USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

Texas High Resolution NHD Complete

Thanks to a long-term collaborative partnership between the U.S. Geological Survey (USGS) and the Texas Water Development Board's Texas Natural Resource Information System (TNRIS) the high resolution National Hydrography Dataset (NHD) is now complete for 210 subbasins in Texas. Long term plans for building the 1:24,000-scale NHD in Texas were part of the initial design of the Texas Strategic Partnership Program (StratMap). Initial funding for the StratMap hydrography and NHD began with the USGS Innovative Partnership program (IP). Additional partners for the NHD included the U.S. Army Corps of Engineers, North Central Texas Council of Governments, and the Bureau of Reclamation. During the entire program, TNRIS managed the cooperative funding and digital production contract with Geo-Digital Mapping, while the USGS provided source materials, technical guidance, and quality assurance. The first phase of this multi-year program was the digital revision of the 4,442 quadrangles of existing Digital Line Graph (DLG) hydrography at 1:24,000-scale. Artificial flow paths and direction of flow were collected during this process. Many lessons were learned during the revision process. For example, the use of Digital Orthophoto Quadrangles rather than stereoscopic aerial photos did not provide sufficient visibility to accurately map stream locations in heavily wooded areas in east Texas. The fluctuations in precipitation in west Texas presented problems in determining current pool levels and inundation areas for many ponds and reservoirs. Ancillary local data sources were used to reconcile differences in water levels and stream locations. The second phase of the NHD program in Texas included the conversion of the DLG hydrography data to a seamless, networked, and linear referenced 1:24,000-scale National Hydrography Dataset. For the first phase, funding was provided by the US-Mexico DOI High Priority program through an Innovative Partnership agreement with the USGS. The initial pilot was in the Brownsville area and was followed up with an additional 47 sub-basins along the US-Mexico border. To complete the entire state, a total of 87 sub-basins were partially funded by the USGS IP agreement and an additional 97 sub-basins were funded through the Texas StratMap program and their partners. TNRIS's StratMap hydrography program coordinator, Erika Boghici, managed the contracts and partnership funding for the entire program. The USGS in Denver provided the quality control, minor corrections and loading to the geodatabase for all subbasins. The final phase of the NHD program in Texas will be to support TNRIS in their stewardship update and maintenance of the high resolution NHD in Texas.

Progress on NHD Geo Edit

The NHD Geo Edit tool used for editing the NHD while maintaining data integrity is now scheduled for release in the January 2006 timeframe. Training classes necessary for using the tool will be scheduled as the tool release is finalized.

Selected NHD Papers from the ESRI User Conference

Nutrient Stations Georeferenced to NHD: Value to Nutrient Criteria Development – Ifeyinwa Davis, U.S. Environmental Protection Agency:
The U. S. Environmental Protection Agency Nutrient Criteria Program has developed a prototype web-based database and ArcIMS mapping application to support states and tribes in developing nutrient criteria recommendations for surface waters. Monitoring station nutrient data were compiled from multiple sources and approximately 65,000 monitoring stations were batch georeferenced to the National Hydrography Dataset (NHD) through various methods. Linking nutrient data to the NHD allows geospatial interoperability with national environmental databases and facilitates query and display of

water-related nutrient data and analyses, such as a station's upstream/downstream relation to discharge points. The ArcIMS application uses multiple layers, including the USGS National Elevation Data (NED), National Land Cover Data (NLCD), and ortho-photography. The current prototype utilizes comprehensive nutrient data and map layers for the Maryland, Virginia, and the District of Columbia pilot study area.

Development of a Stream Channel Profile Smoothing Tool – Al Rea, U.S. Geological Survey:
The U.S. Geological Survey (USGS) StreamStats team and ESRI personnel have developed a tool to extract stream-channel elevation profiles from Digital Elevation Models. The tool filters out erroneous elevation values that often produce unrealistic profiles when overlaying a vector stream on a DEM. The tool's function is based on the assumption that elevation values should decrease along the profile in the downstream direction; therefore, the tool filters out all elevations that increase in the downstream direction and produces a smoothed elevation profile. The tool has been implemented within the Arc Hydro Tools and is being tested for use with the USGS StreamStats application for estimating stream flows at ungaged sites. The smoothed elevation profile also is being used to develop new methods of measuring average stream slope. A modification to this technique is being used to smooth elevations along the NHD.

