USGS National Hydrography Dataset Newsletter
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The NHD in GeoWorld

The February, 2006 issue of GeoWorld features an article about the National Hydrography Dataset. The article explains how the multi-agency dataset is used in geographic information systems to analyze scientific data within the network of the Nation's surface water. GeoWorld specializes in the geographic information systems industry. See http://www.geoplace.com/uploads/featurearticle/0602sdi.asp.

Ephemeral Streams Added to NHD Model

The NHD data model now allows an ephemeral hydrographic category under the Stream/River feature. The Draft Standards for National Hydrography Dataset – High Resolution will be updated to define the ephemeral hydrographic category as: "Contains water only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from melting snow or other sources. Its channel is at all times above the water table." In comparison, intermittent hydrographic category is defined as: "Contains water for only part of the year, but more than just after rainstorms and at snowmelt." Perennial hydrographic category is defined as: "Contains water throughout the year, except for infrequent periods of severe drought." Ephemeral delineation is defined as: "The ephemeral stream/river is limited to one-dimensional features. Two-dimensional ephemeral features with flow path shall be represented by feature Wash and incorporate artificial path." Data Extraction Source Interpretation Guidelines will include: "By their nature, ephemeral streams are most common in arid and semi-arid regions of the earth where precipitation is scant and a moisture deficiency exists most of the time. Ephemeral streams shall be distinguished from perennial and intermittent streams. Terms that may be synonymous with ephemeral are arroyo, gully, wash, and coulee."

Drainage Patterns

Do you know your drainage patterns? Can you distinguish between dendritic, parallel, trellis, rectangular, radial, centripetal, and deranged patterns? Do you know what an accordant or discordant stream is? If you would like to be the toast of your next cocktail party, you can brush up at: http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/fluvial_systems/drainage_patterns.html.

The NHD and ArcHydro

In the development of the NHD, the USGS worked with the Arc Hydro team on the development of the respective data models. As a result of this collaboration, significant overlap exists between the designs. The differences are primarily in the purpose of the design. Arc Hydro encompasses a broad scope of data, including raster data and time series, for integrated hydrologic analysis. In general, this means that users can run an analysis in Arc Hydro using the NHD and other data sources to produce output information for decision support, etc. While the NHD also supports analysis, with extensive networking and linear referencing, the NHD focus is on the data. The scope of data is more limited in the NHD model, with only vector-based feature data. However, the NHD has significant capabilities for change management in support of continuous data improvement that are not available in Arc Hydro. With the NHD, the data changes can be tracked with feature-level metadata and exchanged between distributed cooperators. Additionally, as a nationally managed program, the NHD maintains and manages the identifiers used to link related datasets, such as the water quality reporting by the EPA. While Arc Hydro can take advantage of the NHD and its associated data, it is not a managed and maintained dataset on its own. In summary, Arc Hydro is an analysis toolset and model whereas the NHD is a maintained dataset.

The NHD in Florida

The National Hydrography Dataset is applied in many ways throughout the state of Florida. One user is the Florida Department of Environmental Protection (DEP), Division of Water Resource Management. They use the NHD for water quality monitoring and the reporting of data to the U.S. Environmental Protection Agency. Currently they are using the 1:100,000-scale NHD, but are looking forward to the move to 1:24,000-scale NHD. Priority number one for DEP and the Fish and Wildlife Conservation Commission is a consistent statewide database. Although the NHD needs some editing, the dataset is well suited to achieve this. Also important are reach codes – permanent identifiers on which to relate scientific data. The linear addressing of events is a big part of their program. As is the case with most all NHD users, names are very important and need to be improved upon in the GNIS-based NHD. Also of great interest in the future is the incorporation of urban stormwater systems in the NHD. In their analysis of state water systems, one-fifth of the state is analyzed each year on a five year rotating basis. A statewide water committee is being formed to help manage the application of hydrography data in state programs. The goal is to build on top of the NHD framework with additional data linked to the NHD through linear addressing and tables related to reachcode. One of the complicating issues in Florida is their interest in the ArcHydro model and its ongoing development in various forms by different agencies. This is a problem if the NHD is used as a one-way input to ArcHydro. As the data becomes edited in ArcHydro, the link to the NHD's data maintenance strategy becomes lost and the ability to share the data with the NHD community is limited.

Another important use of the NHD is with the Florida Stream Habitat Classification program. This is used to create a habitat model of where various species of fish are located. Using about a dozen attributes, fish habitat can be predicted. Stream characteristics are used, many of which need to be obtained including elevation data (five meter DEM's), geomorphologic features, substrate conditions, physical data, a corrected network, flow volume and velocity, biological observations, watershed boundary dataset, soils, chemistry land cover, and important stream points. This program borrows on the Missouri GAP program undertaken by MORAP, but in Florida will use the 1:24,000-scale NHD. The highly dynamic nature of water, particularly in extremely flat Florida, makes the process a significant challenge.

