

USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

WBD Harmonization Completed for the U.S.-Mexico Border by Karen Hanson

The U.S. Geological Survey and the Mexican Instituto Nacional de Estadística y Geografía (INEGI) have been collaborating since fall of 2007 and are pleased to announce completion of the cross-border harmonization of the 8-, 10- and 12-digit hydrologic units along this shared international border. Within the United States, the 1:24,000-scale Watershed Boundary (WBD) dataset was adjusted, where required, through close coordination with the respective in-state WBD Stewards. Within Mexico, new 1:50,000-scale 8-, 10- and 12-digit boundaries were developed adopting the "Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD)" <http://pubs.usgs.gov/tm/11/a3/>. This newly harmonized data for the 28 shared 8-digits (Subbasins) is now available for download through the USGS National Map <http://nationalmap.gov/viewers.html>, or in national seamless format <ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/WBD/>. The completed harmonized NHD along this same swath has also been a joint endeavor. Thanks to the many partners, programs and colleagues that willingly supported and participated in this effort. Despite a significant language barrier, and fiscal challenges, this was an amazingly rewarding project, with great respect and friendships formed with our friends to the south.

National Stewardship Activity by Jeff Simley and Bill Smith

As of August, 2014, 38 of 55 States and Territories have Memorandums of Understanding for NHD stewardship. Of the 55 States and Territories, 32 are actively editing the NHD. States and Territories actively editing are: Alabama, Alaska, American Samoa, Arkansas, California, Colorado, Florida, Guam, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New York, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Puerto Rico, Utah, Washington, and Wyoming. In stewardship of the WBD, all 55 States and Territories are actively engaged in stewardship due to national update campaigns.

NHD Standards

The National Hydrography Dataset standards are composed of a triad of references:

(1) The first is the "logical" (or conceptual) standard. This is commonly referred to as FGDC-STD-014.6-2008 – Geographic Information Framework Data Content Standard, Part 6: Hydrography. It can be found at http://www.fgdc.gov/standards/projects/FGDC-standards-projects/framework-data-standard/GI_FrameworkDataStandard_Part6_Hydrography.pdf. It is simply a framework for hydrography. It alone does not define the NHD.

(2) The logical standard (or framework) needs an implementation. This has been done through the National Hydrography Dataset. This implementation has been defined through a data model. Currently this is The National Hydrography Dataset (NHD) Model V2.2. It can be found by going to Geoplatform.gov and search on "The National Map NHD" Scroll down to "Federal" and find "USGS Hydrography (NHD) From The National Map" and click on the PDF tab. This is the complete "physical/implementation model" for the NHD. This is alternately available at:

http://nhd.usgs.gov/NHDv2.2_poster_062614.pdf which is where most people get the data and information needed to use the NHD.

(3) The third cornerstone of the NHD standards triad is the NHD Feature Catalog. It provides structure, definitions, examples, and delineation guidelines. Its primary form is an interactive catalog of definitions of all of the "entities" or features and can be found at:

http://nhd.usgs.gov/userguide.html?url=NHD_User_Guide/Feature_Catalog/NHD_Feature_Catalog.htm.

To use it, click on Feature Catalog in the left panel. Then click on Hydrography Dataset. To understand the criteria for an intermittent stream for example, click on Flowline, and then StreamRiver. Click on intermittent for a definition. For delineation guidelines, click on Feature Template. Alternately, to view this as a text document see the original document at <http://nationalmap.gov/standards/pdf/NHDH0799.PDF>.

Addressing Ephemeral Streams by Jeff Simley and Keven Roth

The NHD began as a representation of Nation's surface water at 1:100,000-scale. The portrayal of streams was limited by this scale to primarily perennial streams with a number of intermittent streams included. Then the NHD was created for a 1:24,000-scale portrayal. At this scale was possible to include many more streams where most of the added streams were intermittent in flow with some ephemeral streams included. Now as the NHD moves towards even larger scales on the order of 1:5,000-scale up to 1:1,000-scale, many of the new streams that are added are primarily ephemeral flowing streams. Thus the NHD is now dealing with ephemeral flowing streams much more often than was traditionally the case.

This poses a challenge to the NHD. In the NHD, the features represent basic, higher-level concepts such as Stream/River, Lake/Pond and Canal/Ditch. Attributes describe the characteristics of the features. In the NHD, Stream/River is defined as a "body of flowing water". The NHD classification made a statement – a stream/river is basically "water". The attribute "Hydrographic Category" further describes the water in terms of how long the water is present (all year - perennial, part of the year - intermittent, after rain - ephemeral). Many users are now adding more detail about the drainage network and morphology is creeping in. Stream/River is no longer just about the water, it is about a course or a channel. In effect, this is changing the definition of Stream/River and the "streamness" is being pushed down to the attributes.

A proposal was made to break out ephemeral streams from Stream/River and make them a new feature – "Channel with ephemeral flow." This new feature would be a NHDFlowline along with Stream/River and be a part of the network. The objective was to not confuse an ephemeral flowing channel with "a body of flowing water" since this condition only exists in very brief periods. The NHD Advisory Team made up of a broad spectrum of NHD users and stewards took up the matter, but support for the proposal was only moderate and will not be adopted, at least for now. Most members of the team opted for the traditional "Stream/River, Hydrographic Category – Perennial, Intermittent, or Ephemeral."

