

USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

USGS Launches NHD Image Update Process

In an effort to make the 1:24,000-scale NHD more compatible with contemporary aerial imagery, a systematic state-by-state review process is underway that will provide limited updates the NHD based on specific minimum thresholds. Double-line streams that have meander changes of more than 1,000-feet will be adjusted to fit the imagery. The imagery used is from the National Agriculture Imagery Program (NAIP). The first two states to be completed are Kansas and Oklahoma, which used 2008 imagery. In Oklahoma, it was found that 38 lakes needed to be modified and eight lakes needed to be added. There were 243 locations where the double-line streams needed to be re-located based on the 1,000-foot rule.

See the NHD Video on YouTube

It is now possible to easily view the NHD video “The Role Hydrography in The National Map” at: <http://www.youtube.com/watch?v=3wp0TzjQKLo>. It is also accessible from the USGS web site at: <http://gallery.usgs.gov/videos/124>.

The Future of Names in the NHD

The database design for vector data in The National Map is being enhanced to provide more efficient operability in the future. That will be a big help for those working in GIS. Much of this redesign is based on the highly successful experience of the NHD design, but it will also enhance the traditional NHD design to a higher level of functionality. The best of many worlds is being consolidated into one model. Some people have called this a best practices model. One of the things that is being done is to integrate the Geographic Names Information System (GNIS) into the vector model. All vector names will be stored in a bucket called “AllPoints”. There is a separate AllPoints for transportation, structures, hydrography, etc. The integration, or conflation, process will check to see if the hydrography name record in AllPoints is in the NHD. It should have been put there when the NHD was built. So if the name is there, the process verifies it and conducts any reconciliation. The name also goes into a gazetteer table in the model called the Gaz_Features. The purpose of this is to allow easy interface to the vector model from applications that serve names. For example, a names web service can work a lot faster if it interfaces with the Gazetteer table than if it interfaces with the NHD itself. The geographic location of the name in the NHD is represented by the NHD vertex string, but in the Gaz_Features table, the name has endpoint or point coordinates. What was once the GNIS_ID will now be called Gaz_ID and what was once GNIS_Name will be called Name. The same Gaz_ID will be found in NHDFlowline, for example, and in the Gaz_Features. Another table will provide Board of Geographic Names decision information indexed with the same Gaz_ID identifier. Other tables provide other information. In addition, the existing feature metadata system will be linked to all of this data. If the name running through the conflation process from AllPoints cannot be found in the NHD, it will simply reside in Gaz_Features. Some day the feature should appear in the NHD, and when it does, the Gaz_ID will be applied. A good example of this is a Bay/Inlet. Bay polygons were not digitized in the NHD, but some day they will. To add a new name into the NHD, the approval process does not change. The name still has to go through the Board of Geographic Names. If approved, it gets a record of decision entry and a Gaz_ID. Then it can be applied to the NHDFlowline.

Access to NHDPlus

It is now possible to quickly access the NHDPlus at <http://www.nhdplus.com>.

NHD in Google Earth - KML Update by Ariel Bates

Last year a procedure was developed to display the NHD in Google Earth using KML. This has proven to be very popular. Now with the release of ArcGIS 9.3 the process has been made considerably easier. Basically it's a matter of taking a "chunk" of NHD data, such as data for the Pacific Northwest, converting to a layer file, and using ArcToolbox to convert to KML using Conversion Tools>To KML>Layer to KML. For specific instructions, contact Ariel Bates at atbates@usgs.gov.

ESRI User Conference

A number of papers were presented at the 2009 ESRI International User Conference of interest to those working with the NHD and WBD. Here is one:

