

A Users Guide for the NHD West Fork Cedar River Demo

Pre-Release Version 3.03, 10/12/99

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Introduction

The West Fork Cedar River demo is an example of how the NHDinARC format of the NHD data, can be used to build water resources applications. The demo is an ArcView application consisting of four pieces:

1. An ArcView project file called nhddemo.apr,
2. The NHDinARC data for the West Fork Cedar River cataloging unit (CU), 07080204,
3. Data from various US Environmental Protection Agency (EPA) water resources databases, such as STORET water quality monitoring stations, drinking water intakes, permitted municipal and industrial discharges, 305(b) waterbodies, 303(d) waterbodies, Toxic Release Inventory, and USGS flow gages, and
4. Other software components.

The demo is contained in a tarred and compressed file called:

WFCR-Demo-303.tgz

and is available on the nhd.usgs.gov Web site. The Web site also contains documentation and tutorials for the NHD data.

In the installation instructions below, you are asked to uncompress and untar the .tgz file. NHDinARC workspaces contain empty tables when not all NHD feature types exist in the CU. If you use WinZip to uncompress and untar the demo, you will lose the empty tables. This will not affect the operation of the demo, however, you should be aware that your NHDinARC workspace for CU 07080204 will be incomplete. To create a complete workspace, you should use the GZIP.EXE and the TAR.EXE that are available on the nhd.usgs.gov Web site.

The West Fork Cedar River Demo is designed to run under ArcView 3.0a or 3.1 for Windows 95/98/NT. At the present time, a version of the demo for UNIX is not available.

Installation

1. Uncompress and untar the demo into a directory of your choice. The sub-directories that are in the .tgz file must be retained under your chosen directory. Two sub-directories will be created: one called \evt_att and one called \Pre-release_07080204_Demo.

In the future, there may be additional NHD demos. Each demo must reside in its own directory. In the remaining instructions, it is assumed that your chosen directory is \your-wfcr-demo and that your directory structure looks like this after the uncompress/untar:


```
\your-wfcr-demo
\your-wfcr-demo\evt_att
\your-wfcr-demo\Pre-release_07080204_Demo
```

