USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

NHD Editing Improvements

The major initiative now underway to significantly improve the NHD update process involves a number of process enhancements outlined in the following requirements specifications ranked in order of high to low:

- Streamline code for NHD tools and utilities
- Single installation package for all NHD update process tools and utilities
- Merge all current NHD toolbars into one toolbar with logical progression of tasks
- Utilize ArcSDE Versioning to manage NHD update process data transactions
- Allow editing with NHD GeoEdit Tool in geographic coordinate system
- Create queue for QC checks
- Create queued edit tool
- Make all NHD update process tools compatible with ESRI Personal Geodatabases (PGDB) and ESRI File Geodatabases (FGDB)
- Streamline NHD update process tools so that they are not reliant on ESRI Task Assistant
- Incorporate NHD Plus build and refresh QC checks to support NHD Plus creation
- Update process workflow to use ESRI ArcGIS Job Tracking Extension (JTX)
- Improve Metadata Process
- Reach code allocation utility process updates
- Bug fixes and enhancements from NHD development group list
- Update tools and installation package to work with ArcGIS 10.0 when released

Links to New NHD Model

Last month's Newsletter discussed the upcoming NHD Model v2.0. To see the specific model changes since v1.06 go to ftp://nhdftp.usgs.gov/model/NHD_05_21_10_v2.0/NHD%20Model%20Changes%20v2.0_May%2021%202010_since_v1.06.doc. To see a poster of the new model go to ftp://nhdftp.usgs.gov/model/NHD_05_21_10_v2.0/NHDv2.0_poster_5_21_2010.pdf.

NHD Region 5 on the Move by Dave Arnold

NHD Region 5 is comprised of the States of Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, and Florida. It also includes the territories of Puerto Rico and the U.S. Virgin Islands. Delaware has finished statewide local resolution NHD and the steward in North Carolina has local resolution data for 19 counties, which is being added to the NHD over time. Virginia continues to submit updates to the NHD while in Florida, the Department of Environmental Protection (DEP) is photo revising the statewide high resolution NHD. The West Virginia agreement has just been signed and the West Virginia Office of GIS State Coordination (WVOGSC) will be the principle steward. WVOGSC has collected a large number of edits and additions that need to be done on the high resolution NHD. It is expected that NHD Edit Tool training will be held in their state sometime this summer, and that work on the NHD data will commence afterwards.

Eight of the ten states and territories in the region have a stewardship agreement either signed or in draft. In Maryland and Georgia the USGS is currently working to formalize an integrated NHD/WBD agreement with their respective principal stewards. The USGS is working with the Maryland Department of the Environment (MDE) to set up a formal stewardship. In Georgia the USGS is working with the

Environmental Protection Division (EPD) of the Department of Natural Resources (DNR) to reach an agreement on maintenance of the NHD. The current plan calls for Information Technology Outreach Services (ITOS) at the University of Georgia, a key player in the early days of the NHD, to revise and update the state's high resolution NHD, prior to EPD taking over as the principle steward. The State of South Carolina is also actively pursuing the ability to update the NHD, although at this time a principal steward has not been found. Florence County is working on a pilot project to create local resolution NHD from LiDAR derived breaklines. This will be a significant amount of work, but the finished project will produce good local resolution data that can also show other interested parties how the NHD can be updated using LiDAR data. Overall Region 5 is well on its way to putting stewardship agreements in place, while also actively refining the NHD using the local knowledge of the stewards.

Big News on the Canadian Border by Pete Steeves

Fourteen subbasins along the Canadian border now contain harmonized U.S. and Canadian data. Hydrography and watershed 'harmonization' along the Canadian border is in full swing and slated for completion by the end of the calendar year. The objective of this effort is to incorporate Canadian hydrography and watershed boundaries into the NHD/WBD and vice versa. Of the roughly ninety 8-digit HUCs that straddle the international border, 14 have been fully loaded into NHD, with 4 more scheduled to be loaded soon after this newsletter release. Most of these harmonized 8-digit HUCs are along the Washington/Idaho/Montana border with British Columbia. Resulting harmonized data is checked for network connectivity and feature/attribute consistency. Significant hurdles have been cleared throughout this international collaborative effort. These include an agreed upon methodology's related to: Hydrologic unit sizes; definition of Great Lakes and other coastal hydrologic units; feature editing, feature coding, and geographic names assignments.

Hydrography from Canada is accessed from Natural Resources Canada (NRCan) as the National Hydrography Dataset (NHN). NRCan works closely with provincial agencies to develop the appropriate data to be loaded into NHN. The harmonization effort is dependent on how far along NRCan is with developing and acquiring provincial data, resulting in several scales (20K or 50K) and several "Levels" of data quality released to the harmonization team and the NHD. Longer term maintenance efforts will ultimately result in optimum data scale and quality along the entire border. Harmonization of watershed 10 and 12-digit HUC's will continue into FY11-12.

