

USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

Hydrologic Generalization and Visibility Field by Ellen Finelli, Larry Stanislawski, and Andrew Stauffer.

A proposed NHD Model change includes a new Visibility attribute with coded values that identify feature significance for eight scale ranges. The new Visibility field within the NHDFlowline, NHDLine, NHDArea, and NHDWaterbody supports identifying the target scale-of-use ranges of: Multi-Resolution (default); less than 1:24,000; 1:24,000–1:99,999; 1:100,000–1:249,999; 1:250,000–1:499,999; 1:500,000–1:999,999; 1:1,000,000–1:1,999,999; 1:2,000,000–1:4,999,999; and Greater than 1:5,000,000.

The Visibility value is derived from a series batch scripts written by the USGS, which apply the “Carto Generalization” tools to enrich and prune data using partitions and target density values derived from the “Hydro Generalization” component. The USGS briefed the NHD Advisory Team on September 22 on both the Hydro- and Carto-Generalization methods to prune high-resolution NHD in a hydrological consistent manner to 1:24,000 and smaller scales by estimating 24K target density with a weighted flow accumulation model. The NHD Advisory Team consisting of a group of 110 users will consider the proposal and provide feedback.

All users are welcome to download and review the [Region 1 Generalization Pilot](#) data and provide comments to Ellen Finelli elfinelli@usgs.gov by October 16th, 2015. Pilot data include the new Visibility value (which identifies the smallest applicable mapping scale range for each feature), and are generalized (pruned only) without any simplification (reduction of vertices).

Upcoming NHD Schema Updates by Kevin McNinch

The upcoming National Hydrography Dataset schema 2.2.1, a minor update of the NHD 2.1 schema, is being prepared for an anticipated fall 2015 release by USGS. The schema changes include:

- 1) Adding new attributes to NHDFlowline feature class
 - i) InNetwork → YesNo Domain
 - ii) MainPath → MainPath (domain) [see #2]
- 2) Creating new coded-value domain MainPath. Coded Values:
 - i) 0 Unspecified [default value]
 - ii) 1 Confluence Main
 - iii) 2 Divergence Main
 - iv) 3 Both Confluence and Divergence

These two new attributes are being added to support the generation of High Resolution NHDPlus (HR NHDPlus). A new schema that includes the official model for the HR NHDPlus is still being developed and will follow after the release of NHD 2.2.1.

USGS NGTOC is currently testing the NHD 2.2.1 schema for compatibility with existing tools, process, and applications. NHD 2.2.1 will be released as soon as testing and validation is complete. A sample test geodatabase schema for NHD 2.2.1 will be made available soon on the [Hydrographic Data Community website \(https://my.usgs.gov/confluence/pages/viewpage.action?pageId=234913870\)](#).

How Far Did Those Salmon Swim? by Al Rea

Here's a question that came in: Someone saw salmon spawning at the confluence of Colt Killed Creek and Big Flat Creek in Idaho. How far did those salmon swim upstream from the Pacific Ocean? Here's how I answered the question:

One of the "Value Added Attributes" (VAAs) that are part of the NHDPlus is called Pathlength. Pathlength is the "Distance to the terminal NHDFlowline feature downstream along the main path, in kilometers". In streams that eventually flow to the ocean, this gives us the distance to the ocean.

I made an ArcGIS Online web map with the NHDPlus Version 2 (1:100,000-scale) using some new map services we are testing out for the Open Water Data Initiative (OWDI), which I described in last month's newsletter. Let's use that web map to find the answer:

1. Open this map in a web browser: <http://arcg.is/1EIL4bP>
2. In the Search box in the upper right, type in "Colt Killed Creek", and click on "Colt Killed Creek, Idaho, United States" when it pops up. Zoom in on the search result till you can see the stream names clearly. (It might help to switch the Basemap to Light Gray Canvas.) Find the confluence with Big Flat Creek, about 11-12 miles southeast of where the search result shows the outlet of Colt Killed Creek.

By default the web map only shows a few of the many NHDPlus attributes, so you need to modify it to turn on the Pathlength attribute. Click "Modify map" in the upper right of the browser window.

See ftp://rockyftp.cr.usgs.gov/outgoing/NHD/Rea_Figure_1.jpg.