The Hydrographic Category classifications were originally assigned by a very large field force employed by the USGS for many years who observed each stream and where possible learned about its history from local landowners. Now new Stream/River flowlines are being added to the NHD without any attempt to classify the hydrography category. Perhaps this warrants the need for a new explicit classification of "Unknown." This issue will be taken up by the NHD Advisory Team in the month ahead.

Provisional Names Add-In by Paul Kimsey

An ArcGIS 10.2.2 Add-In toolbar is currently being developed that will allow editors to submit "Provisional Names" concurrently while editing the NHD through a replicate job checkout. The submissions will be stored in a new Provisional Names table and will be made available for inspection by the GNIS team. The Add-In concept will allow for flexibility in enhancing the Provisional Names capability (without a new NHD Update tool release) and will allow for an enterprise approach where other vector themes could potentially utilize the toolbar. The Provisional names Add-In will be used in conjunction with the yet to be released NHD Update toolbar v6.2x for ArcGIS 10.2.2.

Clean Water Act Definition of "Waters of the U.S."

The following is of interest to all of those working with hydrography data: “The U.S. Environmental Protection Agency and U.S. Army Corps of Engineers jointly released a proposed rule to clarify protection under the Clean Water Act for streams and wetlands that form the foundation of the nation's water resources. Determining Clean Water Act protection for streams and wetlands became confusing and complex following Supreme Court decisions in 2001 and 2006. The proposed rule was [published in the Federal Register](#) on Monday, April 21, 2014. The [public comment period](#) will be open for 182 days and will close on Monday, October 20, 2014.”

(<http://water.epa.gov/lawsregs/guidance/wetlands/CWAwaters.cfm>)

To see the Proposed “Definition of ‘Waters of the United States’ Under the Clean Water Act” see:

http://www2.epa.gov/sites/production/files/2014-06/documents/proposed_regulatory_wus_text_40cfr230_0.pdf

Also of great interest is the “Map of seasonal and rain-dependent streams” found at http://water.epa.gov/lawsregs/guidance/wetlands/upload/IE_Stream_Percentage_high.jpg

The State of NHD Region Four: Part 2 by Dave Arnold

National Hydrography Dataset (NHD) Stewardship Region Four is comprised of 14 eastern states, the District of Columbia, the U.S. Virgin Islands, and Puerto Rico. It is one of the most active areas of stewardship in the country. While many of these states are active in stewardship, other state stewardship programs are currently dormant, or in some states there is no stewardship at all. The following is part 2 of an assessment of each state. Much of this is provided by state stewards or USGS state liaisons. Look for part 3 in the September NHD Newsletter.

Puerto Rico: In Puerto Rico the Caribbean Water Science Center has taken on the task of updating the NHD on the island. They are currently focusing on updating the inland features and in the future they plan to address coastal features. With an enormous amount of vegetation and relatively small hydrographic features, it has proven difficult to conduct a complete update using 2010 U.S. Army Corps of Engineers orthophotography.

District of Columbia: The District of Columbia is nearing completion of a Memorandum of Understanding to take on stewardship of the NHD. They plan to develop a comprehensive large scale hydrography network using LIDAR that was acquired from the Hurricane Sandy project. The result will be an accurate drainage network, coupled with storm drains, outfalls and other storm water features, at fruition the project will deliver accurate above ground flow and inferred below ground flow. Large scale watersheds will also be created during this project, which has a tentative completion date of winter 2015.

Alabama: The Alabama Department of Economic and Community Affairs (ADECA) developed a National Hydrography Dataset Web Editing Tool (NHD-WET). The NHD-WET is used to engage local users who can identify NHD errors and suggest modifications of the data through a web browser. The workflow of the NHD-WET application is based on the concept of incorporating many subject matter experts in the process of reviewing and enhancing the NHD. This distributes the work load, while maintaining central points of quality control and quality assurance with the state steward, who reviews and adds user recommendations. ADECA continues to solicit substewardships throughout the state by meeting with personnel from military installations, and local and state agencies.

Mississippi: Mississippi continues to take advantage of new LiDAR coverage and imagery to update the NHD. Working through the State GIS Coordinating Council, the Mississippi Automated Resource Information System (MARIS), and with the USGS, five 8-digit hydrologic units have been completed and

two more are nearly complete. This work has resulted in over 25% of the state's high resolution NHD being updated, with future updates being discussed. Challenges continue to abound as their surface water features are regularly altered, especially in the Mississippi Alluvial Plain. Also in the Mississippi Delta region, there was an absence of 12-digit hydrologic units. Using LiDAR data, the Watershed Boundary Dataset (WBD) steward for Mississippi added these drainage areas.