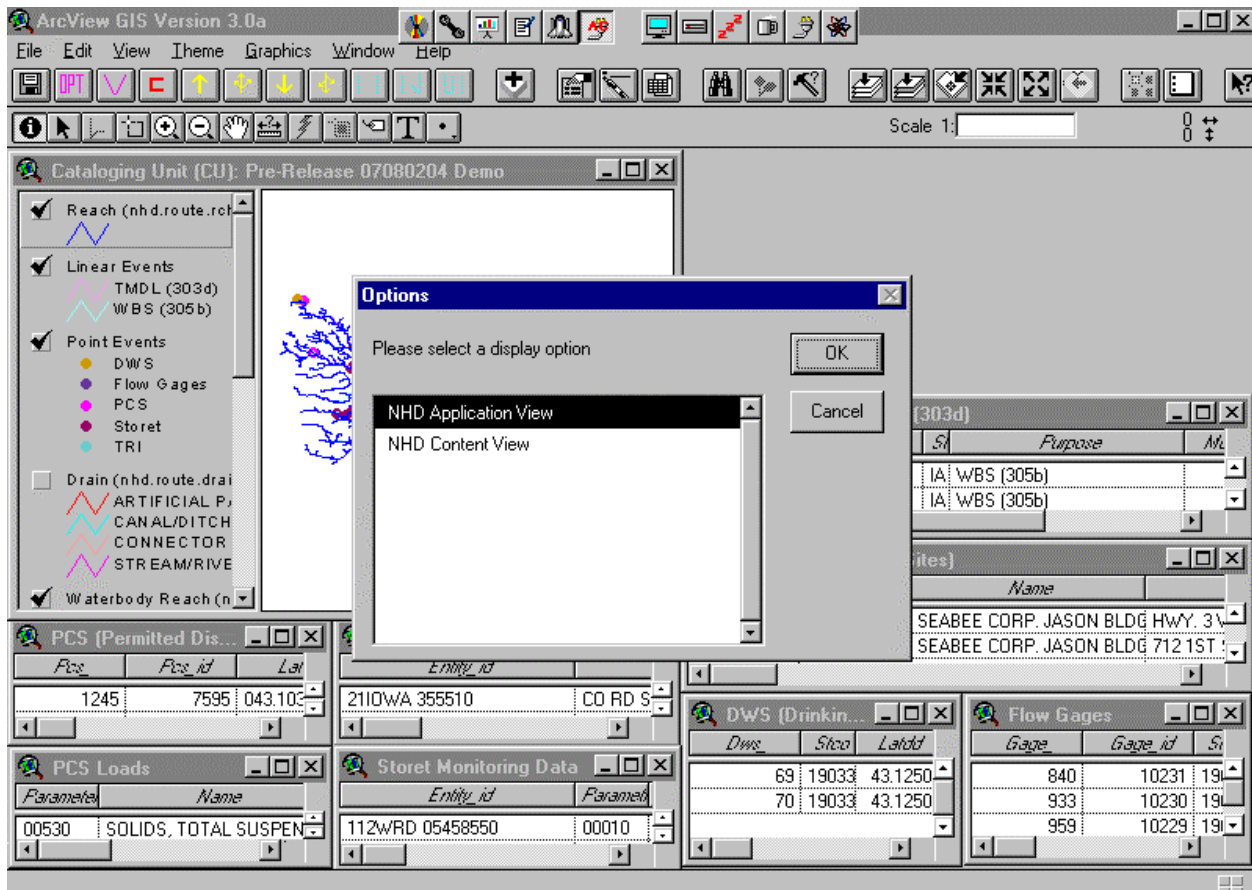
2. Start ArcView 3.0a or 3.1 and open the project called setup.apr. Setup.apr can be found in \your-wfcr-demo. There may be a noticeable pause while Setup does its work. Please WAIT for the view of the CU to appear. You are now ready to exercise the demo. Setup.apr should only be opened the first time you use the demo in ArcView. Setup creates a project called nhddemo.apr, which should be opened for all subsequent uses of the demo. Nhddemo.apr will be saved in \your-wfcr-demo.

Warning: ArcView is fully functional when the demo is loaded. You can, for example, add your own themes. However, it is possible to break the demo by doing things like deleting themes/tables that the demo must have or changing the item order in a table. Therefore, you should use native ArcView functions carefully. If the demo fails, it is probably best to re-start by deleting the .ain and .aih files in the demo's info directory (your-wfcr-demo\Pre-release_07080204_Demo\info) and opening setup.apr again. If that does not fix the problem, you may need to re-install the demo.

Using the Demo

The demo has two views: 'NHD Content View' and 'NHD Application View'. When you first open the demo, you will be in 'NHD Application View'. The 'NHD Content View' actively uses only the NHD themes and is designed to show basic NHD concepts. The 'NHD Application View' also uses the NHD themes and adds events tied to the NHD reach routes and attribute tables related to the events. The 'NHD Application View' is designed to illustrate how NHD can be used to support water resources applications. Both views have a point theme of cities that is provided simply to add interest to the display.

To change views, use the  button. This opens an option box (see below) that allows you to choose a view. The current view is always the highlighted choice in the option box.




NHD Content View

From the NHD Content View, you can see all parts of the NHD data except the tables related to metadata. All of the NHD feature tables are loaded as themes in the view and they are linked to each other according to the NHDinARC schema. The schema can be found on the nhd.usgs.gov Web site.

Note, that the events needed for the 'NHD Application View' remain in the theme list for the 'NHD Content View'. However, the events and their related tables are not used in this view.

The feature tables for the NHD themes can be easily displayed using special demo buttons on the ArcView button bar. In order to manage the screen real estate, the NHD feature themes have been divided into three groups: Network, Waterbodies, and Landmarks. Each group has a button on the button bar that, when pressed, tiles the feature tables for that group around the View window.

