

USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

NHD Management Team Meeting

Each year in December a team of principal stakeholders in the NHD program meets to provide strategic direction for the NHD, in conjunction with the WBD, for the year ahead and the years beyond that. The team members are Jeff Simley and Karen Hanson of the USGS, Tommy Dewald of the USEPA, Dan Wickwire of the BLM, Brian Sanborn of the USFS, Ricardo Lopez from New York, and Mark Olsen from Minnesota. This year the meeting started out with a review of the NHD program from the perspective of each of the agencies represented. These ideas were then used to produce a “report card” indicating the strengths and weaknesses of the program with the objective of continuous improvement by addressing issues to focus on in the year ahead. A review is also made of past report cards to assess the level of progress in the past year. Then the USGS production and development team is given a chance present their strategies for addressing the annual objectives. Attention then turned to Alaska, which is receiving special consideration because the hydrography coverage is very old. Assessments underway indicate that despite the sometime 60-year old source information, the NHD does a reasonable job of describing the current state of the surface water. However, a lot of improvements can be made.

The agenda then focused on the state of data stewardship, which has remained fairly flat the past two years. A review of the new maintenance update process gives hope that the much improved capabilities will allow stewardship to significantly grow in the next few years. The view ahead reveals that high resolution NHDPlus is going to be in demand by water scientists and so preparations are underway to move in this direction. A network improvement process currently underway will set the stage for running value added attributes to the NHD in fiscal year 2014. Strategies on the possibilities for high resolution NHDPlus and even hybrid concepts for NHDPlus were discussed and hold much promise. This was followed by discussions on generalization, which would be highly enabled by NHDPlus. Then attention turned to data editing ideas for the future with emphasis on basing editing tools on a web based platform. Other tools were discussed such as the hydrography event management tool and plans to web enable it. A discussion of tools required to support the NHD and WBD revealed that 18 different tool sets will be needed in the next few years to support the program. The next topic was on the increasingly important subject of water diversions, which are a key component in understanding water budgets, and essential to the water census of the U.S. Then the discussion turned to the support staffs at USGS to help customers implement The National Map in water science and management. In addition to the seven technical points of contact for NHD and WBD, an additional eight water liaisons will be designated to work with customers on NHD and WBD applications.

Next on the agenda was the important subject of LiDAR. There are high hopes for the ability of LiDAR to support new and much expanded hydrography coverage. However, experience has shown that a lot of development needs to take place before this can become economical. A discussion then looked at the possibilities for three-dimensional hydrography, particularly plausible with LiDAR. This then led to the “Ele-Hydro” concept of producing a high integrated elevation and hydrography dataset with several science enabling derivatives. The meeting then concluded with topics on data models and in particular the National Hydrologic Model. It was clear from the meeting that much has been accomplished by the NHD and WBD programs, and the path ahead is full of opportunity to drive water science and management to new heights.

NHD Update tool status by Paul Kimsey

Windows 7, ArcGIS 10.0 (v5.0.0)

Final testing in progress, anticipate a release by December 21st. Release notes will accompany the software download zip file.

Windows 7, ArcGIS 10.1 (v6.0.0)

Testing in progress, anticipate release by end of January. This version will have the same functionality as v5.0.0

November 2012 Status Report for NHD Network Improvements by David Kraemer

Monthly Status

There are four Regions completed for the Network Improvement project; Regions 9, 16, 17, and 18. The State of Minnesota made a request in mid-August to have the entire state reviewed and edited for Network Improvements; which was completed this month. Regions 10 and 13 are being reviewed and edited by Charles Bowker; Region 11 is being reviewed and edited by Allen Karsh; and Region 14 is being reviewed and edited by David Kraemer. Regions 1, 4, and 7 were being reviewed and edited, but now have been put aside to do the Network Improvement project from west to east. All 22 Regions have been delivered by Horizon Systems. To expedite the Network Improvement project the Regions are being reviewed and edited in a west to east order.

Region Completion Percentages

01 – 24%	04 – 06%	07 – 42%	09 – 100%	10 – 95%	11 – 74%
13 – 47%	14 – 25%	16 – 100%	17 – 100%	18 – 100%	

Current Issues

- State partners are working in some areas that are not allowing completion of Regions: Nebraska and Missouri – Region 10; Oklahoma and Louisiana – Region 11; Utah – Region 14. As the partners complete their work then Network Improvement will go back into those areas.
- The Feature-to-Feature rules take 2-8 hours to run, but these checks are needed to find VAA errors and errors that were previously required to be fixed in Maintenance Lite. In the current tools these errors are a severity of 3. It would improve performance to have these checks run separately as severity 1.
- The latest NHD Tools became available on August 7, 2012. Final QC still cannot process jobs with high density networks, so the Network Improvement jobs are between 3-6 sub-basins. This is allowing the jobs to process, but is increasing the number of jobs to complete the project.
- The coastal areas have many high density sub-basins with many errors; so to expedite the Network Improvement project these Regions are being set aside until the rest of the United States is completed and the tools accept File Geodatabase files.

