USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

Annual NHD Management Meeting

The National Hydrography Dataset management team met December 1-3, 2009 to address current and future issues of the program. The management team is chaired by the USGS with federal representation from the U.S. Environmental Protection Agency, the U.S. Forest Service, and the Bureau of Land Management. State representation is from New York and Minnesota. The NHD stewardship strategy was the first item under discussion. This recognized the need to tailor stewardship activities to be more inclusive of the wide range of expertise levels of the stewards rather than focus so heavily on upper end stewards. Next was the technology strategy, which then recognized the need to develop technologies that will address three tiers of expert, knowledgeable, and basic users. While the NHDGeoEdit tool will continue to meet the needs of experts, the Web Edit Tool under development will address basic users. Meanwhile a new Vector Edit tool will be aimed at knowledgeable users with flexibility to become an expert's tool. It was also recognized that the web must play a much larger role in stewardship and applications.

In analyzing the program it was estimated that there are about 100 people dedicated to the NHD in the U.S. with about two-thirds of these being non-USGS resources. Project management has been an important subject for the past year with the organization of the overall NHD program into 11 projects each with a designated lead responsible to the stakeholders. Although USGS hydrography program guidance is based on the projects, the project plans need to have a strong impact on the operations culture to be fully effective. In particular, technical leadership and dedicated technical resources are critical to put the NHD program on a progressive technical path.

A roundtable of input was received from the team participants. In discussions about the future of the NHD some of the main points discussed were: that value-added information is a vital component of NHD, web access opens huge doors to information delivery, web analysis is evolving into robust capabilities, extensive collaboration is underway throughout the NHD community, NHDPlus and StreamStats will be needed at higher resolutions, addressed events will be consumed via the web rather than through traditional file sharing, the NHD drives standardization of water information at the state and federal level, there is a large volume of data edits to be consumed, the NHD is often embedded in state regulations and mandates, there is always a need for more outreach to attract users and stewards, lower-end users need more capabilities aimed at them, the stakes in environmental issues are rising all the time for which the NHD can be applied, the use of the NHD generates greater demand for more from the NHD, and that although many of the science and mapping demands on the NHD are exclusive, the demands can co-exist.

There was a session on the development of enterprise architecture at the USGS to design capabilities that support strategic goals. Also a session on product management pointed out the need to manage the lifecycle of the NHD product so as not to allow it to sunset prematurely. The meeting addressed a series of correspondence between the NHD user community and the USGS to seek improvement on a number of issues resulting from gaps in the staffing of several functions. Notable improvement was recognized. The group stressed that many federal and state programs have become dependent on the NHD and service levels must be maintained.

The chief of the USGS National Geospatial Program, Mark DeMulder, was briefed by the management team on the success of the program, the impact is has had on science and resource management, and the issues that must be continuously addressed to keep the program thriving. All agreed that the NHD has been a significant success story for the extensive partnership.

USGS Names Two New NHD Points of Contact

Two new Points of Contact have been selected to serve in the NHD program at the USGS. Ray Postolovski will cover the upper Midwest, known as area 3, and David Arnold will cover the southeast, known as area 5. Ray replaces Tim Hines who is now working with the USGS in-house staff, and David replaces George Heleine who is now the NSDI liaison to Mississippi. Both Ray and David will be responsible for developing successful vector data stewardship programs with state, local, and federal agencies in their states. They will focus on technical aspects of the program to make sure the tools and processes are in place to make data stewardship work. They will also become experts in many of the water issues in the states to ensure The National Map is serving the mapping, science, and resource management needs of its customers.

Ray Postolovski received his Bachelor of Science in Cartography from Ohio University and is a certified GIS professional. He has worked in the mapping field for over 20 years. Ray began his career with Woolpert in Dayton, Ohio as a GIS technician working on a variety of base map and cadastral GIS projects. At Woolpert he was also a Senior GIS Analyst, Project Manager and Group Manager. He has also held technical and management positions in GIS at Rose Group in Raleigh, North Carolina and most recently at Pixxures in Arvada, Colorado. While at Pixxures, Ray worked with federal, state and local governments as well as energy and utility companies.