Generalization of the National Hydrography Dataset – Jeff Simley, U.S. Geological Survey: Several approaches to the generalization of the NHD were reviewed. The first uses the Thinner code in NHDPlus. This is a pre-generated Value Added Attribute for each flowline that determines the relative appropriateness of the flowline at various levels of flowline thinning. It preserves the network throughout eight levels of thinning. The second method is based on river names associated with the Watershed Boundary Dataset, and uses its hierarchy to progressively eliminate flowlines as hydrologic unit levels are eliminated. In the first step all flowlines are eliminated except rivers named the same as the subwatershed or above. The next step reduces these down to watershed, etc. The third method was developed to produce a 1:1,000,000-scale National Atlas. It uses a hybrid of traditional generalizations used on various map series and attempts to match these by semi-automated selection. It takes into account disparate generalizations commonly found from one map sheet to another. The fourth method was developed for The National Map viewer. It is based on eliminating features based on existing feature attributes such as feature class, name, area, length, FType and FCode. For example, at one level of generalization all lakes less than a certain size are eliminated, while perennial streams are preserved and intermittent streams are eliminated. The sixth method is used for the ESRI topographic map viewer. It uses the flow volume estimates found in the NHDPlus and thus eliminates streams based on how much water flows through them. The above methods are particularly applicable to generalize at scales of 1:100,000-scale and smaller. The following methods are more applicable to larger scales. The seventh method focuses heavily on adjusting the symbolization techniques rather than pruning features. It also uses differential pruning under the assumption that some density differences are geophysically normal, while other differences require differing degrees of pruning. In this method pruning is again based on taking advantage of existing attributes. The eighth method is computationally intensive and produces a new level of capability. It produces a normalization of data densities even in the most disparate conditions. It calculates contributing drainage areas and normalizes bases on these areas. Therefore a very thick density can be thinned down to an adjacent sparse density very effectively. In doing so it preserves the network making the result fully functional analytically. The method also takes into account differential density by calculating regionalized base density targets. Additionally, the method calculates omission and commission coefficients to help determine under or over-pruning tuning.

Feature Catalog – Fun Facts by Keven Roth

Area of Complex Channels - An area where a stream or river flows in an intricate network of interlacing channels. NHDArea.

Area of Complex Channels is used to represent very complex or changeable drainage networks. It has been used for braided streams, especially for glacial outwash channels in Alaska, and in tidal marshes in New Jersey. In many glacial outwash areas, channels visible in a current orthoimage are already out of date because of the constant shifting of channels. Trying to delineate all the channels - and then trying to

keep them current - is not only time-consuming, it can also give the impression that the NHD is not accurate and lead users to question the data. In many cases, it is preferable to delineate a few of the main, more stable channels and use Area of Complex Channels to indicate the extent of the braided area. In coastal areas of the east coast, ditches were dug to drain the marshes to reduce mosquito populations. Straight, parallel ditches were dug from the upland edge of the marsh to the larger tidal creeks. The ditches were usually spaced 115 to 230 feet apart to remove standing pools of water. Almost 90% of the tidal marshes from Maine to Virginia were ditched by 1938. Although these ditches are relatively permanent and stable, the sheer number of them can make the drainage network unnecessarily complex. As an example, one area of the New Jersey coast has over 1500 ditches in an area of about 3.5 sq miles. Many of the ditches are clearly visible on orthoimages and using the image as a backdrop with the NHD may provide a usable alternative. Area of Complex Channels can be used when the delineation of individual drainage features would be too costly to collect AND maintain or are unnecessary for many of the applications for which the NHD was designed. Local datasets can be enhance the NHD and manage project level detail in these areas.

Ground Truthing for Water Quality Planning in the Bitterroot Valley, Montana by Keven Roth

The Montana Department of Environmental Quality (MT DEQ), the Bitterroot National Forest, and the Bitter Root Water Forum (a grassroots watershed group), teamed up to examine causes of impairments to water quality in the Bitterroot River watershed in Montana. This was a follow-up to a study done in 2005 by the MT DEQ which found one of the main sources of potential impairment is sediment, primarily from roads in the National Forests. Residential development, loss of vegetation to wildfires, roads in timber lands, and other factors are resulting in water quality degradation throughout the watershed. The Bitter Root Water Forum asked for volunteers to survey some sites for sources of impairment. At a training session in June, 15 volunteers of various interests and backgrounds signed up to conduct fieldwork and were given maps prepared by Forest Service hydrologists. They spent a day in the field learning how to code various road/stream crossings for their potential to contribute sediment to streams that flow to the Bitterroot River. One team was assigned Moose Creek and some of its tributaries, an area up the East Fork of the Bitterroot River near the Continental Divide. The MT DEQ recommended additional monitoring for Moose Creek because of elevated sediment and nutrient values. The team worked along stream bottoms in the valleys and along the roads climbing toward the ridge tops. They checked several stream crossings that had already been identified as potential sediment “contributing” areas. Each of these areas would receive normally occurring nutrients from decaying vegetation, but the most obvious nutrient sources that could be identified were moose and elk droppings. Most of the stream crossings were in good shape and the culverts were working properly. There were signs of firewood cutting for individual use near the road every once in a while, but generally the sites were cleaned up well. There were old burn areas that could have added sediment to the streams, but even there, low growth vegetation was fairly thick, stabilizing the slopes. All in all, it was a lightly used area with minimal current human impacts.