To display the tables related to the stream network, use the  button. This displays the feature tables for NHD.route.rch (reach routes), NHD.route.drain (basic feature routes), and NHD.nat (including underpasses, if present). In addition, the NHD.rflow table is displayed twice. The left-hand copy (labeled 'Incoming Flow') is linked to the NHD.route.rch theme in the view via COM_ID_2 in NHD.rflow. When you select a reach in NHD.route.rch, the 'Incoming Flow' table highlights the reaches that flow into the selected reach. The right-hand copy (labeled 'Outgoing Flow') is linked to the NHD.route.rch theme in the view via COM_ID_1 in NHD.rflow. When you select a reach in NHD.route.rch, the 'Outgoing Flow' table highlights the reaches that flow out of the selected reach. The NHD.fcode table is displayed in the lower left corner and is highlighted whenever an NHD.route.drain feature is selected. The following figure shows the display for network tables.

ArcView GIS Version 3.0a

File Edit View Theme Graphics Window Help

Scale 1: -93.33
43.19

Cataloging Unit (CU): Pre-Release 07080204 Demo

- Reach (nhd.route.rch)
 - TMDL (303d)
 - WBS (305b)
- Linear Events
 - Flow Gages
 - PCS
 - Storret
 - TRI
- Drain (nhd.route.drain)
 - ARTIFICIAL P...
 - CANAL/DITCH
 - CONNECTOR
 - STREAM/RIVE
- Waterbody Reach (n...

Drain (nhd.route.drain)

Com_id	Pch_com_id	Meters	Fcode	Ftype
3228	5080	7545	46004	STREAM/RIVER
3230	5142	1783	46001	STREAM/RIVER
3232	5138	1299	46001	STREAM/RIVER

Reach (nhd.route.rch)

Com_id	Pch_code	Assign_date	Level	Name
5064	07080204000075	19970424	4	Beaverdam Creel
5066	07080204000076	19970424	4	Beaverdam Creel
5068	07080204000077	19970424	4	Beaverdam Creel

Incoming Flow (...)

Com_id_1	Com_id_2	Seq
5064	5718	
5066	5064	
5128	5064	

Outgoing Flow...


Com_id_1	Com_id_2	Seq
5064	5718	
5066	5064	
5128	5064	

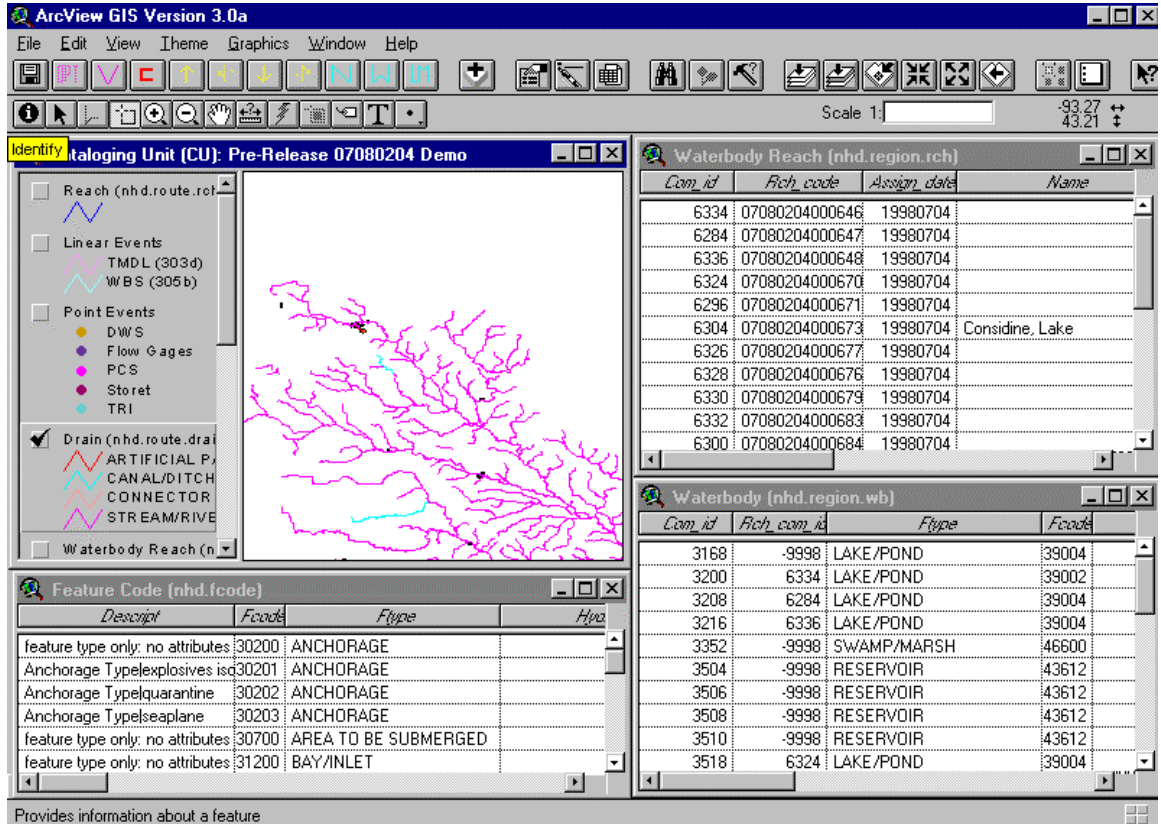
Feature Code (nhd.fcode)