David Arnold graduated with a Master's Degree in Geography from the University of Nebraska. He began his career in mapping as a GIS Specialist with the Natural Resources Conservation Service (NRCS) developing Soil Survey Geographic layers in Nebraska as well as statewide analysis to estimate carbon sequestration levels. David also worked at Space Imaging as a GIS Consultant for the Michigan Department of Natural Resources. In this role he developed data, conducted analyses, and created maps to support clients. David also taught clients the principles of GIS and how to use ArcGIS Desktop software to make better informed decisions. Recently David was employed with the City of Kansas City, Missouri as a GIS analyst where he became the primary contact for advanced analysis. David served in a variety of other roles with the City including project management and web development.

NHD Data Shift Update

Washington has been added to the states that have been inspected and corrections made. Others are New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, Tennessee, Kentucky, Ohio, Indiana, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Texas, Oklahoma, Kansas, North Dakota, Montana, Idaho, New Mexico, Arizona, and California. The overall error rate has now dropped to 0.2% of quadrangles.

NHD Image Update Process

The Kentucky photoinspection is finished resulting in very few issues between the NHD and the 2008 imagery. Indiana, North Carolina, Pennsylvania, Virginia and Oregon are currently being photoinspected.

Status of the Conflation Effort in New Jersey – by David Anderson, NHD Point of Contact

The New Jersey Department of Environmental Protection has been conflating the state's 1:24,000-scale NHD to 1:2,400-scale hydrographic data since January 2009. The process of conflation for NHD is not just a transfer of attributes between data at differing map scales. The user is also accomplishing densification of data, deletion of invalid data, transferring of attribution, reach code migration and code assignment to features; all of which must match the NHD model requirements. This requires significant attention and effort to prepare the target data prior to conflation and significant review after conflation.

New Jersey outsourced the conflation task. To be successful the contractor has to have knowledge of the NHD dataset, model requirements, standards for NHD conflation, and a have a solid conflation tool. Initially the work was done using a combination of contractor proprietary tools plus portions of the USGS NHD conflation tool. Extensive collaboration between the state, the vendor, and the USGS was necessary to ensure the conflated data met the standards required for submittal to the national NHD repository. The need for such collaboration is an important lesson learned from the project. One of the most discussed issues concerning conflation has been data collection standards. The USGS does not currently have a data collection standard in place for local-resolution data. Therefore http://rockyweb.cr.usgs.gov/nmpstds/acrodocs/draft/dlg-f/nhd/NHDH0799.PDF, the high resolution NHD standard, is recommended as the minimal acceptable standard. Other issues arising from conflation of NHD data include the generation of contours using mixed local-resolution and high-resolution NHD data, densification across state boundaries, sequencing of reach codes in mixed scales, and other complications related to very large scale data.

New Jersey has 14 subbasins that intersect the state boundaries. Of these, only four are completely within the state boundaries and all others intersect with New York, Pennsylvania and Delaware. For conflation, the NJ state steward extended their efforts to the first confluence outside of the state boundaries to ensure network connectivity and initiated informal agreements with neighboring states as to the update process. To date, the vendor has delivered all local resolution NHD to the state steward with approximately 50% of New Jersey land area uploaded to the national repository. An additinal 15% is currently in the loading process. An additional four subbasins, comprising the rest of the land area, are being quality checked by the state steward and the USGS. These remaining subbasins are the most difficult because they are the frontal subbasins along the Atlantic coastline with much complexity. With current efforts it is estimated that the entire state should be completed in the first quarter of 2010.

