USGS National Hydrography Dataset Newsletter
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by Jeff Simley, USGS

NHD Challenges in Louisiana – by Bill Smith

The State of Louisiana is in the process of updating several NHD subbasins in the State. The coastal waters in Louisiana have presented serious challenges for the NHD, including (1) how to manage NHD features that change often and rapidly, (2) how to best manage flow in areas where the water actually moves bi-directionally, and (3) how to manage what is currently considered coast. The Louisiana Department of Environmental Quality and Department of Transportation are representing the interests of the state in working with the USGS. The state has special considerations when dealing with NHD maintenance and revision based on the age of the NHD and how quickly features change in the Gulf of Mexico. Severe weather events, plus the Gulf oil spill, place demands on the NHD from emergency operations personnel and many others who require accurate data to complete their mission.

A majority of the NHD in coastal Louisiana is based on 25–30 year-old sources and clearly requires updating. Revising the NHD in Louisiana is difficult, but can be completed using the NHDGeoEdit Tool and NHDConflation Tool. Both have a defined purpose, and editors should decide early in the revision process which process will work most efficiently given their unique challenges. Once the data is brought up-to-date, the question then becomes how to effectively manage the NHD to prevent the data from rapidly becoming obsolete or unusable. This issue can best be addressed by developing techniques and features that lend themselves to maintenance. Louisiana is looking at the possibility of changing some major features in the state's NHD. Features such as Swamp/Marsh change rapidly as the perimeter of the polygons fluctuate with the weather. The stewards are looking at the possibility of implementing a new NHDArea feature "Area of Complex Swamp/Marsh" where larger master polygons will consolidate the many smaller Swamp/Marsh polygons. This new feature could be valuable not only in coastal waters, but also in some northern States with many Swamp/Marsh areas.

The collection of the coastline in Louisiana was only a snapshot in time and each hurricane that hits the coast will alter the coastline. Louisiana would prefer to develop a land-water interface that more closely resembles the actual coastline. Conventional thinking of a coast defines it as a hard line between water and dry land. In Louisiana this is often a soft boundary with many miles of marshland between the open water and the dry land. Is it possible to develop a new NHDArea polygon feature that would further define the difference in modeling between open waters, marsh areas, then dry land. This could include artificial paths to model the flow in assisting planners for disaster recovery efforts and in planning how the storm surge actually moves through these coastal features. Another issue involves the many small islands in the Gulf, many of which are Swamp/Marsh polygons. The NHDFlowline Coastline, which changes often, could be eliminated from the perimeter reducing the workload of maintaining ReachCodes.

Mixed within the many polygons representing Swamp/Marsh in Louisiana are an extensive NHDFlowline network of artificial paths used to model flow through the polygons. Often these artificial paths are redundant and maintaining them takes much time and expense. Some artificial paths may no longer be attributed as "WithDigitized", but would rather be attributed as 'Uninitialized' restricting them from participating in the flow analysis. This would occur south of a line based on water records, salinity, vegetation, and other factors. All artificial paths in main shipping channels, in major Stream/River features entering the Gulf from the main land, and some named canals will be left as "WithDigitized" to allow some flow from the mainland to the Gulf. Many canals and shipping channels in the Gulf area actually flow in two directions, based on tidal effects. Currently, a flowline in the NHD may have direction indicating flow, but this is restricted to one-directional flow. The NHD is reviewing the potential for bi-directional flow that will more closely resemble what is actually occurring. This could

benefit many people. The bi-directional attribute may not directly usable at this time in the NHD's geometric network, but at least it could encoded for future use. For more information contact Bill Smith at wjsmith@usgs.gov.

Highlights from the Pennsylvania NHD Mini Conference - Part I - by The Pennsylvania NHD Committee

The Pennsylvania NHD Mini Conference was held September 8th and 9th at the Pennsylvania Geologic Survey office in Middletown, PA. The purpose of this meeting was to discuss the current status and applications, issues, challenges, and opportunities for working with and enhancing the PA NHD. A wide range of specific topics were addressed by invited speakers: David Anderson (USGS), Amanda Hasemeier (NRCS), David Terrell (USGS), and David Gilbert (GeoDecisions/PAMAGIC). The mini conference was attended by 30 individuals from different organizations including state, local, and federal government agencies, industry, and nonprofit organizations.