1. On the left panel, Click the Content tab between "About" and "Legend", and click the arrow next to "NHDPlus V2.1" to see several layers. Hover your mouse over "Network Flowline" and click three blue dots:
2. Choose "Configure Popup", then click on Configure Attributes under the list of field attributes.
3. Scroll down the attributes box and check on the box for Pathlength. Hit OK, and then at the bottom left of page, Save Popup.
4. Then, if you click on Colt Killed Creek just above its confluence with Big Flat Creek, a box will pop-up with "Network Flowline: Colt Killed Creek" and give a pathlength of 1027 km to the terminus of the flow path, which in this case is the Pacific Ocean. (It is easier to get the results if you uncheck the box by the "Catchment" layer, to turn it off, so that only the Network Flowline layer shows up in the resulting popup.) Your result will look something like this:

See ftp://rockyftp.cr.usgs.gov/outgoing/NHD/Rea_Figure_2.jpg

So, after converting to miles, we see that those fish travelled around 638 stream miles upstream from the ocean. Aren't salmon amazing creatures?

All the other "VAAs" in the NHDPlus Version 2 are available in this web map, and you can use the technique described above to find them easily for any stream in the conterminous US, Hawaii, or Puerto Rico. You can look back at editions of this newsletter from February 2014 through April 2015 (see http://nhd.usgs.gov/newsletter_list.html) for descriptions of other VAAs, and explore them using this web map. If you have an ArcGIS Online account, you can log in and save this map to your own area and customize it however you like. Have fun exploring!

Hydrography Program Software Upgrades Completed by Paul Kimsey

The USGS has made upgrades to servers, services, tools, utilities and add-on's that are now available to the user community. NHD and WBD editors can now install ArcGIS 10.2.2 and complimentary editing tools/utilities and checkout ArcGIS 10.1 jobs from the new stewardship website. USGS appreciates the patience of its users in waiting for this major effort to be completed. The USGS anticipates that the next

upgrades will once again start at the beginning of calendar year 2016. For tool/utility/add-on specifics please see below:

Tool	Version	Windows 7, ArcGIS 10.2.2, NHD Model 2.2, WBD Model 2.2	Format	Db Server/ Services/Replica Version	Product Owner
NHD Update	6.2.0.35	x	Fgdb	10.1	Hank Nelson
GeoConflation	2.1.0.16	x	Fgdb	10.1	David Anderson
NHDFlowChecker	2.1.0.1	x	Fgdb	10.1	David Anderson
NHD Utilities	2.0.1.1	x	Pgdb/Fgdb	10.1	David Anderson
HEM	2.7.2	x	Pgdb/Fgdb	10.1	Mike Tinker
WBD Editor	2.2.0.22	x	Fgdb	10.1	Kim Jones
WBD Add-On's	2.2.0.22	x	Fgdb	10.1	Kim Jones
Compare tool	2.0.0.1	x	Pgdb/Fgdb	10.1	Laurie Temple
Metadata Viewer	1.0.0.5	x	Pgdb/Fgdb	10.1	Mike Tinker

All Tools/Utilities/Add-On's listed above are developed for 64 bit compatibility. The Tools/Utilities/Add-On's may operate on 32 bit systems but are not supported as such and have not been tested as such.

NHD Update Tool User Guide and Quality Control Checks Error Documentation by Dave Arnold

Since the NHD Update tool was released several years ago, there has been a lack of documentation describing the errors generated by the tool's quality control checks and the resolution to those errors. Over the last couple of tool versions, additional quality control checks have been added and the organization of these has been rearranged within the tool's graphic user interface. Over the last six months a concerted effort was made to document all errors that could potentially be generated by each of the quality control check categories including the Invalid Geometry Checks, Spatial Checks, Database Integrity Checks, Flow Checks, Back Flow Checks, Check for Pseudo Nodes and Check for Spatial Vertical Relationships. For each of these groups an overview page was created. Each overview page contains the check's name, what will appear in the Data Reviewer table Notes and ReviewStatus columns, whether the error is severity 1 and must be fixed or is severity 3 and is an optional fix and finally, the options the user has for entries in the VerificationStatus column. Most quality control check errors now have a document that explains how to fix the error and these are accessible from a hyperlink associated with the check's name on the overview page. Once a user has linked to an individual error page, they will be presented with an explanation of why the error exists and below that, they will be walked through at least one and sometimes more methods for fixing the error.

There are around 95 individual errors that the quality control checks can return, with around 65 of these errors now being documented. The reason for the lapse in coverage is because not all errors can be reproduced intentionally. For instance, the Flow Checks happen in a three part process beginning with the NHDFlow table being built, followed by the NHDFlow table build being verified for accuracy, and ending with checking the NHDFlow table against the NHDFlowline features for errors. We can replicate the last step of this process and document the errors, but if the NHDFlow table builds properly, it will also be verified as accurate, which means we cannot document the errors that would be found if the NHDFlow table was to not be built properly. In the natural course of editing, these errors do occasionally occur and for that reason, we implore you to submit these as a problem job so that we can document these errors for other users. We hope these new documents improve your editing experience.

