

USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

NHD Program Improvements

The last NHD Newsletter (March, 2010) listed ten issues that NHD stewards suggested needing to be addressed. Almost all of these issues are directly or indirectly related to the process of maintaining NHD data, and many of these involve the use of the NHDGeoEdit tool. The USGS is now undertaking a major initiative to improve the tool and the processes associated with it. To help with this, two new developers have been hired to assist the one developer already assigned. The development strategy is being guided by Kevin McNinch, Paul Kimsey, and Carl Nelson. The basic objective is to make the maintenance process much easier for a broader range of data stewards. The goal is to have a new version of the tool and maintenance process available in December 2010. There are nine major objectives in the improvement strategy:

1. Requirements analysis and documentation.
2. Improved NHD data model using USGS Best-Practices model, including GUID.
3. Improved software usability by simplifying installation of the NHD tools and scripts.
4. Improved communication by using workflow management and task tracking.
5. Improved quality control checks by simplifying processes and improved workflow with an easy to use user-interface.
6. Improved data editing process by using a geographic coordinate system.
7. Improved feature metadata by enhancing the metadata creation tool.
8. Improved editing workflow by making it simpler and using a logical progression of editing tools and quality control checks.
9. Feedback and improvement cycle to ensure success of above.

New NHD Model Implementation by Paul Kimsey

The USGS is always trying to improve the NHD and one of the things that needs to be done is to periodically revise and modernize the NHD model. The current model is 1.06. A new 1.07 model has been implemented in the operational database but will not be officially released due to the impending release of model 2.0. From a user perspective the 1.07 changes will come out in 2.0. Model 1.07 includes the following changes: (1) Permanent Identifier field will be added in addition to current ComID fields and populated with Globally Unique ID (GUID). Both ID fields will exist in the model for a period of approximately one year at which time the ComID field will be retired. (2) An External Crosswalk table has been added to accommodate cross walking between NHD feature ID's and source ID's. The International border projects will take advantage of this new table to crosswalk NRCAN and INEGI data to the NHD. (3) The foundation for improving metadata is being addressed by adding a Metadata Process ID and new domain values which will allow for future functionality to edit existing metadata. (4) Divergence Structure has been expanded within the NHDPointEvent feature class to include "General", "Withdrawing" and "Contributing". A new NHDPointEvent "Water Quality Station" has been added to the model. The new NHD data model 2.0 will reflect a data model with WBD features rather than the old Hydrologic Units features. As part of the new data model, the extract for NHD data will be updated to extract based on WBD Class 8 boundaries (formerly known as Subbasins).

A date has not been set for release of NHD model 2.0, but it will be very soon. For updates, see the news column in the NHD web site for details <http://nhd.usgs.gov/>. A new version of the NHDGeoEdit tool v3.3.3 is currently being tested. This version will address the model changes implemented in NHD Model 1.07 and Model 2.0. For more information please contact Paul Kimsey pjkimsey@usgs.gov

Watershed Boundary Dataset Update by Paul Kimsey

While WBD will now be available to NHD stewards and other users of NHD data, WBD stewardship operations will not begin until the WBD editing tools and stewardship web pages are created sometime later this fall. Until that time, WBD stewards will continue to provide updates to the WBD to the NRCS office in Ft. Worth. The often talked about reach code migration for the new WBD boundaries will also be a part of version 2.0. Reach migration was fully tested and the results were posted to the distribution database for subregions 1701, 1702, and 1006. While not entirely successful, several lessons were learned and errors corrected for the final migration are due soon. The latest version of the WBD is `WBD_archive_09Apr2010_9.2_File.gdb`. This data can be found at the NRCS data gateway at: http://datagateway.nrcs.usda.gov/FAQ/FAQ_main.html. For more information on WBD integration please contact Stephen Daw, sgdaw@usgs.gov.

