USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

NHD Management Team Annual Meeting

The seven-member multi-agency NHD Management Team and several advisors met the week of December 12 to discuss the future of the NHD and WBD program. The meeting consisted of many formal presentations to lay out the facts behind the issues facing the NHD and WBD programs. From these facts the NHD/WBD program and the USGS can make informed decisions about what to fund in the upcoming years and how to govern the program. This produces a community driven program the focuses not on what the USGS thinks is best for the user, but rather what the user thinks is best for the USGS. Listening to and acting on what the user community says makes the USGS hydrography program highly relevant and effective.

So what do users want from the USGS? They want the data and the tools to work. The NHD and WBD are somewhat sophisticated. The sophistication makes them powerful and desirable to users. The USGS has to step up to the plate and make that sophistication work. And even more challenging, is the fact that it is a moving target. The USGS has to get smarter all the time, which requires an influx of knowledge to keep pace with the changing world. That's fundamentally what's behind everything the users ask for. The USGS can do this, but it's going to take persistence and it's going to take focus.

Reflecting on the meeting produces this conclusion: Surface water science in the past several years has been advanced by the existence of the NHD and WBD, as well as the NED. This advancement is still in its infancy. Much more will be done in the coming decade to utilize geospatial data to sustain and manage the nation's water resources. The pace of this advancement is contingent on the user community to have the resources to apply the data and also on the USGS facilitating to make the data accurate, integrated, accessible, and applicable. The NHD and WBD are fundamentally changing the science from a map reading/interpretation mode to a data synthesis/calculation mode. StreamStats and SPARROW are prime examples from which we can see geospatial data transformed into meaningful information that then generates knowledge about streamflow or nutrient loads. Hopefully this will allow decision makers to make wise decisions about our future. Perhaps the greatest influence on the pace of advancement is up to you to "spread the word" about your work and let your leadership know that investing in water GIS will make their mission more effective.

NHD/WBD 2011 Management Team Meeting Guidance for the Future

A roundtable discussion of user requirements produced this list from the recent NHD/WBD Management Team meeting. The next step is to prioritize significant items that can be achieved, consolidate where practical, and provide funding to start, continue, or complete the work. Comments and suggestions are welcome.

1. Data Design
    a. A Multi-Resolution Hydrography Dataset with generalization capability – "One NHD".
    b. An integrated NHD/WBD/NED dataset – Integration of network with landscape
    c. NHD-based flowline catchments fit and nest within HUC's (HUC-12's).
    d. Simplified dataset – easier to use – more intuitive – for users who need this.
    e. Allow local data ownership in synch with national datasets – the local data may be above and beyond what can be stored in the national holding.
    f. Ability for multiple representations of features (point, line, area, event).
    g. Tie-in with ArcHydro – Engineering aspects, cross sections, floodplains.