Once completed, New Jersey intends to use the conflated 1:2,400-scale data to tie into current NJDEP Water Programs, link data from the statewide Water Quality Exchange (WQX) system, provide an interactive tool for identifying monitoring stations, TMDL, and surface water quality designation and finally to provide a more robust analysis capabilities at the 12-digit HUC level.

Why the HEM Tool is important to the NHD – by Bill Smith, NHD Point of Contact

The Hydrography Event Management (HEM) Tool is a set of processes that all for the creation, management, and refresh of event data linearly referenced to the NHD. Linear referencing is a technique for locating information without having to create duplicative geometry. It also creates powerful analytical opportunities in data such as the NHD. The tool was adapted from the U.S. Forest Service, initially employed by the Pacific Northwest Hydrography Framework group, and further developed by the BLM and the Environmental Protection Agency into the current HEM tool. It is now managed by the USGS.

The HEM Tool allows users to create and manage point and line events which are referenced to NHDFlowline features in the NHD. The tool also allows for the creating and management of polygon events. Linear referenced point and line events are based on the ReachCode structure of the NHDFlowline feature class. In the NHD, a reach is composed of one or more flowlines and is labeled with a unique ReachCode. Then the event needs a position along the reach. This is calculated based on a measure (also called M-Value), which is defined as the length from the start junction for a particular ReachCode to the event, divided by the total length of the ReachCode from the start junction to the end junction. In other words it's the percentage upstream. This then allows one to properly linear reference an event to NHDFlowlines using: (1) a valid NHD ReachCode, and (2) a M-Value calculated along the length of the ReachCode. For a point event one position is needed and for a line event two endpoint positions are needed.

What types of events may be placed over the NHD? Well, just about anything a NHD user might desire! Events will be divided into two groups, 1) USGS-Events, and 2) User-Events. USGS-Events will be stored with the NHD data in separate feature classes created specifically for point events (NHDPointEventFC), line events (NHDLineEventFC), and polygon or area events (NHDAreaEventFC). USGS-Point Events will include dams, stream gages, and diversion points. When a NHD user requests any NHD dataset, they will receive these point events in a specific feature class inside of the Hydrography feature dataset of the geodatabase file. User-Events may be any other event a user may think of, perhaps fish habitat, or location of a culvert. User-Events will not be stored in the NHD data, rather users will store these events in a feature class they create, maintain, and store. Other NHD users will not see these events when they download the NHD.

The HEM Tool (in version 2.1) is available from the USGS by accessing: http://nhd.usgs.gov/tools.html#hem. For the near future, BLM will continue to provide development effort to improve the HEM Tool, and USGS will be responsible for training and help desk support. If you have any questions concerning the HEM Tool, please contact Ariel Bates (email: atbates@usgs.gov – telephone: 303.202.4535) or Bill Smith (email: wjsmith@usgs.gov – telephone: 303.202.4493).

Feature Catalog – Fun Facts by Keven Roth

Wash - The usually dry portion of a stream bed that contains water only during or after a local rainstorm or heavy snowmelt.

In the NHD, washes are represented as areas in the NHDArea feature class. A wash is delineated based on the extent of the cut banks of the dry channel. However, any perennial or intermittent streams within the wash are collected as stream/river. If no stream is apparent within the wash, an artificial path is created to model the flow that could occur within the wash. Whether or not flow appears as surface flow depends principally on the size and permeability of the alluvium and the location of bedrock outcrops along the wash. A wash can have stretches of flowing water alternating with dry stretches. Some USGS topo maps in the arid areas of the United States used a single-line brown dotted symbol to indicate "ephemeral" streams or single-line washes. This symbol was used for a brief period during the 1960's and on a limited number of maps. It was designed to indicate a difference between an intermittent stream which flowed seasonally and an ephemeral stream which flowed only in response to rain or snowmelt. Because it was used differently both in time and space, when the NHD was created, if the original digital data (Hydrography DLGs) included codes for wash, these single-line washes were converted to stream/river; hydrographic category = intermittent. If the NHD was created by digitizing the original map separates, it is likely that only the blue plate was digitized and any single-line washes on the brown plate would not have been digitized. New guidance is being developed to help deal with ephemeral streams and additional channels that can be derived from topographic data, either map contours or more current LiDAR elevation data. Stay tuned for details.

