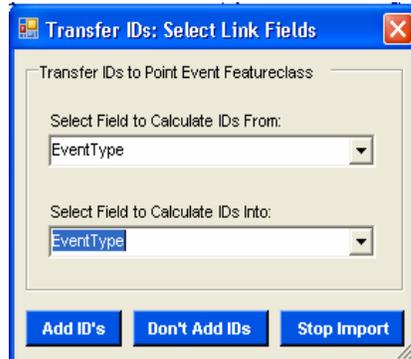
Select the featureclass to import points from in the ArcMap table of contents.



From the HEM Edit Tools menu, select Import Points.



The tool will offer the opportunity to transfer a unique identifier into the point event records. This will be useful for relating the new point events back to the original data source.

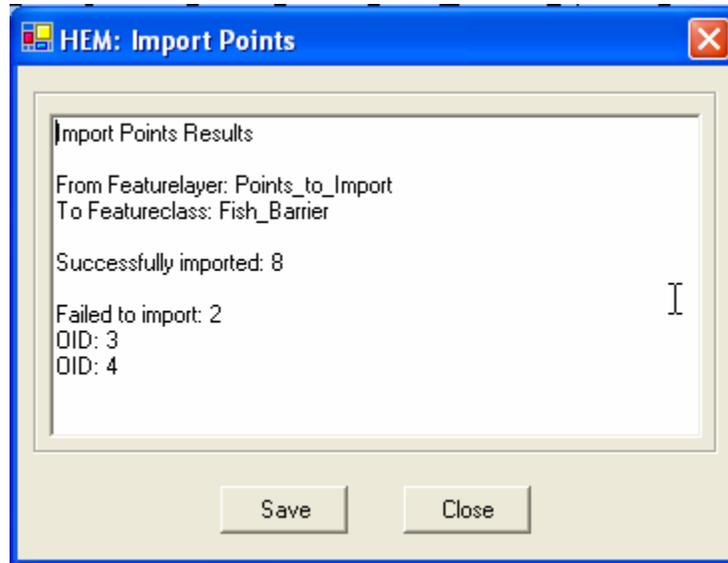


Add ID's – will transfer the attributes from the import field to the target field.

Don't Add ID's – will skip the import of attributes.

Stop Import – exits the tool without importing the points.

The tool will cycle through points to import and attempt to snap them to a flowline record. Depending on how close the points are to a flowline, some may not be imported. A report is generated outlining how many points were successfully imported and which OIDs failed. This report can be saved to a text file.



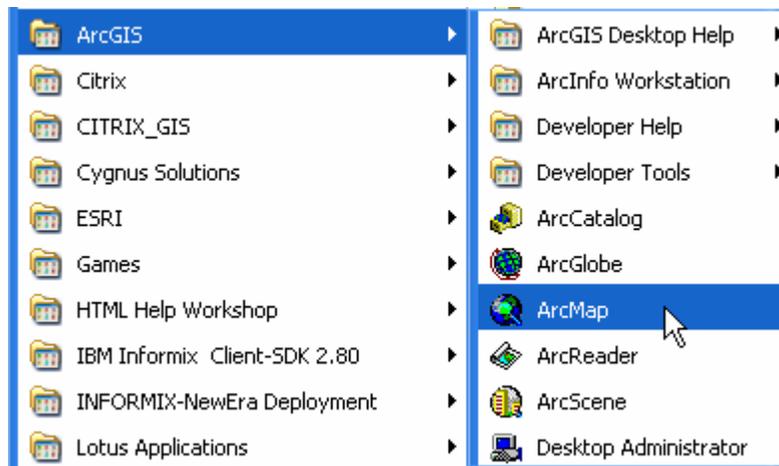
Ex. 2 –Point Events

Create Point Event

In this exercise we will add 4 new point events to the new point featureclass that was created in the last exercise. The 4 point events will represent 4 road stream crossings where a culvert exists or needs to be placed. The point events are marked with red circles on the attached map at the end of this exercise. The map can also be added to ArcMap to assist in locating the point locations.

All of the creating and editing of point and line events is done in Citrix ArcMap.

Launch ArcMap.



If needed add the HEM toolbar to your ArcMap session: select View → Toolbars → Hydro Event Management Tools.



The featureclasses that will be edited and any additional layers that are needed also need to be added to the map.

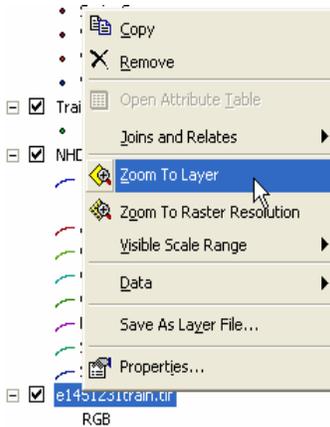
Add the following data to the map from the train folder located @
 \\blm\dfs\or\loc\gis\workspace\or\or_train\HEM

NHDH1709.mdb\Hydrography\NHDflowline
 NHDH1709.mdb\Hydrography\NHDpoint
 E1451231train.tif

Browse to the location where you created the point featureclass in the first exercise, and add it to the map.

To make sure that you are working in the right location the .tif file will be used as a reference layer.

Right click on the E1451231train.tif layer and select Zoom to Layer.



You should be able to see the green topo map in the background that has some red and blue circles on it. This is the map we will be using to add our new points to the points layer (the last page of this manual also contains a copy of the map for your reference).

Use the Zoom tool  to zoom in on the red circle in the upper right corner of the map.

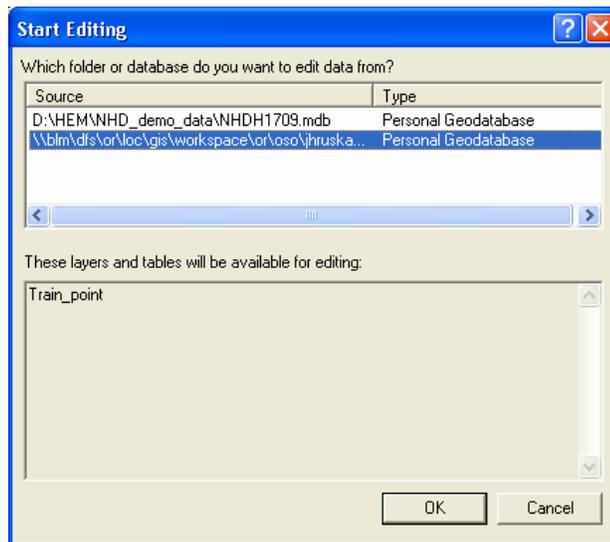


Although it may be hard to tell at this scale on the map there is a road that crosses over the stream near where the yellow line starts on the map. We will use the yellow line in a later exercise. For now we want to create a new point representing a culvert at that road stream intersection.

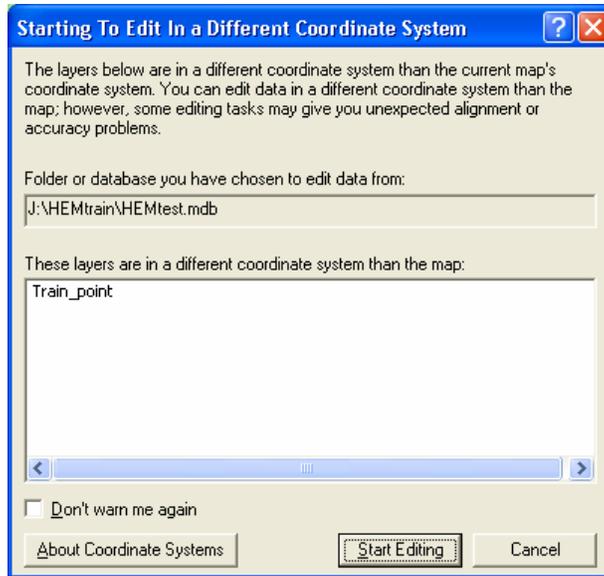
Note: If we also added a road layer to our map, it might be easier to tell where the road and stream intersection is.

A point is created by completing the following steps:

From the ArcMap Editing toolbar select Start Editing and choose the directory that has your points featureclass.



After selecting your edit layer you may receive a warning message telling you that the layer you are trying to edit is not in the same projection as the map. In this case we can ignore the message.



Click Start Editing to continue.

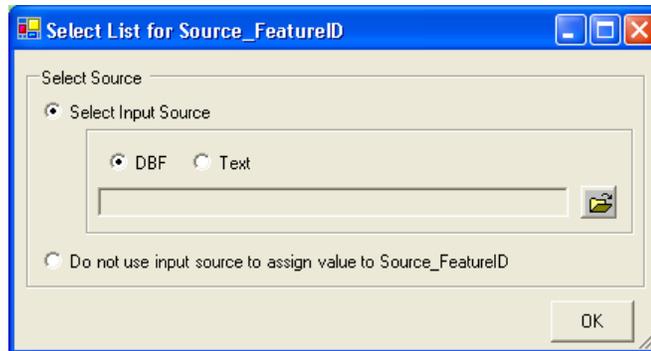
Once you start editing with a valid point or line featureclass the options on the HEM toolbar will become active.

Make sure that your Task is set to Create Point Event, and your Target is Train_point.



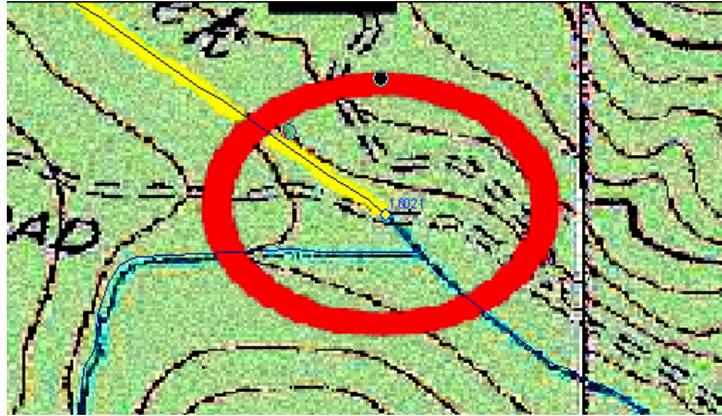
Activate the HEM Event Sketch Tool  and click the road stream intersection on the map to add a new point.

A window will be displayed allowing you to add information to the new points Source_FeatureID field from an external DBF or text file.



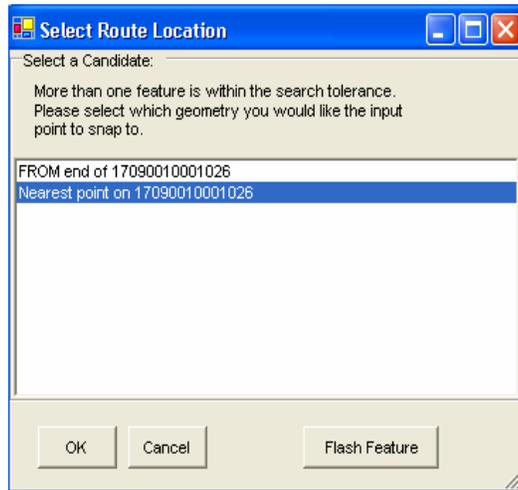
In this case we do not have an external list to populate the Source_FeatureID field with so select the “Do not use” option.

It may take a couple of seconds for the new point to be added to your map; wait until the point is created until clicking again. After the new point has been created you should see the route measure (displayed in blue font) along with the point displayed in your map.



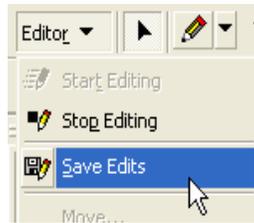
Zoom back to the full extent of the image layer and add the remaining 3 points indicated by the red circles on the map.

If at any time while you are adding points to the map you click on a location that contains more than one possible route location for the point to be created, you will be given the option to choose where you want the point to go.



Each stream in the list can be clicked so that it flashes on the screen. Once you confirm where you want the point to go, select the value from the list and click OK. Don't forget to save your edits often.

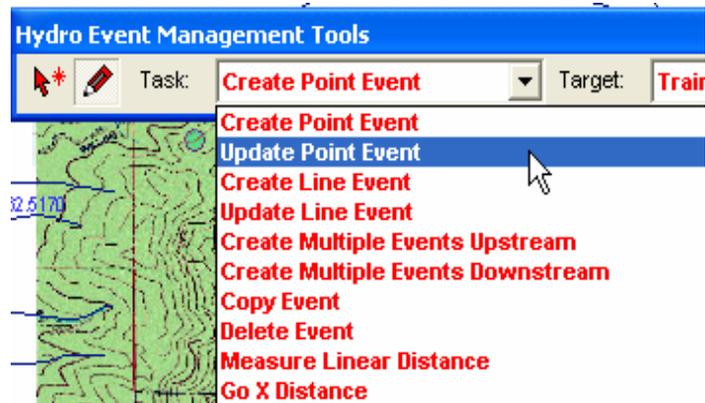
From the Editor menu select Save Edits.



Update Point Location

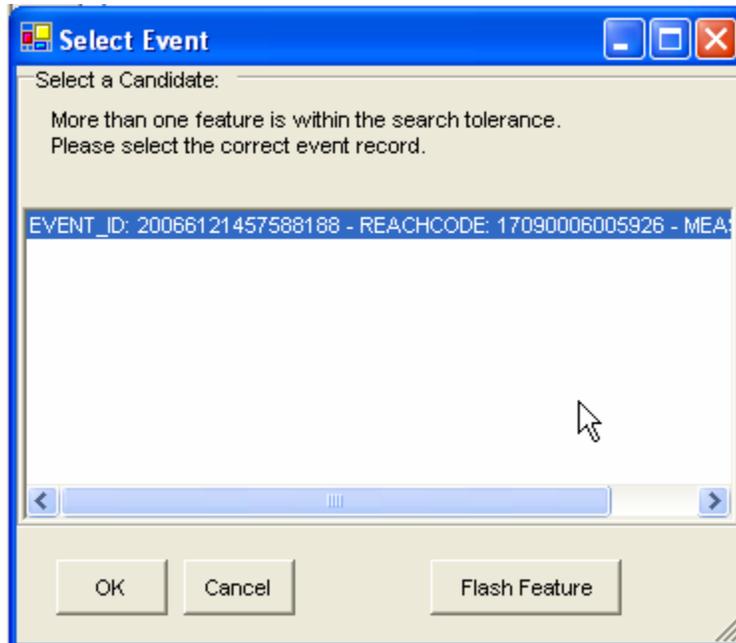
The location of existing point features can be updated, copied, and deleted. In order to perform any of these tasks you must first select the point feature that you want to work with using the Event Selection tool on the HEM toolbar.

Change the Edit task on the HEM toolbar to Update Point Event.



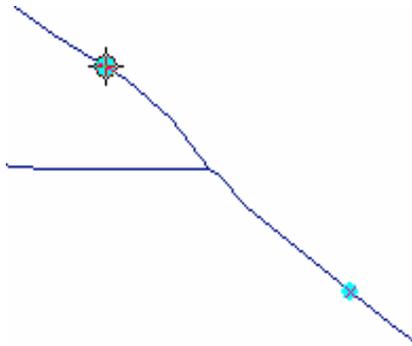
Select the Event Selection tool  on the toolbar and click on one of the newly created points.

The select event dialog box will open. Select the event record to update from the list and click the OK button.

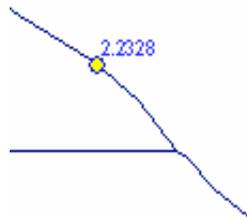


The Event Edit Sketch Tool should automatically activate. If it does not, activate the Event Edit Sketch Tool .

Click on a stream to define the new location for the point.



The record will then be moved to its new location and its REACHCODE and MEAS attributes updated accordingly.



We are done working with point events, save your edits and your map document so that it can be accessed in the next exercise.

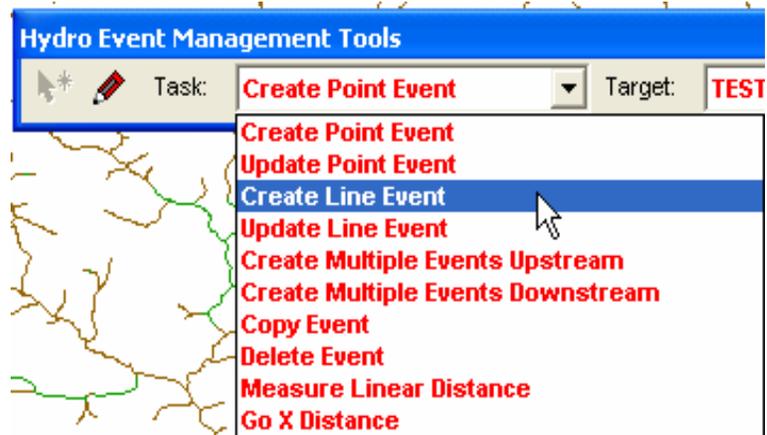
End Exercise 2

D. Linear Events

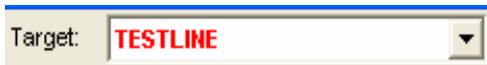
Linear Events can be created in the same way as point events. The biggest difference is that you will be defining the downstream and upstream end of the event. After the downstream end has been defined, holding down the Shift key on the keyboard and clicking the upstream end will define the event as explained in the next few pages.

Create Line Event

Set the Event Edit Task to Create Line Event.

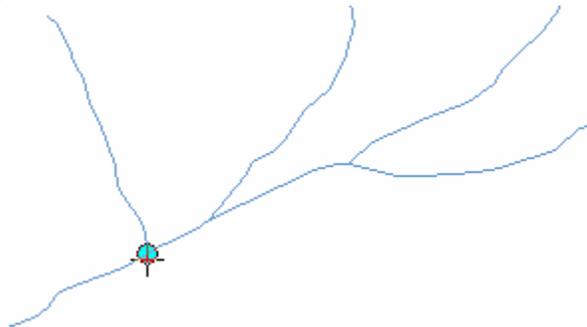


Set the Event Edit Target to the featureclass where you would like to add new records.



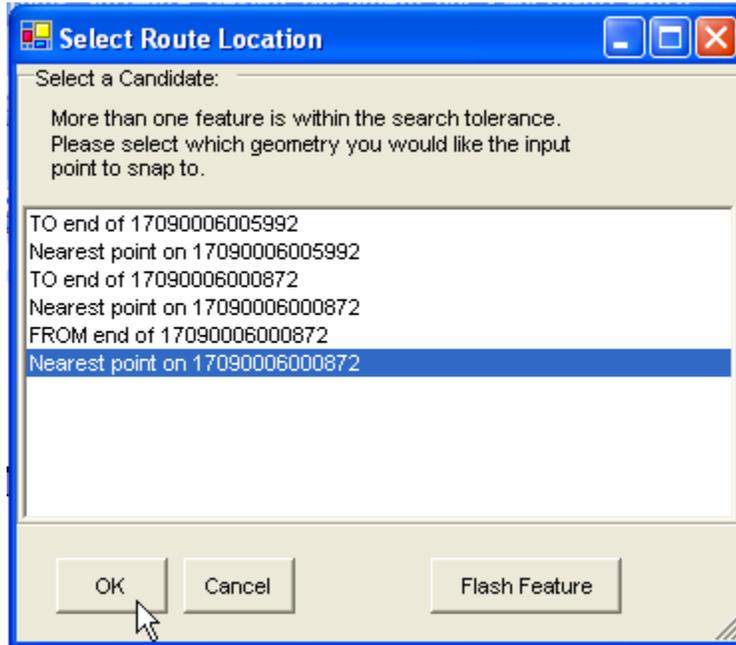
Activate the Event Sketch Tool .