North Carolina: North Carolina continues holding meetings to discuss NHD stewardship but so far an official steward has proven elusive. In the past, North Carolina pursued three projects in support of providing local resolution hydrography to the national NHD database. A grant funded, Urban-Local Resolution Assessment and Demonstration Project was completed, but the final technical report is pending delivery. In 2005, the North Carolina General Assembly provided \$2.6M in funding to generate local resolution hydrography for a nineteen county region in western North Carolina; production was completed in 2007. In 2014, staff with the North Carolina Center for Geographic Information and Analysis (CGIA) worked with the USGS to integrate seventeen watersheds into the NHD. This represented a 114% increase in stream miles and a 402% increase in the number of NHDFlowline features as compared to the original high resolution data for the state.

Network Improvement Project Status by David Kraemer

This month the Network Improvement project has completed the initial phase for Hydrologic Regions 05 and 08. Region 19 (Alaska) will be the final initial phase Region in work. It is being edited in preparation for image analysis improvements. Hydrologic Regions 01 and 18 were completed for the double-check phase. The double-check phase is correcting any additional errors that would prevent the creation of the NHDPlus. Currently in work for double check edits are Regions: 05, 09, 13, 14, 15, 16, 21, and 22. This will be followed by Region 10 (Missouri River). Region 06 was completed for errors found during NHDPlus QA/QC checks.

Most pre-staged model 2.2 NHD file geodatabase Sub-Regions are available with late-July, 2014 dates. Any Network Improvement edits to the NHD geodatabase after those dates are only available through custom extract requests.

Initial Network Improvement Regions Completed: 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, and 22.

Double Check Network Improvement Regions Completed: 01, 02, 06, 07, 12, 18, and 20.

The Network Value Added Attribute of the Month

Do you know your VAA's? This NHD Newsletter article is the seventh in a series to describe each of the Network Value Added Attributes. The flow network embedded in the NHD is what gives NHD its analytic power. The Network VAA's boost this power by pre-calculating a number of network characteristics to make network analysis richer and easier to exploit. This month will examine LevelPathID.

All of the VAA's discussed thus far have dealt with hydrologic sequence number, HydroSeq, described in the February 2014 NHD Newsletter. Another HydroSeq attribute is LevelPathID. This is simply the hydrologic sequence number of the furthest downstream NHDFlowline feature on the existing level path. More detail will be provided on the level path in the future. For now think of a tributary to the Mississippi River such as the Ohio River. The Ohio River is a separate level path from the Mississippi River. If the furthest downstream flowline on the Ohio is HydroSeq=48, then every flowline on the Ohio will have a LevelPathID of 48. This is a handy way of knowing the level path terminus of any flowline on the Ohio. The same principle applies through the rest of the NHD.

NHD Photo of the Month

This month's photo was submitted by Becci Anderson, the USGS Geospatial Liaison to Alaska. It's the Matanuska Glacier in south central Alaska. The photo was taken from her car as she drove past on the Glenn Highway on a recent trip (Wikipedia has a good view of the entire glacier: http://en.wikipedia.org/wiki/Matanuska_Glacier). The glacier feeds the Matanuska River, a large, highly active river studied by hydrologists at the USGS Alaska Science Center (<http://ak.water.usgs.gov/MatSu/mrbe/index.php>). This and other glaciers in Alaska are being updated in the NHD using data from the Randolph Glacier Inventory (<http://www.glims.org/RGI/>). Overview map: http://ak.water.usgs.gov/MatSu/mrbe/data_pubs.php See <ftp://nhdftp.usgs.gov/Hydro/Images/MatanuskaGlacier.jpg>. Submit your photo for the NHD Photo of the Month by sending it to jdsimley@usgs.gov.

July Hydrography Quiz / New August Quiz

Linda Davis of the Idaho Division of Water Resources was the first to guess the July NHD Quiz as the South Basin of Puget Sound in Washington. It includes Nisqually Reach, Eld Inlet, Henderson Inlet, Budd Inlet, Totten Inlet, McNeil Island, and Anderson Island. See <ftp://nhdftp.usgs.gov/Quiz/Hydrography108.jpg> Linda is the GIS manager for the Idaho Department of Water Resources. She has worked for the state of Idaho since June 1989 and have been working with hydrography almost that long as well. Linda worked with other Northwest states on the 1:100,000-scale pacific northwest hydrography in the early 90's and then moved to NHD when that became available.

Others with the correct answer (in order received) were: Gerry Daumiller, Mike Wiedmer, David Hockman-Wert, Laurie Morgan, Tom Denslinger, Dave Straub, Al Rea, Richard Patton, Matt Rehwald, Roger Barlow, Danniell Button, Tom Carlson, John Kosovich, Becca Conklin, John Griffin, Ron Wencl, Susan Buto, Dennis Dempsey, Bernie Sroka, and Evan Hammer.

This month's hydrography quiz can be found at <ftp://nhdftp.usgs.gov/Quiz/Hydrography109.jpg>. This lake is located in the hydrologic subregion (4-digit HUC) with more features in it than any other subregion in the U.S. except 1904 in Alaska. This is obviously a dammed lake. It's in a part of the country where there are not too many large lakes. If you can find the subregion you are well on your way to finding the lake. Where is this? Send your guess to jdsimley@usgs.gov.

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.

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