

USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

Hydrography Seminar Series

On May 21st about 150 people joined together for a webinar featuring Ed Clark of NOAA speaking on the National Flood Interoperability Experiment. This was the second in a series of webinars on hydrography to be presented by the USGS about once every six weeks. The series is designed to provide information about how the NHD, NHDPlus, and WBD work, and features speakers from a variety of disciplines on how the data is applied to solving problems in the management of water resources in the U.S. The National Flood Interoperability Experiment (NFIE) is a one-year collaboration, from September 2014 to August 2015, between the National Weather Service and its government partners, and the academic community and commercial partners, that is designed to demonstrate a transformational suite of science and services for the next generation of national flood hydrology and emergency response. Its intent is to better connect, in both directions, the flow of information among the federal, state and local entities responsible for measurement, forecasting and planning for floods, with the corresponding entities in the emergency response community. See <http://nhd.usgs.gov/HydrographySeminarSeries.html>. A recording of the webinar will become available.

The next seminar at 2:00 PM ET, Thursday, July 30th, will feature Anita Stohr of the Washington State Department of Ecology. Washington State adopted the NHD as its standard hydrography dataset in January 2011. Since that time the state has focused on associating the highest priority water resources, human health, and fisheries datasets to the NHD, and providing access to a variety of users. More information about the seminar will be provided in the next NHD Newsletter.

April 2015 Status Report for NHD Network Improvement Project by Cynthia Ritmiller

This is a regular installment in the monthly NHD Newsletter to keep NHD users apprised on the status of NHD data run through what is known as the Network Improvement project. Read more about what's involved in "Network Improvement" in the following articles.

Initial Phase Network Improvement – Remaining

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

Initial Network Improvement Regions Completed: All Regions except Region 19 (Alaska)

Double Check Phase Network Improvement- Status

- Region 01 - Clean up the few subbasins which have not passed the QC checks. Most of the work is in sub-regions 0105 and 0108. New pre-staged Sub-Regions were received and QC checks were run.
- Region 02 - Completing edits on sub-regions 0203, 0204, and 0208. These edits should be complete within the next few weeks.
- Region 03 - Sub-regions 0308-0318 have been through QC checks. Will complete these edits working with partner schedules.
- Region 04 - Completed double check phase in April.
- Region 05 - Waiting to review one sub-basin within sub-region 0514.
- Region 06 - These sub-regions will be sent to Horizon Systems for the creation of HiRes NHDPlus.

- Region 07 - Completed double check phase. As new data become available it will go through QC check process again.
- Region 08 - Completing double checks within this region.
- Region 09 - Completed double check phase in September
- Region 10 - Completing double checks with only a one sub-basin remaining.
- Region 11 - Completing double checks only sub-region 1114 remains.
- Region 12 - QC checks were completed in April. The data will be sent to Horizon Systems for the production of HiRes NHDPlus within the next couple months.
- Region 13 - Complete double check phase in July
- Region 14 - QC checks were run.
- Region 15 - New pre-staged Sub-Regions were received and QC checks were run.
- Region 16 - Completed double checks for this region.
- Region 17 - QC checks have been run and then subbasins will be ready to assign. Point of Contact's in the area were notified April 8th, 2015.
- Region 18 - Completed double check phase. As new data become available it will go through QC check process again.
- Region 19 (Alaska) - Initial Phase Network Improvement in progress see above.
- Region 20 - Completed double check phase in August
- Region 21 - Completed double check phase in August
- Region 22 (Pacific Islands)- Subregions 2201, 2202 and 2203 were given to Horizon Systems April 1st to begin producing HiRes NHDPlus.

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

Quality Control of the NHD in preparation for NHDPlus by Cynthia Ritmiller, Steve Howard, and Jeff Simley

The National Hydrography Dataset must be examined to ensure that it meets rigorous standards for quality. Quality in this case is defined by the suitability of the NHD in an automated analytical model that must navigate the network. There are a number of workflows for achieving quality standards, but they each contain the same basic elements. For the purpose of illustration this article will follow the Network Improvement program process. All NHD data will go through this process, which is based on the requirements for producing the NHDPlus. The NHDPlus process demands that water can flow through the network in a fully automated logical sequence. Anything that prevents that from happening must be resolved.

1. The HUC-4 Process. This process begins the Network Improvement program by selecting a HUC-4 subset of the NHD.
 1. The data is processed through what is known as the "EPA QA-QC Tools". It is so named because it uses code from the EPA. This is a sequence of 34 checks (see article below) to analyze the flow network and is divided into two groupings.
 1. An edit queue is produced identifying specific features requiring attention as determined by policy inputs. The queue is examined to confirm that actions must take place.
 2. 10 checks must be processed, but don't require action.
 3. 24 checks must be processed, and one of two actions are produced:
 1. Data passes

1. Perform Event (*NHDPointEventFC*) synchronization as necessary
2. Data forwarded to NHDPlus process.
2. Data does not pass
 1. Determine which HUC-8 the error is in.
 2. Go to “2”, the HUC-8 process.
2. The HUC-8 process. This process addresses HUC-8 subsets of the NHD.
 1. The process is guided by the queue generated in 1.1.1
 2. The data is processed through what is known as “Quality Control Checks”. This uses code produced by the USGS. This is a sequence of 9 checks (see article below).
 1. Results are produced and actions are determined by policy inputs. One of three actions takes place.
 1. Data passes.
 2. Severity 1 errors. Must be fixed. Go to NHD Update tool 2.2.2.
 3. Severity 3 errors. Determine what to fix.
 1. Does not need to be fixed.
 2. Does need to be fixed. Go to 2.3
 2. NHD Update tool for fixing data. Go to 2.4 or 2.5 as required.
 3. The results from the queue generated in 1.1.3.2 are examined.
 1. Use the NHD Update tool for fixing data. Go to 2.4 or 2.5 as required.
 4. NHD Utilities. This can perform 3 operations on the data.
 5. The data is processed through what is known as “Final QC Checks”. This uses code produced by the USGS. It processes the same 9 checks as Quality Control Checks, plus additional checks.
 1. Results are produced. One of three actions takes place.
 1. Data passes
 1. Check-in to NHD
 2. Severity 1 errors. Must be fixed. Go to NHD Update tool 2.2.2.
 3. Severity 3 errors. Determine what to fix.
 1. Does not need to be fixed.
 2. Does need to be fixed. Go to NHD Update tool 2.2.2
 3. Go to HUC-4 process 1