Click at a point along a stream. The first point clicked will be considered the downstream extent of the line event.

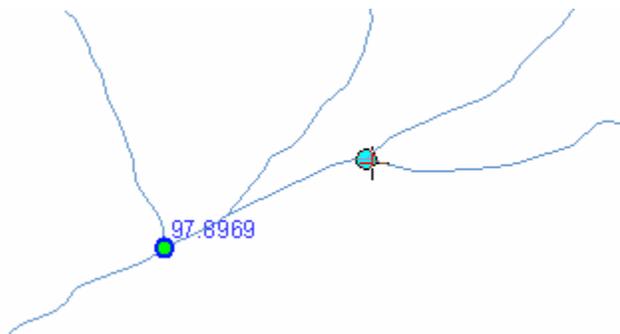


If there are multiple Route Location Candidates at the selected point, select the correct Route Location and click the OK button. If you need assistance determining the correct

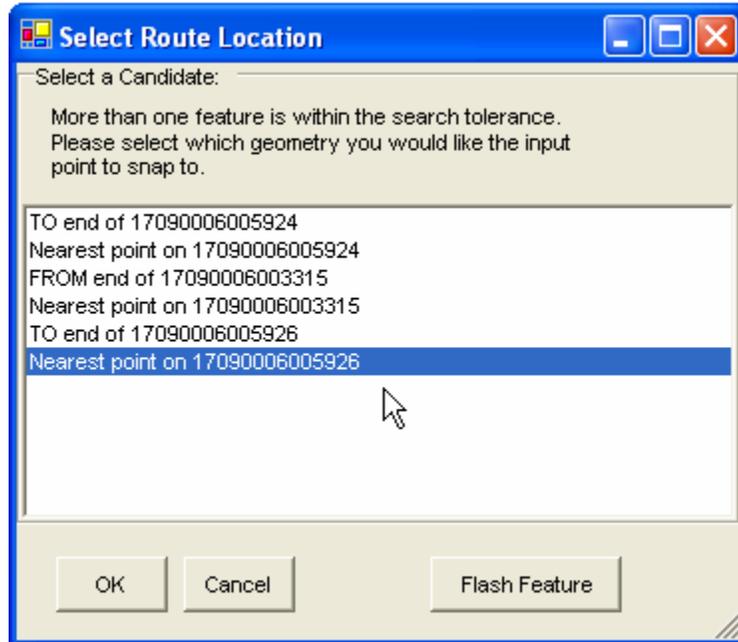
Route Feature, select one of the location candidates from the list. This will flash the feature on the map. You can also click the Flash Feature button to flash it again.



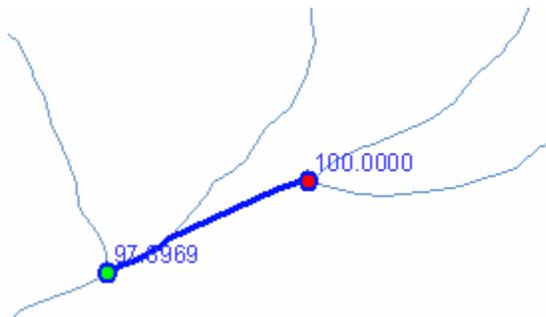
While holding the Shift key on your keyboard, click on a location on a stream to define the upper extent of the line event.



If there are multiple Route Location Candidates at the selected point, select the correct Route Location and click the OK button. If you need assistance determining the correct Route Feature, select one of the location candidates from the list and click the Flash Feature button.



A new line event record will be added to the event featureclass.



Repeat the above steps as needed to complete data entry.

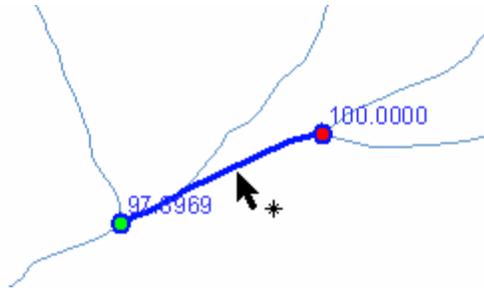
Update Line Event

Change the Event Edit Task to Update Line Event.

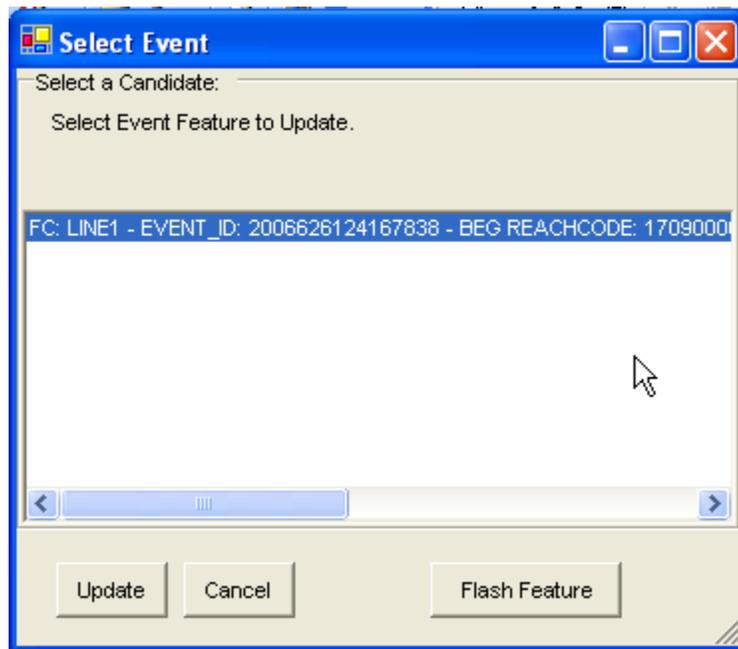


Activate the Event Selection Tool .

Using the Event Selection Tool as you would the ArcMap Selection Tool, select a line event record.

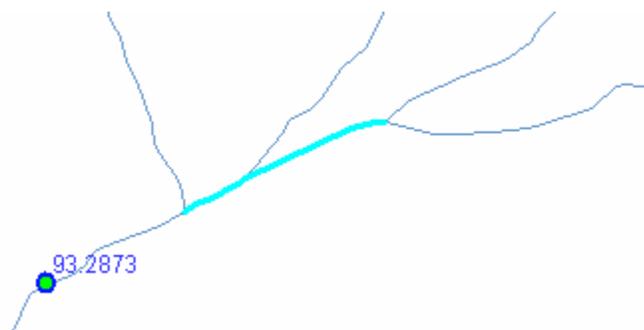


The select event dialog box will open. Select the event record to update from the list and click the OK button.



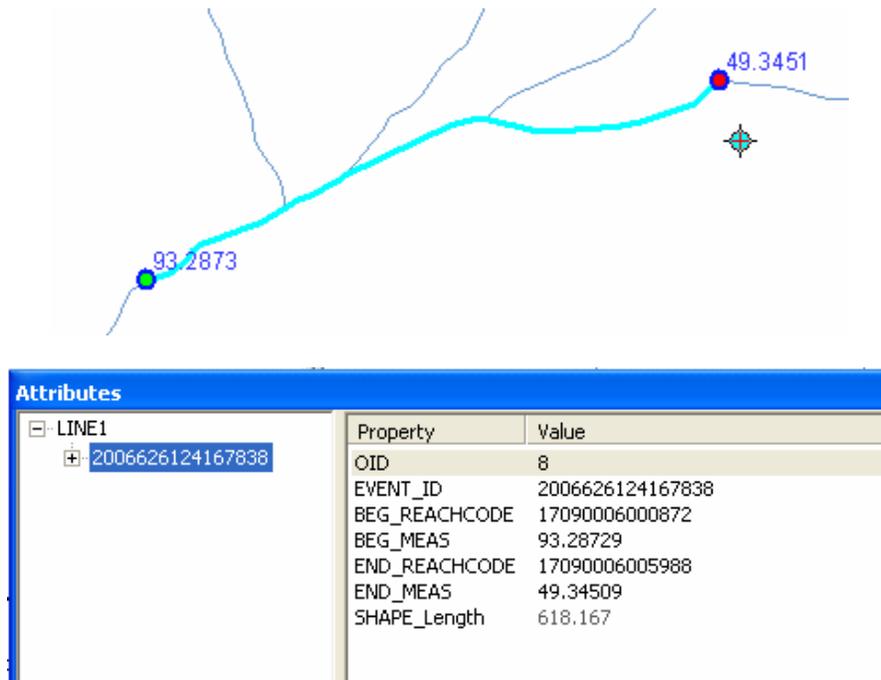
The Event Edit Sketch Tool should automatically activate. If it does not, activate the Event Edit Sketch Tool .

Click on a stream to define the new downstream location for the line.



While holding the Shift key on your keyboard, click on a location on a stream to define the new upper extent of the line event.

The record will then be moved to its new location and its REACHCODE and MEAS attributes updated accordingly.



Create Multiple Events Upstream

The Create Multiple Events Upstream tool creates a single multi-part route that covers all streams upstream from the point that is clicked in the map.

Note: The time it takes the Create Multiple Events Upstream tool to complete is increased by the number of new reaches that are going to be created. If needed barriers can be created to prevent routes from being included in the multiple events all upstream tool. See the section on creating barriers later in the User Guide.

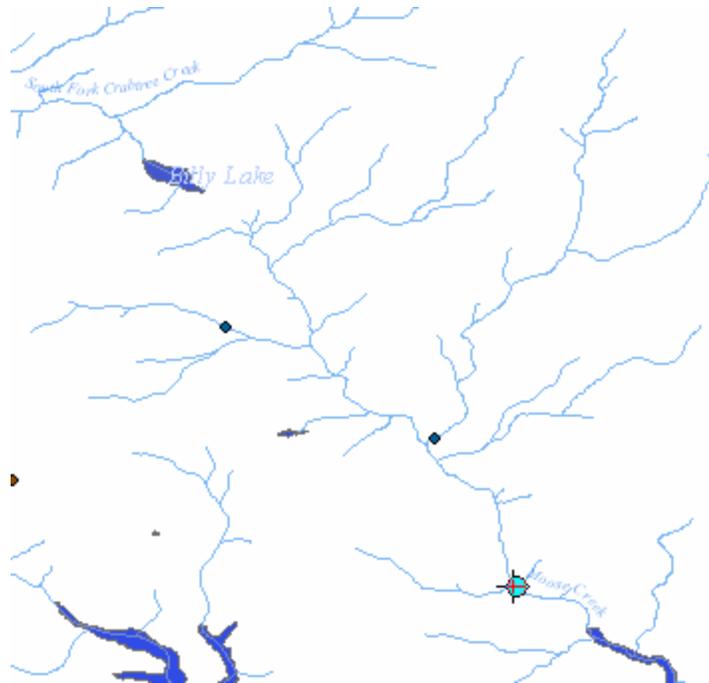
Change the Event Edit Task to Create Multiple Events Upstream.



Select the target event featureclass. The target is the featureclass where the new record(s) will be created.

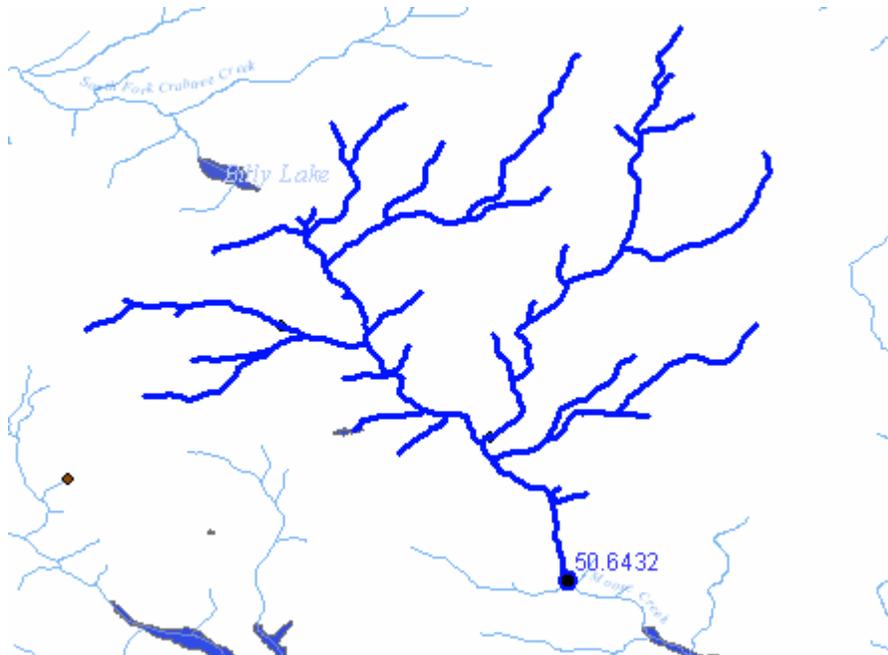


Click at the downstream point. Linear event records will be created for all streams above this point.



If there are multiple Route Location Candidates at the selected point, select the correct Route Location and click the OK button. If you need assistance determining the correct Route Feature, select one of the location candidates from the list and click the Flash Feature button.

When the process has completed, the map will refresh and the new records will be displayed.



Create Multiple Events Downstream

The purpose of this tool is to trace the network downstream from a user defined point and create linear event records that reflect that trace. An example of how this could be used is recording pollution data where it is known that the pollutants will occur everywhere downstream from a study site or to show fish presence downstream from a dam or other Instream device that blocks fish passage.

Note: Just like the Create Multiple Events Upstream tool the downstream tool will take longer depending on how far downstream it has to travel to find the downstream end of the data that is currently in the map. If needed barriers can be created to prevent routes from being included in the multiple events all upstream tool. See the section on creating barriers later in the User Guide.

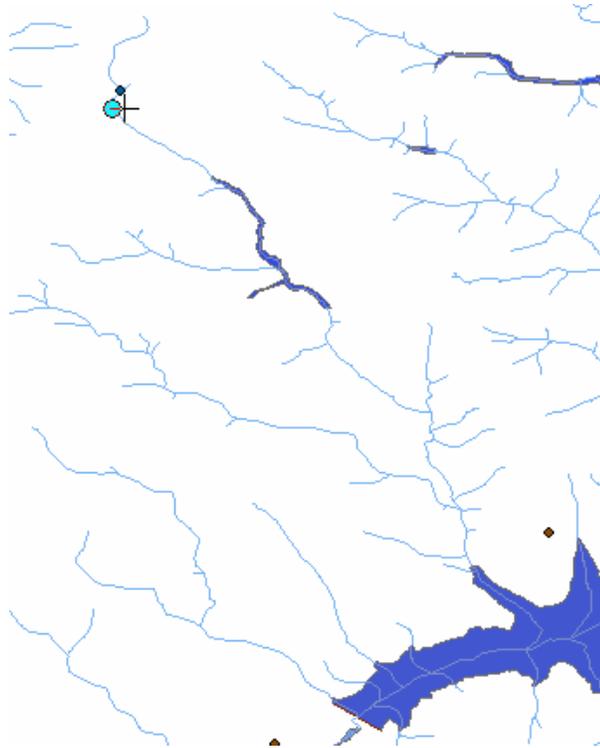
Change the Event Edit Task to Create Multiple Events Downstream.



Select the target event featureclass. The target is the featureclass where the new record(s) will be created.

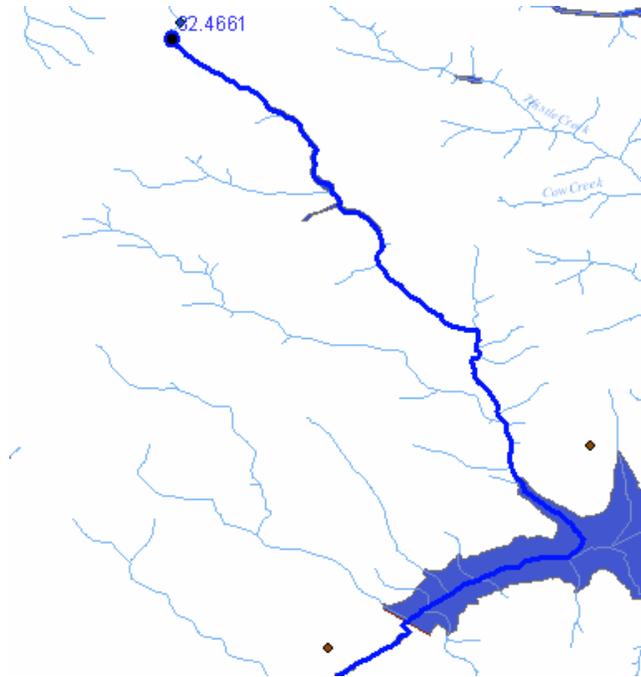


Click at the upstream point.



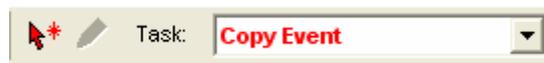
If there are multiple Route Location Candidates at the selected point, select the correct Route Location and click the OK button. If you need assistance determining the correct Route Feature, select one of the location candidates from the list and click the Flash Feature button.

When the process has completed the map will refresh and the new records will be displayed. You may need to zoom to the full extent of your data to see all of the newly created records.



Copy Line Event

Change the Event Edit Task to Copy Event.

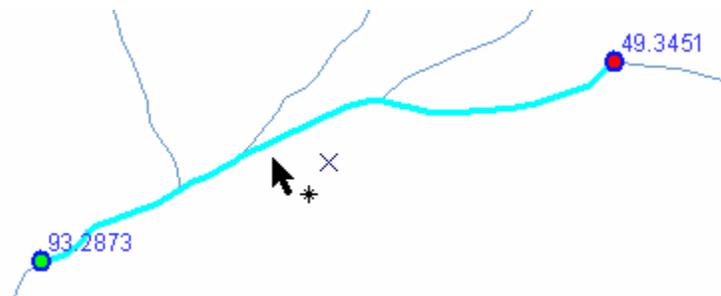


Select the target event featureclass. The target is the featureclass where the new record will be created. This can be the same featureclass as the record to be copied or a different featureclass.

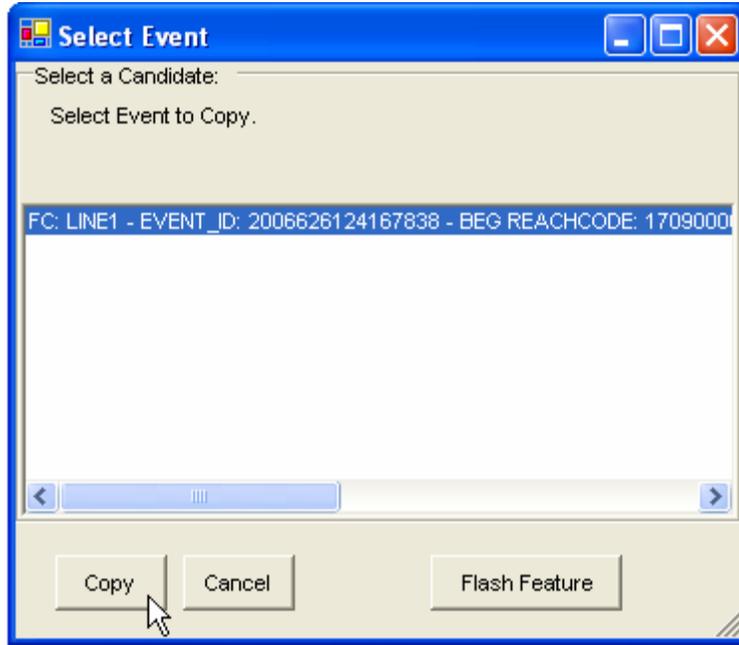


Activate the Event Selection Tool.