American Water Resources Association: GIS and Water Resources IV

Imagine a map of all water resources of Earth on the surface, underground, and in the atmosphere where you can determine how much is available, what constituents are present, what infrastructure has access to it, who owns it, what it costs, how it got there, and how people and the environment are interacting with it … then you are just starting to understand the power of Geographic Information Systems. The use and growth of Geographic Information Systems (GIS) in Water Resources has grown exponentially in the past decade resulting in GIS becoming an essential tool in water resources planning and management. You have the opportunity to directly interact with the leaders in innovation and application through your attendance at this conference. You will be able to enter into a dialog of ideas and problem solving with peers from around the world where users know no geographic boundaries as they map the globe's water resources. The American Water Resources Association GIS and Water Resources IV conference will be held May 8-10, 2005 at the Renaissance Houston Hotel Greenway Plaza in Houston, Texas. Topics will include: National Hydrography (NHD) Dataset, Land Use Classification, Hurricane Katrina/Rita, Remote Sensing, Homeland Security, Policy, LiDAR & IFSAR, FEMA Map Modernization, Climate and Weather Data Integration, Publication on the Web, Temporal Mapping, SPAtially Referenced Regressions on Watershed Attributes (SPARROW), ArcHydro, Ground Water, Watershed Management Plans, Droughts, Waterways and Ports, Adaptive Management and Stream Restoration, and other topics. See http://www.awra.org/meetings/Houston2006/index.html.

The NHD in Canada

Canada's National Hydro Network (NHN) Standard is now official. Last August 2004, the Canadian Council on Geomatics (CCOG) approved the National Hydro Network, Canada, Level 1, Edition 1.0, Standard, in accordance with CCOG resolution F03-05 on GeoBase Data Standard Maintenance. The NHN describes and models, as network components, features of the Canadian surface-water system (inland waters and coastline). The CCOG has commissioned a group of experts from Nova Scotia Geomatics Centre, British Columbia Base Mapping & Geomatics Services, and Natural Resources Canada - Centre for Topographic Information, to undertake the development of the National Hydro Network (NHN) standards. They were tasked to develop the NHN standards by using the same approach that was used for the development of the National Road Network (NRN) standards. Now that the NHN Standard have been reviewed and officially adopted nationally, work will begin to produce GeoBase compliant NHN data by creating an initial version based on existing data. The goal is to produce the first

version of the NHN, with complete national coverage, by 2009. Because this project encompasses key concepts of both hydrography and hydrology to describe Canada's surface water system, the NHN model is flexible enough to support several applications including cartographic representation and data analysis in order to satisfy the requirements of a varied user base. See http://geobase.ca/geobase/en/news/nhn.html.

Answer to September Hydrography Quiz

Joseph Kerski, the USGS Outreach Coordinator based in Denver, Colorado, was the first to guess the location of last month's hydrography quiz as the Mississippi River between Greenville and Vicksburg, Mississippi (see ftp://nhdftp.usgs.gov/Quiz/Hydrography4.pdf). This is an amazing look at a major meandering river. In 1993, a year of massive Mississippi River flooding, an average of 938,000 cubic feet per second of streamflow was recorded at Vicksburg. Just five years earlier in 1988, this section of the Mississippi discharged only half of that amount, an average of 437,900 cubic feet per second. This section of the river drains 1,144,500 square miles and is about 46 feet above sea level at Vicksburg. In this image you can see many classic characteristics of a meandering stream including channel bends, oxbow lakes (isolated), incipient oxbow lakes (connected), channel cutoffs, and yazoo (parallel) streams. The river deposits sediment on the inside of the bends creating point bar deposits, and erodes the outside of the bend creating cut banks. The main channel within the river with the greatest flow velocity is called the thalweg. The artificial path in a NHD double-line stream is not intended to be the thalweg. The meanders of the river tend to migrate downstream because the maximum velocity of the thalweg, and thus erosion, is just beyond the point of inflection in the bend. The river wants to curve to the right and to the left instead of traveling straight because of the friction of the surface. The opposing vectors create a lateral vector and the river is forced to turn right or left. Then as the river bends, additional friction causes the water to flow in an alternating corkscrew pattern known as helical flow. This helical flow erodes the cut banks and fills in the point bars, thus exaggerating the bends into a full-fledged meandering river, a classical example of which is seen here. Some large rivers want to meander and others want to braid. A variety of factors are involved, including gradient, composition of the sediment, bank strength, channel depth, and vegetation. The November quiz is located at ftp://nhdftp.usgs.gov/Quiz/Hydrography5.pdf. Name the river and where this stretch is located. Note that the polygons with the dots are Area of Complex Channel, meaning that there are hundreds of braids within this. Much (if not all) of the water in this river has melted off a mountain first climbed by the Sourdough Boys in 1906.

Recent and Upcoming NHD Workshops and Papers

November 4, Little Rock, Arkansas – Arkansas GIS Conference, http://www.argisforum.org/
November 8 and 9, Columbus, Ohio - The Ohio State University. Contact David Alvarez at alvarez.52@osu.edu.
November 10, Columbus, Ohio - U.S. Geological Survey. Contact Charley Hickman at chickman@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.