USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

Update on NHD SDE databases

The U.S. Geological Survey is working to create SDE databases to allow users such as states to obtain and utilize large state-size files in an SDE environment rather than download subregion or subbasin size files in a personal geodatabase. Creating a SDE database is normally not all that difficult, but three factors must be included when doing this for the National Hydrography Dataset. First, it must be a repeatable push-button process that the USGS can run for its many clients without tying up a lot of resources. Second, to be fully usable, it must contain a geometric network, a logical network flow table, and routed measures for linear addressing. Third, there must be a mechanism for database synchronization with the central NHD repository. Building an SDE database to meet these needs has proven to be difficult because of the very large size of the NHD for a state-size area. The problems that arise are being tackled one-by-one and the technical development staff feels they are close to being done.

Progress on NHD Geo Edit

The NHD Geo Edit tool used for editing the NHD while maintaining data integrity is undergoing a change from ArcGIS version 8.3 to 9.1. When this is done, the tool will then go through an acceptance testing phase to make sure it works in a variety of scenarios. This should begin in early-October. A timetable for making the tool available to trained users will then be determined based on the final acceptance date.

Selected NHD Papers from the ESRI User Conference

Creating National Hydrography Dataset Associated Feature Classes – Greg Enstrom, USDA-Forest Service:
The USDA-Forest Service has developed an ArcGIS tool for creating point and line feature classes to store information about events referenced to the NHD. A GIS tool was needed to delineate points and line segments coincident with the NHD for water resource data management, reporting, and analysis. This tool was designed to work in geodatabase feature classes rather than the traditional coverages in order to be more compatible with analysis tools used in the Forest Service Natural Resource Information System. This system supports water resource hydrologists, fisheries biologists, aquatic ecologists and other natural resource professionals throughout the Forest Service. An example of its application was demonstrated with the Colorado River Cutthroat Trout Assessment project involving nine agencies in five states. The EventMaker tool that creates the events was written in VBA and is available for ArcGIS 8.3 and 9.0 versions.

Analyzing the Relationship of Events in a Hydrography Network – Jeff Simley, USGS:
Analyzing the relationship of events in a hydrography network can lead to important conclusions regarding cause and effect in the landscape. The NHD, which maps surface water, has a flow network and an addressing system to position events within the network. With network position and flow established, it is possible to use operators to determine relationships in terms of route, sequence, distance, time, and value. For example, it is possible to find diversions upstream of a streamgage, look at the trend in sequenced pH values, determine the distance between water sampling sites, calculate the time of travel between a chemical spill and a drinking water intake, or find all species downstream of a construction site. This can be done using simple tools applied to the NHD in Geodatabase within the ArcMap environment or by developing simple VBA programs.

Indexing Streamgage Locations to the National Hydrography Dataset – Al Rea, USGS presenting for Dave Stewart, USGS:
Defined flow relations between the NHD features allow users to determine what is upstream or downstream from a point of interest on the NHD flow network. The National Water Information System (NWIS) is the repository for streamgage locations and streamflow data collected by the U.S. Geological Survey (USGS) for approximately 25,000 currently active and historical streamgages. The locations of the NWIS stream gages were indexed to locations, or addresses, along NHD reaches using an automated snapping process. The addresses are expressed by a reach code and measure. Initially, about seventy-five percent of the gages snapped to the appropriate NHD reach address. After review and adjustment of many stream-gage locations by local USGS district personnel, approximately 22,000 gages were successfully indexed to the NHD.