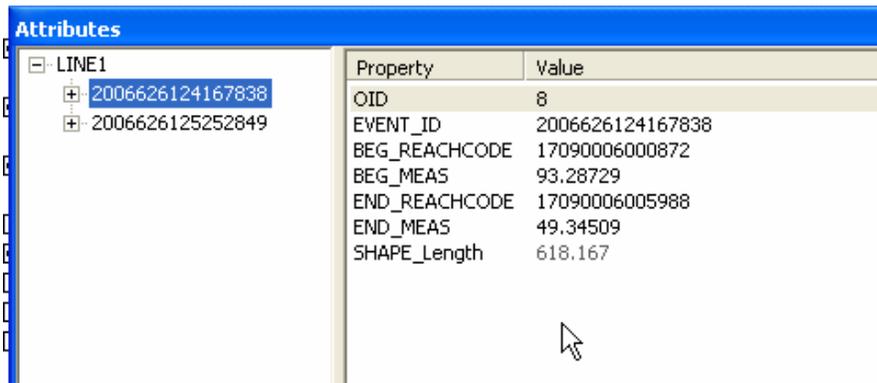
Using the Event Selection Tool as you would the ArcMap Selection Tool, select a line event record.



The select event dialog box will open. Select the event record to update from the list and click the Copy button.



The existing line feature will be copied into the target event featureclass. It is important to note that the copied feature will now stack on top of original feature, so you will need to use the selection tool and attribute table to correctly select the new record.



Delete Line Event

Change the Event Edit Task to Delete Event.

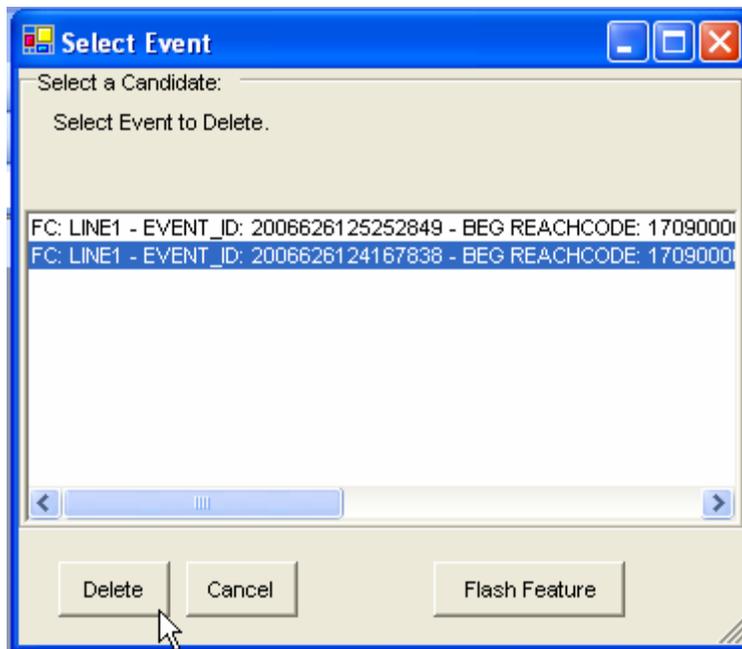


Activate the Event Selection Tool 

Using the Event Selection Tool as you would the ArcMap Selection Tool, select a line event record.



The select event dialog box will open. Select the event record to delete from the list and click the Delete button. If there is more than one record in the same spot, there will be multiple entries in the Select Event box.



The selected line feature will be deleted.

Ex. 3 – Linear Events

Create a Linear Event

Creating a line event is similar to creating a point event with a few extra steps to delineate where the line will be located.

If you completed the last exercise open the Map document that you used in that exercise.

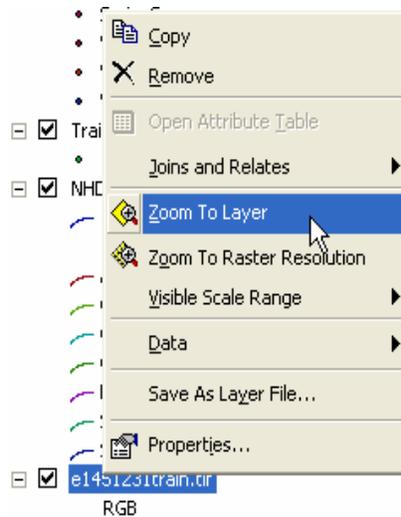
If you did not complete the last exercise add the following data to the map from the train folder located @
 \\blm\dfs\or\loc\gis\workspace\or\or_train\HEM

NHDH1709.mdb\Hydrography\NHDflowline
 NHDH1709.mdb\Hydrography\NHDpoint
 E1451231train.tif

Browse to the location where you created the line featureclass and add it to the map.

To make sure that you are working in the right location the .tif file will be used as a reference layer.

Right click on the E1451231train.tif layer and select Zoom to Layer.



Make sure the HEM toolbar is also turned on (Toolbars → Hydro Event Management Tools).

A linear event is created by completing the following steps:

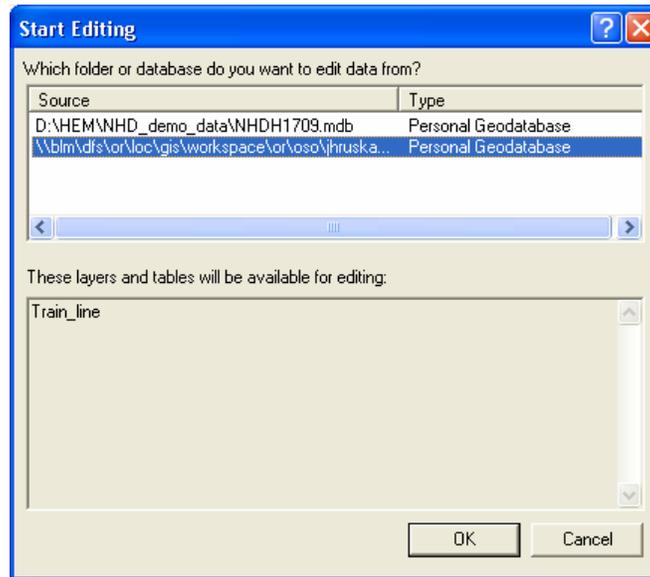
Note: Don't complete these steps now. They will be explained in detail in the next few pages.

Editor → Start Editing

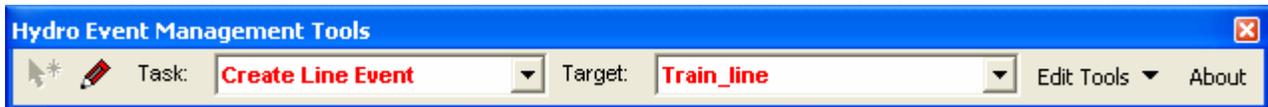
- HEM Toolbar → Task → Create Line Event
- HEM Toolbar → Target → Line featureclass where your new lines will be created
- Event Sketch Tool → Click the downstream end of the line
- Event Sketch Tool → Hold down Shift and click the upstream end of the line

In this exercise we will again be using the DRG map to identify where our reaches will be located. If you have GPS points to help you delineate your reaches, those could also be added to the map at this time.

From the Editor menu select Start Editing and select the directory that contains your line feature.



On the HEM toolbar set the task to Create Line Event and the Target to Train_line.

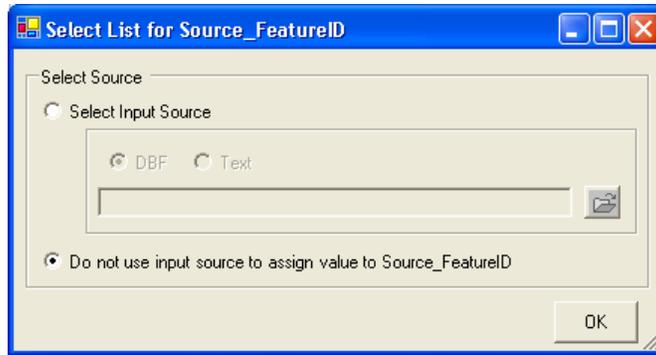


Zoom into the area on the map that has the yellow lines. These lines delineate the location where the new reaches need to be created. The reaches can be created in any order and there should be four total reaches created when you are finished, A-B, C-D, E-F, and G-H.

Using the Event Sketch tool on the HEM toolbar , click the downstream location of a reach.

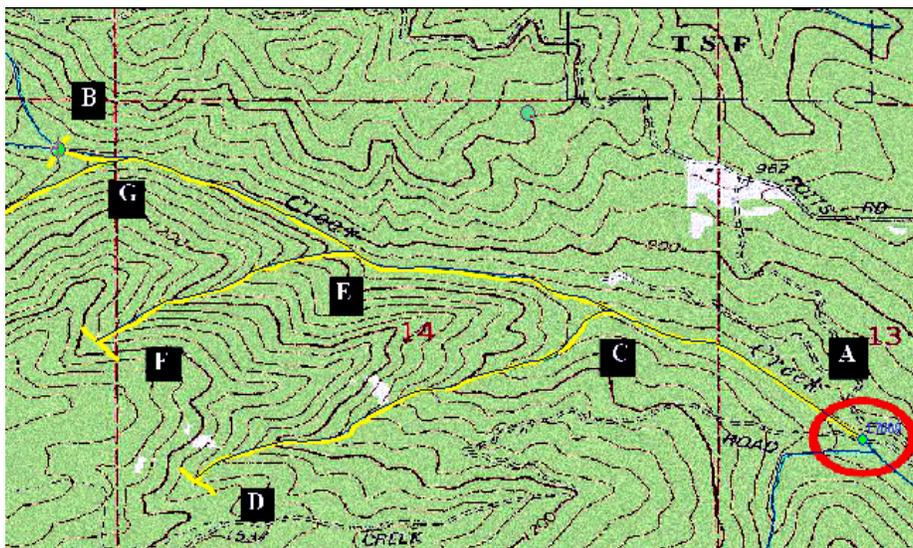
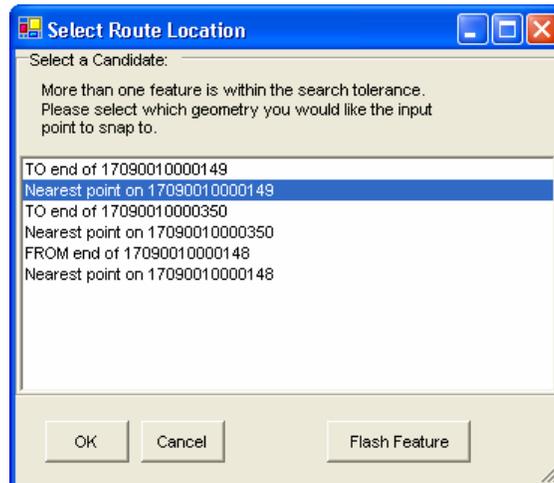
After you click to identify the downstream point of the reach you will again have the option of assigning values to the Source_FeatureID field from an external data source.

Choose the second option (“Do not use input source...”) and click OK.



If the spot that you selected to start your reach has more than one feature within the search tolerance you will be given the option to select the route that you want the reach to start on.

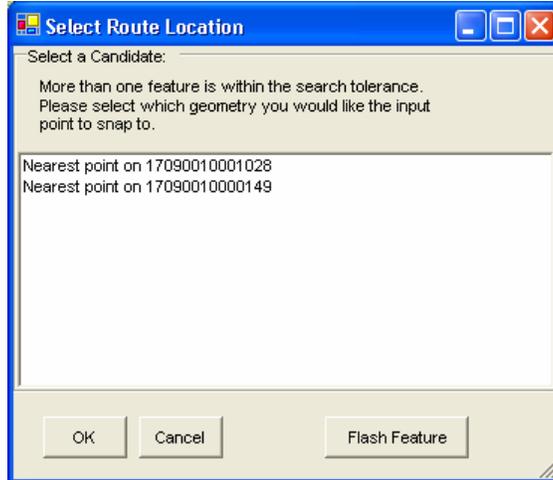
Select the Route to snap to and click OK.



Once the reach index shows up on the screen, hold down the Shift key and click the upstream location.

Again you may be given the option of selecting the route that you want the reach to end on.

After a couple of flashes and a little smoke your new reach is displayed on the screen. Continue this process to add additional reaches, keeping in mind that if you click near a stream intersection you may need to select which stream you want to place your point on in the Select Route Location window.

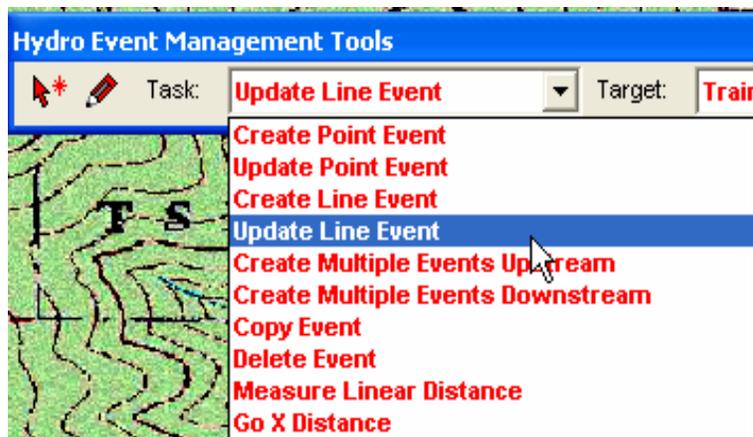


Save your edits.

Update Existing Reaches

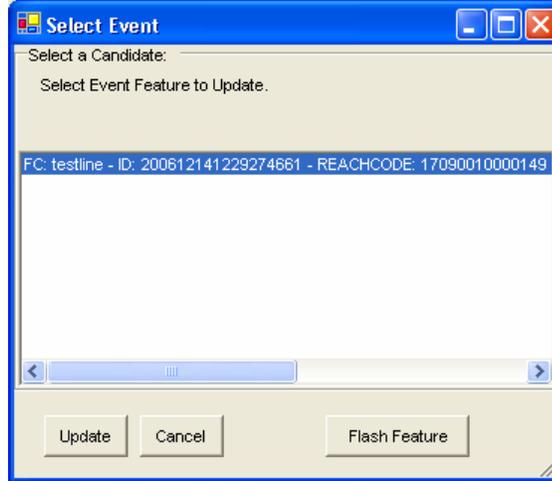
Existing Reaches that have already been created can be updated using the Update Line Event task on the HEM toolbar. This will allow you to change the location of an existing line event without losing any information that may already be attached to that feature.

Change the Task on the HEM toolbar to Update Line Event.



Using the HEM selection tool, click on one of the existing line features that you created earlier in the exercise.

Select the feature that you want to update in the Select Event window and click Update.



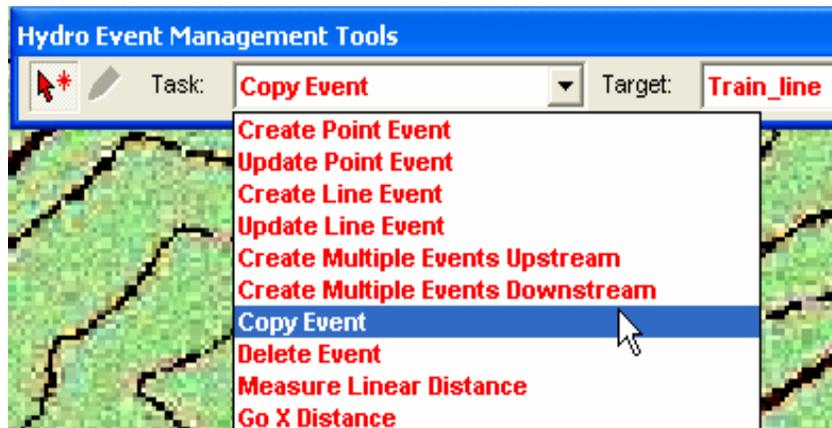
Once the line is selected, the tool switches to the edit tool. Click the new downstream and upstream points for the new location to update the location of your event.

Save your edits.

Copy Line Events

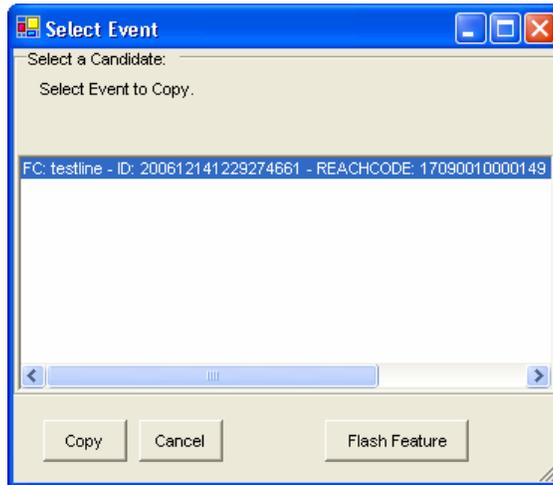
Use the Copy Event Task to copy an existing line feature. The downstream and upstream reach indexes will be copied and a new feature will be created.

Change the Task on the HEM toolbar to Copy Event, also making sure the Target is still set to your line feature.

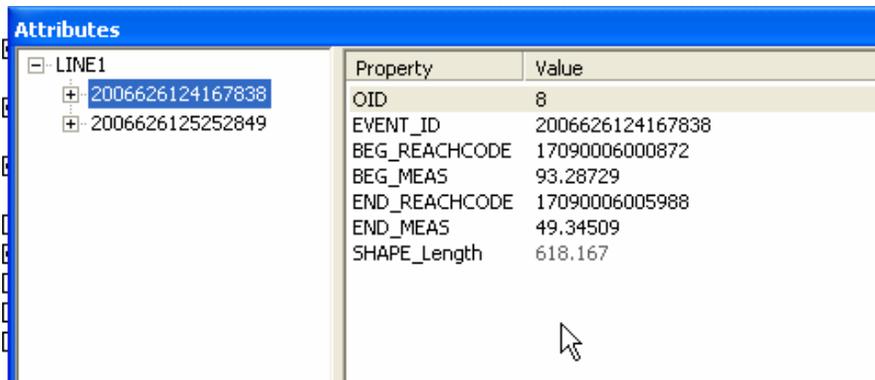


Using the HEM selection tool, click on an existing line feature.

Choose the feature that you want to copy in the Select Event window and click Copy.



Since both features are now on top of each other, you may need to open the attribute window  to see that there are actually two events there.

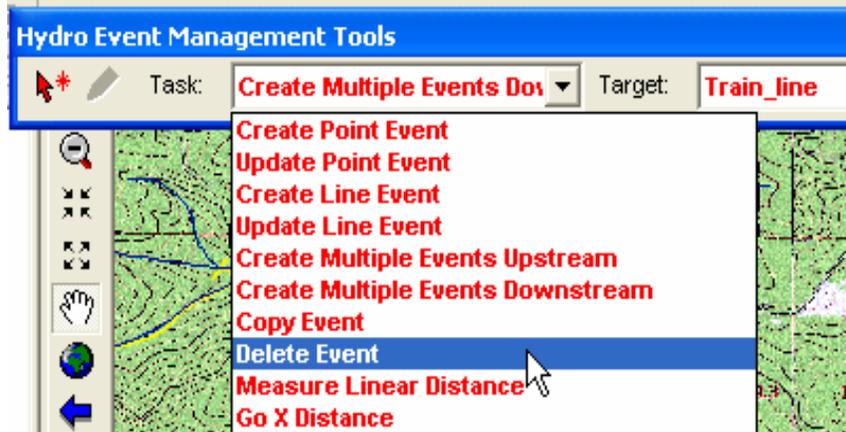


Save your edits.