Pennsylvania has two separate, but inextricably connected problems as identified by the Committee: a need to use the statewide LiDAR dataset to convert the NHD to a 1:2,400-scale dataset known as the PHD – Pennsylvania Hydrography Dataset; and a long-term need to construct a multi-partner, flexible stewardship arrangement to keep that more demanding dataset accurate and current. The conclusion, through much discussion, is that there is a need to raise $100,000 for a first-phase treatment of both issues, consisting of a needs assessment, a requirements study, and construction of specifications for conversion to local resolution.

What can NHD do for Pennsylvania? It can geospatially reference features to the surface waters of the state including dams, stream gauges, divergence structures, public intakes, TMDLs, impaired water systems, aquatic species habitats, STORET data, pollution discharges, stream classes etc. The web sites BASINS, SPARROW, NRIS, and StreamStats use the NHD. ICWater (Incident Command Water) can calculate the time and flow of a contamination from source to intake.

There are still a small number of errors, relative to the size of the database, with the NHD. Problems in the database can include misclassifications and density differences. There are hierarchical differences and geographic names differences, specifically branch names in water bodies. In addition, Karst breaks in hydro network were problematic. The USGS needs stewardship to maintain the database using local knowledge. DEP has not provided much input so USGS is looking to get other entities involved including academia. Short comings in Pennsylvania include stream movement, urban areas that hide streamflow, and stream changes caused by development. Pennsylvania LiDAR may or may not be the best base for NHD. PA NHD data currently can be expressed as 85% correct. Pennsylvania state level data stream system was built for DEP but this data was not integrated in USGS model. For more information, contact Tom Mueller at Mueller@calu.edu.

Stream Density

Many people are interested in the density of streams in the NHD. The analysis below looks at 26 HU4's (subbasins) in HU2 (subregion) 1802, over the Sacramento Valley area of California at 1:24,000-scale. The overall average is 1.49 kilometers of NHDFlowline per square kilometer. The standard deviation is a modest 0.34. These Flowlines consist predominately of Stream/River, but also contain Artificial Paths through rivers and lakes, Canals, water Pipelines, and Connectors. These features were primarily extracted from 7.5-minute series topographic maps. When ephemeral streams are included (over USFS lands), the density rises towards 4.23 km/km^2. Large canal networks are also noted.

Subbasin	Name	km2	km Flowline	Density	Area	km w/ Eph.	Dens. w/ Eph.
0001		2795	3134	1.12			
0002		6879	7847	1.14			
0003		6765	5782	0.85	10% Eph.	8638	1.28
0004		1746	2441	1.40	80% Eph.	4665	2.67
0005		1518	2435	1.60	90% Eph.	4764	3.14
0104		4826	8308	1.72	50% Canal		
0111		749	880	1.19			
0116		2984	7794	2.61	20% Canal		
0121		3104	4233	1.36	20% Eph.	6197	2.00
0122		2633	4178	1.59	100% Eph.	11132	4.23
0123		3496	5896	1.69	80% Eph.	12913	3.69
0125		3445	5116	1.49	70% Eph.	11878	3.45
0126		1215	1940	1.60			
0128		2594	3342	1.29	80% Eph.	8871	3.42
0129		2176	2827	1.30	80% Eph.	6532	3.00
0151		1095	1700	1.55			
0152		2418	4669	1.93			
0153		946	1101	1.16			
0154		1757	3067	1.75			
0155		1085	1991	1.84			
0157		2439	3986	1.63			
0158		2099	3805	1.81	40% Canal		
0159		1982	2716	1.37	10% Canal		
0161		1111	1814	1.63	20% Canal		
0162		1676	2352	1.40			
0163		3147	5699	1.81	40% Canal		
Total		66680	99053	1.49			

Local Resolution NHD Data Using LiDAR in South Carolina by David Arnold

Light Detection and Ranging (LiDAR), the use of laser pulses and associated analytical software to determine the topography of an area, is increasingly being used to generate hydrographic features. Some states are using LiDAR derived hydro break lines to update the NHD. Within Region 5, Florence County in South Carolina is developing a pilot project to update the NHD with local resolution hydrography. In the process of doing this, plans are to develop of a set of pre-conflation guidelines and instructions for the preparation of LiDAR derived hydro that could be applied to the NHD throughout the country. In May 2010, the USGS provided a WebEx session to interested users from both Florence County and the University of South Carolina. This demonstration detailed the process of importing raw LiDAR data into an NHD geodatabase template schema, as well as how the imported data needs to be modified to ready it for the GeoConflation process. In July 2010, after the initial edits from Florence County were reviewed, the USGS provided a second WebEx presentation to the South Carolina NHD users to discuss the progress of the project. During this session details were discussed on what was completed and what still needs to be accomplished before the geodatabase containing the LiDAR data will be ready for GeoConflation. NHD GeoConflation training for the appropriate NHD users is tentatively scheduled for October 25-27, 2010. For more information contact David Arnold at darnold@usgs.gov.