Background

This project was chartered on June 16, 2011. The scope of this project covers the complete high resolution NHD for all 50 states and U.S. territories; plus the sub-basins extending into Canada and Mexico. This project is to identify network problems based on Contractor delivered checks. These checks are delivered by NHD Regions and include:

- Identify where Hydrography feature names must follow most appropriate path in coordination with Geographic Names Information System practices.
- Identify that Canada and Mexico outflow and inflow connections are correct (not changing Canada and Mexico geometry unless coordinated with Canada and Mexico).
- Identify all disconnects in the high resolution NHD network.
- Identify logical Connections Not made

- Identify enclosed basins.
- Identify isolated network of flowlines with no logical connection.
- Identify water diversion network flow errors.
- Edit the high resolution NHD to resolve the network connection errors (with edits made in coordination with the POC and State stewards).
- Create appropriate metadata to document actions.

Notes

Sub-regions 0201 and 0111 have been migrated to sub-region 0415. Sub-region 1001 has been migrated to sub-region 0904.

High Resolution NHDPlus – The Possibilities Available Today - by Cindy McKay

The NHDPlus transforms the National Hydrography Dataset (NHD) from a 1-dimensional representation of streams into a full 3-dimensional representation of the surface water. It starts with the development of a fully quality assured flow table, and then incorporates the National Elevation Dataset (NED) with the Watershed Boundary Dataset (WBD). A rigorous process is used to match the NHD stream channels to the NED-defined channels and then builds “walls” with the WBD so that stream catchment boundaries will line up with WBD boundaries. This produces catchments for each stream segment (two-dimensional) and the NED-based catchment landscape (three-dimensional). With the QA’d network, the catchments can be aggregated to define the watershed for any point in the NHD. “Raindrop” tools can be used with the DEM to route down from any point in the landscape; the possibilities for watershed characterization and modeling are “wide open” in NHDPlus.

NHDPlus is the vertical and horizontal integration of the National Hydrography Dataset (NHD), the National Elevation Dataset (NED) or other DEM data, and the Watershed Boundary Dataset (WBD). But NHDPlus is much more than the integration of these datasets, NHDPlus provides the link between the landscape and the mapped stream network. The link is created through the NHDPlus Catchments, which are defined as the land area that drains to a single NHDFlowline feature. Once this link is established, a whole world of applications become not only possible, but feasible. For example:

- Watershed delineation from any point on the stream network.
- Watershed characterization using the many available landscape datasets – e.g. NLCD, STATSGO, Prism, etc.
- Stream flow estimates at ungaged locations.
- Computation of non-point source stream loads.
- Impact analysis for emergency spills, permitted discharges, and for proposed land development.
- Fate/Transport Dilution modeling.

Presently, the NHDPlus is available for 1:100,000-scale streams, 30 meter elevation, and the February 2012 version of WBD. This dataset is called NHDPlus Medium Resolution (NHDPlusMR). Version 1 (NHDPlusV1) of NHDPlusMR was introduced in 2006. NHDPlusMR Version 2 (NHDPlusV2) was recently released and includes many significant enhancements.

As a consequence of building NHDPlusV2, the program has taken giant steps forward toward the possibility of NHDPlus High Resolution (NHDPlusHR) using High Resolution NHD, 10 and 3 meter elevation and the most up-to-date WBD.

Why produce NHDPlusHR? Because it enables users to perform very detailed water resources management in ways that we have never been able to do before. Just the existence of NHDPlus data layers, means that water resource projects can save enormous time and money that previously went into building the project’s base data. And the inherent capabilities of NHDPlus like those listed above,

provide powerful analysis capability. The truth of these statements is established by the current NHDPlus applications that can now be counted in the hundreds. You can learn more about these applications at:

- NHDPlus Concepts and Applications, by Tommy Dewald (ftp://ftp.horizon-systems.com/NHDPlus/NHDPlusV21/Documentation/NHDPlusV2_Concepts_Appls_Dewald.pptx)
- USGS NHDPlus SPARROW Models, by Rich Moore (ftp://ftp.horizon-systems.com/NHDPlus/NHDPlusV21/Documentation/NHDPlusV2_SPARROW_Moore.pptx)
- The NHDPlus applications web page - <http://www.horizon-systems.com/NHDPlus/applications.php>

Because of the work on NHDPlusV2, the program is now poised to actually build NHDPlusHR, because there now exists:

1. Rigorous procedures and a group of tools for building (or refreshing) NHDPlus,
2. An accomplished team of NHDPlus experts,
3. A network of servers configured specifically for NHDPlus processing, and
4. A defined path toward NHDPlusHR stewardship where NHDPlusHR can be refreshed frequently as the NHD, WBD and NED are improved.