A long-term goal is the development of a North American version of these datasets (hydrography and watershed boundaries). The level of cooperation/collaboration that has taken place in the past 2 years has allowed this vision to become more of a reality.

Accessing *The National Map* data from ArcGIS Web Map Services (WMS) by Dave Anderson

Web Map Services (WMS) is a standard protocol developed by the Open Geospatial Consortium in 1999 to allow the serving of georeferenced map images and data across the Internet from GIS databases stored somewhere other than a local hard drive. WMS services are developed on the server-side and although these feature classes cannot be used for direct analysis from the service, they can be queried by using the *Identify* tool and can be used for cartographic applications.

The National Map comprises a number of data themes from sources ranging from geographic names, to transportation, to the National Hydrography Dataset (NHD), to NEXRAD Weather. These sources can be viewed through *The National Map* viewer (http://viewer.nationalmap.gov/viewer/) or they can be brought into the ArcGIS working environment using a web map service (WMS). The web services are delivered in GCS WGS-84 horizontal datum.

To see what large scale vector sources (geographic names, governmental units, NHD, etc.) are available, go to: http://services.nationalmap.gov/ArcGIS/REST/services. Select a service you would like to add to your application. You will be taken to a metadata page with information about the service such as what layers are included, spatial reference, extent, etc. Navigate to the bottom of the metadata page to find supported interfaces (WMS, SOAP, REST, KMZ) and operation. When you select WMS as a service, the viewer takes you to the XML that drives the WMS operation. The URL in your browser's address bar is needed to enter into the "URL" of the **Add WMS Server** dialogue in ArcCatalog. As an example, let's say you wanted to add the NHD layers as a background for a map you are developing. After following the previous steps, copy and paste the URL for the WMS service (minus the *service=WMS* portion) so you would enter:
http://services.nationalmap.gov/ArcGIS/services/nhd/MapServer/WMSServer?request=GetCapabilities&
into the URL for the **Add WMS Server** and select "Get Layers."

More information about integrating WMS, KML, SOAP or REST services can be found at:
http://viewer.nationalmap.gov/help/documents/FAQs/FAQ%20-%20Using%20TNM%20Services.pdf

Updating the NHD using the NHD GeoConflation Tool by Elizabeth McCartney

The GeoConflation Tool is one of several methods available to update the National Hydrography Dataset (NHD). The tool automates the NHD Create Process used to generate the high resolution (24K) NHD data from the medium resolution (100K) data. NHD conflation is the integration of two datasets into one. The basic goal of conflation is to conserve ReachCodes and ComID's by duplicating them from the original dataset to the modified or target dataset whenever possible. This allows the history of the ReachCodes, and by association any information tied to the ReachCode, to be preserved.

One way to think of the process is "change detection". There are two inputs to the tool: the original NHD subbasin and the newly created or updated geometry called the target subbasin. The source NHD subbasin is then compared to the target subbasin. Where the geometries of flowlines and/or waterbodies match within specified tolerances, ReachCodes and ComIDs are automatically transferred from the source NHD to the target dataset. Close matches are flagged for closer review by the user to determine if there is an actual match or not. If the feature exists in the original, but not in the target, a "delete feature" is automatically generated. In the alternative circumstance where the feature exists in the target but not the source, a new ReachCode and ComID is applied to the feature and a "create new feature" is automatically generated.

As in any update process the results are only as good as the input data. The updates or target data must have FTypes, FCodes, connectivity, and be in correct the NHD schema. In addition, the target data must pass all QA/QC checks required before any data is integrated into the NHD. The end result of the conflation process is a "new" dataset consisting of the new geometry complete with ReachCodes and ComIDs. All changes have been tracked. The updates are then uploaded to the database. In the near future, the new PermID and Crosswalk tables will be incorporated into the tool. Future articles will focus on specific experiences using the GeoConflation tool and ongoing development of the tool.
For questions or more information, please contact Elizabeth McCartney at emccartney@usgs.gov.

MyUSGS and the NHD by Joel Skalet

MYUSGS is a collaborative information management system whereby you can access and share information within the NHD community. MYUSGS provides advanced document management, a wiki, Web site content management capability, and a suite of custom portal technologies to integrate all community tools and content. There are several communities that involve the NHD; NHD Advisory, NHD Tech, HEM Tools, and WBD communities. The MYUSGS site is located at the following url,

https://my.usgs.gov/home/. If you are interested in getting involved with any of these communities, please contact Joel Skalet, jjskalet@usgs.gov.

The communities are: (1) The NHD Advisory community is designed for state stewards, Federal Agency representatives, and USGS staff to discuss NHD Program issues. (2) The NHD Tech community is for sharing technical information about NHD tools, data management, and processes amongst technical personnel. (3) The HEM_Tools community is for Hydro Event Management users and the HEM project team to share project documents, status reports, meeting notes and ideas about HEM development. (4) The WBD community is designed for the sharing of Watershed Boundary Dataset information, specifically regarding design and migration.