NHD Quality Control Checks by Cynthia Ritmiller and Cindy McKay

You have been reading about the Network Improvement program in the NHD Newsletter for a couple of years. This is being done to ensure the NHD can be processed into NHDPlus. It’s a daunting task that must be run on many millions of features. The following checks, listed in sequential order, will give you an idea of what is being checked. The first list of 24 checks is known as “Severity 1” checks and refers to part 1.1.3 in the article above. These are checks that must be tested and resolved. The second list of 10 checks is known as “Severity 3” checks and refers to part 1.1.2 in the article above. These must be processed, but don’t need to be resolved. The third list is known as the Quality Control Checks, which refers to part 2.2 in the article above.

Severity “1”

- Check 1 – Flow table never navigated.
- Check 2 – *Improper network end.
- Check 3 – *Invalid flow table entry.
- Check 4 – *Improper network start.

- Check 26 – *Flowline with both flowing and non-flowing flow table entries.
- Check 5 – Potential loop.
- Check 8 – *Duplicate flow table entry.
- Check 9 – *Incomplete divergence.
- Check 10 – *Flow table and feature type disagree.
- Check 11 – *Flow table and flowline flow direction disagree.
- Check 12 – Isolated network postdating 2012.
- Check 13 – *Coordinate order and flow table disagree.
- Check 25 – Nonlinear named path.
- Check 17 – Flowline not in linear reach.
- Check 19 – Non-linear reach.
- Check 24 – Non-linear flowline.
- Check 21 – Flowline with length equal to zero.
- Check 22 – Reachable waterbody not in Area reach.
- Check 27 – Waterbody reach has multiple waterbodies that do not touch.
- Check 29 – Duplicate NHDFlowline features.
- Check 32 – Reach surrounded by multiple HUC's.
- Check 33 – Coastline dangles.
- Check 28 – Microgaps.
- Check 34 – Measure problem (M-Values).

Severity “3”

- Check 14 – *Flowlines relate in flow table, but do not touch.
- Check 15 – *Flowlines touch, but do not relate in flow table (not Canal/Ditch).
- Check 16 – Flowing connections and elevations disagree.
- Check 23 – Circular named path.
- Check 6 – Possible outflowing connection.
- Check 7 – Possible inflowing connection.
- Check 18 – Circular reach.
- Check 20 – Circular flowline.
- Check 30 – Duplicate NHDWaterbody features.
- Check 31 – Duplicate NHDArea features.

* - Only at issue when the flow table (NHDFlow) has potential errors from manual edits.

Quality Control Checks

- Invalid geometry
- Spatial checks
- Database integrity
- Feature-to-feature rules (artificial paths)
- Feature-to-feature rules (Area)
- Feature-to-feature rules (Flowline)
- Feature-to-feature rules (Waterbody)
- Flow checks
- Backflow checks

NHD Photo of the Month

This month's photo is Deluge Creek in the Gore Range of Colorado and was taken by Jeff Simley in August, 2012. See ftp://nhdftp.usgs.gov/Hydro_Images/Deluge_Creek.JPG. According to StreamStats, the estimated flow at this point for August, when the photo was taken, is 1.12 cubic feet per second. In the opinion of the photographer, that makes perfect sense. The StreamStats estimated June flow is 7.84 cubic feet per second, when there is massive snowmelt runoff from this basin over 11,000 feet in altitude. According to the NHDPlus V2.1 this stream segment has an estimated mean annual flow of 3.534 cubic feet per second. In the photographer's opinion that too makes perfect sense. Submit your photo for the NHD Photo of the Month by sending it to jdsimley@usgs.gov.

April Hydrography Quiz / New May Quiz

Linda Davis was the first to correctly guess the April NHD quiz as the Colorado River headwaters in Colorado. See <ftp://nhdftp.usgs.gov/Quiz/Hydrography117.jpg>. This was a tricky quiz because most people don't think of the Los Angeles water supply as coming from the Colorado River. Linda is with the Idaho Department of Water Resources and has been working with Hydrography since 1990. The Idaho Department of Water Resources is primarily responsible for water quantity. Water issues can be complicated in the west, and many counties are experiencing drought, so hydrography is an important layer. Linda says she has had the benefit of working with great people both in Idaho as well as across the nation. She likes the quizzes, but would need to know more to do well on the east coast hydrography questions.

Others with the correct answer (in order received) were: Evan Hammer, John Kosovich, Alex Pellet, and Matt Rehwald.

This month's hydrography quiz can be found at <ftp://nhdftp.usgs.gov/Quiz/Hydrography118.jpg>. This is a Watershed Boundary Dataset quiz for a change. The water flows from east to west and involves ten states. Where is it? Send your guess to jdsimley@usgs.gov.

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Thanks to Cynthia Ritmiller, Steve Howard, and Cindy McKay.

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.