Descript	Fcode	Ftype	Hvc
feature type only: no attributes	30200	ANCHORAGE	
Anchorage Typeexplosives is	30201	ANCHORAGE	
Anchorage Typequarantine	30202	ANCHORAGE	
Anchorage Typeeaplane	30203	ANCHORAGE	
feature type only: no attributes	30700	AREA TO BE SUBMERGED	
feature type only: no attributes	31200	BAY/INLET	

Node (nhd.node)

Com_id	Ftype	Is_above_is	Is_below_is
-9998		-9999	-9999
-9998		-9999	-9999
-9998		-9999	-9999
-9998		-9999	-9999

To display the tables related to waterbodies, use the  button. This displays the feature tables for NHD.region.wb (waterbody basic features) and NHD.region.rch (waterbody reaches). The NHD.fcode table is displayed in the lower left corner and is highlighted whenever an NHD.region.wb feature is selected. The following figure shows the display for waterbody tables.



The screenshot shows the ArcView GIS interface with several panels open. The main map area displays a network of waterbodies in pink and blue. The 'Identify' panel on the left shows a legend for 'Cataloging Unit (CU): Pre-Release 07080204 Demo'. The 'Waterbody Reach (nhd.region.rch)' table is displayed in the top right, and the 'Waterbody (nhd.region.wb)' table is displayed in the bottom right. The 'Feature Code (nhd.fcode)' table is displayed in the bottom left.

Waterbody Reach (nhd.region.rch)

Com_id	Rch_code	Assign_date	Name
6334	07080204000646	19980704	
6284	07080204000647	19980704	
6336	07080204000648	19980704	
6324	07080204000670	19980704	
6296	07080204000671	19980704	
6304	07080204000673	19980704	Considine, Lake
6326	07080204000677	19980704	
6328	07080204000676	19980704	
6330	07080204000679	19980704	
6332	07080204000683	19980704	
6300	07080204000684	19980704	


Waterbody (nhd.region.wb)