NHD Photo of the Month

This month's photo was submitted by John Kosovich of the USGS and shows Taylor Park Reservoir near Gunnison, Colorado. The reservoir was built as part of the Uncompahgre Project. To see the photo of the month go to ftp://nhdftp.usgs.gov/Hydro_Images/TaylorReservoir.jpg. The map was made by Kathy Isham. Submit your photo for the NHD Photo of the Month by sending it to krisham@usgs.gov.

August Hydrography Quiz / New September Quiz

Bill Wilen was the first to correctly guess the August hydrography quiz as the Lake Superior harbor of Duluth, Minnesota/Superior, Wisconsin. See ftp://nhdftp.usgs.gov/Quiz/Hydrography61.pdf. Bill joined the U.S. Fish and Wildlife Service's National Wetlands Inventory in 1976. He has worked for NWI in various positions ever since. Currently, he chairs the Federal Geographic Data Committee's Wetlands Working Committee. Both the committee's wetlands classification system and mapping standard are Federal Geographic Data Committee Standards. He has also been involved with the Sea Level Affecting Marshes Model (SLAMM) for nearly 25 years and with the on-line viewer SLAMM-view since its inception. See the NWI's Wetlands Mapper: http://www.fws.gov/wetlands/

Others with the correct answer were (in order received): Calvin Meyer, Al Rea, Linda Davis, Matthew Starry, Richard Patton, Roger Barlow, Steve Shivers, Joanna Wood, Ken Koch, Dan Sandhous, Ellen Finelli, David Straub, Jim McDonald, Jim Seay, Ron Wencl, Jennifer Campbell-Allison, Kevin Amick, John Lynam, Tia Morita and David Asbury.

Matthew Starry pointed out that the port is ranked number one in terms of total cargo volume out of Great Lakes ports. He notes there have been many shipments of wind turbine components lately in and out of the ports. Major shipments out of the port include coal, taconite, and grain with limestone, salt, and cement being shipped in (among other things). See http://www.duluthport.com/port.php. Joanna Wood pointed out that this is the mouth of the St. Louis River. Ron Wencl writes that this view of Duluth/Superior harbor highlights some of the characteristics of this region. Stream density is different on the "south shore" of Lake Superior while the "north shore" is characterized with rocky waterfalls associated with an old fault line that now defines the shoreline. There is very old Pre-Cambrian bedrock in northeast MN with extensive old basalt flows and gabbro outcrops around the area. The "south shore" in Wisconsin is more easily eroded sandstone. There are some really neat dikes in the exposed bedrock on portions of the St. Louis River and local streams.

This month's hydrography quiz can be found at ftp://nhdftp.usgs.gov/Quiz/Hydrography62.pdf. This is a photo of Stephen Daw, the USGS Point–of-Contact for WBD stewardship, standing on top of a 13,700+ foot mountain pouring water directly on top of the triple divide between the Missouri, Arkansas, and Colorado Rivers where three hydrologic regions, or HU2's, meet. What's the name of this mountain? Send your guess to jdsimley@usgs.gov.

Upcoming NHD Training

October 25 - 27: NHD GeoConflation, Columbia, SC., Contact Dave Arnold (darnold@usgs.gov)
October 25 - 28: NHD Applications, Texas GIS Forum, Austin, TX - Contact BJ Smith (wjsmith@usgs.gov)
November 3 - Basic HEM Functions - 4 Hour WebEx, Sign up at: http://nhd.usgs.gov/tools.html#hem Contact: HEM@usgs.gov
December 2 - Advanced HEM Functions - 4 Hour WebEx, Sign up at: http://nhd.usgs.gov/tools.html#hem Contact: HEM@usgs.gov

January 12-13 - HEM 2 Day Classroom (Denver) Sign up at: http://nhd.usgs.gov/html#hem Contact: HEM@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.