Delete an Existing Reach

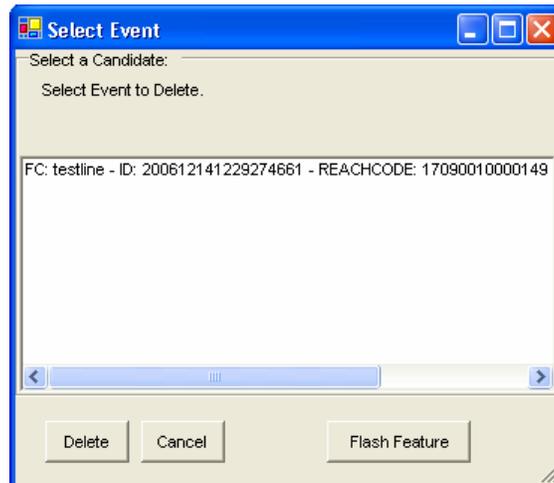
The Delete Event task can be used to delete existing line features.

Change the Task on the HEM toolbar to Delete Event.



Using the HEM selection tool, click on an existing line feature.

Select the feature that you want to delete from the Select Event dialog and click Delete.



After you click Delete the event graphics may still be visible.

Select Clear HEM Elements from the Edit Tools dropdown list on the HEM toolbar to remove the elements representing the event.

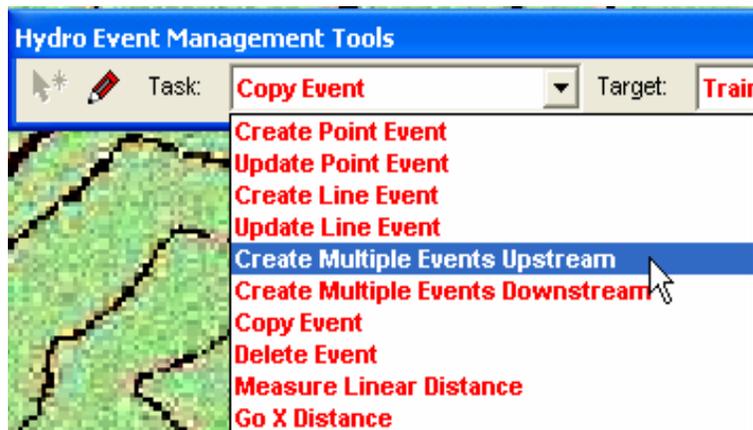


Save your edits.

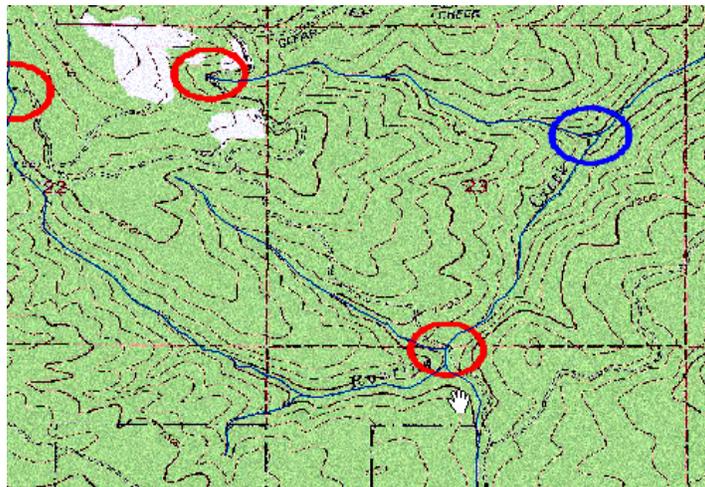
Create Multiple Events Upstream

The Create Multiple Events Upstream tool allows you to create multiple events from a single downstream point. All reaches upstream from the point that is clicked will have a line feature created for them unless barriers have been set on those reaches (see the next exercise for instructions on how to set barriers).

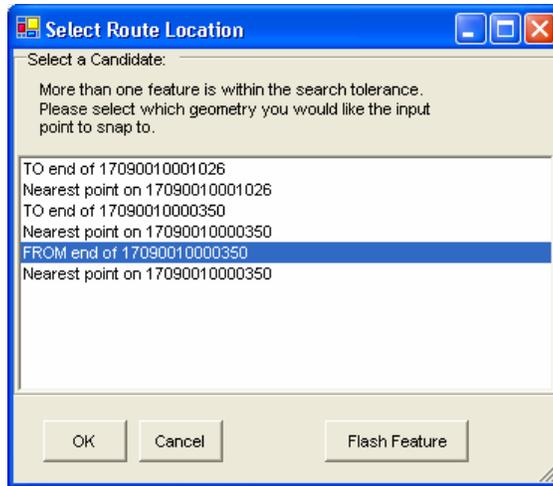
Change the Task on the Hem toolbar to Create Multiple Events Upstream.



Zoom to the blue circle that is on your JPG image

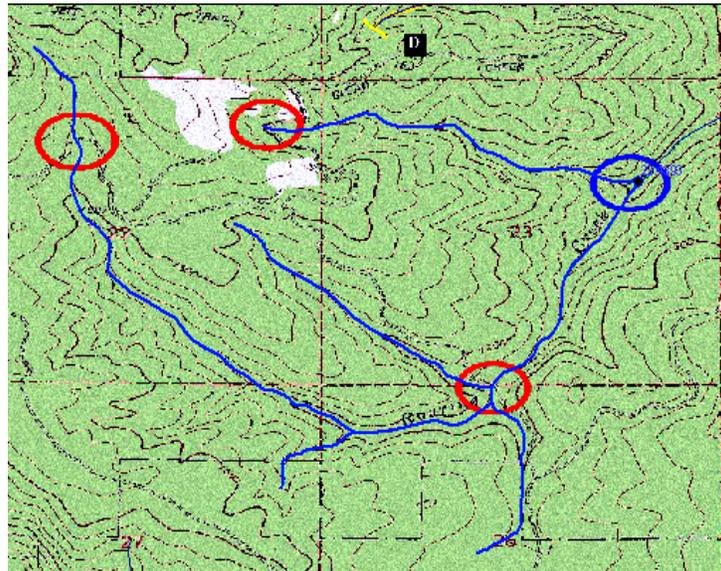


Using the HEM Edit tool, click the point inside the blue circle where the two streams intersect. You should be asked which stream you want to snap your point to.



Select the option to snap your point to “FROM end of 17090010000350” and click OK.

After another flash of light and a little smoke you should see dark blue lines representing all of the new line features that have been created upstream from the point that you clicked (note: the more line features that are created, the longer it may take to see the blue lines show up on the screen).

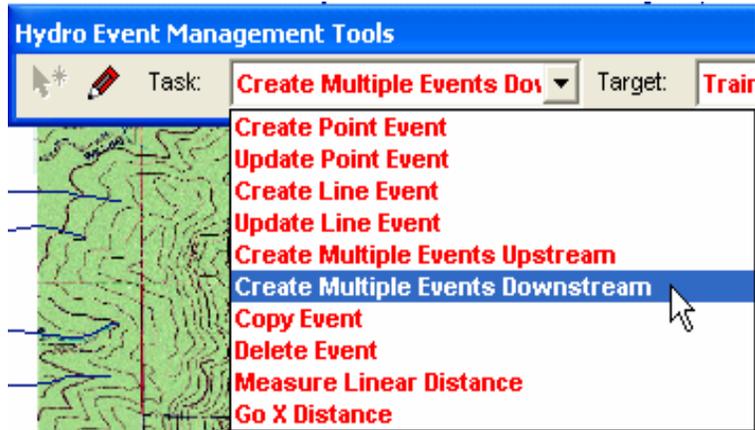


Save your edits.

Create Multiple Events Downstream

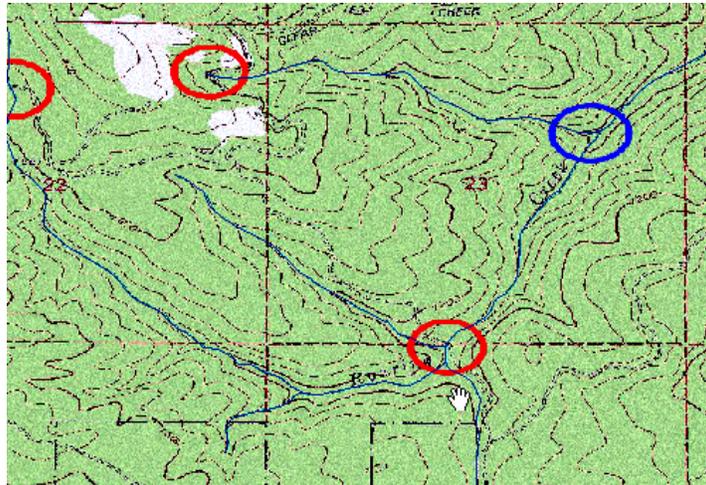
The Create Multiple Events Downstream task will create a single path line event that follows the most direct downstream route from the point that you click.

Change the Task on the HEM toolbar to Create Multiple Events Downstream.

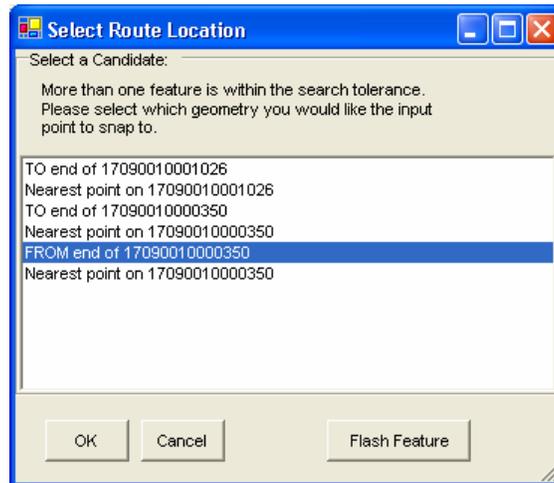


We can use the same point on the map that we used for the Create Upstream tool to create multiple events downstream.

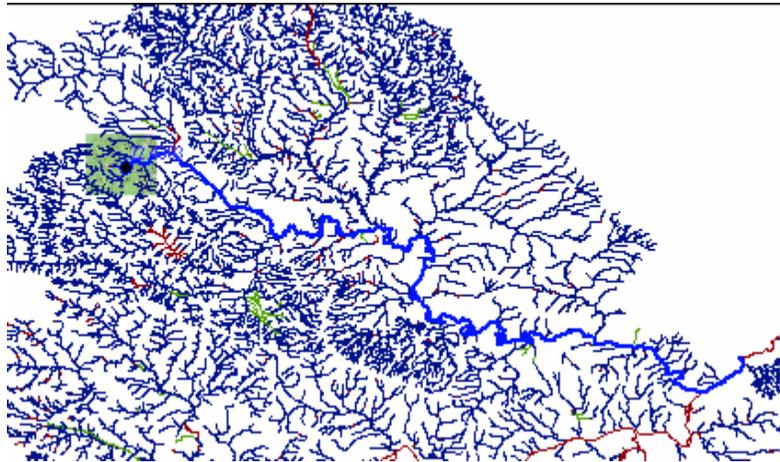
Using the HEM Edit Tool, click inside of the blue circle.



Select the main stream (FROM end of 170900010000350) from the Select Route Location window to start the reach creation process.



After the process completes you should have a new reach that travels to the lowest point of the stream network (you may need to zoom out to see the entire reach).



Save your edits and your map.

End Exercise 3

E. Other Functions

Measure Linear Distance

The purpose of this tool is to provide a method for calculating the stream linear distance between two user-identified points along a stream.

Set the Event Edit Task to Measure Linear Distance. You do not need to set an Event Edit Target.

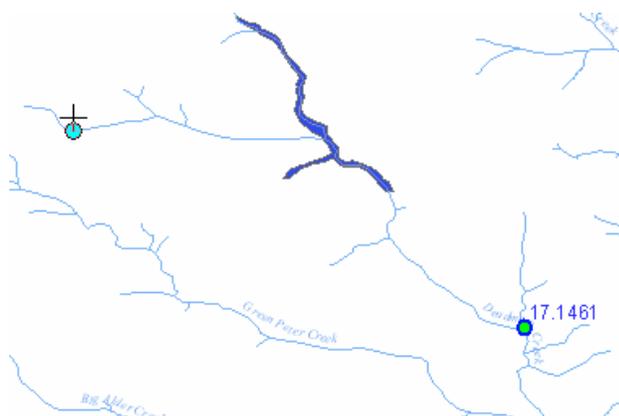
Activate the Event Sketch Tool .

Click at a point along a stream.



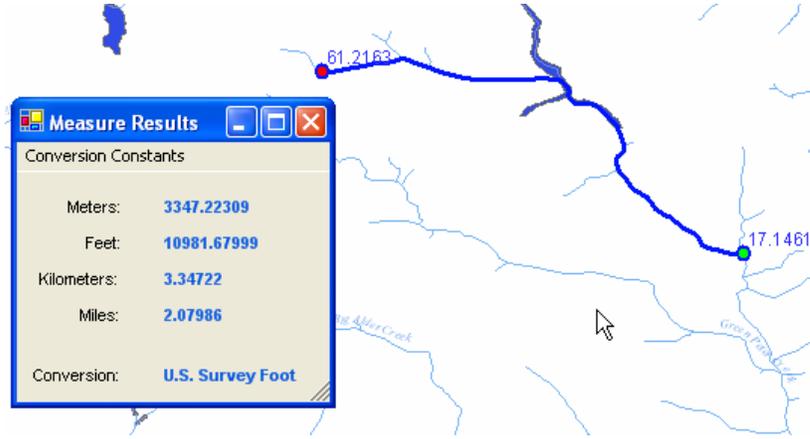
If there are multiple Route Location Candidates at the selected point, select the correct Route Location and click the OK button. If you need assistance determining the correct Route Feature, select one of the location candidates from the list. This will flash the feature on the map. You can also click the Flash Feature button to flash it again.

While holding the Shift key on your keyboard, click on a location on a stream to define the other end of the line you wish to measure.



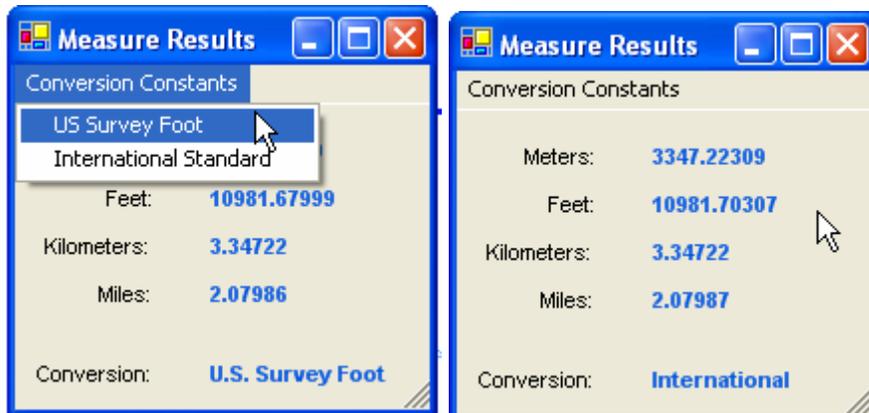
If there are multiple Route Location Candidates at the selected point, repeat the process listed above to select the correct route location.

The network path between the two points will be solved and the Measure Results dialog box will open.



The measure box by default opens using the US Survey Foot conversion between units of measure. The input value (in either feet or meters) is then calculated to the other units of measure. The input unit of measure is based on the unit of measure for the data projection. If the data uses the Geographic coordinate system, the polyline created by the network solve is first projected to the Albers projection and then the length of feature is calculated.

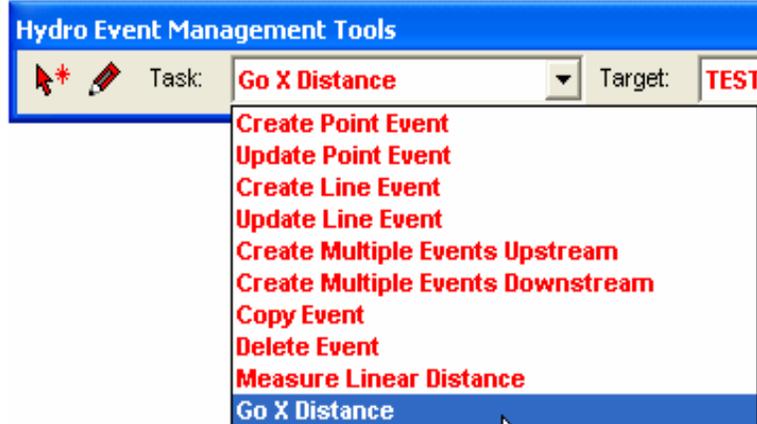
To toggle between the US Survey Foot and International conversion standards, select the Conversion Constants pulldown menu from the top of the form. The values on the form will change based on the constant selected.



Go X Distance

The purpose of this tool is to provide a mechanism to travel up or downstream a user-defined distance.

Set the Event Edit Task to Go X Distance. You do not need to set an event edit target.

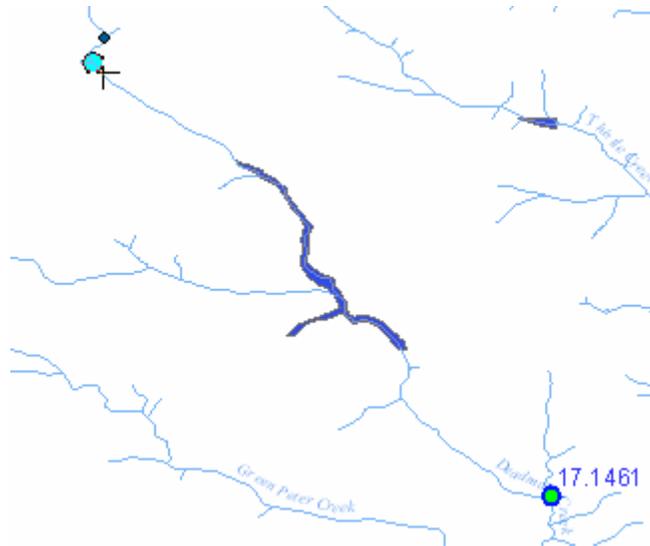


Activate the Event Sketch Tool .

Click at a point along a stream. This will serve as the point from which the distance will be measured.



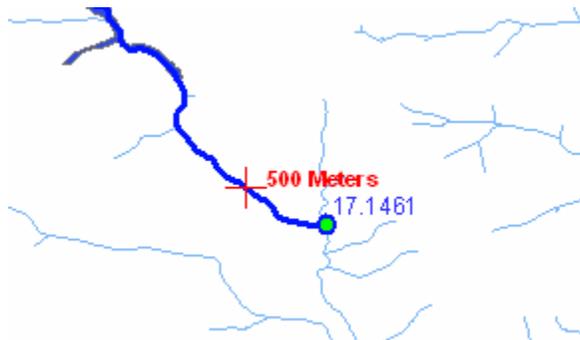
Going in the distance you would like to travel, while holding down the Shift key, click somewhere up or downstream beyond your estimate of the distance (i.e. if you want to measure a point that is 30 meters upstream from your first point click a location that is at least 30 meters from your first point so that the distance you want to measure is contained between the two points). This will help establish the path of where the trace should go. The standard ArcMap measure tool can be used to give a rough estimate of the distance.



The measure distance box will open. Input a distance using the unit of measure from the projection that your NHD data (and the data frame) utilizes and then press the Enter key on your keyboard.