The NHDPlus Build/Refresh procedures and tools standardize much of the process of building NHDPlus. These tools have been refined and improved with the national production of NHDPlusV2. During the on-going NHDPlusHR (1:24K NHD, 10 meter NED) pilot in Minnesota and during the NHDPlusHR (1:8K NHD, 3 meter DEM) production in New York, the ability of the tools to handle higher resolution inputs has been demonstrated.

Even with the tools, the process of building NHDPlusMR and NHDPlusHR is complex. Success depends on a combined effort from the NHDPlus experts, the NHD stewards, the WBD stewards and, in some cases, state water resource agencies. The roles of the NHDPlus team members are:

- Horizon Systems staff and consultants support the Build/Refresh tools, maintain the server network, and provide overall management of the Build/Refresh process.
- Al Rea of the USGS Idaho Water Science Center and Rich Moore and Craig Johnston of the USGS New Hampshire Water Science Center provide technical support to the Build/Refresh process, including the raster processing.
- Tim Bondelid provides technical support to the Build/Refresh process, including the stream flow estimates.
- The NHD Stewards edit and qaqc the NHD until it meets the requirements of the NHDPlus Build/Refresh process. Help build the hydro-enforcement data. Provide data review for the NHDPlus components such as the Value Added Attributes and the Catchments.
- The WBD Stewards edit and quality assure the WBD until it meets the requirements of the NHDPlus process.
- State water resource agencies may become involved with the Build/Refresh process during the stream flow estimation procedures.

The NHDPlus Build/Refresh process runs on a network of servers configured specifically for this purpose. The Build/Refresh tools run on the server network and are improved, maintained and supported by Horizon. The server environment, also maintained by Horizon, has a rapid Internet connection which supports VPN/Remote-Desktop access for all members of the NHDPlus team mentioned above. Finally,

through the NHDPlusHR pilot in Minnesota and production in New York, the path to NHDPlusHR is becoming more explicitly defined. And the tools have vastly improved the Build/Refresh process and made it feasible to refresh NHDPlus on a more frequent basis as the NHD, NED, and WBD are improved through the stewardship process. If there are questions about NHDPlusHR or you would like to explore the possibilities for NHDPlusHR in your area of interest, please contact Cindy McKay at LDM@horizon-systems.com.

Remains of a River Video by Ariel Doumbouya

The Upper Colorado River Basin Water Conference recently held in Grand Junction, Colorado presented a fascinating movie titled “Remains of a River.” It is the story of two kayakers who went from the headwaters of the Green and Colorado River to the outlet in the Gulf of Mexico. They talk about a lot of water issues like diversions, recreational uses, agriculture, etc. The movie is about 45 min long and is now available on the conference website, along with abstracts and presenter bios:

<http://www.coloradomesa.edu/WaterCenter/UpperColoradoRiverBasinWaterForum.html>

NHD Photo of the Month

This month’s photo was submitted by Dan Saul with the Washington State Department of Ecology and highlights Lake Chelan. The photo was taken from the Lake Chelan Lakeshore Trail approximately 10 miles SE of the town of Stehekin, looking down lake (SouthEast). To see the photo of the month go to <ftp://nhdftp.usgs.gov/Hydro/Images/LakeChelan.jpeg>. Submit your photo for the NHD Photo of the Month by sending it to krisham@usgs.gov. This will allow the program to build a library of real-world photos linked to the NHD.

November Hydrography Quiz / New December Quiz

James Simard of Air Worldwide in Boston was the first to guess the October NHD Quiz as Key West in Florida. See <ftp://nhdftp.usgs.gov/Quiz/Hydrography88.pdf>. James is a Senior GIS Analyst with AIR Worldwide. AIR provides risk modeling software and consulting services to more than 400 insurance, reinsurance, financial, corporate, and government clients. They model several different perils such as hurricanes, wildfire, earthquakes, severe thunderstorms, and inland flooding. James leads a highly-talented GIS team in generating input data for our inland flood models.

Others with the correct answer (in order received) were: David Asbury, Jonathan Labie, Amy Prues, Evan Hammer, Calvin Meyer, John Lynam, Barbara Rosenbaum, Dave Hockman-Wert, Linda Davis, Steve Shivers, Bob Harmon, Roger Barlow, Jon Becker, Ken Koch, Lorri Peltz-Lewis, Kim Foiles, Ed Carter, Kitty Kolb, Edwin Abbey, Dave Straub, Jim Sherwood, Janet Brewster, Jim Mitchell, Mark Yandrick, Matt Rehwald, Cindy McKay, Dan Saul, Ellen Lesch, Barbara Simpson, Steve Aichele, Bernie Sroka, and Robert Clemans.

This month’s hydrography quiz can be found at <ftp://nhdftp.usgs.gov/Quiz/Hydrography89.pdf>. What is the name of the mountain represented by the red dot. Send your guess to jdsimley@usgs.gov.

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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.