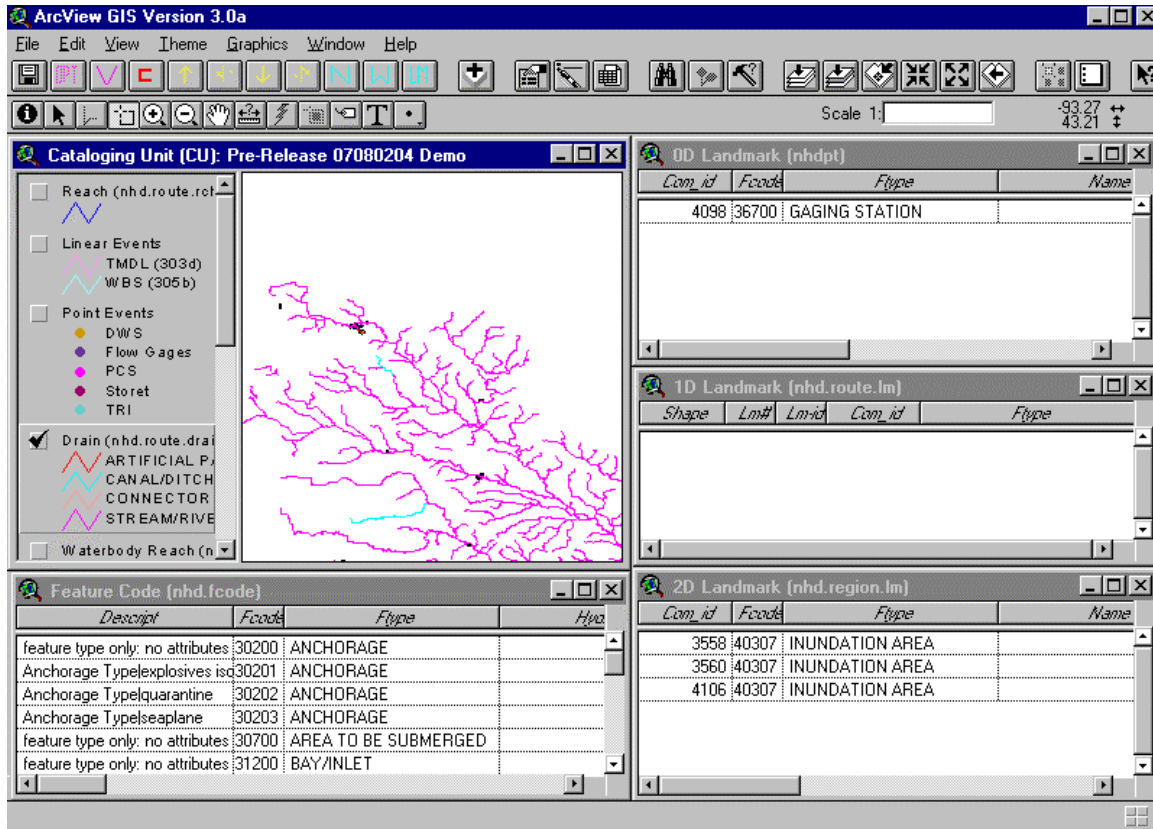
Com_id	Rch_com_id	Ftype	Fcode
3168	-9998	LAKE/POND	39004
3200	6334	LAKE/POND	39002
3208	6284	LAKE/POND	39004
3216	6336	LAKE/POND	39004
3352	-9998	SWAMP/MARSH	46600
3504	-9998	RESERVOIR	43612
3506	-9998	RESERVOIR	43612
3508	-9998	RESERVOIR	43612
3510	-9998	RESERVOIR	43612
3518	6324	LAKE/POND	39004

Feature Code (nhd.fcode)

Descript	Fcode	Ftype	How
feature type only: no attributes	30200	ANCHORAGE	
Anchorage Type explosives isg	30201	ANCHORAGE	
Anchorage Type quarantine	30202	ANCHORAGE	
Anchorage Type seaplane	30203	ANCHORAGE	
feature type only: no attributes	30700	AREA TO BE SUBMERGED	
feature type only: no attributes	31200	BAY/INLET	

Provides information about a feature

To display the tables related to landmarks, use the  button. This displays the feature tables for NHDPT (point landmarks), NHD.route.lm (linear landmarks), and NHD.region.lm (area landmarks). The NHD.fcode table is displayed in the lower left corner and is highlighted whenever an NHDPT or NHD.route.lm or NHD.region.lm feature is selected. The following figure shows the display for landmark tables.



NHD Application View

The NHD Application View is intended to show how NHDinArc data can be used to build applications. The view window for the NHD Application View is the same as the NHD Content View, however the active buttons on the ArcView button bar and the tables tiled on the screen are different.