Converting Events from One Route Reference to Another

A number of scientists have recorded event data using linear referencing before there was a NHD. They used legacy hydrography data upon which they built their own routes acting as the linear reference system. A common system used in the Pacific Northwest region of the Country was the LLID system in which an entire length of river acted as the reference measure or route. The mouth of the river acted as measure 0 and the farthest headwater reach acted as the endpoint measure; such as 33,645 meters. An event would then be addressed at its value between 0 and 33,645 meters. This 33,645 meter route would need a unique identifier label, so the longitude and latitude of the mouth was used, thus the term "LLID." The address of an event might be route-1243613434853, measure-17698. Tributaries to this primary route would become additional routes with the LLID label coming from the confluence point. The NHD uses individual reaches as the linear referencing route, an entirely different system, but one that works quite well thanks to the flow sequencing of reaches using the NHDFlow table that makes it possible to relate events anywhere in the network. Fortunately, ArcMap makes it easy for legacy event data to be converted to the NHD linear referencing system. This is also useful to rebuild events if extensive editing of the NHDFlowlines in stewardship results in newly built routes. The *Route Events GeoProcessing Wizard* will highlight the *Transform events from one route system to another* radio button when two different route systems are detected. Once selected, the wizard requests information on the events to be transformed, the route system to be transformed to, and the name for the transformed event table. After a short processing interval the newly transformed events are added to the table of contents. The new table will include the new route and measure, but not the original route and measure. The transformation works by spatially searching from each event for the nearest measure on the new route system.

Answer to August Hydrography Quiz

Carrie Thompson, a Water Resources GIS Specialist from Aurora Water in Aurora, Colorado, was the first to correctly guess the location of last month's hydrography quiz as the Susquehanna River west of Scranton, Pennsylvania (see ftp://nhdftp.usgs.gov/Quiz/Hydrography3.pdf). The Susquehanna River is located in the northeastern United States and is approximately 410 mi (715 km) long. The river contains two main branches, with the North Branch, which rises in upstate New York often regarded as an extension of the main branch. The shorter West Branch, which rises in western Pennsylvania, is sometimes regarded as the principal tributary, joining the North Branch near Sunbury in central Pennsylvania. Our quiz was located on the North Branch. The river drains a large watershed within the Allegheny Plateau of the Appalachian Mountains, cutting through water gaps in the lateral mountain ridges in a broad zigzag course to flow across the rural heartland of southeastern Pennsylvania, emptying in the north end of the Chesapeake Bay. The quiz noted that a railroad is named after this river. This is the Susquehanna Railroad. Other railroads in the United States named after rivers include the Erie, the Lackawanna (both of which merged into the Erie Lackawanna), the Delaware and Hudson, the Wabash, the Monon (Monongahela), and the Rio Grande. The September quiz is located at

ftp://nhdftp.usgs.gov/Quiz/Hydrography4.pdf. Name the river and where this stretch is located. The hint is that this is too big for a hint.

California NHD Workshops

Sixty scientists and GIS experts attended a series of three all-day hands-on NHD workshops at the Bureau of Reclamation in Sacramento, California recently. An additional thirty resource and GIS managers attended a shorter half-day session with less technical detail. The attendees represented a variety of Federal, state, and local government agencies, as well as industry and academia. The workshops described how the NHD is being used around the Country and then demonstrated the techniques used in these applications. Having completed the workshop, the attendees are able to apply cutting-edge GIS analysis methods to their own research projects. Additional workshops will be presented in California in the near future. For information, contact Carol Ostergren at costergren@usgs.gov.

Recent and Upcoming NHD Workshops and Papers

September 29, Rochester, New York – National States Geographic Information Council, http://www.nsgic.org/events/2005_conference.cfm
October 5, St.Cloud, Minnesota – Minnesota GIS/LIS Conference, http://www.mngislis.org/conf2005/conf2005.htm
October 7, St. Paul Minnesota – Minnesota Pollution Control Agency, http://www.pca.state.mn.us/
October 10, Kansas City, Missouri – URISA's 43rd Annual Conference, http://www.urisa.org/Annual_Conference/annual.htm
November 1-4, Little Rock, Arkansas – Arkansas GIS Conference, http://www.argisforum.org/
November 8, Columbus, Ohio - The Ohio State University. Contact David Alvarez at alvarez.52@osu.edu.

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The NHD Newsletter is published monthly. Get on the mailing list by contacting jdsimley@usgs.gov.
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Jeff Simley, USGS, assumes full responsibility for the content of this newsletter.