NHDGeoEdit tool v3.3.2 for ArcGIS 9.3x now available by Carl Nelson

A new release of the NHDGeoEdit tool is now available for ArcGIS 9.3 SP1 & ArcGIS 9.3.1 users. The new version addresses ArcMap memory errors encountered while applying feature to feature rules on large NHDArea and NHDWaterbody features by removing the redundancy in re-checking objects which eventually exceeded the maximum ArcMap memory. NHDGeoEdit tool Version 3.3.2 is available to stewards at: http://webhosts.cr.usgs.gov/steward/scripts/st2_software.pl

American Water Resources Association GIS and Water Resources VI

Use of the National Hydrography Dataset in the USGS StreamStats Web – Alan Rea. Reviewed by Pete Steeves: StreamStats, a USGS Web-based GIS application developed as a tool for water-resources planning and management, has been using the NHD in several ways. AI showed some of the newer NHD functionality which allows users to navigate the stream network to locate upstream or downstream stream gaging stations and dams (point discharges and other water-related features can also be traced when added to StreamStats) and get information about those features. The tools have been designed to work on both the high-resolution NHD and the medium-resolution NHD (used in the NHDPlus) data. One tool uses the network to search upstream and downstream for stream gages and can provide streamflow estimates for an ungaged site based on flow records for similar gages. A “raindrop” trace to the network tool will trace the overland flow path from any user-selected point and identify the point where the water would enter the stream network. Another tool allows the user to specify two points on the stream network and receive a three-dimensional profile of the stream segment in graphical and tabular format. Most StreamStats functionality is available through Web services, and can be called from either the StreamStats interactive map interface, or from a program.

LiDAR and the NHD/WBD

LiDAR is an important topic to the geographic information science community. It is of particular interest to the hydrography community because most LiDAR images vividly show stream channels. It is intuitive to many people that this can make a strong contribution to the development of hydrography and the maintenance of the NHD and WBD. A group of about 40 people gathered at the recent American Water Resources Association conference on GIS and Water Resources VI to discuss the future role of LiDAR in the NHD. Many people in the group were experienced in the issues surrounding LiDAR and hydrography. It was apparent from the discussion that this field is still in its infancy, particularly with regard for hydrography. There are four steps in the LiDAR process that need to be addressed. The first step is the LiDAR collection process, which for the most part is an established technology. The second step is perhaps the most critical. It deals with the post processing of the raw data collection into a usable

set of elevations. According to the group discussion, the methods by which this post processing is accomplished can have a large effect on how well hydrography can be derived. This is a concern for stream channels and polygonal waterbodies. It was suggested that much research is needed to determine how to optimize this post processing. Related to this is the need for adequate specifications and standards to direct this optimization. Complicating the matter is that different objectives for the use of LiDAR data (such as in structures or transportation) may require different processing techniques. Third is the processing of the elevations into stream channels. Although this has been a well-established technology for a number of years, it may be necessary to optimize the techniques as applied to LiDAR. Finally, the fourth issue is the processing of stream channels into the NHD. This would involve the conflation of the existing NHD attribute structure to the new geometry. Conflation is currently technically feasible, but there are issues with its productivity, particularly if large operations are undertaken. Yet another issue surrounding the use of LiDAR is its cost, which is very expensive.

At the conclusion of the meeting it was recommended that a special advisory team be formed to further elaborate on the use of LiDAR in hydrography leading to the development of a best practices guide. If you are interested in joining this team, contact Jeff Simley at jdsimley@usgs.gov.

Datum Shift Update Program by Ariel Bates

The datum shift project is being wrapped up. Two subbasins remain that require minor updates, one quad in Utah and 3 quads in Maine. In total 53952 quads were checked for datum shift errors, of those, only 123 quads required some type of editing. That is errors in less than 0.23% of all quads checked. The remaining quads will be finished as soon as the data becomes available.

NHD Image Update Program by Ariel Bates

In an effort to inspect and correct major changes to hydrography; Kentucky, Kansas, Oklahoma, Tennessee, Minnesota, Pennsylvania, Texas, Virginia, Indiana, Iowa, North Carolina, Wisconsin, Michigan, Vermont, Georgia, Arkansas, South Carolina and Minnesota have been photoinspected and corrections made. States currently being corrected include Texas, Ohio, New Mexico, West Virginia, North Dakota, South Dakota and Louisiana. Multiple other states are currently being photoinspected. In all, 25 states are either in work or already completed.