    h. Coordination with OGC/CUAHSI.
    i. Offshore features in the NHD/WBD.
2. Stewardship/Maintenance
    a. Data Model and Tools to make is easier for fiscally challenged (funding, sophistication, turnaround, technical) organizations to implement NHD/WBD into business needs.
    b. Instant updates so that database is updated rapidly after editing.
    c. Transparent tools that work on the data easily and instantly (i.e. accessible web services and user tools).
    d. Easy ways to update the NHD/WBD data.
    e. Markup tools to enable quick and easy identification of errors/problems.
    f. Collaborative stewardship between NHD and WBD.
    g. Collaborative stewardship with NHD/WBD and National Wetlands Inventory
    h. Collaborative stewardship with NHD/WBD and NOAA Coastline.
    i. Consider value of improving data – the cost effectiveness of improving the NHD/WBD.
    j. Database cleanup to ensure good M-values, Waterbody ID's, metadata, geometry.
    k. International stewardship (Canada/Mexico).
    l. Well defined understanding of NHD/WBD, and enforcement of this across the country – consistency – standards – requirements.
    m. Improve periodicity (perennial/intermittent/ephemeral) of network and document it.
    n. Cross education on WBD and NHD – consider each other when doing editing.
3. Events/Linear Referencing
    a. Enable anyone with water information to easily link it to a NHD reach/catchment – create events.
    b. Event and information finding functions to work against the NHD/WBD dataset.
    c. Process events to look at event interaction in problem solving.
4. Network/Flow/Analysis
    a. Underground infrastructure (i.e. stormwater) integrated with network –Hydraulic routing (using complex junctions).
    b. Ensure network quality - solid network – authoritative – resolved network.
    c. A flow network that operates in different states of hydrologic conditions (i.e. floods) – where control points in the network act as operators on flow.
    d. Events that can be used to control flow in the network routing.
5. Data Delivery
    a. Data delivery feature Services – to make data delivery transparent to user. Good, fast, efficient web services to use the data directly.
    b. Host NWIS streamgage drainage areas.
    c. Deliver NHD Coastline with WBD.
    d. Mobile apps to enable NHD/WBD usage and editing in the field.
    e. Publish the WBD and NHD as cache tile services for high performance web services.
    f. Publish the WBD and NHD as ArcGIS 10.1 services for integration into models and applications.
6. NHDPlus/Hydro-Elevation
    a. Building on USGS/NGP strategic plan – to focus on hydrography and elevation.
    b. High Res NHDPlus to enable sophisticated analysis of the high resolution NHD (1:24,000-scale and better).
    c. Generalization of the network and NHDPlus enhanced data (i.e. catchments).
    d. Create the 3D aspect of NHD – Z-values. Use contours to populate z-values.
    e. A need for Value Added Attributes such as found in the NHDPlus.
7. Integration
    a. Gaz/Vector integration and the ability to use provisional names.

b. Municipal integration to utilize hydrography data in high density/critical locations such as cities.
c. NHD/WBD at local level – counties, municipalities.
d. Integrate with Groundwater.
e. Integrate with FEMA floodmapping.

NHD/WBD Stewardship Conference

The fourth bi-annual NHD/WBD Stewardship Conference will be held in New Orleans, Louisiana March 29-30, 2012. It will be held in conjunction with the American Water Resources Association's 2012 Spring Specialty Conference on Geographic Information Systems and Water Resources VI, held March 26-28 in New Orleans at the Sheraton, see http://www.awra.org/meetings/Spring2012/index.html. The AWRA conference will focus on applications of GIS in water resources, which involves the NHD and WBD, while the stewardship conference will focus on data stewardship and data maintenance issues. Holding the two conferences together will enable travelers who would normally attend both conferences do so in just one trip. Although abstracts for the AWRA conference are closed, abstracts for the stewardship conference will be open through January 23, 2012. Please submit an abstract in an email to Jeff Simley, jdsimley@usgs.gov with the subject "Stewardship Conference". More information on the conference will be forthcoming. If you have an interest in the NHD/WBD Stewardship Conference, please contact Jeff Simley at jdsimley@usgs.gov.

Attending the NHD/WBD Stewardship Conference

The stewardship conference will be held all-day Thursday and Friday morning March 29-30, 2012. If you plan to attend the stewardship conference send an email with the subject "Stewardship Conference" to Jeff Simley at jdsimley@usgs.gov. If you would like to attend, but are not sure if you can, please also send an email with the same subject line. That will help determine interest in the conference. If you plan to attend, make hotel reservations as soon as possible. The weekend is the Men's Final Four NCAA Basketball Championship. See http://www.ncaa.com/championships/basketball-men/d1. Hotel rooms are very scarce and very expensive. However, if booking the hotel room through AWRA you can take advantage of 60 rooms set aside for the Stewardship Conference Thursday night at $149.00. See http://www.awra.org/meetings/Spring2012/travel.html. Plan on departing New Orleans Friday afternoon.