If you find incorrect information while using the NHD Update tool user guide, have suggestions for a better way to fix an error, find an error that doesn't exist in the documentation and want to help us add it, or if you have other things you would like to see in the documentation please contact Dave Arnold at darnold@usgs.gov or by phone at 573-308-3533.

NHD Status in Region Three, Part 3 by Joel Skalet

The National Hydrography Dataset (NHD) Stewardship Region 3 consists of 17 states including Minnesota, Iowa, Wisconsin, Illinois, Indiana, Michigan, Ohio, Kentucky, Pennsylvania, New York, New Jersey, Massachusetts, Rhode Island, Connecticut, Vermont, New Hampshire, and Maine. Also there are several U.S. Forest Service sub-stewardship activities occurring in many of the states. Many different forms of stewardship exist in this region and more information will come in future newsletters. Information here has been provided mostly by individual State Stewards.

New Jersey:

The New Jersey Dept. of Environmental Protection (NJDEP) produced the statewide 1:2,400-scale NHD over 5 years ago from 2002 1-foot orthoimagery. This remains the only state in the country with 1:2,400-scale NHD statewide. The Maryland Dept. of the Environment will embark on a 1:2,400-scale NHD pilot this summer, with the intention of expanding this coverage statewide. NJDEP will be performing a statewide review of the 1:2,400-scale NHD this summer and fall using the 2012 1-foot leaf-off orthoimagery, existing lidar (mostly QL3), and the NJDEP produced 2012 Land Use Land Cover map.

The NJ Water Science Center continues to investigate extending 1:2,400-scale head-water streams derived from QL3 lidar using a software called BOTHAT.

Richard Stockton College is using QL3 topographic lidar (2011) and 2012 EAARL-B topo/bathymetric lidar to determine shoreline using the National Geodetic Survey (NGS) V-Datum software at 1:2,400-scale. This pilot work will be in Barnegat Bay, and is taking place now (March 2015). Resulting shoreline(s) will be submitted to the NGS Continually Updated Shoreline Product (CUSP) for approval. CUSP is used for US Topo shoreline source.

Pennsylvania:

The NHD is used widely in Pennsylvania. The Department of Environmental Protection, The Commonwealth of Pennsylvania relies heavily on the NHD for Environmental monitoring and regulation of activities associated with water.

There has been a strong desire by interested parties for a LIDAR based Local resolution version of the NHD like New Jersey and others states have. There seems to be resistance to fund further NHD related development within the government in Pennsylvania. People have proposed generating a LIDAR based NHD in PA in the past and were unsuccessful at getting support for the idea.

New York:

Over several years, the New York State Department of Environmental Conservation completed a targeted update of stream geometry for most subbasins within the State. A few subbasins, primarily the Atlantic coastal subbasins, are still in need of geometry updates. The NHD is currently integrated into the workflows of several Department programs including links to water quality data, cartographic output, and modeling applications. Currently very limited resources are available for stewardship activities, but staff are able to stay current on national stewardship activities and respond to limited requests for error corrections or updates of specific features, as well as supporting Department applications.

The New York City Department of Environmental Protection sponsored an update of all hydrography within the City's 1,900 square mile water supply watershed using hydrography extraction from LiDAR techniques. This work was completed in 2012 using 2009 LiDAR. The City uses this data for watershed management activities to protect water quality within the watershed, including linking to management data and modeling applications. The watershed supplies more than 1 billion gallons of water per day to approximately 9 million people (New York City Department of Environmental Protection).

Massachusetts:

Within the Massachusetts Department of Environmental Protection there has been an increased resolution of hydrography and watershed boundaries in public-water supply areas. They are also coordinating with Rhode Island to conflate streams to local resolution in the Blackstone River Basin.

NHD Network Improvement Project September 2015 Status Report by Cynthia Ritmiller

Initial Phase Network Improvement – Remaining

Region 19 (Alaska) is being completed as part of the Hydrographic Image Update project using the 2012 Horizon Systems QA/QC check results.