The NHD Application View contains various types of water resources data. Tables for these data are tiled on the screen when you first enter the NHD Application View (see figure below). These data were extracted from various national EPA databases. Their content represents the state of the source databases at the times the extracts were performed. The source databases may now contain more current information. Each of the source databases is described briefly below, however, you may obtain additional information from EPA's Web site at www.epa.gov.

The screenshot shows the ArcView GIS interface with the following data tables visible:

- PCS (Permitted Discharges):**

Fac	Fac_id	Lat
1245	7595	043.103
- Storet (Monitoring Stations):**

Entity_id	State
2110WA 355510	CO RD S
- PCS Loads:**

Parameter	Name
00530	SOLIDS, TOTAL SUSPEN...
- Storet Monitoring Data:**

Entity_id	Parameter
112WRD 05458550	00010
- WBS (305b) / TMDL (303d):**

Entity_id	State	Purpose	Mod
IA 02-WFC-0020_435 1	IA	WBS (305b)	
IA 02-WFC-0020_435 2	IA	WBS (305b)	
- TRI (Toxic Release Sites):**

Tr92	Tr92_id	Name
136	136	SEABEE CORP. JASON BLDG HWY. 3
137	137	SEABEE CORP. JASON BLDG 712 1ST
- DWS (Drinking Water Supplies):**

Dws	State	Lat/lon
69	19033	43.1250
70	19033	43.1250
- Flow Gages:**

Gage	Gage_id	State
840	10231	19
933	10230	19
959	10229	19

The WBS (305b)/TMDL (303d) table contains information about these EPA programs. In the 305b program, states define important waterbodies in which they track water quality overtime. The 303d program identifies waterbodies where Total Maximum Daily Loads are being implemented.

The TRI table contains information from the Toxic Release Inventory. Each entry represents volume of toxic material released in one year.

The DWS table contains information about public drinking water supplies.

The Flow Gages table contains information about USGS in-stream flow gages.

The PCS and PCS Loads tables contain information about permitted discharges into the surface water network. The PCS table contains one entry for each discharge location and the PCS Loads table contains entries for individual constituents which have a limit specified in the discharge permit.

The STORET and STORET Monitoring Data tables contain information about water quality monitoring stations. The STORET table contains one entry for each station and the STORET Monitoring Data table contains some of the data collected at each station and each entry in the table represents one constituent that was monitored at the station.

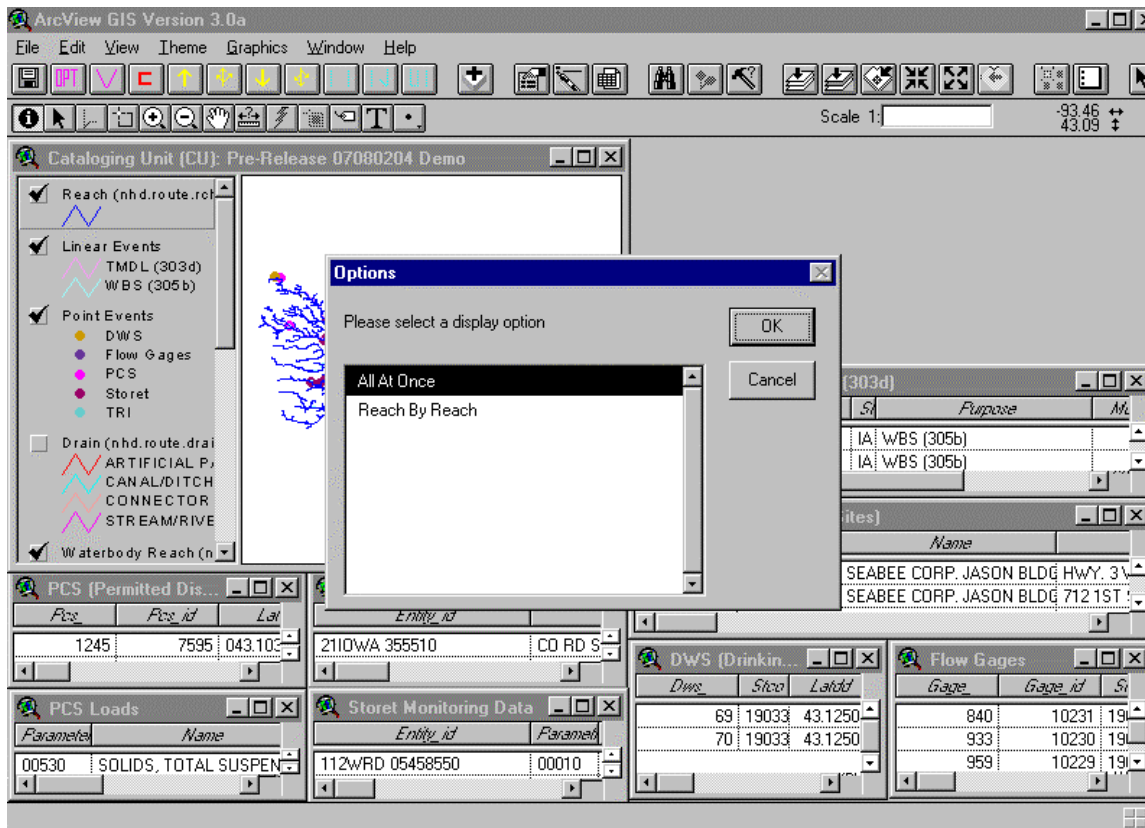
The 305b and 303d programs are displayed in the Linear Event Theme. In the View window, linear events are displayed as lines using the shape of the reaches to which they are indexed. To make the events and the reaches visible at the same time, each event is displayed with a slight offset from the reaches to which it is indexed. If more than one event occurs along a given reach, each event is displayed with a different offset so that all events are visible. Some events are indexed to portions of a reach and they will begin or end at an interior point along a reach based on their beginning or ending measure along the reach route.