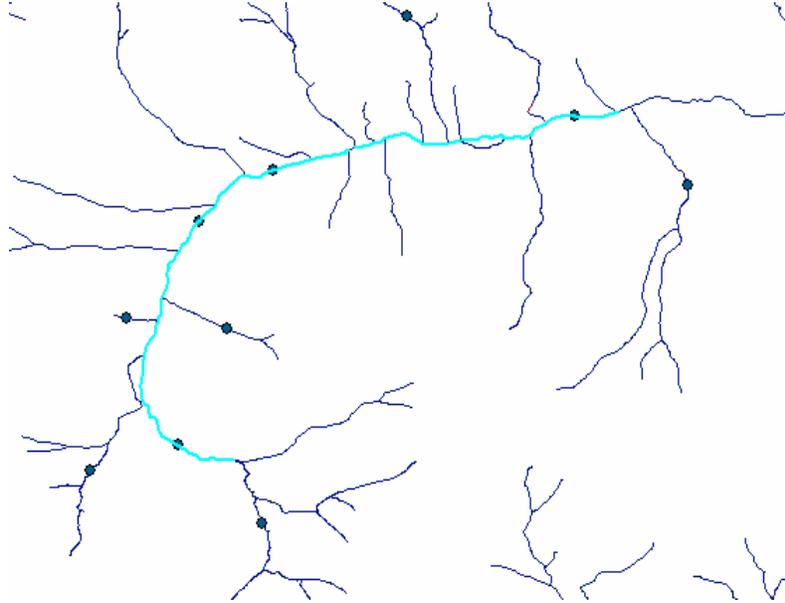
A red cross-hair graphic will appear on the stream at the user defined distance.



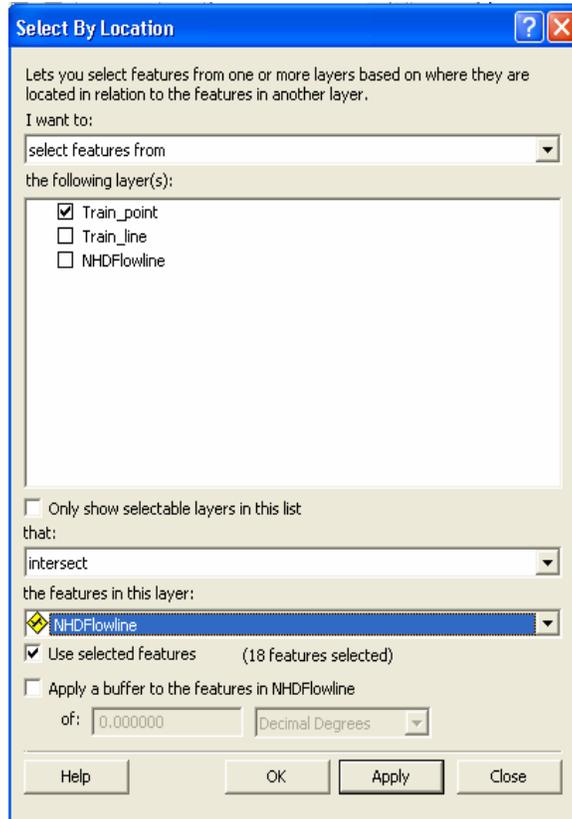
Select by Selected 

The select by selected tool will select a point or line event in your map based on an existing selection. This tool can be used to find all point or line events on a selected stream segment and then update those points or lines.

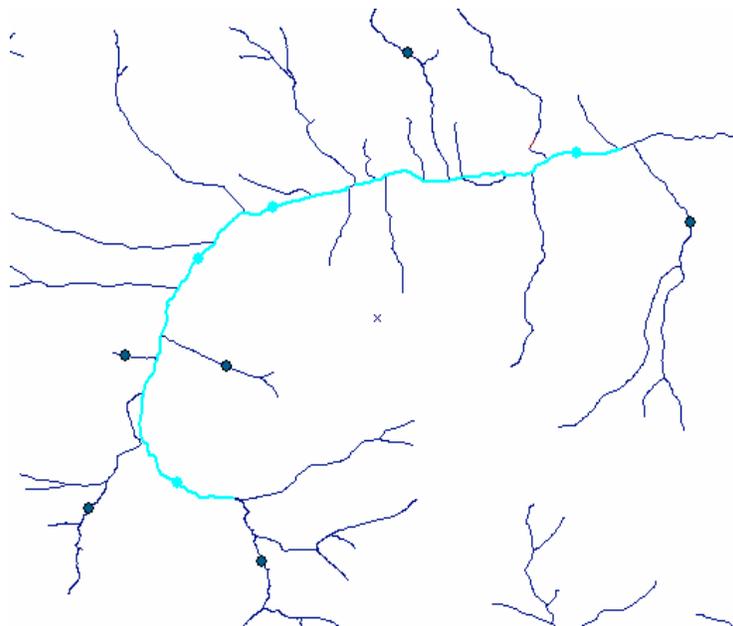
The stream that we want to select points with has already been selected.



Using the Standard ArcMap Select by location dialog we can select all of the points that intersect our selected stream. Make sure that you check the box to use only the selected features in the Select by Location dialog.



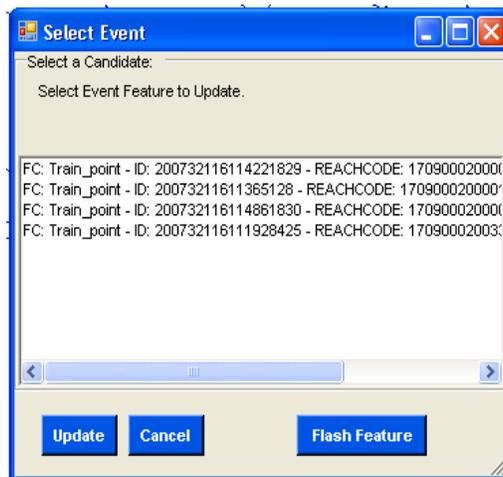
The point events on our selected line are now also selected.



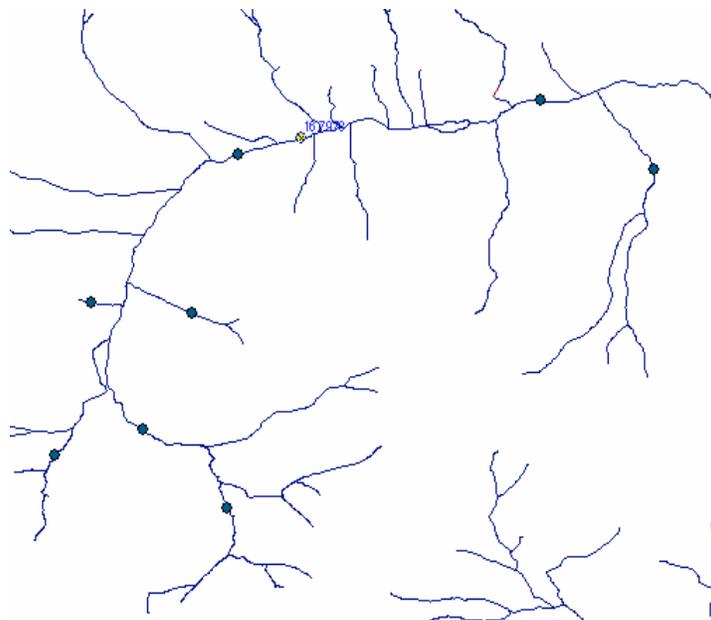
Change the task on the HEM toolbar to Update Point Event and select the Select by Selected button from the Edit Tools dropdown.



The Select Event dialog box opens and allows you to pick which point event you want to update, if needed the features can be flashed on the map.



After you have selected a feature and clicked the update button, click on the map where you want to move the feature to. The new feature will be displayed on the map.



The Select by Selected tool can also be used with the Copy and Delete tasks.

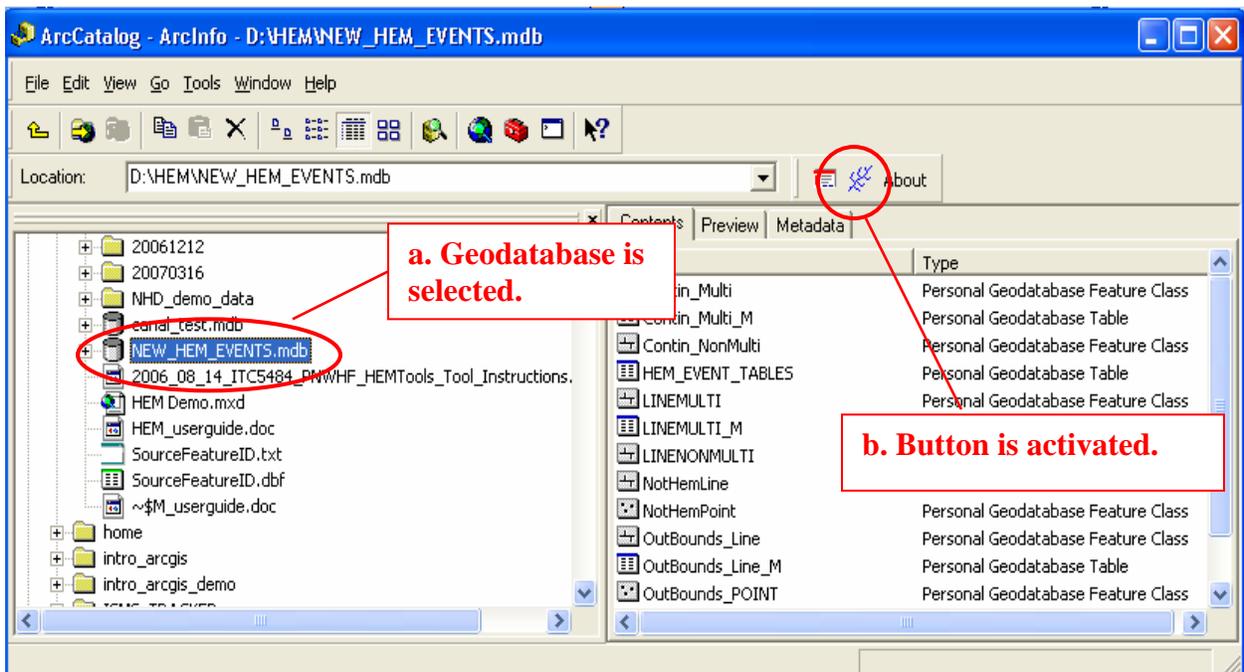
Check Continuous Events

The check continuous events button provides a way to verify that events that should be continuous do not have any gaps or overlaps. This tool can be run from ArcCatalog on an entire feature class or in ArcMap on a selected set of features. Any errors that are found are put into a text report as well as a new Personal Geodatabase table that can be joined to the route featureclass and used to display errors in the map.

Note: The Check Continuous Events tool only functions on an event featureclass that contains continuous events as specified when the featureclass is created using the Event Table manager.

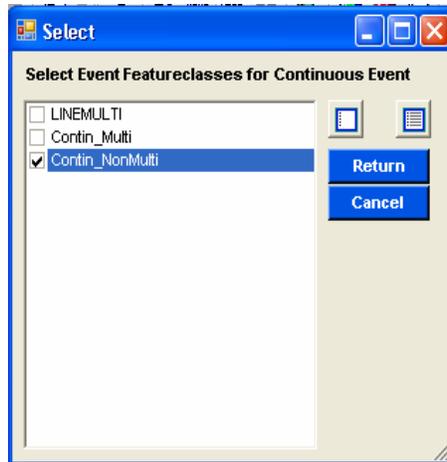
To use the Check Continuous Events tool in ArcCatalog

Select the workspace that contains the event featureclass to enable the tool.

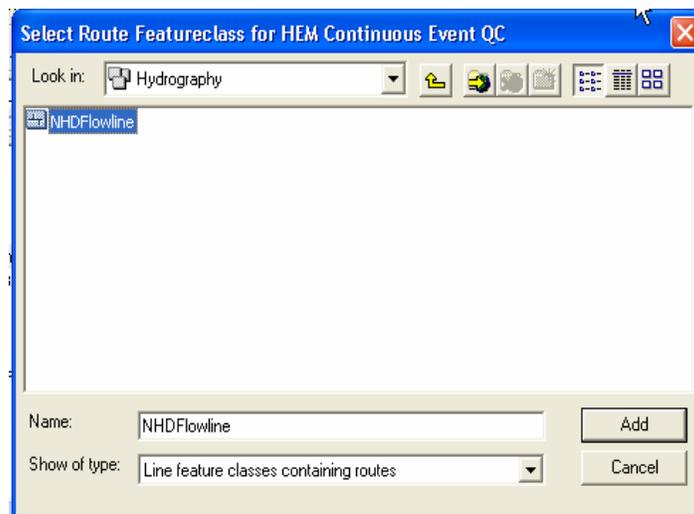


Click the Check Continuous Events button to launch to tool.

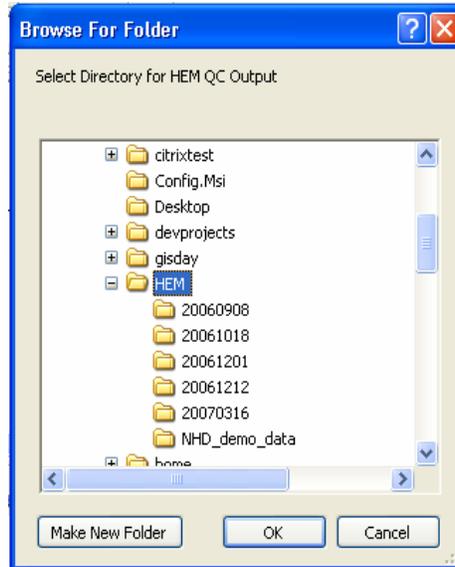
All of the featureclasses that contain continuous events will be listed, choose the featureclass that you want to run the tool on and click the Return button.



The next screen allows you to select the route featureclass that will be used to QC the events.



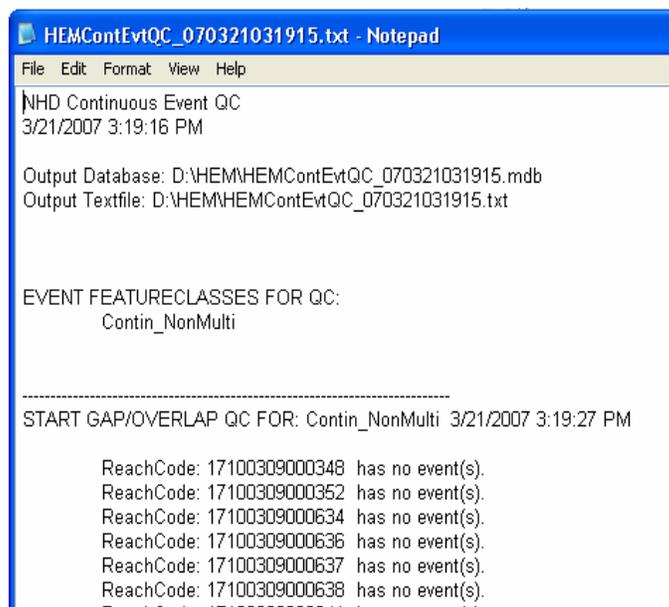
The last screen lets you specify the output folder to store the QC table and geodatabase in.



Once the data has been QC'd a window will open telling you that the process has finished.

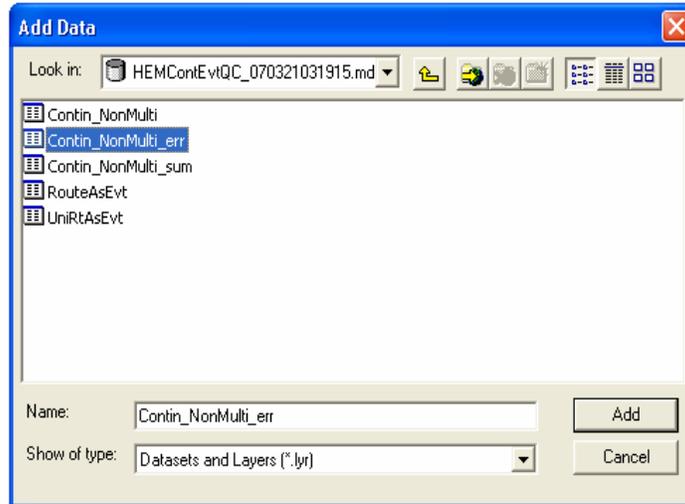


The text file that was created and placed in your output folder contains a list of all of the errors that were encountered in your event featureclass, what the ReachCode was where the error was found and what the error was. The name of the text file that is generated by the tool will be: HEMContEvtQC followed by a date and time stamp of when the error report was created.

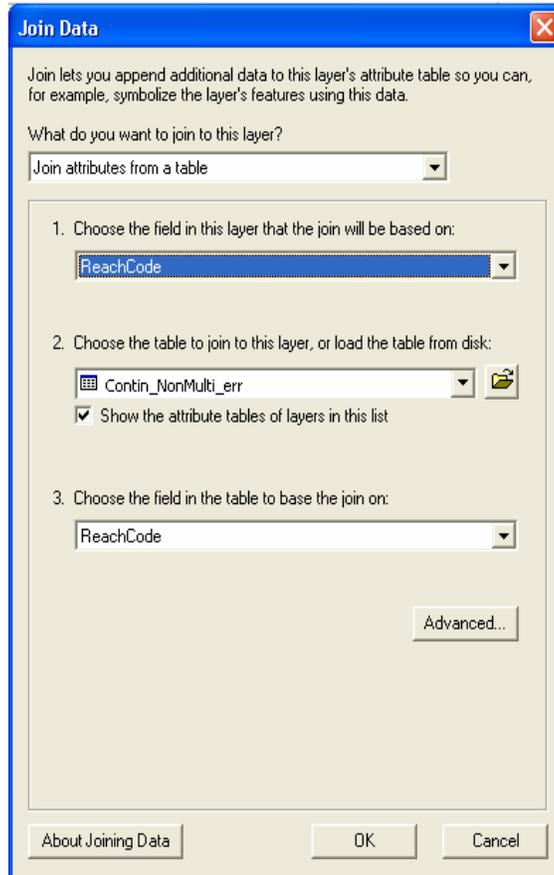


The text file can be used to inspect the data to see if there are any errors. Once it is determined that the data has errors the Personal Geodatabase table that is created by the tool can be added to ArcMap to view the errors.

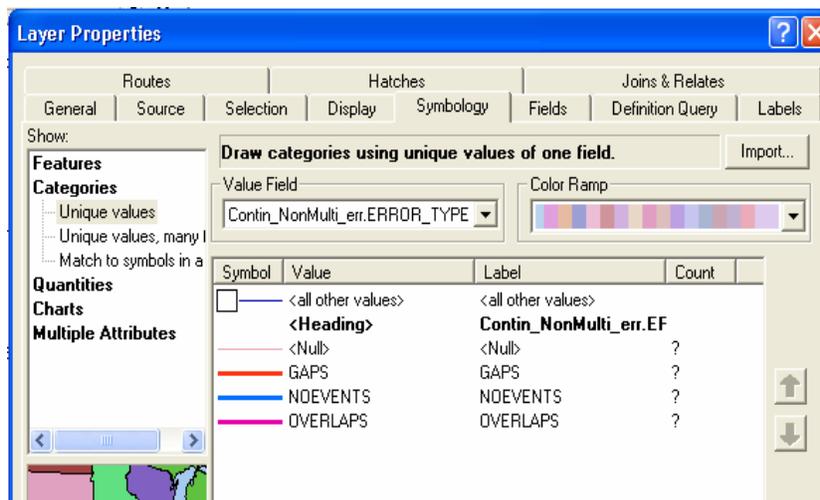
After adding the event featureclass that is being QC'd and the NHD linework that was used to check the featureclass. The Personal Geodatabase error report table can also be added to the map. The personal geodatabase uses the same naming convention as the text file: HEMContEvtQC followed by the date and time stamp and the mdb extension. The table that ends with “_err” is the error report.