WBD in the NHD by Stephen Daw

We are nearing a major milestone in the integration of the Watershed Boundary Dataset (WBD) into the National Hydrography Dataset (NHD). Starting on June 14th, 2010 data downloaded from the NHD web-site will include certified WBD data instead of the old 1:250k hydrologic units.

Also starting June 14th, users and stewards will select and download their data using the 8-digit hydrologic unit boundaries (also known as subbasins) of the WBD instead of the old HUC-8 boundaries. The WBD and the Hydrologic units are very similar in boundaries and appearance, but the WBD reflects years of work to not only improve the accuracy of the boundaries but also certify that the boundary delineation conforms to a national standard.

This is the first step in the integration process that will ultimately allow state WBD stewards to participate in the NHD process. Over the coming months, the NHD web-site will be updated and expanded to accommodate WBD stewardship. Concurrently WBD editing tools and procedures are being developed and will be rolled out later this year.

We invite you to take a look at the new and improved NHD and to provide feedback as we work through this much anticipated integration process with the WBD. Spread the word, the NHD is the surface water, and boundaries of the nation. For more information, please contact Stephen Daw, sgdaw@usgs.gov

American Water Resources Association GIS and Water Resources VI

Here is another review of a paper presented at the recent AWRA GIS and Water Resources VI conference in Orlando, Florida, March 29-31, 2010. Reviewed by Jeff Simley:
Practical Considerations for Integrating LiDAR DEMs with Legacy Hydrographic Data – Benjamin Houston, Erika Boghici, Cheryl Rose. It is necessary to accurately delineate stormwater watersheds to comply with USEPA mandates for stormwater. This is attempted using LiDAR derived bare-earth elevation models which show stream channels. However, stormwater pipes cause unnatural flow patterns that significantly alter the flow. The LiDAR data isn't perfect and contains many artifacts giving some unexpected results. LiDAR noise, point classification error due to reflectance, and artifacts such as tree stumps can cause problems. Breaklines are needed to process the data and the data must be significantly conditioned, including smoothing, to be of use. The derived elevation data also needs to integrate well with other data. The derived stream channels due not reconcile with the NHD, with streams off by as much as 30 meters. The ideal solution is to photo-derive a stream network and burn-in to the LiDAR elevation model. This was accomplished using the NHDPlus method of the Agree algorithm. Much of this work mirrored the NHDPlus process, but at a considerably higher resolution.

Datum Shift Update Program by Ariel Bates

The datum shift project is being wrapped up. One subbasin remains that requires minor updates, 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 23 states have been photoinspected and corrections made. Colorado is the last state that supports the FY2010 graphics program. All others have been inspected/updated with new NHD state extracts provided. Evaluation of the Louisiana coastline has temporarily reallocated some resources. Once Colorado and Louisiana are finished the FY2011 states will photoinspected and revised.

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.

NHD Photo of the Month

This month's photo is the Rio Grande River as it flows out of Cochiti Dam near Santa Fe, New Mexico. 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/CochitiDam.pdf. To submit your photo for the NHD Photo of the Month, please send it to krisham@usgs.gov.

April Hydrography Quiz / New May Quiz

Tom Denslinger of the Pennsylvania Department of Environmental Protection was the first to correctly guess the very difficult April hydrography quiz as the Llano Estacado in west Texas and eastern New Mexico. See ftp://nhdftp.usgs.gov/Quiz/Hydrography57.pdf. Tom is Chief of the Water Use Management Section in the Division of Water Use Planning. His work involves the water rights program for public water suppliers using surface water. More recently he also has been involved in providing technical assistance to regional office staff on water resources management and instream flow protection issues related to water withdrawal for hydrofracing gas wells in the Marcellus Shale play.

According to Tom: "The area shown in the quiz is the Llano Estacado, in Spanish. In English it means Staked Plain. The area is in the West Texas panhandle and eastern New Mexico. The area was given the name by Spanish explorer Francisco Coronado in 1541. The area is a plateau formed of horizontal sedimentary rock." He also notes: "Of all the websites I researched for this answer I found this one to give the most thorough explanation: http://www.llanoestacado.org/resources/LlanoEstacado.ppt. 'The Llano Estacado is an uplifted plateau in a dry region of the United States, so its habitats are characterized by elevation, low amount of water, and the consequences of wind and water erosion.' Many links are at: http://www.llanoestacado.org/links.htm." For a map of the area see http://www.llanoestacado.org/resources/LlanoEstacado_small.jpg

Others with the correct answer were (in order received): Richard Patton, and Michael Hill.

This month's hydrography quiz can be found at ftp://nhdftp.usgs.gov/Quiz/Hydrography58.pdf. This waterbody is one of the nation's notable hydrography features. The large polygon is classified as a Lake/Pond with a highly unusual value in the Elevation field. The light blue lines are classified as Intermittent Stream/River. The orange lines are Canal/Ditch. Send your guess to jdsimley@usgs.gov.

Upcoming NHD Training

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

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