Overview of the NHD Seminar

A webex recording is available from the National States Geographic Information Council (NSGIC) providing an overview of the NHD. The presentation is by Jeff Simley and lasts 40 minutes plus 20 minutes of questions and answers. The presentation covers NHD event referencing, navigation, a water information architecture, the NHDPlus, future tasks of the NHD, and the stewardship program. You can view this from the NSGIC webex site at:

<https://nsgic.webex.com/nsgic/lsr.php?AT=pb&SP=TC&rID=17242787&rKey=69ae23ba2e8e29f9&act=pb>

Amazing Mississippi River Maps

Rick Jordan and Mike Woodall from the Washington Department of Ecology alerted us to some amazing historical maps of the lower Mississippi River see: <http://www.radicalcartography.net/?fisk>

National Geographic: World of Rivers

National Geographic magazine produced an excellent map supplement: World of Rivers, found in the April 2010 edition of the magazine. Any student of hydrography will be interested in seeing this map. It was created by deriving stream channels from the 30-meter Shuttle Radar Topography Mission from 2000 through the HydroSHEDS database developed by the World Wildlife Fund Conservation Science Program. The resulting map is a dramatic depiction of the world's rivers and lakes with stream symbolization based on flow volume and distinguishing perennial and intermittent streams. It is very similar to the NHDPlus maps you have seen produced by Ariel Bates. Learn more about the April 2010 edition of the magazine at <http://ngm.nationalgeographic.com/2010/04/table-of-contents>.

Louisiana Exchange Network Grant by Jim Mitchell

The "Exchange Network" is a partnership among states, tribes, and the US Environmental Protection Agency to promote the sharing of environmental data. This year's grant program made NHD a funding priority. LADOTD was awarded nearly \$350,000 to perform updates on eight HUCs and work with the three states' environmental agencies; Louisiana Department of Environmental Quality, Mississippi Department of Environmental Quality, and the Texas Commission on Environmental Quality. As partners, they will connect their environmental monitoring sites and other events along the revised NHD network. When the project is complete, Louisiana will have approximately 1/3 of its HUCs photorevised to high-resolution NHD.

By funding the updating and revision of NHD basins, the Exchange Network recognized the important role geospatial data play in environmental monitoring and management. A key element in the project is the partnership between state environmental agencies. By updating NHD basins that cross state boundaries and connecting events that provide environmental data, the states can better perform their regulatory and reporting functions. The NHD provides the opportunity for interoperability between the states by connecting the data on each side of the border and providing a framework for modeling while also allowing for a better understanding the hydrologic processes in the entire basin.

For more information on the project, contact Jim Mitchell, IT GIS Manger, LADOTD, at jim.mitchell@al.gov. For more information about the Exchange Network, go to: <http://www.exchangenetwork.net>. This year, \$13 million in grant proposals were submitted to the program; \$10 million were awarded

ESRI User Conference Sessions on NHD

NHD Maintenance and Applications, Tuesday, July 13, 8:30-9:45 AM, Room 25 C, The session presents NHD data development strategies and applications:

Introduction to the Hydrography Event Management (HEM) Tools

Ariel Bates, U.S. Geological Survey

Diversion Structures in the NHD

Jeffrey Simley, U.S. Geological Survey

WBD/NHD Integration - A New Opportunity for GIS

Stephen Daw, USGS

International Watersheds Initiative, Binational Hydrographic Data Harmonization Effort

Michael Laitta, International Joint Commission of Canada and US

NHDPlus in Action, Tuesday, July 13, 10:15-11:30 AM, Room 25 C, Different tools and uses for NHDPlus are presented. NHD Plus V2 is discussed:

What's Happening with the National Hydrography Dataset Plus (NHDPlus)?

Tommy Dewald, USEPA - Office of Water

National Hydrography Dataset Plus (NHDPlus) Version 2.0

Cindy McKay, Horizon Systems Corporation

Improving Stream Flow Estimates in NHDPlus

Timothy Bondelid, Independent Consultant, Kernell Ries, U.S. Geological Survey, Richard Moore, U.S. Geological Survey

NHD User Group Meeting, Tuesday, July 13, 12:00 – 1:00 PM, Room 25 C:

The NHD User Group meeting brings together GIS professionals utilizing both the National Hydrography Dataset and ESRI GIS in Water Resource Management. Discover how other organizations are utilizing GIS, learn about the latest GIS trends and build your contact base.