AWRA Preliminary Program

The AWRA Spring Specialty Conference on GIS and Water Resources VI preliminary program is available at http://www.awra.org/meetings/Spring2012/doc/GIS2012At-Glance.pdf . Here are some reasons for attending the conference:

- Discover the most recent advances of GIS in the analysis and management of water resources systems
- Ascertain the state of knowledge of GIS use in planning and analysis of land use and landscape analysis
- Bridging GIS and Climate Change: See how GIS is used to assess impacts of climate change, decision support, and hydrologic forecasting
- Learn about integrating surface and groundwater GIS systems
- Find out about the latest developments in models, programs, tools and techniques such as NHD, HIS, AGWA, and LiDAR Enhanced Analysis
- Learn how GIS is used in mining and hydrologic fracturing impact assessment

- Inform yourself about the use of GIS in flood loss planning and about available mitigation and spatial tools
- Discuss hydrologic and riparian ecosystem effects related to climate change and how GIS can aid in the study of these effects.
- Share your experiences and knowledge of the GIS field with other attendees
- Listen to experts from the USA and elsewhere discuss the use and ramifications of GIS to their own unique problems
- Examine how GIS has been used in case studies of water supply and demand
- Discover decision support systems and information management systems related to or that use GIS
- Participate in and learn from the oral and poster sessions and commercial exhibits while networking with other water resources experts

NHD Network Improvement Program

A key component of the NHD is the flow network. This gives the NHD the ability to perform cause and effect analysis, and this is what makes the NHD so useful. The NHD can also enrich itself by processing the network to get characteristics like stream order, stream level, generalization, cumulative sums, and the list goes on and on. But to make all of this work effectively, the network has to work. To help ensure this the USGS is going to focus in the next year to clean up any loose ends in network quality. Steve Howard is leading this effort and is getting help from Horizon Systems Corp. who are experts in hydrography network analysis with lengthy experience in the NHD. Stewards will be contacted when errors are found and invited to participate in the process. The network improvement will be conducted on a hydrologic region basis in this sequence: 17, 16, 18, 1, 2, 3, 4, 12, 13, 14, 15, 9, 10, 11, 5, 6, 7, 8, 20, 21, 22, and 19.

Pour Points – Integration of the NHD and WBD

The NHD and WBD are being integrated into one geodatabase. One of the advantages of this is to allow them to interact in the data model. By cross-referencing pointers to each other, one dataset can locate its position in the other dataset and then take advantage of the information contained in that other dataset. For example, find all dams upstream in a HU-8 and find all the dams upstream of that HU-8. It is possible to use the spatial functions interactively in a GIS to do this, but it is also possible to do this in a more automated fashion such as with a web query. Doing this would require knowing where the HU-8 was in the NHD network. To do this, the primary outflow point, or pour point, of the HU-8 needs to be found in the NHD network using linear referencing. This provides the reach and measure of the pour point, which gives a precise location in the NHD network and can then be stored within the HU-8. From this position it is possible to navigate the NHD and find the dam events. To populate the pour point addresses, the USGS is starting to collect these by intersecting the WBD with the NHD, find the primary pour point, derive the address, and store it. This will be done for all HU-8's in the U.S.

Twitter Update by Kathy Isham

The NHD now has 407 followers. Twitter has proved to be a valuable communication tool to reach the NHD and Water resources community. You can follow the NHD on Twitter by signing up with an account at https://twitter.com/. Search for NHD by typing @USGSNHD in the search box and choose the option to "follow". This will enable you to see the NHD News feed. You can also view the news feed through the Twitter widget on the NHD home page at http://nhd.usgs.gov/.