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 Phase Network Improvement- Status

- Region 01 - Sub-regions 0101-0109 were sent to Horizon systems and are being processed in the creation of HiRes NHDPlus. The one remaining sub-region 0110 will be sent to Horizon Systems soon.
- Region 02 - New pre-staged Sub-Regions were received and QA/QC checks were run. Any edits will be completed before the region is sent to Horizon Systems for the creation of HiRes NHDPlus.
- Region 03 - Three sub-basins need to be reviewed and may need edits. Sub-regions include 0309 and 0311. Will complete these edits working with our partners schedules.
- Region 04 - New pre-staged Sub-Regions were received and QA/QC checks were run. Completing edits.
- Region 05 - New pre-staged Sub-Regions were received. QAQC checks have been run for some HUC4's. The remaining HUC4's will be run in October and editors will be assigned to review. POC's have already been contacted.
- Region 06 - The entire region (Sub-regions 0601, 0602, 0603, and 0604) was sent to Horizon Systems in August for the creation of HiRes NHDPlus.
- Region 07 - New pre-staged Sub-Regions were received. QAQC checks will be run in October and editors will be assigned to review. POC's have already been contacted.
- Region 08 - Completing double checks within this region. Edits in 08030204 remain. Sub-regions 0808, 0809 need QAQC checks run.
- Region 09 - completed double check phase. As new data become available it will go through QA/QC check process again.
- Region 10 - New pre-staged Sub-Regions were received. QAQC checks have been run for some HUC4's. The remaining HUC4's will be run in October and editors will be assigned to review. POC's have already been contacted.
- Region 11 - Completing double checks within this region. Edits remain in sub-region 1102, 1103, and 1107.

- Region 12 - New pre-staged Sub-Regions were received. QA/QC checks were run. Any edits will be completed before the region is sent to Horizon Systems for the creation of HiRes NHDPlus.
- Region 13 - New pre-staged Sub-Regions were received. QA/QC checks will be run in October and editors will be assigned to review. POC's have already been contacted.
- Region 14 - New pre-staged Sub-Regions were received. QA/QC checks were run. Edits will be completed before the region is sent to Horizon Systems for the creation of HiRes NHDPlus.
- Region 15 - Completing edits. As new data become available it will go through QA/QC check process again.
- Region 16 - Completed double checks for this region in January. As new data become available it will go through QA/QC check process.
- Region 17 - QA/QC checks have been run and completing the edits (subregions 1701, 1705, and 1707 remain).
- Region 18 - Completed double check phase. As new data become available it will go through QA/QC check process.
- Region 19 (Alaska) - Initial Phase Network Improvement in progress see above.
- Region 20 - Completed double check phase
- Region 21 - Completed double check phase
- Region 22 (Pacific Islands) - Subregions 2201, 2202 and 2203 were given to Horizon Systems April 1st 2015 to begin producing HiRes NHDPlus.

Note: Regions will be edited as per the NHDPlus contract schedule. Before starting a Region the area POC will be contacted.

NHD Quality Control Errors and How to Resolve Those Errors by Bill Smith

Many NHD editors are reporting issues resolving particular errors that are showing up frequently in their Quality Control (QC) error reporting 'Data Reviewer' tables. In some cases, editors are asking why these errors are just now showing up in the QC process. This is a second in a series that takes errors that are appearing on a regular basis, discuss the errors, explain why the errors are showing up, and provide guidance on how to resolve these errors. In the next few issues of the NHD Newsletter, problem jobs submitted to USGS for review will be studied, and prevalent errors will be discussed.

- Error: Missing Related Metadata Record
- QC Check: Database Integrity Checks (Feature-to-Metadata):
- NOTES Description: Feature does not have an associated record in the NHDFeatureToMetadata table (FeatureToMetadataValidation)
- REVIEWSTATUS Description: Missing related metadata record in FeatureToMetadata table linking to new metadata table.
- Severity: 1
- Description of Error: The error is indicating an NHD feature has been edited in the current editing session, but an appropriate record tying this edit to the current NHDMetadata session does not exist in the NHDFeatureToMetadata table.
- Why are we now seeing this error? For some reason (typically someone editing outside of the NHD Update Tool process) a feature has been detected in your 'ESRI Replica Change' table and is not recognized as being modified in your 'Edit History' file. This means the particular edit does not appear to be tied to your current NHDMetadata sessions Meta_ProcessID in the NHDFeatureToMetadata table.

Error Resolution:

The resolution for this error is to create a new Metadata session and tie the offending edit to the new Metadata session in the NHDFeatureToMetadata table. In your ArcMap editing session, select the offending feature or features by highlighting all records in the Reviewer table with this error in blue, hover your cursor over any of the blue highlighted records, right mouse click, and select 'Select Feature Geometry' from the dropdown menu. Verify you have the appropriate number of features selected. Now select the 'Utilities' tab, then select 'Tag Untracked Edit(s)' from the dropdown menu. In the 'Assign Metadata' dialog window, set the 'specify an NHD Layer' to the appropriate feature class. Under 'specify a metadata session', select '[Create New Metadata Session...]' from the dropdown menu. Add all required information to the blank Metadata Session in the 'Metadata Viewer' window, and save the new Metadata session. Select the 'OK' button in the 'Assign Metadata' dialog window. Finally, open the NHDFeatureToMetadata table, move to the end of the table, and verify you have added the appropriate number of records to the NHDFeatureToMetadata table. Remember to go back to your Reviewer table and mark the error record as 'Resolved'.