For more information see: <http://brwaterforum.org>, <http://cwaic.mt.gov/default>, and <http://www.deq.state.mt.us/wqinfo/TMDL/finalReports.asp> (look for Bitterroot Headwaters).

NHD Photo's Needed

Each month the NHD web site will highlight a photo of a real-world hydrography feature that can be found in the NHD. Send your favorite photograph of a hydrography feature to the USGS and each month one will be selected for display on the web site. Send digital photographs to: krisham@usgs.gov.

AWRA Conference – Call for Abstracts

The American Water Resources Association's popular series of conferences on GIS & Water Resources continues with its sixth GIS & Water Resources conference, this time in Orlando, FL March 29-31, 2010. The Call for Abstracts is now open and will close October 9. Geographic Information Systems (GIS) have become a fundamental tool for the analysis, planning and management of environmental and water resources systems. This Specialty Conference continues the AWRA biennial tradition of surveying the state of knowledge in the field, following the 2004 conference in Nashville, 2006 conference in Houston and 2008 conference in San Mateo. Because of its interdisciplinary approach to water resource opportunities and problems, AWRA provides an excellent professional home for the most comprehensive forum on the application of GIS to water resources engineering and sciences. The Conference Organizing Committee invites you to join this important community of scholars and practitioners in GIS and water resources in Orlando by sharing your experiences and knowledge with an oral presentation or present a poster in the gallery at the conference. Plan to submit an abstract and join us to network and experience what your colleagues are doing with GIS and Water Resources. Meet the leaders of geospatial and hydrologic technologies using and applying their skills in the sessions, exhibit hall, Opening Reception, luncheon, workshops, field trip, and networking events. AWRA's Spring Conference will be packed with opportunities for you to learn more, network, and be entertained. For the latest information visit: <http://www.awra.org/meetings/Florida2010/>

July Hydrography Quiz / New August Quiz

David Asbury was the first to correctly guess the July hydrography quiz at 471 miles distance between Pittsburgh and Cincinnati on the Ohio River. This is done by downloading hydrologic subregions 0503 and 0509 and displaying them in ArcMap. Turn on the Utility Network Analyst toolbar. Then put a Start Navigation flag on the Ohio River Artificial Path at Sawmill Run. Change Options-Results to Selected Features and Trace Downstream. Be sure to use Barriers on any braids in the Ohio to get a single path distance. Open the NHDFlowline attribute table, right-click on the LengthKM column heading, click Statistics and read the Sum. Then do this again for 0509 starting at the start of the Ohio and put a Barrier at Mill Creek in Cincinnati. The total of the two sums is 758 kilometers or 471 miles. The answer between the high-resolution and the medium-resolution NHD is within one-half mile of each other.

David Asbury works for the Center for Ecosystem Management and Restoration (CEMAR) an environmental non-profit based in Oakland, CA. One project CEMAR is currently working on quantifies endangered steelhead trout habitat in coastal Southern California. Field biologist's observations are plotted using community-based mapping techniques and linear referencing. Both the NHD and NHDPlus are used for cartography, and as the base layer for delimiting habitat and barrier locations. Others with the correct answer (in order received) were: There were no other guesses. This type of quiz must be too hard!

This month's hydrography quiz can be found at <ftp://nhdftp.usgs.gov/Quiz/Hydrography49.pdf>. What is the current name of the Lake? The lake also has a historical name. It is the historical name that is mistakenly used in the GNIS and consequently in the NHD. Also, can you name the drainage pattern north of the Lake? It's a giveaway to the location. Send your guess to jdsimley@usgs.gov.

Upcoming NHD Maintenance Training

September 15-17, Augusta, ME. Contact David Anderson (danderson@usgs.gov) and Anji Redmond (anji.redmond@maine.gov)

October 13-15, Washington. Contact Hank Nelson hpnelson@usgs.gov.

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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.