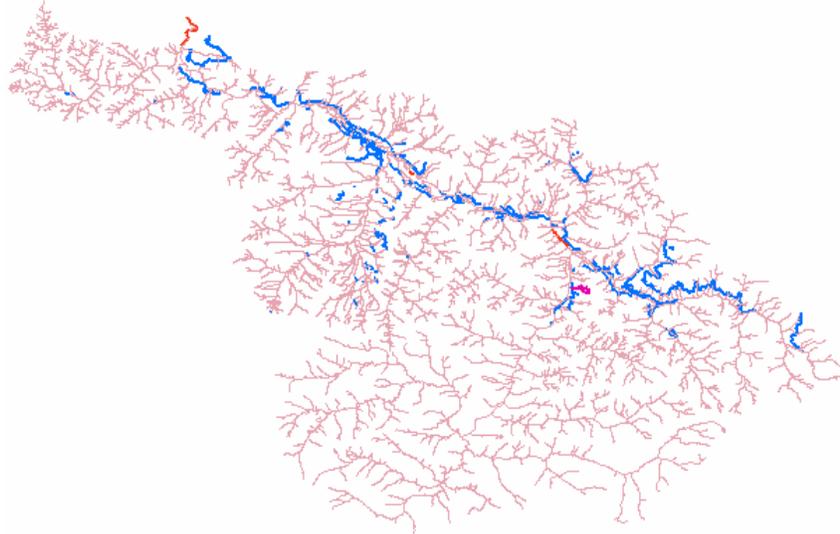
Once the table is added to ArcMap it can be joined to the NHD flowline using the ReachCode field.



Once the error report is joined to the NHD layer the layer can be symbolized using the type of error identified in the error report for that line.



The map now displays all of the errors that were found in the event featureclass. The standard HEM edit tools discussed earlier can be used to fix these errors.

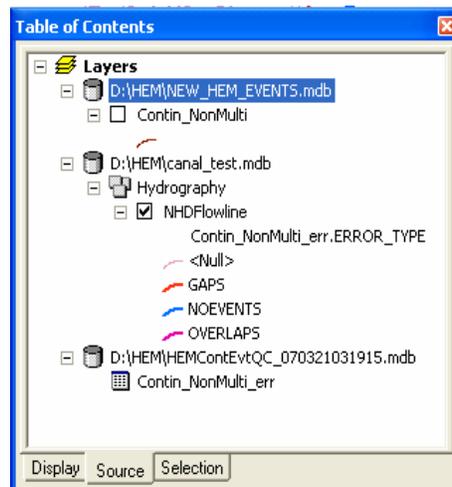


Using the Check Continuous Events tool in ArcMap

The tool performs similarly in ArcMap as it does in ArcCatalog with a few exceptions.

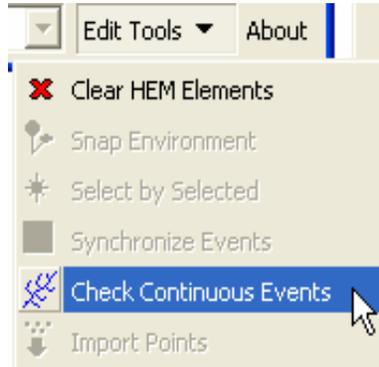
When running the tool in ArcMap you can select the features in your route featureclass that you want the tool to check for errors. You also need to select the event workspace using the Table of Contents source tab before the tool becomes enabled.

Once you have the features in your route featureclass that you want to QC selected, click the Source tab at the bottom of the ArcMap Table of Contents and highlight the workspace that contains the event featureclass.



In ArcMap the tool is located under the Edit Tools dropdown list on the HEM toolbar.

Select Edit Tools → Check Continuous Events to start the tool. The rest of the steps are the same as they are in ArcCatalog.



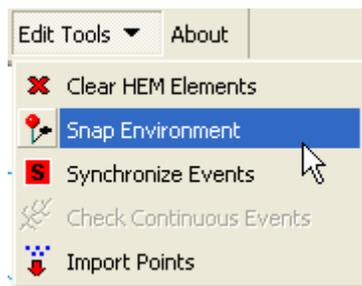
Snap Environment

The application provides a tool that automatically sets up the snap environment for editing. Once the default settings have been established, the ArcMap snapping window opens so the user can review those settings and adjust as necessary. This is an optional tool that is meant to facilitate snapping event data to the NHD Flowline features.

Open ArcMap and add the NHD line work datasets and event datasets that will be edited.

Start editing.

From the Edit Tools dropdown on the HEM toolbar click the Snap Environment button.



The snap environment will be set and then the snapping window opens. Review the environment and adjust as needed to meet your editing needs.

Layer	Vertex	Edge	End
NHDPoint	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HYDRO_NET_Junctic	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NHDFlowline	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NHDWaterbody	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
NHDArea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
POINT1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LINE1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LINE2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
POINT2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The snapping window can be left open or closed.

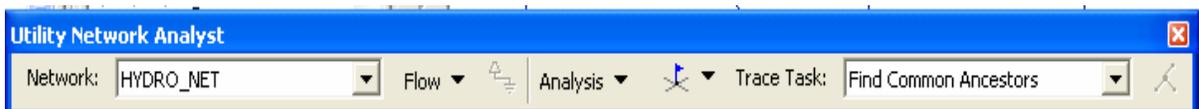
Clear HEM Elements

Click this tool to clear all of the flag and line elements created by the HEM tools.

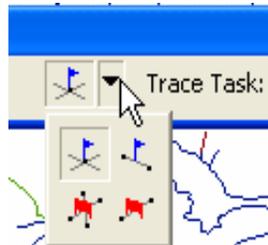
Setting Barriers

The application relies on the network tracing capability of ArcGIS. Occasionally in some areas, such as braided streams, the tools may not return the path that you intended. In this case, you will want to utilize the Add Junction Barrier and Add Edge Barrier tools located on the Utility Network Analyst toolbar.

Turn on the Utility Network Analyst toolbar from ArcMap's list of toolbars.

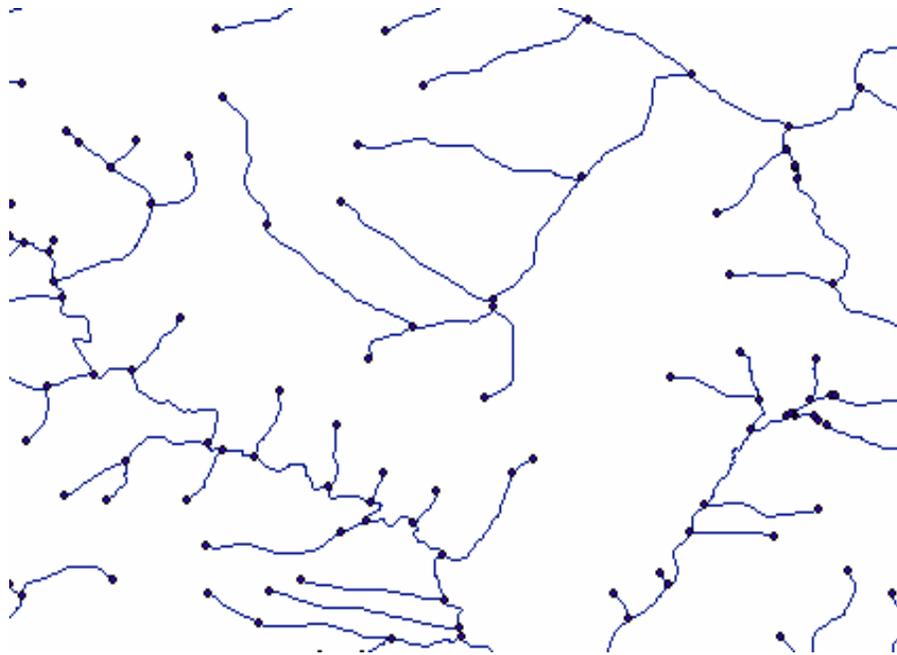
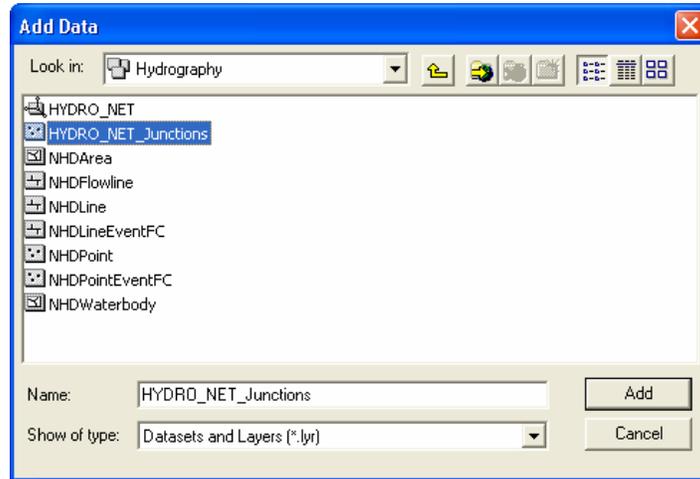


The add junction and edge barriers are in the dropdown list represented with the blue flag in the above graphic; click the error next to the flag to choose which barrier you want to use.



The Add Junction Barrier  can be used to block the path of the new route that is being created at intersections and the Add Edge Barrier  can be used anywhere along the stream to stop the tool from adding a route beyond that point.

In order for the Junction Barrier tool to work you must first add the network junctions to your map. The network junctions should be in the same feature dataset as the hydrologic units that you have already added to your map.



Once the Junctions are added to the map they can be turned off and the tool will still function.

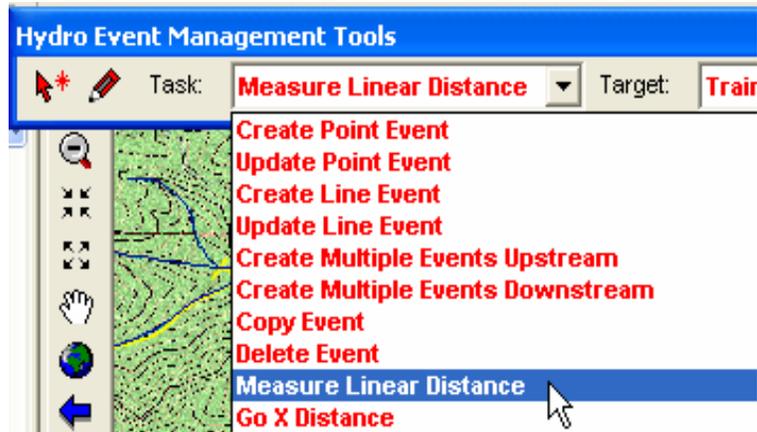
When working with the Create Multiple Events All Upstream tool, the add edge barrier can only be used to create events on the chosen stream network (i.e., make sure that you do not add any barriers to a network that is not upstream from the point you plan to click to start the tool).

Ex. 4 – Other Functions

Measure Linear Distance

The Measure Linear Distance tool allows you to measure the linear distance of a reach along its length. This tool can be used to make sure that the reaches you created are the correct length.

Set the Event Edit Task to Measure Linear Distance. You do not need to set an Event Edit Target.

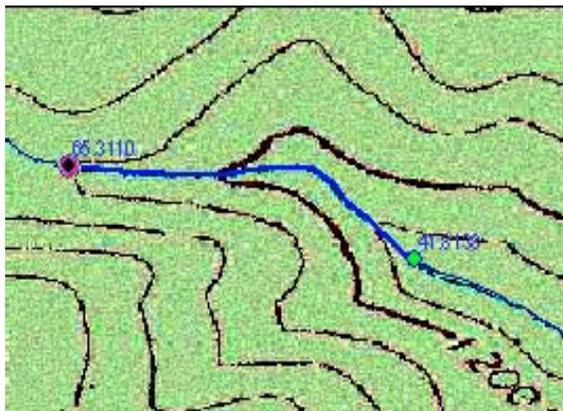


Activate the Event Sketch Tool .

Click at a point along a stream.

After you click, a green dot along with the Route index value will be displayed. Once this is displayed you can define the other end of the route that you want to measure.

Hold down the Shift key and click a point upstream from your first point.



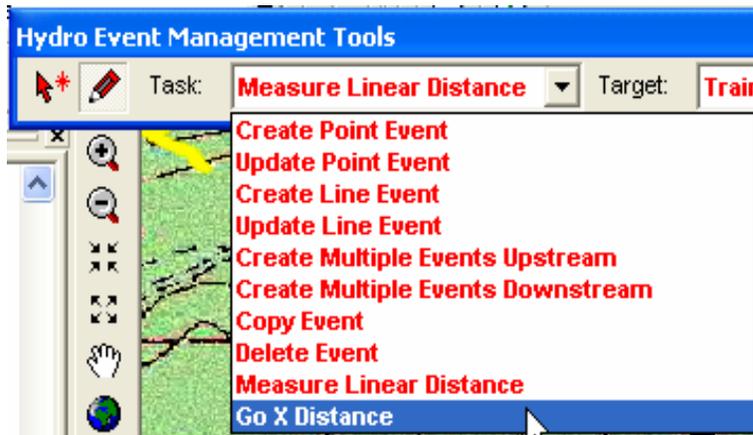
The route measure values will be displayed in a new window.



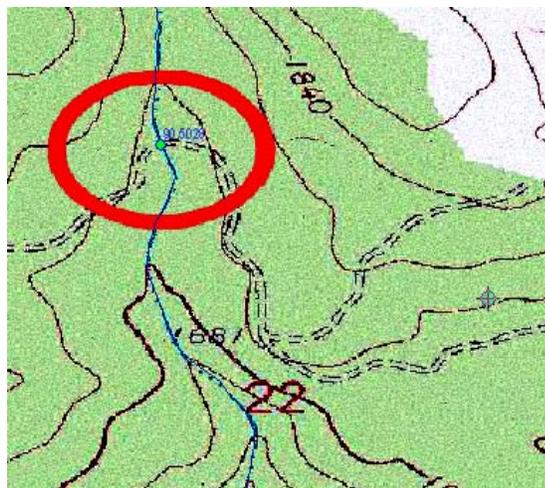
Go X Distance

This tool allows you to find a point on a stream that is a specified distance from another point. This could be useful if you know that a survey starts 100 meters upstream from a bridge or other type of landmark that is easily identifiable.

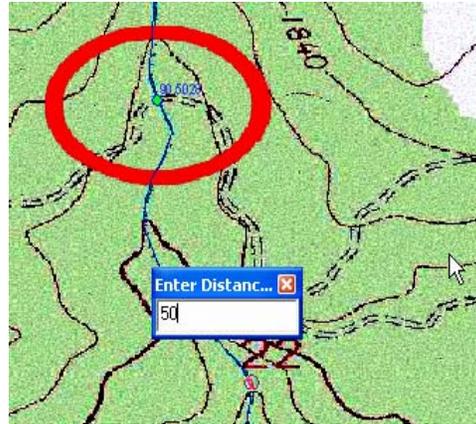
Set the Edit task on the Hem toolbar to Go X Distance.



Using the Event Sketch Tool  click a point that you want to measure distance from (in this case, a road stream crossing).



Hold down the Shift key and click on the stream in the direction that you want to measure. Make sure that you move far enough downstream or upstream to include the distance you are going to measure in the path (i.e., if you want to measure 50 meters make sure your path is at least 50 meters).

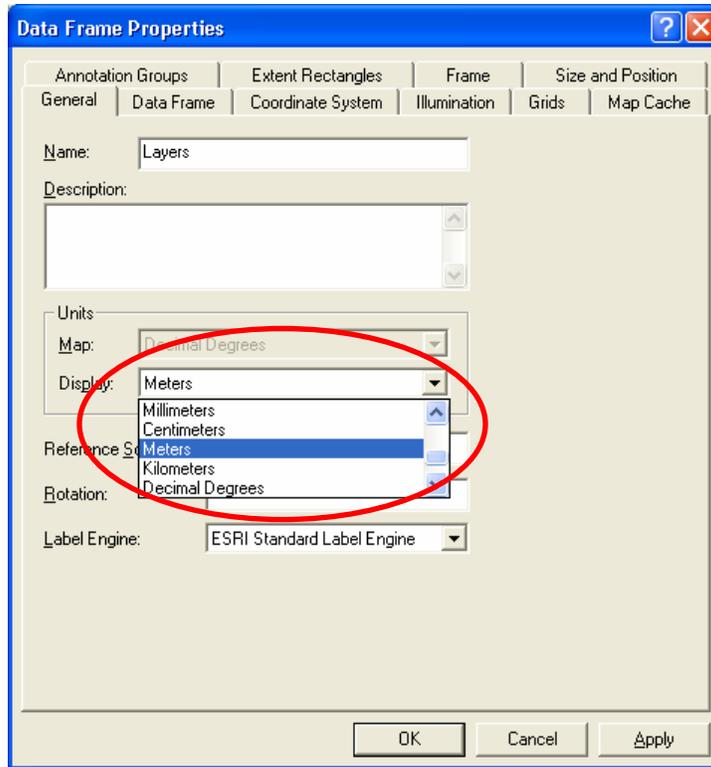


After you click, enter the distance in the Enter Distance box. The units will be the units that the current map display is set to, in this case meters.



A red X is placed on the map along with your measurement at the point that is the specified distance from the first point that you clicked (the green dot and 90.5028 measure in the above image). The second point clicked that defined the downstream point on the stream is also shown in red.

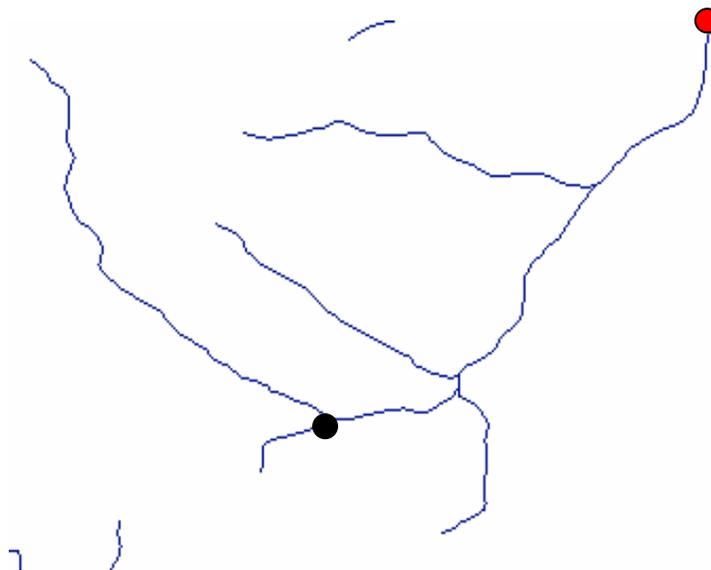
Note: If you want to use a different unit of measurement for the Go X Distance tool the units can be changed in the Data Frame Properties window.



Setting Barriers

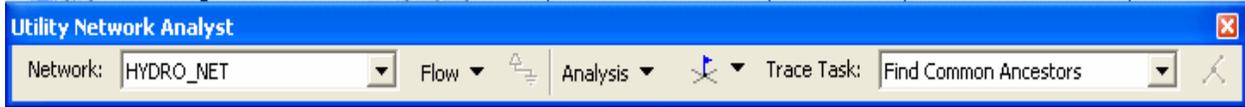
By using barriers we can limit the path of the upstream and downstream reach creation tools.

In the following stream network let's assume that we want to create multiple reaches upstream from the red dot but not include any of the routes upstream from the highest tributary (black dot).



Barriers can be added to your stream network from the Utility Network Analyst toolbar.