Vacancy Announcement - NHD Applied Researcher

Below is the direct link to the Interdisciplinary Cartographer/Geographer, GS-0150/1370-12/13 position. This vacancy opens 10-5-2015, closes 10-16-2015 and is open to all current / former Federal employees government wide.

ATL-2015-1341 - MP

<https://www.usajobs.gov/GetJob/ViewDetails/417443300>

The National Hydrography Dataset (NHD) Applied Researcher is focused on several activities in support of the U.S. Geological Survey's (USGS) National Geospatial Program. The primary activities include promoting data integration between the NHD and other USGS data layers; developing policy recommendations for USGS senior management regarding data collection, derived data products, and the integration of hydrography and elevation; and consulting with other scientists in external agencies on issues of geospatial conflation and generalization. The NHD Applied Researcher works to enhance and improve consistency of data resolution and accuracy across NHD and other data themes. The NHD Applied Researcher also works on planning and formulating long-range plans and programs in leading regional and national science NHD/Watershed Boundary Dataset efforts to define and promote opportunities for additional traditional and web-based mapping applications.

Who may apply: Current/former Federal employees with competitive status or eligible under a special or noncompetitive appointing authority (severely disabled, eligible Pathways Intern within conversion period, former Intern noncompetitively converted to a term appointment, Returning Peace Corps Volunteer, etc.). Veterans who are preference eligible or have been separated from the armed forces under honorable conditions after approximately 3 years or more of continuous active service.

NHD Photo of the Month

This month's photo is Peru Creek in the Blue River subbasin (14010002) located high in the Rocky Mountains of Colorado. The headwaters of the creek start at 12,500 feet and the location of the photo is 11,000 feet. Although the water is very clear, the rocks lining the creek are distinctly red due to heavy metals entering the creek from the abandoned Pennsylvania Mine upstream. The photo was taken by Jeff Simley of the USGS. See ftp://rockyftp.cr.usgs.gov/outgoing/NHD/Peru_Creek.JPG. Submit your photo for the NHD Photo of the Month by sending it to jdsimley@usgs.gov.

August Hydrography Quiz / New September Quiz

John Kosovich of the USGS was the first to correctly guess the August NHD quiz as the Trinity River in Texas flowing down into Galveston Bay. See <ftp://nhdftp.usgs.gov/Quiz/Hydrography121.jpg>

John is a Physical Scientist who works in Lakewood, Colorado, for the USGS Core Science Analytics, Synthesis, and Libraries (CSASL) group, whose mission is to accelerate research and decision-making through data science, information delivery, advanced computing, and biodiversity analytics. CSASL provides high performance computing support to many USGS and external scientists and modelers, produces and maintains a national biodiversity hub that integrates species occurrence, habitat, taxonomy, and range data for terrestrial, freshwater, and marine life, and advances science data lifecycle practices and principles through partnership communities. Examples of CSASL programs and products are GAP Analysis, the National Fish Habitat Partnership, the ScienceBase Catalog (<https://www.sciencebase.gov/catalog/>), and the Community for Data Integration. John applies his lengthy background in GIS, topographic mapping, and lidar to help support these activities. Interestingly, he is a native of rural Colorado who as a young "volunteer" for science ("I didn't really have a say in the matter...") helped his father operate a remote USGS seismograph station by developing 35mm film strips of seismic traces and sending them to the Golden Earthquake Center several hundred miles away - so his destiny with USGS was a no-brainer.

Others with the correct answer (in order received) were: Gerry Daumiller, Evan Hammer, Matt Rehwald, Daniel Button, Ron Wencl, David Straub, and Janet Brewster.

This month's hydrography quiz can be found at <ftp://rockyftp.cr.usgs.gov/outgoing/NHD/Hydrography122.jpg>. This is an important river in the Midwest. It is a level 2 river formed at the confluence of two level 3 rivers at the top, and drains into a major level 1 river at the bottom. The surrounding hydrography is that of a HU2. What is the river in red? 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.

Thanks to Ellen Finelli, Larry Stanislawski, Andrew Stauffer, Kevin McNinch, Al Rea, Paul Kimsey, Dave Arnold, Cynthia Ritmiller, and Bill Smith.

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.