Digital River Charts from USACE

The U.S. inland waterway navigation system consists of 8,200 miles of rivers maintained by the U.S. Army Corps of Engineers (USACE) in 22 states. The Army Geospatial Center's (AGC) inland electronic navigational charts (IENCs) were developed by USACE to improve maritime awareness by providing accurate and real-time displays of vessel positions relative to waterway features, improved voyage planning and monitoring, new personnel training tools, and an integrated display of river charts, radar and automatic identification system (AIS) overlays to the entire inland navigation community. The charts are used by USACE, the dredging industry, environmental planners, recreational boaters, hydraulic engineers, transportation specialists and others requiring detailed navigation. More than 5,700 miles of navigable rivers have been electronically charted to date. IENCs for the following rivers are available for download at no charge and unlimited use from USACE's E-Charting website, www.agc.army.mil/echarts. These datasets encompass the Allegheny, Arkansas, Atachafalaya, Black Warrior-Tombigbee, Cumberland, Green, Illinois, Kanawha, Kaskaskia, Lower Mississippi, Missouri, Monongahela, Ohio, Ouachita, Red, Tennessee, Tennessee- Tombigbee and Upper Mississippi rivers. IENCs for the Alabama and White rivers are currently under development, with completion scheduled for this fiscal year. A shapefile is a geospatial vector data format used by the GIS community for creating maps and charts easily and efficiently. KML is a format used to display 3-D geographic data in a browser such as Google Earth or Google Maps. Charts are updated frequently, and quality assurance measures are conducted before data is posted to ensure that the latest chart and aids to navigation data are available to users.

What does this mean for the NHD? USGS POC David Anderson has these insights:

1) The USACE data is similar in form to the NOAA ENC charts for coastal navigation and based on the needs of the maritime navigation community. The development need of this product is due to hazards involving navigation, such as bridges, anchorages, and other man-made objects.
2) Most of the IENC data is at a 1:45,000-scale or smaller, making it coarser than the current NHD data. Most non-navigable rivers are at scales of 1:60,000 or 1:30,000 for navigable rivers, lakes and shorelines are collected 1:300,000 or smaller, transportation such as rail & roadways, however, are collected at 1:15,000-scale.
3) Data comes in river "sections", even the RSS feeds, so they are pertinent to the river mile markers. Databases could be written, but the structure would be immense and converting the data over to a usable NHD feature could get messy.
4) Data comes in shapefiles or S-57 standard - no complete geodatabase available (according to the USACE web site) and only for a portion of the navigable rivers. Nowhere does it state the cycle for collecting the rest of the data, say for the Hudson or Columbia River systems.
5) Some features in the IENC could be taken advantage as events or features; such as locks, dams, jetty/weir, overhead or submerged pipelines, transportation bridges, but most features in the data are navigational structures, such as lights, anchorages, moorings, etc., that are not that useful for scientific analysis.

NHD Photo of the Month by Kathy Isham

This month's photo was submitted by Dave Kraemer of the USGS and features a waterfall in El Yunque National Forest, Puerto Rico. El Yunque is the only tropical rain forest in the United States. To see the photo of the month go to ftp://nhdftp.usgs.gov/Hydro_Images/El_Yunque.JPG. 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

Greg Winters of the USGS U.S. Board on Geographic Names was the first to guess the October NHD Quiz as the confluence of the Snake and Columbia Rivers. This was a difficult quiz because it was at large scale. See ftp://nhdftp.usgs.gov/Quiz/Hydrography76.pdf. Greg is a staff researcher with the U.S. Board on Geographic Names Domestic Names Section in USGS Reston, Virginia.

Others with the correct answer (in order received) were Jim Sherwood, Matt Rehwald, John Lynam, Roger Barlow, Steve Shivers, Dan Saul, Florence Thompson, Claire DeVaughan, David Brower, Bryan Anderson, and Kitty Kolb. Dan Saul notes: "The confluence of the Columbia and Snake Rivers just downstream from the cities of Pasco, Kennewick, and Richland (often referred to locally as the Tri-Cities) in Washington State. The two rivers at that point are both part of Lake Wallula, which is formed by the impoundment of the Columbia by McNary Dam, located about 40 miles downstream near Hermiston, Oregon." Kitty Kolb adds: "One interesting fact about the area is that the Lewis and Clark company camped at the point between the two rivers for two nights in October 16th and 17th, 1805. It is now called Sacajewea State Park."

This month's hydrography quiz can be found at ftp://nhdftp.usgs.gov/Quiz/Hydrography77.pdf . Again, this is the confluence of two very significant rivers, this time in the middle of the country. Where is it? For extra credit, there seems to be something wrong with the NHD. What is it? 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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