USGS National Hydrography Dataset Newsletter
Vol. 5, No. 7, May 2006
by Jeff Simley, USGS

The NHD in Alaska by Bill Smith

A Salmon Habitat workshop sponsored by The Nature Conservancy was recently conducted in Anchorage, Alaska. The focus was to predict Alaskan salmon habitat based on various types of data and procedures using GIS. Part of the workshop was dedicated to exploring what state and national geospatial datasets are available for predicting salmon habitat. The National Hydrography Dataset (NHD) was discussed as the one important part of the equation. It is one of the few currently available statewide/nationwide seamless vector datasets. The many linear referencing, stream navigation and stream analysis capabilities of the NHD were highlighted during the discussion. Also noted were some of the characteristics of the NHD that need improvement. One is the lack of intermittent stream classification in Alaska, with all Alaskan streams coded as perennial. Another issue is the inconsistency in proper stream density. Other issues include: minor editing that must be completed prior to use, improved flow direction, and the inconsistent collection of foreshore. Streamgages are very important to studying salmon habitat and the small number of active gages is a major concern. The location of culverts, dams, waterfalls and other impediments to salmon reaching their spawning habitat were discussed. The new NHDPointEventFC and NHDLineEventFC feature classes recently added to the NHD model are of great interest since they can be used to efficiently collect, display and analyze many water related features and events critical to stream network analysis and fish movement studies. The NHD for Alaska has been produced at a level of content and accuracy equivalent to 1:63,360-scale. Two of the 133 subbasins in the state have not yet been finalized and many subbasins in the state are undergoing editing to cleanup minor problems.

The NHD in New Jersey

The New Jersey Department of Environmental Protection (NJDEP) is in the process of generating new hydrography linework statewide. The new hydrography is heads-up digitized off of 2002 one-foot resolution orthoimagery by AIS, Inc. of Redlands, CA. The delineation project will yield an estimated data scale of about 1:2,400. To date, 80% of the state is completed. The current USGS 1:24,000-scale NHD was digitized from 1970-1990 era topographic maps. The 2002 imagery delineated at 1:2,400-scale reveals a significant change in the linework from 1:24,000-scale NHD. The 2002 imagery also reveals many streams that were not delineated in the USGS NHD. These new streams account for 50-percent increase in the number of flowlines or a linear growth of about 10-20 percent over the current NHD.

The increased resolution and control of the 2002 imagery provides new hydrography with better map accuracy and precision, the ability for better integration with other themes, compatibility with a wide range of municipal GIS applications, and much improved currentness and content. The NJDEP is currently researching how to conflate the newly generated geometry with the current NHD to take advantage of the extensive data structure of the NHD and bring full utility to the new hydrography. The USGS recently conducted a training session for NJDEP and for the USGS New Jersey Water Science Office to train potential users on the NHD structure and outline the importance of the NHD Create tool for data conflation. Although conflation is the logical path for the new data, no program funding is in place to allow a statewide process. The NJDEP is seeking grants to pilot the conflation and build process sometime in the fall of 2006.

The NHD in West Virginia

West Virginia is experiencing significant landscape change due to mining activities in the state, and also due to more common changes such as urban growth and hydrology dynamics. To study these issues, a 1:4,800-scale hydrography database for the state is highly desirable. In the spring of 2003, the West Virginia State Addressing and Mapping Board collected aerial photography with two-foot resolution.

Hydrography, among other features, was collected from these images using stereo pair methods. A comparative analysis was made between the existing 1:24,000-scale NHD and the new 1:4,800-scale photo derived hydrography. The results are quite unexpected. It turns out that there are many streams in the high resolution NHD which were not collected in the newer higher resolution program, perhaps as much as 25-percent of the total miles. It is believed that these discrepancies are primarily due to uncollected intermittent streams which had no visible water during the time of collection, or from landscape changes caused by mining and man-made development. The collection rules used to digitize 1:4,800-scale hydrographic features depended on the presence of water and thus many intermittent streams were not collected. Secondly, photo interpretation analysis shows that 5 percent of the 1:24,000-scale NHD streams are missing from the new data because of actual landscape change. According to the Environmental Protection Agency, an estimated 2-percent of the state's streams have been eliminated due to mining activities. Photo interpretation analysis confirmed this as the dominant landscape change, with suburban development and road building rounding out the list of change forces.

Conversely, the 1:4,800-scale analysis detected many streams not found in the 1:24,000-scale NHD. Approximately 13-percent of the 1:4,800-scale stream segments are new. Not surprisingly, the majority of streams coexist in both the 1:4,800-scale analysis and the high resolution NHD, but with better accuracy and precision in the newer data. Development of 1:4,800-scale derived local resolution NHD will result in an increase in density of features as well as in the level of detail in the representation of individual streams. Rather than eliminate the non-collected stream segments, it is desirable to retain them in a final dataset. This will be accomplished by retaining the 1:24,000-scale linework for streams not collected in the 1:4,800-scale analysis. As such, the current plan is to produce a hybrid dataset. In the test watershed, approximately 83-percent of the new dataset will be made up of 1:4,800-scale geometry with 1:24,000-scale NHD making up the remaining 17-percent. This ratio will likely vary throughout the state.