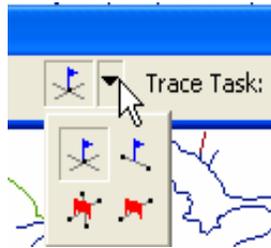
If needed turn on the Utility Network Analyst Toolbar (Toolbars → Utility Network Analyst).



The barrier options are located in the dropdown list that currently has the blue flag selected .

The Add Junction Barrier  can be used to block the path of the new route that is being created at intersections and the Add Edge Barrier  can be used anywhere along the stream to stop the tool from adding a route beyond that point.

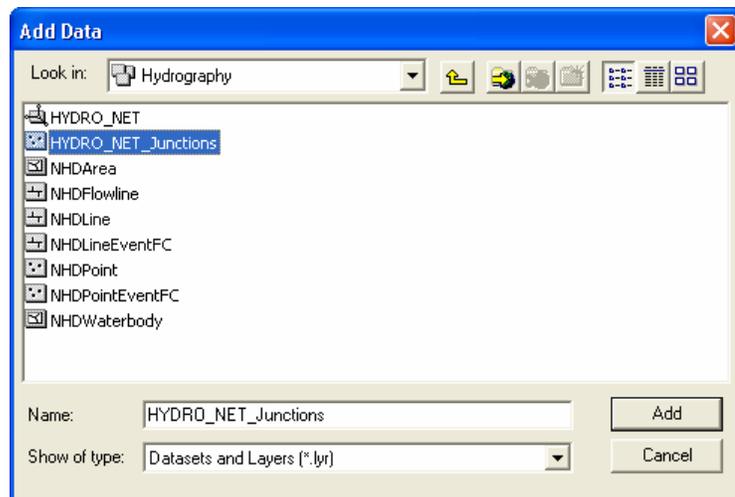
Click the arrow to the right of the flag to choose a network barrier.



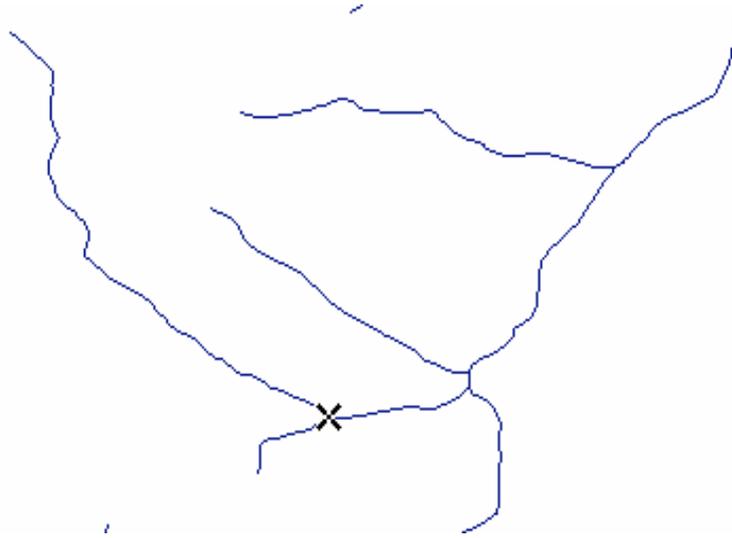
The Add Junction Barrier  can be used to block the path of the new route that is being created at intersections and the Add Edge Barrier  can be used anywhere along the stream to stop the tool from adding a route beyond that point.

Select the Add Junction Barrier .

If you haven't already, make sure the network junctions have been added to your map.



Click on the stream network where you want to place your barrier.



A red X representing your Junction Barrier will be displayed on the stream network. If needed you can add additional barriers now.

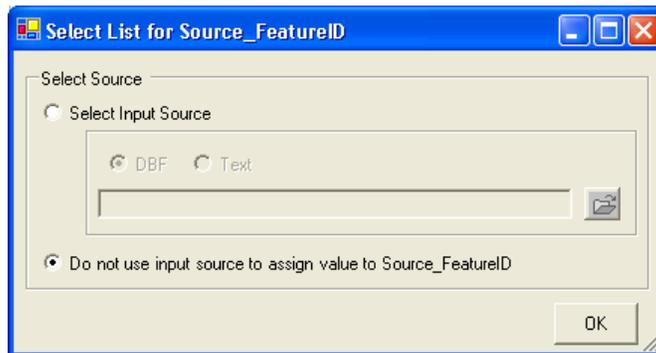
Note: If you place a barrier at the intersection of the main stream and first tributary you will essentially be blocking everything upstream from that point. If you do not want to include a tributary in the multiple reach creation process use the Edge barrier instead of the Junction barrier to block off unwanted tributaries.

Set your task to Create Multiple Events Upstream and your target to your line feature and click on the map where you want your event to start.

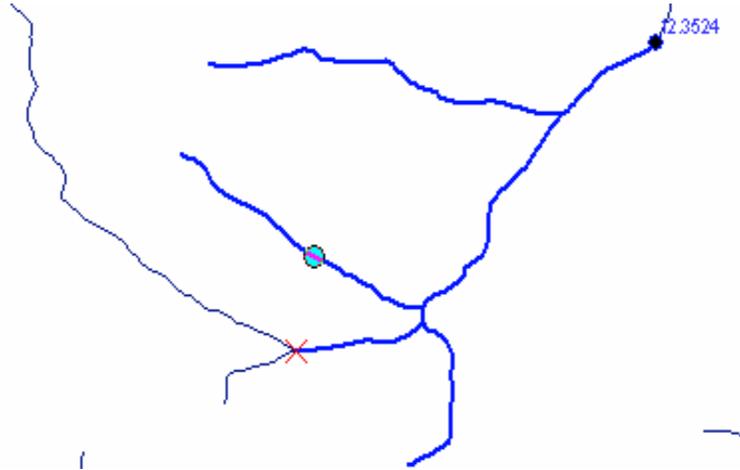


Once again you will be asked if you want to populate the Source_FeatureID field.

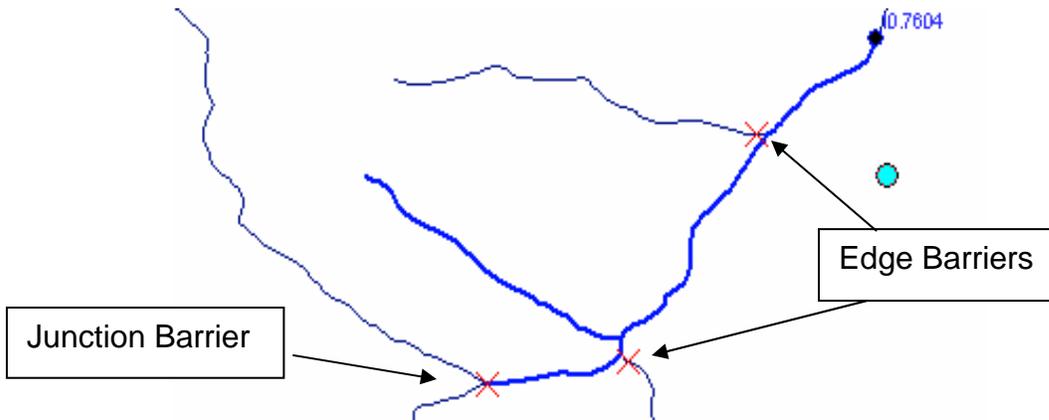
Choose an option and click OK.



Your new upstream network is displayed and includes all streams from the point that you clicked up to the barrier.

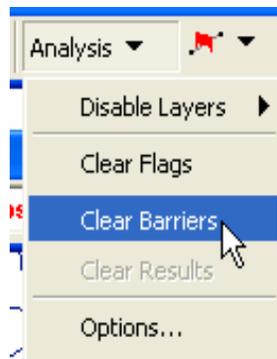


Here is another example of using the edge barrier to not include some of the tributaries.



Barriers can be cleared from the Analysis menu on the Utility Network Analyst toolbar.

Clear all the barriers that you have created by selecting Analysis → Clear Barriers.



Save your edits and exit ArcMap.

End Exercise 4

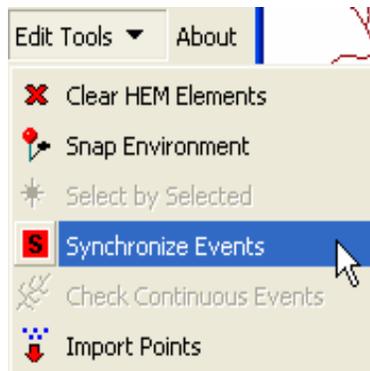
F. Event Synchronization

The Event Synchronization Tool is a tool that assists the user with updating records that have become out of sync with the underlying NHDFlowline data. The tool will detect which event records have a potential error based on the date of the last edit to the Flowline data. Typically, this tool would be run on event data when updated Hydrography data has been downloaded from the NHD Repository.

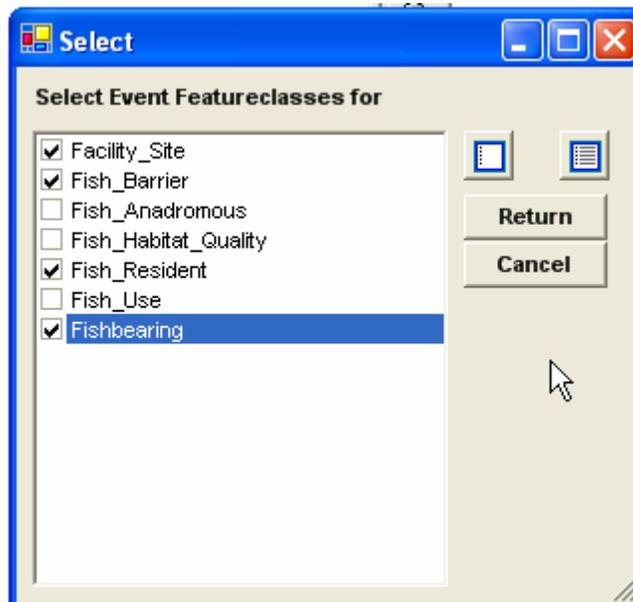
The following steps outline how to use the tool.

Select the event records to check for synchronization – records from multiple event featureclasses may be selected.

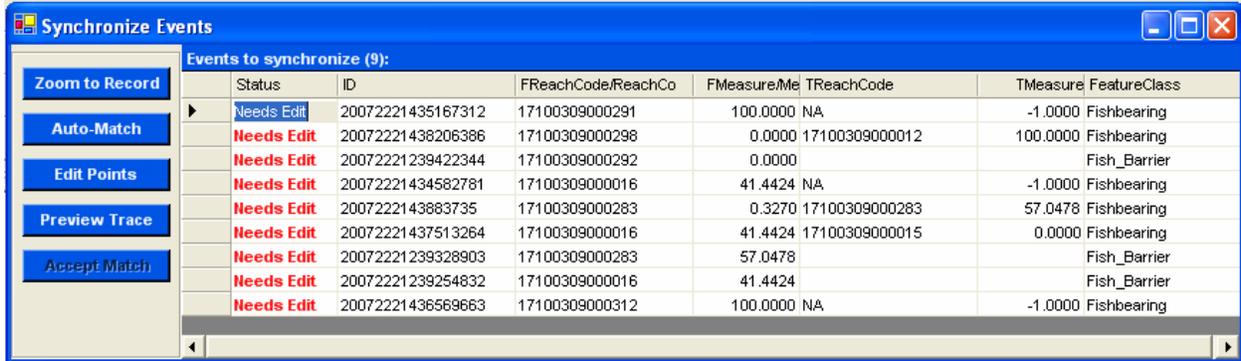
From the HEM Edit Tools menu, select Synchronize Events.



Select the event featureclasses that you want to synchronize from the list and then click the Return button.



The Synchronize Events form will then open. Depending on the number of records selected, this may take a few moments. At this time, the application is comparing the edit date of the event record to the last edited date of the underlying NHDFlowline data. When the form opens, the event records that are displayed are those that need synchronization.



Synchronize Events Form Overview:

Zoom to Record – zooms the map display to the event record selected in the grid.

Auto-Match – for the event record selected in the grid, the application will attempt to automatically update the geometry of the event to match the underlying NHDFlowline records.

Edit Points – facilitates the manual update of the event record selected in the grid.

Preview Trace – previews the automatic match results. This provides the user the opportunity to view the update before the edit is committed to the dataset.

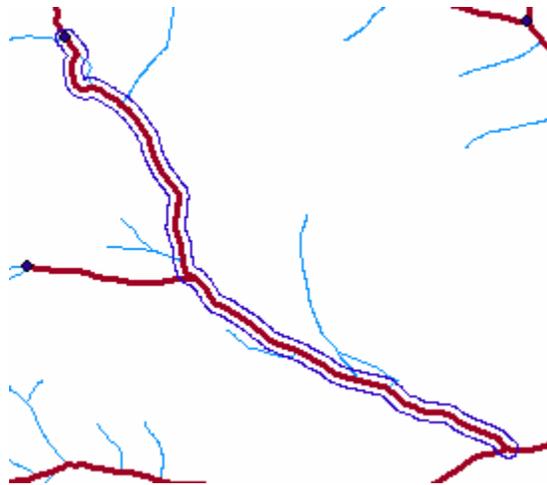
Accept Match – if the Preview Trace is acceptable, Accept Match will complete the edit to the selected record.

To perform an Auto-Match

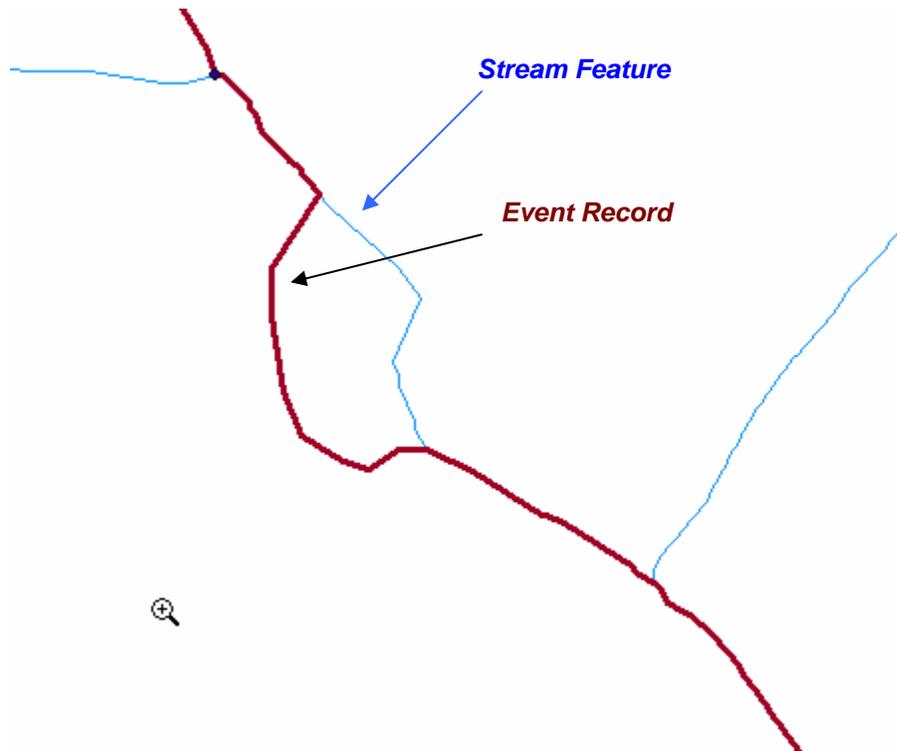
Select one of the records in the grid.

Status	ID	FReachCode/ReachCo	FMeasure/Me	TReachCode	TMeasure	FeatureClass
Needs Edit	20072221239422344	17100309000292	0.0000			Fish_Barrier
Needs Edit	20072221436569663	17100309000312	100.0000	NA	-1.0000	Fishbearing
Needs Edit	20072221239254832	17100309000016	41.4424			Fish_Barrier
Needs Edit	2007222143883735	17100309000283	0.3270	17100309000283	57.0478	Fishbearing
Needs Edit	20072221438206386	17100309000298	0.0000	17100309000012	100.0000	Fishbearing
Needs Edit	20072221239328903	17100309000283	57.0478			Fish_Barrier
Needs Edit	20072221437513264	17100309000016	41.4424	17100309000015	0.0000	Fishbearing
Needs Edit	20072221434582781	17100309000016	41.4424	NA	-1.0000	Fishbearing

Selecting the record in the grid will highlight it on the map.

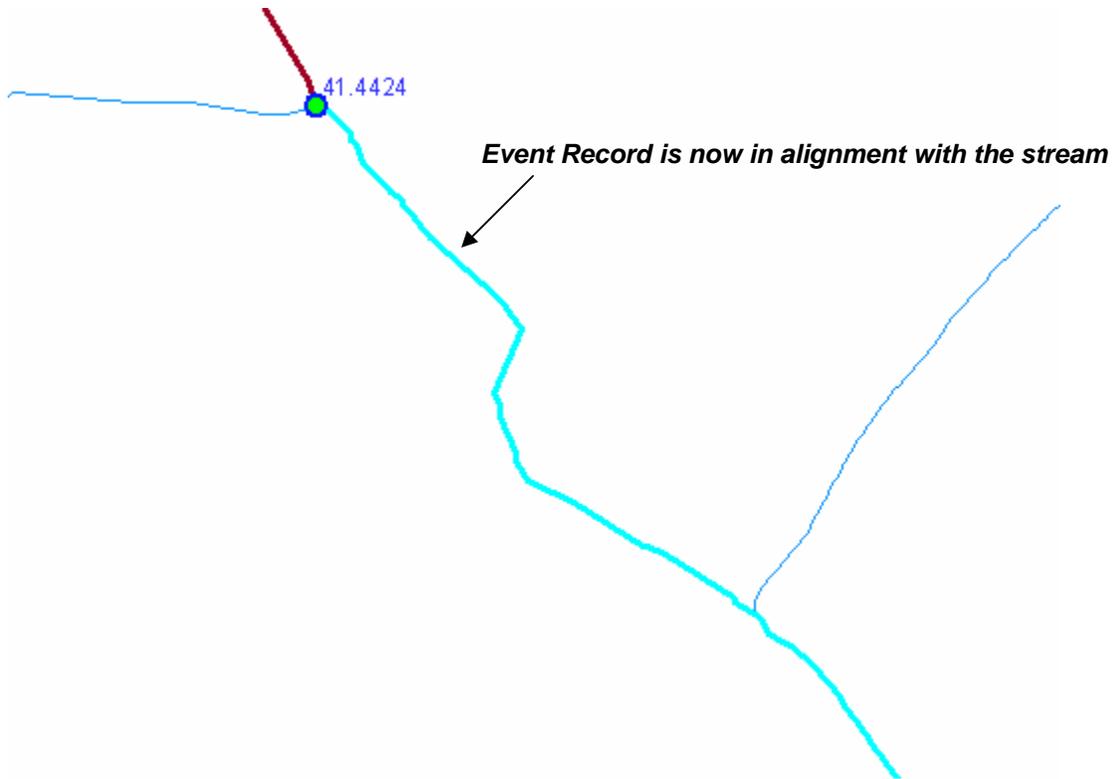


Observe how the selected event record has become out of sync with the underlying stream.