Water in Florida is managed by five water management districts. One is the St. Johns River Water Management District. They have been updating the 1:24,000-scale NHDinGeo, utilizing training received by the USGS Rolla, Missouri office. Through their updates, they have improved NHDFlowline connectivity from 75% connected to 91% connected, and have improved initialized flow from 41% to 67%. Over 8,000 features have been modified. Keeping the NHD up-to-date has been a commitment of the District. They are also developing an ArcHydro model in parallel to the NHD model thereby using both systems. The South Florida Water Management District began their hydrography prototype using ArcHydro and is currently developing an ArcHydro pilot project. They are focused on building major flow paths and building updated and accurate waterbody perimeters. The South West Water Management District paid the USGS to make 1:24,000-scale NHD, but the intent has been to use this for cartographic purposes. Their main interest is in hydrologic engineering, with most of the applications contracted out. The NHD did not have the level of content needed for this, so they built it themselves in the ArcHydro model. They are interested in enhancing the names found on the NHD.

Stewardship of the NHD in Florida will likely see the Florida Department of Environmental Protection acting as the principal steward and each of the five water management districts supplying a large amount of the editing.

Answer to February Hydrography Quiz / March Quiz

Jennifer Sharpe, from the USGS Illinois Water Science Center in Urbana, Illinois was the first to correctly guess last month's hydrography quiz as Mt. Rainier, Washington (see ftp://nhdftp.usgs.gov/Quiz/Hydrography8.pdf). Others with the correct answer were Sharon O'Connor, Ken Koch, David Asbury, Mike Wiedmer, Calvin Meyer, Gary Kress, Susan Russell-Robinson, Ed Carter, David A Kraemer, Terry L. Detlefsen, and Gail Jackson. Many other people guessed Mt. St. Helens. Jennifer pointed out that the grey features in the image are snow. Specifically, they are coded in the NHD as NHDWaterbody – Ice Mass. Between the 14th century and A.D. 1850, many of the glaciers on Mount Rainier advanced their farthest since the last ice age. Many advances of this sort occurred worldwide during this time period known to geologists as the Little Ice Age. Retreat of the Little Ice Age glaciers was slow until about 1920 when retreat became more rapid. Between the height of the Little Ice Age and 1950, Mount Rainier's glaciers lost about one-quarter of their length. Beginning in 1950 and continuing through the early 1980's, however, many of the major glaciers advanced in response to relatively cooler temperatures of the mid-century. Several glaciers advanced during the late 1970's and early 1980's as a result of high snowfalls during the 1960's and 1970's. Since the early-1980's and through 1992, however, many glaciers have been thinning and retreating and some advances have slowed, perhaps in response to drier conditions that have prevailed at Mount Rainier since 1977. For more information see http://www.nps.gov/mora/ncrd/glaciers.htm. Mt. Rainier has a distinct radial drainage pattern just as you would suspect from the flow off of a mountain. The January quiz is located at ftp://nhdftp.usgs.gov/Quiz/Hydrography9.pdf. Can you identify where this is? The light blue lines are intermittent streams while the dark blue are perennial rivers. This is a very famous location. Send your guess to jdsimley@usgs.gov.

Upcoming NHD Workshops

Phoenix, Arizona – March 1, 2006. Limited to the Bureau of Land Management.
Fayetteville, Arkansas – March 6 & 7, 2006. Contact Bill Sneed at wsneed@usgs.gov.
Little Rock, Arkansas – March 8, 9 & 10, 2006. Contact Bill Sneed at wsneed@usgs.gov.
Santa Barbara, California – April 4, 5 & 6, 2006. Contact Carol Ostergren at costergren@usgs.gov.
Salt Lake City, Utah – April 20, 2006. Limited to the U.S. Forest Service.
Austin, Texas – May 1, 2006. 16th Annual Texas GIS Forum. Contact Claire DeVaughan at cdevaugh@usgs.gov.
Houston, Texas – May 9, 2006. Various NHD papers. American Water Resources Association. See http://www.awra.org/meetings/Houston2006/index.html.
Morgantown, West Virginia – May 16, 2006. Contact Bruce Bauch at bbauch@usgs.gov.
Camp Hill, Pennsylvania – May 17, 2006. 2006 Pennsylvania GIS Conference. Demonstration. Contact David Terrell at dterrell@usgs.gov.
Trenton, New Jersey – May 19, 2006. Contact Roger Barlow at rbarlow@usgs.gov.
Coeur d' Alene, ID – Summer, 2006. Contact Frank Roberts at fmroberts@cdatribe-nsn.gov.
Salem and Portland, Oregon – Summer, 2006. Contact Nancy Tubbs at ntubbs@usgs.gov.
Olympia, Washington – Summer, 2006. Contact Sam Bardelson at stbardelson@usgs.gov.
San Diego, California – August 7-11, 2006. ESRI User Conference. Various NHD papers. http://www.esri.com/events/uc/.

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