The DWS, TRI, STORET, and PCS programs, as well as flow gages, are displayed in the Point Event Theme. These events are indexed to reaches. The points are displayed on the indexed reach at a place that is based on their measure along the reach route.





The functionality in the NHD Application View enables you to select a reach and then navigate either upstream or downstream and view the linear and point events that are encountered during the navigation. When navigating upstream you can choose to include tributaries or not. When navigating downstream, you can choose to include divergences or not.

The steps for performing a navigation are:

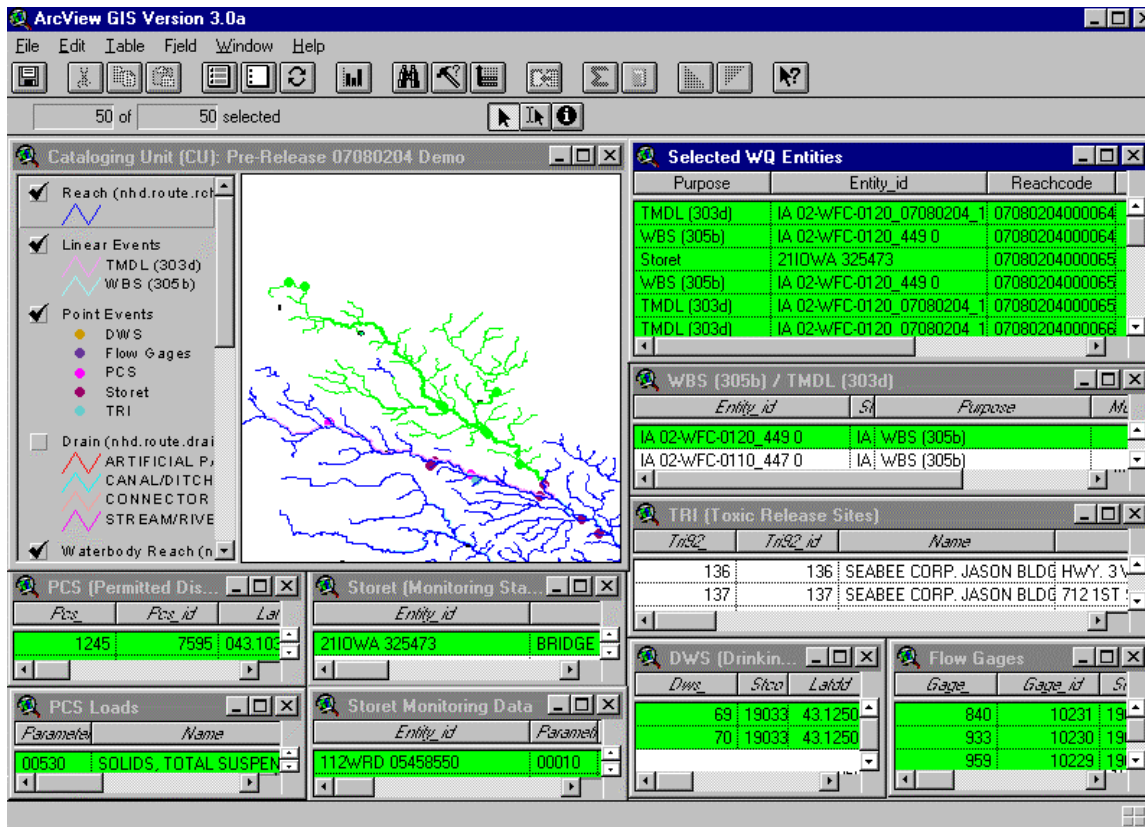
1. Select a Reach: Make the 'Reach' theme active. Chose the ArcView 'Selection' tool. Point to and select a reach. You must select one and only one reach. You may wish to zoom in to select the reach. If so, you will probably wish to zoom back out before you perform the navigation.
2. Select a display mode: The reaches navigated can be highlighted one-at-a-time or all-at-once. Pressing the **OPT** button will display an option box (see figure below) that allows you to change the display mode. Once a display mode is selected, it will be in effect until a different display mode is selected. There is no need to set the display mode for each navigation. If you are doing a long navigation (i.e. many reaches), the one-at-a-time mode can be VERY slow. The default display mode is all-at-once. The currently selected mode is highlighted in the option box.



3. Select the navigation mode and perform and display the navigation. For:

- Upstream mainstem only, press 
- Upstream with tributaries, press 
- Downstream mainstem only, press 
- Downstream with divergences, press 

Once a navigation mode button is pressed, the navigation is performed and the results are displayed (see figure below). When the navigation is being performed the cursor is an hour glass. As soon as the navigation is complete the results are displayed.