HEM Training by Ariel Bates

Upcoming Hydrography Event Management (HEM) Tool training for May include the Basics WebEx on May 18th. These trainings are 4 hours in length and open to anyone interested in learning the tools. This month's training includes an overview of the tools, creating event feature classes, creating point, line and area events, and many other editing tasks. Check the NHD Stewardship Page or the HEM_Tools myUSGS community for additional upcoming trainings. Contact HEM@usgs.gov with questions.

NHD Photo of the Month

This month's photo of the beautiful Oregon Coast was submitted by Al Rea of the USGS Idaho Water Science Center in Boise, Idaho. The map showing where the photo was taken was created by Kathy Isham. To see the photo of the month go to ftp://nhdftp.usgs.gov/Hydro_Images/Oregoncoast.pdf. To submit your photo for the NHD Photo of the Month, please send it to krisham@usgs.gov.

Flowing Streams – In Outer Space

In 1977 NASA launched the Voyager spacecraft on an interstellar mission and by 1990 the Voyager left our solar system. Now the Voyager is 10 billion miles from Earth. In the event that another civilization discovers the spacecraft, the Voyager contained examples of civilization on the planet Earth. One such artifact was a record that recorded the sounds of Earth. It included the message “Greetings from the planet Earth” in many languages. It also included examples of music from Earth. One of the songs was the Japanese song “Flowing Streams.” You can listen to Flowing Streams at: <http://www.npr.org/templates/player/mediaPlayer.html?action=1&t=1&islist=false&id=123534818&m=123606859>

March Hydrography Quiz / New April Quiz

Jim Sherwood, a former USGS hydrologist, was the first to correctly guess the March hydrography quiz as the Little River Drainage Project adjacent to the Mississippi River in Southeast Missouri. See <ftp://nhdftp.usgs.gov/Quiz/Hydrography56.pdf>. Jim retired from the Ohio Water Science Center after a wonderful and rewarding career at the USGS. He now lives in Vandemere, North Carolina.

Others with the correct answer were (in order received): Mark Olsen, Calvin Meyer, David Straub, Gary Penn, John Guthrie, David Asbury, Stephanie Kula, Roger Barlow, Janet Brewster, Crystal Bowles, Elaine Blok, Tom Denslinger, Richard Patton, and Robert Rinehart.

Calvin Meyer notes: The Little River Drainage District was the largest drainage and levee district of its kind in the world, and drained more than 500,000 acres of land in seven counties. The project was completed in 1928 at an estimated cost of \$11 million. For more information, go to <http://www.rootsweb.ancestry.com/~mostodd2/history/swampstocotton.htm>. Tom Denslinger notes: Today, The Little River Drainage District oversees and maintains numerous drainage facilities assuring that Southeast Missouri remains free of unwanted water. It is responsible for operation of 957.8 miles of ditches and 304.43 miles of levees. The district serves parts of seven Missouri counties: Bollinger, Cape Girardeau, Dunklin, New Madrid, Pemiscot, Scott and Stoddard.

This month's hydrography quiz can be found at <ftp://nhdftp.usgs.gov/Quiz/Hydrography57.pdf>. The subject once again is drainage patterns. This is one of several giant "holes" in the NHD. This one measures 180 miles across and 300 miles north to south. Most of the few streams that exist here are called "draws." Where is this and why are there no streams here? The movie Giant with James Dean illustrates why there are no streams here. This is a particular type of steppe geography. Send your guess to jdsimley@usgs.gov.

Upcoming NHD Training

May 18, 2010: "HEM Basics": WebEx, Contact HEM@usgs.gov, registration information at <http://nhd.usgs.gov/tools.html#hem>

June 10, 2010: "Advanced HEM Functions": WebEx, Contact HEM@usgs.gov, registration information at <http://nhd.usgs.gov/tools.html#hem>

June, 22, 2010: Applications, New York City, N.Y., Hosted by GITA, Contact David Anderson (danderson@usgs.gov)

August 4 - 5, 2010: "HEM 2 Day Classroom": Denver, CO, Contact HEM@usgs.gov, registration information at <http://nhd.usgs.gov/tools.html#hem>

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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The NHD Newsletter is published monthly. Get on the mailing list by contacting jdsimley@usgs.gov.

You can view past NHD Newsletters at http://nhd.usgs.gov/newsletter_list.html

Jeff Simley, USGS, assumes full responsibility for the content of this newsletter.