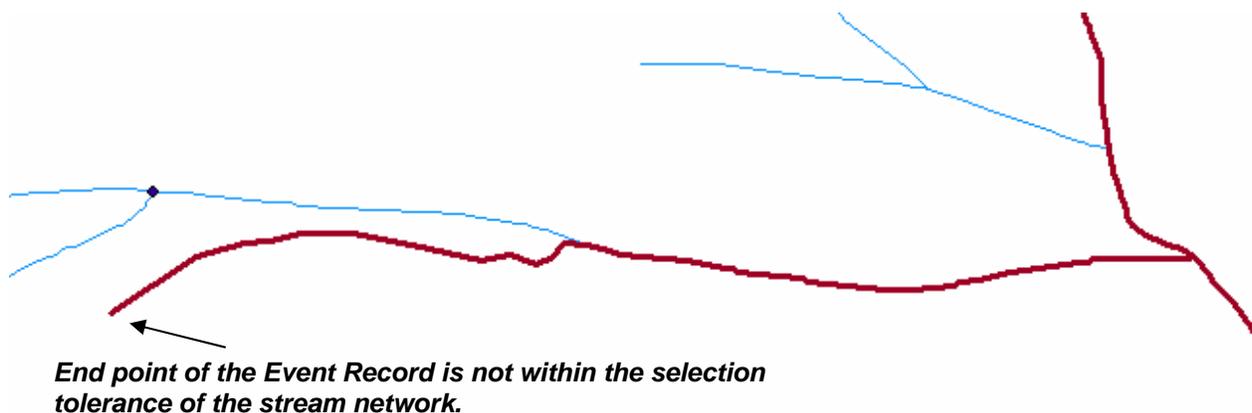


Click the Auto-Match button 

If the Auto-Match is successful, the event record will be re-aligned to the stream and the event record will disappear from the records in the grid.



Occasionally you may run across an event record that cannot be Auto-Matched. This occurs because one or more of the endpoints of the event record no longer fall within the selection tolerance of the underlying stream network. When this occurs the Auto-Match function will return a message similar to the following:



In order to synchronize a record that cannot be auto matched, you will need to perform a manual edit.

To Manually Edit Points

Select the event record in the grid.

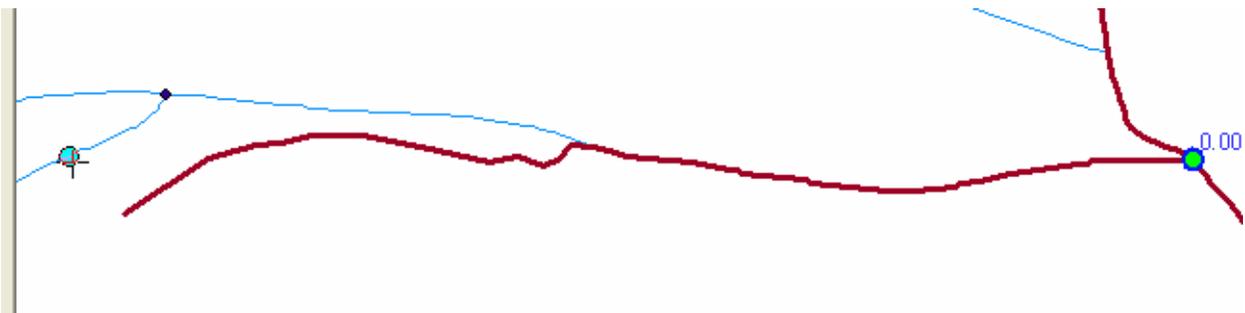
Events to synchronize (7):							
Status	ID	FReachCode/ReachCo	FMeasure/Me	TReachCode	TMeasure	FeatureClass	
Needs Edit	20072221239328903	17100309000283	57.0478			Fish_Barrier	
Needs Edit	20072221239254832	17100309000016	41.4424			Fish_Barrier	
Needs Edit	2007222143883735	17100309000283	0.3270	17100309000283	57.0478	Fishbearing	
Needs Edit	20072221436569663	17100309000312	100.0000	NA	-1.0000	Fishbearing	
Needs Edit	20072221239422344	17100309000292	0.0000			Fish_Barrier	
Needs Edit	20072221434582781	17100309000016	41.4424	NA	-1.0000	Fishbearing	
Needs Edit	20072221438206386	17100309000298	0.0000	17100309000012	100.0000	Fishbearing	

Click the Edit Points button.

This will automatically set up the edit – selecting the event record, changing the task to Update Line/Point Event, and activating the HEM sketch tool.



Click on the map where the start and end points should be located.



The event record will be updated and the entry removed from the grid.



Preview Trace

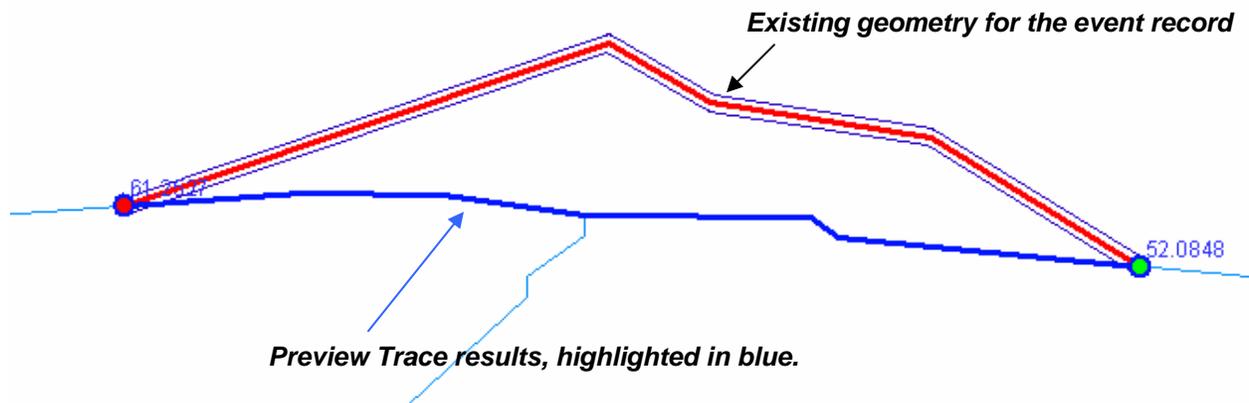
Occasionally you may encounter a record that needs to be synchronized that you would like to preview the Auto-Match before it completes. To do this:

Select the event record in the grid.

Events to synchronize (1):							
Status	ID	FReachCode/ReachCo	FMeasure/Me	TReachCode	TMeasure	FeatureClass	
Needs Edit	200739154096681	17100309000283	52.0849	17100309001189	4.2033	Fish_Habitat_Quality	

Click the Preview Trace button

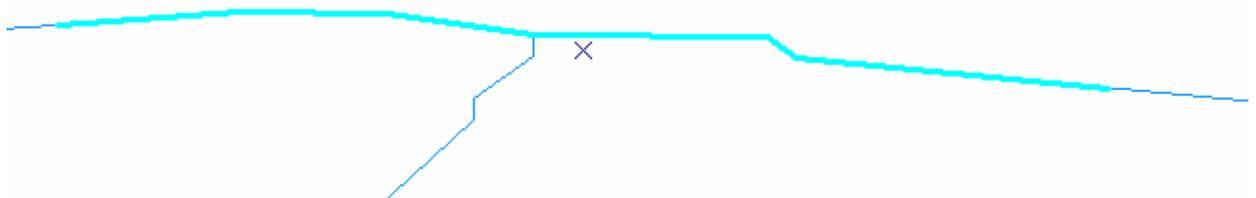
Preview Trace



If the Preview Trace results are acceptable, you may click the Accept Match button to accept the edit to the select event record.

Accept Match

Event record is now updated.



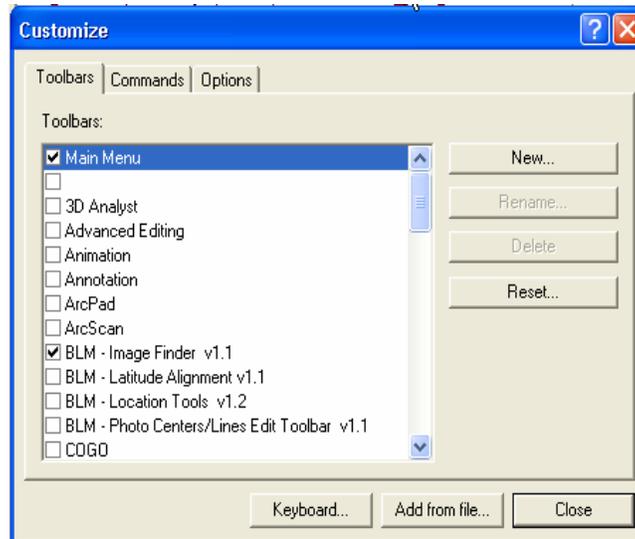
When all records have been updated, you can click the X button  in the corner of the Synchronize events form to close the form. Be sure to select Save Edits from the ArcMap Editor toolbar to save all changes to the dataset.

G. Tips and Tricks

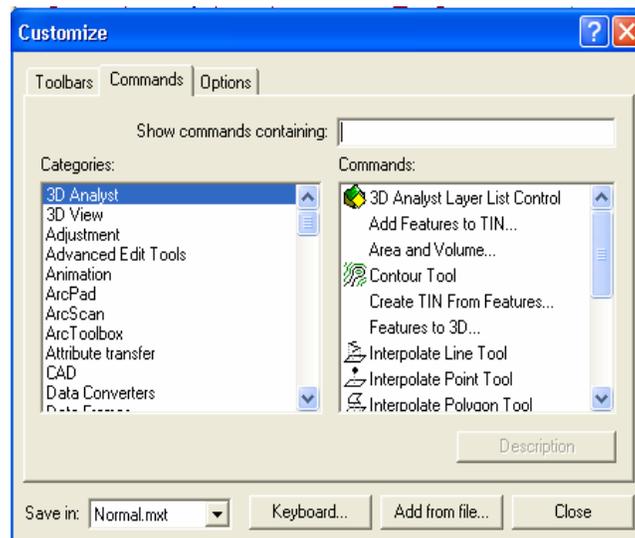
Customizing the HEM Toolbar

Commonly used buttons or tools can be added to the HEM toolbar using the ArcMap customize window.

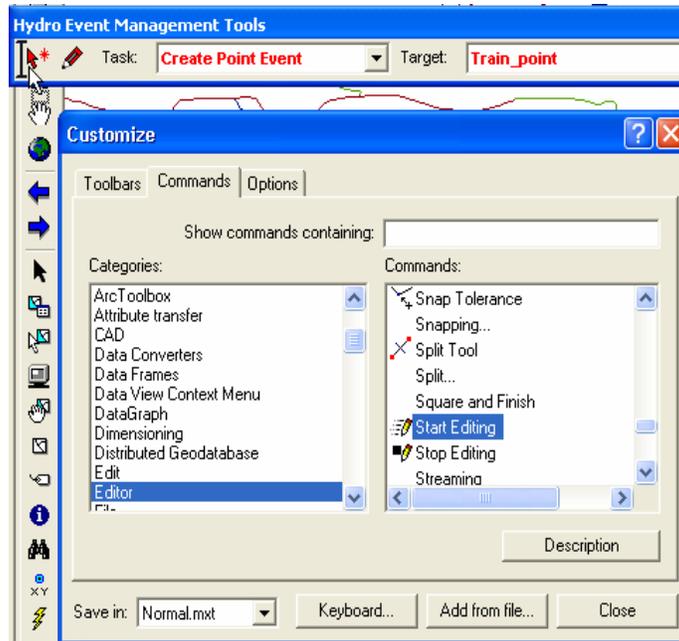
To open the customize window select View → Toolbars → Customize from the ArcMap menu. As long as the customize window is open you can add and remove commands from toolbars.



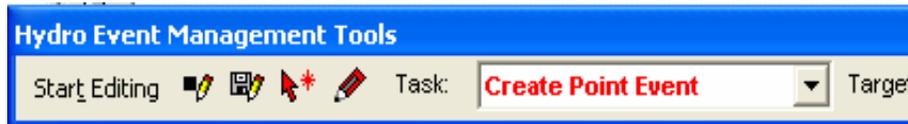
Activate the commands tab to find commands to add to the toolbar.



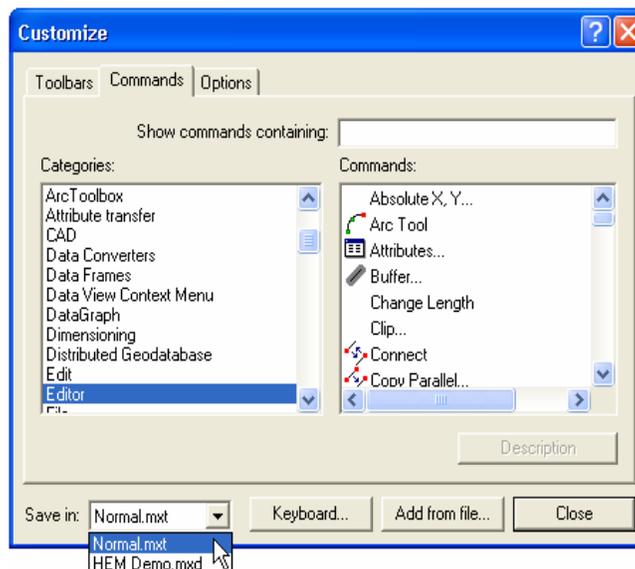
Once you find a command click and drag it from the commands box onto the toolbar. In the following image the Start Editing command is being added before the HEM selection tool (shown by the black i-beam to the left of the selection tool).



Once the new command is added to the toolbar the properties of that command can be changed (right click to bring up the context menu). For instance to only display the text for the start editing command instead of the image.



If you want your customizations to apply to all future ArcMap sessions make sure that the “Save in:” box at the bottom of the customize window is set to Normal.mxt otherwise you can set it to the name of your current map document and the changes that you make to the tool bar will only be applied to the current map document.



Appendix 1: HEM Event Table Structure

The following is the structure of the event tables and featureclasses that are compatible with the HEM tools. Event tables can be created with either the Full or Compressed schema. The Full Schema includes all attributes identified by the NHD Data Model for event data and those attributes needed for the HEM tools to function. The Compressed Schema includes only those attributes that were identified as the minimum required attributes for the HEM tools to function. This data format should not be used for data that will be submitted to the NHD Repository.

Point Event Data

Field Name	Data Type	Allow Nulls?	Domain	Length	Description	Schema
OID	Object ID				ESRI system maintained identifier.	Both
ComID	Long Integer	No			<Additional Definition to be provided by USGS>	Both
Event Date	Date	Yes		8	The date the event record was created or last modified.	Both
ReachCode	String	No		14	The ReachCode value for the NHDFlowline record that the event record references.	Both
ReachSMDate	Date	No		8	The reach spatial modification date.	Both
ReachResolution	Long Integer	No	Resolution		Code for the source resolution.	Both
FeatureComID	Long Integer	Yes			<Additional Definition to be provided by USGS>	Full Only
FeatureClassRef	Long Integer	Yes			<Additional Definition to be provided by USGS>	Full Only
SourceOriginator	String	Yes		130	<Additional Definition to be provided by USGS>	Full Only
SourceDataDesc	String	Yes		100	<Additional Definition to be provided by USGS>	Full Only
Source_FeatureID	String	Yes		40	<Additional Definition to be provided by USGS>	Full Only
FeatureDetailURL	String	Yes		255	<Additional Definition to be provided by USGS>	Full Only
Measure	Double	No		0	The measure along the NHDFlowline record where the event record is located.	Both
Offset	Double	No		0	<Additional Definition to be provided by USGS>	Both
EventType	Long Integer	No			<Additional Definition to be provided by USGS>	Both
ID	String	No		34	HEM unique identifier. Maintained by the editing tools	Both
Shape	Geometry				Point geometry for the event record.	Both

Single-Route Linear Events

Single-route events are linear event records that do not cross multiple NHD Flowline records.

Field Name	Data Type	Allow Nulls?	Domain	Length	Description	Schema*
OID	Object ID				ESRI system maintained identifier.	Both
ComID	Long Integer	No			<Additional Definition to be provided by USGS>	Both
Event Date	Date	Yes		8	The date the event record was created or last modified.	Both
ReachCode	String	No		14	The ReachCode value for the NHDFlowline record that the event record references.	Both
ReachSMDate	Date	No		8	The reach spatial modification date.	Both
ReachResolution	Long Integer	No	Resolution		Code for the source resolution.	Both
FeatureComID	Long Integer	Yes			<Additional Definition to be provided by USGS>	Full Only
FeatureClassRef	Long Integer	Yes			<Additional Definition to be provided by USGS>	Full Only
SourceOriginator	String	Yes		130	<Additional Definition to be provided by USGS>	Full Only
SourceDataDesc	String	Yes		100	<Additional Definition to be provided by USGS>	Full Only
Source_FeatureID	String	Yes		40	<Additional Definition to be provided by USGS>	Full Only
FeatureDetailURL	String	Yes		255	<Additional Definition to be provided by USGS>	Full Only
FMeasure	Double	No		0	The measure along the NHDFlowline record where the start point of the event record is located.	Both
TMeasure	Double	No		0	The measure along the NHDFlowline record where the end point of the event record is located.	Both
Offset	Double	No		0	<Additional Definition to be provided by USGS>	Both
EventType	Long Integer	No			<Additional Definition to be provided by USGS>	Both
ID	String	No		34	HEM unique identifier. Maintained by the editing tools	Both
Shape	Geometry				Polyline geometry for the event record.	Both

Multi-Route Linear Events

Multi-route linear events refer to events that may cross one or many NHD Flowline records. Detailed ReachCode and Measure data is stored in the related “_M” table.

Field Name	Data Type	Allow Nulls?	Domain	Length	Description	Schema*
OID	Object ID				ESRI system maintained identifier.	Both
ComID	Long Integer	No			<Additional Definition to be provided by USGS>	Both
Event Date	Date	Yes		8	The date the event record was created or last modified.	Both
FReachCode	String	No		14	The ReachCode value for the NHDFlowline record that the start point of	Both

					the event record references.	
TReachCode	String	No		14	The ReachCode value for the NHDFlowline record that the end point of the event record references.	Both
ReachSMDate	Date	No		8	The reach spatial modification date.	Both
ReachResolution	Long Integer	No	Resolution		Code for the source resolution.	Both
FeatureComID	Long Integer	Yes			<Additional Definition to be provided by USGS>	Full Only
FeatureClassRef	Long Integer	Yes			<Additional Definition to be provided by USGS>	Full Only
SourceOriginator	String	Yes		130	<Additional Definition to be provided by USGS>	Full Only
SourceDataDesc	String	Yes		100	<Additional Definition to be provided by USGS>	Full Only
Source_FeatureID	String	Yes		40	<Additional Definition to be provided by USGS>	Full Only
FeatureDetailURL	String	Yes		255	<Additional Definition to be provided by USGS>	Full Only
FMeasure	Double	No		0	The measure along the NHDFlowline record where the start point of the event record is located.	Both
TMeasure	Double	No		0	The measure along the NHDFlowline record where the end point of the event record is located.	Both
Offset	Double	No		0	<Additional Definition to be provided by USGS>	Both
EventType	Long Integer	No			<Additional Definition to be provided by USGS>	Both
ID	String	No		34	HEM unique identifier. Maintained by the editing tools.	Both
Shape	Geometry				Polyline geometry for the event record.	Both

M Table Structure

Field Name	Data Type	Allow Nulls?	Length	Description	Schema*
OID	Object ID			ESRI system maintained identifier.	Both
ReachCode	String	No	14	The ReachCode value for the NHDFlowline record that the event record references.	Both
ReachSMDate	Date	No	8	The reach spatial modification date.	Both
FMeasure	Double	No	0	The measure along the NHDFlowline record where the start point of the event record is located.	Both
TMeasure	Double	No	0	The measure along the NHDFlowline record where the end point of the event record is located.	Both
ID	String	No	34	HEM unique identifier. Maintained by the editing tools.	Both