As the navigation is displayed, a table of the encountered events (the Selected WQ Entities table) opens in the top right corner. Each linear and point event that was encountered during the navigation is listed in this window in the order that it was encountered. In addition, the information is highlighted in the other tables on the screen that are related to each of these events. In the view window, the reaches and the events are highlighted. Once the navigation results are fully displayed, you can select an entry in the Selected WQ Entities table. This will cause just that event to highlight in the view window. Also, that event's associated information in the other tables will highlight.

Note: The navigation with tributaries is performed by stream level. First the mainstem is traversed, then the tributaries to the mainstem, then the tributaries to the tributaries, etc. This order drives the order that the events are displayed in the Selected WQ Events table and the order that the reaches are highlighted in the one-at-a-time display mode.

4. You can clear the navigation result from the display by pressing the  button.

Troubleshooting

The demo contains many table links. Depending upon the combination of functions that you perform in the demo, ArcView may begin to behave badly and the project will become unstable. This is a known problem with ArcView and is usually manifested in the links between the tables. If the number of records that get selected from a table is either a lot more or a lot less than expected, the project is probably unstable. If you detect that this is happening, simply close the project, delete all the .ain and .aih files from the demo's info directory (\your-wfcr-demo\Pre-release_07080204_Demo\info), and reopen the project nhddemo.apr.

Problems or enhancement suggestions may be reported to Jen Hill at jrh@hscnet.com or Cindy McKay at ldm@hscnet.com. Before reporting problems, please confirm that you are running the most recent version of the West Fork Cedar River Demo by checking the nhd.usgs.gov Web site. You can determine which version you have by looking at the 'About West Fork Cedar Demo' option on the ArcView HELP menu.