This summer, in conjunction with the U.S. Geological Survey, West Virginia University's West Virginia GIS Technical Center and Natural Resource Analysis Center will pursue the statewide stream layer improvement program which will enhance both the geometry and attribution of all major hydrographic features recorded in the State. The initial phase of the program will merge the local resolution 1:4,800- and 1:24,000 scale NHD hydrographic features into a single *geometry*, followed by a second phase which will conflate the 1:24,000-scale NHD *attributes* to the improved resolution geometry.

Improvements to NHD Projection Tool – Version 1.2 by Greg Enstrom

The USFS Reprojection Toolbar changes geographic projection and can transform Datums using all available ESRI ArcObjects model algorithms. This is an add-on toolbar written for ESRI's ArcGIS 9.x (ArcCatalog). The new version 1.2 enhancements allow reprojection of feature classes with empty schemas (no data) and feature class name aliases with spaces. Data extent is buffered by 20% in the output to allow data additions on the periphery of existing data, and to allow extra extent needed during some transformations where data feature distribution is elongated. Version 1.2 provides improved messaging and instructions when one or more features are not reprojected due to data size, data distribution or coordinate extent available. Feature classes with a large number of records are immediately recognized. ESRI's default ArcMap settings only allow a maximum of 9,500 record locks per feature class. The tool now instructs where and exactly how to make appropriate changes when this occurs. Default precision has been restored to 1,000 in order to maintain NHD data integrity, specifically snapping behavior, during NHDGeoEdit sessions. Other precision levels can be customized via the Options button. Enhancements also include two checkbox buttons that allow users independent custom control to retain Imported XY domain and/or retain Imported precision values. This new tool should be available at http://nhd.usgs.gov/applications.html#usfs soon.

Answer to April Hydrography Quiz / New May Quiz

Charley Hickman was the first to correctly guess last month's hydrography quiz as a canal-bridge over the River Elbe that joins the former East and West Germany, part of the German unification project. It is located in the city of Magdeburg, near Berlin. The photo was taken on the day of inauguration (see ftp://nhdftp.usgs.gov/Quiz/Hydrography11a.bmp). Charley works for the USGS as a mapping liaison to the states of Ohio, Indiana, and until recently, Michigan. USGS liaisons work with key geodata framework groups in every state to help encourage partnerships to develop and maintain the National Spatial Data Infrastructure. A list of all the liaisons by state is online at http://nmcatalog.usgs.gov/crreps/faces/crreps.jspx. Charley is based in Columbus, Ohio and is a long-time employee of the USGS. Charley worked on the standards teams that defined many of the features used in the NHD today. About the bridge, Charley notes "The canal crossing over a river example is a bit unusual, but situations like these were identified in the early 1990's as the data model for NHD was being developed. The group guided by Keven Roth tried to make NHD as robust as possible without sacrificing efficiency, so we looked at lots of unusual and pathological cases, including canals and aqueducts over rivers. While we use a planar, topologically-structured graph at the spatial primitive level, we try to semantically model non-planar reality at the feature level, so we don't interrupt the links in the hydro network if the canal is truly above the river. These non planar situations are rare in NHD, but much more common in framework transportation with road and street overpasses and with stacked bridges and highways." Other correct answers came from Ed Carter, Ellen Lesch, Kat Buscombe, Laurie Morgan, Ken Koch, and Tom Denslinger who notes "The bridge connects two canals. The waterbridge is 918 meters long and opened on October 10, 2003. The waterbridge cost a half billion euros or 632 million dollars. A good article on the bridge's opening can be found at http://www.dw-world.de/dw/article/0,,990878,00.html."

For the May quiz look at ftp://nhdftp.usgs.gov/Quiz/Hydrography12.pdf . Can you identify where this is? Perennial streams are dark blue, intermittent streams are light blue. Red feature in Southeast corner of lake is a dam. Tan ring around lake is inundation area. Send your guess to jdsimley@usgs.gov.

Upcoming NHD Workshops

Milwaukee, WI – June 5, 2006. Contact Joe Miller at jbmiller@fs.fed.us
Ames, IA – July 25, 2006. Contact Bob Lemen at rlemen@usgs.gov
San Diego, California – August 7-11, 2006. ESRI User Conference. Various NHD papers. NHD User Group Meeting – August 9, 12:00 PM, room 30B. http://www.esri.com/events/uc/.
Coeur d' Alene, ID – Summer, 2006. Contact Frank Roberts at fmroberts@cdatribe-nsn.gov.
Salem and Portland, Oregon – Summer, 2006. Contact Nancy Tubbs at ntubbs@usgs.gov.
Olympia, Washington – Summer, 2006. Contact Sam Bardelson at stbardelson@usgs.gov.
New Mexico – September 11, 2006. Contact Gary Kress at gekress@usgs.gov.

Note: Between April and September 2006, classes in the NHD Geo Edit tool will be taught in Connecticut/New York (May 8), Delaware (May 10), Minnesota (May 22-25), Florida, Pennsylvania, and Wyoming – Contact Carl Nelson at cwnelson@usgs.gov. Classes in Kansas (June 5-8), Utah/Idaho (July 10-12), Nebraska, Alaska, and Montana - contact Paul Kimsey at pjkimsey@usgs.gov. Classes in New Mexico, Texas, and Colorado - contact Bill Smith at wjsmith@usgs.gov. Classes in Arkansas (September) - contact Tim Hines at thines@usgs.gov.

Thanks to Bill Smith, Craig Coutros, Evan Fedorko, Greg Enstrom, Mary Watkins, and Terry Higgins.
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.