NHD Photo of the Month

Jeremy Isham has submitted the featured photo for this month of Crystal Mill in central Colorado. ftp://nhdftp.usgs.gov/Hydro_Images/CrystalMill.pdf. To submit your photo to be considered for the NHD Photo of the Month, please send it to krisham@usgs.gov.

AWRA Conference

The American Water Resources Association's popular series of conferences on GIS & Water Resources continues with its sixth GIS & Water Resources conference, this time in Orlando, FL March 29-31, 2010. For the latest information visit: http://www.awra.org/meetings/Florida2010/

November Hydrography Quiz / New December Quiz

Dave Greenlee was the first to correctly guess the November hydrography quiz. The quiz asked what direction the view is looking towards and what is the blue line in the middle of the left channel and why there isn't one in the right channel? Dave answered that the view was looking southeast (he pointed out that we left the compass in the view), and that the line in the left channel was the Artificial Path placed there because it was within the U.S. part of the river. See ftp://nhdftp.usgs.gov/Quiz/Hydrography52.pdf.

For nearly 40 years Dave Greenlee has worked on Geographic Information Systems. He started out working for a 24-year old named Dangermond who was just founding ESRI. Dave got a degree from the University of Redlands and worked a couple of years at ESRI before moving to South Dakota and joining another start-up known as the EROS Data Center. He specialized in GIS applications and the integration of GIS with remotely sensed data. Over the years, he has worked to integrate and web enable small- to medium-scale data (e.g. elevation, orthoimagery, and land cover) into what we now call *The National Map*. In recent years, he has also participated in projects that assist USGS's partners (e.g. North Carolina's NC OneMap, GIS for the Gulf (post Katrina), and NSF's National Ecological Observatory Network) in their GIS activities. Dave has served as the National Director of the GIS Division, American Society of Photogrammetry and Remote Sensing, and has been a member of ASPRS since 1976.

A lot of people guessed that the quiz was of Niagara Falls, but only the following joined Dave in the real answers (in order received): Andy Woeber, Richard Patton, Cindy McKay, Ken Koch, and Mark Yandrick. Incidentally, Roger Barlow noted "about half the flow of the Niagara River is diverted for power generation - hard to believe what those rapids would be like with twice the water in them!"

Niagara Falls were formed when glaciers receded at the end of the Wisconsin glaciation (the last ice age), and water from the newly-formed Great Lakes carved a path through the Niagara Escarpment en route to the Atlantic Ocean. While not exceptionally high, the Niagara Falls are very wide. More than six million cubic feet of water falls over the crest line every minute in high flow, and almost 4 million cubic feet on average. It is the most powerful waterfall in North America. (From Wikipedia)

This month's hydrography quiz can be found at ftp://nhdftp.usgs.gov/Quiz/Hydrography53.pdf. Name this really big waterbody. Send your guess to jdsimley@usgs.gov. Thanks to Kathy Isham for the quiz.

Upcoming NHD Maintenance Training

January 12–15, 2010: NHDGeoEdit, Trenton, NJ, Contact David Anderson (danderson@usgs.gov) or Craig Coutros (craig.coutros@dep.state.nj.us)
January 12-14, 2010: Conflation, Nashville, TN, Contact Elizabeth McCartney (emccartney@usgs.gov) or Bruce Bauch (bbauch@usgs.gov)
March 22, 2010: Applications, New York City, N.Y., Contact David Anderson (danderson@usgs.gov) (This event subject to change)
June 2–4, 2010: Conflation, Manhattan, Kansas, Contact Tim Hines (thines@usgs.gov) or Ingrid Landgrapf (imlandgrapf@usgs.gov)

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